L. F. KRIES.

ELECTRIC SWITCH AND FUSE BOX.

APPLICATION FILED MAR. 12, 1910.

1,224,880.

Patented May 1, 1917.

3 SHEETS—SHEET 1.

Fig. 1.

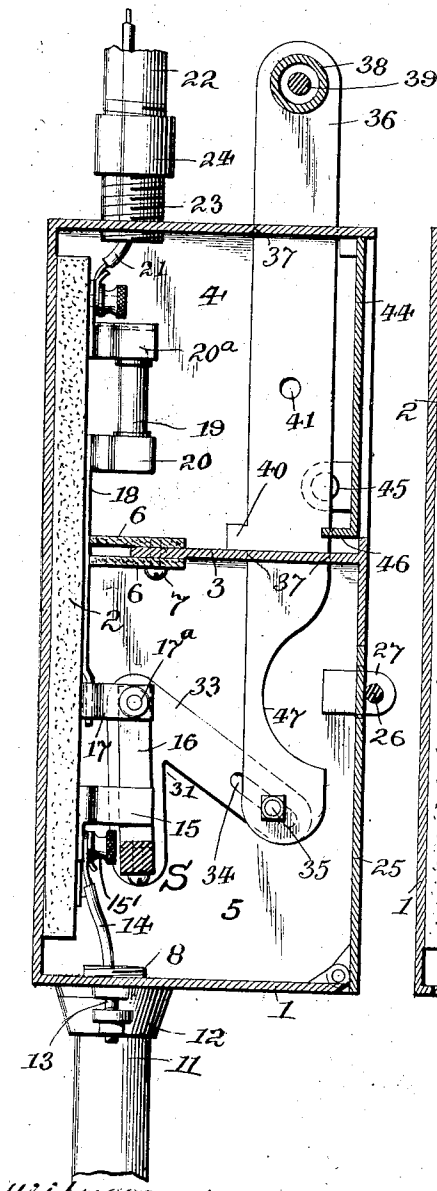
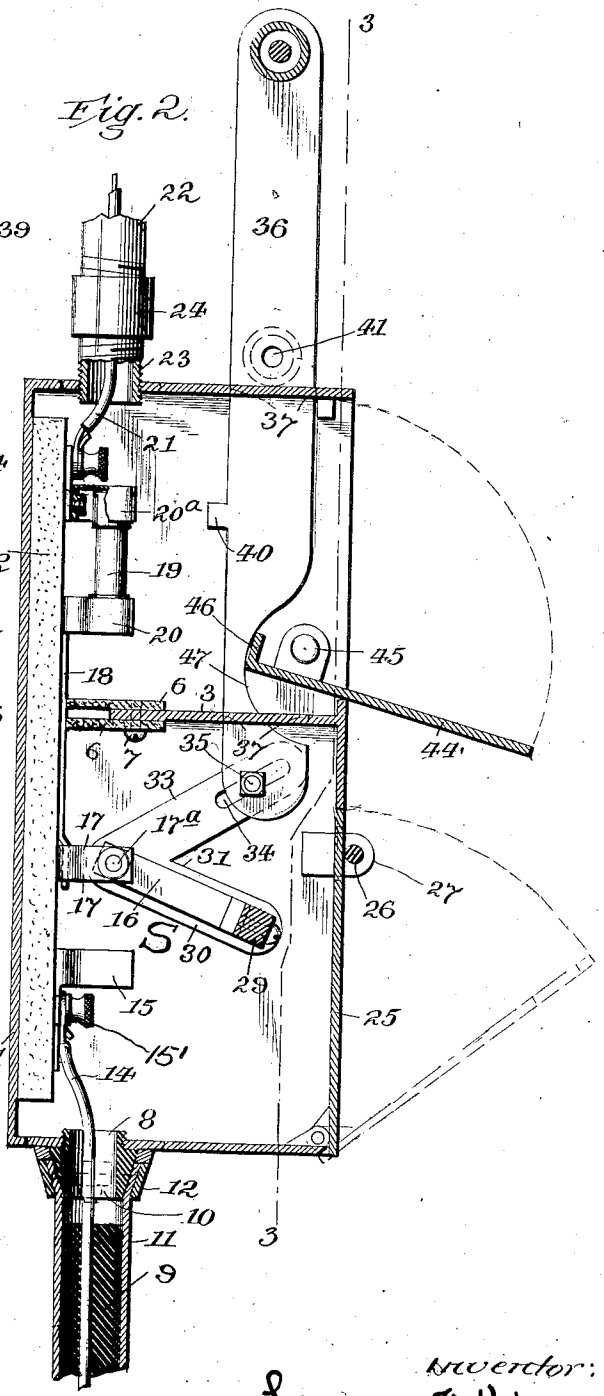


