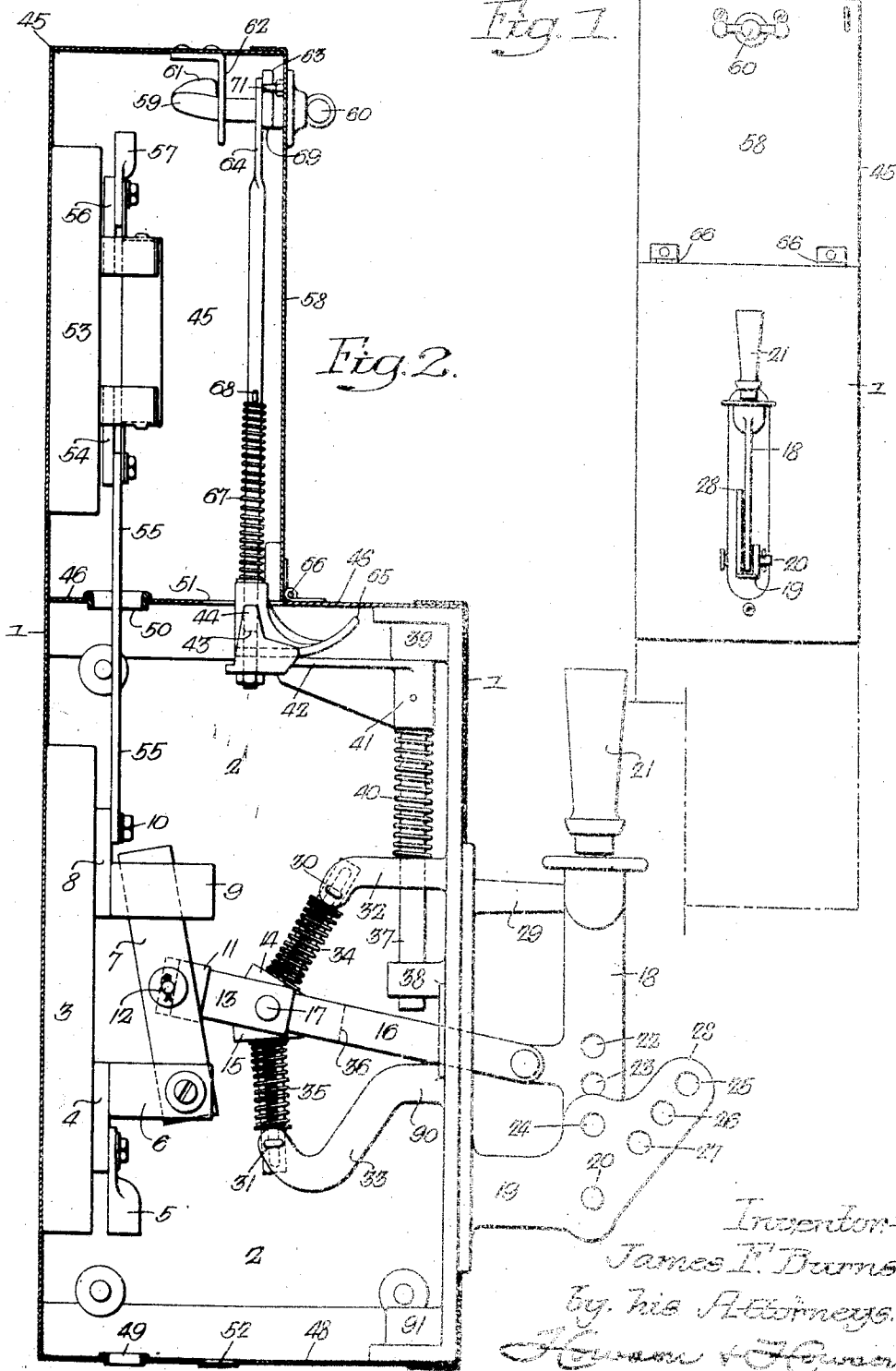


Jan. 30, 1923.

