

Sept. 11, 1956

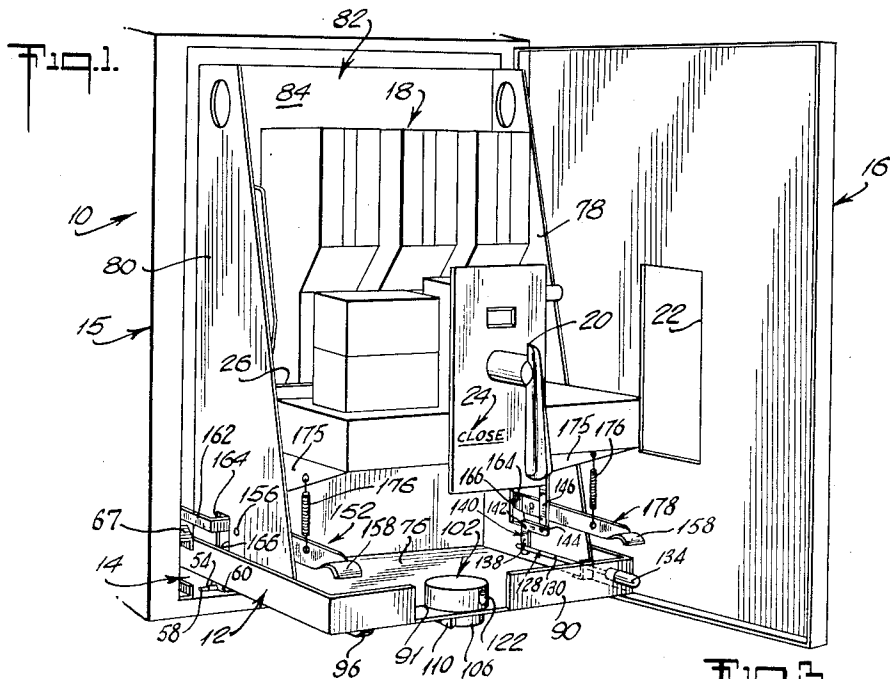
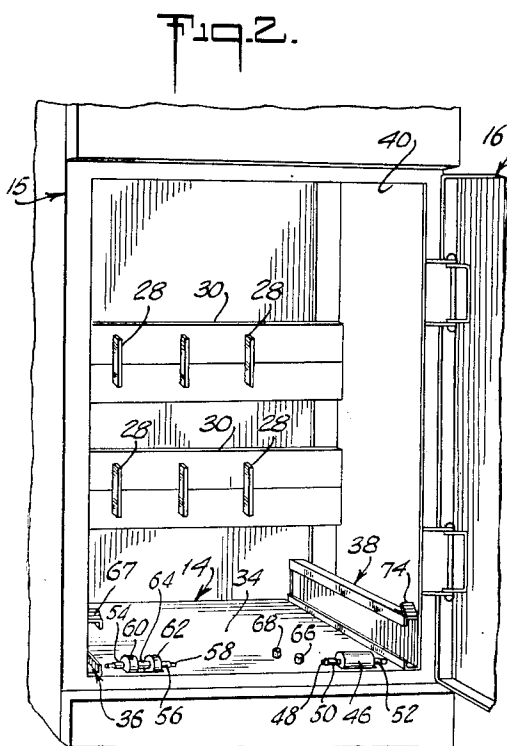
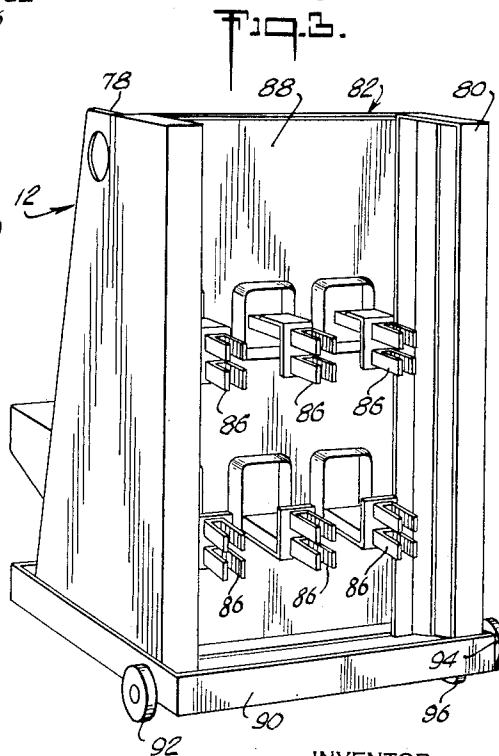
E. E. WILLS

