H. A. HUMPHREY.

ELEVATOR.

APPLICATION FILED DEC. 21, 1908.

963,567.

Patented July 5, 1910.

3 SHEETS—SHEET 1.

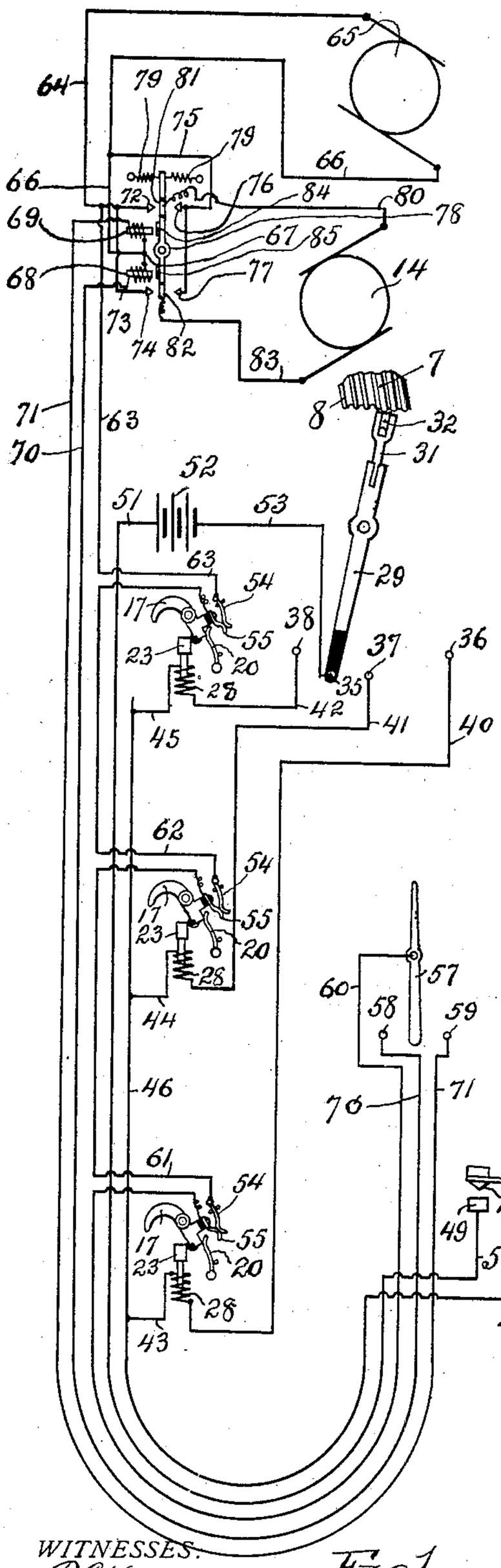

Fig 1

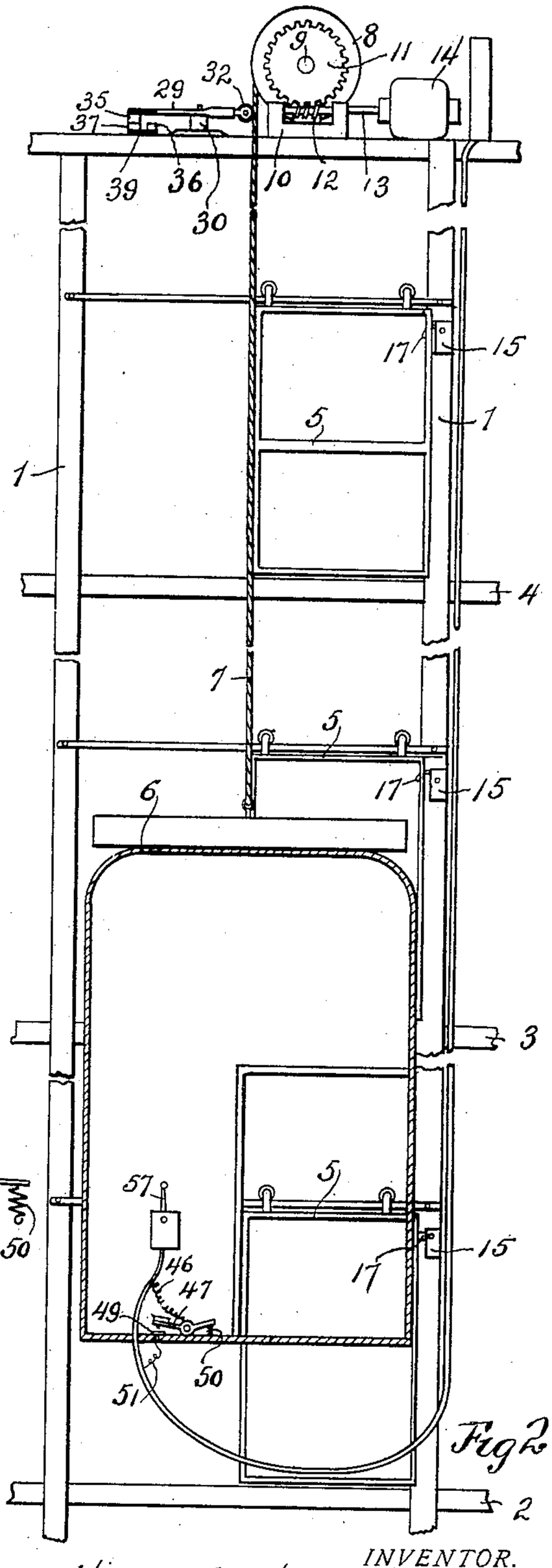

Fig 2

WITNESSES.

