Nov. 7, 1939. R. A. MILLERMASTER 2,178,600

SAFETY SWITCH

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Fig. 1

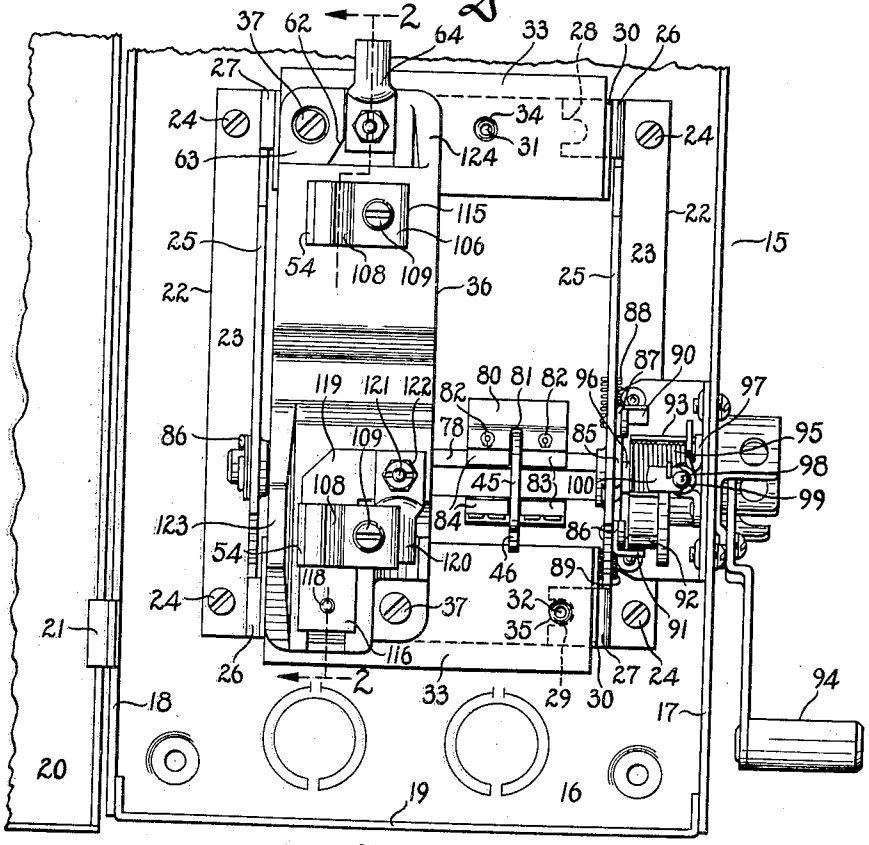
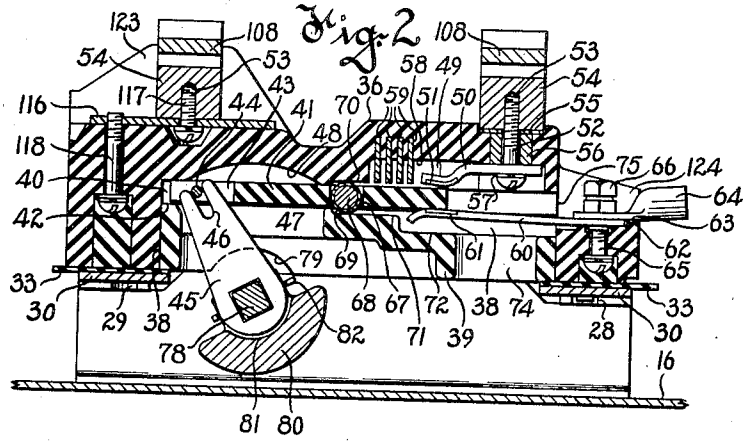


Fig. 2



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Fig. 3

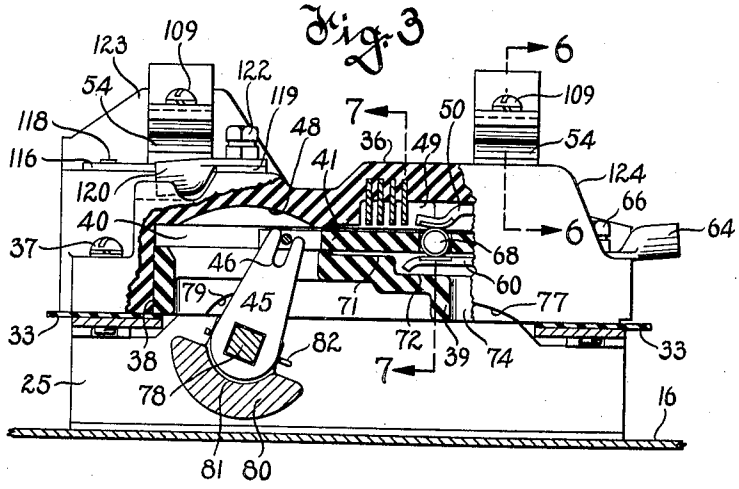


Fig. 4

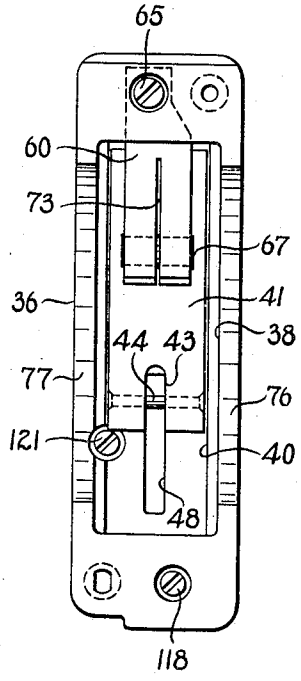


Fig. 5

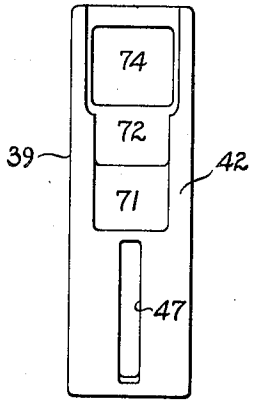


Fig. 6

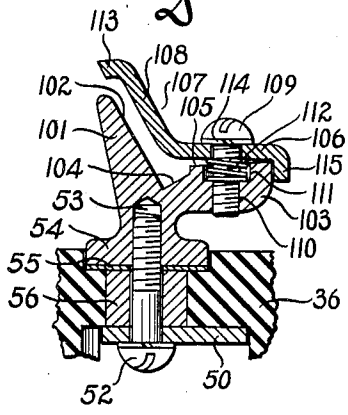
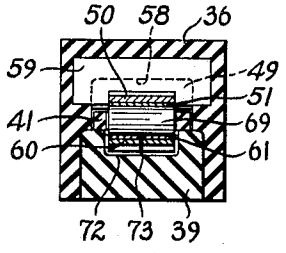


