J. E. BOYCE.

ELEVATOR DOOR LOCK.

APPLICATION FILED NOV. 30, 1907.

991,691. Patented May 9, 1911.

2 SHEETS—SHEET 1.

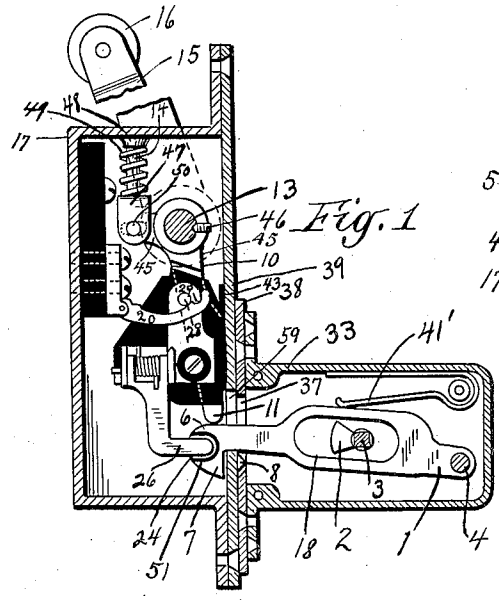

Fig. 1.

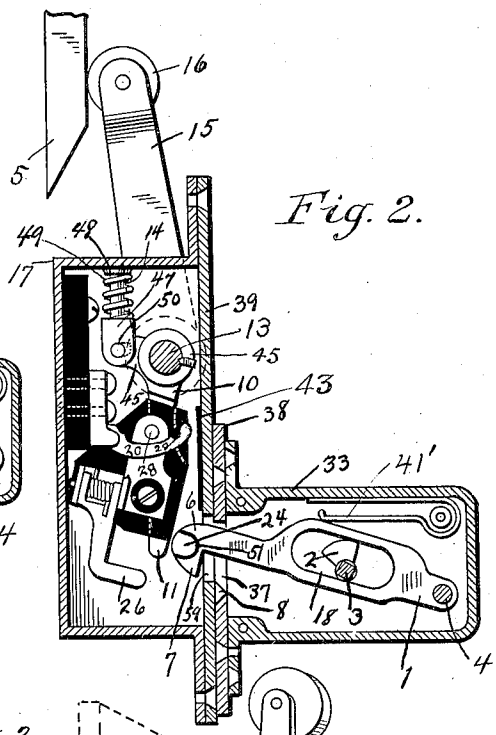

Fig. 2.

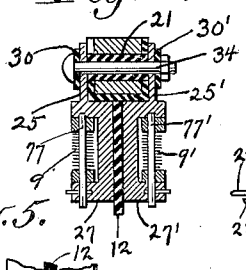

Fig. 4.

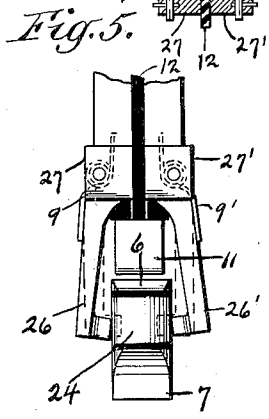

Fig. 5.

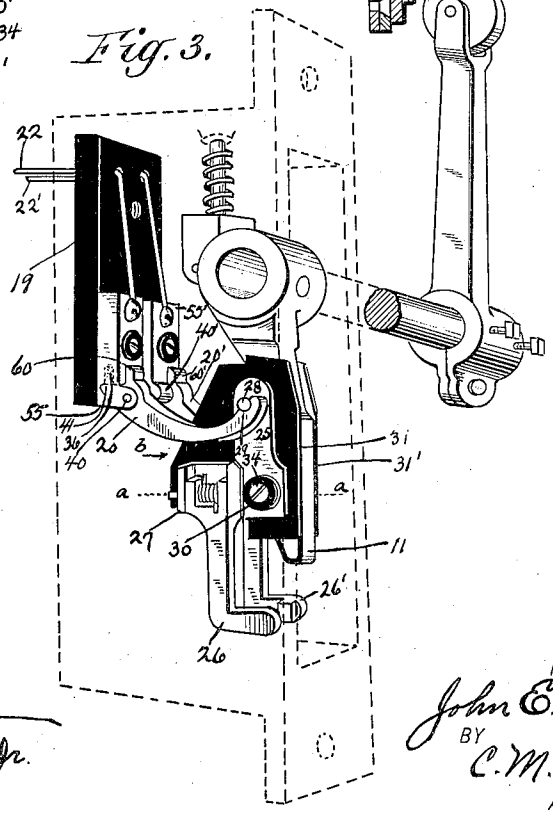

Fig. 3.

