Jan. 21, 1941. P. B. HOYE **2,229,504**

SWITCH CONSTRUCTION

Filed Oct. 30, 1939 5 Sheets-Sheet 1

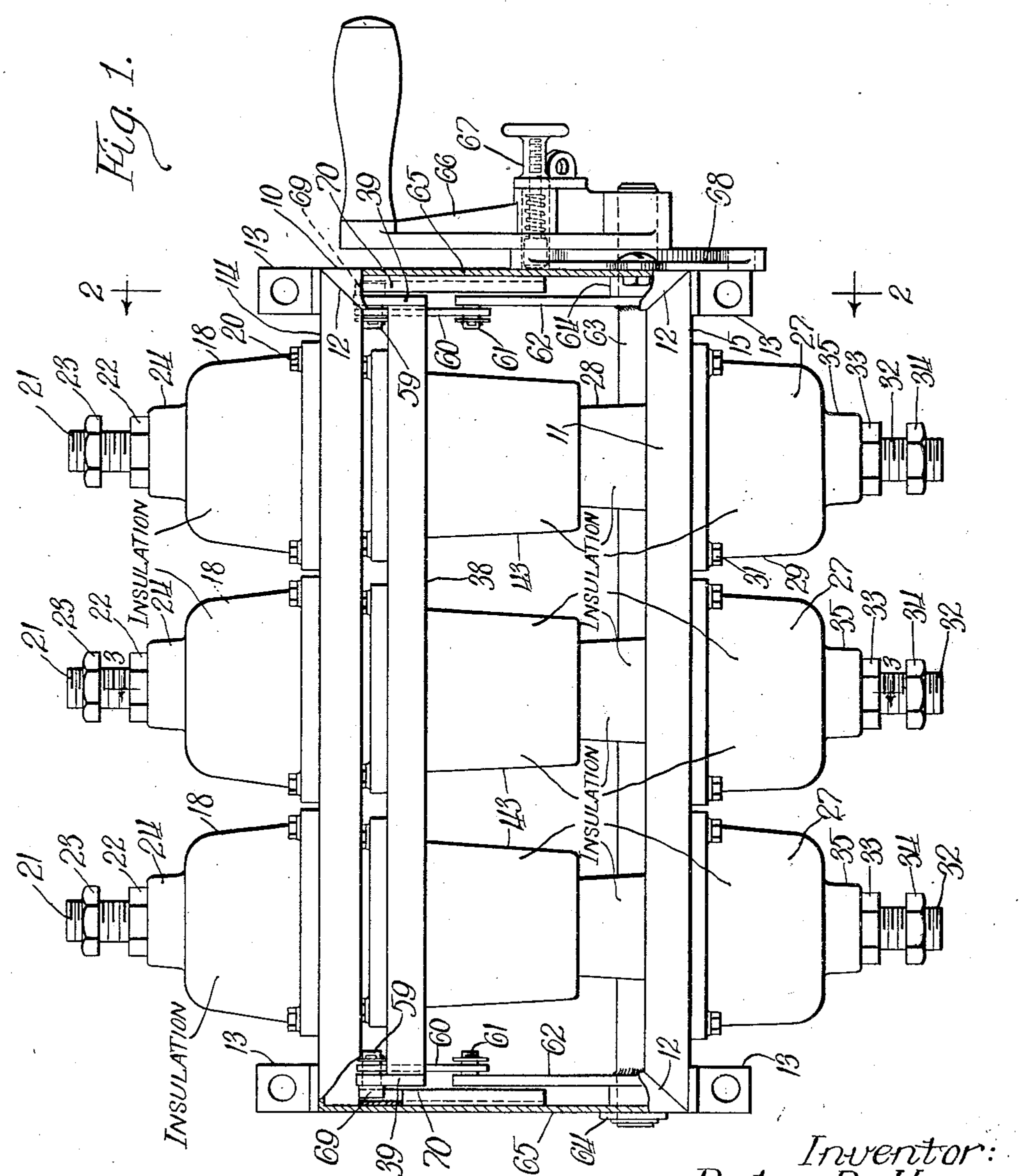


Fig. 1.

Inventor:
Peder B. Hoye

By Brown Jackson Boettcher & Dienner

Attys.

Jan. 21, 1941. P. B. HOYE 2,229,504

SWITCH CONSTRUCTION

Filed Oct. 30, 1939 5 Sheets-Sheet 2

Fig. 2.