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

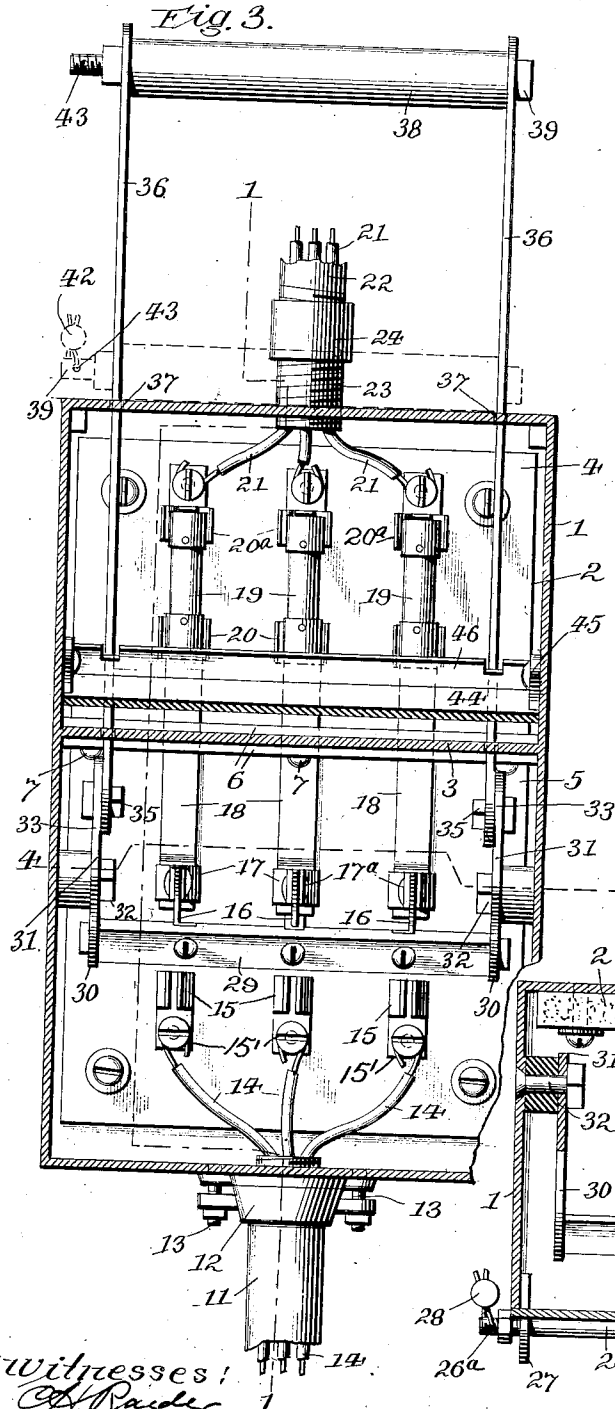


Fig. 5.

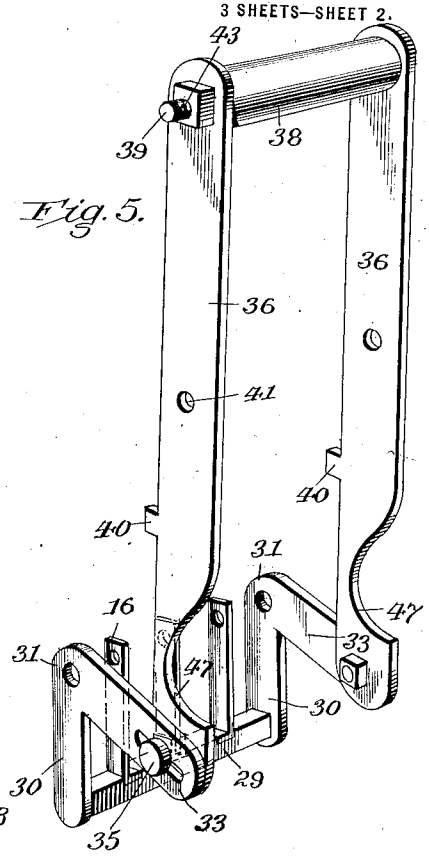
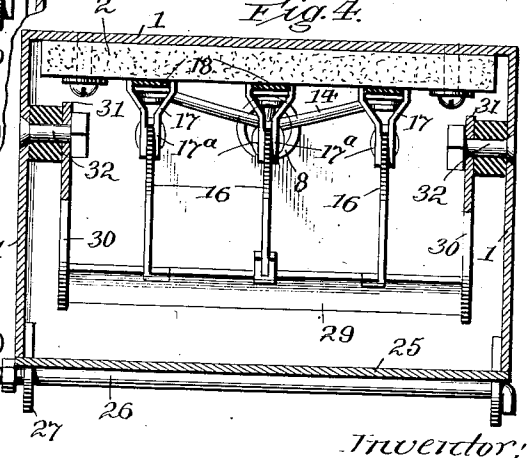