WITNESSES

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2 SHEETS—SHEET 2.

Fig. 7.

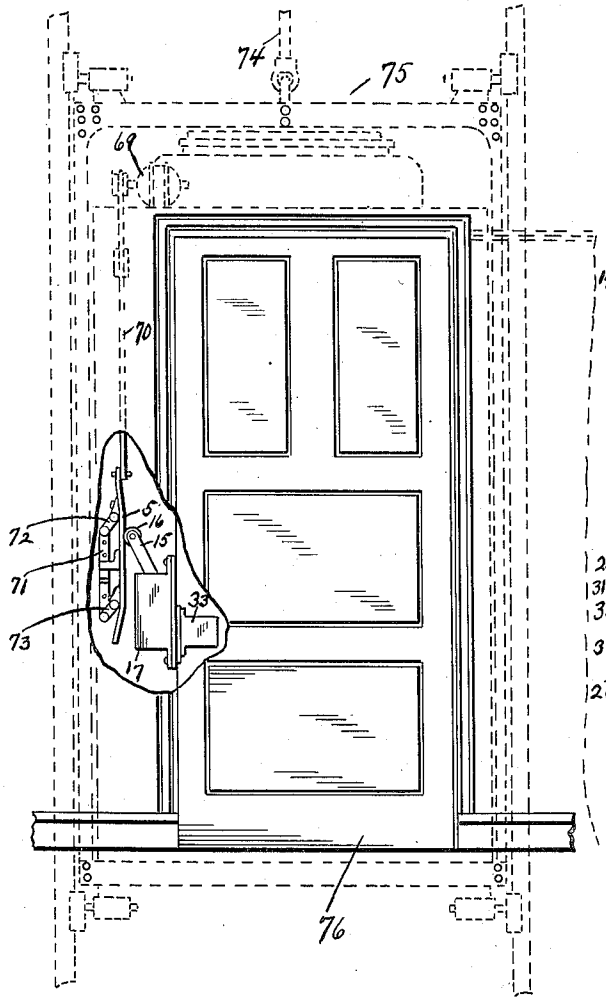
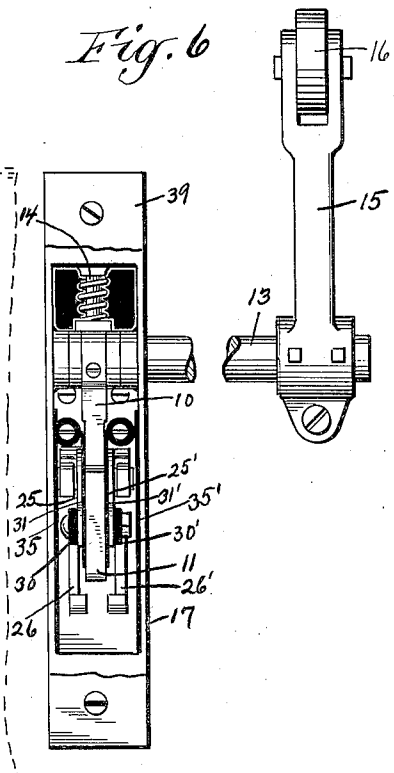


Fig. 6



WITNESSES

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UNITED STATES PATENT OFFICE.

JOHN E. BOYCE, OF NEW YORK, N. Y., ASSIGNOR TO OTIS ELEVATOR COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ELEVATOR-DOOR LOCK.

991,691. Specification of Letters Patent. Patented May 9, 1911.

Application filed November 30, 1907. Serial No. 404,501.

To all whom it may concern:

Be it known that I, JOHN E. BOYCE, a citizen of the United States, residing in New York city, in the county of New York and State of New York, have invented a new and useful Improvement in Elevator-Door Locks, of which the following is a specification.

My invention relates to locks for doors, and although it may have a general application, it is particularly adapted to elevator doors.

It is an improvement on the patent to Coyle, No. 671,878, granted April 9, 1901, lock for elevator doors.

One of the objects of my invention is to provide an improved, safe and efficient door lock.

A further object of this invention is the provision of a lock which shall be positive in its action, both as to locking the door and the closing of the circuit-closer co-acting with the locking mechanism.