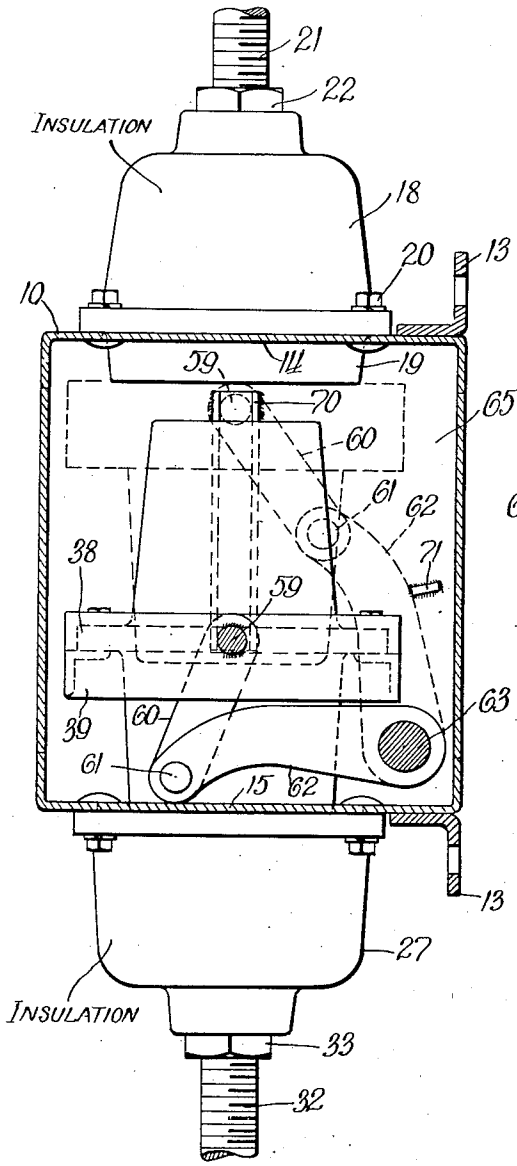
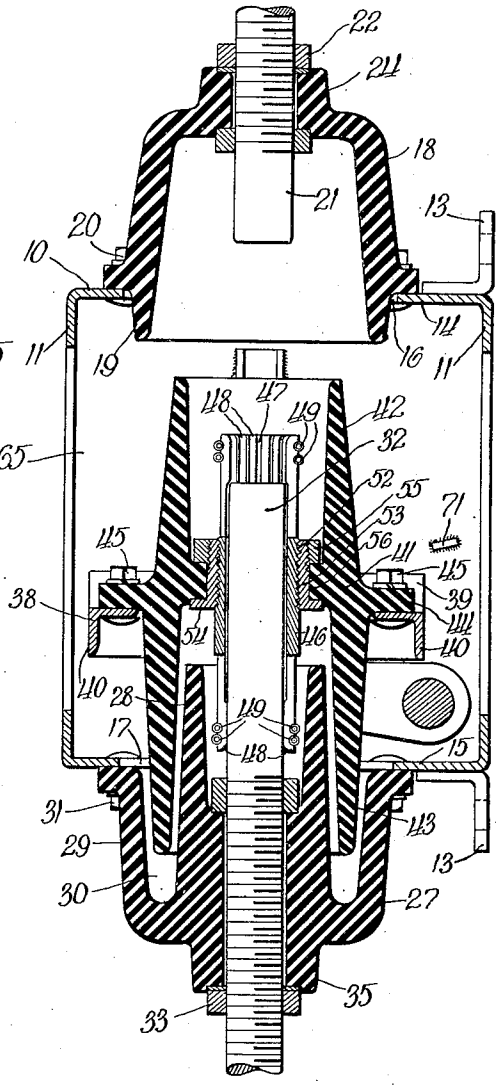


Fig. 3.



Inventor:
Peder B. Hoye

By Macpherson Bartlett & Brewer

Attys.

Jan. 21, 1941. P. B. HOYE 2,229,504

SWITCH CONSTRUCTION

Filed Oct. 30, 1939 5 Sheets-Sheet 3

Fig. 4.

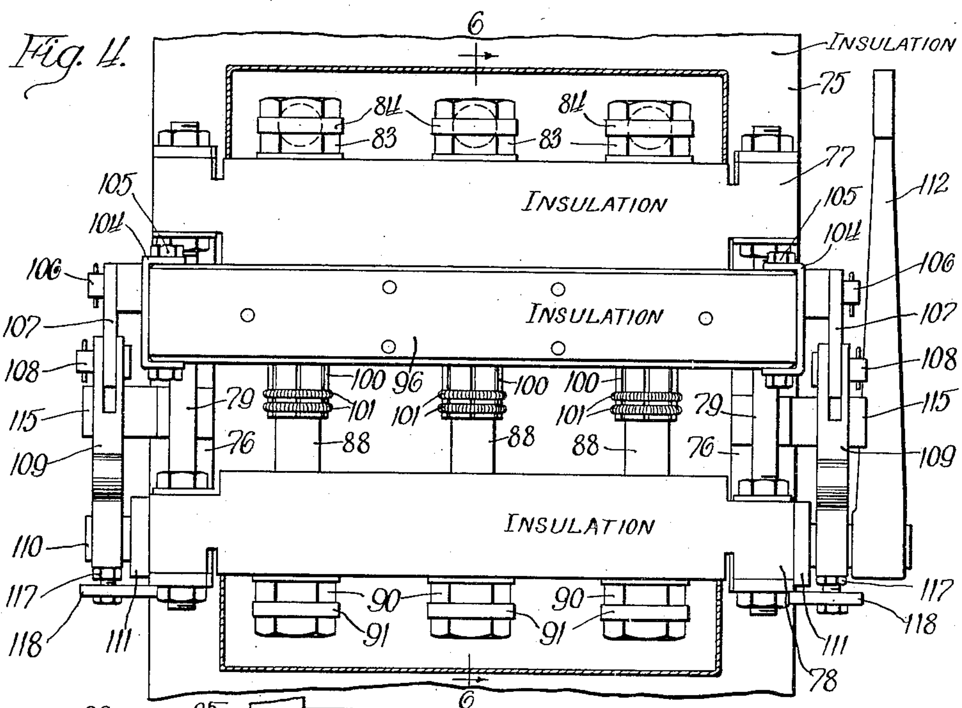
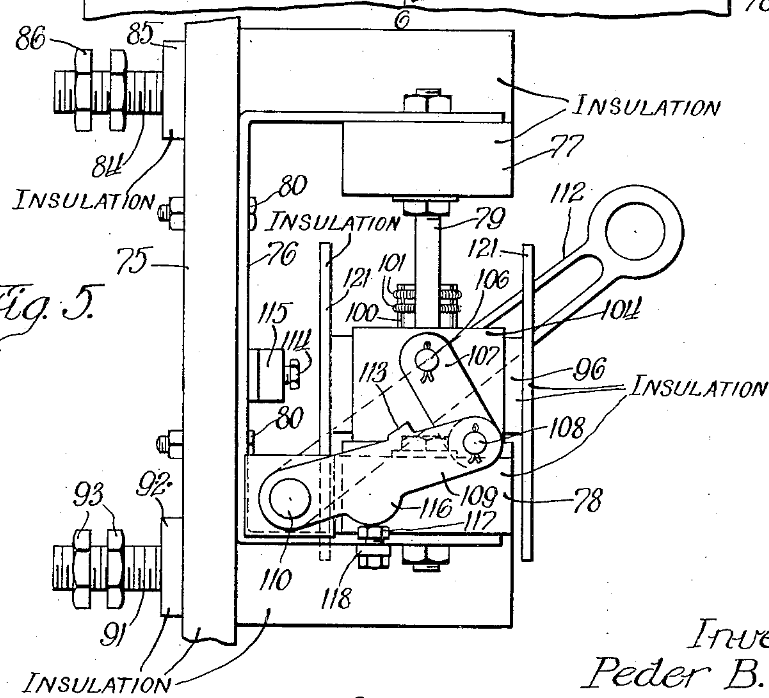


Fig. 5.