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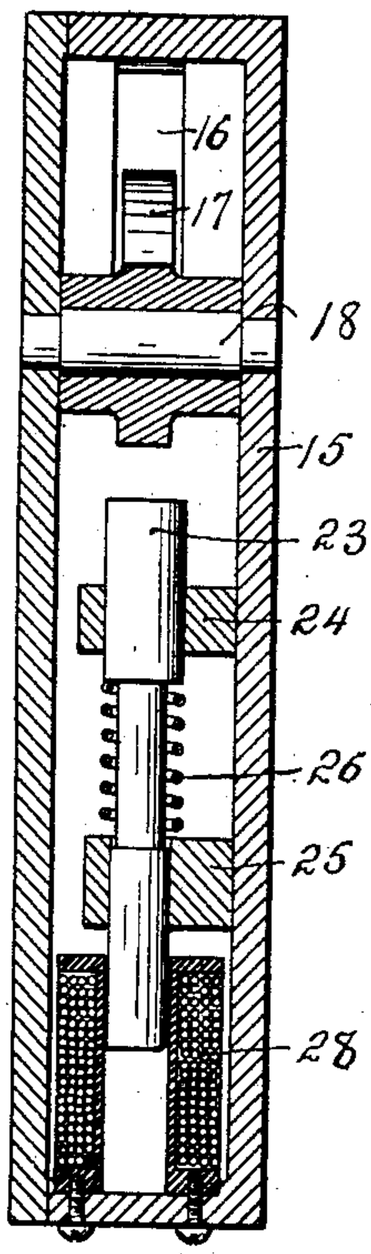