2,762,879

DRAW-OUT SWITCH GEAR

Filed Jan. 2, 1953

5 Sheets-Sheet 1



INVENTOR  
ERVIN E. WILLS  
BY *Edwin L. Devel*  
*Harry Cole*  
ATTORNEYS

Sept. 11, 1956

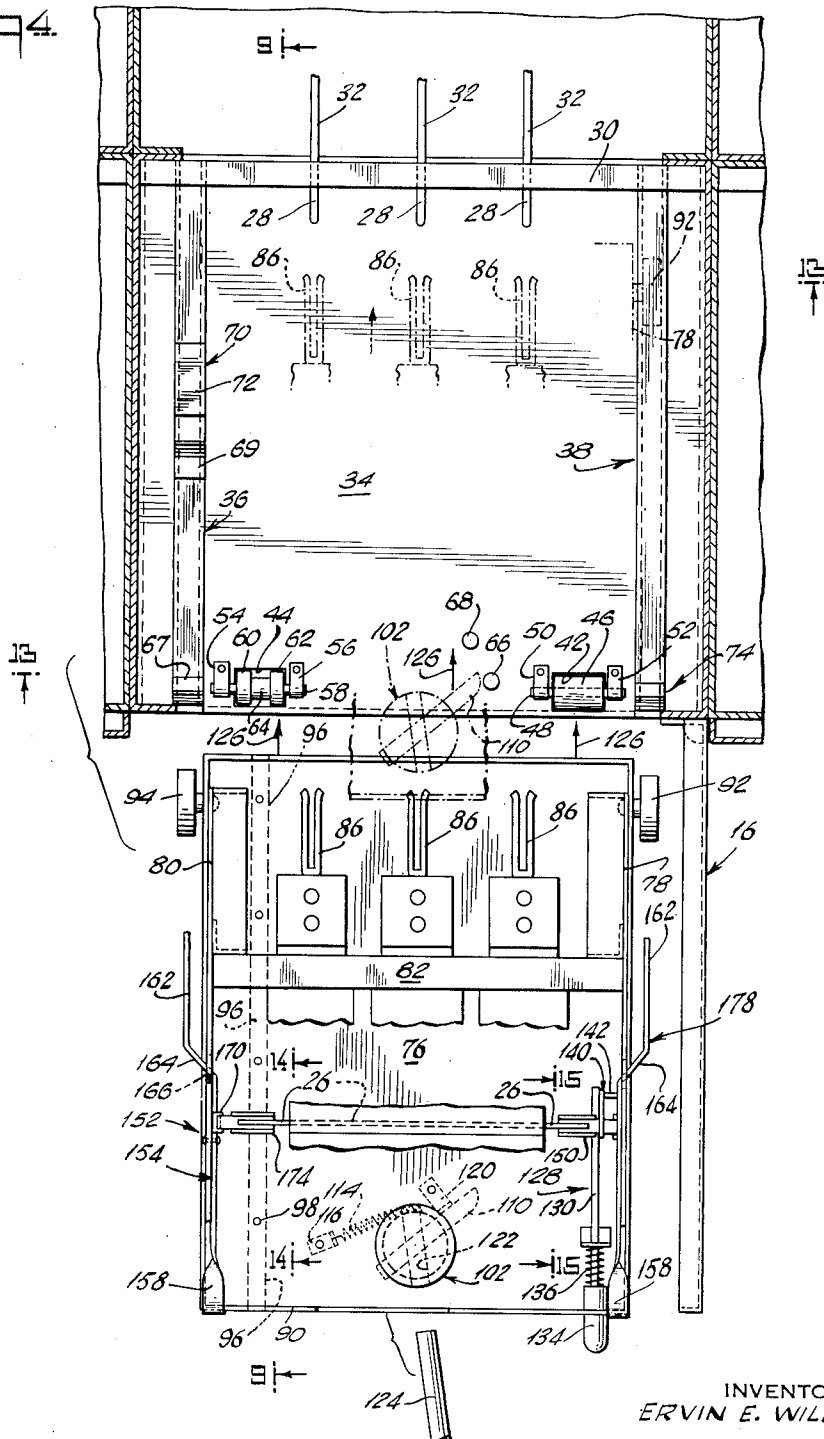
E. E. WILLS

2,762,879

DRAW-OUT SWITCH GEAR

Filed Jan. 2, 1953

5 Sheets-Sheet 2



INVENTOR  
ERVIN E. WILLS

BY *Edwin L. Linsch*  
*Hayes*  
ATTORNEYS

Sept. 11, 1956

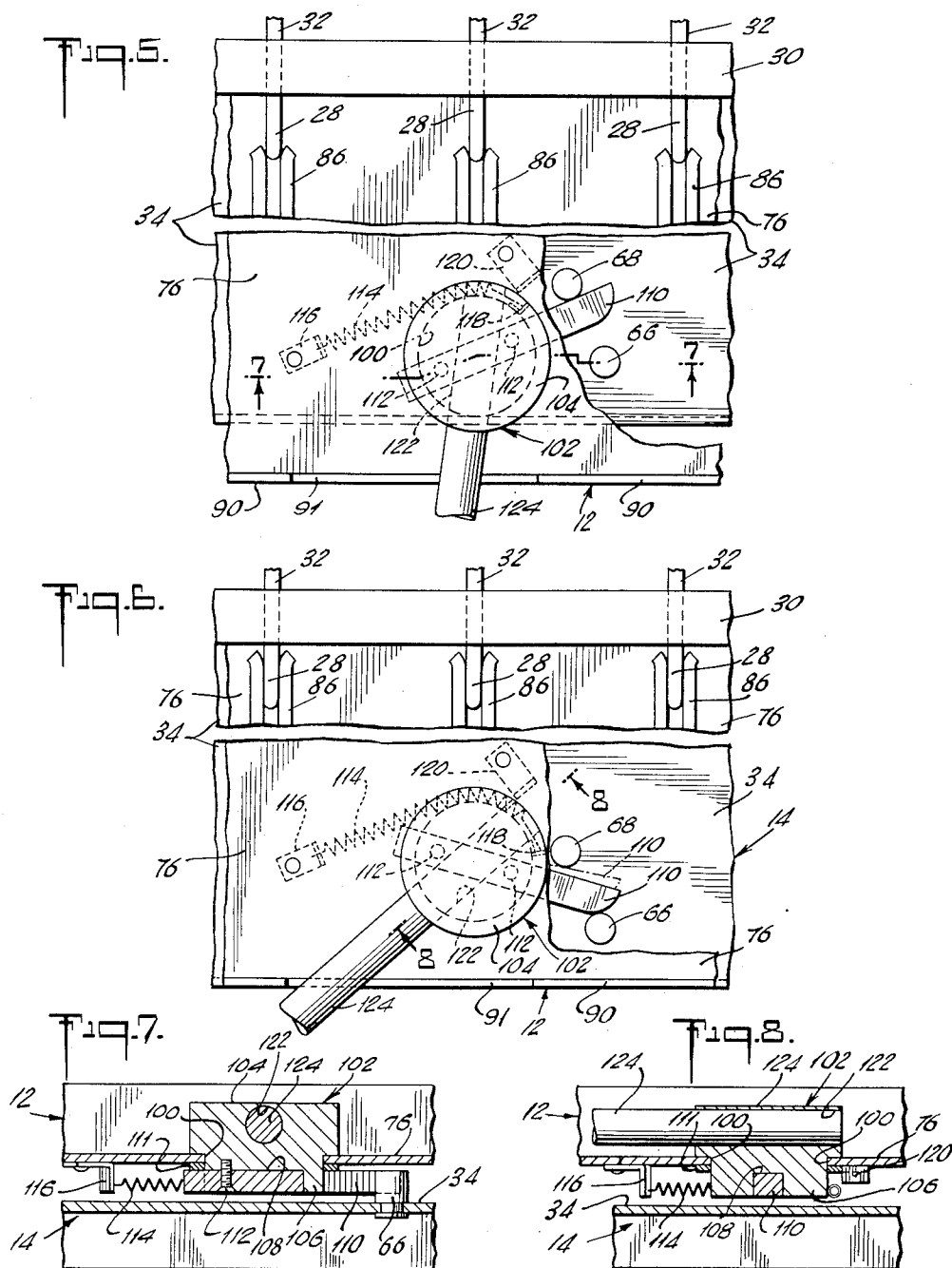
E. E. WILLS

2,762,879

DRAW-OUT SWITCH GEAR

Filed Jan. 2, 1953

5 Sheets-Sheet 3