Inventor:
Peder B. Hoye

By Brown, Jackson, Boettcher & Dienner

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Jan. 21, 1941. P. B. HOYE 2,229,504

SWITCH CONSTRUCTION

Filed Oct. 30, 1939 5 Sheets-Sheet 4

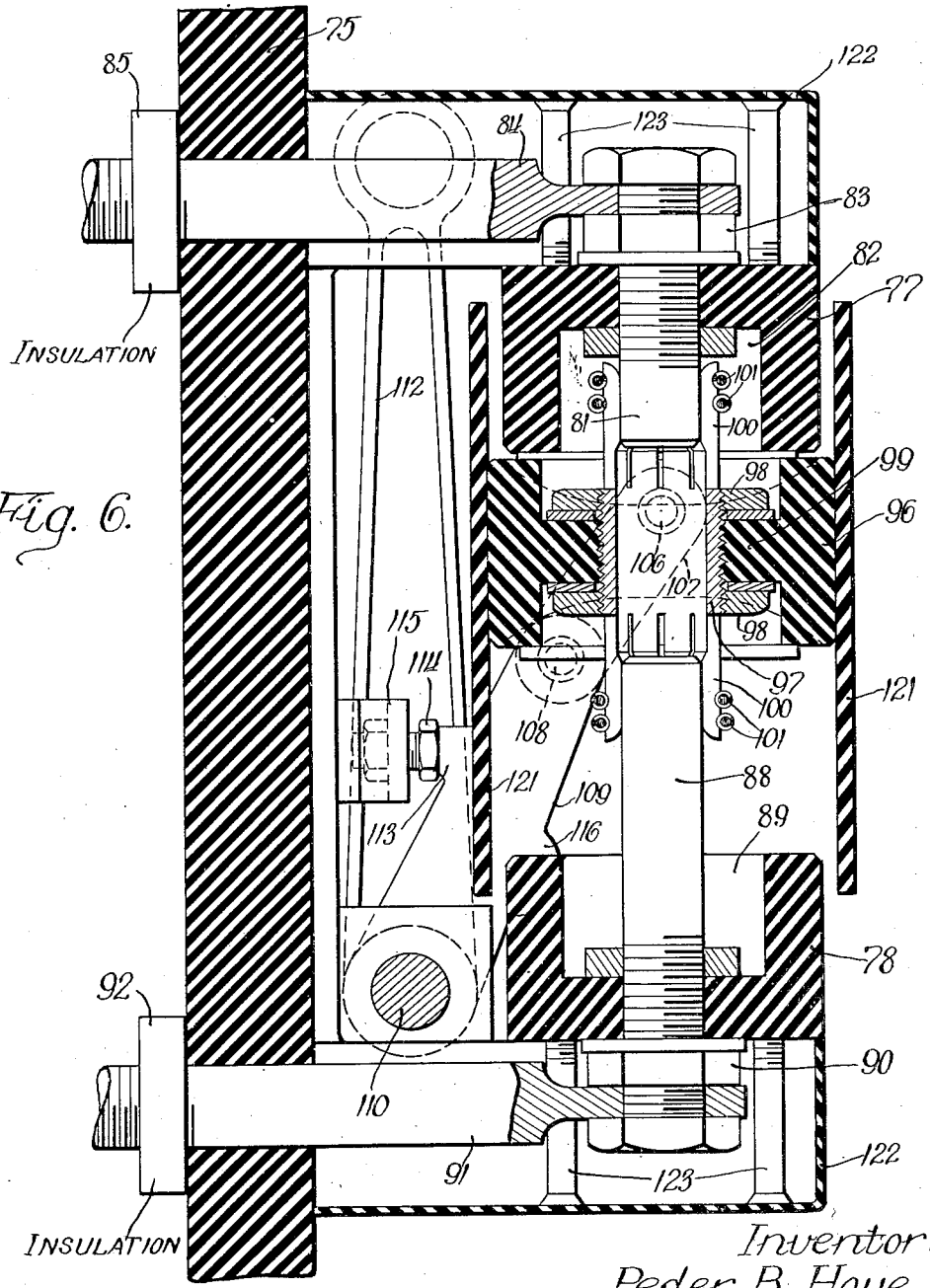

Fig. 6.

Inventor:
Peder B. Hoye

By Brown Jackson Boettcher & Dienner

Attys.

