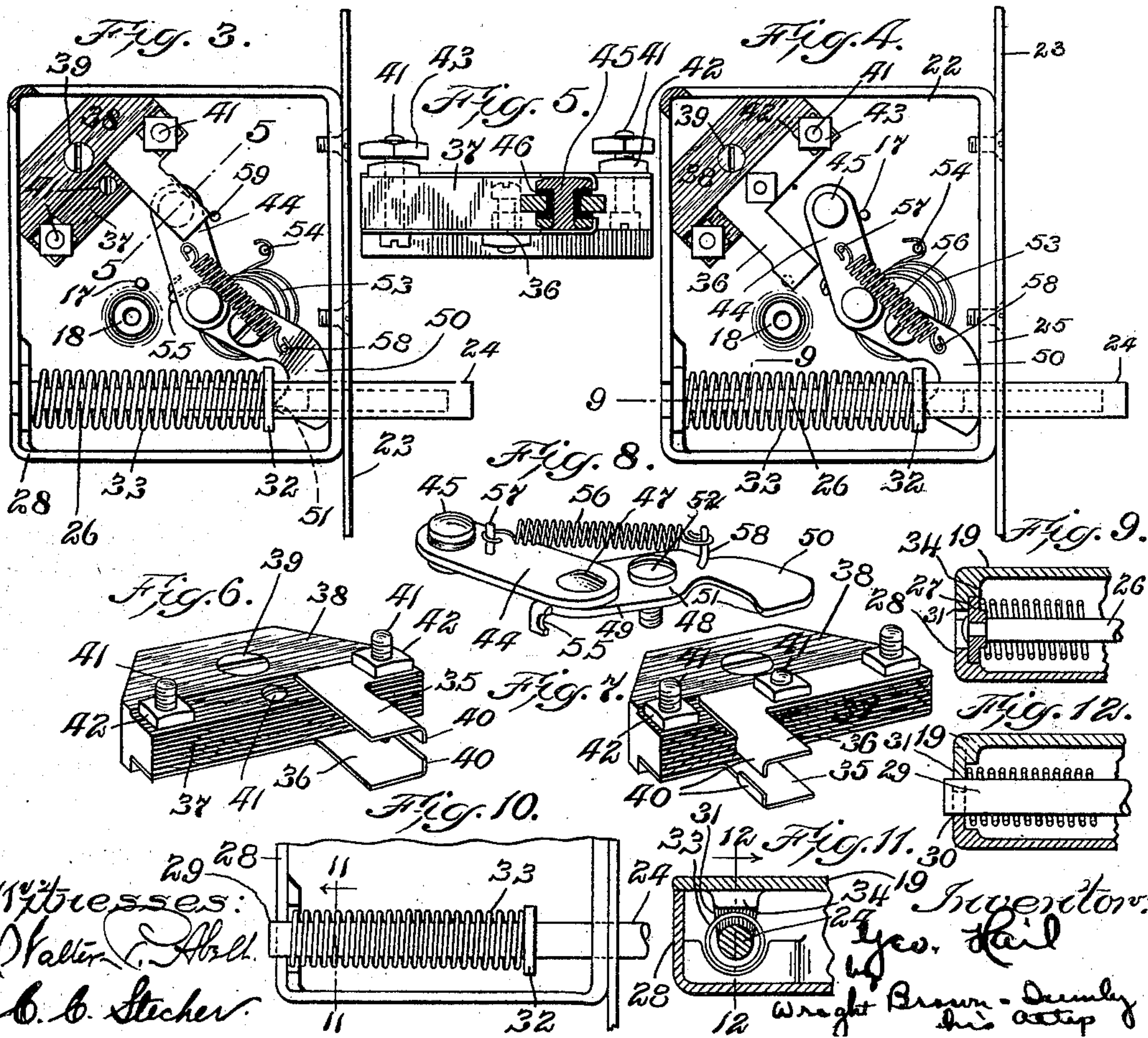
