J. COLLINS.

ELECTRIC SWITCH.

APPLICATION FILED MAR. 12, 1920.

1,370,784.

Patented Mar. 8, 1921.

3 SHEETS—SHEET 1.

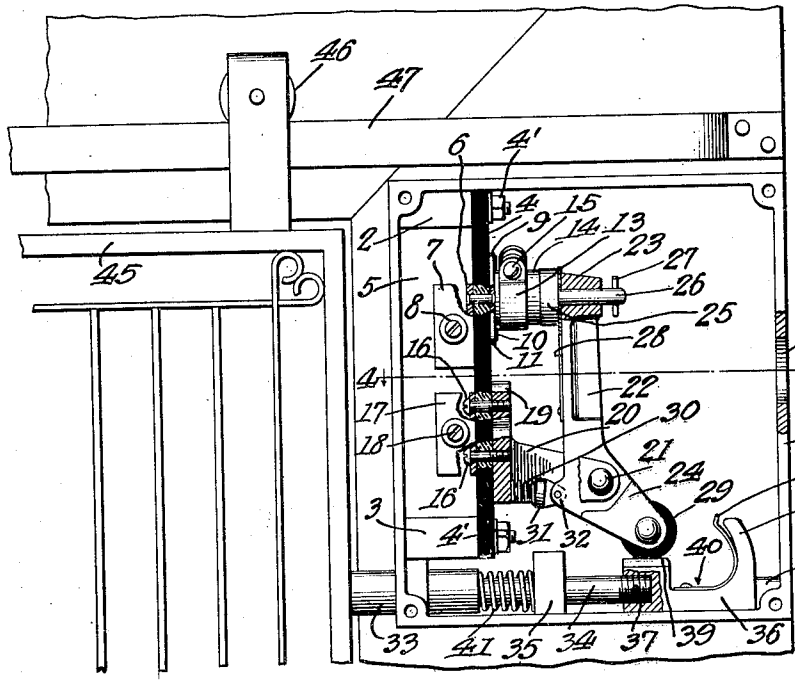


Fig. 1.