Jan. 21, 1941. P. B. HOYE 2,229,504

SWITCH CONSTRUCTION

Filed Oct. 30, 1939 5 Sheets-Sheet 5

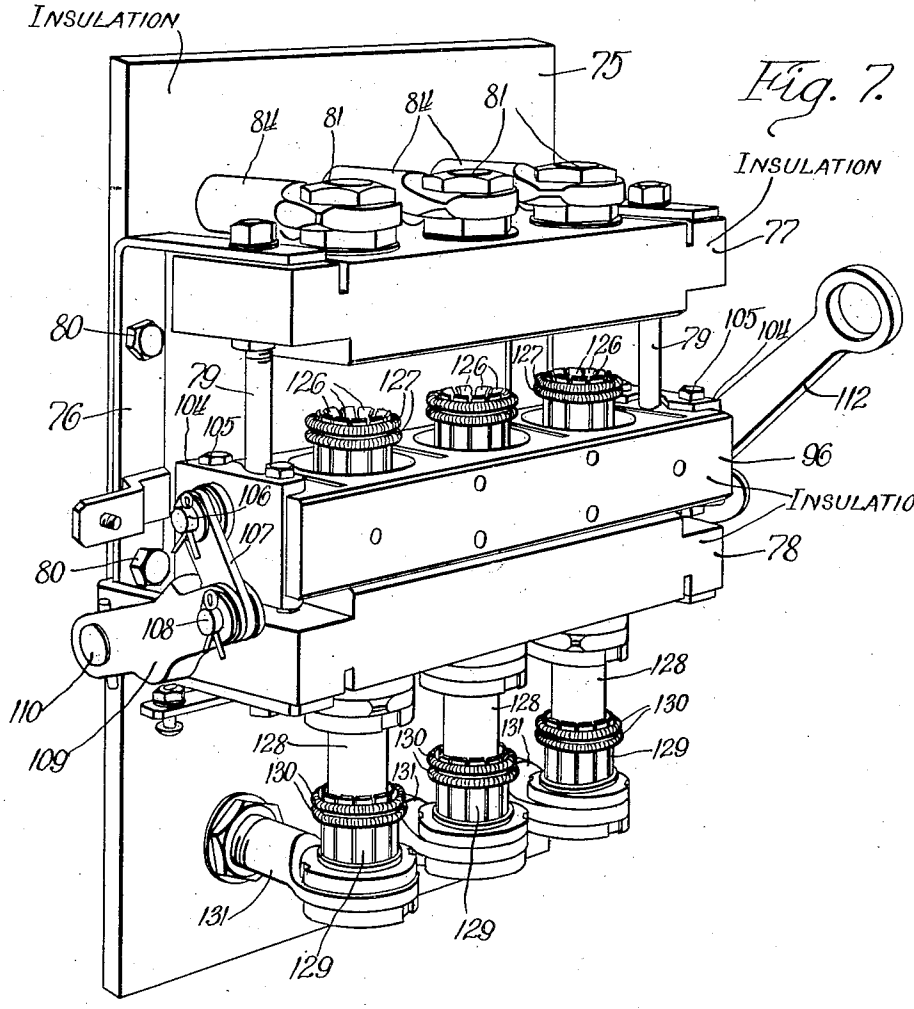

Fig. 7.

Inventor:
Peder B. Hoye
By Brown Jackson Boettcher & Dienner
Attys.

Patented Jan. 21, 1941 2,229,504

UNITED STATES PATENT OFFICE

2,229,504

SWITCH CONSTRUCTION

Peder B. Hoye, Maywood, Ill., assignor to Electrical Engineers Equipment Co., Melrose Park, Ill., a corporation of Illinois

Application October 30, 1939, Serial No. 301,899

13 Claims. (Cl. 200—16)

My invention relates, generally, to electric switch constructions and it has particular relation to switches of the disconnecting type for use in electric power distribution circuits.

The object of my invention, generally stated, is to provide a disconnecting switch construction that shall be simple and efficient in operation, safe to use, and which can be readily and economically manufactured and installed.

An object of my invention is to so arrange the installation in a gang operated disconnecting switch as to require a minimum of spacing between the terminals.

Another object of my invention is to provide an improved frame construction for a gang operated disconnecting switch by employing a one-piece panel member as the principal part.

Still another object of my invention is to provide for guiding a movable shelf carrying contact members within the one piece frame construction by providing guide channels on the inside of the ends of the frame for cooperation with guide members carried by the shelf.

Another object of my invention is to provide a relatively rigid frame construction for a disconnecting switch intended for mounting on a panel of insulating material.

A still further object of my invention is to provide for rear connecting of a disconnecting switch arranged for panel mounting.

A still further object of my invention is to provide for mounting the movable contact members of a disconnecting switch on a shelf that itself is formed of insulating material.

Another object of my invention is to provide a double throw disconnecting switch for panel mounting in which the movable contact members are carried by a shelf that itself is formed of insulating material.

Other objects of my invention will, in part, be obvious and, in part, appear hereinafter.

My invention, accordingly, is disclosed in the embodiments thereof shown in the accompanying drawings, and it comprises the features of construction, combination of elements and arrangement of parts which will be exemplified in the constructions hereinafter set forth, and the scope of the application of which will be indicated in the appended claims.

For a more complete understanding of the nature and scope of my invention, reference may be had to the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a view, in front elevation, of a gang operated disconnecting switch having a one-piece frame construction and intended for use on circuits where the voltage is of the order of 5,000 volts, certain parts being broken away in order to more clearly show the details of construction;

Figure 2 is a longitudinal sectional view taken along the line 2—2 of Figure 1;

Figure 3 is a longitudinal sectional view taken along the line 3—3 of Figure 1;

Figure 4 is a view in front elevation of a panel type of disconnecting switch adapted for use on circuits the voltage of which is the order of 600 volts, the upper and lower barriers being shown in section and a movable barrier being omitted in order to more clearly show the details of construction;

Figure 5 is a view in end elevation of the switch shown in Figure 4;

Figure 6 is a longitudinal sectional view taken along the line 6—6 of Figure 4; and

Figure 7 is a perspective view showing a double throw type of disconnecting switch for panel mounting that is constructed generally along the lines shown in Figures 4, 5, and 6 of the drawings.

Referring now particularly to Figures 1, 2, and 3 of the drawings, it will be observed that the reference character 10 designates a generally rectangular frame 10, the cross section of which is generally channel shaped. The frame 10 is formed in one piece by bending a suitable channel shaped metal member, the flanges of which are indicated at 11, into the desired rectangular shape. In order to do this, portions of the flanges 11 are removed at the corners and then, when the frame has been properly bent into shape, the abutting edges of the flanges 11 are welded together as indicated at 12. It is only necessary to complete the welds along the abutting edges 12 of both flanges 11 and to weld the abutting edges of the flat portions together along one corner in order to provide a rigid and relatively inexpensive frame that is comparatively light in weight. At the rear corners apertured lugs 13 are welded to permit mounting the frame 10 and the switch mechanism carried thereby on a suitable supporting structure such as a type frame or a well, as will be readily understood.

The frame 10 is provided with a top 14 and a bottom 15 that are provided respectively with aligned apertures 16 and 17, Figure 3.

It will be observed that three inverted cup-shaped insulators 18 are provided having portions 19 projecting downwardly through the openings 16 in the top 14 of the frame 10. The insulators 18 may be formed of any suitable in-

sulating material such as a phenolic condensation product. Bolts 20, projecting through a flange integrally formed with the insulators 18 and through suitable apertures and the apertures 16 in the top 14 serve to hold the insulators 18 in position. Centrally located within each of the insulators 18 is a rode-like terminal 21 that is secured in position by means of a nut 22. It will be understood that connection to the rod-like terminals 21 is provided by means of suitable terminals that may be clamped in position by nuts 23, Figure 1.

With a view to facilitating the application of insulating tape to cover the projecting portions of the rod-like terminals 21 and the line terminal attached thereto, the upper ends of the insulators 18 are reduced, as indicated at 24. The tape can then be readily applied to the exposed metallic connections and extended over the reduced end portions 24, as will be readily understood.

