

April 10, 1934.

A. S. CASWELL

1,954,583

CIRCUIT BREAKER UNIT

Filed July 22, 1931

5 Sheets-Sheet 1

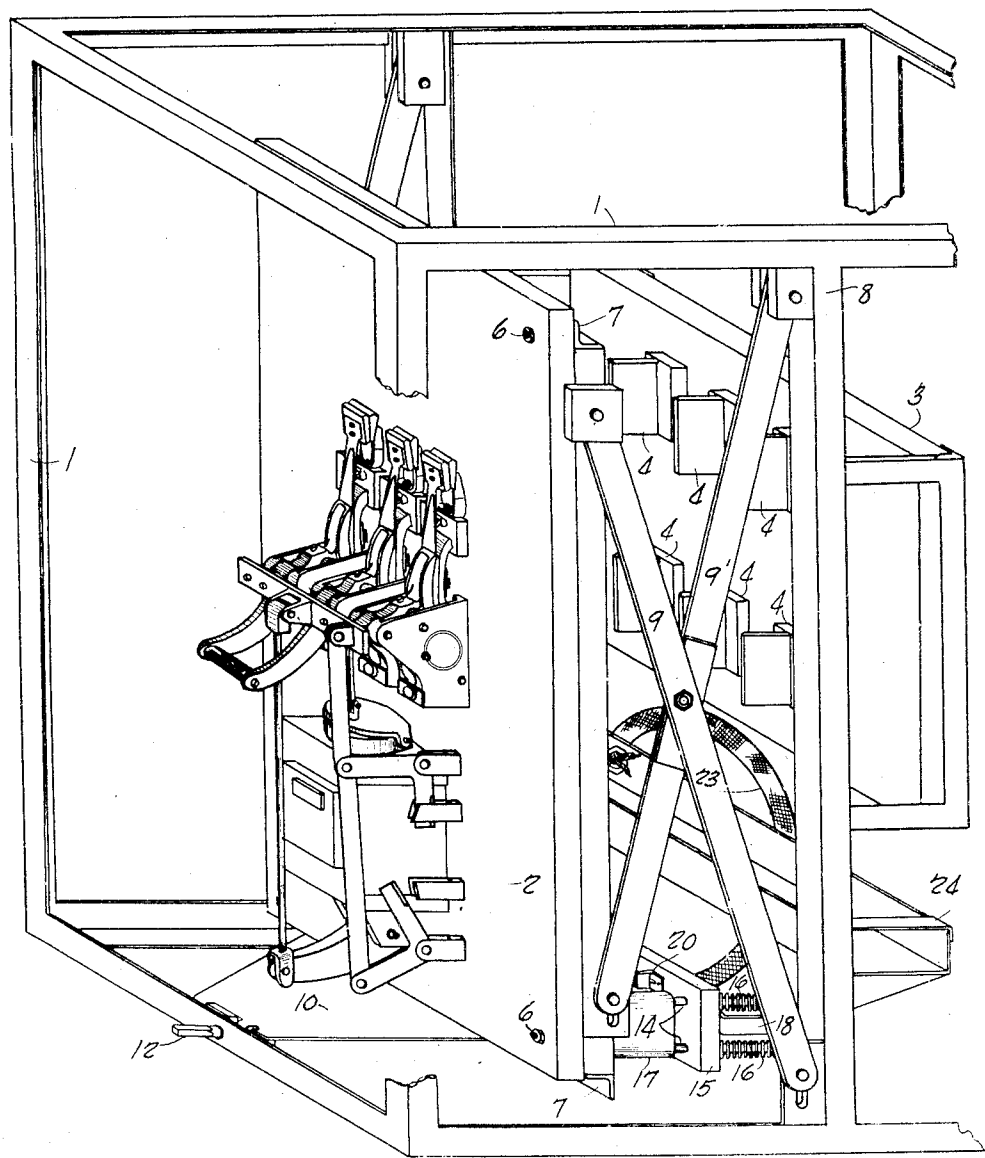


FIG. #1

