

**July 21, 1925.**

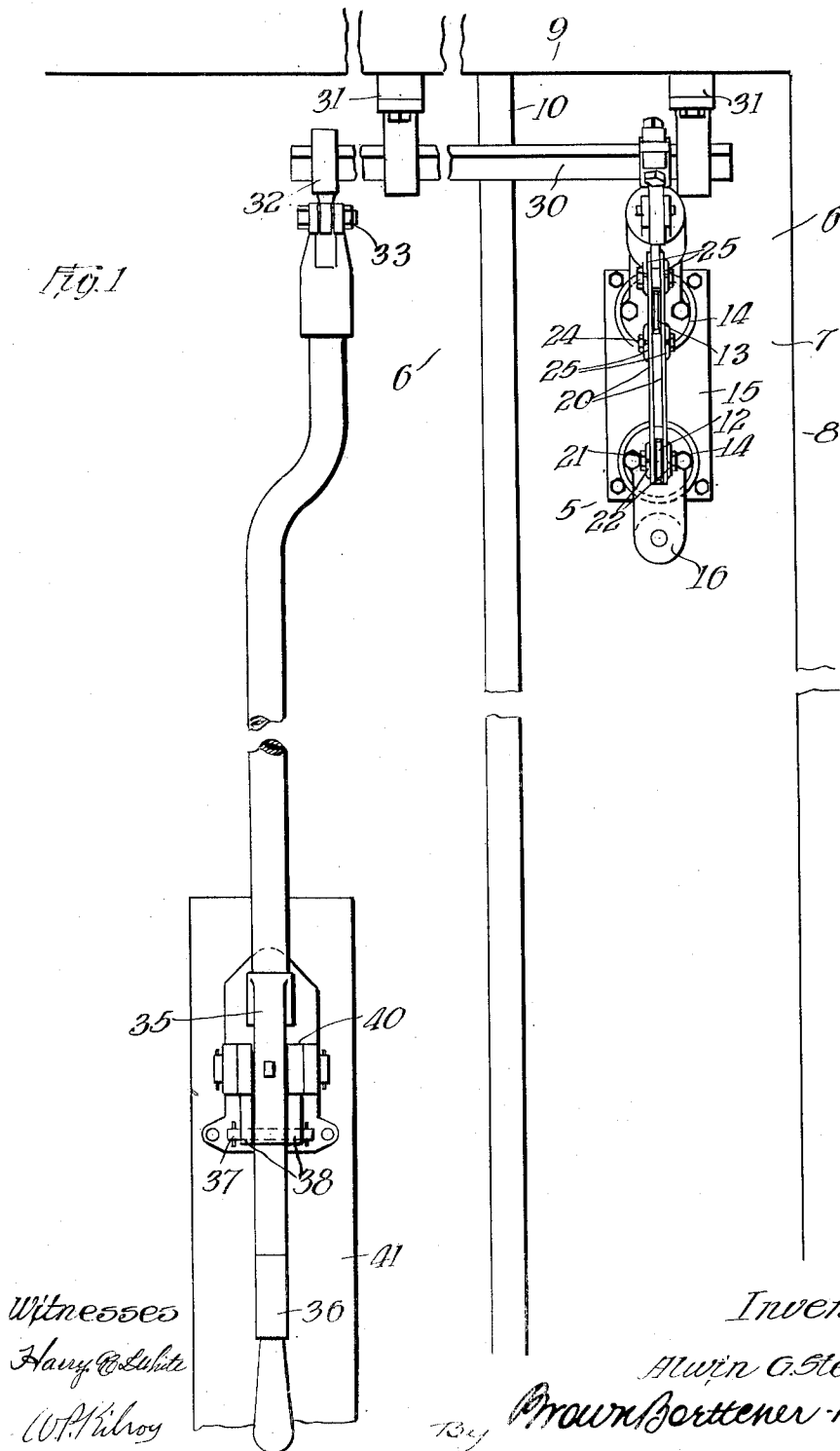
**1,546,802**

A. G. STEINMAYER

## DISCONNECTING SWITCH

Filed July 28, 1923

4 Sheets-Sheet 1



July 21, 1925.