1,443,867

J. F. BURNS,
SWITCH INTERLOCK DEVICE.
FILED OCT. 29, 1917.

3 SHEETS-SHEET 1

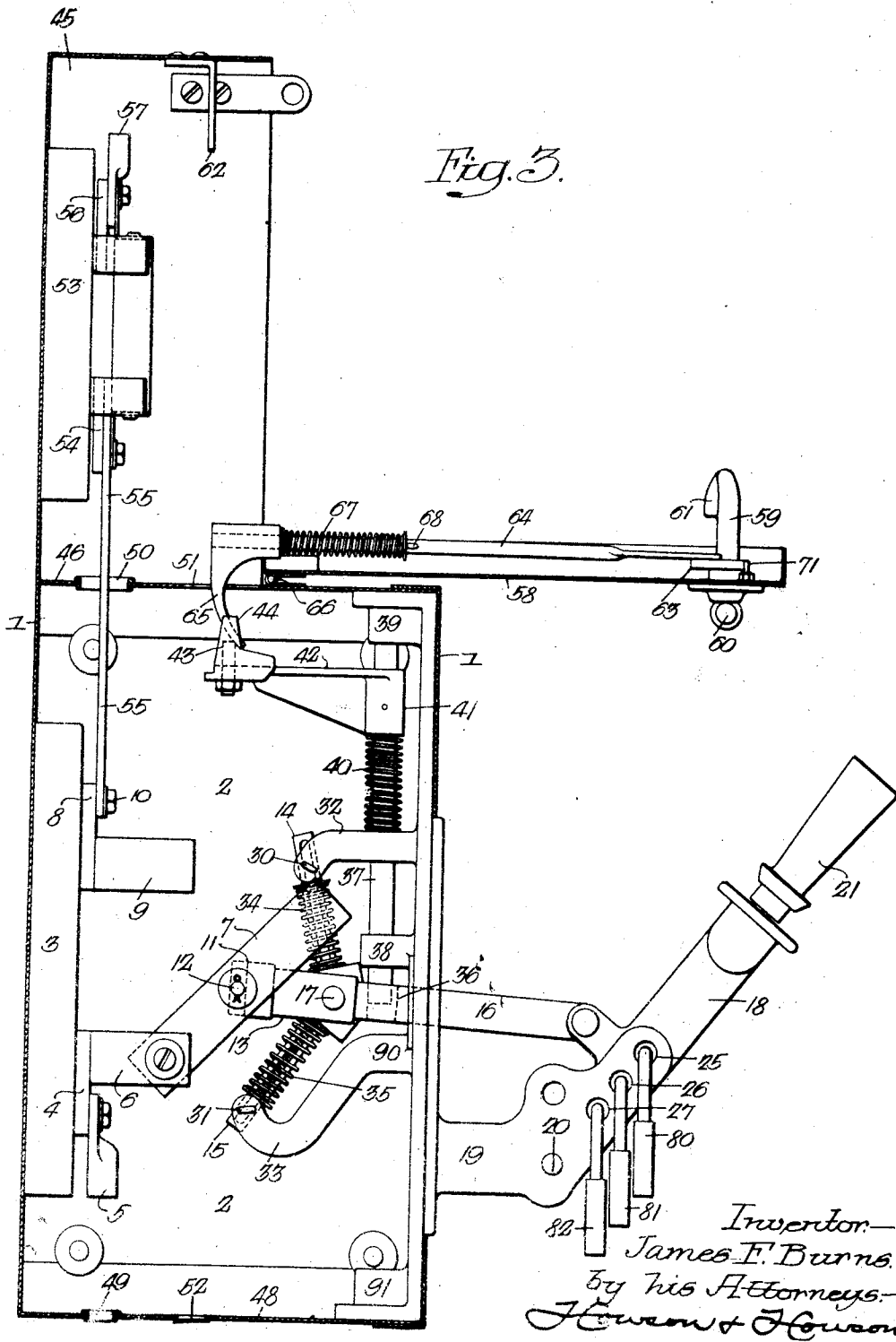


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3 SHEETS-SHEET 2



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3 SHEETS-SHEET 3

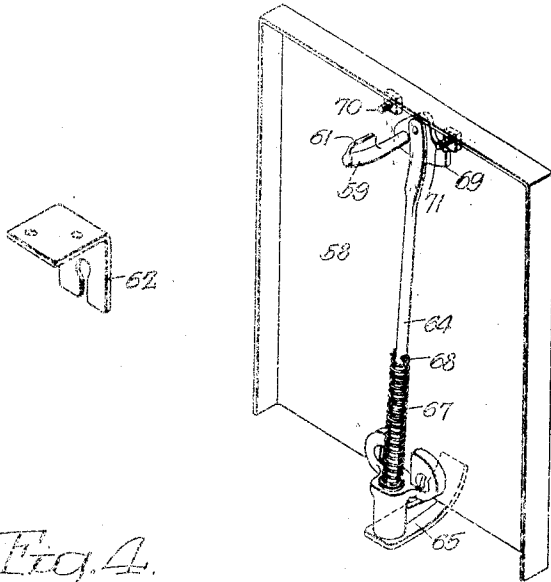
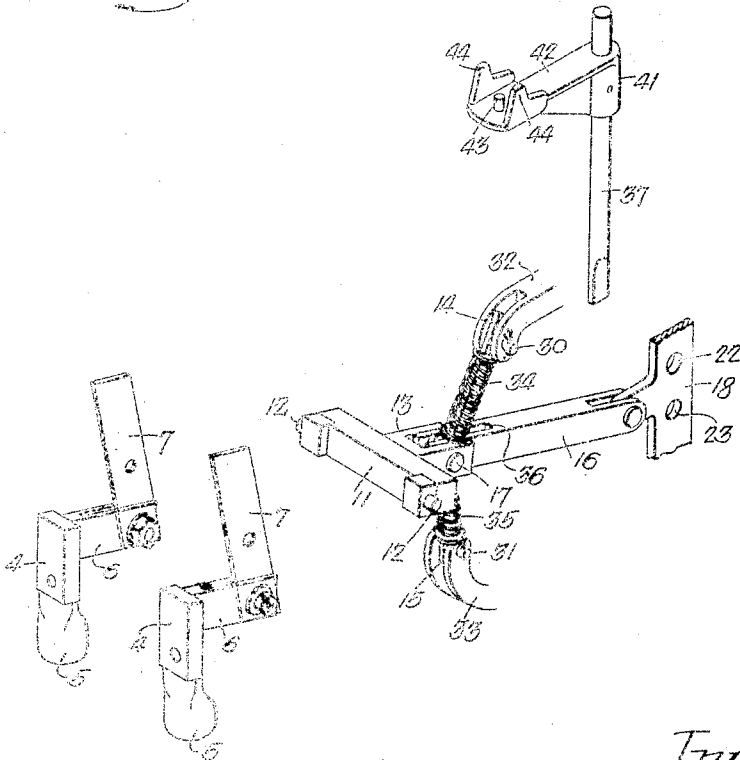


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES F. BURNS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO V. V. FITTINGS COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

SWITCH INTERLOCK DEVICE.

Application filed October 29, 1917. Serial No. 198,968.

To all whom it may concern:

Be it known that I, JAMES F. BURNS, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented a Switch Interlock Device, of which the following is a specification.

One object of this invention is to provide a novel form and arrangement of mechanism, for so connecting the switch-operating member with a door lock, and more particularly with the lock or latch for the door to a fuse containing box, that it shall be impossible to unlatch and open the door until the switch actuated by said member has been opened, and also impossible to close the switch until the door has been closed and locked in its closed position;—the invention contemplating an arrangement whereby injury to an operator by reason of the blowing of a fuse or by reason of contact with live parts of an electric circuit is effectually prevented.

Another object of the invention is to provide mechanism of the general type above noted, with novel means for preventing operation of the door-locking or latching device when said door is open and thus making possible the closure of the switch before the door is closed and locked;—the invention also including novel means for connecting a switch operating member with a switch which shall insure the relatively quick engagement and disengagement of the movable and fixed contacts to a large extent independent of the speed of operation of said member.

I further desire to provide a device of the character described with an attachment whereby a plurality of different locks may be employed to retain the switch operating member and hence the switch in its open position;—the arrangement being such that it is necessary for all of said locks to be removed or released before the switch can be closed.