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5 Sheets-Sheet 2

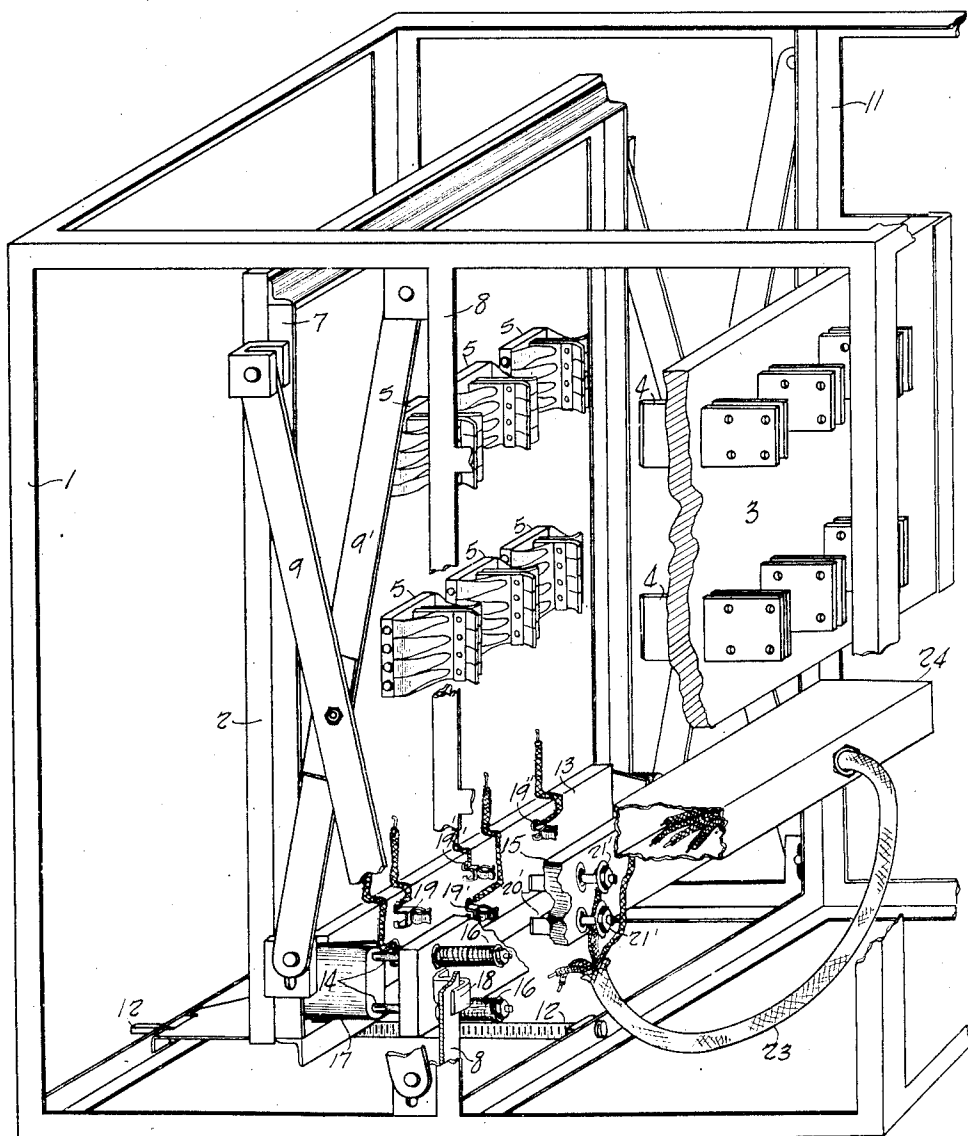


FIG. 2

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