E. S. MORRELL.

PANEL BOARD CONSTRUCTION.

APPLICATION FILED JAN. 16, 1912.

1,040,381.

Patented Oct. 8, 1912.

3 SHEETS—SHEET 1.

FIG. 1.

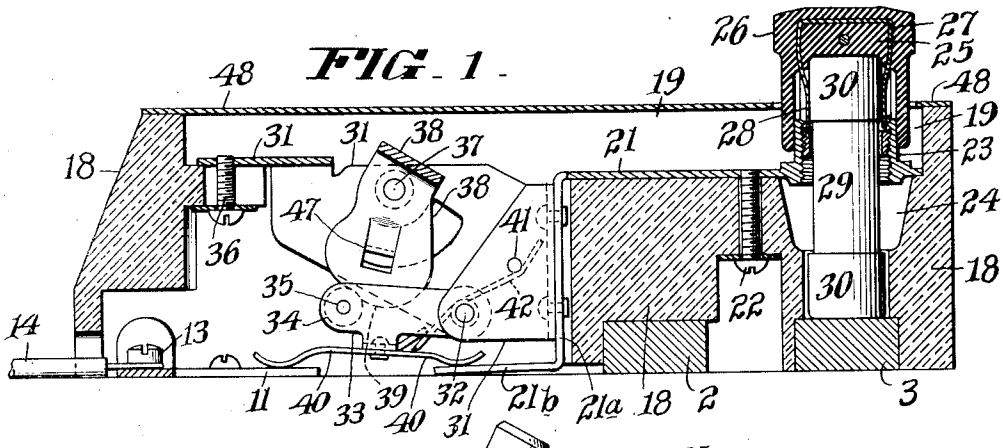


FIG. 2.

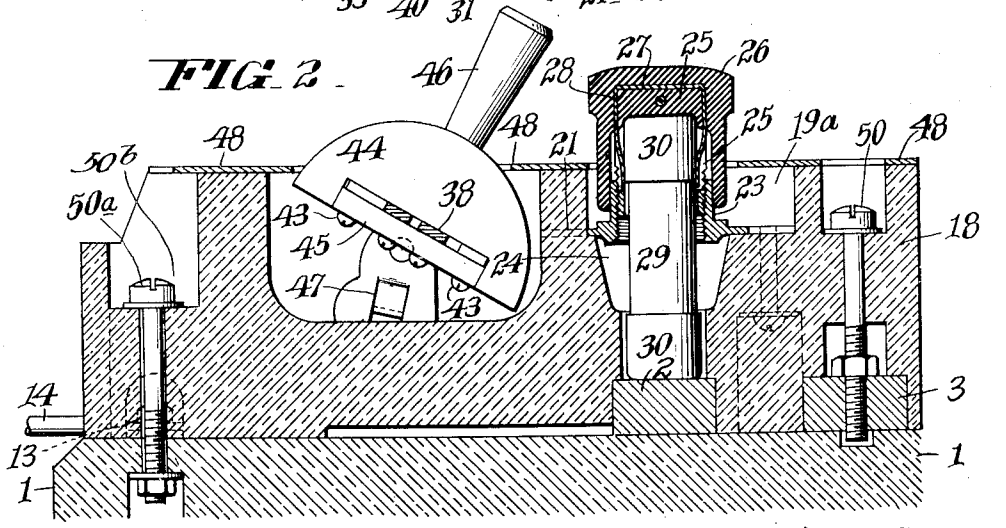
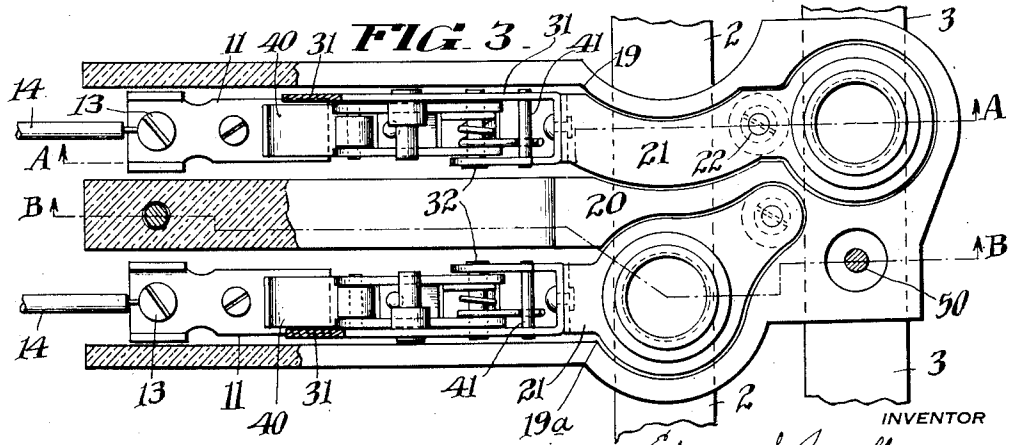