1,546,802

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DISCONNECTING SWITCH

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4 Sheets-Sheet 2

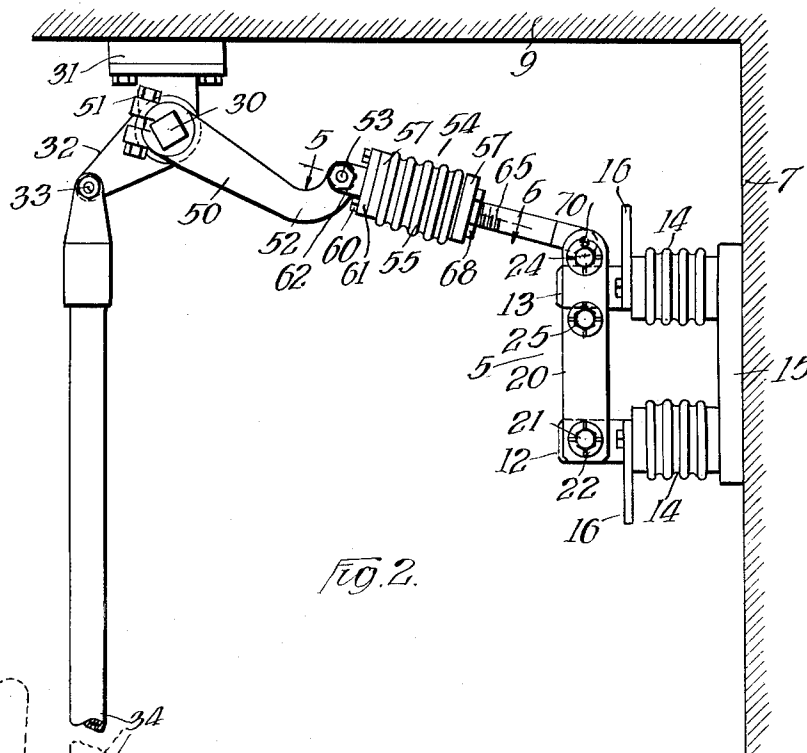


FIG. 2.

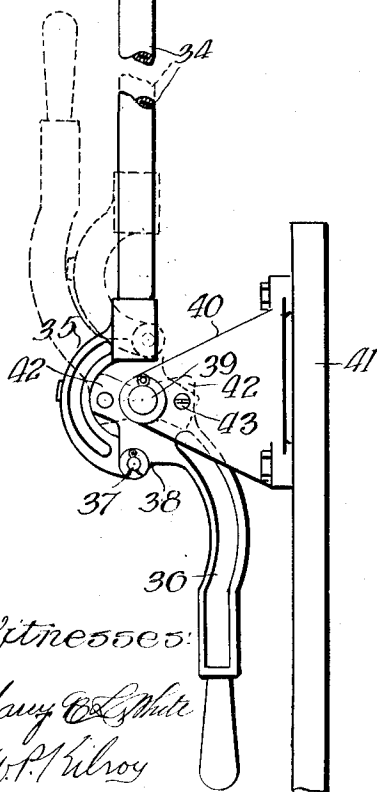
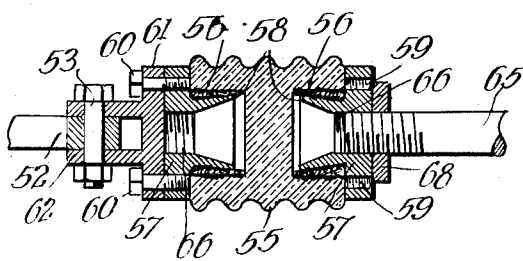


FIG. 5.