Fig 4

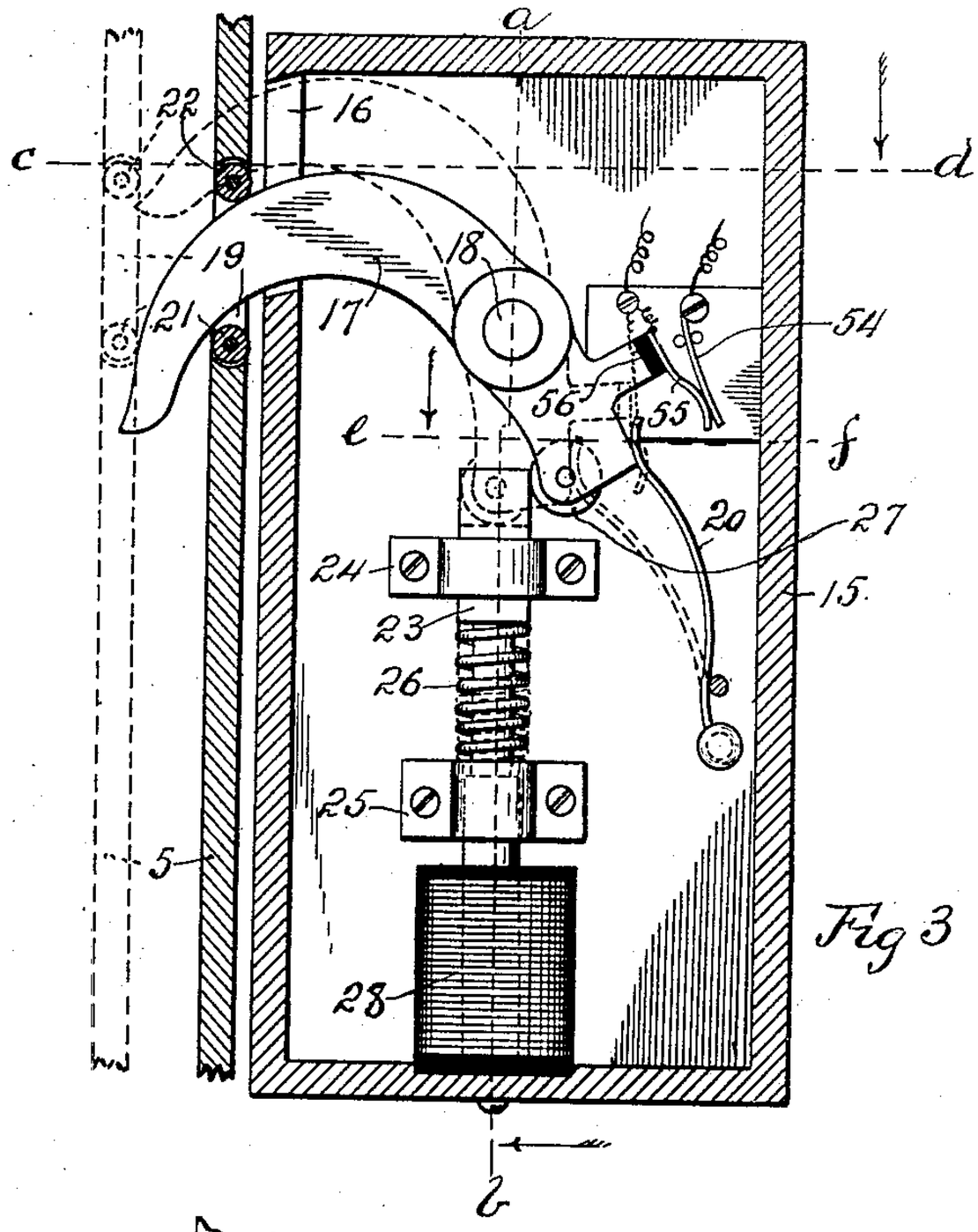

Fig 3

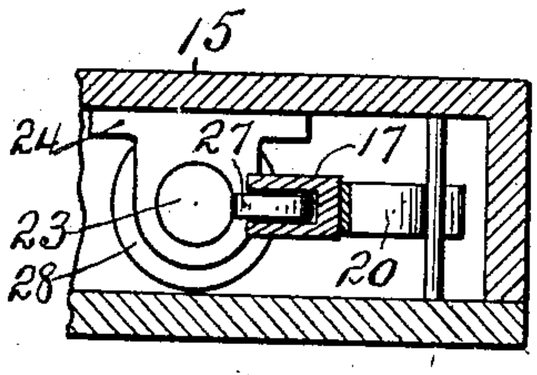

Fig 6

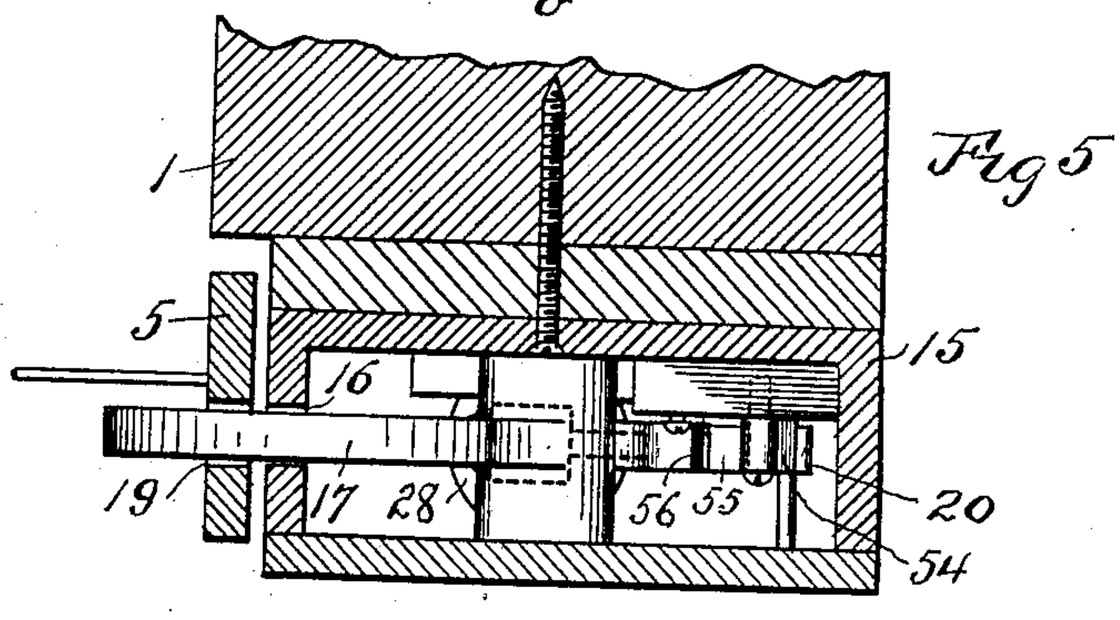

Fig 5