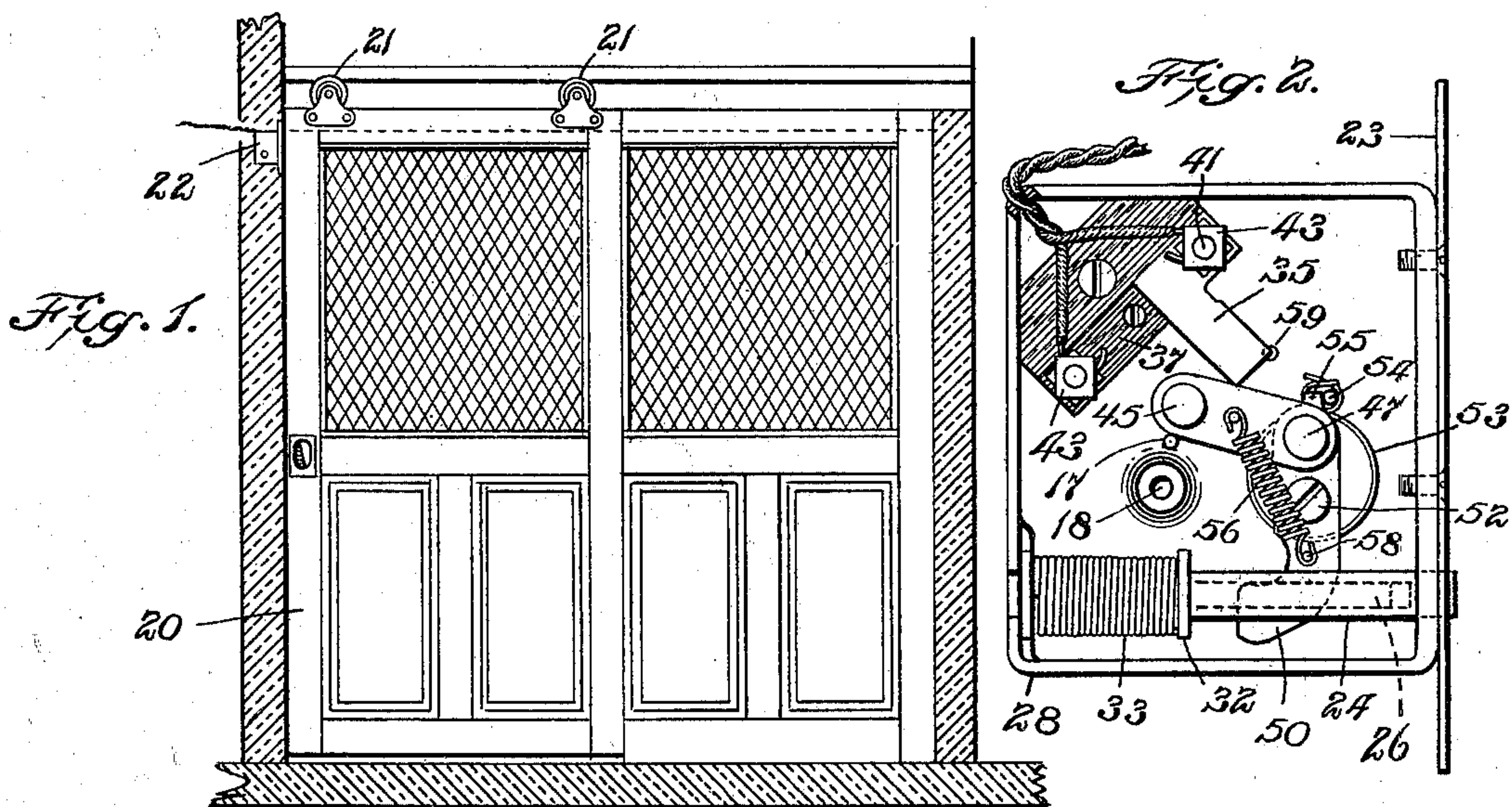