Other objects of my invention are to provide a lock which shall have flexibility of parts so as to allow shrinkage of the doors and casing, or settling of the same, and which shall be free from exposed energized contacts at all times.

Another object of my invention is to provide improved means for locking the door before the door circuit-closer is placed in closed position, and for effecting an opening of said circuit-closer before the door is unlocked.

A further object of the invention is to provide means for limiting the outward movement of the movable contacts of the circuit-closer.

Other objects of the present invention will appear hereinafter, the novel combinations of elements being pointed out in the claims.

In the accompanying drawings, Figure 1 represents a sectional elevation of my invention with the parts in locking position; Fig. 2 is a similar view showing the lock in unlocked position; Fig. 3 is a perspective view illustrating more clearly the relation of the various parts; Fig. 4 is a horizontal plan sectional view taken on the line *a—a* of Fig. 3; Fig. 5 is a broken away elevational view of the mechanism shown in Fig. 3 looking in the direction of the arrow *b*; Fig. 6 is a side elevational view with the face plate of the keeper casing broken away to show the relation of parts in said casing; and Fig. 7 shows an application of my invention to an elevator door.

In a co-pending application, Serial No. 269,182, filed July 11, 1905, I have described and claimed an invention similar to the one disclosed herein. In that case, however, the lock was particularly adapted to swinging doors, whereas, in the present application the lock is designed for sliding doors. In another co-pending application, Serial No. 269,183, filed July 11, 1905, for an improvement in means for operating an elevator door lock, I have clearly set forth an application of a door circuit-closer when used in connection with an elevator system.

Referring to Fig. 1, it will be seen that I have provided in this instance a swinging latch bar 1 pivoted at 4, and provided with a longitudinal slot 18 in which is adapted to play a cam member 2 fixed to the spindle 3. The latch bar 1 is normally held down by the spring 41′, but when the knob attached to the spindle 3 is turned the latch bar may be lifted as indicated in Fig. 2, provided the cam 5 has been operated in a manner hereinafter explained. Instead of being pivoted, the latch bar 1 may be mounted so as to slide back and forth if desired.

The keeper casing 17 is provided with a rock-shaft 13 which extends outwardly and has adjustably secured to its outer end the arm 15. This arm 15 carries an anti-friction roller 16 at its upper end which is adapted to co-act with the cam 5 of the electro-magnetic cam apparatus shown in Fig. 7.

Attached to the rock-shaft 13, as by means of a set screw 46, is a bell-crank lever 45, one arm of which has a pin-and-slot connection 50 with the abutment 47. A vertical rod 14 extends from this abutment through an opening or recess in the circular boss 48 in the upper part of the casing 17. A spring 49 encircles the rod 14 between the abutment 47 and the boss 48, and acts to move the rock-shaft in anti-clockwise direction so as to hold the lever arm 15 in the position shown in Fig. 1. The other arm 10 of the bell-crank lever 45 extends downwardly to form a detent 11 at its lower end to co-act with the head 6 of the latch bar 1 when the latter is in its lowermost position as indicated in Fig. 1.

The lock casing 33 is provided with a face

plate 38 which has an opening 37 so that when the door is closed the beveled portion of the hook 7 will ride up on the incline 8 and then move through the opening 59 in the face plate 39 of the keeper casing 17. After passing through the opening 59, the spring 41′ will act to move the head 6 into its locking position, as indicated in Fig. 1. The head 6 has a section 24 which is separated from the body of the latch bar by means of insulation 51, and this section is arranged to connect certain movable terminals of an electric circuit, which in an electric elevator system would preferably be the controlling circuit.

Secured to the sides of the arm 10 by means of a bolt 34 are the conducting plates 25, 25′. Between these plates and the arm 10 are strips of insulation 31, 31′, and between the bolt 34 and the arm 10 are the insulating washers 30, 30′, and the insulating bushing 21.

Attached to the lower ends of the plates 25, 25′ and to the backs thereof are the supporting frames 27, 27′ for the movable terminals 26, 26′. The plates 25, 25′ may be integral with the frames 27, 27′ as indicated in Fig. 4, or they may be secured thereto in any desirable manner. A strip of insulation 12 separates the frames 27 and 27′ electrically from each other. The terminals 26, 26′ are spring-pressed, in that they are pivoted on the bearings 77, 77′ in the frames 27, 27′, respectively, and the springs 9, 9′ tend to move said terminals 26, 26′ toward each other, this movement being limited, however, by the upper ends of the terminal levers striking against their supporting frames. As indicated in Fig. 5, the insulated section 24 of the latch bar 1 is adapted to electrically connect the terminals 26 and 26′ when the parts are in locking position, as indicated in Fig. 1. Obviously the spring 49 tends to move the arm 10, together with the parts carried thereby, against the inner surface of the face plate 39 of the keeper casing, and to insure the proper insulation of the electric terminals from each other, a strip of insulating material 43 is placed in the path of the arm 10 and the detent 11 on the inner surface of said plate 39 just above the opening 59.