INVENTOR  
 ERVIN E. WILLS  
 BY *Edwin J. S. S. S.*  
*Harry C. S.*  
 ATTORNEYS

Sept. 11, 1956

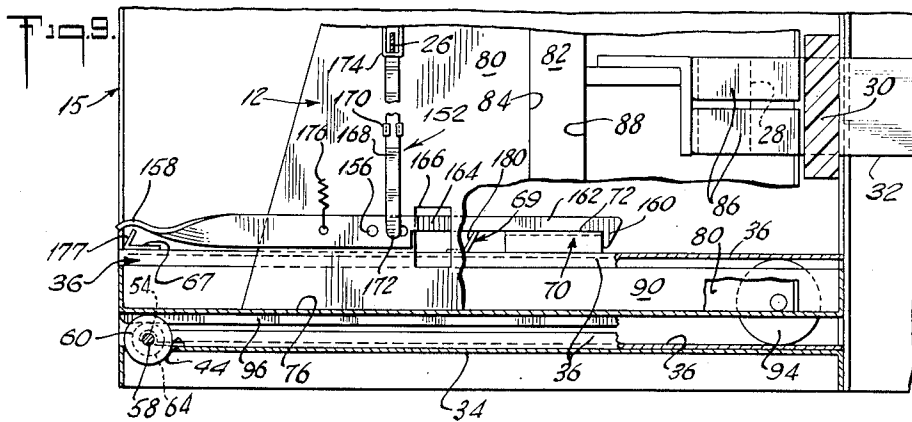
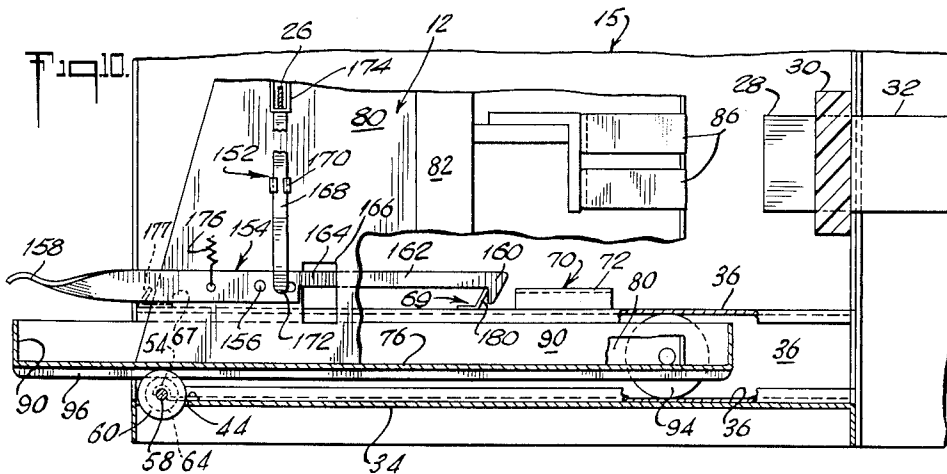
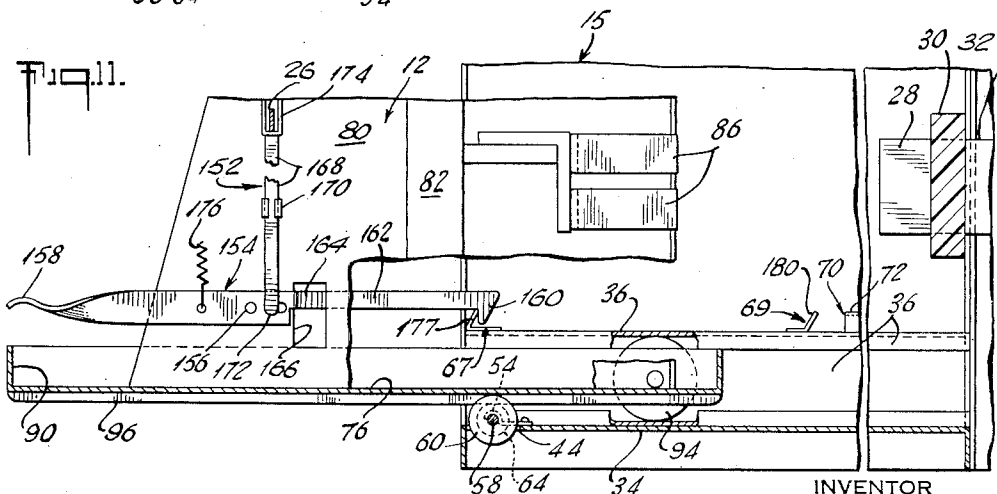
E. E. WILLS

**2,762,879**

## DRAW-OUT SWITCH GEAR

Filed Jan. 2, 1953

5 Sheets-Sheet 4



INVENTOR  
ERVIN E. WILLS  
BY *Edwin Lenzol*  
*Hay Col*  
ATTORNEYS

Sept. 11, 1956

E. E. WILLS  
DRAW-OUT SWITCH GEAR

2,762,879

Filed Jan. 2, 1953

5 Sheets-Sheet 5

Fig. 12.