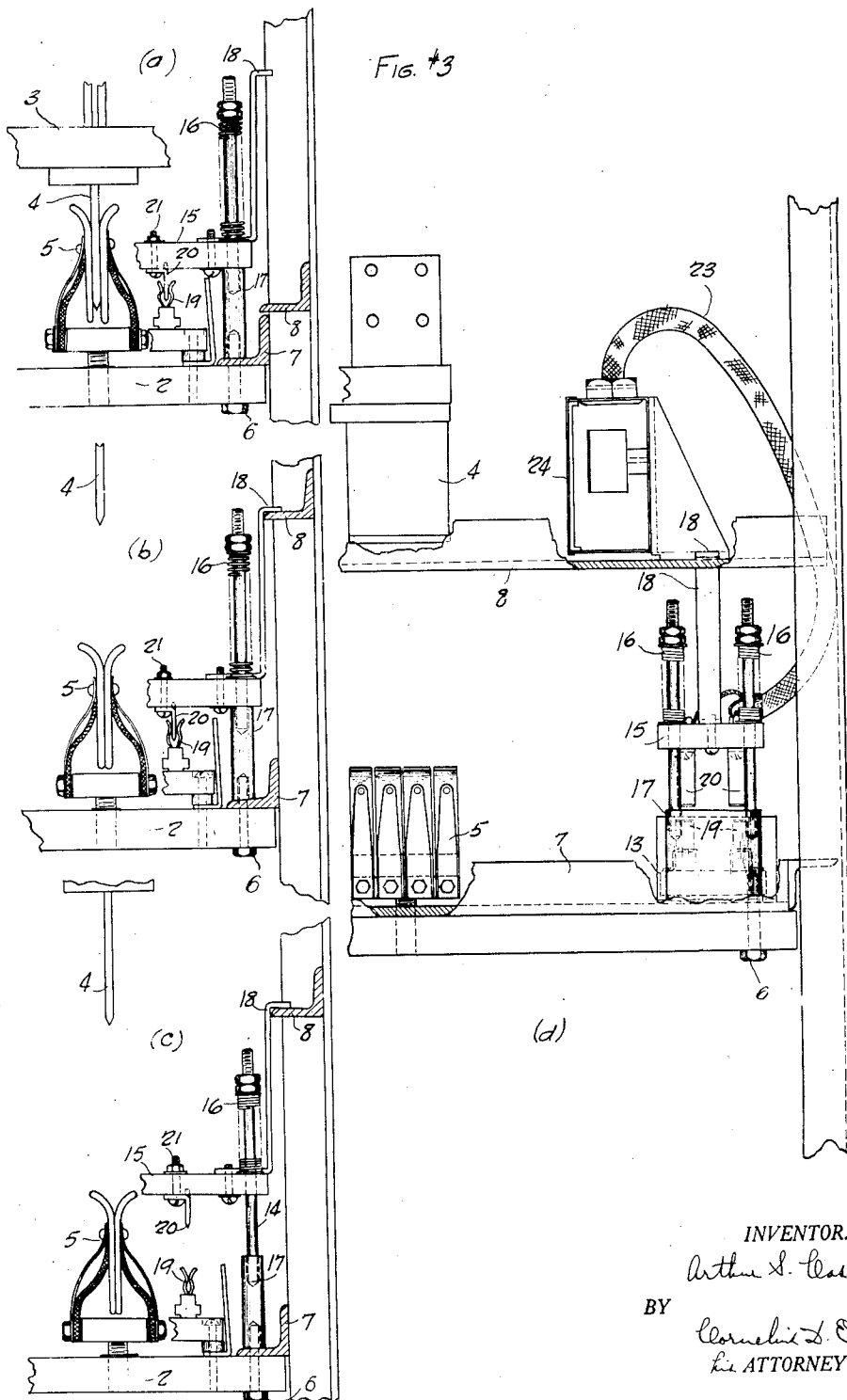
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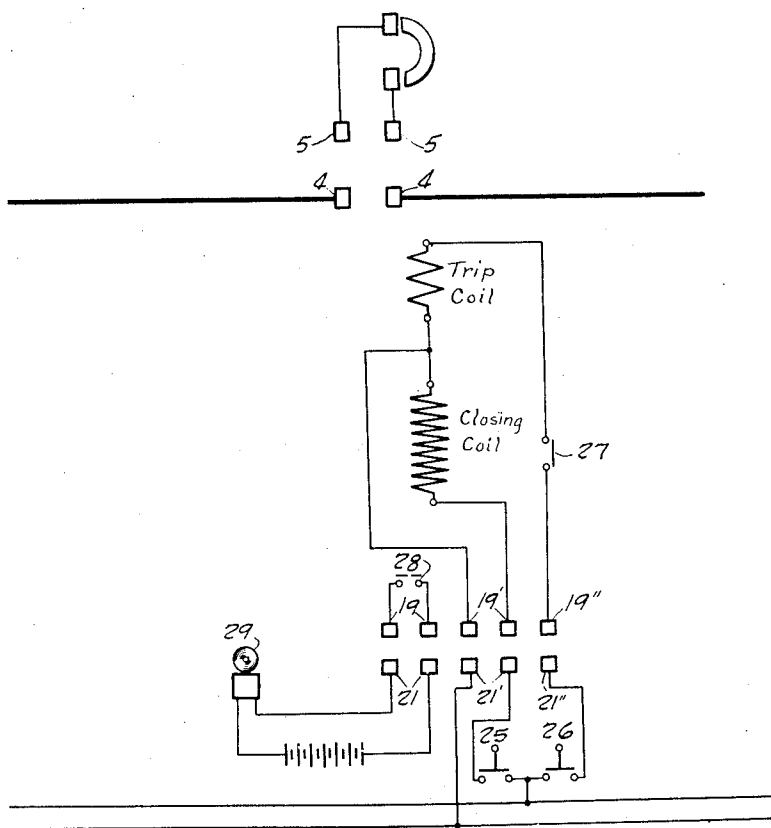