Fig. 7



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Fig. 8

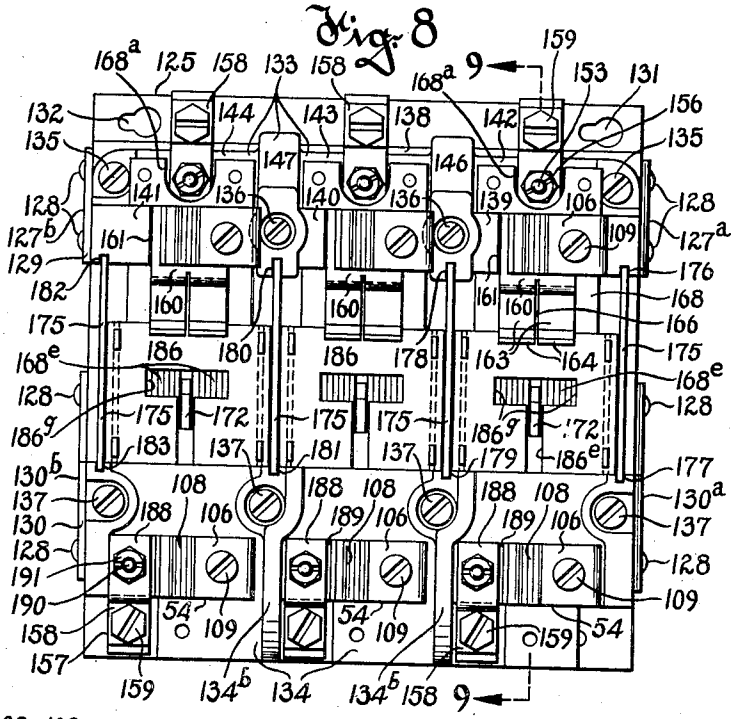
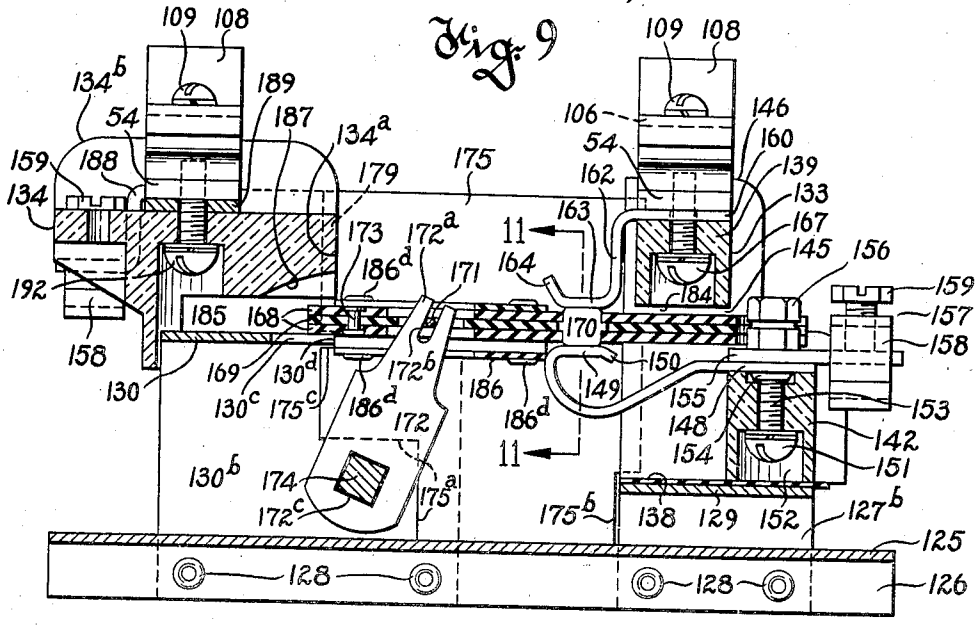


Fig. 9



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Fig. 10

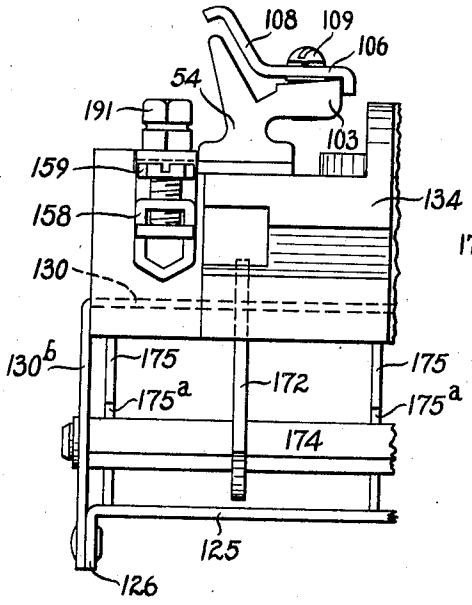


Fig. 11

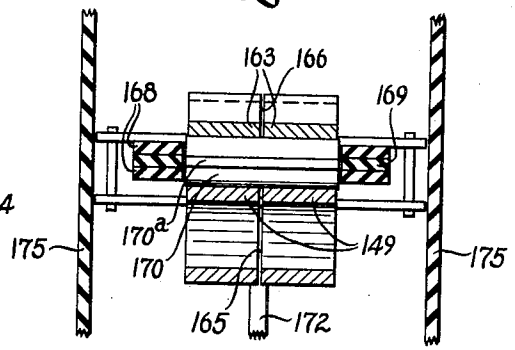


Fig. 12

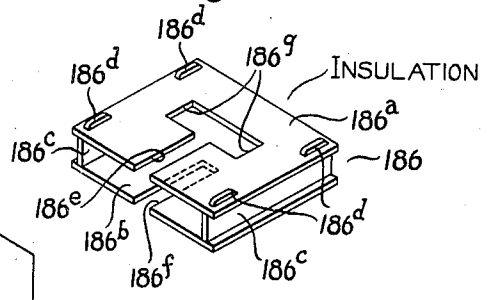
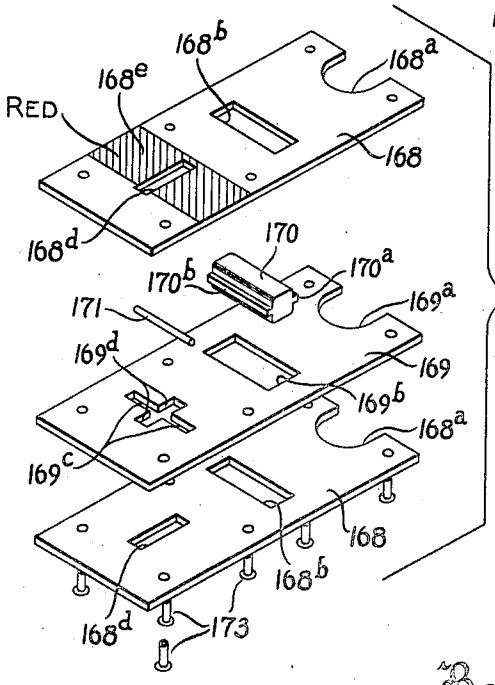


Fig. 13



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Patented Nov. 7, 1939 2,178,600

UNITED STATES PATENT OFFICE

2,178,600

SAFETY SWITCH

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Application July 6, 1937, Serial No. 152,029

20 Claims. (Cl. 200—76)

This invention relates to improvements in safety switches.

An object of the invention is to generally improve and simplify the details of construction and assembly of the parts and the operating characteristics of such switches.

Another object is to provide a safety switch of relatively small size and weight but having a relatively high current controlling capacity.

Another object is to provide a safety switch having a contactor of novel form and a novel form of slidable carrier therefor.

Another object is to provide a novel form of operating means for the slidable contact carrier of the switch.

Another object is to provide a safety switch of the sliding contactor type having the desirable operating characteristics and the external appearance of safety switches of standard form.

Another object is to provide a switch unit which may be employed individually or in any desired multiples, in combination with suitable operating means, to provide a safety switch having the desired circuit controlling characteristics.

Another object is to provide a switch unit having a novel form and arrangement of fuse clamping elements associated therewith.

Another and more specific object is to provide a novel form of clamping device for cartridge fuses having blade type terminals.

Another object is to provide a switch having arc extinguishing means of novel form.

Another object is to provide a switch of the aforementioned character having snap action mechanism associated therewith.

Another object is to provide a safety switch having novel means to visually indicate or warn of the engaging positioning of the switch contacts, regardless of whether or not the switch operating handle properly indicates such condition.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate certain embodiments of the invention which will now be described, it being understood that the embodiments illustrated are susceptible of modification in respect of certain structural details thereof without departing from the scope of the appended claims.

In the drawings,

Figure 1 is a fragmentary top plan view of a metal switch box or casing, with the cover opened, and showing my improved switch mechanism in assembled relation thereto,—one of the switch units being removed for purposes of illustration, and the operating parts being shown in circuit interrupting position.

Fig. 2 is a sectional view, on the line 2—2 of Fig. 1,—with the switch parts in open circuit position.

Fig. 3 is a view, partly in section similar to Fig. 2 and partly in side elevation, showing the switch parts in closed circuit position.

Fig. 4 is a bottom plan view of one of the insulating base members of the switch, showing the switch parts in circuit closing position.