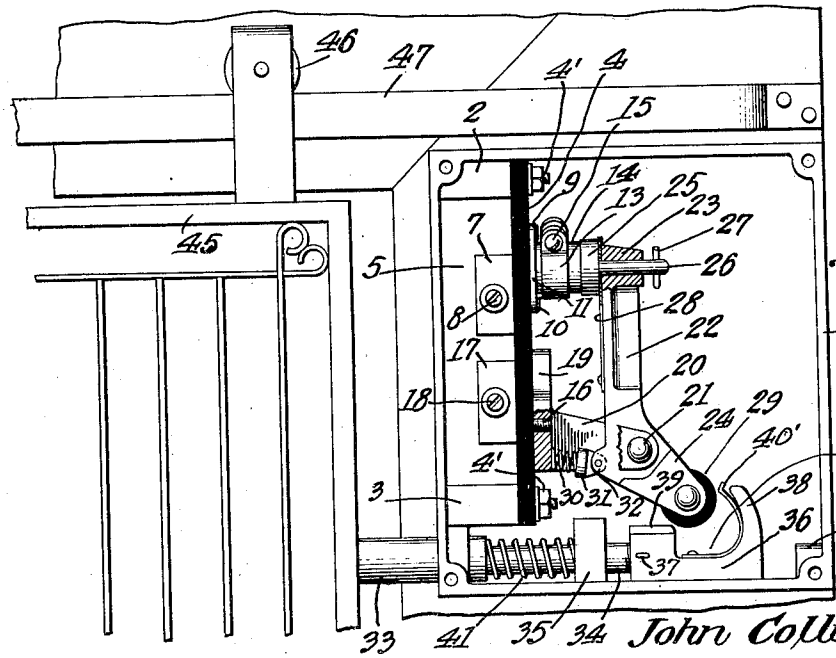


Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

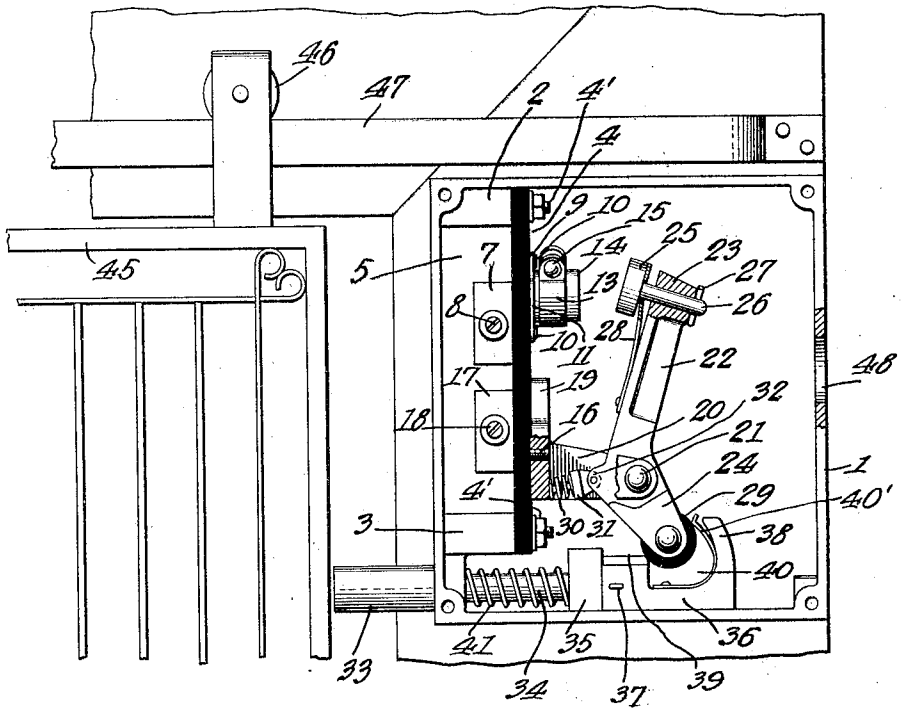


Fig. 4.

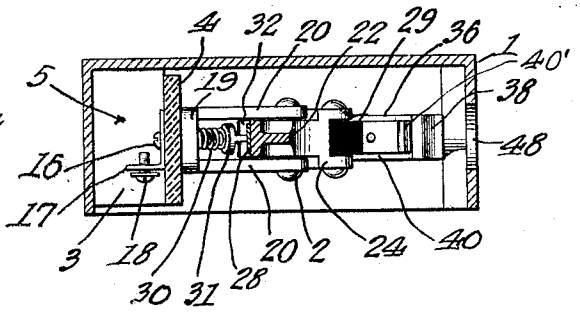
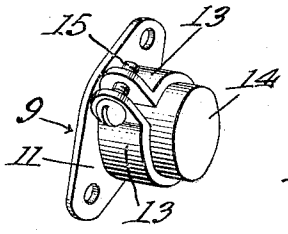


Fig. 5.



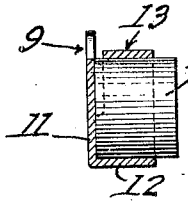


Fig. 6.

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3 SHEETS—SHEET 3.

Fig. 7.