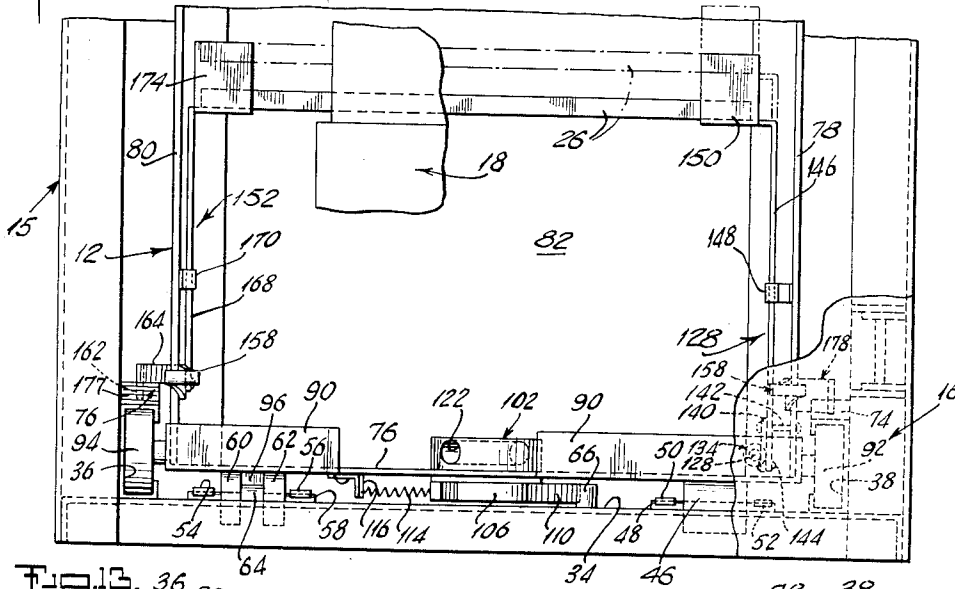
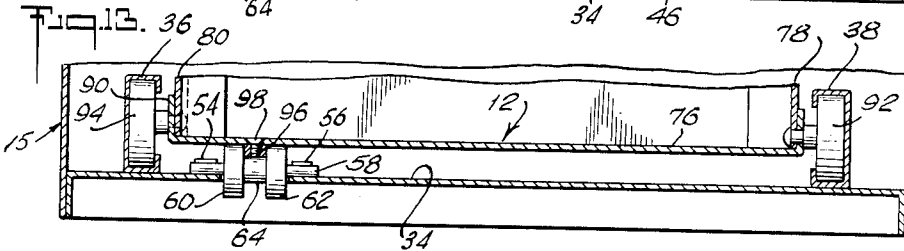


Fig. 14.

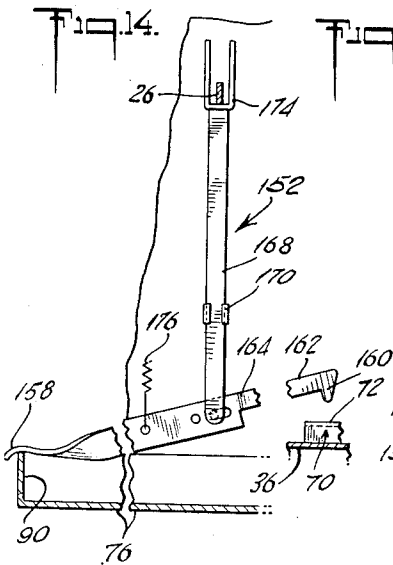
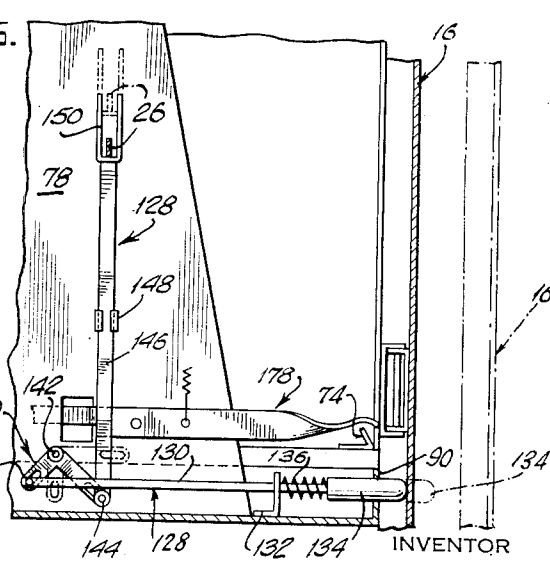


Fig. 15.



INVENTOR  
ERVIN E. WILLS  
BY *Edwin Sarnock* &  
*Harry Col*  
ATTORNEYS

1

2,762,879

## DRAW-OUT SWITCH GEAR

Ervin E. Wills, Afton, Mo., assignor to Federal Electric Products Company, a corporation of Delaware

Application January 2, 1953, Serial No. 329,165

15 Claims. (Cl. 200—50)

The present invention relates to a drawout switch gear for use, for example and not by way of limitation, in a power center or at a control center.

A drawout switch gear of the present type is provided with line contacts of the plug-in type for engagement with companion stationary contacts provided on power line bus bars. Said plug-in contacts are spring biased for good contact pressure and are also usually quite heavy so that a substantial amount of force is required to force them into engagement with the companion stationary contacts. Therefore, it is an object of the present invention to facilitate said engagement of the plug-in line contacts with the companion stationary contacts.

Another object is to provide a simple and efficient lever- ing apparatus for moving a drawout switch gear into operating position and for withdrawing it from said position.

A further object is to provide means for accurately aligning the contacts on a drawout switch gear with companion stationary contacts as said drawout switch gear is moved into operating position thereof.

A further object is to provide for safe and positive operation of the drawout switch gear through the provision of an interlock arrangement which permits the breaker thereof to be closed only when properly latched into the operating position thereof, an intermediate test position thereof, and a fully withdrawn position thereof.

Pursuant to the last mentioned object, a still further object is the provision of a door interlock device which operates in conjunction with the mechanical interlock to provide an added safety factor.

The above and other objects, features and advantages of the present invention will be more fully understood from the following description considered in connection with the accompanying illustrative drawings.

In the drawings:

Fig. 1 is a perspective view of a drawout switch gear pursuant to the present invention, the carriage thereof being illustrated in the fully withdrawn position thereof;

Fig. 2 is a perspective view illustrating the chassis or compartment mounting means for the movable carriage of the drawout switch gear;

Fig. 3 is a rear view of the carriage illustrating the plug-in contacts thereof;

Fig. 4 is an exploded plan view of the drawout switch gear, parts of the chassis being illustrated in section and parts on the carriage being broken away for purposes of illustration;

Fig. 5 is a fragmentary view similar to Fig. 4 illustrating the initial engagement of the plug-in contacts with the stationary contacts when the carriage is moved to the operating position thereof;

Fig. 6 is a view similar to Fig. 5 and illustrates the fully engaged condition of the contacts, the carriage being in the operative position thereof;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 5;

2

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 6;

Fig. 9 is a sectional view taken on the line 9—9 of Fig. 4 and illustrates the carriage in the fully inserted or operative position thereof, as in Fig. 6;

Fig. 10 is a view similar to Fig. 9 with the carriage in the intermediate test or inspection position thereof;

Fig. 11 is a view similar to Fig. 9 with the carriage in the fully withdrawn position thereof as in Fig. 1;

Fig. 12 is a front view illustrating the carriage fully inserted in the chassis with the door thereof closed, a fragmentary portion only of the door being illustrated, and parts being broken away;

Fig. 13 is a sectional view taken on the line 13—13 of Fig. 4 with the carriage inserted in the chassis;

Fig. 14 is a fragmentary view taken on the line 14—14 of Fig. 4, a latch member on the carriage being shown in the manually operated condition thereof; and

Fig. 15 is a fragmentary view taken on the line 15—15 of Fig. 4, the carriage being fully inserted in the chassis and the door thereof being closed.