On the underside of the bottom 15 of the frame 10 there are provided three upright cup-shaped insulators 27 which are provided with portions 28 that extend upwardly through the respective apertures 17. The insulators 27 are also provided with flanges 29, spaced from the portions 28 forming therebetween an annular recess 30, Figure 3, the purpose of which will be presently apparent. Bolts 31 extending through flanges integrally formed with the insulators 27 and through suitable apertures in the bottom 15 serve to hold the insulators 27 in position. Mounted within each of the insulators 27, shown in Figure 3, is a rod-like terminal 32, which, as shown, extends a substantial distance into the frame 10 and beyond the upper end of the upwardly extending portion 28 of the insulator 27. The lower end of each rod-like terminal 32 is threaded and is secured in position in its insulator 27 by a nut 33. A nut 34, Figure 1, serves to clamp a line terminal thereto. The lower ends 35 of each of the insulators 27 is reduced to facilitate taping as described hereinbefore.

Within the housing 10 and movable between the top 14 and bottom 15 is a shelf 38 that is preferably formed by welding end plates 39 across the ends of angle members 40. It will be apparent that this will provide a rigid generally rectangular frame for receiving thereon three sleeve insulators 41. The upper end 42 of each sleeve insulator 41 is tapered and is arranged to telescopically interfit within the corresponding inverted cup-shaped insulator 18 thereabout in the switch closed position. The lower end 43 of each of the sleeve insulators 41 is likewise tapered and is arranged to telescopically interfit with the corresponding upright cup-shaped insulator 27 and to extend into the annular groove 30 in the switch open position. By providing the annular groove 30 in each of the lower upright cup-shaped insulators 27, it is possible to substantially reduce the distance that would otherwise be required between the top 14 and bottom 15 of the frame 10. It will be obvious that proper clearance distances must be provided between the live parts of the switch and the frame and that when voltages of the order of 5,000 volts and above are employed the provision of the proper clearance presents quite a problem. The lower end 43 of each sleeve insulator 41 must be of sufficient length to overlap the upwardly extending portion 28 of the corresponding insulator 27 when the switch is in the closed position. In the switch open position provision must be made for taking care of the depending portion 43 of each of the sleeve insulators 41. At the same time proper creepage distance must be maintained between the lower rod-like terminals 32 and the frame 10. By providing the flanged portions 29 on the upright cup-shaped insulators 27 and the annular grooves 30 therein, a simple and satisfactory solution to this problem is provided.

Each of the sleeve insulators 41 is provided with an outwardly extending flange 44 through which bolts 45 project through suitable apertures in the angle members 40 for holding the sleeve insulators 41 in position in alignment with the corresponding upper and lower insulators 18 and 27, as will be readily understood.

Within each of the sleeve insulators 41 and movable therewith is provided a sleeve contact member 46, the ends of which are longitudinally slotted as indicated at 47, Figure 3, to provide relatively flexible contact fingers 48 for engaging the corresponding rod-like terminals 21 and 32. Garter springs 49 surrounding the contact fingers 48 to serve to increase the contact pressure that is otherwise provided by the contact fingers 48 alone. It will be understood that the contact sleeve 46 always remains in engagement with the relatively long rod-like terminal 32 in both the switch open and the switch closed position. The circuit is closed and opened by engagement of the upper end of the contact sleeve 46 with the respective upper rod-like terminal 21.

The contact sleeve 46 is threaded at 52 intermediate its ends and a collar 53 having a flanged lower end 54 is threaded thereon. A clamp nut 55 is threaded on the collar 53, as shown, to clamp the contact sleeve 46 in operative position on opposite sides of a flange 56 that extends inwardly from the sleeve insulator 41.

It will be understood that the upright cup-shaped insulators 27 and the sleeve insulators 41 are formed of material similar to that of which the inverted cup-shaped insulators 18 are formed. As indicated hereinbefore, this may be a phenolic condensation product.

With a view to operating the shelf 38 from one position to another within the frame 10, the end plates 39 are provided with pins 59 through which one end of links 60 are pivoted. The other ends of the links 60 are pivoted to pins 61 that are carried by links 62 at one end, the other ends being securely fastened, as by welding, to an operating shaft 63 which is mounted in bearings 64 that are carried by the ends 65 of the frame 10. An operating arm or handle 66 is secured to one end of the operating shaft 63 to permit manual rotation thereof. A spring biased pin 67 cooperates with a pivotally apertured face plate 68 for locking the operating arm or handle 66 in either of the two extreme positions. Additional locking means are also provided as will be presently apparent.

The shelf 38 is guided in its movement within the housing 10, in part, by heads 69 of the pins 59 sliding in guide channels 70 that are secured, as by welding, to the inner surfaces of the ends 65 of the frame 10. Additional guiding action is also provided by the contact sleeves 46 in sliding over their respective rod-like terminal members 32.

When the operating arm or handle 66 is rotated to the position shown in Figure 1 of the drawings, the links 60 and 62 are rotated to move the shelf 38 and parts carried thereby upwardly. In this switch closed position the upper ends of the contact sleeves 46 are in contact engagement

with the respective rod-like terminals 21 while the lower ends, as described, remain in contact engagement with the elongated rod-like terminals 32. Also in this position the upper ends 42 of the sleeve insulators 41 telescope within the inverted cup-shaped insulators 18. The links 60 and 62 provide an over-center toggle for, as shown in Figure 2 of the drawings, in the switch closed position, the pin 61 interconnecting the links 60 and 62 is moved to a position that is slightly beyond the line connecting the center of the pin 59 and the center of the shaft 63. This over-center toggle arrangement provides additional means for locking the switch in the closed position. Movement of the links 62 passed the center position is limited by stops 71 which may be formed of suitable metal members secured, as by welding, to the inside of the ends 65. Movement of the shelf 38 downwardly is limited by the engagement of the outer ends of the links 62 with the upper surface of the bottom 15 of the frame 10.