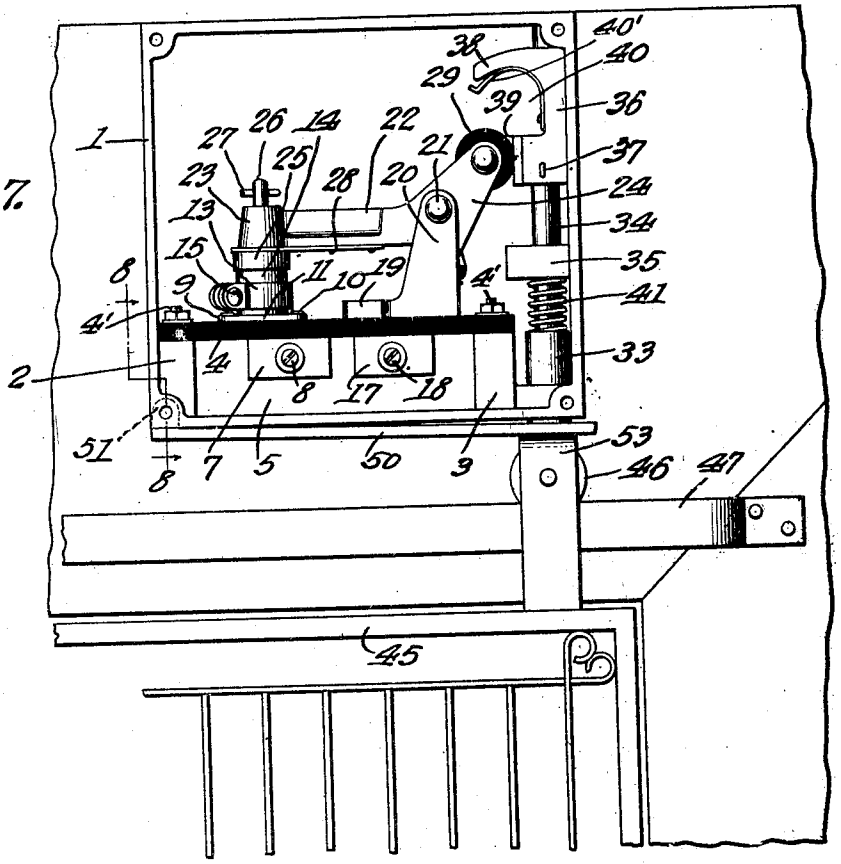


Fig. 8.

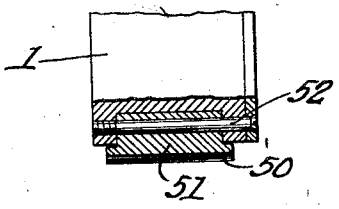


Fig. 10.

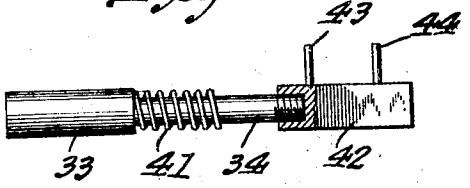
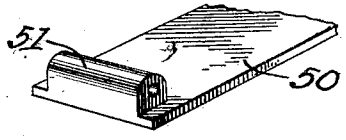


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN COLLINS, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTRIC SWITCH.

1,370,784. Specification of Letters Patent. Patented Mar. 8, 1921.

Application filed March 12, 1920. Serial No. 365,247.

To all whom it may concern:

Be it known that I, JOHN COLLINS, a citizen of the United States of America, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

This invention relates to electric switches and has particular reference to electric switches adapted to be employed in connection with doors or other similar structures, such as elevator doors, railway car doors, etc.

The primary object of this invention is to provide automatic means for preventing an elevator or other vehicle from being moved by an electric current until its coöperating element, a door or the like, is in closed or locked position.

A further object of this invention is to provide a switch in which the contact will be positively actuated by an extended plunger being forced into the casing of the switch when force is applied against the extended end of the plunger.

Another object of this invention is to provide an electric switch in which the contact will be positively actuated by a spring pressed plunger being forced into the casing of the switch when force is applied against the extended end of the plunger, and which switch will further have a double functioning spring adapted to hold the contact should the first mentioned spring be out of order.

Another and important object of my invention is to prevent damage or injury to the switch mechanism from the shocks or blows which are unavoidable in a door-operated switch from the more or less violent movement of the door in closing, it being important in such a case to take into account the fact that the door, by reason of inexact construction, may move the plunger farther than necessary to close the switch.