FIG. 3.



INVENTOR

Edward S. Morrell

BY

Cornelius D. Ethret

His ATTORNEY

WITNESSES

Daniel Webster, Jr.

Anna E. Steinbach

E. S. MORRELL.

PANEL BOARD CONSTRUCTION.

APPLICATION FILED JAN. 16, 1912.

1,040,381.

Patented Oct. 8, 1912.

3 SHEETS—SHEET 2.

FIG. 4.

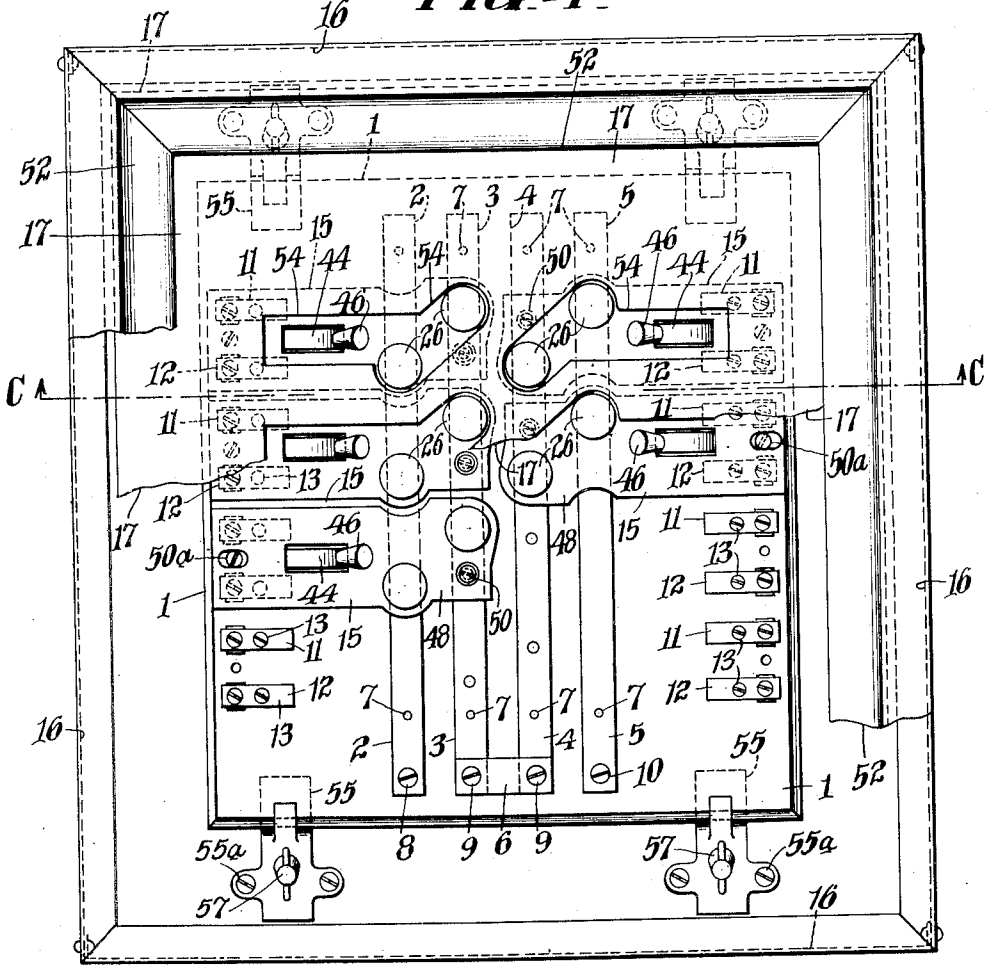
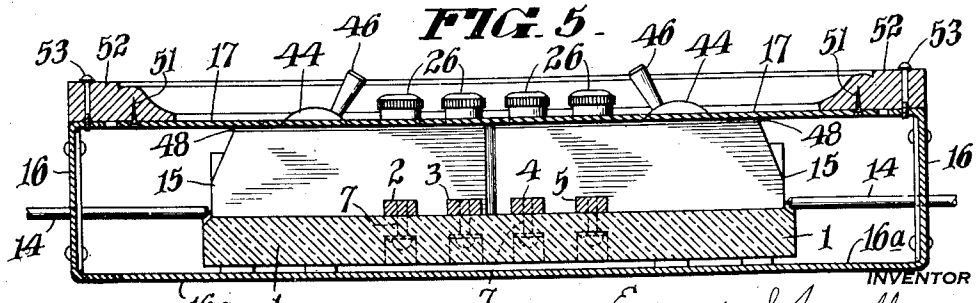