Fig. 5 is a top plan view of an auxiliary insulating member adapted to be positioned within the downwardly opening recess in the insulating base.

Fig. 6 is a detail sectional view, on the line 6—6 of Fig. 3, showing the structure of my improved fuse clamping device.

Fig. 7 is a sectional view, on the broken line 7—7 of Fig. 3.

Fig. 8 is a top plan view of a group of three switch units of modified form assembled upon a novel form of metal frame to be attached to the bottom wall of a switch casing.

Fig. 9 is a sectional view substantially on the line 9—9 of Fig. 8.

Fig. 10 is a fragmentary lower end view of the switch shown in Figs. 8 and 9.

Fig. 11 is a fragmentary sectional view, on the line 11—11 of Fig. 9.

Fig. 12 is a perspective view of the hollow insulating arc snuffer to be associated with each contact carrier of the switch, and

Fig. 13 is a perspective view, in separated relation, of the parts of the laminated insulating slide member and the metal parts to be associated therewith.

Referring first to Figs. 1 to 7: The numeral 15 designates in general a casing, preferably formed of sheet metal, having a bottom wall 16, side walls 17 and 18, a pair of end walls, of which one is shown at 19 in the fragmentary view of Fig. 1, and an openable cover 20 hinged to side wall 18 in the manner indicated in part at 21 in Fig. 1. The switch shown in Figs. 1 to 7 is of the double-pole type; but it will be apparent that by reason of the unit form of switch mechanism herein disclosed, switches of the single-pole, triple-pole or four-pole type may also be readily provided by merely modifying the size of the casing, the supporting frame, the operating shaft, and by increasing or decreasing the number of switch units to be employed.

The switch frame as shown preferably comprises a pair of brackets 22 of like form, each

bracket having an outwardly extending bottom flange 23 to be secured to the bottom wall 16 of the casing, as by means of a pair of screws 24, a vertically extending portion 25, and a pair of relatively short inwardly extending flanges 26 and 27,—the inner ends of the latter preferably having curved notches as shown at 28 and 29 (in dotted lines in Fig. 1 and in full lines in Fig. 2), for a purpose to be described. Superimposed upon and spot-welded or otherwise rigidly attached to the transversely alined pairs (26, 27 and 27, 26) of short flanges are a pair of flat, punched sheet metal top frame members 30 of like form, but arranged in reversed relationship to each other at the respective ends of the frame. Each member 30 is provided with a pair of tapped openings,—one opening of a pair being shown at 31 in the upper member (Fig. 1) and the other opening of a pair being shown at 32 in said figure.

Superimposed upon each plate 30 is a relatively wider but slightly shorter punched plate 33 of insulating material,—plates 33 being of like form, but reversely arranged to bring the pairs of openings 34 and 35 therein into register with the respective pairs of tapped openings 31 and 32 in top frame plates 30. By the arrangement shown the tapped openings 31 and 32 in the upper and lower plates 30 are positioned in diagonally disposed pairs, for alinement thereof with diagonally disposed openings provided in each insulating base member 36 for cooperation with the pair of securing screws shown at 37, 37 (Fig. 1). The aforementioned notches 29 in the respective short flanges 27 each provide clearance for the shank of one screw 37 of each pair. It will thus be apparent that the notches 28 in short flanges 26 might be omitted.

Each base member 36 is preferably of substantially rectangular contour,—the same being provided with a downwardly opening substantially rectangular recess 38 (Figs. 2, 3 and 4) to accommodate with a fairly snug fit an auxiliary insulating base member 39. Member 39 seats within recess 38 in a relation substantially flush with the lower surface of base 36. The upper wall of recess 38 is formed with a groove as shown at 40 to accommodate with a slide fit the flat, oblong insulating plate 41, and the underlying surface 42 of member 39 is adapted to restrain plate 41 from downward displacement with respect to said groove.

Plate 41 is provided at one end thereof with a notch or slot 43, and with a transversely extending opening which accommodates a pin or rod 44,—the ends of which are upset in flush relationship to the respective side edges of plate 41, as shown in dotted lines in Fig. 4, whereby said pin is retained in position. A crank arm 45 having a slot 46 at its upper end cooperates with pin 44 to provide a pin and slot or lost motion driving connection between said parts. Member 39 is provided with an opening 47 affording clearance for the oscillatory crank arm 45,—and the upper wall of recess 38 is provided with an auxiliary recess 48 for a like purpose.

Secured within an auxiliary recess 49 in the upper wall of recess 38 is a resilient stationary contact 50. The major portion of contact 50 preferably consists of copper or a suitable copper alloy, whereas the portion 51 engageable by the movable contactor preferably consists of an inlaid body of silver. The manner of forming composite metal members of this character is well known in the art. Member 50 is secured in position by means of a screw 52, the shank of which takes into a tapped recess 53 provided in the lower surface of a block 54, preferably of copper, which forms one element of my improved clamping device for the blade terminal of a cartridge type fuse. Positioned beneath block 54 is a conducting metal plate or washer 55, and interposed between plate 55 and member 50 is a tubular member 56, preferably formed of copper. A lock washer 57 is preferably interposed between member 50 and the head of screw 52 to prevent accidental loosening of the latter. The bottom portion of block 54 is preferably of rectangular contour, and the same fits into a correspondingly shaped recess in the upper surface of base 36, whereby turning of said block is prevented. The structure of said fuse terminal clamping device will be described in detail hereinafter.

Rigidly secured within and extending from the top 58 and side walls of auxiliary recess 49 are a plurality of metal plates 59 arranged in equally spaced parallel relationship to each other. Also located within recess 38 is a second stationary contact 60,—the inlaid silver contact portion 61 of which underlies the silver contact portion 51 aforedescribed. The terminal end of contact 60 is positioned within a correspondingly shaped shallow recess 62 in the ledge 63 formed at one end of base 36. Superimposed upon said terminal end of contact 60 is the flattened end of a solder-type wiring terminal member 64 of well known form. A securing screw 65 has its head positioned in a countersink or recess in the lower surface of base 36 and its shank extending upwardly through contact member 60 and terminal member 64, as best illustrated in Fig. 2,—a nut 66 having threaded engagement with said screw shank to retain said parts in assembled relation to base 36.

As best illustrated in Figs. 2 and 3 plate 41 is of such length as to be interposed between the portions 51 and 61 of the stationary contacts in all positions of said plate. Plate 41 is provided intermediate the ends thereof with a rectangular opening 67 of a size to freely receive and permit rotation of the bridging contactor. Said contactor as shown preferably comprises an inner cylindrical portion 68 formed of a suitable conducting material, such as gilding metal, and an outer layer 69 of silver. Contactor 68, 69 is preferably of a length corresponding to the width of the opposed silver contact portions 51, 61 of contacts 50 and 60. Contactor 68, 69 preferably has a diameter substantially greater than the thickness of plate 41, as shown in Figs. 2, 3 and 7.

Upon movement of contactor 69 from the circuit interrupting position thereof shown in Fig. 2 to the circuit completing position thereof shown in Fig. 3, substantial upward displacement of said contactor is prevented by engagement thereof with the auxiliary recess wall 70 and with the respective lower edges of plates 59, and substantial downward displacement is prevented by the bottom wall of a recess 71 provided in the upper surface of auxiliary insulating member 39. The forward end of portion 51 of contact 50 is bent to extend upwardly to a slight degree above the plane of the lower edges of plates 59. The forward end of portion 61 of contact 60 is bent downwardly to a plane slightly below said surface 71,—an auxiliary recess 72 in member 39 accommodating said bent end. Recesses 49 and 72 provide bending clearance for contacts 50 and 60 upon bridging engagement of contactor 69 therewith, as shown in Fig. 3. I prefer to provide the lower contact 60 with a slit or kerf 73 (Figs. 4 and

7) extending throughout the major portion of the length thereof to increase its resiliency; and a similar slit may, if desired, be provided in the upper contact **50**, for a like purpose.