Fig. 4.



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3 SHEETS—SHEET 3.

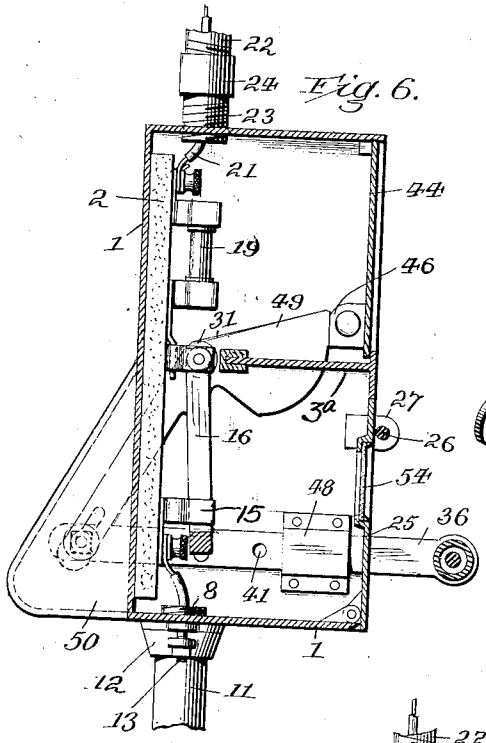


Fig. 6.

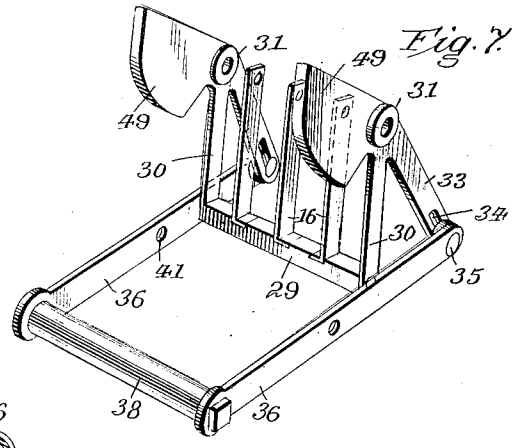


Fig. 7.

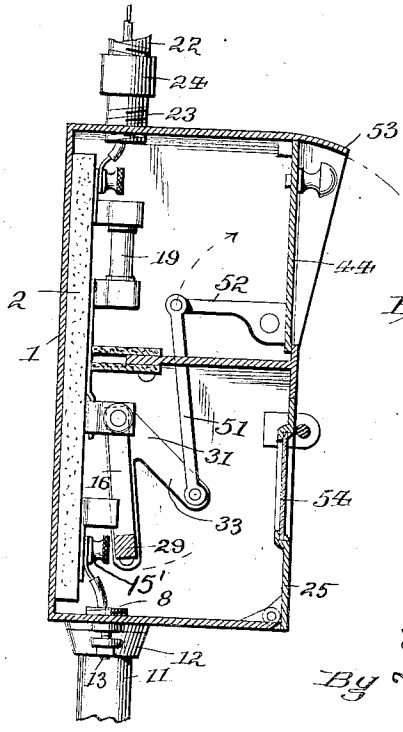


Fig. 8.

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UNITED STATES PATENT OFFICE.

LAWRENCE F. KRIES, OF BALTIMORE, MARYLAND, ASSIGNOR TO CHARLES MORGAN MARSHALL, TRUSTEE, OF BALTIMORE, MARYLAND.

ELECTRIC SWITCH AND FUSE BOX.

1,224,880. Specification of Letters Patent. Patented May 1, 1917.