FIG. 4

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CIRCUIT BREAKER UNIT

Filed July 22, 1931

5 Sheets-Sheet 5

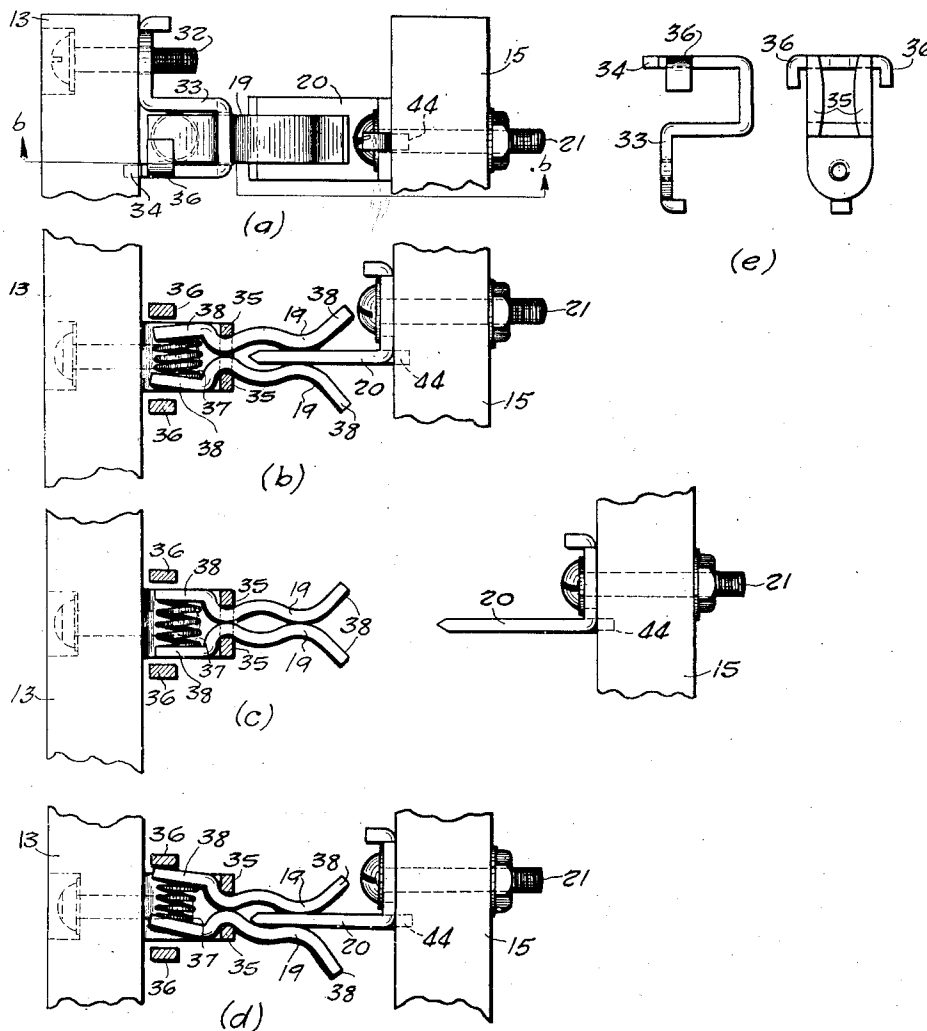


Fig. 15

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UNITED STATES PATENT OFFICE

1,954,583

CIRCUIT BREAKER UNIT

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Application July 22, 1931, Serial No. 552,337

10 Claims. (Cl. 175—298)

My invention relates to switching mechanism generally, and particularly automatic switching mechanism or circuit breakers, movable as a unit with its support or mounting, to cause supplemental movable contacts or terminals movable with the unit, and electrically connected with the terminals or contacts of the switching mechanism or circuit breaker, to engage with or disengage from fixed contacts or terminals.

In accordance with my invention there are comprised in a movable unit of the character aforesaid auxiliary contacts, adapted upon movement of the unit to engage with and disengage from associated contacts, for closing or opening auxiliary or control circuits for any purpose, particularly for control or operation of the switching mechanism or circuit breaker, for signalling or the like; the auxiliary contacts of an auxiliary or control circuit remain in engagement with each other and, without substantial alteration of their position with respect to each other, follow the movement of the unit to a position in which the aforesaid supplemental contacts separate in removing the switching mechanism or circuit breaker from its circuit, the continued engagement of the auxiliary contacts permitting for such position of the unit testing or other operation of or by the auxiliary or control circuit; upon further movement of the unit in the same direction one of the auxiliary contacts is arrested and thereafter remains stationary while its coacting auxiliary contact, carried by or movable with the unit, separates from it and so opens the auxiliary or control circuit.

My invention is concerned further with the structure of coacting contacts, more particularly the auxiliary contacts for the control or auxiliary circuits aforesaid.

For an understanding of my invention and for illustration of some of the forms it may take, reference is had to the accompanying drawings, in which:

Fig. 1 is a view in perspective showing the front and side of a circuit breaker unit constructed in accordance with my invention, and with both the supplemental and auxiliary contacts in disengagement.

Fig. 2 is a side view looking from the rear of the circuit breaker unit in the same position as shown in Fig. 1.

Fig. 3 shows in plan and elevation the relation of the supplemental and auxiliary contact members in closed, intermediate and full open positions of the circuit breaker unit.

Fig. 4 is a schematic diagram of a typical ar-

range ment of the circuits controlled by the supplemental and auxiliary contacts; and

Fig. 5 shows the details in plan and elevational views of a contact assembly which comprises one of the features of my invention.

Figs. 1 and 2 show a cell comprising a circuit breaker unit supported in a fixed frame in such manner that the unit can be moved in or out to engage or disengage the circuit breaker supplemental contacts with complementary main stationary contacts to which are secured the main incoming and outgoing conductors to thereby disconnect the unit from the circuits which it controls. The circuit breaker shown is of the solenoid operated type, and it is necessary for the breaker to be controlled by and to control auxiliary circuits, such as those for operating the closing and trip coils, for signalling purposes, and to operate remote control devices, interlocks, and the like.

In order that the breaker unit may be readily removable for inspection, repair or replacement purposes, it is desirable to have contacts in these various control circuits which are connected and disconnected by the same motion which connects and disconnects supplemental contacts from the main stationary contacts. In my arrangement the supplemental and stationary contacts may be disconnected, and the auxiliary control circuit contacts caused to follow up the movement of the unit so as to remain in their original fixed engagement in an intermediate position of the switch in order that the operation of the circuit breaker and the auxiliary circuits and apparatus associated therewith may be tested under the identical conditions which obtain in service, and yet not effect a connection to the main incoming and outgoing conductors.