Other objects and advantages of this invention will be apparent from the following description, and the particular features of novelty will be pointed out in the appended claims, it being understood however, that various changes in the form and proportion of the device may be made such as fall within the scope of the appended claims without departing from the spirit of the invention.

In the drawings, forming a part of this specification, and wherein similar characters of reference designate similar parts in the several views,

Figure 1 illustrates a side elevation of the device, partly in section, showing the contacts in the "wedge-lock" position.

Fig. 2 illustrates a side elevation of the device, partly in section, showing the spring actuated plunger in a slightly different position from that shown in Fig. 1.

Fig. 3 illustrates a side elevation of the device, partly in section, showing the contact broken.

Fig. 4 is a sectional view taken on the line 4—4, Fig. 1.

Fig. 5 is a perspective view of the carbon contact support employed with the device.

Fig. 6 is a sectional view of the carbon contact shown in Fig. 5.

Fig. 7 is an elevation of the invention as applied to a different type of elevator door frame than that shown in Fig. 1.

Fig. 8 is a sectional view taken on the line 8—8 Fig. 7.

Fig. 9 is a fragmentary perspective view of the attachment used in Fig. 7, and

Fig. 10 is a modified form of the plunger head illustrated in Figs. 1, 2, 3, and 7.

Referring now, more particularly to the drawings, the invention comprises a casing 1, which may be of any desired size and shape, being illustrated for the purpose of convenience as substantially square in elevation, and formed of cast metal, and provided with one open side which is normally closed by a suitable cover, not shown.

To one side of the interior of the casing 1 are secured and preferably cast integral therewith, supports 2 and 3, to which is secured, by means of bolts 4′, a partition 4 formed of suitable insulating material. The partition 4 is normally spaced from the rear wall of the casing 1, as illustrated in Fig. 4, for a purpose to be hereinafter described, and said partition provides a compartment 5 between the side of the casing 1 and said partition.

Secured within the compartment 5 and to the partition 4 by means of a rivet 6, or other suitable means, is a binding post 7, provided with a connector 8. The rivet 6 also secures, to the opposite side of the partition 4, a carbon contact support 9 which may be also secured to said partition 4 by means of screws 10, or other suitable means.

As shown in Figs. 5 and 6, this carbon contact support comprises a plate 11 having a portion thereof bent at substantially right angles as shown at 12. Said plate is split forming clamping arms 13 arranged substantially at right angles to the above mentioned bent portion 12, which arms secure a carbon contact block 14 by means of a clamping screw 15 engaged therewith.

Secured within the compartment 5, beneath the binding post 7, by means of screws 16, is a binding post 17 having a connector 18. Secured to the opposite side of the partition 4, and opposite the binding post 17, by means of the above mentioned screws 16 is a support 19.

The support 19 is provided with parallelly arranged, forwardly extending arms 20 between which is pivotally mounted, as shown at 21, a contact lever 22, provided with a head 23 and angularly disposed, rearwardly extending leg 24.

The head 23 is provided with an aperture which extends therethrough, said aperture receiving the extension 26 of a movable contact head 25. The extension 26 is of sufficient length to extend beyond the head 23 and is prevented against accidental displacement by a pin 27 extending therethrough.

Secured to the lever 22 and engaging against the movable contact head 25 is a flat spring 28 which tends to hold the contact head in the position illustrated in Fig. 3.

By the removal of the pin, 27, the head, 23, may readily be freed so that it may be removed from the lever when worn or broken and a new one substituted.

By referring to Fig. 3 it will be seen that the forward face of the head, 25, in moving toward the stationary contact, 14, moves downward as it approaches the stationary contact, 14, with the result that when the faces of the two contacts are together there is a downward sliding, wiping movement of the face of the head, 25, over the face of the fixed contact, 14, by which action the contacting surfaces are kept clean and therefore in good electrical conducting condition. This sliding movement though an effective one is gentle and easy because it takes place while the spring, 28, supports the head, 25.