Member **39** is preferably provided with a relatively large through passage or opening **74** to facilitate circulation of air around and about the contacts **50**, **60**,—base **36** being formed as shown at **75**, Fig. 2, to permit outward passage or escape of heated air. Base **36** is preferably provided at opposite sides thereof with curved cut-away edges **76** and **77** to reduce the amount of insulating material required and to provide clearance for the shaft **78** which carries the crank arms **45**. Member **39** is provided at opposite sides thereof with cut-away lower edge portions of arcuate form to likewise provide clearance for shaft **78**,—one of the cut-away portions being shown at **79** in Figs. 2 and 3.

Shaft **78**, which is preferably of square or other angular cross section, is adapted to bear within suitable openings provided in the side members **25**, **25** of the metal supporting frame. Prior to insertion of the metal frame into the switch casing the shaft **78** (Fig. 1) has its left-hand end inserted into the frame through the opening in the right-hand side member **25**,—the required number (two in this instance) of crank arms **45** being telescoped onto the shaft. Associated with each crank arm **45** is a combined positioning and counterweight member **80**, each member **80** having a slot **81** to receive the lower end of a crank arm **45** and to restrain the latter against displacement endwise of the shaft. The shaft is provided with pairs of transverse passages to receive cotter pins **82** which penetrate alined pairs of lugs **83** and **84** on members **80**, whereby the same are constrained to move with the shaft **78**; and endwise displacement of the same and of the respective crank arms is prevented.

Shaft **78** is provided at the right-hand end thereof with a rigidly attached plate **85** to prevent endwise displacement thereof toward the left, and the left-hand end of said shaft is provided with a cotter pin **86** (Fig. 1) to prevent displacement thereof toward the right.

The combined snap action mechanism and cover interlock is of the character disclosed in my prior Patent No. 1,945,819, dated February 6, 1934,—to which reference may be had for a detailed description of the construction and operation of such parts. It may be pointed out, however, that plate **85** (Fig. 1) is provided with a pair of ratchet teeth (not shown) to be respectively engaged alternately by the spring-pressed pawls **86** and **87** pivotally supported by the right-hand frame plate **25**,—the biasing springs being shown at **88** and **89**. Said pawls are provided with projections **90** and **91** to be alternately engaged by a cam surface **92** formed on a cast and machined element **93** with which the external operating handle **94** is rigidly connected. Member **93** houses a coiled torsion spring **95** between the extended ends of which a lug or projection **96** on plate **85** is interposed,—in the manner illustrated in Fig. 5, for example, of my Patent No. 1,945,819. By this means rotary snap movement of shaft **78** from each extreme position thereof to the other is insured,—with consequent snap movement of the respective contactors **69** into and out of bridging engagement with the pairs of stationary contacts **50** and **60**.

The interlock between the switch operating mechanism and the casing cover is of the character disclosed both in my aforementioned Patent No. 1,945,819 and in Patent No. 1,857,711, dated May 10, 1932, to Joseph J. Dante. Said interlock (Fig. 1) comprises essentially a sheet metal bracket **97** positioned adjacent to the upper edge of the right-hand side wall **17** of the casing; and a pin **98** which is slidable and rotatable with respect to said bracket,—said pin being biased upwardly and rotatably, in a counter-clockwise direction, by a combined compression and torsion spring **99**. Pin **98** is provided at its lower end with a lug cooperable with the bracket to prevent rotation of the pin in either direction when the parts are in the positions thereof illustrated in Fig. 1, whereby closed-circuit positioning of the switch mechanism is normally prevented when the cover **20** is raised or open. Pin **98** is provided at its upper end with a lug **100** which is rotatable clockwise to cooperate with a part (not shown) carried by cover **20** to lock the latter against opening when the switch mechanism is in closed-circuit position.

Each fuse clamping device aforementioned comprises a block **54** of copper, which consists of a length or section sawed or cut from an extruded rod or bar having the cross sectional form best illustrated in Fig. 6. Extending upwardly at the desired angle from the base portion of block **54** is a tapered arm or flange **101** providing the flat surface **102** to be engaged by the blade terminal (not shown) of a cartridge type fuse. Extending laterally from the base of block **54** is a second arm or flange **103** which provides a flat surface **104** against which the lower edge of the terminal blade is adapted to seat, and a flat surface **105** against which the flat portion **106** of a punched and stamped sheet metal clamping member **107** may seat. Member **107** is preferably formed of steel, and the same is provided with a flat portion **108** arranged substantially parallel to the aforementioned surface **102** and movable to and from the latter to clamp and release an interposed blade terminal. The means for effecting such clamping movement of portion **108** preferably comprises a screw **109** the shank of which freely penetrates an opening provided in portion **106** and takes into a tapped opening **110** provided in arm **103**.

Surrounding opening **110** at the upper end thereof is a recess **111** which is adapted to completely accommodate a coiled compression spring **112** upon full tightening of screw **109**. The arrangement is such that upon loosening of screw **109** spring **112** acts to move or tilt member **107** upwardly whereby portion **108** is moved away from surface **102** to release or permit removal of the blade terminal. Portion **108** is preferably provided at its upper end with a lug or flange **113** which overlies the upper edge of an inserted blade terminal after tightening of screw **109** to positively prevent removal of the blade terminal. The arrangement is such, however, that lug **113** offers substantially no interference to insertion of the terminal blade when screw **109** is withdrawn to the required degree. A spring lock washer **114** is preferably interposed beneath the head of screw **109** to prevent accidental loosening of the latter. Portion **106** of member **107** is preferably provided with a downwardly extending flange **115** which cooperates with the outer edge of arm **103** to prevent rotary displacement of member **107** relatively to block **54** during tightening or loosening of screw **109**.

Both fuse blade clamping devices **54** employed with each unit of the switch mechanism are of

like form and have been given like numerals of reference. The left hand block **54**, in Figs. 2 and 3 is attached to a metal plate **116**, as by means of a screw **117** which takes into the tapped opening **53** in said block. Plate **116** is secured at one end to the upper surface of base **36** as by means of a screw **118**, as best illustrated in Fig. 2; and said plate has an extension **119** to which a known form of solder-type wiring terminal element **120** may be attached, as by means of a second securing screw **121** and its cooperating nut **122**.

The switch aforedescribed has a rating of 100 amperes at 230 to 600 volts. Where a greater or lesser spacing of the fuse clamping devices is desired or required, such change may be effected by attaching the left-hand block **54** (Fig. 2) at another point on plate **116**;—and if desired the latter may be provided with an integral portion (not shown) extending beyond the left-hand end of base **36** to which the fuse clamping device may be attached. Each base **36** is provided on its upper surface with suitable insulating formations or barriers, such as shown at **123** and **124** to properly insulate the current carrying elements of the respective units of the switch.

In Figs. 8 to 13, inclusive, I have illustrated a modified form of safety switch which embodies many features like or substantially similar to those of the switch aforedescribed. In the switch of Figs. 8 to 13, however, the amount of insulating material required has been substantially reduced, thereby reducing the total weight or amount of material required for a given switch mechanism; assembly of the switch parts is further simplified and facilitated, and the arc-quenching characteristics of the switch mechanism are improved.

Thus in Figs. 8 and 9 I have shown mechanism providing a switch of the three-pole type, but the number of poles in the switch mechanism may be increased or decreased, as desired, by merely substituting a larger or smaller pair of insulating base members,—with a corresponding increase or decrease in the size of the switch frame and in the size of the metal casing to be employed therewith. The metal frame preferably comprises a substantially rectangular plate **125** of sheet metal, the same having a pair of downwardly extending parallel legs or flanges at two of the opposite sides thereof,—one of said flanges being shown at **126** in Fig. 9. Said metal frame further comprises an inverted U-shaped sheet metal member having parallel legs **127a**, **127b** (Fig. 8) respectively arranged exteriorly of but closely adjacent to the flanges, such as **126**, of plate **125**,—one of said legs, **127b**, being shown in Fig. 9; and said legs being rigidly attached to said flanges as by means of hollow rivets or eyelets, such as shown at **128**. The integral flat connecting portion **129** of said U-shaped member is arranged or positioned only a relatively short distance above plate **125**. A second relatively wider and relatively higher inverted U-shaped sheet metal member having a flat connecting portion **130**, and a pair of parallel legs **130a**, **130b** (Fig. 8) secured exteriorly to the flanges of plate **125**, as shown at **128**, completes the structure of the metal frame.