G. HAIL.
ELECTRIC SWITCH.
APPLICATION FILED OCT. 31, 1902.

NO MODEL.



UNITED STATES PATENT OFFICE.

GEORGE HAIL, OF PROVIDENCE, RHODE ISLAND.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 735,249, dated August 4, 1903.

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To all whom it may concern:

Be it known that I, GEORGE HAIL, of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

This invention has relation to electric switches, and while the construction of the illustrated embodiment of the invention is more particularly adapted for employment in connection with elevator safety appliances, yet so far as many of the features of the invention are concerned they are applicable for other forms of circuit changers or switches in which it is desired to secure the quick engagement or disengagement of the switch members or contacts.

Viewed in its aspect with relation to elevator safety appliances the invention is so designed as to be adapted for employment in connection with the corridor-doors by which access is permitted to the elevator-car or the shaft or well. In many cases such doors, from one reason or another, become warped and do not fit closely in the frame, rendering it extremely difficult with the switches heretofore used to effect the engagement or disengagement of the contacts, and as the operation of the safety devices is dependent upon such engagement or disengagement the failure of the switch to be properly actuated greatly detracts from the element of safety afforded by the presence of such devices. Again, it is impossible for the elevator attendant to exercise great care in the opening and closing of the elevator-door. Such doors are frequently slammed shut, striking upon the projecting portion of the switch violently and tending in many cases to destroy or injure the relatively delicate portions of the switch mechanism.

The object of the present invention, therefore, is to provide a switch mechanism in which the contacts will be properly actuated even though the door fails to properly fit against the jamb and in which the violent closing of the door will have no injurious effect upon the switch mechanism.

In addition the invention has for its object to provide for the quick engagement and

disengagement of the contacts even though the member which is engaged by the door is slowly operated.

On the accompanying drawings, Figure 1 represents an elevator-landing with the usual sliding door and also illustrates the relation of the switch mechanism to the door. Fig. 2 represents the switch with the top plate of the casing removed, so as to show the mechanism located therein. Fig. 3 represents a similar view, which shows the movable contact in engagement with the stationary contacts. Fig. 4 is a similar view of a switch which is employed in connection with a normally closed circuit, the switches in Figs. 2 and 3 being adjusted for a normally broken circuit. Fig. 5 represents an enlarged section on the line 5 5 of Fig. 3. Figs. 6 and 7 illustrate the insulating-support upon which the stationary contacts are mounted, the contacts being shown in different positions. Fig. 8 illustrates in perspective view the movable member and its oscillatory support. Fig. 9 represents a section on the line 9 9 of Fig. 4. Fig. 10 represents a portion of a switch in which the door-actuated member or plunger consists of a solid bar, in contradistinction to a construction which is illustrated in Fig. 2, in which the plunger is formed of two telescoping members. Fig. 11 illustrates a section on the line 11 11 of Fig. 10. Fig. 12 represents a section on the line 12 12 of Fig. 11.

Referring first to Fig. 1, 20 indicates a sliding door, which may be moved to the right to open the entrance to the elevator shaft or well. This door may be supported by rolling hangers 21 21 and when closed engages the plunger of a switch mechanism, which is illustrated as being located in the frame near the top of the door. The switch mechanism is secured within a substantially flat casing 22, which is adapted to be inserted in a recess formed in the door-frame. The casing is substantially in the shape of a square flat box, and it has a top 19, which is attached thereto by a screw (not shown) passed into a boss 18, projecting upwardly from the bottom plate of the casing. To one side of the box is secured the ornamental plate 23. The plunger or member which is engaged by the door may

be solid, as indicated in Fig. 10, or it may be formed of two telescoping parts, as shown in Figs. 2 to 4. The said plunger is indicated at 24. It is passed through the side wall 25 and through the plate 23 and its end projects forward therefrom a considerable distance, so as to insure the engagement of the door therewith. In Figs. 2, 3, and 4 this plunger is shown as hollow to receive the end of a rod 26, to which is secured a head 27, fitting in a recess formed in the side wall 28 of the casing. (Shown in Fig. 9.) This head is held in place by the top plate 19 of the casing. Where the solid bar is employed as a plunger, its end 29 may be passed through an aperture 30 in the rear wall 28, the top plate being formed with a projection 31 to rest upon the top of said bar and hold it in place, as shown in Figs. 11 and 12. The plunger 24 is provided with a collar or flange 32, between which and the head 27 is placed a helical spring 33. In Figs. 10, 11, and 12, which illustrate the solid plunger, the rear end of the spring bears directly against the side wall 28 of the casing and against the lug 31 of the top plate. The top plate has a shoulder 34, which serves to hold in place either the head 27, as shown in Fig. 9, or the spring 33, as shown in Figs. 11 and 12. In either construction the plunger 24 may be thrust rearwardly or to the left against the tension of the spring 33. When the door is closed, the plunger will be forced rearwardly to the normal position, (shown in Fig. 2,) and when the door is open the spring 33 will force the plunger 24 to the position shown in Figs. 3 and 4.