Witnesses:

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DISCONNECTING SWITCH

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4 Sheets-Sheet 3

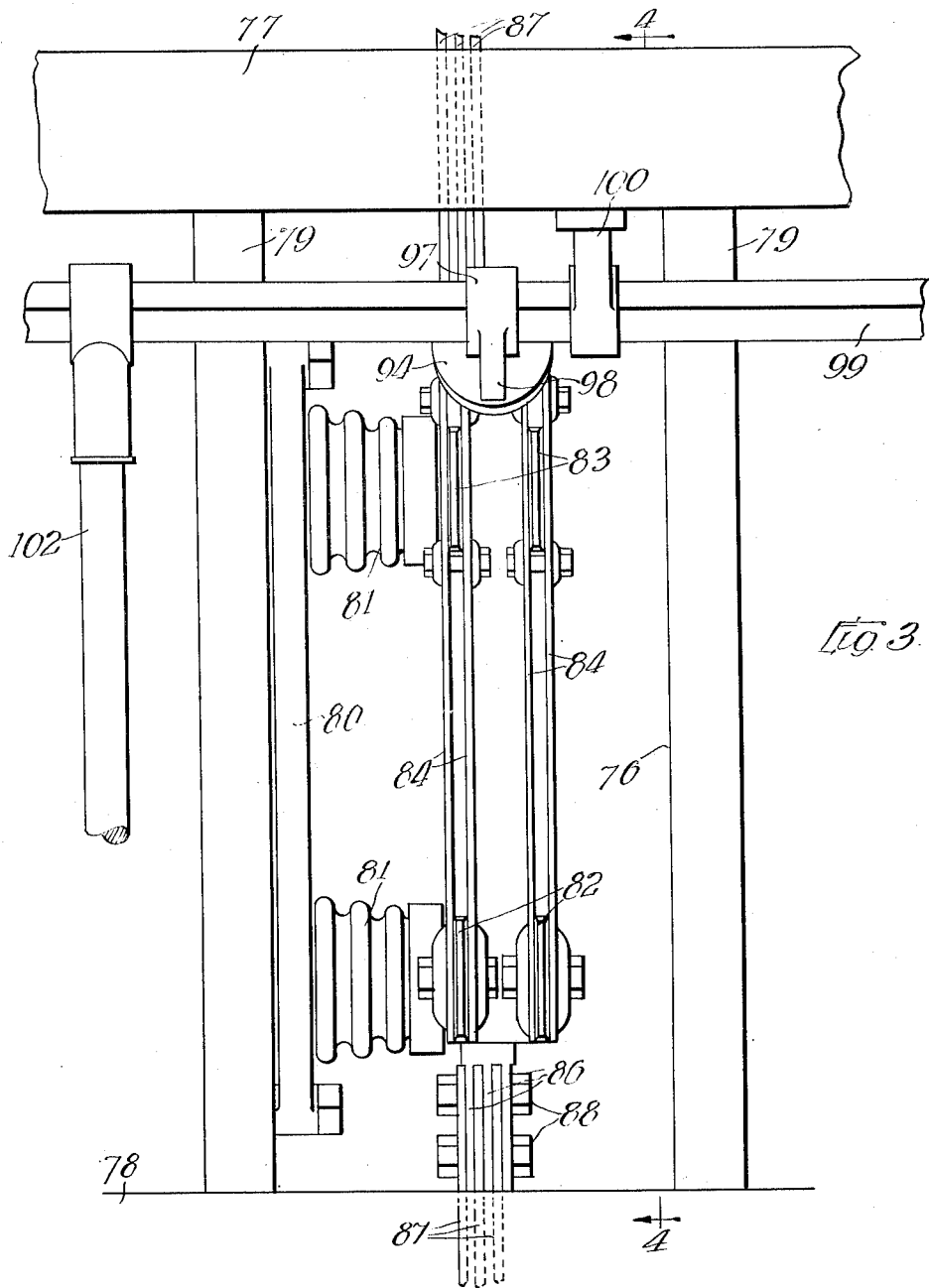


Fig. 3.