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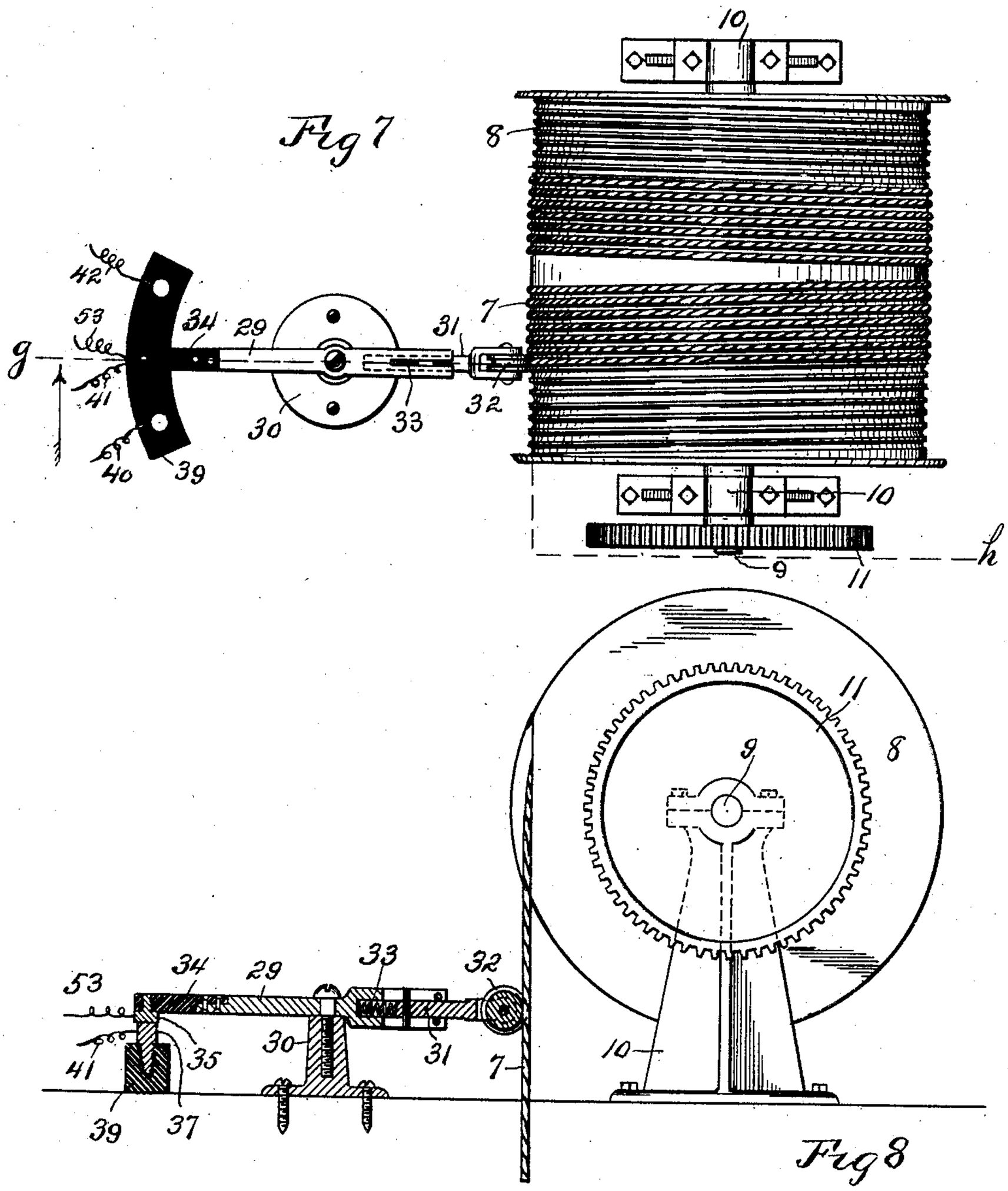
3 SHEETS—SHEET 3.

Fig 7



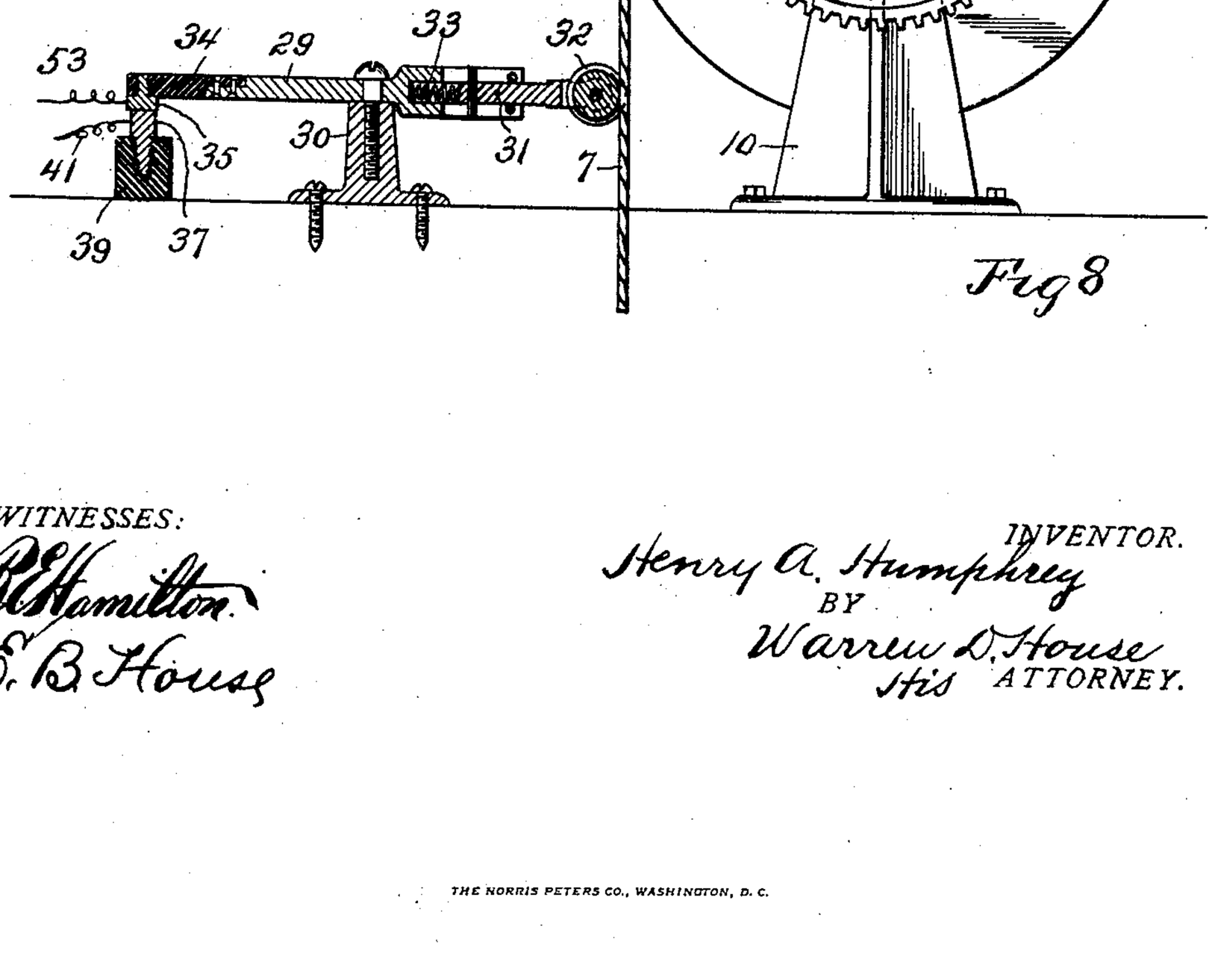


Fig 8

WITNESSES:

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UNITED STATES PATENT OFFICE.

HENRY A. HUMPHREY, OF KANSAS CITY, MISSOURI, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO SAFETY ELEVATOR LOCK AND SIGNAL COMPANY, A CORPORATION OF MISSOURI.

ELEVATOR.

963,567. Specification of Letters Patent. Patented July 5, 1910.

Application filed December 21, 1908. Serial No. 468,641.

To all whom it may concern:

Be it known that I, HENRY A. HUMPHREY, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented a certain new and useful Improvement in Elevators, of which the following is a specification.

My invention relates to improvements in elevators.

The object of my invention is to provide an elevator construction which will eliminate the danger of any one falling through an open gateway into an elevator shaft. I accomplish this result by providing a construction in which the elevator gates are normally held in the locked, closed position and can be opened only when the car is at the floor at which the gate to be opened is located, means being provided for preventing movement of the car from a floor unless the gate at that particular floor is in the locked, closed position.

My invention provides further, means by which the car hoisting mechanism becomes inoperative if one of the shaft gates is not in the closed position.

The novel features of my invention are hereinafter fully described and claimed.

In the accompanying drawings illustrative of my invention—Figure 1 is a diagrammatic view of the different circuits. Fig. 2 is a view partly in elevation and partly in vertical section, and partly broken away, of an elevator embodying my invention. Fig. 3 is an enlarged vertical sectional view of one of the gate locking mechanisms, the locking hook and gate being shown in solid lines in a locked position, and in dotted lines in the unlocked position. Fig. 4 is a vertical sectional view taken on the dotted line *a*—*b* of Fig. 3. Fig. 5 is a horizontal sectional view taken on the dotted line *c*—*d* of Fig. 3. Fig. 6 is a horizontal sectional view taken on the dotted line *e*—*f* of Fig. 3. Fig. 7 is a plan view enlarged of the hoisting drum and mechanism connected therewith. Fig. 8 is a vertical sectional view taken on the broken dotted line *g*—*h* of Fig. 7.

Similar characters of reference denote similar parts.

1 denotes the walls of the elevator shaft which extends through the different floors of the building, such as 2, 3 and 4.

The gates, denoted by 5, and located respectively at the different floors, may be of any well known construction, preferably of the horizontal sliding type, shown in the drawings.

6 denotes the car, which may be of any desired construction, and which is supported and hoisted by any desired type of hoisting mechanism.

In the drawings, I have illustrated a construction provided with a wire cable 7, secured to the car 6 and mounted upon a horizontal hoisting drum 8, secured upon a horizontal shaft 9, mounted in suitably supported bearings 10, the shaft having secured to it a worm gear 11, which meshes with worm threads 12, provided on the armature shaft 13, of an electric motor 14.

The gates 5 are provided respectively with a plurality of locking devices, each comprising the following described parts:—15 denotes a casing, secured to the shaft wall 1, and provided in the vertical wall adjacent to the adjacent gate 5 with a vertical slot 16, through which extends the concavo-convex end of a locking hook 17, pivotally mounted on a horizontal stud 18, having its ends supported in opposite vertical walls of the casing 15. The curved outer end of the hook 17 is adapted, when the gate 5 is moved to the closed position, shown in solid lines in Fig. 3, to enter a vertical slot 19, provided in the gate 5, at such times as the hook 17 is swung to the position shown in dotted lines in Fig. 3. To swing the hook to said position a flat spring 20 is provided. This spring is secured rigidly at its lower end to the casing 15 and at its upper end bears against the rear side of the hook 17, below the stud 18. In the slot 19 of the gate 5, are rotatively mounted two horizontal rollers 21 and 22, between which the outer end of the hook 17 is adapted to enter when the hook is in the unlocked position, shown in dotted lines in Fig. 3. When the gate 5 is moved from the open position, as shown in dotted lines in Fig. 3, to the closed position shown in solid lines, the hook 17 will enter the slot 19 and will be depressed by the roller 22 to the position shown in solid lines in Fig. 3.