Application filed March 12, 1910. Serial No. 548,925.

To all whom it may concern:

Be it known that I, LAWRENCE F. KRIES, a citizen of the United States, residing at Baltimore city, in the State of Maryland, have invented certain new and useful Improvements in Electric Switch and Fuse Boxes, of which the following is a specification.

My invention pertains to boxes or holders for electrical apparatus, and is designed to permit the opening thereof whenever necessary for inspection or renewal of the apparatus, but to preclude the passage of the current to the apparatus while the box or holder is open, and to prevent the possible taking of current at such time from within the chamber. Though susceptible of use in various other relations or with other apparatus, the invention is primarily intended for, and is illustrated in connection with, a switch and fuse box for the introduction of current from a service main into a room or building where the current is to be used.

Briefly stated, the invention consists in a novel construction and arrangement of parts, prominent among which is a closure for the fuse box or apparatus-containing chamber, which closure is so connected with or related to a line switch inaccessibly mounted in a separate compartment that the switch must be opened before, and remain open during, the opening of the containing chamber. Various other features, details, and combinations will be pointed out.

Under prior constructions two plans have commonly been adopted for the construction of fuse boxes and the like. In one, the box is capable of being freely opened to give access to the fuse or fuses, with the consequence that there is considerable danger of inexperienced persons receiving a severe shock through the handling of live contacts, and there is the possibility of robbing the supply company of its current by carrying off branches from the fuse holders or contacts.

To obviate these objections it is now quite common to adopt the second plan, which consists in providing the cover or closure of the box or containing chamber with a lock, the key of which is retained by an agent of the company supply current. This latter plan is objectionable, in that in case a fuse blows out or is destroyed, or other apparatus is put out of order, delay is occasioned in making repairs, owing to the necessity of sending for and awaiting the arrival of the keeper of the key.

By my invention I avoid these several difficulties, give free and prompt access to the interior of the box or containing chamber, preclude all chance of accidental contact with live wires or conductors, and render impossible the taking of current from within the box or chamber while said box is open. The details of construction may vary widely within the limits of my invention, convenient forms of the structure, when designed as a fuse box, being represented in the accompanying drawings, in which:—

Figure 1 is a longitudinal section of the complete device on the line 1—1 of Fig. 3, showing the switch closed;

Fig. 2 is similar to Fig. 1 but shows the positions assumed by the various parts when the switch is open;

Fig. 3 is a longitudinal section on the line 3—3 of Fig. 2;

Fig. 4 is a transverse section on the line 4—4 of Fig. 3;

Fig. 5 is a perspective view of the locking slide and switch;

Fig. 6 is a longitudinal section of a modified form of the device adapted to operation from the front;

Fig. 7 is a perspective view of the locking segment and switch of the structure shown in Fig. 6; and

Fig. 8 is a longitudinal section of a modification in which the movements of a door actuate the switch.

Referring by numerals to the structure shown in Figs. 1 to 5 of the drawings, 1 represents the casing or box that incloses the device. This may be of cast iron, pressed steel or any other suitable material, the principal requisites being that the box be tight and strong. So far as possible the use of screws and other removable fastenings is avoided throughout the construction of the box to prevent any tampering with its mechanism.

A slate or other non-conducting base 2 such as is commonly used for switches and fuses is attached to the back of the box, to support and insulate the electrical mechanism. A strong partition 3 extends clear across the box and down to within a short distance from the base 2. This partition

divides the box into two chambers 4 and 5 which I shall call the fuse chamber and switch chamber respectively, though it will be understood that other apparatus than fuses might be inclosed therein. The partition 3 is insulated from the connections carried by the base 2, by insulating strips 6 extending beyond its edge and attached by screws 7 insulated from the switch chamber side.

Where the switch box is used to control the circuit entering a building, the connections from the street main will enter the box at 8. In such service a lead sheathed cable 9 is commonly used and a convenient mode of attaching such cables is to provide a conical nipple 10 on the box, force the lead sheath 11 of the cable over this nipple and clamp it in place with a ring 12 held by bolts 13. Any other suitable method may of course be employed, the idea being merely to secure a tight joint between the sheath and the box.

The line or supply wires 14, leading from the source of current supply, through cable 9, enter the casing and their ends are connected to the supply wire terminals 15', to which are secured the live switch contacts 15 of a switch S. These terminals and switch contacts are suitably secured to the base 2. In the drawings, the invention is shown in connection with a three-wire system, for illustration; but obviously it is adapted for any number of wires by simply varying the number of switch blades, contacts, fuses, etc.