Referring now to Figs. 1, 2 and 3 of the drawings in detail, there is illustrated the drawout switch gear 10 which comprises a carriage 12 mounted for movement in a chassis 14, which, as here shown, may be provided in a compartment 15 of a control or power center. A hinged closure or door for said compartment is illustrated at 16. The carriage 12 is provided with conventional circuit breaker mechanism, generally indicated at 18. Said circuit breaker mechanism is provided with a manual operating member or handle 20 which, when the carriage is fully inserted into the chassis, and the door 16 is closed, extends through an opening 22 provided in said door. The handle is illustrated in Fig. 1 as positioned in the manually open condition of the circuit breaker, and it will be understood that the handle is rotated in a clockwise direction to close the circuit breaker, as at 24. Further, it will be understood that in the tripped condition of the circuit breaker, the handle is disposed at the other side of said open position thereof. The circuit breaker is provided with a conventional trip bar 26, which is normally biased to a lowermost position thereof, as illustrated in Figs. 9, 10, 11 and 15. It will be understood that in the tripped position of the circuit breaker, the trip bar is disposed upwardly from said lowermost position, as illustrated in Fig. 14 and in broken line in Fig. 15. Further it will be understood that with the trip bar retained in said tripped position thereof, the handle 20 cannot be operated to close the circuit breaker.

The compartment or enclosure 15 is provided at the rear of the chassis with the stationary blade-like contacts 28 which, as here shown, are mounted in position by the insulated support members 30. Said stationary contacts are carried in a suitable manner by companion bus bars 32 (Figs. 9, 10 and 11) which are connected to a suitable power source.

The chassis 14 is disposed within the compartment 15 and is constituted by the floor 34 of said compartment on which is provided the confronting guide channels 36 and 38, at opposite sides thereof. Adjacent the front opening 40 of the compartment 15, the chassis member 34 is provided with the laterally spaced openings 42 and 44, as best seen in Fig. 4. A roller 46 substantially fills the opening 42, said roller being mounted for free rotary movement therein by a pin 48, the opposite ends of which are positioned by the elements 50 and 52 provided on the chassis member 34. The chassis member 34 is also provided with the spaced similar elements 54 and 56 at the opposite sides of the previously mentioned opening 44 for positioning the ends of the pin member 58. Said pin member mounts the laterally spaced rollers 60 and 62, as best illustrated in Fig. 13, to provide the spac-

3

ing 64 therebetween. However, it will be understood that the rollers 60 and 62 may be formed of a single roller which is undercut to provide said space 64. In addition to the rollers, the chassis member 34 is also provided with the spaced lugs 66 and 68 which are mutually displaced, both longitudinally and transversely of the chassis member 34, as illustrated in Figs. 2, 4, 5 and 6, the function of which lugs will presently appear.

The guide channel member 36 is provided at the upper surface thereof, adjacent the front opening 40, with the rearwardly directed angular stop member or detent element 67, as best illustrated in Figs. 4 and 9 to 11. Said element fixes the outermost or fully withdrawn position of the carriage 12 relative to the chassis, as hereinafter described in detail. Substantially centrally thereof, the channel 36 is provided with the rearwardly directed intermediate stop member or detent element 69 which fixes the partially withdrawn position of the carriage, as hereinafter described in detail. Rearwardly of the stop 69 the channel 36 is provided with the elongated stop member or detent element 70 which is provided with an upper surface 72 spaced above the channel 36 and which extends longitudinally thereof. The stop member 70 fixes the fully inserted or operative position of the carriage, as hereinafter described in detail. The opposing channel guide 38, as here shown, is provided with the single stop member or detent element 74, which is similar to the previously mentioned stop member 67 and which is in lateral alignment therewith at the front opening 40 of the compartment 15.

The carriage 12 comprises a pan or support member 76 which is provided at the periphery thereof with the upwardly directed flange 90 (Figs. 1 and 12) to which are secured the laterally disposed upstanding side wall members 78 and 80. A wall member or mounting plate 82 is secured between the side walls 78 and 80 and extends therebetween for mounting the circuit breaker 18 at the front surface 84 thereof, the plug-in contacts 86 of the circuit breaker projecting from the rear surface 88 of said wall 82. Adjacent the rear of the carriage, the pan 76 is provided with the laterally aligned rollers 92 and 94 which are adapted to ride in the guide channels 38 and 36, respectively. At the lower surface thereof the pan 76 is provided with the longitudinally extending bar or guide member 96, which is disposed adjacent the roller 94, and is secured to the pan as by the securing means 98. From the foregoing it will be understood that when the carriage is inserted into the chassis, the carriage rollers 92 and 94 ride within the guide channels or tracks 38 and 36, respectively, the bottom surface of the pan 76 riding on the roller 46 and the companion rollers 60 and 62, the guide bar 98 being disposed in the space 64 between said latter rollers. Pursuant to one feature of the present invention, due to the disposition of the carriage rollers 92 and 94 in the companion guide tracks or channels of the chassis, and due to the engagement of the guide bar 98 of the carriage between the companion rollers 60 and 62, lateral movement or shifting of the carriage within the chassis is prevented so that the plug-in contacts 86 carried thereby are automatically and accurately aligned with the companion stationary blade contacts 28 for engagement of the latter in said plug-in contacts. In this connection, it will be noted from Figs. 9, 10 and 11, that after the carriage is inserted into the chassis, the aligned rollers 92 and 94 thereof are always disposed in their companion guides, rearwardly of the companion rollers 60 and 62 of the chassis, said latter rollers serving to retain successive portions of one bar 96 against lateral shift, whereby the carriage is retained against lateral movement at tri-angularly related points for effecting said alignment of the contacts.