In the circuit breaker described herein there are three conditions available; (1) all contacts, both supplemental and auxiliary, are engaged in the closed position of the circuit breaker unit, (2) in an intermediate or test position the supplemental contacts are disengaged but all the necessary auxiliary control contacts remain in their original position of engagement; and (3) in the full open position both the supplemental and auxiliary contacts are disengaged and all circuits are open, and the breaker unit may be removed or repairs may be safely made since there are no live circuits remaining on the unit.

Referring to Figs. 1 and 2 of the drawings, there is shown a fixed framework 1 in which is enclosed a solenoid operated circuit breaker mounted on a panel 2 of slate or other insulating

material. An insulating stationary panel 3 carries the blades 4 of the main fixed contacts to which the incoming and outgoing mains or bus conductors (not shown) are connected. The panel 2 carries the supplemental contacts 5 (Fig. 2) which comprise rear terminals for the circuit breaker and which receive the blades 4, and is secured by bolts 6 to a movable angle iron frame 7 supported from the side members 8 of the cell framework by two pairs of pantograph links 9 and 9', one pair to each side of the panel. The pantograph links are pivoted at their upper ends to the stationary and movable frames, respectively, while their lower ends have a slotted connection with the frames, and the breaker unit may thus be withdrawn and moved towards the front of the cell, as shown in Figs. 1 and 2, to give various positions with respect to the fixed contact panel 3. A screw jacking mechanism 12 engages plate 10 which is secured to the lower part of the angle iron frame 7 and reduces the effort required for engaging and disengaging the breaker unit contacts.

Secured to the back of the circuit breaker panel is a contact base 13 carrying the auxiliary control circuit contact fingers 19, 19' and 19''. On either end of this base are metal blocks 17 welded to the frame 7, which carry guide rods 14. Another auxiliary contact terminal base 15, which carries the complementary auxiliary circuit blades 20, 20' and 20'' is slidably supported by these rods, the compressed springs 16 urging the base 15 towards the contact base 13 and normally causing engagement of the complementary auxiliary contacts. The auxiliary circuit leads from the closing and trip coils and switches mechanically operated by movement of the main breaker contact arms on the front of panel 2 pass through to the back of the panel, and are connected to the terminal fingers 19, 19' and 19'' on contact base 13 as shown, and the leads from the studs 21, 21' and 21'' which connect with the complementary auxiliary circuit blades are gathered into a cable 23 and are led into wiring trough 24. Portions of the base 15 and the wiring trough are broken away in Fig. 2 in order to show the spacing of the contact fingers carried by contact base 13.

The various circuits of the arrangement are shown in Fig. 4. The supplemental contacts 5 and fixed contacts 4 control the connection of the circuit breaker unit to the incoming and outgoing conductors of the circuit which the breaker controls. A closing solenoid circuit, a trip coil and an alarm circuit are also shown, although various other auxiliary circuits may be and often are used. The circuit breaker shown may be electrically closed and opened by switches 25 and 26 which are in circuit with the closing solenoid and trip coil, respectively. When the breaker is tripped either manually, or by abnormal circuit conditions, or by remote control switch 26, the switch 27 which is mechanically operated by movement of the main breaker contact arms is caused to open to break the circuit of the tripping coil, and the switch 28 is closed to complete the circuit of the alarm signal 29.

The operation of the circuit breaker unit is as follows: In the closed position all contacts are in engagement as shown in Fig. 3(a). As the circuit breaker unit is withdrawn, the supplemental contacts are disengaged because the panel 3 supporting the blades 4 is stationary, whereas

the panel 2 carrying the supplemental contacts 5 is withdrawn with the breaker unit.

The male auxiliary contact terminal base 15, however, follows up the breaker panel by the urging of springs 16 and maintains the original fixed engagement of auxiliary contacts 19 and 20, thus making contact from the closed position of the breaker to the intermediate or test position shown in Fig. 3(b), after the supplemental contacts have disengaged and are separated by a safe distance. In this manner, the relative positions of the auxiliary contacts have not changed, but still retain their original fixed contact relation. In this position the operation of breaker and the auxiliary circuits may be observed under service conditions, but without disturbing the main circuit controlled by the breaker. At the intermediate position, however, stops 18 which are secured to either side of the terminal base 15 abut against the frame members 8, thus preventing further outward movement of the base 15. Continued movement of the breaker panel therefore separates the auxiliary contacts because base 13 continues to follow up the panel. Figs. 3 (c) and (d) show plan and elevational views of all the contacts in the full open position of the breaker unit.