Plate **125** is preferably provided at the upper and lower ends thereof with openings of keyhole shape, as shown at **131** and **132** at the upper end of Fig. 8. The enlarged portions of said keyhole openings are adapted to freely accommodate and permit passage therethrough of the heads of suitable securing screws (not shown) having threaded engagement with the bottom wall of the switch casing. The switch frame (Fig. 8) is thereafter bodily shifted toward the right whereby the screw heads will overlap the reduced portions of the keyhole openings, to permit tightening of such screws to retain the frame in place. Such lateral shifting of the metal frame with the switch mechanism assembled thereon is also utilized to effect interlocking or operative engagement of such mechanism with a manually operable snap action mechanism associated with the switch casing in the manner disclosed in Figs. 1 to 7. By this means the switch frame with its associated switch mechanism may be bodily removed from the casing to provide for inspection, or replacement of another like mechanism therefor, by merely loosening, without entirely removing, the securing screws from the casing; and without disturbing the snap action mechanism of the switch. The advantages of such an arrangement are obvious.

The insulating base of the switch preferably comprises a pair of insulating blocks **133** and **134**, each produced by a straight line molding operation. Each block **133** and **134** has a length corresponding substantially to the width of the metal framework of the switch. Block **133** is rigidly secured to the flat connecting portion **129** of the relatively low inverted U-shaped member at the upper end (Fig. 1) of the switch, as by means of a pair of end screws **135**, **135** and a pair of intermediate screws **136**, **136**. Block **134** is rigidly secured to the flat connecting portion **130** of the relatively higher inverted U-shaped member at the lower end (Fig. 1) of the switch, as by means of four screws of like size, each designated by the numeral **137**.

An insulating plate or sheet **138** is preferably interposed between block **133** and said flat portion **129**. Block **133** is so formed as to provide a series of three substantially identical upper insulating portions **139**, **140** and **141** and a corresponding series of lower insulating portions **142**, **143** and **144**; all of said insulating portions being formed as integral parts of block **133**,—but arranged to provide three transversely extending passages or openings, one of which is shown at **145** in Fig. 9. Said insulating portions are connected with each other at opposite ends of block **133**, and at points intermediate the ends of the latter, as by means of integral barrier portions **146** and **147**. The circuit controlling elements for each pole of the switch are of identical form, and the same have been given like numerals of reference.

Each set of elements comprises a lower resilient stationary contact having a flat portion **148** positioned upon the upper surface of one of the lower insulating portions (such as **142**, Fig. 9) of block **133**. The free end of said contact is bent, as shown in Fig. 9, to reflexed form whereby a rearwardly extending contact tip **149** having a flared extremity **150** is provided. Portion **148** of said contact is secured in position by a screw or bolt the head **151** of which is located in a recess or countersink **152** in the lower surface of block **133**,—the insulating plate **138** insuring proper electrical separation of head **151** from the aforementioned portion **129** of the metal frame. Shank **153** of said bolt takes into a tapped opening in the extruded portion **154** of said contact,—said shank being sufficiently long to penetrate an opening provided in one end of a suitable ter-

minal plate 155, which is clamped in position, as by means of a nut 156 of well known form.

Plate 155 has attached thereto a well known form of cable clamp designated in general by the numeral 157. Said clamp as shown comprises a tubular metal member 158 which surrounds or straddles a reduced portion of the plate,—a screw or bolt 159 having threaded engagement with a tapped opening in the upper end portion of member 158 whereby the lower end portion of the latter may be drawn into clamping engagement with a cable or wire interposed between the same and the lower surface of plate 155.

The upper resilient stationary contact comprises a flat portion 160 which is seated within a correspondingly shaped groove 161 in the top surface of an upper portion 139 of block 133; a portion 162 extending downwardly at substantially a right angle to portion 160, and a contact tip 163 positioned above and in alinement with the contact tip 149 aforementioned,—contact tip 163 having a flared extremity, as shown at 164. The free ends of both the lower and upper stationary contacts are preferably provided with centrally located kerfs or slits, as best illustrated at 165 and 166 in Fig. 11. The block 54 of one of the aforedescribed blade type fuse terminal clamping devices is superimposed upon the portion 160 of the upper stationary contact,—a screw 167 having its shank extending upwardly through portions 139 and 160 (Fig. 9) and taking into a tapped recess in the lower surface of block 54 to retain said parts in assembled relation.

Continuously interposed between each set of upper and lower stationary contacts is a flat insulating member, which is preferably of laminated form and comprises upper and lower plates 168 of like form and an intermediate plate 169. Said plates are respectively provided with curved end notches 168a, 169a to provide clearance between the same and screw shank 153 and nut 156 in one extreme position of said insulating member, as best illustrated in Fig. 8. Plate 169 is provided with an opening 169b of a size to accommodate the laterally extending flanges 170a, 170b provided intermediate the height of a bridging contactor 170;—plates 168 having openings 168b to respectively permit extension of the upper and lower portions of contact 170 therethrough and therebeyond, as best illustrated in Figs. 9 and 11.

Plate 169 is provided with an opening 169c to accommodate the transversely extending pin 171 (Figs. 9 and 13), and the plates are respectively provided with registering openings 168d, 169d to provide clearance for the upper end 172a of a crank member 172,—said upper end having a slot 172b the walls of which are adapted to cooperatively engage pin 171. Plates 168 and 169 are tightly retained in assembled relationship to each other as by means of a plurality of rivets 173,—the opposite ends of which are driven into substantially flush relationship with the outer surfaces of the respective plates 168, as best illustrated in Fig. 9.

Each crank member 172 is provided with an opening 172c of square or other angular contour to fit onto and be driven by the shaft 174 of corresponding form in transverse cross section. Thus upon oscillatory movement of shaft 174 from each extreme position thereof to the other by snap action mechanism like that described in connection with Figs. 1 to 7, the several contactors 170 will be moved alternately out of and into bridging engagement with the respective sets of stationary contacts.

To properly insulate the sets of stationary and movable contacts I prefer to provide a plurality (four in this instance) of flat punched insulating plates 175 of like form; the side edges of said plates fitting into opposed pairs of grooves 176, 177; 178, 179; 180, 181, and 182, 183 provided in the respective base members 133 and 134. The form of plates 175 is best illustrated in full and dotted lines in Fig. 9, the same being cut away at 175a to provide clearance for shaft 174; cut away at 175b to clear the aforementioned portion 129 of the metal frame; and cut away or notched, as shown at 175c to interlock with one edge of flat portion 130 of the frame,—to thereby prevent accidental displacement of plates 175, after complete assembly of the switch parts.

The flat member comprising insulating plates 168 and plate 169 is slidably supported adjacent to one end by engagement thereof with the upper and lower contacts associated therewith,—said end being restrained against lateral displacement by the side walls of the recess 184 in base member 133 which provides the aforementioned opening 145. Said flat member at its other end is slidably interposed between the top surface of flat portion 130 of the switch frame and the top wall of a recess 185 provided in the lower surface of base member 134,—the side walls of recess 185 acting to restrain said flat member against substantial lateral displacement. As shown in Fig. 9, the forward edge of flat portion 130 of said frame member is provided with notches 130c to provide clearance for the respective crank members 172.

In order to assist in snuffing or quenching any arcs formed incident to separation of each contactor 170 from its associated pair of stationary contacts 149, 163, I prefer to provide a tubular insulating member 186 (Fig. 12) of substantially rectangular form in cross section. Member 186 is telescoped onto the flat insulating member during assembly of the switch parts with respect to the metal frame,—the depth of the passage through member 186 being sufficient to slidably accommodate the contactor 170 when the latter is moved toward the left, Fig. 9, to circuit interrupting position, and the four long edges of said contactor being rounded or beveled, as shown, to facilitate movement thereof into said member. The left hand end of member 186 (Fig. 9) is adapted to abut against the forward face 134a of block 134 and the forward edge 130d of flat portion 130 of the frame; and the right hand end of said member is adapted to abut against the adjacent portions of one or both of the stationary contacts 149, 163, whereby substantial endwise displacement of member 186 is prevented.