FIG. 5.



WITNESSES

Daniel Webster Jr.

Anna E. Steinbock

INVENTOR

Edward S. Morrell

BY Cornelius D. Ehret

His ATTORNEY

E. S. MORRELL.

PANEL BOARD CONSTRUCTION.

APPLICATION FILED JAN. 16, 1912.

1,040,381.

Patented Oct. 8, 1912.

3 SHEETS—SHEET 3.

FIG. 6.

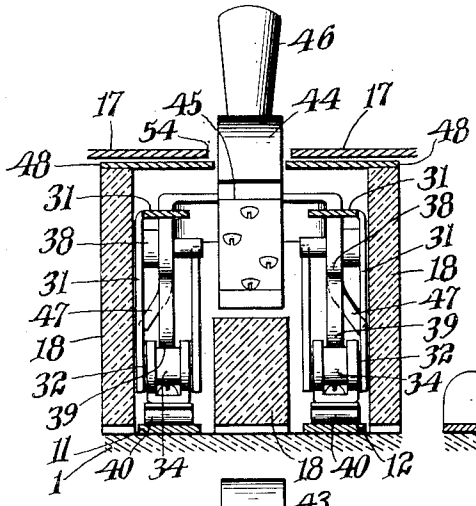


FIG. 7.

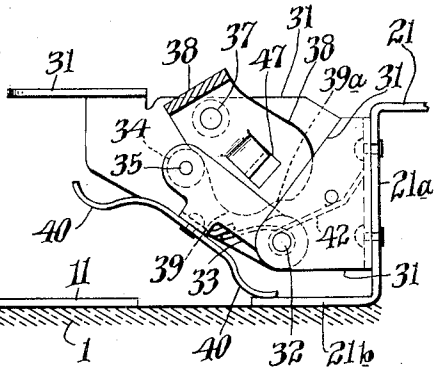


FIG. 8.

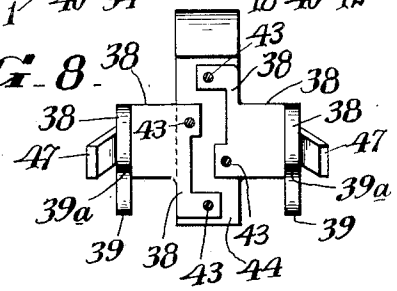


FIG. 9.

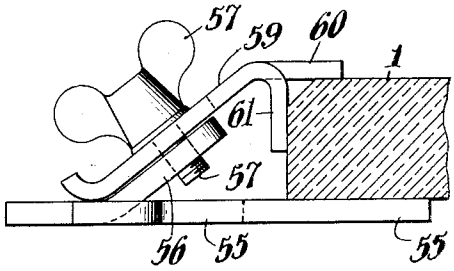


FIG. 10.

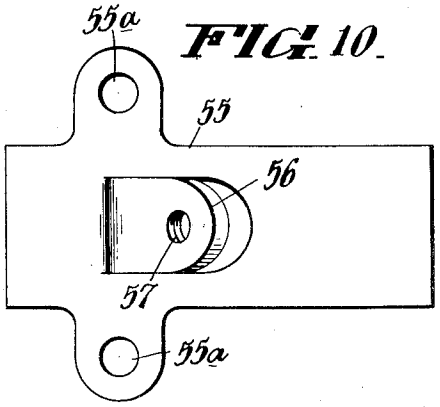
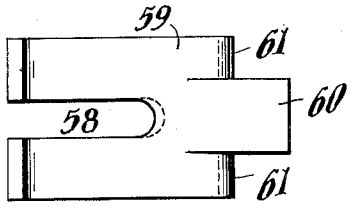


FIG. 11.