While the switch construction shown in Figures 1, 2, and 3 is provided with three poles for three phase use, it will be apparent that any desired number of poles may be employed. For example, only two poles may be provided for single phase use. In some cases it may also be desirable to provide only a single pole switch construction. The only change that is required for the different numbers of poles, in general, is to change the length of the frame 10 and the length of the shelf 38. It will be obvious that the construction shown and described in Figures 1, 2, and 3 of the drawings is simple and compact and yet proper clearances and creepage distances are provided for high voltage circuits.

Referring now particularly to Figures 4, 5, and 6 of the drawings, it will be observed that a switch construction is there shown that is adapted to be mounted on a panel 75 of suitable insulating material such as slate, marble or ebony asbestos or other suitable insulating material. The switch construction shown in these figures is of the three pole type for connection in a three phase circuit operating at a relatively low voltage of the order of 600 volts. For this voltage it will be appreciated that the clearance and creepage distances are much less than are required for the high voltage switch construction shown and described in the preceding figures. While the switch construction shown in Figures 4, 5, and 6 of the drawings is of the three pole type, it will be readily understood that it might be of the two pole type for single phase circuit, or, if desired, of the single pole type.

A frame for the switch is provided, in part, by U-shaped strap iron frame members 76 and upper and lower insulator blocks 77 and 78 that are positioned, as shown, underneath and above the outwardly extending ends of the members 76 and secured in rigid spaced-apart relation by rods 79. When the flat portions of the frame members 76 are secured, as by bolts 80, to the panel 75, it will be observed that a rigid frame structure for the switch is provided by the parts just described. The upper and lower insulator blocks 77 and 78 may be formed of any suitable insulating material such as ebony asbestos. The rods 79 are threaded at their ends, as shown, and are secured in position by nuts threaded thereon, as will be readily understood.

As shown more clearly in Figure 6 of the drawings, the upper insulator block 77 carries rod-like terminal members 81 which project downwardly into recessed apertures 82 on the underside thereof. Nuts 83 serve to hold the terminal members 81 in position. It is desirable to provide for rear connecting the switch. This is effected by the use of rod-like terminal connectors 84 which extend through suitable apertures in the panel 75. Discs 85, of suitable insulating material such as a phenolic condensation product, are threaded onto the terminal rods 84 on the rear side of the panel 75 for holding them in position.

The lower insulator block 78 is likewise provided with rod-like terminals 88 which extend upwardly through recessed openings 89 on the upper side thereof. Nuts 90 serve to hold the rod-like terminals 88 in position. Terminal rods 91, extending through the panel 75 and held in position, in part, by threaded insulating discs 92 provide for rear connection to the terminals 88.

It will be understood that the terminals of the line conductors are positioned on the rearwardly extending terminal connectors 84 and 91 and that they may be secured thereon by suitable nuts 86 and 93 respectively.

Between the upper and lower insulator blocks 77 and 78 there is provided a removable insulator block 96 which carries three contact sleeves 97. Contact sleeves 97 are secured in position by nuts 98 that are threaded, as shown in Figure 6, on the central portion thereof and are disposed on opposite sides of inwardly extending flanges 99 integrally formed with the movable insulator blocks 96. The upper and lower ends of the contact sleeves 97 are slotted, as previously described, to provide relatively flexible contact fingers 100 but are further biased by garter springs 101 into contact engagement with the rod-like terminals 81 and 88. It will be understood that the contact sleeve 97 is always in contact engagement with the rod-like terminal 88 and that, on movement of the movable insulator block 96, it is moved into and out of engagement with the respective rod-like terminals 81.

The movable insulator block 96 is guided in its movement between the upper and lower insulator blocks 77 and 78 by the rods 79 which project through suitable apertures near the ends which, while they are large enough to permit the movable insulator block 96 to freely slide, are still small enough to provide the desired guiding action. At the ends of the movable insulator block 96 there are provided generally C-shaped metal end members 104 that are secured in position by any suitable means, such as the transversely extending bolts 105. Pins 106 extend from the end members 104 for pivotally mounting one end of links 107, the other ends of which are pivotally mounted on pins 108 extending transversely through one end of links 109 that are secured at their other end to an operating shaft 110. The operating shaft 110 is mounted in suitable bearings 111 that are carried by the frame members 76. An operating arm or handle 112 is also secured to the operating shaft 110 for rocking the same. The links 109 are provided on one side with a boss 113 which is arranged to engage an adjustable stop 114 that is carried by a stepped support member 115 extending from the rear portion of the frame members 76. Also the other side of each of the links 109 is provided with a boss 116 which is arranged to engage an adjustable stop 117 that is carried by a lug 118 extending from the lower arm of the frame member 76.

When the operating arm handle 112 is moved to the position shown in Figures 4 and 6 of the drawings, the links 107 and 109, which in effect form a toggle linkage, are moved to such a position that the pin 108 interconnecting the links is moved to a position which is slightly beyond a line joining the center of the pin 106 and the center of the operating shaft 110. In this position the movable insulator block 96 has carried the contact sleeves 97 into engagement with the respective rod-like terminals 81. They are then securely locked in this position and will remain there until the operating arm or handle 112 is rotated to first move the links 107 and 109 back past the dead center position, after which further movement will cause the movable insulator block 96 to move downwardly carrying with it the contact sleeves 97 to the open circuit position.

It is desirable that the live parts of the switch be covered so that there is no likelihood of a person coming in contact with them. For this purpose barrier plates 121 are secured on opposite sides of the movable insulator block 96. In the switch closed position it will be observed that the barrier plates 121 overlap both the upper and the lower insulator blocks 77 and 78 as shown in Figure 6. In the open circuit position, as shown in Figure 5, the barrier plates 121 move to positions slightly below the upper insulator block 77 thereby permitting a visual inspection of the air gap that is present between the rod-like terminals 81 and the contact sleeves 97.

For the same purpose insulating barriers 122 are provided for covering the projecting ends of the rod-like terminals 81 and 88 and the portions of the terminal connectors 84 and 91 which extend from the front of the panel 75. They are held in position on the upper and lower insulator blocks 77 and 78 by any suitable means such as screws 123.