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**July 21, 1925.**

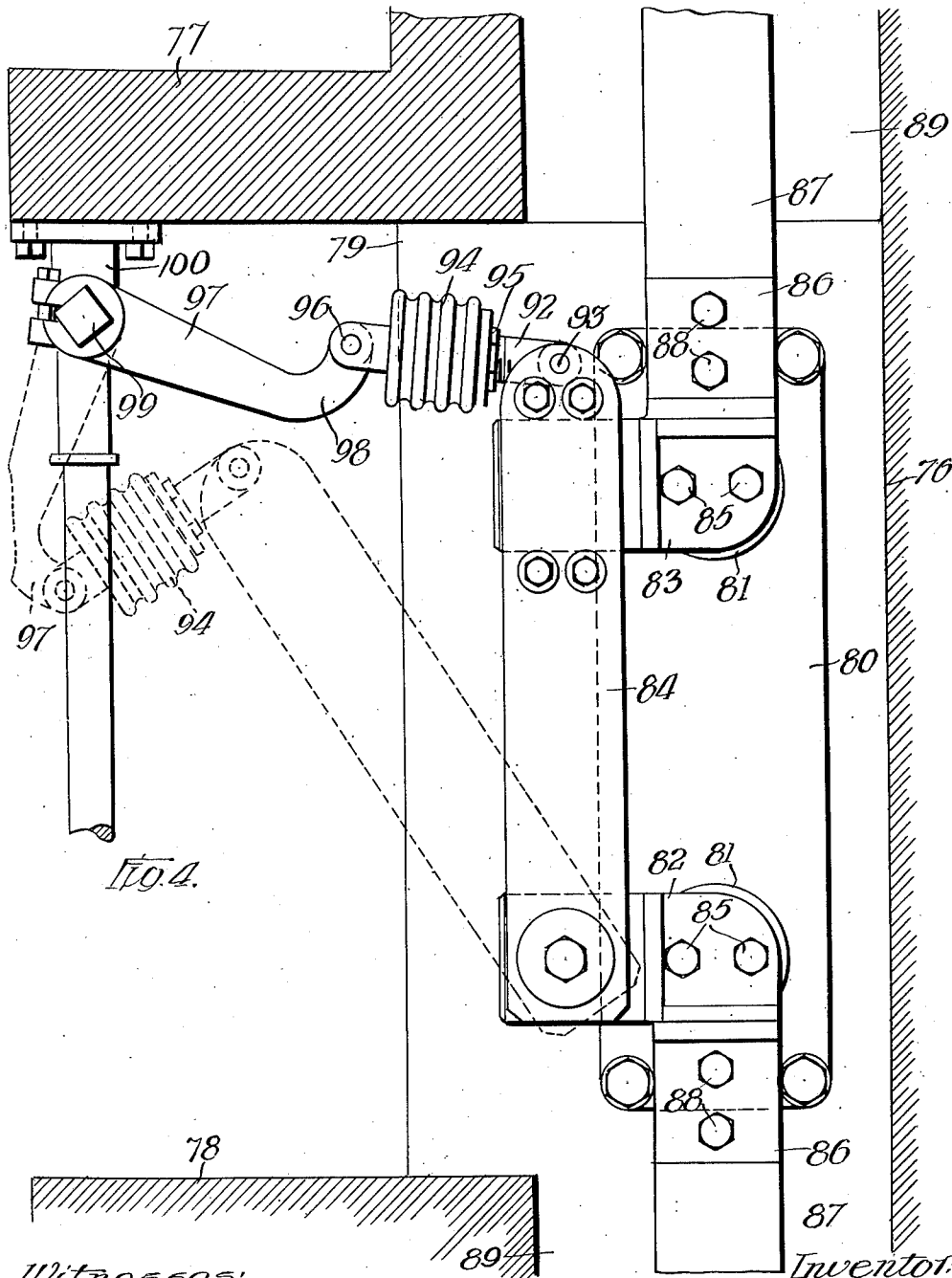
**1,546,802**

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## DISCONNECTING SWITCH

Filed July 28, 1923

4 Sheets-Sheet 4



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Patented July 21, 1925.