WITNESSES

Daniel Webster, Jr.

Anna E. Steinbock

INVENTOR

Edward S. Morrell

BY Cornelius D. Ehret

his ATTORNEY

UNITED STATES PATENT OFFICE.

EDWARD S. MORRELL, OF PHILADELPHIA, PENNSYLVANIA.

PANEL-BOARD CONSTRUCTION.

1,040,381. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed January 16, 1912. Serial No. 671,431.

To all whom it may concern:

Be it known that I, EDWARD S. MORRELL, a citizen of the United States, residing in the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Panel-Board Construction, of which the following is a specification.

My invention relates to electric panel or distributing boards, such, for example, as used in the interior wiring of houses or buildings, for making electrical connections between service or supply circuit conductors and the lamp or other consumption circuit conductors.

It is the object of my invention to provide a panel board construction in which the switches, or switches and fuses, are assembled as separable and detachable units suitably mounted upon an insulating member, and disposed in such relation that a minimum of space is occupied, and preferably in such manner that the movable contact member of a removable switch engages a terminal stationary upon the panel board and not removable with the switch or switch and fuse unit.

It is a further object of my invention to provide a panel board construction in which the parts having or requiring finish are placed or mounted after the actual wiring and connections of the wiring have been done.

It is a further object of my invention to provide a panel board construction having a front or cover which is removable without disturbing the condition of the supply or consumption circuits, that is, without disturbing any parts which may be conducting or carrying current.

A further object is to provide a panel board construction in which the usual side insulating linings within the box are dispensed with or avoided, as by employing the insulating material, forming the removable switch or switch and fuse units to form a gutter between themselves and the outer panel box; and in such relation further the use of a fuse as the connecting medium or link between the supply and consumption circuits, as between the supply circuits and the switch.

It is a further object of my invention to provide a panel board construction in which the fuses are so arranged that it is impossible for an operator to come into contact with any electrically alive parts while refusing a circuit or circuits.

Another object of my invention is to provide two cover plates, the outer of which covers the panel board apparatus and has an aperture or apertures sufficiently large as to easily clear the projecting parts of the panel board apparatus, as the switch or switch and fuse units, while the inner cover, which is a separate inner cover for each switch or switch and fuse unit, has an aperture or apertures with small clearances over the projecting parts of the switch or the switch and fuse units.

From a construction such as herein described there results a considerable saving in space, since the bus bars are mounted side by side and since the switches and fuses, and switch and fuse units are mounted side by side and, further, because the fuses are disposed over or above the bus bars, the width of the panel board is decreased below that of prior practice. A further saving in space results from inclosing the switch, fuse, or the switch and fuse within or upon a body or block of insulating material. In my preferred construction the fuses are located directly over the bus bars to facilitate connection between fuse holders and bus bars. Because of this inclosure of the electrically alive metal parts in insulating material, the operator is prevented from touching them and re-fusing of the panel board is possible, with a maximum degree of safety to the operator touching electrically alive metal parts. And by making the switch and fuse removable as an unit from the panel board having thereon the posts and consumption circuit terminals, the panel board proper may be installed and connections made thereto while the rough work in a building is being done; and while the building is being finished or after it has been finished the removable switch and fuse units are attached to the parts previously installed, thus avoiding any danger of damage to the switches or fuses during the building process, as is usual with the present type of panel boards. And by the employment of removable switch and fuse units a new switch and fuse unit may be added or withdrawn at any time without disturbing the operation or service of the remainder of the panel board and without cutting off current

from the panel board. And repairs are facilitated since any switch or fuse unit requiring repair may be independently removed without removing the panel board and without interrupting service. While the switches and other visible parts of prior panel boards require polishing and finishing, by my construction the amount of high finish or ornamental finish is reduced to a minimum, since practically all the parts are covered, and the cover only need be finished or ornamented.