In Figure 7 of the drawings there is shown a three pole double throw switch construction which is generally similar to that shown in Figures 4, 5, and 6 of the drawings. A principal difference, however, resides in the construction of the contact members carried by the movable insulator block 96. As shown in Figure 7, the contact members carried by the movable insulator block 96 are provided at their upper ends with relatively flexible contact fingers that are biased inwardly by garter springs 127. The low ends are provided with rod-like portions for extending through contact sleeves, not shown, that are carried by the lower insulator block 78. The rod-like portions 128 are provided for engagement with the respective contact sockets 129 which, as shown, are provided with a plurality of relatively flexible fingers that are biased inwardly by garter springs 130. It will be understood that the contact sleeves carried by the lower insulator block 78 are similar in construction to the contact sockets 129, the details of which are generally shown. The contact sockets 129 are carried by suitable terminal studs 131 that extend through the panel 75. In the event that the contact sockets 129 are employed for grounding the circuit when the switch is in the open position, then the studs 131 will be commonly connected together and to ground.

Since it is obvious that further changes may be made in the above constructions and different embodiments of the invention may be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In a switch, in combination, a one piece generally rectangular metal frame having an internal channel section with aligned openings in the top and bottom, inverted cup-shaped insulators carried by said top with portions projecting downwardly therethrough, upright cup-shaped insulators carried by said bottom with portions projecting upwardly therethrough, a rod-like contact stud carried by each of said insulators, a shelf guided for movement within said frame between the top and bottom thereof, a plurality of sleeve insulators carried by said shelf and aligned with said insulators above and below for telescopic movement with respect to the same, a contact sleeve carried by each of said sleeve insulators always in engagement with the corresponding lower contact stud and movable into and out of engagement with the corresponding upper contact stud, and means for moving said shelf to move said contact sleeves into and out of contact engagement with said upper contact studs.

2. In a switch, in combination, a one piece generally rectangular metal frame having an internal channel section with aligned openings in the top and bottom, inverted cup-shaped insulators carried by said top with portions projecting downwardly therethrough, upright cup-shaped insulators carried by said bottom with portions projecting upwardly therethrough, a rod-like contact stud carried by each of said insulators, a guide channel secured to the inside of each end of said metal frame and extending vertically thereof, a shelf movable within said frame between the top and bottom thereof, a guide member at each end of said shelf projecting into and guided by the guide channel thereat, a plurality of sleeve insulators carried by said shelf and aligned with said insulators above and below for telescopic movement with respect to the same, a contact sleeve carried by each of said sleeve insulators always in engagement with the corresponding lower contact stud and movable into and out of engagement with the corresponding upper contact stud, and means for moving said shelf to move said contact sleeves into and out of contact engagement with said upper contact studs.

3. In a switch, in combination, a one piece generally rectangular metal frame having an internal channel section with aligned openings in the top and bottom, inverted cup-shaped insulators carried by said top with portions projecting downwardly therethrough, upright cup-shaped insulators carried by said bottom with portions projecting upwardly therethrough, a rod-like contact stud carried by each of said insulators, a shelf guided for movement within said frame between the top and bottom thereof, a plurality of sleeve insulators carried by said shelf and aligned with said insulators above and below for telescopic movement with respect to the same, a contact sleeve carried by each of said sleeve insulators always in engagement with the corresponding lower contact stud and movable into and out of engagement with the corresponding upper contact stud, an operating shaft rockably mounted on the ends of said metal frame, a link pivoted to each end of said shelf and to a link secured to each end of said shaft, and an operating arm secured to said shaft for rocking the same to move said shelf

and thereby said contact sleeves into and out of contact engagement with said upper contact studs.

4. In a switch, in combination, a one piece generally rectangular metal frame having an internal channel section with aligned openings in the top and bottom, inverted cup-shaped insulators carried by said top with portions projecting downwardly therethrough, upright cup-shaped insulators carried by said bottom with portions projecting upwardly therethrough, a rod-like contact stud carried by each of said insulators, a guide channel secured to the inside of each end of said metal frame and extending vertically thereof, a shelf movable within said frame between the top and bottom thereof, a guide member at each end of said shelf projecting into and guided by the guide channel thereat, a plurality of sleeve insulators carried by said shelf and aligned with said insulators above and below for telescopic movement with respect to the same, a contact sleeve carried by each of said sleeve insulators always in engagement with the corresponding lower contact stud and movable into and out of engagement with the corresponding upper contact stud, an operating shaft rockably mounted on the ends of said metal frame, a link pivoted to each end of said shelf on said guide member thereat and to a link secured to each end of said shaft, and an operating arm secured to said shaft for rocking the same to move said shelf and thereby said contact sleeves into and out of contact engagement with said upper contact studs.

5. In a switch for mounting on a panel, in combination, a pair of U-shaped support members adapted to be secured to the panel in vertical spaced relation, upper and lower insulator blocks carried by the outstanding ends of said support members, guide rods extending through said ends of said support members and the ends of said insulator blocks thereat for securing the same in rigid spaced relation, sets of upper and lower stationary contact members carried by said upper and lower insulator blocks, an insulator block guided for movement on said guide rods between said upper and lower insulator blocks, contact members carried by the movable insulator block always in engagement with one set of said stationary contact members and movable into and out of engagement with the other set of stationary contact members, and means for moving said movable insulator block to move said contact members carried thereby into and out of contact engagement with said other set of stationary contact members.

6. In a switch for mounting on a panel, in combination, a pair of U-shaped support members adapted to be secured to the panel in vertical spaced relation, upper and lower insulator blocks carried by the outstanding ends of said support members, guide rods extending through said ends of said support members and the ends of said insulator blocks thereat for securing the same in rigid spaced relation, sets of upper and lower stationary contact members carried by said upper and lower insulator blocks, terminals secured to said upper and lower sets of stationary contact members and adapted to extend through said panel to permit rear connection to the switch, an insulator block guided for movement on said guide rods between said upper and lower insulator blocks, contact members carried by the movable insulator block always in engagement with one set of said stationary contact members and movable into and out of engagement with the other set of stationary contact members, and means for moving said movable insulator block to move said contact members carried thereby into and out of contact engagement with said other set of stationary contact members.