As best illustrated in Fig. 12, member 186 preferably comprises upper and lower punched plates 186a and 186b of bone hard fiber, or other suitable heat resisting insulating material, and a pair of punched side plates 186c of identical form composed of the aforementioned insulating material. Plates 186a and 186b are provided with perforations, and side plates 186c are provided with projections penetrating said perforations,—said projections being upset or distorted, as shown at 186d to rigidly secure said plates in assembled relationship to each other. Plates 186a and 186b are respectively provided with slots 186e and 186f to provide clearance for the associated crank arm 172; and slot 186e is enlarged to substantially T-shape, as indicated at 186g. The portion

186ᵍ of said slot serves to permit ventilation or cooling of contactor 170 after extinguishment or snuffing of any arcs formed upon separation thereof from the contacts; and said portion of the slot additionally serves to permit inspection of contactor 170 in the circuit interrupting position thereof,—as will be apparent from consideration of Figs. 8 and 9.

Said portion 186ᵍ of slot 186ᵉ is also adapted for cooperation with a portion of the area 168ᵉ on the upper plate 168 of the slide,—said area 168ᵉ being painted or otherwise colored with distinctive color, such as red, which will be visible through said portion 186ᵍ of slot 186ᵉ only when the contactor is in engagement with the stationary contacts of the switch. The form and arrangement of base members 133 and 134 is likewise such that said area 168ᵉ is visible from the front of the switch; and for this purpose the cover of the metal casing may be provided with a glazed or transparent opening (not shown) to afford such indication in the closed position of the casing. This feature is of great importance from the viewpoint of safety to the operator, as in steel mill control devices; inasmuch as the indication or warning as to engagement of the contactor and contacts is provided, regardless of whether or not the switch operating handle properly indicates such condition; as, for instance, in the event of breakage or defection of the snap action spring.

As shown in Fig. 9 block 134 is provided in its lower surface with recesses 187 to provide clearance for the several crank arms 172. Block 134 is provided on its upper surface with a pair of barriers 134ᵇ which properly insulate from each other the three blade type fuse terminal clamping devices 54, 106, etc., and the solderless wiring terminal devices 158, 159 associated therewith. Said wiring terminal devices are carried by terminal plates 188 of the form best illustrated at the left hand end of Fig. 9. Terminal plates 188 are attached to flat plates 189 as by means of bolts 190 and nuts 191. Plates 189 underlie the blocks 54 of the respective fuse clamps, and are additionally clamped to base 134 by screws such as shown at 192 in Fig. 9.

The switch contactors 170 preferably consist of the desired lengths of extruded copper, and the stationary contacts 149, 163 preferably are formed from the required lengths of flat bar copper. As will be apparent from consideration of Fig. 9 the switch mechanism is of extremely light construction, with reference to its current controlling capacity which is like that of the switch shown in Figs. 1 to 7. Moreover, with the switch mounted in the usual manner, with consequent vertical positioning of frame member 125, circulation of cooling air about the various switch parts is provided for.

What I claim as new and desire to secure by Letters Patent is:

1. In an electric switch, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, a flat member of insulating material slidably positioned within said recess and having its movements guided in part by the walls of said recess, a member underlying said recess to assist in guiding the movements of said insulating member, a pair of upper and lower stationary contacts between which said insulating member is interposed in all positions of the latter, said insulating member having an opening therein intermediate the ends thereof, a bridging contactor positioned within said opening and having portions thereof projecting a substantial distance beyond each surface of said insulating member, said contactor being movable by said insulating member into and out of engagement with said contacts jointly, a crank arm, means providing a driving connection between said crank arm and said insulating member adjacent to the end of the latter remote from said contacts, a rotatable shaft positioned under said insulating base and having a positive driving connection with said crank arm, a metal housing having bottom, side and end walls and an openable cover, said switch being positioned within said housing and secured to the bottom wall of the latter, a manually operable handle rotatably attached to a side wall of said housing and accessible from the exterior of the latter, and means providing a releasable interlocking connection between said handle and said shaft, said last mentioned means including cooperating spring means and latch means for jointly insuring snap movement of said shaft from each extreme position thereof to the other.

2. In an electric switch, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, a flat member of insulating material slidably positioned within said recess and having its movements guided in part by the walls of said recess, a member underlying said recess to assist in guiding the movement of said insulating member, a pair of upper and lower stationary contacts between which said insulating member is interposed in all positions of the latter, said insulating member having a substantially rectangular opening therein intermediate the ends thereof, a contactor positioned within said opening and projecting a substantial distance beyond each surface of said insulating member, said contactor being movable by said insulating member into and out of bridging engagement with said contacts, a pin extending transversely of and carried by said insulating member at the end of the latter remote from said contacts, a crank arm having a driving connection with said pin, a rotatable shaft positioned under said insulating base and having a positive driving connection with said crank arm, and manually operable snap action mechanism having a removable interlocking connection with said shaft.

3. In a safety switch of relatively high current controlling capacity, in combination, a pair of upper and lower insulating base members complementally formed to provide a recess therebetween, a pair of upper and lower stationary contacts located within said recess in spaced relation to each other, a flat insulating member slidably mounted within said recess and having its movements guided by the walls of said recess, said flat insulating member being continuously interposed between said contacts to properly insulate the latter in the off position of the switch, said flat insulating member having a substantially rectangular opening formed therein intermediate the ends thereof, a contactor positioned within said opening and adapted to project a substantial distance beyond each surface of said flat insulating member, the former being movable by the latter into and out of bridging engagement with said contacts, an oscillatable crank arm, means providing a driving connection between said crank arm and said flat insulating member, a rotatable shaft positioned beneath

said insulating base members and having a positive driving connection with said crank arm, manually operable snap action mechanism positioned at one side of said switch, and means providing a releasable interlocking connection between said mechanism and said shaft.

4. In an electric switch, in combination, a pair of upper and lower insulating members complementally formed to provide a recess therebetween, a pair of upper and lower stationary contacts located within said recess in spaced relation to each other, a flat plate of insulating material slidably mounted within said recess and having its movements guided and limited by the walls of said recess, said plate being continuously interposed between said contacts to properly insulate the latter in the off position of the switch, said plate having a substantially rectangular opening formed therein intermediate the ends thereof, a substantially cylindrical contactor freely insertable into said opening and rotatable with respect to the walls of the latter, said contactor being movable by said plate into and out of bridging engagement with said contacts, said plate having a pin extending transversely thereof adjacent to the end thereof remote from said contacts, said lower insulating member having an opening formed therein to provide access to said pin, a crank arm penetrating said last mentioned opening and having a slotted driving connection with said pin, and a shaft having a driving connection with said crank arm.

5. In an electric switch, in combination, a pair of upper and lower insulating members complementally formed to provide a recess therebetween, a pair of upper and lower resilient stationary contacts located within said recess in spaced relation to each other, a flat plate of insulating material slidably mounted within said recess and having its movements guided and limited by the walls of said recess, said plate being continuously interposed between said contacts to properly insulate the latter in the off position of the switch, said plate having a substantially rectangular opening formed therein intermediate the ends thereof, a substantially cylindrical contactor freely insertable into said opening and rotatable with respect to the walls of the latter, said contactor being movable by said plate into and out of bridging engagement with said contacts, said plate having a pin extending transversely thereof adjacent to the end thereof remote from said contacts, said lower insulating member having an opening formed therein to provide access to said pin, a crank arm penetrating said last mentioned opening and having a slotted driving connection with said pin, a shaft having a driving connection with said crank arm, a metal housing having bottom, side and end walls and an openable cover, said switch being positioned within said housing and secured to the bottom wall of the latter, a manually operable handle rotatably attached to a side wall of said housing and accessible from the exterior of the latter, and means providing a releasable interlocking driving connection between said handle and said shaft.