By the construction herein illustrated a "flush" arrangement is provided; that is, only the switch handles and fuse handles protrude and all other parts are included within the panel board box. And by the employment of the switch and fuse units the use of risers, jumpers, or cross bars heretofore commonly used, is obviated. My construction is such that either the fuse or the switch may be directly in communication with the bus bars and the switch and the fuse in electrical communication with the consumption circuit terminal.

My invention resides in the features above referred to; and in the other features of construction hereinafter described and claimed.

For an illustration of one of the forms my invention may take, reference is to be had to the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view, some parts in elevation, taken through a separable or detachable switch and fuse unit, taken on the line A—A of Fig. 3. Fig. 2 is a longitudinal sectional view taken on the line B—B of Fig. 3. Fig. 3 is a top plan view of the two switches and fuse connections of a switch and fuse unit, with the switch actuating the parts, and the covers and other parts omitted. Fig. 4 is a top plan view of the panel board, with parts of the covers removed, and showing several switch and fuse units in place. Fig. 5 is a cross sectional view of the panel board and box shown in Fig. 4, and taken on the line C—C of Fig. 4. Fig. 6 is a cross sectional view, parts in elevation, through a switch unit and through its cover, and through a part of the outer cover. Fig. 7 is a side elevational view of a switch unit with a switch element in open position, the independent and separate consumption circuit terminal being shown in coöperating position. Fig. 8 is an under side plan view of the switch operating members. Fig. 9 is a side elevational view of means for holding the panel board within the box. Fig. 10 is a top plan view of one of the members shown in Fig. 9. Fig. 11 is a top plan view of another member shown in Fig. 9.

Referring first to Figs. 4 and 5, the panel board proper consists of the plate or member 1 of suitable insulating material, such as slate or the like. Upon this member 1 are secured the service or supply circuit bus bars 2, 3, 4 and 5, extending substantially parallel to each other along the board or member 1. The bus bars 3 and 4 are electrically connected together by the member 6, so that the bus bars 3 and 4 are electrically unitary, but mechanically separate in order to accommodate the switch and fuse units hereinafter described. In the example shown there are three electrically distinct bus bars, such as may be used for an ordinary three-wire system. It is to be understood, however, that my invention is not limited to the number of bus bars disclosed nor to the example of their electrical connection as shown. It is apparent that bus bars 3 and 5 may be electrically connected together and bus bars 2 and 4 electrically connected together and each pair connected to one wire of a two-wire supply circuit. Or the bus bar arrangements may be anything desired for two, three, or more wire circuits or for single, two-phase, three-phase or other phase circuits of alternating current supply. The bus bars 2, 3, 4 and 5 are secured to the slate base 1 by screws 7 and the service conductors are electrically connected to the bus bars by the binding screws 8, 9 and 10. On the base 1 are mounted also the consumption or lamp circuit terminals in pairs 11 and 12, a pair for each consumption circuit. Each terminal 11 and 12 is supplied with a binding screw 13 for electrically connecting to the terminal the consumption circuit conductor, such conductors 14 being shown in Figs. 1, 2, 3 and 5. Between the bus bars and the consumption circuit terminals electrical communication is afforded by the separable and detachable fuse units 15 as hereinafter described. Inclosing the units 15 and the bus bars and the consumption circuit terminals is a box having the sides 16 and bottom 16^a which may be of sheet metal, and the outer cover or covers 17.

Referring now to Figs. 1 to 3 inclusive, and Figs. 6 to 8 inclusive, the switch and fuse unit is shown as comprised of the supporting member 18 of molded porcelain, or any other suitable insulating material. There are two longitudinal channels 19 and 19^a in the top side of the block 18, the channels being more distinct at the right hand ends, Figs. 1 to 3 inclusive, where there is a porcelain separating wall 20 between them. In the bottom of the channel 19 is disposed a conductor 21 secured to the block 18 by a screw 22 and in the bottom of the channel 19^a is disposed a similar conductor 21 similarly secured to the block 18 by a screw 22. Each conductor 21 terminates in a screw-threaded member 23 disposed over a hole 24, one hole 24 extending down to the bare bus bar 2 while the other extends down to the bare bus bar 3, see Figs. 1 and 2. In