The spring, 28, forms a cushion at the first contact of the head, 25, with the stationary contact block, 14, and thus noise and possible damage are obviated and yet the spring, 28, being finally backed up by the contact of lever, 22, therewith, the two contacts, 25 and 14, are positively and firmly pressed together so as to assure good electrical contact of their abutting surfaces.

At the time the contact head, 25, touches the stationary block, 14, their opposing faces are not parallel, or in the same plane, but the head, 25, touches the block, 14, only at the bottom edge of the head, 25, whose contact face, therefore, diverges upward and away from the contact face of the block, 14. This condition has a two-fold importance. First, it permits the continued movement of the arm, 22, notwithstanding that its block-carrying end, 23, at the time of such edge contact, begins to move downward in an arc because such movement must be accompanied by a constant change of angle of the contact face of the head, 25, before contact with the face of the block, 14, throughout the extent of the face of the head, 25, and as the angle of the head, 25, may thus change during the continued movement of the arm, 22, it follows that the stem, 26, of the head, 25, may slide through the hole in the arm head, 23, and thus the above described sliding or wiping movement of the head, 25, over the face of the contact block, 14, may take place, even though the stem, 26, has only a sliding fit in the arm head, 23, but, of course, a close sliding fit is not indispensable. Second, arcing on the contact of the head, 25, with the block, 14, occurs at the bottom edge of the head, 25, and, as will be seen by reference to Figs. 1, 2, and 7, when the head, 25, and the block, 14, have their contacting faces in the same plane, the bottom edge of the head, 15, passes off the fixed contact, 14, and thus the only portions of the surfaces that are affected by the arcing are away from the path of the current so that inferior contacting surfaces which would permit arcing are avoided.

The lower end, or leg 24, of the lever 22 extends rearwardly, as above mentioned, and is bifurcated, supporting a roller 29 of suitable insulating material.

Between the above mentioned arms 20 of the support 19, is mounted a spiral spring 30, one end of which is seated against the support 19, and the other end carries a head 31 which is secured within a slot in an extension 32 of the lever 22; said extension 32 being in substantially the same horizontal plane as the pivot point 21 of the lever 22.

Slidably mounted at the lower portion of the casing 1 is a spring pressed plunger 33 which passes through an opening in said casing, the end of said plunger extending beyond the casing. The plunger 33 is provided with a reduced end 34 which is slidable in a bearing 35, preferably cast inte-

gral with the casing 1. The end of portion 34 of the plunger is screw-threaded to receive the internally screw-threaded end of a head 36. Said head 36, is prevented against accidental displacement by means of a pin 37 extending therethrough and into said screw-threaded end of plunger 34.

As clearly shown in the drawings, the base of the head 36, is slidable on the interior of the casing 1 and is provided with an upwardly extending, curved arm 38, a straight wedge-surface 39 and a cut-out roller receiving portion 40. Secured within the cut-out portion 40, and extending adjacent the curved arm 38 is a curved flat spring 40′, the purpose of which will be hereinafter described.

As clearly shown in Fig. 1, when the lever, 22, has been moved to the limit of its motion to close the circuit and the head, 25, is pressed hard against the stationary contact, 14, the roller, 29, is in contact with the surface, 39, which extends parallel with the direction in which it moves with the plunger, 33. It will therefore be evident that the instant the roller, 29, rests on the surface, 39, the movement of the latter with the plunger may continue without knocks or blows upon the lever, 22, as might strain or otherwise damage the parts. Hence no damage can come by reason of the more-or-less inaccurate fitting of the switch and door, so that considerable excess movement of the door in closing may take place without injury to the parts.

As shown in Fig. 3, the parts above mentioned are so positioned that when the plunger 33 is extended, the roller 29 is received within the cut-out portion 40.