A preferable means for holding the hook 17 releasably in the locked position, comprises the following described parts:—A vertical magnetizable core is vertically slidable in bearings 24 and 25, provided in the

casing 15. The core 23 is adapted to have its upper end disposed in a position in which it will be in the path of movement of the lower end of the hook 17. To normally retain the core 23 in this last named position, a coil spring 26, encircling said core, has its lower end bearing upon the bearing 25 and its upper end bearing against the enlarged upper end of the core 23. The hook 17 has preferably mounted thereon a friction roller 27, which is adapted, as shown in Fig. 3, to come in contact with the core 23, when the core is in the raised position, thereby preventing the hook 17 being swung from the locked position in which the hook engages the roller 21 and prevents the gate being opened. When the core 23 is downwardly drawn to the position shown in dotted lines in Fig. 3, the spring 20 will force the hook 17 to the open position when the gate 5 is also moved to the open position. In order that the core 23 be retracted downwardly to permit the opening of the gate when the car 6 reaches the floor at which the gate to be opened is located, I provide means controlled by the hoisting mechanism, which will operate to draw the core 23 downward when the car reaches the floor. I also preferably provide on the car means by which the operator of the car may, at his option, bring into operation this hoisting controlled means.

I will now describe the preferred form of mechanism which is designed to effect the downward pulling of the cores 23:—A plurality of helices 28 are respectively mounted in the casings 15. The cores 23 extend respectively, at their lower ends, into the upper ends of the helices 28, which, when energized, will respectively pull downward the cores 23, thereby permitting the springs 20, when the gates 5 are opened, to swing the locking hooks 17 to the open position.

Referring to Fig. 1 and also to Figs. 7 and 8, 29 denotes a horizontal lever pivoted to swing on a vertical axis on a suitable support 30, disposed adjacent to one side of the drum 8. One end of the lever 29 is longitudinally slotted and has longitudinally slidable therein, a horizontal bar 31, upon the outer end of which is pivotally mounted a grooved roller 32 which engages the hoisting cable 7. A coil spring 33, located in the slot in the lever 29, bears against the inner end of the bar 31 and normally forces said bar outwardly so that the roller 32 will have its grooved periphery always in engagement with the cable 7 irrespective of the swinging movement of the lever. The opposite end of the lever 29 has secured to it a block of insulation 34, to which is secured an electrical contact plate 35, adapted to consecutively make contact with contact posts 36, 37, and 38, when the lever 29 is swung to and fro by the winding and unwinding of the cable 7 on the drum 8, as the car 6 moves from floor to floor, upward and downward in the elevator shaft. The contact posts 36, 37 and 38 are secured in a block of insulating material 39 and are respectively connected by conductors 40, 41 and 42 with one set of ends of the windings of the helices 28, the other set of ends of which are respectively connected by conductors 43, 44 and 45, with a conductor 46 which in turn is connected to a lever 47, pivotally supported on the floor of the car 6 and which is provided with a contact 48, normally held out of contact with a contact 49, by means of a spring 50 connected to the lever 47 and to the floor of the car. The contact 49, which is secured on the floor of the car, is connected by a conductor 51 with a battery 52, which is connected by a conductor 53 with the contact 35.

From the above it will be understood that as the car moves upwardly from floor to floor the cable 7 being wound upon the drum 8 will swing the lever 29 so that the contact 35 carried thereby will successively come in contact with contact posts 36, 37 and 38, thus successively completing the circuit containing the battery 52 through the helices 28, located at floors 2, 3 and 4 respectively. The circuit containing the battery however, will not be completely closed unless the operator on the car or some other person carried by the car, swings the lever 47 so as to bring together the contacts 48 and 49.

When the operator reaches a floor at which it is desired to stop, as for instance, at floor 3, he will depress the lever 47 so as to close the circuit containing battery 52 at contacts 48 and 49. At this time the lever 29 will be in the middle position shown in Figs. 7 and 8, in which contact 35 will rest upon contact post 37, thus completing the circuit including battery 52, through conductors 41 and 44, helix 28 connected to said conductors, conductor 46, lever 47, contacts 48 and 49, conductor 51, battery 52, and conductor 53. The energizing of the said helix 28 will cause the adjacent core 23 to be drawn downward, thereby releasing the adjacent hook 17 so as to prevent its being swung to the open position and also permitting the operator to open the gate 5 adjacent to the car.

To prevent the car from being moved from the floor until the gate has been closed, I provide means for causing the opening of the gate to break the circuit containing the electric motor 14, which actuates the hoisting mechanism. The preferable means for effecting this result comprises the following described mechanism:—A plurality of contact plates 54 are secured respectively to the inner walls of the casings 15. A plurality of contact plates 55 are secured upon the locking hooks 17 respectively but are respectively insulated therefrom by insulating blocks 56. The contact plates 55 are so ar-

ranged that they will respectively make contact with the plates 54 when the hooks 17 are in the locked position shown in solid lines in Fig. 3. When the locking hooks 17 are in the open position shown in dotted lines in Fig. 3, the contact plates 55 and 54 will be separated from each other. The contact plates 55 and 54 are all located in circuit with the motor 14 so that when any one of the sets of plates 54 and 55 have their members separated from each other the circuit containing said plates and the motor 14 will be broken.