the screw-threaded member 23 engages a screw-threaded member 25 secured in the insulating handle or cap 26 of hard rubber or other suitable insulating material. Between the member 25 and the cap 26 is secured the conducting member 27 which terminates in the conducting spring fingers 28 extending inwardly through the walls of the member 25. An inclosed fuse 29 having the conducting caps 30 has its upper cap 30 inserted into and engaging the spring fingers 28, thereby being brought into electrical communication with the conductor 21. The cap 30 at the other end of the fuse engages one of the bus bars as 2 or 3, one fuse cap engaging bus bar 2 and the lower cap of the other fuse engaging the bus bar 3. By grasping the cap 26 and unscrewing the same, the member 25 with tips 28 is removed and the fuse 29 is removed therewith. Each conductor 21 extends to the left, as viewed in Figs. 1 to 3 inclusive, and continues in a downwardly vertically extending portion 21^a and thence in a horizontal portion 21^b forming one terminal of each electric switch, each switch and fuse unit here shown comprising two pairs of switches and fuses. Secured to the vertical member 21^a is the bracket 31 to which there is pivoted at 32 a link or lever 33 carrying at its outer end a roller 34 pivoted to 33 at 35. The bracket 31 extends longitudinally of the block 18 and is supported at its outer end by screw 36 to the block 18. Pivoted to this same bracket member 31 at 37 is the cam member 38 having the cam surface 39 adapted to engage the roller 34. Secured to the link or lever 33 is the movable switch contact 40 of resilient sheet metal whose one end maintains contact with the contact 21^b and whose other end is adapted to engage the consumption circuit terminal 11 or 12. With its one end secured to the bracket 21 and passing under the pin 41 therein and winding around the pivot 32 is the spring 42 attached at its other end to the members 34 and 40 as an unit. The tension of this spring 42 is such as to tend to rotate the link 34 and the attached contact 40 in a clockwise direction about the pivot 42, as viewed in Fig. 1, to cause the member 40, which is bridging contacts 21^b and contact 11 or 12, to leave contact 11 or 12 to break circuit. The cam members 38 of two neighboring switches on the same block 18 are electrically distinct as shown in Fig. 8, and secured by screws 43 to the under side of the insulating block 44, the screws 43 extending through the piece of insulating material 45 before passing into the block 44. The block 44 is provided with the operator's handle 46. By rotating the cam members 38 in a clockwise direction about their pivots 37, as viewed in Fig. 7, by pushing the handle 36 for each pair in a clockwise direction, as viewed in Fig. 2, the cam surface 39 engages the roller 34, thus depressing the link 33 and bringing the movable contact 40 into engagement with the consumption circuit terminal 11 or 12 in opposition to the spring 42. When the circuit closing position is reached the parts stay locked because of the depression 39^a in the cam surface which receives the roller 34. To open the circuit the handle 46 is pushed in counter-clockwise direction, as viewed in Figs. 2 and 7, raising the roller 34 out of depression 39^a and spring 42 completes the opening movement, whereupon the cam members 38 occupy the position shown in Fig. 7. The operation of the switch is a snap or quick break action. Stops 47 upon the cam members 38 engage in arc-shaped slots in the side cheeks of the members 31 to limit the extent of rotative motion, if desired, of the cam members.

Across the top of each block 18 is a cover plate 48, which may be of metal, and suitably finished or ornamented, and provided with suitably shaped apertures, to allow the passage of the cap or handle members 26 of the fuses and the handle 46 and the member 49 as indicated in Figs. 1, 2, 5 and 6. These apertures are so small, or their clearance is so small, that the inner cover plate 48 is not removable when these parts 26, etc., are in operative position. At the fuse end of each block 18 is a screw 50 which extends downwardly and engages in one of the bus bars to mechanically secure the fuse block and the parts carried thereby to the panel board. At the other end is a similar screw 50^a which extends downwardly through a longitudinal slot 50^b into the base 1, see Fig. 2, where it engages in a nut held in a socket on the under side of the base 1. The several blocks 18 each carrying a pair of switch and fuse units are then secured in operative relation to the panel board, as shown in Fig. 4, and by each switch and fuse unit an electrical connection is made from a bus bar to a distributing or consumption circuit terminal, the current passing from the bus bar through the fuse, then through the member 21, through the switch contact 40 to the consumption circuit terminal 11 or 12.