Mounted on the reduced portion 34, and between the bearing 35 and plunger portion 33 is an expansible coil spring 41, adapted to hold the plunger in an extended position.

Fig. 10 discloses a modified form of the head secured to the plunger portion 34, and comprises a substantially rectangular block 42 which is secured to the reduced end 34 and is provided with upstanding pins or arms 43 and 44, which may be formed integral with the block or head 42. These pins 43 and 44 serve to actuate the contact lever 22 in the manner hereinafter to be described with relation to the type shown in Figs. 1, 2 and 3.

The numeral 45 designates an elevator door which is slidable on rollers 46 on a track 47, all of which are of the usual construction.

The connectors 8 and 18 are electrically connected together to a source of electric current, by means of the usual wires (not shown), which pass through an opening 48 in the side of the casing 1 and between the partition 4 and casing 1.

When a door or other structure with which my device may be employed, is in open position as shown in Fig. 3, the plunger 33 is fully extended by means of the spring 41, and the several parts of the device assume the positions as illustrated in this figure. The bearing 35 serves as a stop for limiting the longitudinal movement of the plunger 33 because of the head 36 abutting thereagainst. It can be seen that the contact head 25 is out of contact with the carbon contact block 14 and the circuit broken.

It is obvious that as the door 45 is closed the plunger 33 will be forced inwardly against the tension of the spring 41, forcing the leg 24 inwardly; the roller 29 riding on the straight wedge surface 39, the lever 22 moving forcing the contact head 25 into contact with the carbon contact block 14, completing a circuit through the connectors 8 and 18 and through the contact lever, thus allowing the operator of the elevator, or other structure, to operate the same.

Should the spring, 30, break or become otherwise inactive or should the spring, 28, break, the device will nevertheless be operative to close the circuit because regardless of the action of said springs, the lever, 22, is swung by the engagement of the plunger head, 36, to place the head, 25, into electrical contact with the block, 14.

The position of the coil spring 30 is to be particularly noted, and is of the utmost importance, and it can be seen by the drawings, that said spring 30 is secured to the support 19 at a point below the horizontal plane of the pivot point 21 of the contact lever 22, and that further, the head 31 secured to the spring 30 is secured to the extension 32 at a point which is in substantially the same horizontal plane as the pivot. The spring 30 is thus, angularly mounted with respect to the horizontal plane of the pivot point, but it is to be observed that the point to which the spring 30 is secured to the support 19 is intermediate the uppermost and lowermost points of the arc described by the extension 32 in its travel.

This positioning of the spring 30 serves a double function. When the door 45 is open, and the contact lever in the position shown in Fig. 3, the spring 30 serves to retain the contact lever out of contact, and when the door 45 is closed, as illustrated in Fig. 1, the spring 30 is disposed at a downward angle, and serves to hold the contact head 25 in contact with the carbon contact block 14. It may be further obvious that the several parts of the plunger 33 may assume such position that the roller 29 will not be engaged by any of them, and the downward angle of the spring 30 will still retain the contact 25 in contact with the carbon contact block 14.

Should the operator slide the door of the elevator with insufficient force to operate the several parts of the device, the tension of the spring 41 will return the plunger 33 to the extended position, thereby further opening the door 45, and keeping the head 25 and carbon block 14 out of contact, preventing any starting of the elevator. Inasmuch as the spring, 41, has sufficient strength to move the door from a closed position, obviously the operator is compelled to lock the door in a closed position and if it is not locked and an attempt is made to start the elevator, the switch, by the action of the spring, 41, will open.

As the door 45 is opened, the spring 41 will force the plunger 33 outwardly and the spring 40′ will engage the roller 29, and thus force the contact head 25 out of contact with the carbon block 14 breaking the circuit. It will be noted that the free end of the spring, 40′, is positioned so that it engages the roller, 29, at a point above the roller axis and as the spring arches forward it exerts a pressure on the roller that is substantially at right angles to a radius from the pivot of the lever, 22, and thus the force of the spring, 40′, is most advantageously exerted on the lever to move it to break the contact of head, 25, and fixed contact, 14. The effect of the engagement of the spring, 40′, and the lever roller, 29, is first to increase the tension of said spring, and it follows that when the lever, 22, finally begins to move, the expansive force of the spring acts suddenly or quickly to rapidly move the lever and thus quickly break the electrical contact.