As previously indicated, the plug-in contacts 86 are quite heavy and are provided with suitable strong spring pressure for maintaining good contact pressure with the companion blade contacts 28. Fig. 5 illustrates the initial

4

engagement of the plug-in contacts with the companion blade contacts, and Fig. 6 illustrates the fully inserted position of the blade contacts in the companion plug-in contacts in the operative disposition of the carriage in the chassis. A substantially great degree of force, on the part of an operator, is ordinarily necessary for him to push the carriage, from the position thereof illustrated in Fig. 5 to the position thereof illustrated in Fig. 6, to provide for the full engagement of the companion contacts.

Pursuant to another feature of the present invention, mechanism is provided to facilitate said full engagement of the companion contacts so that it may be accomplished by only one operator without too much physical exertion. For this purpose, the pan 76 of the carriage is apertured as at 100 (Figs. 7 and 8), adjacent the front edge thereof. A circular rotary member 102 is disposed within said aperture, said member having an enlarged portion 104 which overlies the aperture at the upper surface of the pan 76 and a narrowed neck 106 which extends through the aperture 100. The neck is cut out or milled as at 108, and an arm 110, which projects from the periphery thereof, is disposed within said cutout, being secured therein as by the securing elements 112. A washer 111 is interposed between said arm and the bottom surface of the pan. A spring member 114 is provided at the lower surface of the pan 76, one end thereof being secured to the retaining element 116 carried by the pan, and the other end thereof being secured to a retaining pin 118 (Figs. 5 and 6) on the neck 106, whereby to bias the member 102 for counter-clockwise rotation, viewing Figs. 5 and 6. A detent member 120 is also provided at the lower surface of the pan 76, the function of which will presently appear. The rotary member 102 is provided with a diametrically extending circular passageway 122 for removably receiving a companion bar or rod 124 therein, the flange 90 being cut away at 91 to allow for the insertion of said rod.

The operation of the rotary member 102 for effecting full engagement of the stationary contacts 28 by the companion spring biased plug-in contacts 86 is as follows: With the carriage moving in the chassis in the direction of the arrow 126 in Fig. 4, from the outermost position thereof illustrated in Fig. 11, to the innermost position thereof illustrated in Fig. 9, it will be noted that the arm 110, which is secured in the rotary member 102, is initially disposed in abutment with the previously mentioned stop 120 by the spring 114, as best illustrated at the bottom of Fig. 4 which shows, in full line, the carriage in a relative position fully withdrawn and detached from the chassis. Assuming now that the carriage has been inserted into the companion chassis and is in the broken line position thereof illustrated in said latter figure, it will be noted that in said position the rotary member 102 is entering the chassis. In said position, the arm 110, due to its positioning by the detent 120, clears the forward one 66 of the previously mentioned lugs provided on the chassis 34. However, as said arm 110 continues to move in the direction of the arrow 126, it will be apparent that the companion lug 68 will be in the path of movement thereof so that said arm will abut said latter lug and be rotated away from the detent 120, as illustrated in Fig. 5. At this moment, the plug-in contacts 86 make initial contact with the companion stationary contacts 28, as illustrated in said latter figure, the carriage having been moved to this position with little exertion by the operator. Now, in order to effect the full engagement of said contacts, the bar 124 is inserted in the opening therefor provided in the rotary member 102 and said bar is rotated in a clockwise direction, viewing Figs. 5 and 6, so that the arm 110 will now move into engagement with the forward lug 66, as illustrated in full line in Fig. 6. It will be apparent that no inward movement of the carriage occurs during the movement of the arm from the lug 68 to the lug 66. However, continued

5

rotation of the rod 124 in the same direction, with the arm 110 in engagement with the forward lug 66 causes pivotal movement of the arm about the lug, which serves as a fulcrum therefor, to lever the carriage forwardly into the chassis, for the full engagement of the stationary contacts 28 in the companion plug-in contacts 86, as illustrated in Fig. 6. The carriage is now in the operative position thereof with the circuit breaker 18 connected to the power line. The rod may now be withdrawn and the spring 114, which had expanded upon rotation of the arm 110 to engage the lug 66, contracts and returns the arm into abutment with the inner lug 68, as illustrated in broken line in Fig. 6. Thereafter, when it is desired to disengage the companion contacts, the rod 124 is again inserted into the rotary member 102 and the rod is now rotated in a counter-clockwise direction, so that the arm 110 will lever against the inner lug 68, as a fulcrum, to effect the disengagement of the contacts. When the carriage is withdrawn sufficiently for the arm 110 to disengage the lug 68, the spring 114 will carry said arm into engagement with the detent 120.

Pursuant to another feature of the present invention, provision is made for an automatically operated door interlock mechanism, generally indicated at 128, in Figs. 1, 4, 12 and 15, for effecting automatic opening of the circuit breaker upon the opening of the hinged door 16. In circuit breakers of the present type, when the breaker trips, due to an overload or short in the circuit thereof, there is a heavy discharge of hot gases which may at times be accompanied by flame. The door 16 would serve to protect the operator against the gases and the flame if he should be standing in front of the circuit breaker. However, should he first fail to manually or electrically open the circuit breaker by means of the handle 20, before opening the door 16, it will be readily apparent that he may be injured by the hot gases and the hot flame if an overload or short occurs while he is opening the door. This possibility is obviated due to the door interlock 128. Said interlock comprises, as here shown (Fig. 15), the axially movable operating member 130 which is carried at the inner surface of the carriage wall 78 by the angle member 132. At the outer end thereof, the member 130 is provided with a button 134 which projects through an aperture provided in the flange 90, a compression spring 136 being carried by the member 130, between said button and the angle member 136, biasing the member to the outer position thereof, as illustrated in broken line in Fig. 15. At the inner end thereof, the member 130 is pivotally connected, as at 138, with one end of a bell crank lever 140, which is pivoted to the wall 78, as at 142. The other arm of the bell crank lever is pivotally connected, as at 144, with one end of the vertically disposed axially movable member 146, which is retained for slidable movement on the wall 78 by the guide 148 carried by said wall. At the upper end thereof the member 146 is provided with a yoke 150 which engages the previously mentioned trip bar 26, adjacent one end thereof (Fig. 12). With the door 16 in the closed position thereof, as in full line in Fig. 15, said door will engage the button 134 so that the various parts of the interlock 128 will be disposed in the full line position thereof illustrated in said figure in which position the member 146 is lowered so that the trip member 26 is in the lower position thereof, and the spring 136 is compressed. A slight opening movement only of the door 16, as illustrated in broken line, is sufficient to permit the spring 136 to expand sufficiently to effect the rotation of the bell crank lever from the full line to the broken line position thereof for raising the member 146 to move the trip bar upwardly for tripping the circuit breaker.