1,546,802

# UNITED STATES PATENT OFFICE.

ALWIN G. STEINMAYER, OF CHICAGO, ILLINOIS, ASSIGNOR TO ELECTRICAL ENGINEERS EQUIPMENT COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## DISCONNECTING SWITCH.

Application filed July 28, 1923. Serial No. 654,296.

*To all whom it may concern:*

Be it known that I, ALWIN G. STEINMAYER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Disconnecting Switches, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to disconnecting switches and more particularly to disconnecting switches adapted for remote control and for interrupting or opening electrical circuits carrying electric currents of high potentials.

Switches of this sort are employed for sectionalizing main and branch lines, for disconnecting branch circuits or a section or number of sections of a main or branch line, also for opening the transmission line where it enters the station or sub-station to disconnect station apparatus and permit repairs and adjustment without danger of injury from the line potential. The present invention may be embodied in switches for arrangement outside the power house or sub-station upon a tower or pole or inside the station in suitable switch cells, for example; and while particularly adapted to switches for use in groups or gangs, as in multiple phase work, the invention is equally as applicable to single phase switching.

In switches of this sort, locking or holding of the movable switch member against accidental opening, as, for example, upon the occurrence of a disturbance in the line or a section or branch thereof, and the matter of insulating the switch member and other live parts from the operating handle has been difficult. Where the movable switch member is locked or held closed solely by means at a point remote therefrom, play in the connections between the switch member and that point allows movement or play in the blade or switch member which may result in improper contact or even complete opening. Where the insulation between the blade or movable switch member and the operating handle is at a point remote from the blade and the mechanism between that point and the switch is not insulated from the live parts of the switch, the protection against accidental contact is only partial. Where

considerable current must be carried, and particularly where relatively high tension current is involved, the matter of providing a quick positive opening switch is also important. This is particularly true where the switch is large and the weight and frictional resistance to be overcome is relatively great. A relatively great initial force to secure a positive break followed by an increase in speed to secure quick opening is desirable.

My invention contemplates an improved switch in which means at the blade or movable switch member locks or holds said member closed and insulates the same from the operating handle and other operating connections between the handle and the blade. The connections between the blade and the blade holding or locking means and the play accompanying such connections are minimized and effective protection against accidental contact with live parts is provided from the operating handle all the way to the blade or movable switch member. The mechanism provided imparts a powerful initial force followed by an increase in velocity to secure positive and quick opening of the switch and the insulation employed between the blade and the operating handle acts in direct compression when the switch is held closed. The insulating material best suited for this purpose is strongest in compression. There are no torsional stresses upon the insulation. The switch is especially adapted for mounting in switch cells or compartments where the available space is usually limited.

Certain structural features of the invention are novel and important.

In the accompanying drawings:

Fig. 1 is a front elevation view of a switch cell or compartment showing one embodiment of my invention in front elevation;

Fig. 2 is a vertical section on line 2—2 of Fig. 1 showing the switch and operating mechanism in side elevation;

Fig. 3 is a view similar to Fig. 1 of another embodiment of the invention;

Fig. 4 is a vertical section on line 4—4 of Fig. 3 showing the switch and operating mechanism in side elevation; and

Fig. 5 is an enlarged axial section through the insulating unit on line 5—5 of Fig. 2.

In the embodiment shown in Figs. 1 and 2, I have illustrated a single switch unit mounted in a switch cell or compartment 6,

which may be employed separately or in any desired gang or group arrangement mounted in a row of parallel, vertical or any other suitably arranged cells. Cell 6 is defined by a back wall 7, side wall 8, ceiling or top 9, and vertical partition 10 of "transit board" or any other suitable insulating material. Where a number of cells are desired, they may be defined by additional partitions 10.