A cover plate 17, Figs. 4, 5 and 6, in one or more sections as desired, is secured by screws 51, Fig. 5, to the wooden or other finish strip or mold 52 secured by screws 53 to the inturned edge of the metal side walls 16. The outer cover 17 has a large irregularly shaped aperture which is shown at 54, Figs. 4 and 6, having sufficient opening or clearance to pass freely over the switch handles 46 and the fuse caps 26. By this construction, the outer cover 17 may be easily removed without touching or disturbing any of the caps 26 or handles 46, thus exposing or baring the various independent switch and fuse units each having its own

separate and independent cover plate 48. Then, by loosening the screws 50 and 50ª of any unit, that unit may be removed without disturbing any of the other units which may be conducting current and supplying it to a consumption circuit. In other words, by this construction any of the switch and fuse units may be removed without disturbing any of the others and so without interrupting service to the various of the consumption circuits. The unit so removed may be repaired if necessary, and then restored, again without disturbing any of the the circuits or units. Any consumption circuit may be re-fused by simply unscrewing the caps 26 of a unit and inserting therein new fuse cartridges and replacing the same. This can be done either with the cover 17 in place or removed.

As will be readily understood by moving the switch handles 46 to one position or the other the corresponding consumption circuit is either interrupted or closed.

The slate base 1 is secured to the bottom 16ª of the box 16 by the clamps, one of which is illustrated in Figs. 9 to 11 inclusive. The bottom clamp member 55 is secured by screws or rivets 55ª to the bottom 16ª. The member 55 has an upwardly inclined portion 56 having a screw-threaded hole to receive the screw-threaded thumb screw or nut 57 which passes through the slot 58 in the upper clamping member 59 which has a horizontal lug 60 engaging the top of the base 1, see Fig. 9, and which has a vertical lug 61 resting against the side of the base 1. By clamping the member 59 to the member 56 the base 1 is clamped to the bottom 16ª and the slot 58 allows adjustment.

With the insulating blocks 18 in position, as shown in Figs. 4 and 5, there is formed between exposed outer sides and ends of the blocks 18 and the inner wall of the box 16 a trough suitable for receiving service and consumption circuit conductors, thus avoiding the necessity for the use of a slate or other insulating side or trough member commonly used around the slate bases of prior panel boards to form a trough or space between the same and the inner side of the box.

From the foregoing description, it is apparent that I have provided a panel board which occupies a minimum amount of space; which protects any one from injury and which nevertheless has the parts necessary for operation exposed for convenient use; which prevents the operator from injuring himself when operating switches or renewing fuses; which makes it impossible for the operator or any one else to short circuit any of the supply or consumption circuits; which is adapted for modern building conditions; which makes it possible and convenient to replace parts liable to be damaged; which makes it possible to replace damaged parts without disturbing or cutting off current from the other working parts; which decreases the amount of exposed surface or number of exposed parts which must necessarily, if exposed, be finished; and which eliminates or avoids the necessity for the present form of said linings.

What I claim is:

1. The combination with a panel board, of bus bars thereon, consumption circuit terminals permanently secured thereon, a removable switch unit comprising contact members movable with respect thereto for connecting said bus bars with said consumption circuit terminals, a cover on said switch unit, members of said switch unit projecting through said cover, and a cover for said panel board, said cover having apertures with which said projections on said switch units register, said apertures having sufficient clearance around said projections for removal of said cover without removal of said projections.

2. In combination, a panel board, bus bars in engagement therewith throughout their length and secured thereto, consumption circuit terminals on said panel board, a container of insulating material adapted to be secured to said panel board, and a switch and a fuse within and carried by said container and removable therewith as a unit, said fuse being disposed at right angles to the plane of said panel board.

3. In combination, a panel board, bus bars in engagement therewith throughout their length and secured thereto, consumption circuit terminals on said panel board, a container of insulating material adapted to be secured to said panel board, and a switch and a fuse within and carried by said container and removable therewith as a unit, the movable element of said switch adapted to engage with a contact secured to said panel board.

4. In combination, a metal box, a panel board within the same, clamps for securing said panel board to said box and for permitting adjustment with relation thereto, bus bars upon said panel board, consumption circuit terminals upon said panel board, a plurality of independent members of insulating material disposed side by side and secured independently of each other to said panel board at a distance from a side of said box, whereby a gutter is formed between a side of said box and said members, and a fuse and a switch carried by each of said members and removable as a unit therewith.