Pursuant to another feature of the present invention, provision is made for an additional mechanical interlock which is generally indicated by the reference numeral 152 in Figs. 1, 4, 9-12 and 14. The interlock 152 comprises

6

a manually operable latch member or lever 154 which is pivotally mounted at the inner surface of the wall 80, as at 156. At the outer end thereof, said lever is provided with a handle 158 and at the inner end thereof provision is made for a downwardly directed hook 160 which is connected to the body of the lever by a shank 162. Said shank is outwardly offset as at 164 (Fig. 4), the offset portion extending through an opening 166 defined in the wall 80 so that the hook is at the outer surface of said wall. An axially extending vertically movable member 168 is slidably disposed at the inner surface of said wall, by the guide 170. At the lower end thereof the member 168 is pivoted to the lever 154, as at 172, and at the upper end thereof said member is provided with a yoke 174 which engages the trip bar 26, at the other end thereof. A tension spring 176 has one end thereof secured to the lever 154, between the pivot 156 and the handle 158 thereof, the other end being secured to a platform 175 provided on the carriage for mounting the circuit breaker 18 thereon. The lever 154 latches with the previously mentioned detent elements 67, 69 and 70 provided on the guide channel 36 of the chassis.

Assuming now that the carriage is being moved into the chassis from a position wherein it is completely removed therefrom, as illustrated in Fig. 4, the previously mentioned rollers 92 and 94 on the carriage will first be engaged in the companion guides 38 and 36 respectively, and the bar 96 on the carriage will engage between the companion rollers 60 and 62 of the chassis. Inward movement of the carriage will result in initial engagement of the hook 160 and the rearwardly directed portion 177 of the detent member 67. The hook will ride up on said portion and this will cause a counter-clockwise pivoting of the latch member 154, to result in upward movement of the member 168 to trip the trip bar 26. It will be noted that the trip bar will be in the upper tripped position thereof during said inward movement of the carriage, due to the disengagement of the door 16 from the door interlock button 134. However, the interlock 152 provides an added safety factor in the event that said button of the door interlock is being manually depressed as the carriage is being moved into the chassis, so that in said latter case the interlock 152 will be effective to trip the breaker as the carriage is being initially inserted into the chassis. If for any reason, an attempt is made to manually or electrically close the breaker before the hook completely rides over said detent portion 177, to be latched therewith as illustrated in Fig. 11, the breaker will not close because the trip bar thereof is being retained in its upper position. However, as soon as the hook rides over said portion 177 of said detent element, the spring 176 will contract and cause the hook to latch in behind said detent portion, as illustrated in Fig. 11, and the trip bar will drop to the lower position thereof. This position of the carriage represents a fully withdrawn position of the carriage in the chassis, without complete disengagement from the chassis, and is available as a maintenance position for making minor repairs or adjustments to the mechanism. It will be noted that in said position, the chassis rollers 60 and 62, as well as the roller 46, serve as fulcrums for the carriage. However, the engagement of the carriage rollers 92 and 94 in the companion chassis guides at positions inwardly of said fulcrums prevents pivotal movement of the carriage, and engagement of the hook 160 in the detent 67 prevents the carriage from falling out of the chassis. If desired, an additional manually operable latch member or lever 178 may be provided on the opposite carriage wall 78 for engagement with the previously mentioned detent element 74 on the guide 38. It will be understood that the lever 178 and the detent element 74 will operate in the same manner as the lever 154 and the detent element 67 to prevent inadvertent removal or disengagement of the carriage from the chassis. If it is desired to manipulate the handle 20 of the breaker, in

the position of the carriage illustrated in Fig. 11, for closing the breaker, the button 134 on the interlock 128 must be manually depressed to return the trip bar 26 to the lower position thereof.

In moving the carriage from the position thereof illustrated in Fig. 11, to the intermediate position thereof illustrated in Fig. 10, which represents an inspection and testing position of the carriage, the hook 160 of the lever 150 will ride over the rearwardly directed portion 180 of the detent 69 to effect counter-clockwise rotation of the lever 154 for tripping the circuit breaker, in the event that the button 134 is being manually depressed. Again, it will be apparent that the breaker can't be closed until the hook latches in behind portion 180 as in Fig. 10, and in order to operate the handle 20 for manually closing the breaker in said position of the carriage the button 134 must be maintained in the depressed condition thereof.

In moving the carriage from the intermediate position thereof, illustrated in Fig. 10, to the operative position thereof illustrated in Fig. 9, wherein the companion contacts are in full engagement, as previously described, the hook 160 rides up onto the upper surface 72 of the detent member 70 for effecting counter-clockwise rotation of the lever 154, to result in automatic tripping of the circuit breaker in the event that the button 134 is being manually depressed. It will be noted that while the hook is in engagement on the upper surface of the detent 70, the circuit breaker cannot be manually closed even with the button 134 in the depressed condition thereof, since the trip bar is retained in the tripped position thereof. When the hook drops into engagement with the detent 72, as illustrated in Fig. 9, the circuit breaker can be manually closed if the button 134 is depressed. Upon release of the button it will be readily apparent that the circuit breaker will automatically trip and cannot be closed until the door 16 is closed, for depressing the button 134.