6. In an electric switch, in combination, a pair of upper and lower insulating members complementally formed to provide a recess therebetween, a pair of upper and lower resilient stationary contacts located within said recess in spaced relation to each other, a flat plate of insulating material slidably mounted within said recess and having its movements guided and limited by the walls of said recess, said plate being continuously interposed between said contacts to properly insulate the latter in the off position of the switch, said plate having a substantially rectangular opening formed therein intermediate the ends thereof, a substantially cylindrical contactor freely insertable into said opening and rotatable with respect to the walls of the latter, said contactor being movable by said plate into and out of bridging engagement with said contacts, said plate having a pin extending transversely thereof adjacent to the end thereof remote from said contacts, said lower insulating member having an opening formed therein to provide access to said pin, a crank arm penetrating said last mentioned opening and having a slotted driving connection with said pin, a shaft having a driving connection with said crank arm, a metal housing having bottom, side and end walls and an openable cover, said switch being positioned within said housing and secured to the bottom wall of the latter, a manually operable handle rotatably attached to a side wall of said housing and accessible from the exterior of the latter, and means providing a driving connection between said handle and said shaft, said last mentioned means including automatically releasable spring means for insuring snap movement of said shaft and the parts driven thereby from each extreme position to the other.

7. In an electric switch, in combination, a pair of upper and lower insulating members complementally formed to provide a recess therebetween, a pair of upper and lower stationary contacts located within said recess in spaced relation to each other, a flat plate of insulating material slidably mounted within said recess and having its movements guided by the walls of said recess, said plate being continuously interposed between said contacts to properly insulate the latter in the off position of the switch, said plate having a substantially rectangular opening formed therein intermediate the ends thereof, a substantially cylindrical contactor freely insertable into said opening and rotatable with respect to the walls of the latter, the diameter of said contactor being greater than the thickness of said plate, said contactor being movable by said plate into and out of bridging engagement with said contacts, said plate having a pin extending transversely thereof adjacent to the end thereof remote from said contacts, said lower insulating member having an opening formed therein to provide access to said pin, a crank arm penetrating said last mentioned opening and having a slotted driving connection with said pin, a shaft having a driving connection with said crank arm, a metal housing having bottom, side and end walls and an openable cover, said switch being positioned within said housing and secured to the bottom wall of the latter, a manually operable handle rotatably attached to a side wall of said housing and accessible from the exterior of the latter, and means providing a driving connection between said handle and said shaft, said last mentioned means including automatically releasable spring means for insuring snap movement of said shaft and the parts driven thereby from each extreme position to the other.

8. In an electric switch, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, a flat member of insulating material slidably positioned within said recess and having its movements guided in part by the walls of said

recess, a member underlying said recess to assist in guiding the movements of said insulating member, a pair of upper and lower stationary contacts between which said insulating member is interposed in all positions of the latter, said insulating member having an opening therein intermediate the ends thereof, a bridging contactor positioned within said opening and having portions thereof projecting a substantial distance beyond each surface of said insulating member, said contactor being movable by said insulating member into and out of engagement with said contacts jointly, a crank arm, means providing a pin and slot driving connection between said crank arm and said insulating member adjacent to the end of the latter remote from said contacts, a rotatable shaft positioned under said insulating base and having a positive driving connection with said crank arm, a manually operable snap action mechanism positioned laterally of said switch and having a releasable interlocking connection with said shaft, a pair of manually adjustable fuse clamps secured to the upper surface of said base in alinement with each other, said fuse clamps being positioned in substantial vertical alinement with the respective end walls of said recess, one of said fuse clamps being electrically and mechanically connected with one of said contacts, and the other fuse clamp having a wiring terminal element associated therewith.

9. In an electric switch, in combination, a molded insulating base having a recess formed therein and opening to the lower surface thereof, a flat member of insulating material slidably positioned within said recess and having its movements guided in part by the walls of said recess, a member underlying said recess to assist in guiding the movements of said insulating member, a pair of upper and lower resilient stationary contacts between which said insulating member is interposed in all positions of the latter, said insulating member having an opening therein intermediate the ends thereof, a bridging contactor positioned within said opening and having portions thereof projecting a substantial distance beyond each surface of said insulating member, said contactor being movable by said insulating member into and out of engagement with said contacts jointly, a crank arm, means providing a pin and slot driving connection between said crank arm and said insulating member adjacent to the end of the latter remote from said contacts, a rotatable shaft positioned under said insulating base and having a positive driving connection with said crank arm, a manually operable snap action mechanism positioned laterally of said switch and having a releasable interlocking connection with said shaft, a pair of manually adjustable fuse clamps secured to the upper surface of said base in alinement with each other, said fuse clamps being positioned in substantial vertical alinement with the respective end walls of said recess, one of said fuse clamps being electrically and mechanically connected with one of said contacts, the other fuse clamp having a wiring terminal element associated therewith, an openable metal box within which said switch is enclosed, a part of said manually operable mechanism being exposed exteriorly of said box at one side of the latter, and cooperating elements associated with said box and said switch to insure against opening of the box when the switch is closed and to also insure against closing of the switch when the box is open.

10. In an electric safety switch, in combination, a sheet metal casing having bottom, side and end walls and a hinged cover, a sheet metal frame of substantially inverted channel-shape attached to the bottom wall of said casing, a molded insulating base member superimposed upon and attached to said frame in parallel relation to the bottom wall of said casing, said base member having a downwardly opening recess formed therein, a flat insulating member slidable within said recess in a plane parallel to the bottom wall of said casing, a rotatable shaft supported by said frame below the lower surface of said base member, a crank arm carried by said shaft and projecting upwardly beyond said frame, said crank arm having a lost motion driving connection with said flat member, a pair of alined resilient stationary contacts located within said recess and between which said flat member is interposed in all positions of the latter, means additional to said contacts and including the top and side walls of said recess to restrict said flat member to straight line movements in a single plane, a contactor carried by said flat member and movable thereby into and out of bridging engagement with said contacts, portions of said contactor being adapted to project above and below the upper and lower surfaces respectively of said flat member, a series of metal plates embedded in and depending from the top wall of said recess in parallel spaced relationship to each other, the lower ends of said plates being located in a common plane adjacent to the path of movement of said contactor, whereby any arcs formed incident to separation of the latter from said contacts are divided and cooled to assist in extinguishing the same, and an exterior handle rotatably carried by one side wall of said casing, said shaft having a releasable interlocking connection with said handle.

11. In an electric safety switch, in combination, a metal casing having bottom, side and end walls and a hinged cover, a metal frame of substantially inverted channel-shape attached to the bottom wall of said casing, a shaft rotatably carried by said frame in a plane parallel to said bottom wall, a crank arm secured to said shaft and projecting upwardly beyond said frame, a molded insulating base member seated upon said frame in parallel relation to the bottom wall of said casing, said base member having a downwardly opening recess formed therein, a flat insulating member slidable within said recess in a plane parallel to the bottom wall of said casing, said crank arm having a driving connection with said flat member, a pair of alined stationary contacts located within said recess and between which said flat member is interposed in all positions of the latter, means additional to said contacts and including the top and side walls of said recess to restrict said flat member to straight line movements in a single plane, a bridging contactor carried by said flat member and movable thereby into and out of engagement with said contacts, portions of said contactor being adapted to project above and below the upper and lower surfaces of said flat member, a handle rotatably supported by one side wall of said casing and accessible from the exterior of the latter, and means providing a releasable interlocking connection between said handle and said shaft.