The switch S is adapted, when closed, to electrically connect the supply wires in the part 5 of the casing with the fuse terminals 20 in the part 4, and when the switch is open, the electrical connection between the supply wires and said fuse terminals is broken. The switch S is preferably a knife switch having blades 16, pivoted to switch terminals 17, and movable into and out of engagement with the live switch contacts 15. The switch terminals 17 are connected by conductors 18 to the fuse terminals 20. When the switch S is closed, the circuits are completed from the supply wires through the switch to the conductors 18 and fuse terminals 20, thence through fuses 19 to the fuse terminals 20^a, connected to conductors 21, which latter are suitably inclosed, as by a metallic conduit 22, and lead to the meter and house connections. The conduit 22 may be connected to the box by a nipple 23 and sleeve 24, as shown.

The ends of the supply wires, the supply wire terminals, and the switch contacts 15, all of which parts are constantly alive, are in the part 5 of the casing and inaccessible from the part 4 thereof, by reason of the partition or barrier 3. As shown in Figs. 1 and 2, the switch blades are also wholly within the part 5 and inaccessible from the part 4. Access to the chamber or part 5 may be had only by opening a door 25 and this door is held closed by a bar 26 passing through ears 27 on the box 1 and sealed in position by the usual lead seal 28, attached through the hole 26^a. Thus access to the switch chamber is available only to authorized employees of the electric power company.

The switch, however, may be operated by anyone through the following mechanism. The switch blades 16 are connected to move in unison by an insulating bar 29 which is mounted at its ends on the arms 30 of bell crank levers 31. The levers 31 turn on pivots 32 on the box 1, the pivots 32 being alined with the pivots 17^a in the switch blades 16.

The other arms 33 of the bell crank levers 31 are slotted at 34 to engage the pins 35 which are carried by the slides 36 guided in slots 37, in the partition 3 and an end wall of case 1. The slides 36 are connected by a handle 38 carried on a bolt 39, the slides, bolt and handle constituting a bail. Thus the switch is closed by the inward movement of the slides and opened by the outward movement thereof. The inward motion of the slides is limited by the engagement of the lugs 40 with the partition 3 (see Fig. 1). The switch may be sealed open by removing handle 38 and attaching it in the position indicated in dotted lines in Figs. 2 and 3 by passing bolt 39 through the holes 41 in slides 36 and sealing it in place with the lead seal 42 (Fig. 3), a hole 43 being provided in bolt 39 for that purpose.

It is often desirable, both on behalf of the power company and the customer, when a building is vacated, to be able to lock the switch in open position, so that no one but an authorized person can close it, and this is accomplished in a simple manner by the means just described.

Access to the fuse chamber 4 can be had only through the aperture closed by door 44. This door is pivoted at 45 the pivots being some distance from the edge of the door so that as it is opened a heel portion 46 of the door swings into the chamber. When the slides 36 are in any position but their outermost one the heel 46 is prevented from inward motion by the slides 36 so that the door cannot be opened. When however the slides are in their outermost position a cam recess 47 in the slides comes immediately behind the heel 46 and permits the opening of the door. A very slight inward motion of the slides will close the door, and the parts are so proportioned that the door will be completely closed and held closed prior to the initial closing of the switch. While the fuse terminals are thus accessible when

the door is open, for the purpose of removing or replacing fuses, the switch is also open and the accessible conducting parts are dead, while the live parts of the apparatus, which include the supply wires, supply terminals and live switch contacts, are inaccessible through said opening by reason of the barrier 3.

The modification shown in Figs. 6 and 7 is identical in principle, but is arranged for use where a box set flush in a wall is desired. Parts identical with those already described are similarly numbered in these figures and further explanation is needless. In the modified structure the bell cranks 31 are of slightly different form, and the slides 36 are guided in guides 48 and pass through the front of the box.

The switch blades 16 are shown pivoted in line with the barrier 3^a, and their hinged ends are thus partly accessible when the door 44 is open; but as the switch is always open when the door is open, and the door is always closed before the switch is closed, it is impossible to either receive a shock or steal current from the switch blades.

Cam segments 49 are carried by the bell cranks 31 and serve to engage the heel 46 on the door 44 so that no cam recesses appear in the slides 36. The case 1 is provided with rearwardly projecting chambers 50 to give the necessary clearance.