Switch unit 5 includes a lower hinge or pivot terminal 12, and an upper contact terminal 13, mounted on the outer ends of supporting insulators 14 carried by and projecting from a mounting base 15 mounted in cell 6 upon back wall 7. Terminals 12 and 13 are electrically connected into the circuit in which the switch is arranged by leading the conductors or busses into cell 6 and securing them electrically to terminal lugs 16 projecting from the bases of terminals 12 and 13, said terminals 12 and 13 being adapted to be connected and disconnected by a blade or movable switch member comprising a pair of parallel blades 20—20 clamped at one end to the opposite sides of pivot terminal 12 by a bolt 21 and spring washers 22. Blades 20—20 are held in firm contact with opposite sides of terminal lug 13 by bolts 24 and spring washers 25, said blades being preferably floating and free to adjust themselves to the surfaces of the terminal lug at all times.

The mechanism for operating the switch includes a horizontal square shaft 30 rotatably journaled in bearings 31 bolted to and depending from top or ceiling 9. The portions of shaft 30 journaled in bearings 31 may be circular in cross section, or bushings with circular peripheries may be employed for permitting rotation of the shaft. Fixed on shaft 30 is an arm 32 having pivotal connection at 33 with an operating rod 34 which extends down to a point conveniently accessible from the floor, for example, and is there pivotally connected through a recurved arm 35 with an operating lever 36. Arm 35 is pivotally connected by a pivot pin 37 between lugs 38 projecting from lever 36. Lever 36 is pivotally supported on a pin 39 mounted in a forked bracket 40 bolted to an upright mounting stand 41 or to an adjacent wall or other suitable support. When operating lever is in the upper position illustrated, pivoted connection 37 is in dead center, i. e., in the vertical plane of pivot 39, or is thrown past said plane to lock the operating mechanism against opening movement at the point of operation. When lever 36 is swung up into dotted line position, pivot 37 is again in or past the vertical plane of pivot 39 to lock the operating mechanism in open condition at that point. The connections may be arranged so that lever 36 is normally in dotted line position and adapted to be thrown down in opening

the switch. The operating mechanism may be additionally locked adjacent lever 36 by providing the lever with lugs 42 having apertures adapted to register with an aperture 43 in bracket 40 in the two positions of the lever to receive a locking pin or padlock. Where the blades or switch members 20 are locked in closed position by means at the remote operating handle 36 only, play in the connections from that point to the blade allows play in the blade with resulting improper contact or even complete opening upon the occurrence of a disturbance in the line. I find that by providing additional holding means at the blade itself and at each blade where a number of switches are connected for group control between which holding means and the blade there are no intermediate connections in which play and movement is permitted that the blades are held securely closed under the severest conditions. This means is in the present embodiment of the invention embodied in the operating connection between shaft 30 and the switch units. This connection comprises an arm 50 fixed on shaft 30 through a split hub and bolt 51 forwardly of each switch member 20. The free end of arm 50 is arced or recurved at 52 and has pivotal connection at 53 with one end of an insulating unit 54. Insulating unit 54 comprises a corrugated body portion 55 (Fig. 5) of porcelain or other suitable insulating material having an inwardly tapering socket 56 in each of its opposite ends. On one end of insulator 55 is an end plate 57 having a tapered projection 58 cemented in socket 56 and threaded openings 59 for the reception of bolts 60 by means of which a fitting 61 is secured to end plate 57. Fitting 61 has a projecting lug 62 through which pivotal connection is had at 63 with arm 50. On the other end of insulator 55 is a similar end plate or fitting 57 having a tapered projection cemented in socket 56 and the threaded end of a link or stem 65 is adjustably secured in the axial threaded opening 66 in fitting 57, a nut 68 being provided for locking stem 65 and the insulating unit in adjusted condition.