Should the spring 41 become broken at any time, it is obvious that this breakage does not render the device inoperative, as is the case in present day usage, because, as the door 45 actuates the plunger 33, forcing the roller 29 on to the wedge surface 39, the contact lever 22 will be held in the closed position, the contact head 25 remaining in contact with the carbon block 14, and it is obvious that when the operator next opens that door, the plunger 33 will not be actuated and the operator discovers that the circuit is still closed and the elevator operative while the door is open, thus advising him that said spring is broken.

Fig. 7 illustrates a modified form of the device, for operating in a different position on an elevator door frame, or for use with a different type of elevator. The several parts of the device within the casing are identical with those above described, but in addition, this construction provides a plate 50 which is pivoted at one end to the corner of the casing 1 by means of a stud 51 projecting thereinto and which is secured in operative position by means of a bolt 52. This plate is loosely mounted and its end is adapted to bear against the end of the plunger 33 and force same inwardly when the roller support 53, secured to the door 45 engages against said plate. The function of the spring 30 in holding the contact head 25 away from the carbon block 14 is clearly obvious from this figure.

It is believed that the operation of the device will be readily understood by those skilled in the art to which it appertains, and in view of the above, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A switch of the class described comprising fixed and movable contacts, and a door actuated plunger, said movable contact and said plunger having coacting members to impart movement to the movable contact and the plunger having a surface to engage said movable contact that extends in the direction in which the plunger moves to place the movable contact into contact with the fixed contact.

2. A switch of the class described comprising a fixed contact, a movable contact, a door-actuated plunger, a part connected with the movable contact, and two spaced surfaces on the plunger situated to engage said part when the plunger is moved in opposite directions, respectively, at least one of such surfaces being resilient and acting on said part when the plunger moves in the direction to separate the contacts.

3. A switch of the class described comprising a fixed contact, a movable contact, a door-actuated plunger, a part connected with the movable contact, two spaced surfaces on the plunger situated to engage said part when the plunger is moved in opposite directions, respectively, one of such surfaces being resilient and acting on said part when the plunger moves in the direction to separate the contacts, and the other such surface being rigid.

4. A switch of the class described comprising a fixed contact, a movable contact, a spring coacting with the movable contact to shift it in either direction, and a door actuated plunger having a part that engages the movable contact to move it into contact with the fixed contact, said part having surfaces at an angle to one another that are situated to successively engage such movable contact, one of such surfaces extending in the direction of movement of the plunger.

5. A switch comprising a movable contact, a plunger having an arm, a roller carried by the movable contact and situated in the path of movement of said arm, and a curved spring interposed between the roller and the said arm, said spring having a portion that contacts with the roller which normally is in advance of said arm.

6. A switch comprising a lever-form mov-

able contact, a plunger, a roller carried by the movable contact, and a spring carried by the plunger, said spring having contact with the roller at a point between the roller axis and the pivot of the movable contact.

7. A switch comprising a fixed contact, a movable contact, said contacts having plane abutting surfaces, the initial touching of said contacts being at one edge of the movable contact, and means to cause the sliding of the face of the movable contact over the face of the fixed contact concurrently with the movement of the movable contact in closing the circuit, and to move the portion of the movable contact first touching the fixed contact, away from the latter, comprising a swinging arm, said movable contact being a head slidably mounted on said arm.

In testimony whereof I hereby affix my signature in the presence of two witnesses.

JOHN COLLINS.

Witnesses:
JOHN C. FIRMIN,
N. A. MINNETT.