Another object of my invention is to provide a novel form of mechanism for operatively connecting the switch operating member of a switch box with the door lock or latch of a structurally independent fuse box mounted on or adjacent said switch box;—the invention contemplating such a combination as will permit of said fuse box being mounted in any of several positions relatively to the switch box without interfering

with the proper connection of the switch actuating member and the door latch or lock on the fuse box.

These objects and other advantageous ends I secure as hereinafter set forth, reference being had to the accompanying drawings, in which,

Fig. 1 is a front elevation of a switch and a fuse box mounted in position for the application of my invention;

Fig. 2 is a vertical section illustrating the detail construction and arrangement of my inter-lock mechanism when the switch is closed and the door of the fuse box is locked;

Fig. 3 is a section similar to Fig. 2, but showing the parts of the inter-lock mechanism in the positions occupied when the switch is open and the door of the fuse box is unlocked and open; and

Fig. 4 is a detached perspective view illustrating the detail construction of certain of the parts constituting my invention.

In the above drawings, 1 represents a box usually of sheet metal having a removable side 2 held in place by screws or bolts and designed to contain an electric switch. This latter includes a base 3 of slate, marble or other insulating material and in the present instance is of the double pole type, having a pair of terminals 4—4 to which are connected cable or conductor terminals 5—5. Said terminals also have a pair of jaws 6 to which are planed or pivoted blades 7—7. Also mounted on the base 3 is a second pair of terminals 8—8 having clips or jaws 9 for the reception of the blades 7—7 and respectively provided with clamping bolts 10 for the attachment of conductors.

For operating purposes the two blades 7—7 are connected by an insulating bar 11 which is free to turn on its attaching screws or trunnions 12 and has projecting from it a slotted extension 13 to which a pair of oppositely projecting arms 14 and 15 as well as a link 16 are movably connected by a pivot 17. The outer end of the link extends through the front of the casing 1 and is pivotally connected to a switch operating member 18 preferably made in the form of a blade having one end connected to a standard or bracket 19 by means of a pivot 20 from which it projects upwardly, its upper end being provided with a suitable handle 21.

The lower part of this operating member

is provided with a plurality,—(in the present case) three, holes 22, 23 and 24, designed to respectively align with three holes 25, 26 and 27 in the outer part of a guide plate 28 when said member is in its outer position (Fig. 3). If desired, I may also provide an opening in the guide 28 designed to register with the opening 24 of the switch member 18 in order to allow of the insertion of the hasp of a padlock when it is desired to retain the switch in its locked position against accidental or malicious opening. Both the bracket 19 and the guide 28 are rigidly connected to and project outwardly from the front face of the casing 1 as does also a post 29 positioned to engage the upper part of the handle 18 to limit its movement toward said casing.

The arms 14 and 15 are respectively slotted for the reception of pins 30 and 31 which respectively connect the forked ends of brackets 32 and 33 projecting inwardly from the front face of the casing, and there are springs 34 and 35 confined between the ends of these brackets and the distant ends of said arms so as to resist their movement under the action of the link 16 and handle 18 from the position shown in Fig. 2 toward a neutral position and thereafter assist such movement toward the position shown in Fig. 3 or vice versa.

As shown in Fig. 4, the link 16 is so made as to provide a vertically extending slot or hole 36 which when the switch member 18 is in its outermost position, is in line with a locking bolt 37 vertically guided in bearings or brackets 38 and 39 mounted on the inner face of the front of the casing, and it is noted that said bolt is provided with a spring 40 extending between a sleeve 41 fixed to its upper end and the bracket 38,—the arrangement being such that said spring at all times tends to lift the bolt with its associated parts. The sleeve 41 has projecting laterally from it a braced arm 42 which at its outer end carries an upwardly projecting pin 43 and is preferably also provided with a pair of side guides 44;—these parts constituting in effect parts of the locking bolt.

Said bolt is provided when it is desired to utilize the above described switch mechanism in combination with a fuse containing casing such as that indicated at 45, and this latter is preferably made in the form of a box which may be attached in any suitable manner either to the top or bottom of the switch box 1 or as in the case shown, formed as part of said box. This fuse casing 45 is mounted upon or provided with an end parallel with and immediately adjacent the top 46 of said switch box, or if desired, it may be connected to the bottom 48 of the switch box and it is to be understood that the various parts of the apparatus constituting my

invention are so constructed as to be equally well applied to or used in connection with such a fuse box regardless of whether it is mounted above or below the switch box.