This adjustment permits taking up any play between shaft 30 and the switch member, stem or link 65 being pivotally secured at its opposite end between the blades of the switch member at 70.

As the switch is closed, pivotal connection 53 is moved into dead center, that is, into a straight line between the axis of shaft 30 and pivotal connection 70, and the switch member is thereby positively held against opening. Insulating unit 54 acts in compression at this time. The insulating material is strongest in compression. No torsional stresses are imposed and this unit insulates the blade and live switch parts from the entire operating mechanism to the

operating handle not merely from a remote portion of the operating mechanism.

In the embodiment shown in Figs. 3 and 4 the switch cells 75 are defined by a back wall 76, forwardly extending tops and bottom walls 77 and 78 and vertical partitions 79. In this case the switch units are mounted upon partitions 79 and comprise mounting bases 80 carrying supporting insulators 81 on the outer ends of which are mounted pivot and contact terminals 82 and 83. Each of the terminals 82 and 83 includes a pair of tongues or terminal lugs and each movable switch member comprises two sets of blades 84 adapted for embracing the terminal lugs of the contact terminal, and pivoted on the terminal lugs or tongues of the lower hinge or pivot terminal, spring washers being provided for pressing the blades into contact with the sides of the terminal lugs. Terminals 82 and 83 are mounted on insulators 81 by bolts 85 and projecting normal or at right angles to the terminal lugs or tongues are lugs 86 to which the line conductors or busses 87 formed in this case of strips or bars of oblong cross section are electrically and mechanically connected by bolts 88. Busses 87 lead in to terminals 82 and 83 through vertical passageways 89 which lead into the switch cells from above and below along back wall 76. Threaded stud 92 pivoted between the two pairs of blades 84—84 and 84—84 at 93 has adjustable threaded connection with insulating unit 94 at 95. Insulating unit 94 has pivotal connection at its opposite end at 96 with an arm 97 arced or recurved at 98 to exert an initial downward pull in opening the switch as in the embodiment shown in Figs. 1 and 2. Arm 97 is fixed upon horizontal operating shaft 99 which extends along the open front of the switch cell or along the open front of a row of cells in a gang arrangement, and is journaled in bearings 100 attached to and depending from top portion 77. Shaft 99 is rotated from a remote point by a downwardly extending operating rod 102 similar to that described in Figs. 1 and 2. When the switch is closed insulating unit acts in compression against opening of the switch, and pivotal connection 96 is in dead center to effectively lock the blades closed. The alignment of the pivotal connections at this time provides an exceedingly strong linkage against opening. Insulating unit 94 is arranged at the switch blade without intermediate connections between it and the operating mechanism, and insulates the live parts from the operating mechanism at that point. As the switch blade is pulled into open position, the insulating unit acts in tension throughout its various positions. The linkage breaks in opening the switch at pivotal connection 96

without imposing twisting or torsional stresses.

I do not intend to be limited to the precise details illustrated and described.

I claim:—

1. In combination, a movable switch member, a contact terminal for said member, an operating shaft journaled for rotation forwardly of the switch member, remote control mechanism situated at a point remote from said switch member for rotating said operating shaft, and toggle means connecting said shaft and the movable switch member and movable into its dead center position in closing the switch to automatically lock the movable switch member against accidental opening, said toggle comprising connected swingable links and the swinging movement of all said links and of the movable switch member being all substantially parallel to a common plane.

2. In combination, a movable switch member, a contact terminal for said member, an operating shaft journaled for rotation forwardly of the switch member, remote control mechanism situated at a point remote from said switch member for rotating said operating shaft, and toggle means connecting said shaft and the movable switch member and movable into dead center position in closing the switch to automatically lock the movable switch member against accidental opening, said toggle comprising link means and an insulating unit positioned when the toggle is in dead center to act in compression against opening of the switch, said link means and insulating unit being movable and the movement of all said means and of the movable switch member in its opening and closing movement being all substantially parallel to a common plane.