12. In an electric safety switch, in combination, a metal casing having bottom, side and end walls and a hinged cover, a metal frame of substantially inverted channel-shape attached to the bottom wall of said casing, a shaft rotatably carried by said frame in a plane parallel to said bottom wall, a crank arm secured to said shaft and projecting upwardly beyond said frame, a molded insulating base member seated upon said frame in parallel relation to the bottom wall of said casing, said base member having a downwardly opening recess formed therein, a flat insulating member slidable within said recess in a plane parallel to the bottom wall of said casing, said crank arm having a driving connection with said flat member, a pair of alined resilient stationary contacts located within said recess and between which said flat member is interposed in all positions of the latter, means additional to said contacts and including the top and side walls of said recess to restrict said flat member to straight line movements in a single plane, a bridging contactor carried by said flat member and movable thereby into and out of engagement with said contacts, portions of said contactor being adapted to project above and below the upper and lower surfaces of said flat member, a handle rotatably supported by one side wall of said casing and accessible from the exterior of the latter, means providing a releasable interlocking connection between said handle and said shaft, and means including spring means, cam means and latch means associated with said handle and said shaft to insure snap movements of the latter in each direction upon corresponding regular movements of the former.

13. In an electric switch, in combination, a molded insulating base, a flat member of insulating material slidably positioned at and in a plane parallel to the rear surface thereof, a pair of upper and lower contacts at least one of which is resilient between which said insulating member is interposed in all positions of the latter, a bridging contactor carried by said insulating member, and a sleeve of arc resistant insulation surrounding said insulating member and supported thereby and into which the bridging contactor is drawn upon opening movement of the switch.

14. In an electric safety switch, in combination, a molded insulating base having a recess formed in the rear surface thereof, a flat insulating member of substantially rectangular contour slidably mounted within said recess and guided by the side walls of the latter, said base having an opening in the front surface thereof communicating with said recess, a pair of upper and lower contacts between which said insulating member is interposed in all positions of the latter, a contactor carried by said insulating member and movable thereby into and out of bridging engagement with said contacts, a sleeve of arc resistant insulating material surrounding said flat member and of less length than the latter, said flat member being provided upon its front surface with a predetermined area of distinctive color, and said sleeve and said base opening being so arranged as to insure exposure of at least a portion of said distinctively colored area only in the circuit closing position of said switch.

15. In a safety switch, in combination, a metal casing having bottom, side and end walls and a hinged cover, a sheet metal frame comprising spaced inverted U-shaped portions rigidly connected to each other and to the bottom wall of said casing, a shaft rotatably supported by said frame, a plurality of crank arms arranged in spaced relation upon said shaft to be positively driven thereby, a corresponding number of molded insulating base members of like form spanning said U-shaped frame portions and rigidly attached to the upper surfaces thereof, each of said base members having a recess formed therein and opening to the lower surface thereof, said crank arms extending upwardly into the respective recesses, flat insulating members slidably mounted within said recesses in a common plane at right angles to the planes of said crank arms, said crank arms having pin and slot driving connections with said flat members, pairs of resilient stationary contacts located within the respective recesses and between which pairs said flat members are continuously interposed in all positions of the latter, contactors carried by said flat members and movable thereby into and out of bridging enagement with said pairs of contacts, a snap action mechanism rotatably supported by one side wall of said casing and having a handle accessible exteriorly of the latter, and said shaft having a releasable interlocking connection with said snap action mechanism to insure snap movements of said contactors jointly from each extreme position thereof to the other.

16. In a safety switch, in combination, a metal casing having bottom, side and end walls and a hinged cover, a sheet metal frame comprising spaced inverted U-shaped portions rigidly connected to each other and to the bottom wall of said casing, a shaft rotatably supported by said frame, a plurality of crank arms arranged in spaced relation upon said shaft to be positively driven thereby, a corresponding number of molded insulating base members of like form spanning said U-shaped frame portions and rigidly attached to the upper surfaces thereof, each of said base members having a recess formed therein and opening to the lower surface thereof, said crank arms extending upwardly into the respective recesses, flat insulating members slidably mounted within said recesses in a common plane at right angles to the planes of said crank arms, said crank arms having pin and slot driving connections with said flat members, pairs of resilient stationary contacts located within the respective recesses and between which pairs said flat members are continuously interposed in all positions of the latter, contactors carried by said flat members and movable thereby into and out of bridging engagement with said pairs of contacts, a snap action mechanism rotatably supported by one side wall of said casing and having a handle accessible exteriorly of the latter, said shaft having a releasable interlocking connection with said snap action mechanism to insure snap movements of said contactors jointly from each extreme position thereof to the other, each of said base members having a pair of manually adjustable fuse clamps attached to the upper surface adjacent to the respective ends thereof, one fuse clamp of each pair being electrically connected with one contact of each pair, and the other fuse clamp of each pair having a wiring terminal element attached thereto.

17. In a safety switch, in combination, a molded insulating base having a downwardly opening recess formed therein, a metal frame having spaced portions of inverted channel-shape upon which said base is adapted to seat, a pair of upper and lower resilient stationary contacts secured to said base at one end of the latter and having alined contact tips positioned within said

recess, a slide member comprising an intermediate insulating plate having openings to respectively accommodate a contactor and a transversely extending pin, insulating plates arranged on opposite sides of said first mentioned plate and having interlocking engagement with said contactor and said pin to retain the same in assembled relation to said slide member, said plates being rigidly attached to each other, a shaft rotatably supported by said frame in a plane beneath said slide member, a crank arm driven by said shaft, said crank arm having a portion extending upwardly through said slide member and having a lost motion driving connection with said pin, said slide member being continuously interposed between said contact tips and said contactor being movable thereby into and out of bridging engagement with said contact tips, a hollow insulating member of substantially rectangular form in cross section surrounding said slide member and of a size to accommodate said contactor immediately after disengagement of the latter from said contact tips to assist in extinguishing any arcs drawn therebetween, said insulating member being restrained by a portion of said base and by said contact tips aaginst substantial endwise displacement, and said insulating member having slots in the upper and lower sides thereof to provide clearance for said crank arm.

18. In a switch of the character described, in combination, a pair of upper and lower stationary contacts, a flat insulating slide member continuously interposed between said contacts in all positions of the former, a contactor carried by said slide member and having portions projecting substantial distances above and below opposite faces of the latter and movable thereby into and out of bridging engagement with said contacts, a hollow insulating member of rectangular form in transverse cross section surrounding said slide member and of a size to accommodate with a slide fit the latter and said contactor, and means providing a shoulder engageable by one end of said hollow member for retaining the other end thereof in a substantially fixed position adjacent to said contacts to receive said contactor to thereby snuff any arcs drawn incident to separation of the latter from said contacts.

19. In a switch of the character described, in combination, a pair of upper and lower resilient stationary contacts, a flat insulating slide member continuously interposed between said contacts in all positions of the former, a contactor carried by said slide member and having portions exposed above and below opposite faces of the latter and movable thereby into and out of bridging engagement with said contacts, a hollow insulating member of rectangular form in transverse cross section surrounding said slide member and of a size to accommodate with a slide fit the latter and said contactor, means for retaining said hollow member in a substantially fixed position adjacent to said contacts to receive said contactor and to snuff any arcs drawn incident to separation of the latter from said contacts, said hollow member comprising a pair of upper and lower flat plates of bone hard fiber and a pair of relatively narrow side plates of like material, certain of said plates having openings and other of said plates having projections penetrating said openings, and said projections being upset to retain all of said plates in assembled relation.

20. In an electric safety switch, in combination, a molded insulating base having a recess in the rear surface thereof, a flat insulating member of substantially rectangular contour slidably mounted within said recess, said base having an opening in the front surface thereof communicating with said recess and of smaller area than the latter, a pair of upper and lower contacts between which said insulating member is interposed in all positions of the latter, a contactor carried by said insulating member and movable thereby into and out of bridging engagement with said contacts, a sleeve of arc resistant insulating material surrounding said flat member and retained in a substantially fixed position, said flat member being provided upon its front surface with a predetermined area of distinctive color, said sleeve having an opening of smaller size than but registering with said base opening to provide for exposure of at least a portion of said distinctively colored area only in the circuit closing position of said switch, and an actuating member having driving engagement with said flat member intermediate the ends of the latter, said sleeve having portions thereof cut away to provide clearance for said actuating member.

RALPH A. MILLERMASTER.