The parts are so adjusted that when the lock is in locked position, as indicated in Fig. 1, the pins 28 make a sliding electrical contact with the arms 20, 20′, but do not quite reach the notches 29 at the outer ends of said arms and at the upper sides thereof. If the face plate 39 is removed, however, as for example, when it is desired to repair or adjust any of the inclosed parts, the latch device comprising the arms 20, 20′, with the notches 29 therein, and the laterally projecting pins 28, will prevent the spring 49 from moving the rod 14 out of its recess or hole in the boss 48, and also prevent the terminals 26, 26′ from moving out of the casing 17. When the face plate is thus removed, the parts will assume the positions indicated in Fig. 3. Obviously, this outward movement of the arm 10 with the parts carried thereby, may be varied as desired, but it need be only slight. Preferably the arms 20, 20′ are pivoted respectively at 40, 40′ to metal blocks 55, 55′ on which are mounted the binding posts for the wires 22, 22′. These wires may be connected to any apparatus which it is desired to control, but in an elevator system they are preferably placed in the controlling circuit. The blocks 55, 55′ are secured to the casing 17, but insulated therefrom by means of the insulation 19. The arms 20, 20′ are movable in a downward direction against the action of the springs 36 which act on the heels 41. The upward movement of these arms is limited by the stops 60, 60′. The pins 28 are preferably located near the upper ends of the plates 25, 25′ and are connected thereto so as to laterally project therefrom.

In Fig. 7 I have illustrated in dotted lines an elevator car 75 which is suspended by one or more cables 74 and connected thereby to any suitable hoisting apparatus; a rotary motor 69, mounted preferably on top of the car, is connected by a strap or rod 70 to the cam 5 which is in turn connected to the support 71 by means of the links 72 and 73. When the door 76 is closed, as indicated in Fig. 7, and the car with the electro-magnetic cam carried thereby, stops opposite said door, the motor may be deënergized so as to allow the cam 5 to move against the upper end of the lever arm 15. In so doing, the arm 10, together with the detent 11 and the terminals 26, 26′, will be moved against the action of the spring 49 to the position indicated in Fig. 2. This will have the effect of opening the electric switch co-acting with the door lock both at the terminals 26, 26′ and at the outer ends of the arms 20, 20′. Furthermore, the detent 11 will be moved away from the top of the head 6 of the latch bar 1, and consequently the latter may be moved upwardly, as indicated in Fig. 2, when the door is pulled open. It should be particularly noted that at this time the laterally projecting pins 28 are wholly out of contact with the arms 20, 20′, and therefore there is no possibility of gaining access to energized contacts, as 26, 26′, through the opening 59, and thereby obtain electric shocks.

Inasmuch as the circuit-closer is placed in the controlling circuit when used in conjunction with an electric elevator system, the door must be closed and such circuit-closer also closed before the car can be moved away from the landing. In closing the door the beveled portion of the hook 7 will ride

up on the incline 8 of the face plate 39, and thence move through the opening 59 when the spring 41′ will force the head 6 to latching position. No circuit at this time is closed if the parts have the positions indicated in Fig. 2, but when the circuit-controller in the car is operated so as to energize the motor 69 and effect the lifting of the cam 5 to the position indicated in Fig. 7, the spring 49 will act to move the detent 11 over the top of the head 6, and substantially at the same time or a short time thereafter the terminals 26, 26′ will be moved on opposite sides of the insulated section 24. It will be noted that the laterally projecting pins 28 slide over the upper surface of the outer ends of the arms 20, 20′, thus making a wiping electrical connection therewith. In the same manner the terminals 26, 26′ slide over the lateral faces of the section 24, thus tending to keep the electrical connections free from dust and dirt, and therefore at all times comparatively clean. In other words, at each of the four electrical connections there is sliding or wiping engagement between the contacts. If at any time it should happen that the cam 5 is released or moved to its upper position, as indicated in Fig. 7, before the door is closed, the head 6 will strike the detent 11 and move the same backwardly until the spring 41′ moves the hook 7 into its latching position, when the spring 49 will at once actuate the detent 11 to locking position, and at the same time operate the circuit-closers. It is obvious that the parts may be so adjusted that the detent 11 will always positively lock the latch head in its final position before the terminals 26, 26′ are electrically connected by the section 24. Furthermore, the size, as for instance the length of the insulated section 24, may be varied so that the circuit-closer will still be operative although the face plate 38 does not come in contact with the face plate 39. So also the head 6 may be designed to be held loosely in locking position so as to allow a certain amount of settling of the door without interfering with the operation of the locking mechanism and the electric switch. There may also be a lateral movement of the door without interfering with the switch of the locking mechanism by reason of the terminals 26, 26′ being provided with springs 9, 9′ which allows a certain lateral to-and-fro movement without breaking contact with the section 24.