In either case the latter is provided with pairs of bottom and top openings in which are mounted insulated bushings 49 and 50 and in addition the part 46 has an opening 51 entering the lower front part of the fuse box 45; there being also a "knock-out" 52 placed in a similar position in the bottom 48 in order that a similar opening may be conveniently provided in case the invention is to be applied to an installation in which the fuse box is below instead of above the switch box.

In the present instance the fuse box has mounted against its rear wall an insulating base 53 having a pair of terminals 54—54 equipped with fuse-holding clips connected with the terminals 8 in the switch box by copper bars or other suitable conductors 55—55 which pass loosely or freely through the bushings 50. Also mounted within said fuse box is a second pair of terminals 56—56 also having fuse receiving clips and designed for the connection of cable terminals or conductors 57—57.

According to my invention the door 58 of this fuse box, which in the present instance is hinged to the top 46 of the switch box so as to open downwardly, is provided at its top with a rotary longitudinally curved locking spindle or key 59 having an operating knob or handle 60. This spindle is provided with a bit or web 61 designed to fit into a hole of the same section formed in a plate 62 projecting downwardly from the top of the fuse box;—the arrangement being such that after the spindle has been entered into said hole and turned, it cannot be thereafter withdrawn until it has been again moved into a position in which said web is in line with the slot of the keyhole. Likewise it cannot be inserted in said hole except when said parts are in these latter relative positions.

Also connected to the spindle 59 is a crank plate 63 to which is pinned or pivoted one end of a rod 64 extending downwardly on the inner face of the door 58 and projecting through a circularly curved segment 65 which is fixed at one end to said door so as to be substantially concentric with the axis of the hinges 66. This segment has a sleeve portion extending through the opening 51 and is movable between the side flanges or guides 44 of the arm 42, which are of sufficient length to prevent the latter from turning out of a vertical plane including said segment.

A spring 67 is mounted on the rod 64 between a pin 68 thereon and the segment 65, so as to at all times tend to turn the crank 63 and spindle 59 out of a position in

which its bit 61 is in position to enter the keyhole of the plate 62, and the crank preferably has a projecting arm 69 cooperating with a pair of stops 70 and 71 placed to limit rotation of the spindle 59 and knob 60 from a position in which the bit will enter the keyhole to a position 180° therefrom.

With the above described arrangement of parts, if it be assumed that the switch blades 7-7 are in their closed positions, the operating member 18 is then in its innermost position resting against the stop 29 and the door 58 is locked in its closed position with the spindle 59 so turned that the bit 61 is out of line with the keyhole in the plate 62. Under these conditions the door 58 of the fuse box cannot be opened since rotation of the spindle 59 to a position in which its bit will be in line with the slot of the keyhole, is prevented by the crank 63 and rod 64 which are maintained in their upper positions by the pin 43, arm 42 and the locking bolt 37.

If it be attempted to turn the handle or knob 60 to unlock the door, such movement is impossible because the lower end of the bolt 37, being out of line with the hole or passage 36, strikes the body of the link 16 and thereby prevents such turning of the spindle and its bit as would permit release of the door 58. When however the switch operating member 18 is swung outwardly into the position shown in Fig. 3 and is thereby caused to move the switch blade 7 out of engagement with the clips 8, the opening 36 of the link 16 is brought vertically under the lower end of the bolt 37 and the handle or knob 60 may be turned through an angle of 180°, thus moving the crank 63 from a position in which its pin is above the spindle 69 to a position in which it is below the same, forcing down the rod 64 with the pin 43, arm 42 and bolt 37 against the action of the spring 40. Said bolt therefore enters the opening 36 of the link 16 and thus effectively locks the switch operating member in its outer position and the switch in its open position.

It is now possible to move the door 58 of the fuse box to its open position, thereby exposing the fuses, all of whose terminals are "dead". It is to be noted that the rod 64 is of such length that when the bit 61 is in line with the slot of the keyhole and the door is thereby released, the lower end of said rod is substantially flush with the outer curved surface of the segment 65. When therefore the door is swung to its open position, the end of the pin 43 on the arm 42 rides over the curved surface of said segment, preventing upward movement of the bolt 37 under the action of its spring 40.