In addition to the plunger the switch comprises stationary contacts, a movable contact, and instrumentalities whereby the movement of the plunger effects either directly or indirectly the actuation of the movable member. The stationary contacts are indicated at 35 36, respectively. They are secured to a flange or web 37, projecting from a support 38, formed of fiber, porcelain, or other suitable insulating material. This support is detachably secured by a screw 39 in the corner of the casing. The two contacts 35 36 are preferably formed of resilient metal, each consisting of a right-angled strip having a stop or lug 40. The strips are secured to the web 37 by screws and nuts 41 42, respectively, one of the contacts being secured to the top of the web and the other to the under face thereof, whereby they are insulated from each other. The terminal wires of the electric circuits may be secured to the screws 41 42, respectively, by binding-nuts 43, as shown in Fig. 2.

The stationary contacts 35 36 project forwardly from their insulating-supports, and they are adapted to yield as the movable contact enters between them. The said movable contact consists of an arm 44, having in its free end a two-headed stud 45, electrically separated from the arm 44 by an insulating-

bushing 46. The said stud is adapted to be moved by said arm into and out of engagement with the movable contacts 35 36. When the said stud is moved into engagement with the said contacts, it closes the circuits between them. The said arm is loosely pivoted by a stud or pin 47 upon an oscillatory support 48. This support consists of a two-armed lever, one arm, 49, carrying the stud 47 and the arm 44, and the other arm, 50, being curved, so as to extend between the side wall 25 of the casing and the collar 32 on the plunger 24. When the plunger is extended, the collar 32 engages the rounded corner 51 on the arm 50 and holds said arm against the side wall 25.

The oscillatory support 48 is fulcrumed upon a screw 52, which is passed into the bottom wall of the casing, and about said screw is coiled a spring 53. One end of this spring is attached to a pin 54, projecting upwardly from the bottom wall of the casing, and the other end of the spring is secured to a hook 55, formed on the end of the arm 49 of the said support 48. This spring is not as strong as the helical spring 33; but it is of sufficient strength to oscillate the support 48 about the stud 52 and to cause the arm 50 to follow the collar 32 when the plunger is retracted until the movement of the support is arrested by the stop 54, as shown in Fig. 2. By reason of this construction it will be seen that the support is moved in one direction by the spring 53 and in the other direction by the spring 33. This provides for a relatively long lost motion of the plunger after the support has been oscillated, as indicated in Fig. 2, so that although the door be violently closed and the plunger retracted it cannot seriously affect the switch mechanism, as the oscillatory support is not connected to the plunger, but is caused to follow the plunger by its own spring 53.

To secure a quick make and break of the circuit, the arm 44 is loosely pivoted to the arm 49 of the support 48 and is in addition connected thereto by a helical spring 56. The ends of the spring are connected to pins 57 58, mounted upon the arm 44 and the arm 50. The pin 57 is located between the ends of the arm 44, while the pin 58 is on the arm 50, so that when the arm 44 is swung to one side or the other of a line connecting the pin 58 and the axis of the stud 47 the spring 56 will swing the arm 44 about the stud 47. The movement of the arm 44 is limited by the stops 40 on the stationary contacts 35 36 and by the pin 17, which is inserted in a hole in the bottom plate of the casing. Assuming that the parts are in the position shown in Fig. 3, the retraction of the plunger 24 will permit the spring 53 to swing the lever or support 48 about its center. So long as the oscillatory support and the arm 44 remain in the position shown in Fig. 3 the spring 56 will hold the arm 44 between the stationary

contacts 35 36 and against the stops 40. As the oscillatory support swings about its center, however, the stud 47 is carried laterally with relation to the stops on the stationary contacts until said stud passes by the central line of the spring 56. As the stud continues to move, so that the arms 44 and 49 form an angle to each other, the spring 56 quickly draws the arm 44 to the position shown in Fig. 2, where it rests against the pin 17. When the plunger is forced outward by the spring, the action is the reverse of that just described and the arm 44 is quickly snapped into position between the stationary contacts.