Heretofore it has been proposed to use a circular-closer in conjunction with a positive locking device, but in such case the circuit-closer could be operated independently of the locking device. For example, when the door is closed and the head 6 moved to latching position, the latter will operate a circuit-closer which would permit the elevator apparatus to be operated in the desired manner. In conjunction with the latch 6 there was a positive locking device which would operate automatically when the cam apparatus similar to that herein disclosed was actuated, or the car moved away from the floor. But it has been found in practice that the operation of such positive locking device is uncertain by reason of the sticking of its parts, as, for example, by rust, and in such case even after the car had left the floor or was at another landing the door could at any time be easily opened. It is, therefore, one of the important features of my invention that if the positive locking device becomes inoperative, the circuit-closing device would also be inoperative. In other words, the positive locking device must always act in conjunction with the circuit-closing apparatus and preferably ahead thereof. This I accomplish by having the arm 10 carry both the detent 11 and the terminals 26, 26′ so that when the latch is in the position indicated in Fig. 1, and the electro-magnetic cam apparatus releases the arm 15, the spring 49 will act to move both the detent 11 and the terminals 26, 26′ at the same time respectively to locking and circuit-closing positions with respect to the head 6 of the latch bar 1. If the parts are so designed that the detent 11 must positively hold the latch bar 6 in locking position before the terminals 26, 26′ are electrically connected by the section 24, it follows that in opening the door the terminals 26, 26′ must be moved out of contact with the section 24 before the detent 11 will release the latch. When this occurs, the parts will assume the positions indicated in Fig. 2, when the latch-head may be lifted by turning the spindle 3, and the door then operated to slide open in an obvious manner.

Although the lever 15 and the arm 10 with the parts carried by the latter move together as a single device, the same arm 10 may be adjusted in angular relation with the lever 15 by means of the set screw 46. Other adjustments may also be provided for if desired. Furthermore, various changes in the details and arrangement of parts as disclosed may be made by those skilled in the art without departing from the principles of my invention. I desire, therefore, not to be limited to the precise construction herein shown and described.

Having thus fully described my invention, what I desire to have protected by Letters Patent of the United States is:—

1. The combination with electric terminals, of a movable member for connecting said terminals, a locking bar carrying said movable member and movable into and out of locking position, a detent co-acting with said locking bar to hold the latter stationary in said locking position and the said movable

member in circuit-closing position, and a movable arm carrying said detent and electric terminals.

2. The combination with a keeper casing provided with electric terminals, of a clutch carrying an insulated section for connecting said electric terminals and movable into and out of locking position, and a detent movable with said electric terminals and co-acting with said latch to lock the latter stationary in said locking and substantially fixed position when said electric terminals are connected.

3. The combination with a keeper casing, of a lock casing, a latch carrying an insulated section, a locking bar carrying said latch, a detent coacting with said locking bar to hold the latter in stationary locking position, electric terminals, and an arm carrying said detent and said electric terminals and movable to such position where the detent locks the latch and the electric terminals are connected by said insulated section.

4. The combination with a keeper casing provided with an opening, of a latch movable through said opening into the casing, an arm pivoted within the casing with its free end projecting into the path of movement of the entering latch, means normally tending to move the free end of the arm into position to positively lock the latch by blocking its return movement, said means being yieldable to permit the arm to swing on its pivot when struck by the entering latch, means exterior of the casing connected to the arms to actuate the latter, and an electric switch operated by said arm and co-acting with said latch to be closed thereby after the latch is locked.