3. In combination, a movable switch member, a contact terminal for said member, pivoted operating means arranged forwardly of the movable switch member to pull said member into open and force same into closed position, said operating means being movable into dead center position in closing the switch to lock the movable switch member against accidental opening, and comprising toggle means composed of links and all said links and the movable switch member being swingable substantially parallel to a common plane.

4. In combination, a movable switch member, a contact terminal for said member, pivoted operating means arranged forwardly of the movable switch member to pull said member into open and force same into closed position, said operating means being movable into dead center position in closing the switch to lock the movable switch member against accidental opening, and comprising link means and an insulat-

ing unit positioned when the operating means is in dead center to act in compression against opening of the switch, said link means, insulating unit and the movable switch member being all swingable substantially parallel to a common plane.

5. In combination, a movable switch member, a contact terminal for said member, a rotatably journaled operating shaft, an arm on said shaft, and a link having pivotal connection with the movable switch member and with said arm, said link and arm both being swingable and the movable switch member movable substantially parallel to a common plane.

6. In combination, a movable switch member, a contact terminal for said member, a rotatably journaled operating shaft, an arm on said shaft, a second arm having pivotal connection with the movable switch member and with said first arm, and an insulating unit in one of said arms movable in closing the switch into position to act in compression against accidental opening of the switch member, both said arms being swingable in operating the switch and the switch member movable all substantially parallel to a common plane.

7. In a switch, a movable switch member, a pivot terminal for said member, a contact terminal for said member, and operating means having connection with the movable switch member adjacent the contact terminal and including an insulating member positioned adjacent the movable switch member and acting in compression against accidental opening of said member when the switch is closed, said insulating unit and the movable switch member being both movable in the operation of the switch substantially parallel to a common plane.

8. In a switch, the combination of a movable switch member and an operating member of an insulator having sockets at both ends, a fitting on each end of said insulator, one fitting having a lug for pivotal connection and the other a threaded recess for adjustable connection between the operating member and the movable switch member.

9. In combination, an insulator having tapered sockets at both ends, fittings on the opposite ends of said insulator, said fittings having projections cemented in said sockets

and one having a projecting lug and the other a threaded recess.

10. In a switch, a movable switch member, a pivot terminal for said member, a contact terminal for said member, a rotatably journaled operating shaft, an arm on said shaft, an insulating unit comprising an insulator having a fitting on one end for pivotal connection between said arm and the movable switch member, and a fitting on its other end for adjustable connection between the arm and said switch member.

11. In a switch, a switch cell having a switch mounted therein and formed with a back wall and vertical passageways leading into the interior of the cell along said back wall from above and below, a forwardly extending ceiling or top portion, switch operating means having fixed pivotal support on said ceiling, the switch being mounted on the back wall and toggle means connecting the switch and fixed pivotal support, said toggle means being movable into dead center in closing the switch to lock same against accidental opening.

12. In combination, a pivot terminal, a contact terminal, a blade pivoted on said pivot terminal and swingable into and out of cooperation with said contact terminal, an arm having stationary pivotal support, said arm and the blade being both swingable substantially parallel to a common plane, and an inarticulate link having pivotal connection at one end with the blade, and at its opposite end with said arm.

13. In combination, a pivot terminal, a contact terminal, a blade pivoted on said pivot terminal and swingable into and out of cooperation with said contact terminal, an arm having stationary pivotal support, said arm and the blade being both swingable substantial parallel to a common plane, and a link pivoted to the blade at one end and pivoted to said arm at its opposite end, the pivotal connection between the arm and said link lying when the switch is closed in a line through the pivotal support for said arm and the connection between the link and blade.

In witness whereof, I hereunto subscribe my name this 24 day of July, 1923.

ALWIN G. STEINMAYER.