In either of the structures described above access may be had to the fuse chamber only after opening the switch, and before the circuit can be again closed the door 44 must tightly close. It is impossible to steal current from the fuse terminals without actually breaking the box as the current can be turned on only while the door is closed, and it closes too tightly to permit wires to be led around the edges.

As such fuses are customarily mounted between the street mains and the meter, this point is of the greatest importance.

In the modification shown in Fig. 8 parts already described bear corresponding numbers. The bell crank lever 31 is similar to that shown in Figs. 1 to 5, but the slot 34, slides 36 and parts carried thereby, and the heel 46 on the door are omitted. Instead, the arms 33 are connected by links 51 to inwardly projecting arms 52 on the door, the parts being so proportioned that a slight opening movement of the door effects the complete opening of the switch. A flange 53 conforming to the path of the edge of the door and projecting from the front of the box prevents access thereto, until the switch is fully opened. This embodiment is not, however, as desirable as the others since it is difficult to secure a satisfactory opening of the switch on a sufficiently small movement of the door and also because the door must remain open so long as the switch is open, whether access to the chamber is desired or not.

The construction shown in Fig. 8 is not specifically claimed in the present application, as it forms the subject-matter of a divisional application, Serial No. 787,438, filed August 30, 1913, in which it is described and claimed.

If for any reason desired, a glass window 54 may be placed in door 25 to permit a clear view of the switch, as illustrated in Figs. 6 and 8.

It is obvious that other forms of electrical apparatus in addition to or in place of the fuses shown, might be inclosed in chamber 4, the essential idea of the invention being the combination of an apparatus-containing chamber and a switch in such a manner that the opening of the apparatus containing chamber becomes possible only when the switch is open. Additional features are the isolation or inaccessibility of all parts that remain alive when the switch is open and various structural details above set forth.

Obviously, various changes and modifications are possible without departing from the spirit and scope of the invention. For instance, instead of having the wires enter or leave the box at opposite ends, they may all be arranged at one end, or they may enter and leave at the sides, or in fact at any desired points, but should be led through the switch and fuses in the order or arrangement here set forth. If the supply wires enter through the fuse chamber in passing to the supply wire terminals in the switch chamber, they should of course, be protected against access in the fuse chamber, as otherwise current could be taken from them.

Having thus described my invention, what I claim is:—

1. The combination with a casing having an opening, and a door on the casing for closing said opening, of fuse terminals in one part of the casing, accessible through said opening when the door is open, supply-wire terminals and live switch contacts in another part of the casing, a barrier within the casing preventing access through said opening to said live terminals and switch contacts, a movable switch-member within the casing for connecting said switch contacts with said fuse terminals, and means operatively related to the door and switch member necessitating the closure of the door prior to the closure of the switch and the opening of the switch prior to the opening of the door.

2. The combination with a casing having a door thereon, of fuse terminals in one part of the casing accessible when the door is open and inaccessible when the door is closed, supply terminals and live switch contacts in another part of the casing, a barrier

within the casing preventing access to said supply terminals and switch contacts when the door is open, movable switch members within the casing for connecting said switch contacts with said fuse terminals, and an accessible mechanism for actuating said switch members and for simultaneously controlling the door, said mechanism comprising means for preventing the door from being opened while said switch members are in closed position, and for permitting the door to be opened after said members have been moved to open position.

3. The combination with a casing having a door thereon, of fuse terminals in one part of the casing accessible when the door is open and inaccessible when the door is closed, supply terminals and live switch contacts in another part of the casing, inaccessible through said opening, movable switch members for connecting said switch contacts with the fuse terminals, and means operable from without the casing for actuating said members and door, said means acting to close and lock the door when said members are moved toward closed position and to release the door when said members are moved to open position.

4. The combination with a casing having a door thereon, of fuse terminals in one part of the casing accessible when the door is open and inaccessible when the door is closed, supply terminals and live switch contacts in another part of the casing, a barrier within the casing preventing access to said supply terminals and switch contacts when the door is open, pivoted switch arms for connecting said switch contacts with the fuse terminals, and means operable from without the casing for rocking the switch arms and acting to close and lock the door when said arms are moved toward closed position and to release the door when said arms are moved from closed position.