The stationary contacts are reversible, so that the same switch may be employed for either normally open circuits or normally closed circuits. Assuming that the normal position of the plunger is when it is retracted and the spring 33 is compressed, (this being its position when the door of the elevator is closed,) the stationary contacts may be arranged as shown in Fig. 4, when a normally closed circuit is to be used. In this case the pin 17 is inserted in a hole 59, which is provided in the bottom plate of the casing. Where a normally open or broken circuit to be closed by the opening of a door is to be used, the stationary contacts may be located as shown in Figs. 2, 3, and 6, and where a normally closed circuit to be broken by the opening of a door is to be used the said contacts may be located as shown in Figs. 4 and 7. This adjustment of the contacts may be secured by reversing each contact end for end, care being taken to pass the screws 41 through the insulator-support, so that they will project upwardly to receive the binding-nuts 43, by which the terminals of the conductor-wires are attached to said screws.

Unless the sense otherwise demands it the term "plunger" is used to mean any movable actuating member which may be engaged by a door or other part and which co-acts with the remainder of the mechanism, substantially as described.

Having thus explained the nature of the invention and described a way of constructing and using the same, although without attempting to set forth all of the forms in which it may be made or all of the modes of its use, I declare that what I claim is—

1. An electric switch comprising a normally extended plunger, means for extending the plunger, a movable member, means whereby the retraction of said plunger causes the operation of said movable member, and provisions whereby said plunger may have a loose retractive movement relatively to the movable member subsequent to the operation of said movable member.

2. An electric switch comprising the following elements, to wit, a normally extended plunger; a spring for extending the plunger; a movable member operatively engaged with but disconnected from said plunger; and pro-

visions for causing said member to immediately follow the plunger when it is initially retracted; said elements being constructed and arranged whereby said plunger has a lost motion with relation to said movable member.

3. An electric switch comprising a spring-pressed plunger having an engaging portion, a movable member bearing against said engaging portion whereby when the plunger is extended said engaging portion moves the member with it, a spring for causing said member to follow said engaging portion when the plunger is retracted, a stationary contact, and a spring-tensioned contact loosely pivoted on said member.

4. An electric switch comprising a spring-pressed plunger having a shoulder, a stationary contact, a pivoted member carrying a movable contact and adapted to loosely engage with said shoulder, and a spring for holding said member against and causing it to follow said shoulder during the initial retractive movement of said plunger.

5. An electric switch comprising a plunger having a shoulder, a spring adapted to extend said plunger, a movable member bearing against said shoulder and adapted to be moved thereby when said plunger is extended, a spring for moving said member in the opposite direction so as to follow said plunger when the plunger is retracted, and means for limiting the movement of the said member.

6. An electric switch comprising a stationary contact, a movable support, a movable contact, a pivot for connecting said contact to said support, and a tension-spring connected to said support and to said movable contact on opposite sides of said pivot.

7. An electric switch comprising separated stops, a movable member adapted to play between said stops, a support movable longitudinally of a line connecting said stops, a pivot connecting the member to the support, and a tension-spring connected to said member and to said support on opposite sides of said pivot.

8. An electric switch comprising a plunger, a spring for extending the plunger, a pivoted support operatively engaged with said plunger, a movable contact pivoted to said support, a spring connected to the contact and to the support on opposite sides of their pivot connection, and a stationary contact adapted to be engaged by said movable contact.

9. An electric switch comprising a stationary contact, a support therefor, a movable contact adapted to engage said stationary contact at only one end of its movement, and provisions for the reversible attachment of said stationary contact to said support whereby it may be engaged at either end of the movement of the movable contact.

10. An electric switch comprising a movable contact and means for causing said contact to rest normally at one end of its movement, a stationary contact adapted to be en-

gaged by the movable contact, and provisions for reversing said stationary contact whereby it may be engaged at one end of the movement of said movable contact to produce
5 a normally open switch or at the other end of said movement to produce a normally closed switch.

In testimony whereof I have affixed my signature in presence of two witnesses.

GEORGE HAIL.

Witnesses:

HENRY A. GREENE,
AUGUSTA ALLEN.