The auxiliary contacts are preferably of the type shown in Fig. 5, in which the contacts are shown in normal engagement in the elevational and sectional views of (a) and (b), and in disengagement in (c). The view of (d) illustrates the flexibility of the contacts when in misalignment, and (e) is a detail of the supporting bracket. The contact assembly comprises a female metal contact support or bracket 33 secured to the insulating base 13, the bracket being formed in the shape of a square cornered U with its open end towards the base. An extension of one end 34 acts as a dowel in a hole in the base while the other end is tapped to receive the fastening machine screw 32, which also serves as a binding post for connecting control wires. The central portion of the bracket has an opening defined by the arcuate edges 35 through which the contact leaves or fingers 19 pass to receive the male blade 20. These contact leaves are duplicates placed in opposed relation and formed so that they will rock or rotate about the edges 35 of the bracket. The inner ends of the contacts are offset from the center line with parallel end portions 38 against which the compressed contact spring 37 exerts its pressure, and since the leaves are fulcrumed on the arcuate edges 35 the pressure of spring 37 causes good contact to be maintained with the support 33 and the inserted blade 20.

The outer ends 38 of the contact leaves have a wide flare for easy entrance of the blade, while at the end of this flare the contacts are tangent to each other and then diverge by reason of the opposing concave portions forming a pocket between the contact point and the hinge point. This design allows a considerable variation in the relative position of the male blade without interfering with the efficiency of contact as shown in Fig. 5 (d). The motion about the hinge is limited by the lugs 36 which are formed with the piece 33.

The male or blade contact consists of a flat bar of metal bent into the shape of the letter L. The shorter leg is pierced for receiving the screw 21 which secure it to the base 15 and also serves as a binding post. The longer leg extends at right angles to the base forming the contact

blade 20, the outer edges of which are chamfered for easy entrance into other contact. An extension of the blade acts as a dowel 44 which fits in a hole in the base and prevents the contact from turning.

In the foregoing construction, due to the freedom of movement of the contacts in a vertical, horizontal and rotational direction, the contacts will automatically align themselves with the male blade upon insertion of the latter, and will give the same contact area and thus the same electrical connection whether the contacts are in alignment, or are misaligned within wide limits. Also, by providing a sufficient clearance between the contacts 19 and the opening defined by the arcuate edges 35, either of the contacts may be removed through the opening without disturbing the electrical connections to the bracket, and thus permit of ready cleaning or replacement of the contact fingers which are the usual source of trouble in a switch.

What I claim is:

1. Switching mechanism comprising a circuit breaker unit having supplemental contacts in engagement with fixed bus contacts and auxiliary circuit contacts in fixed engagement, means for causing disconnection of the supplemental contacts in a position of the breaker unit intermediate its closed and full open positions, means for causing the auxiliary contacts to follow up the movement of the breaker unit to the intermediate position to prevent disengagement of the auxiliary contacts, means for disengaging the auxiliary contacts in full open position of the breaker unit and for causing their reengagement when the breaker unit is returned to the intermediate position, said auxiliary contacts comprising opposing tongues and a cooperating blade for engagement or disengagement therewith, the said tongues adapted at one end to receive the blade, and having their other ends positioned within a supporting bracket and spaced apart by spring means, the tongues passing through the opening in said bracket to receive the blade, the tongues being flexibly mounted to permit horizontal, vertical, and rotational misalignment of the tongues or blade.