7. In a switch for mounting on a panel, in combination, a pair of U-shaped support members adapted to be secured to the panel in vertical spaced relation, upper and lower insulator blocks carried by the outstanding ends of said support members, guide rods extending through said ends of said support members and the ends of said insulator blocks thereat for securing the same in rigid spaced relation, sets of upper and lower stationary contact members carried by said upper and lower insulator blocks, terminals secured to said upper and lower sets of stationary contact members and adapted to extend through said panel to permit rear connection to the switch, an insulator block guided for movement on said guide rods between said upper and lower insulator blocks, contact members carried by the movable insulator block always in engagement with one set of said stationary contact members and movable into and out of engagement with the other set of stationary contact members, insulating barrier means covering substantially all live parts of the switch to prevent accidental contact therewith, and means for moving said movable insulator block to move said contact members carried thereby into and out of contact engagement with said other set of stationary contact members.

8. In a switch for mounting on a panel, in combination, a pair of U-shaped support members adapted to be secured to the panel in vertical spaced relation, upper and lower insulator blocks carried by the outstanding ends of said support members, guide rods extending through said ends of said support members and the ends of said insulator blocks thereat for securing the same in rigid spaced relation, sets of upper and lower stationary contact members carried by said upper and lower insulator blocks, an insulator block guided for movement on said guide rods between said upper and lower insulator blocks, contact members carried by the movable insulator block always in engagement with one set of said stationary contact members and movable into and out of engagement with the other set of stationary contact members, an operating shaft rockably mounted on said U-shaped support members, a link pivoted to each end of said movable insulator block and to a link secured to each end of said shaft, and an operating arm secured to said shaft for rocking the same to move said movable insulator block and the contact members carried thereby into and out of contact engagement with said other set of stationary contact members.

9. In a switch for mounting on a panel, in combination, a pair of U-shaped strap iron support members adapted to be secured to the panel in vertical spaced relation, upper and lower insulator blocks respectively underneath and upon the outstanding ends of said support members, guide rods extending through said ends of said support members and the ends of said insulator blocks thereat for securing the same in rigid spaced relation, upper and lower sets of stationary contact studs carried by said upper and lower insulator blocks, an insulator block guided for movement on said guide rods between said upper

and lower insulator blocks, contact sleeves carried by said movable insulator block always in engagement with said lower set of contact studs and movable into and out of engagement with said upper set of contact studs, and means for moving said movable insulator block to move said contact sleeves carried thereby into and out of contact engagement with said upper set of contact studs.

10. In a switch for mounting on a panel, in combination, a pair of U-shaped strap iron support members adapted to be secured to the panel in vertical spaced relation, upper and lower insulator blocks respectively underneath and upon the outstanding ends of said support members, guide rods extending through said ends of said support members and the ends of said insulator blocks thereat for securing the same in rigid spaced relation, upper and lower sets of stationary contact studs carried by said upper and lower insulator blocks, terminals secured to said upper and lower sets of stationary contact studs and adapted to extend through said panel to permit rear connection to the switch, an insulator block guided for movement on said guide rods between said upper and lower insulator blocks, contact sleeves carried by said movable insulator block always in engagement with said lower set of contact studs and movable into and out of engagement with said upper set of contact studs, and means for moving said movable insulator block to move said contact sleeves carried thereby into and out of contact engagement with said upper set of contact studs.

11. In a switch for mounting on a panel, in combination, a pair of U-shaped strap iron support members adapted to be secured to the panel in vertical spaced relation, upper and lower insulator blocks respectively underneath and upon the outstanding ends of said support members, guide rods extending through said ends of said support members and the ends of said insulator blocks thereat for securing the same in rigid spaced relation, upper and lower sets of stationary contact studs carried by said upper and lower insulator blocks, an insulator block guided for movement on said guide rods between said upper and lower insulator blocks, contact sleeves carried by said movable insulator block always in engagement with said lower set of contact studs and movable into and out of engagement with said upper set of contact studs, an operating shaft rockably mounted on said U-shaped support members, a link pivoted to each end of said movable insulator block and to a link secured to each end of said shaft, and an operating arm secured to said shaft for rocking the same to move said movable insulator block and the contact sleeves carried thereby into and out of contact engagement with said upper set of contact studs.

12. In a double throw switch for mounting on a panel, in combination, a pair of U-shaped support members adapted to be secured to the panel in vertical spaced relation, upper and lower insulator blocks carried by the outstanding ends of said support members, guide rods extending through said ends of said support members and the ends of said insulator blocks thereat for securing the same in rigid spaced relation, a set of contact studs carried by said upper insulator block, a set of contact sleeves carried by said lower insulator block, a set of contact sleeves mounted below said lower insulator block and aligned respectively with said set of contact sleeves carried thereby, an insulator block guided for movement on said guide rods between said upper and lower insulator blocks, contact members carried by said movable insulator block each including a contact sleeve at its upper end for engagement with the respective contact stud carried by said upper insulator block and a contact stud at its lower end always in engagement with the respective contact sleeve carried by said lower insulator block and adapted to engage the respective contact sleeve of the set thereof disposed below said lower insulator block, and means for moving said movable insulator block to move said contact members carried thereby into engagement with said contact studs in one position and to move them into engagement with said contact sleeves below said lower insulator block in the other position.

13. In a double throw switch for mounting on a panel, in combination, a pair of U-shaped support members adapted to be secured to the panel in vertical spaced relation, upper and lower insulator blocks carried by the outstanding ends of said support members, guide rods extending through said ends of said support members and the ends of said insulator blocks thereat for securing the same in rigid spaced relation, a set of contact studs carried by said upper insulator block, a set of contact sleeves carried by said lower insulator block, a set of contact sleeves mounted below said lower insulator block and aligned respectively with said set of contact sleeves carried thereby, an insulator block guided for movement on said guide rods between said upper and lower insulator blocks, contact members carried by said movable insulator block each including a contact sleeve at its upper end for engagement with the respective contact stud carried by said upper insulator block and a contact stud at its lower end always in engagement with the respective contact sleeve carried by said lower insulator block and adapted to engage the respective contact sleeve of the set thereof disposed below said lower insulator block, terminals secured to the stationary contact studs and sleeves and adapted to extend through said panel to permit rear connection to the switch, and means for moving said movable insulator block to move said contact members carried thereby into engagement with said contact studs in one position and to move them into engagement with said contact sleeves below said lower insulator block in the other position.

PEDER B. HOYE.