The link 16 and therefore the switch operating member and switch blades 7-7, remain locked regardless of any position of said door other than the closed position, so

that there is no possibility of an operator receiving a shock or causing current to be delivered to the fuses or lines connected thereto, as long as the door is open.

In order to make possible the closing of the switch it is necessary first to close the door 58, and then turn the handle 60 with the spindle 59 through an angle of 180°. The pin 43, being then in line with the lower end of the rod 64, is allowed to move upwardly by the rotation of the handle 60 as it follows said rod through the lower opening in the segment 65, under the action of the spring 40 on the bolt 37, which is thus moved out of the opening 36 of the link 16. The switch member 18 with the switch blades 7-7 may be now moved to their inner or closed positions so as to permit flow of current to the circuit whose ends are connected to the fuse terminals. Owing to the relation of the pin 43 and rod 64, it is not possible for the bolt 37 to be released by a partial closing of the door 58, since these members cannot be brought into line to permit the release of the link 16 by the bolt 37 until said door occupies a fully closed position.

It is particularly to be noted that the movement of the switch blades 7-7 to their open position is resisted by the springs 34 and 35 until said blades are almost clear of the terminal clips 9 and said arms 14 and 15 are in line with each other. As the operating member 18 and blades 7-7 are moved outwardly beyond such position, the springs 34 and 35 act to assist their movement, with the result that said blades are moved at a relatively high speed out of engagement with the terminal clips 9-9, insuring a quick break of the electric circuit. Similarly when the switch member is being moved to close the switch, its motion is resisted by the springs until the arms 14 and 15 are in line or pass a dead point, after which it is assisted by said springs so that the blades are caused to move at a relatively high speed at the time of their engagement with said clips 9-9.

From the above description it will be noted that the switch cannot be opened until the door of the fuse box has been closed and locked, and similarly the switch is locked in an open position as long as the cover of the fuse box is in any position other than closed. It is therefore an impossibility for current to be supplied to the fuses or to the terminals in the fuse box until the door thereof has been closed.

If it be assumed that an electric circuit controlled by the switch in the box supplies current to a number of industrial departments or establishments, it frequently happens that the different operators in charge of said departments may desire to be assured that the switch shall remain

opened while alterations or repairs are being made to the electrical apparatus supplied by said circuits, and in such case if it be assumed that there are three such departments; the three foremen or operators may apply three separate padlocks 80, 81 and 82, with their hasps respectively inserted through the three sets of holes 22—25, 23—26, and 24—27, so as to lock the switch operating member in a position in which the blades 7—7 are open. Before the switch can be closed to again supply current to the circuits controlled thereby, it will be necessary for all of said operators to unlock and remove their respective padlocks, since as long as one padlock remains in position, the switch cannot be operated. It is therefore an impossibility for damage or injury to be done by the premature closure of the switch.

While I have referred to the box 53 as a fuse box and have described the devices therein as fuses, it is to be understood that without departing from my invention, any other suitable form of circuit breaking device or other electrically actuated instrument may be mounted within said box.

When the fuse box is applied to the lower end or bottom 48 of the switch box, the locking bolt 37 with its spring is movably mounted in suitable openings formed in lugs or brackets 90 and 91 and the "knockout" 52 is removed for the reception of the segment 65;—the door of the fuse box being hinged to the bottom instead of the top of the switch box. Obviously when the box is so applied, the bolt is given such a length as to cause it to function as above described, and after the "knockout" is removed, the opening thus provided is enlarged as may be required to accommodate the segment 65.

I claim:—

1. The combination of a switch box; a switch therein; a fuse box having a door; a locking bolt for the movable member of the switch; a rotary lock for said door; and means connected to transmit movement from the lock to the bolt and hold the latter in a switch locking position when the lock is in a door releasing position.

2. The combination of a switch box; a switch therein; a fuse box having a door; a lock for said door; a reciprocable switch operating member; a bolt for locking said member; and mechanism for transmitting movement from said lock to the bolt adjusted to prevent release of the lock until the switch is opened, said mechanism including means for positively holding said bolt in a switch-locking position when the lock is in a door-releasing position.