5. In combination, a metal box, a panel board within the same, clamps for securing said panel board to said box and for permitting adjustment with relation thereto,

bus bars upon said panel board, consumption circuit terminals upon said panel board, a plurality of independent members of insulating material disposed side by side and secured independently of each other to said panel board at a distance from a side of said box, whereby a gutter is formed between a side of said box and said members, a fuse and a switch carried by each of said members and removable as a unit therewith, a cover for each of said members, switch and fuse parts projecting through said cover, and a cover for said box having an aperture for each unit with which said switch and fuse parts of each unit register, said apertures in said cover having so great a clearance from said switch and fuse parts that said cover may be removed without disturbing said switch and fuse parts.

6. The combination with a panel board and its bus bars and consumption circuit terminals secured thereon, of a removable fuse unit comprising a fuse support and a fuse, a box inclosing said panel board and said unit, and a cover for said box having an aperture through which said fuse may be inserted in said unit without removal of said cover or said unit.

7. The combination with a panel board and its bus bars and consumption circuit terminals secured thereon, of a removable switch unit for connecting said bus bars with said consumption circuit terminals, a box inclosing said panel board and said switch unit, a cover for said box having an aperture through which operating mechanism of said switch extends, and a cover on said switch unit having an aperture through which said operating mechanism of said switch extends.

8. The combination with a panel board, of bus bars secured thereon, consumption circuit terminals secured thereon, a plurality of removable units each comprising a block of insulating material and conductors thereon for bridging said bus bars and consumption circuit terminals, a box inclosing said panel board and said units, said units disposed side by side and at a distance from a side of said box, whereby a gutter is formed between a side of said box and the insulating material of said units.

9. The combination with a panel board, of a bus bar thereon, a consumption circuit terminal contact secured to said panel board, and a detachable switch unit comprising a block of insulating material and a contact member carried thereby and movable with respect thereto, said switch unit contact when moved with respect to said block adapted to engage with or disengage from said consumption circuit terminal contact.

10. The combination with a panel board, of a bus bar secured thereon, a consumption circuit terminal contact secured to said board, and a detachable switch unit comprising a block of insulating material and a switch contact carried by and movable with respect to said block, said switch contact adapted to engage with or disengage from said consumption circuit terminal contact upon the movement of said switch contact with respect to said block, said block having a recess receiving said bus bar.

11. The combination with a panel board, of a bus bar and a consumption circuit terminal contact secured thereon, a detachable switch and fuse unit comprising a block of insulating material, a fuse terminal, a fuse, and a switch contact carried by said block, said switch contact movable with respect to said block for engaging with or disengaging from said consumption circuit terminal contact, the free terminal of said fuse engaging said bus bar.

12. The combination with a panel board, of a bus bar and a consumption circuit terminal contact secured thereon, a detachable switch and fuse unit comprising a block of insulating material, a fuse terminal, a fuse, and a switch contact carried by said block, said switch contact movable with respect to said block for engaging with and disengaging from said consumption circuit terminal contact, the free terminal of said fuse engaging said bus bar, said block having a recess receiving said bus bar.

13. The combination with a panel board, of a bus bar thereon, a consumption circuit terminal contact secured to said panel board, and a detachable switch unit comprising a block of insulating material and a contact member carried thereby and movable with respect thereto, said switch unit contact when moved with respect to said block adapted to engage with or disengage from said consumption circuit terminal contact, said block of insulating material inclosing said consumption circuit terminal contact.

14. The combination with a panel board, of a bus bar and a consumption circuit terminal contact secured thereon, of a detachable switch and fuse unit comprising a block of insulating material, a fuse disposed at right angles to said panel board and adapted to engage said bus bar, and a switch contact carried by and movable with respect to said block for engaging with or disengaging from said consumption circuit terminal contact.

15. The combination with a panel board, of a bus bar and a consumption circuit terminal secured thereon, of a detachable fuse unit for electrically connecting said bus bar and said consumption circuit terminal, said unit comprising a block of insulating material, a fuse terminal carried by said block, a fuse, a detachable fuse holder car-

rying said fuse and adapted to make electrical connection with said fuse terminal, the free end of said fuse adapted to engage said bus bar, and means for connecting said fuse terminal with said consumption circuit terminal.

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

EDWARD S. MORRELL.

Witnesses:
ANNA E. STEINBOCK,
ELEANOR T. MCCALL.