5. The combination with a casing having a door hinged thereto, of fuse terminals in one part of the casing accessible when the door is open and inaccessible when the door is closed, supply terminals and live switch contacts in another part of the casing, a barrier within the casing preventing access to said supply terminals and switch contacts when the door is open, pivotally mounted switch arms within the casing for connecting said switch contacts with the fuse terminals, and means operable from without the casing for rocking the switch arms and controlling the door, said means acting to lock the door when said arms are moved toward closed position and to release the door when said arms are moved from closed position.

6. The combination with a casing, of fuse terminals in one part of said casing, supply-wire terminals and a switch in another part of the casing, said switch adapted to connect the latter terminals with the fuse terminals, a door, hinged to the casing, for permitting access to the fuse terminals, said door having a projecting part adjacent its pivotal axis, a barrier within said casing for preventing access to said supply-wire terminals and switch, and mechanism for actuating the switch and simultaneously controlling the door, said mechanism being operable from without the casing and comprising means acting to engage said projecting part on the door and lock the door when the switch is closed.

7. The combination with a casing having an opening, and a door, hinged to the casing, for closing said opening, fuse terminals within said casing accessible through said opening when the door is open, supply wire terminals and live switch contacts in another part of the casing, inaccessible through said opening, movable switch members within the casing for connecting said fuse terminals with said switch contacts, and actuating mechanism for the switch operable from without the casing, said mechanism and door having interlocking parts acting to automatically lock the door in closed position when said mechanism is moved to close the switch, the interlocking part on the door being located adjacent its pivotal axis.

8. The combination with a casing having an opening, and a door on the casing for closing said opening, of fuse terminals in one part of the casing accessible when the door is open and inaccessible when the door is closed, supply-wire terminals and live switch contacts in another part of the casing, inaccessible through said opening in all positions of the door, rocking switch arms within the casing for connecting said switch contacts with said fuse terminals, and mechanism for operating said switch and simultaneously controlling the door, said mechanism comprising a sliding member projecting through one wall of the casing and having means for closing and locking the door prior to the closure of the switch and unlocking the door subsequent to the opening of the switch.

9. The combination with a casing having an opening, and a door on the casing for closing said opening, of fuse terminals in one part of the casing accessible when the door is open and inaccessible when the door is closed, supply-wire terminals and live switch contacts in another part of the casing, inaccessible through said opening in all positions of the door, rocking switch arms within the casing for connecting said switch contacts with said fuse terminals, and operating mechanism for the switch and door comprising a pair of rods projecting through one wall of the casing and a handle piece

connecting said rods outside the casing, said mechanism having means for closing and locking the door prior to the closure of the switch and unlocking the door subsequent to the opening of the switch.

10. The combination with a casing having an opening and a door on the casing for closing said opening, of fuse terminals in one part of the casing accessible when the door is open and inaccessible when the door is closed, supply-wire terminals and live switch contacts in another part of the casing, a barrier within the casing preventing access to said supply terminals and switch contacts through said opening, movable switch members within the casing adapted to connect said fuse terminals and switch contacts, mechanism for operating said switch members and for simultaneously controlling the door, said mechanism projecting outside the casing and comprising means for locking the door when the switch members are in closed position and releasing the door when the switch members have been moved to open position, and means for locking the said operating mechanism so as to hold said switch members in open position.

11. The combination with a casing having an opening and a door on the casing for closing said opening, of fuse terminals in one part of the casing accessible when the door is open and inaccessible when the door is closed, supply-wire terminals and live switch contacts in another part of the casing, a barrier within the casing preventing access to said supply terminals and switch contacts through said opening, movable switch members within the casing adapted to connect said fuse terminals and switch contacts, mechanism for operating said switch members and for simultaneously controlling the door, said mechanism comprising a bail having its arms projecting through the casing, said arms having perforations adapted to receive a locking rod, outside the casing, when the switch members are in open position, and said mechanism having means for locking the door when the switch members are in closed position and releasing the door after said switch members have been moved to open position.

12. The combination with a casing having an opening, and a door hinged to the casing for closing said opening, of fuse terminals in one part of the casing, accessible when the door is open and inaccessible when the door is closed, supply-wire terminals and live switch contacts in another part of the casing, inaccessible through said opening, pivoted switch members within the casing adapted to connect said fuse terminals and switch contacts, mechanism for operating said switch members and simultaneously controlling the door, said mechanism projecting outside the casing and comprising means for locking the door when the switch members are in closed position and releasing the door when the switch members have been moved to open position, and means for locking the said operating mechanism so as to hold said switch members in open position.

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

LAWRENCE F. KRIES.

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