3. The combination of a switch box; a switch therein; a fuse box having a door; a lock for said door; a reciprocable switch operating member; a bolt for locking said

member; and mechanism for transmitting movement from said lock to the bolt adjusted to prevent release of the lock when the switch is closed, the same including means for positively holding the bolt in a switch-locking position when the lock is in a door-releasing position.

4. The combination of a switch box; a switch therein; a fuse box having a door; a lock for said door; a reciprocable switch operating member; a bolt for locking said member; and mechanism for transmitting movement from said lock to the bolt adjusted to positively hold said bolt in position to retain the switch in an open position when the door is opened.

5. The combination of a switch box; a switch therein; a fuse box having a door; a lock for said door; a reciprocable switch operating member; a bolt for locking said member; and a series of permanently engaged elements for transmitting movement from said lock to the bolt adjusted to cause said bolt to retain the switch in an open position as long as the door lock is released.

6. The combination of a switch box; a switch therein; a fuse box having a door; a lock for said door; a reciprocable switch-operating member; a bolt for locking said member; and a bar longitudinally movable by said door lock for moving said bolt into position to hold the switch-operating member when the switch is open and the lock is released.

7. The combination of a switch box; a switch therein; a fuse box having a door; a lock for said door; a reciprocable switch operating member; a bolt for locking said member including an arm and a projecting pin; with a bar longitudinally movable by said door lock to move said bolt through the pin into a position to hold the switch operating member with the switch open when the lock is released.

8. The combination of a switch box; a switch therein; a fuse box having a door; a locking bolt for the movable member of the switch; a rotary lock for the door; means for transmitting movement from the lock to the bolt for holding said bolt in a switch locking position when the lock is in the door releasing position; and a device independent of said transmitting means for preventing movement of the bolt when the door is opened.

9. The combination of a switch box; a switch therein; a fuse box having a door; a locking bolt for the movable member of the switch; a rotary lock for the door; means for transmitting movement from the lock to the bolt for holding it in a switch locking position when the lock is in a door releasing position; and a device independent of said transmitting means for preventing movement of the bolt when the door is

opened, said device consisting of a curved segment carried by the door and presented thereby to the bolt.

10. The combination of a switch box; a switch therein; a fuse box having a door; a locking bolt for the movable member of the switch; a spring tending to move said bolt to a releasing position; a lock for the door; means for transmitting movement from said lock to the bolt to move and hold it, against the action of the spring, in a switch locking position when said lock is in a door releasing position; and a device for preventing movement of the bolt by the spring when the door is open.

11. The combination of a switch box; a switch therein; a fuse box having a door; a locking bolt for the movable member of the switch; a lock for the door; and means carried by the door for transmitting movement from the lock to the bolt to hold the latter in a switch locking position when said lock is in a door releasing position.

12. The combination of a switch box; a switch therein; a fuse box having a door; a locking bolt for the movable member of the switch; a lock for the door; means carried by the door for transmitting movement from the lock to the bolt to hold the latter in a switch locking position when said lock is in a door releasing position; and a device also carried by the door for preventing movement of the bolt when the door is open.

13. The combination of a switch box; a switch therein; a switch operating member; a fuse box having a door; a lock; a longi-

tudinally movable member mounted on the door and actuated by said lock; and a bolt actuated by said door carried member for locking the switch operating member with the switch in an open position.

14. The combination of a switch box; a switch therein; a switch operating member; a fuse box having a door; a lock including a crank mounted on said door; and a bolt actuated by said crank and formed to interlock with the switch operating member to positively hold it with the switch in an open position.

15. The combination of a switch box; a switch therein; a switch operating member; a fuse box having a door; a lock; a longitudinally movable member mounted on the door and actuated by said lock; a bolt actuated by said door carried member for locking the switch operating member with the switch in an open position; and a spring for moving the bolt independently of the door carried member to release the bolt from the switch operating member.

16. The combination of a switch box; a switch therein; a switch operating member; a link connecting the movable member of the switch and said operating member; a fuse box having a door; a lock including a crank mounted on the door; and a bolt moved by said crank, positioned to enter an opening in the link when the switch operating member with the switch is in an open position.

In witness whereof I affix my signature.

JAMES F. BURNS.