2. Switching mechanism comprising a circuit breaker unit having supplemental contacts in engagement with fixed bus contacts and auxiliary circuit contacts in fixed engagement, means for causing disconnection of the supplemental contacts in a position of the breaker unit intermediate its closed and full open positions, means for causing the auxiliary contacts to follow up the movement of the breaker unit to the intermediate position to prevent disengagement of the auxiliary contacts, means for disengaging the auxiliary contacts in full open position of the breaker unit and for causing their reengagement when the breaker unit is returned to the intermediate position, said auxiliary contacts comprising oppositely disposed contact fingers and a cooperating blade for engagement or disengagement therewith, one end of each of the contacts fingers loosely mounted in a bracket, spring means for resiliently holding said ends apart, the fingers extending through an opening in the bracket to receive the blade, the wall of the opening comprising a fulcrum for the blades with such clearance that the blades have a limited, horizontal, vertical, and rotational movement whereby the fingers will align themselves with the blade upon insertion of the latter.

3. Switching mechanism comprising a circuit-breaker, supporting structure therefor movable to disconnect the circuit-breaker from its circuit, auxiliary circuit-contacts carried by said movable supporting structure, and means for effecting separation of said auxiliary contacts upon movement of said structure from in-circuit position of the circuit breaker beyond an intermediate position for which the circuit-breaker is out of circuit.

4. Switching mechanism comprising a circuit-breaker, movable supporting structure therefor, structure for supporting bus contacts adapted to be engaged by supplemental contacts carried by said movable supporting structure, relatively movable auxiliary-circuit contacts, carried by said movable supporting structure, means movable with said movable supporting structure tending to maintain said auxiliary contacts in engagement, and means for effecting separation of said auxiliary contacts when said movable structure is moved beyond a position for which said supplemental contacts are out of engagement with said bus contacts.

5. Switching mechanism comprising a circuit breaker unit, movable to disengage contacts movable therewith from bus contacts, auxiliary contact structure mounted in fixed position upon said breaker unit, complementary auxiliary contact structure carried by said circuit-breaker unit and movable relative to said auxiliary contact structure, and means effective upon movement of said unit beyond a position effecting disengagement of said bus contacts and said first-named contacts to effect separation of said auxiliary contacts carried by said circuit-breaker unit.

6. Switching mechanism comprising a circuit breaker unit, movable to disengage contacts movable therewith from bus contacts, auxiliary contact structure mounted in fixed position upon said breaker, structure supported by said unit for movement relative thereto, complementary auxiliary contacts carried by said structure, and means for restraining said structure from movement with said circuit-breaker unit beyond a position effecting disengagement of said bus contacts and said first-named contacts to effect separation of said auxiliary contacts.

7. Switching mechanism comprising a circuit-breaker mounted on a panel carrying contacts on the rear thereof and movable to effect disengagement with bus contacts, relatively fixed and movable auxiliary contacts mounted from the rear of said panel, and means for effecting separation of said auxiliary contacts carried by said panel when said panel is moved beyond an intermediate position for which said bus contacts and said first-named contacts are disengaged.

8. Switching mechanism comprising a circuit-breaker mounted on a panel carrying contacts on the rear thereof and movable to effect disengagement with bus contacts, fixed auxiliary contacts mounted on the rear of said panel, guide structure extending from the rear of said panel, a member guided thereby and carrying complementary auxiliary contacts, means for biasing said member to a position effecting engagement of said auxiliary contacts, and means for restraining movement of said member with said panel, as said panel is moved beyond an intermediate position for which said bus contacts and said first-named contacts are disengaged, to effect separation of said auxiliary contacts.

9. Switching mechanism comprising a circuit breaker, a cell therefor, supporting structure for

said circuit breaker permitting movement thereof toward the front of said cell to disconnect the circuit-breaker from its circuit; auxiliary contacts carried by said structure and remaining in engagement for forward movement of said structure to an intermediate position beyond its circuit-breaker disconnect position, and means for effecting separation of said auxiliary contacts upon forward movement of said structure beyond said intermediate position. 80

10. Switching mechanism comprising a circuit breaker, a cell therefor, pantograph linkage supporting the circuit-breaker panel within said cell and permitting movement of said circuit-breaker toward the front of said cell to disconnect it from its circuit, auxiliary contacts carried by the circuit-breaker panel and remaining in engagement for forward movement of said linkage to an intermediate position beyond its circuit-breaker disconnect position, and means for effecting separation of said auxiliary contacts upon forward movement of said linkage beyond said intermediate position. 85

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