Any desired system may be employed for connecting in circuit the motor 14 and the contact plates 54 and 55. In Fig. 1 I have illustrated a system for effecting this result. Pivotally mounted on the car 6 is an operating lever 57 which is adapted alternately to be swung to positions in which it will make contact with contacts 58 and 59. The lever 57 is of conducting material and is connected by a conductor 60 with the lowest one of the contact plates 55. The lowest contact plate 54 is connected by a conductor 61 with the next higher contact 55. The next higher contact 54 is connected by a conductor 62 with the uppermost contact 55. The uppermost contact 54 is connected by a conductor 63 with a conductor 64 which is connected to one brush of an electric generator 65, the other brush of which is connected by a conductor 66 which in turn is connected to a conductor 67 which connects one set of ends of the windings of two electro magnets 68 and 69, the other set of ends being connected by conductors 70 and 71 respectively to the contacts 58 and 59. Connected to the conductor 64 is a contact 72 and connected also to said conductor is a conductor 73 which is connected to the contact 74. A conductor 75 is connected to conductor 66 and to two contacts 76 and 77. A contact bar 78 is pivotally mounted intermediate the electro magnets 68 and 69 and intermediate contacts 72, 74 and 76, 77. Two springs 79, disposed at opposite sides of and secured to the lever 78, normally hold said lever out of engagement with the contacts 72, 74, 76 and 77. A conductor 80 is connected at one end to one brush of the motor 14 and at its other end to a contact plate 81, carried by but insulated from the lever 78. A similar contact plate 82 is carried by and insulated from the lever 78 and is connected by a conductor 83 with the opposite brush of the motor 14. The lever 78 at opposite sides of the pivotal point of said lever has mounted thereon two armatures 84 and 85, disposed respectively in the magnetic fields of magnets 69 and 68.

By swinging the lever 57 to and fro the operator may direct the current through the motor 14 in opposite directions, thereby reversing the motor so as to have the car move upward or downward as desired. When the lever 57 is swung against contact 58, all the contact plates 54 and 55 being at the time in the closed position, the current will pass from the generator 65 by conductors 66, conductor 67, thence through electromagnet 68 and conductor 70 to contact 58, thence by lever 57 and conductor 60 to the lower contacts 55 and 54, thence by conductor 61 to the next higher contacts 55 and 54, thence by conductor 62 to the uppermost contacts 55 and 54, and thence by conductors 63 and 64 to the generator 65. The magnet 68 being energized will attract the armature 85 thereby swinging the lever 78 to a position in which the contacts 81 and 82 carried thereby will respectively contact with the contacts 76 and 73. A portion of the current from the generator 65 will now pass therefrom by conductor 66 to conductor 75, thence to contact 76, thence through contact 81 and conductor 80 to one brush of the motor 14, thence through the motor 14 and its opposite brush, to the conductor 83, thence through contacts 82 and 74 to conductor 73, thence through conductor 64 back to the generator 65.

Upon swinging the lever 57 against contact 59 the currents will pass from generator 65 through conductors 66 and 67, magnet 69, conductor 71, to contact 59, thence through lever 57, conductor 60, back to generator 65 in the path heretofore described. The magnet 69 being energized will attract the armature 84 and swing the lever 78 so that contacts 81 and 82 are respectively against contacts 72 and 77. The current will now pass from generator 65 through conductors 66 and 75 to and through contacts 77 and 82, thence through conductor 83, to and through motor 14, thence by conductor 80 to and through contacts 81 and 72 and thence by conductor 64 back to generator 65.

From the above it will be seen that the direction of the current through the motor 14 may be changed by swinging the lever 57 from the contact 58 to the contact 59. When the lever 57 is swung to the intermediate position, as shown in Fig. 1, the circuits containing the magnets 68 and 69 will be broken, upon which the springs 79 will swing the lever 78 to the neutral position shown in Fig. 1, thereby breaking the circuit connecting motor 14 with generator 65.

From the above description it will be understood that the gates 5 will be held locked in the closed position excepting at such time as the elevator is disposed in a position such that the lever 29 closes one of the circuits containing the contacts 36, 37 and 38, and the operator at the same time has depressed the lever 47 so as to bring the contacts 48 and 49 together. At such time the adjacent gate 5 may be slid to the open position but upon this being done the motor circuit will

be broken by the separation of the adjacent contacts 54 and 55. The motor circuit will remain broken and the operator will therefore be unable to move his car from the floor at which it is standing until the gate has been again closed and he has removed his foot from the lever 47. As the gates 5 can only be opened when the car 6 is opposite thereto and as the car cannot move until the gate has been closed, it will be impossible for any one to fall into the elevator shaft through a gateway.

I do not limit my invention to the particular construction herein described as many modifications thereof within the scope of the appended claims may be made without departing from the spirit of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:—

1. In elevators, the combination with a car, of car hoisting means, an electric motor for actuating said hoisting means, an electric circuit in which the motor is located, a gate, gate locking means, a supplemental circuit, means actuated by said hoisting means for controlling said supplemental circuit, means located in said supplemental circuit for controlling said locking means, and means actuated by said locking means for controlling the first named circuit.

2. In elevators, the combination with a car, of car hoisting means, an electric motor for actuating the hoisting means, an electric circuit in which said motor is located, a gate, gate locking means, means controlled by said hoisting means for controlling said locking means, manually operated means carried by the car for controlling said controlling means, and means actuated by said locking means for controlling said circuit.

3. In elevators, the combination with a car, of car hoisting means, an electric motor for actuating said hoisting means, an electric circuit in which the motor is located, a gate, gate locking means, a supplemental circuit, means actuated by said hoisting means for controlling said supplemental circuit, means carried by the car for controlling said supplemental circuit, means located in said supplemental circuit for controlling said locking means, and means actuated by said locking means for controlling the first named circuit.