5. The combination with a keeper casing, of a rock-shaft extending transversely through said keeper casing, an arm carried by said rock-shaft outside of the casing, a pendent arm on the shaft within the casing, a detent at the lower end of said arm, a latch, yieldable means for swinging the detent over said latch to positively hold the latter in locking josition, and a circuit-closing device operated when the latch is locked and comprising members carried by said pendent arm.

6. The combination with a keeper casing, of a transverse rock-shaft, a detent connected to said rock-shaft, a latch, means for automatically moving said detent into engagement with said latch to hold the same positively in locking position, and an electric switch operated by the movement of said detent and co-acting with said latch to close the circuit when the detent is in locking position.

7. The combination with a locking member, of means for positively holding said locking member in locking position, a device for moving said locking means into locking position and an electric switch movable with said locking means and co-acting with said locking member to close an electric circuit while the latter is held in locking position.

8. The combination with a keeper casing provided with an opening, of a locking member movable through said opening into the keeper casing, a rock-shaft supported by said casing, a bell-crank lever secured to said rock-shaft, one arm of said bell-crank lever being provided with a detent at its end to co-act with said locking member to hold the same positively in locking position, a resilient device acting on the other arm of said bell-crank lever to move said detent to such locking position, electric terminals carried by said detent arm, and means co-acting with said locking member to electrically connect said terminals upon the detent being moved to hold the locking member in locking position.

9. The combination with a rock-shaft, of an actuating arm secured thereto, a detent connected to said rock-shaft, insulated electrical terminals mounted on said detent to move therewith, electrical connections between said terminals and portions of an electric circuit, a locking member, means carried by said locking member for electrically connecting said electric terminals, and a resilient device for moving said detent to positively hold the locking member in locking position, and substantially at the same time or a short time thereafter, to move the electrical terminals to circuit-closing position.

10. The combination with a keeper casing, of a face plate therefor, a rock-shaft transversely disposed with respect to said keeper casing, a dependent arm secured to said rock-shaft within said casing, electric terminals secured by insulation to said dependent arm, said arm being movable against the inner surface of said face plate, and means for limiting the outward movement of said arm and terminals when the face plate is removed.

11. The combination with a keeper casing, of a rock-shaft transversely disposed with respect thereto, a pendent arm secured to said rock-shaft, electric terminals carried by but insulated from said pendent arm, a locking member movable through an opening in said casing, means for moving the pendent arm to positively hold said locking member in locking position, and means for deënergizing said terminals when said detent arm is moved to unlocking position.

12. The combination with a keeper casing, of a locking lever pivoted thereto, an outside lever for moving said locking lever in one direction, a spring for moving said locking lever in the other direction, electric terminals carried by but insulated from said

locking lever, a lock casing, and a latch carried by said lock casing and while cooperating with the locking lever to positively lock the said casings together, electrically connecting said terminals.

13. The combination with a sliding door, of a latch carried thereby, a fixed catch cooperating with said latch for holding the door in closed position, a pivoted detent, a spring for moving said detent into engagement with the latch to lock the same in latching position, a plurality of circuit closers each open when the door is unlocked, and a device for moving said detent to unlocking position and effecting the opening of all the circuit closers.

14. In an elevator door lock, the combination with a keeper casing, of a lock casing, a spring-pressed latch in said lock casing, a pivoted locking detent in the keeper casing, a spring tending to move said detent into engagement with said latch to hold the latter in locking position, an outside lever for moving said detent to unlocking position, a pair of circuit terminals carried by but insulated from the keeper casing, a second pair of terminals carried by but insulated from said detent, and connections respectively between the pairs of terminals arranged to be opened when the outside lever is actuated and closed when said lever is released, the second pair of terminals being electrically connected together by the latch when the door is locked.

15. In an elevator door lock, the combination with a keeper casing, a pivoted detent mounted thereon, a lock casing, a spring pressed latch in said lock casing, a spring urging the detent to a position where it will hold the latch positively locked, an outside lever for actuating said detent to unlocking position, two electric terminals mounted on but insulated from the lateral faces of said detent and arranged to be electrically connected by the latch when the detent holds the same in locking position, and an additional pair of electric terminals mounted in the keeper casing but insulated from each other and arranged to interrupt the continuity of the circuit through the first named terminals and said latch when the detent is in unlocking position.

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

JOHN E. BOYCE.

Witnesses:
CHAS. M. NISSEN,
ERNEST L. GALE, Jr.