4. In elevators, the combination with a car, of car hoisting means, an electric motor for actuating said hoisting means, a circuit containing said motor, a plurality of gates, a plurality of gate locking means for respectively locking said gates, means controlled by said hoisting means for controlling said locking means, means carried by the car for controlling said controlling means, and a plurality of means respectively actuated by said locking means for controlling said circuit.

5. In elevators, the combination with a car, of car hoisting means, an electric motor for actuating said hoisting means, a circuit containing said motor, a plurality of gates, a plurality of gate locking means for respectively locking said gates, a supplemental circuit, means actuated by said hoisting means for controlling said supplemental circuit, a plurality of means located in said supplemental circuit for respectively controlling said locking means, and a plurality of means actuated by said locking means respectively for controlling the first named circuit.

6. In elevators, the combination with a car, of car hoisting means, an electric motor for actuating said hoisting means, a circuit containing said motor, a plurality of gates, a plurality of gate locking means for respectively locking said gates, a supplemental circuit, means carried by the car for controlling said supplemental circuit, means actuated by said hoisting means for controlling said supplemental circuit, a plurality of means located in said supplemental circuit for respectively controlling said locking means, and a plurality of means actuated respectively by said locking means for controlling the first named circuit.

7. In elevators, the combination with an electric motor, of hoisting means operated thereby, a circuit containing said motor, a pivoted member, means connected with said pivoted member for controlling said circuit, electromagnetic means controlled by said hoisting means for controlling the swinging of said pivoted member, and a gate controlling the swinging of said pivoted member.

8. In elevators, the combination with an electric motor, of hoisting means operated thereby, a circuit containing said motor, means for making and breaking said circuit, a pivoted member for operating said circuit making and breaking means, electromagnetic means controlled by said hoisting means for controlling the swinging of said pivoted member, and a gate controlling the swinging of said pivoted member.

9. In elevators, the combination with an electric motor, of a circuit controlling said motor, hoisting means operated by said motor, a gate, a pivoted member for locking said gate in the closed position, electromagnetic means controlled by the hoisting means for controlling the swinging of the pivoted member, and means actuated by said pivoted member for controlling said circuit.

10. In elevators, the combination with an electric motor, of a circuit containing said motor, a gate, a pivoted member for locking said gate in the closed position, said pivoted member being movable when in one position

by said gate, electromagnetically actuated holding means for preventing movement of said pivoted member to said position, and means controlled by said pivoted member for controlling said circuit.

11. In elevators, the combination with an electric motor, of a circuit containing said motor, a pivoted locking member, circuit making and breaking means operated by said locking member, hoisting means operated by said motor, a gate adapted to be engaged and held in the closed position by said locking member, releasable means for holding said pivoted member in a locked position, in which position the circuit making and breaking means closes said circuit, and electromagnetic means controlled by said hoisting means for actuating said releasable means.

12. In elevators, the combination with an electric motor, of a circuit containing said motor, a gate, a pivoted member for locking said gate, means for holding said pivoted member engaged with said gate, hoisting means operated by said motor, means actuated by said hoisting means for actuating said holding means to release the pivoted member, and means actuated by said pivoted member for controlling said circuit.

13. In elevators, the combination with hoisting means, of a motor for operating said hoisting means, circuit controlling means, an electric circuit containing said motor and said controlling means, a gate, locking means for holding said gate in the closed position and actuating said controlling means, electromagnetic means controlling said locking means, and means actuated by said hoisting means for actuating said electromagnetic means.

14. In elevators, the combination with a plurality of gate locking means, of a plurality of releasable devices respectively controlling said locking means, hoisting means, a pivoted device actuated by said hoisting means, a plurality of means controlled by said locking means respectively for controlling the hoisting means, and means controlled by said pivoted device for consecutively operating said releasable devices.

15. In elevators, the combination with a gate locking device, of electromagnetic means controlling the operation of said locking means, a circuit containing said electromagnetic means, hoisting means, a lever operated by said hoisting means, and means actuated by said lever for controlling said circuit.

16. In elevators, the combination with gate locking means, of electromagnetic means controlling said locking means, a hoisting cable, a lever operated by said hoisting cable, an electric circuit containing said electromagnetic means, and means actuated by said lever for controlling said circuit.

17. In elevators, the combination with a hoisting cable, of a lever engaging said hoisting cable, a plurality of gate locking means, a car supported by said cable, circuit controlling means carried by said car, a plurality of electromagnetic devices respectively controlling said locking means, an electric circuit containing said circuit controlling means and said electromagnetic devices, and means actuated by said lever for successively closing said circuit through said electromagnetic devices.

18. In elevators, the combination with a car, of hoisting means for operating said car, circuit controlling means carried by said car, gate locking means, electromagnetic means controlling said gate locking means, an electric circuit containing said circuit controlling means and said electromagnetic means, and means actuated by said hoisting means for controlling said circuit.

19. In elevators, the combination with a hoisting drum, of a cable mounted thereon, a pivoted lever, a car, a plurality of gate locking means located at different points along the travel of said car, a plurality of electromagnetic means respectively controlling said gate locking means, a plurality of gates engaged by said locking means respectively, and means actuated by said lever for energizing said electromagnetic means at such times as the car is opposite said gates.

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

HENRY A. HUMPHREY.

Witnesses:

E. B. HOUSE,

R. E. HAMILTON.