Assuming now that the door is in closed condition and the circuit breaker is also in the closed condition thereof, opening of the door will result in automatic tripping of the circuit breaker due to the action of the door interlock 128, as previously described. Any attempt now to manually close the circuit breaker will require the manual depression of the button 134 and will serve to clearly bring home to the operator the fact that he is not being protected by the door interlock if he should manually close the circuit breaker with the contacts in engagement. In order to move the carriage back to the intermediate position thereof, it is necessary to depress the handle 158, to rotate the lever 154 in a counter-clockwise direction, before the clockwise rotation of rod 124, as previously explained. This will automatically trip the circuit breaker in the event that the button 134 is manually depressed. Continued outward movement of the carriage will result in the hook dropping off the surface 72 and into engagement with the detent 69, as illustrated in Fig. 10. In this position the companion contacts are fully disengaged and in order to manually close the breaker for purposes of testing and inspection, the button 134 must be manually depressed. In order to release the carriage from said intermediate position for outward movement thereof to the maintenance position, the handle 158 must be depressed and, in the event that the button 134 is being manually depressed, the circuit breaker mechanism will be automatically tripped. Continued outward movement of the carriage will result in the engagement of the hook 160 with the detent 67, as illustrated in Fig. 11 to prevent the carriage from inadvertently slipping out of the chassis. As previously indicated, the additional lever 178 and companion detent 74 may be provided for this purpose.

While I have shown and described the preferred embodiments of my invention, it will be understood that various changes may be made in the present invention without departing from the underlying idea or principles

of the invention within the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:

1. A drawout switch gear comprising a chassis unit provided with stationary contacts, a carriage unit mounted for movement on said chassis and provided with movable contacts engageable with said stationary contacts, respectively, and cooperating means on said carriage and chassis for aligning said movable contacts with the companion stationary contacts, respectively, for said engagement thereof, said cooperating means including a guide member provided on one of said units and a pair of aligned rollers on the other of said units on which said one unit rides and said aligned rollers serving to laterally retain said guide member therebetween whereby to retain said units against relative lateral displacement.

2. A drawout switch gear comprising mounting means having laterally spaced guide means and provided with stationary contacts disposed therebetween, carriage means provided with rollers engageable in said guide means and having movable contacts engageable with said stationary contacts respectively, and means for aligning said movable contacts with said stationary contacts comprising a member provided on said carriage and extending in the direction of movement thereof, and rotary guide means on said mounting means for retaining said member against lateral movement.

3. A drawout switch gear comprising a chassis unit provided with stationary contacts, a carriage unit mounted for movement in a predetermined direction on said chassis and provided with movable contacts engageable with said stationary contacts, respectively, and means operable triangularly of said carriage for retaining the latter against movement in a direction transversely of said movement thereof, whereby to align said movable contacts with said stationary contacts as the former are moved to engage the latter.

4. A drawout switch gear comprising a chassis unit provided with stationary contacts, a carriage unit mounted for movement in a predetermined direction on said chassis and provided with movable contacts engageable with said stationary contacts, respectively, and means operable triangularly of said carriage for retaining the latter against movement in a direction transversely of said movement thereof, whereby to align said movable contacts with said stationary contacts as the former are moved to engage the latter, said means comprising laterally aligned rollers provided on the carriage, spaced guides provided on said chassis in which said rollers are disposed, respectively, a guide member provided on said carriage between said rollers thereof and extending in the direction of said movement thereof and guide means in said chassis for retaining said member against lateral movement, said guide means engaging said guide member at successive portions, respectively, thereof, rearwardly of said rollers as said carriage moves into said chassis, whereby to provide triangularly related points constituted by said rollers and the portion of said member engaged by said guide means at which the carriage is retained against lateral shift in said chassis.

5. A drawout switchgear comprising a chassis unit provided with stationary contacts, a carriage unit mounted for movement on said chassis and provided with movable contacts engageable with said stationary contacts, respectively, and cooperating means on said carriage and chassis for providing leverage in a first direction to force said movable contacts into engagement with said stationary contacts, and for providing leverage in an opposite direction to disengage said movable contacts from said stationary contacts, said cooperating means being spaced fulcrum means provided on said chassis unit and movable lever means provided on said carriage unit, said lever means pivoting on one of said fulcrum means for effecting engagement of said contacts and pivoting on the

other of said fulcrum means for effecting disengagement of said contacts.

6. A drawout switchgear comprising a chassis unit provided with stationary contacts, a carriage unit mounted for movement on said chassis and provided with movable contacts engageable with said stationary contacts, respectively, and cooperating means on said carriage and chassis for providing leverage in a first direction to force said movable contacts into engagement with said stationary contacts, and for providing leverage in an opposite direction to disengage said movable contacts from said stationary contacts, said cooperating means being a member mounted for rotation on said carriage and provided with a lever arm, and spaced fulcrum elements provided on said chassis, said lever arm being normally disposed between said elements when said carriage is within said chassis, and said member being rotatable in one direction for effecting engagement of said contacts and rotatable in the opposite direction for disengaging said contacts, and an additional member removably engageable with said first mentioned member for effecting rotation thereof.

7. A drawout switchgear comprising a chassis unit provided with stationary contacts, a carriage unit mounted for movement on said chassis and provided with movable contacts engageable with said stationary contacts, respectively, and cooperating means on said carriage and chassis for providing leverage in a first direction to force said movable contacts into engagement with said stationary contacts, and for providing leverage in an opposite direction to disengage said movable contacts from said stationary contacts, said cooperating means being a member mounted for rotation on said carriage and provided with a lever arm, and spaced fulcrum elements provided on said chassis, said lever arm being normally disposed between said elements when said carriage is within said chassis, and said member being rotatable in one direction for effecting engagement of said contacts and rotatable in the opposite direction for disengaging said contacts, one of said fulcrum elements being disposed in the path of movement of said lever arm upon insertion of said carriage into said chassis for positioning said lever arm between said elements, said other element being offset laterally and forwardly of said one element, whereby said contacts are forced into engagement when said member is rotated in a direction to pivot said lever arm on said other fulcrum element and said contacts are disengaged when said member is rotated in the opposite direction to pivot said lever arm on said one fulcrum element.

8. A drawout switchgear comprising a chassis unit provided with stationary contacts, a carriage unit mounted for movement in a predetermined direction on said chassis and provided with movable contacts engageable with said stationary contacts respectively, and means operable triangularly of said carriage for retaining the latter against movement in a direction transversely of said movement thereof, whereby to align said movable contacts with said stationary contacts as the former are moved to engage the latter, and cooperating means on said carriage and chassis for aligning said movable contacts with companion stationary contacts, respectively, for said engagement thereof, and additional cooperating means in said carriage and said chassis for providing leverage in a first direction to force said movable contacts into engagement with said stationary contacts, and for providing leverage in an opposite direction to disengage said movable contacts from said stationary contacts.

9. A drawout switchgear comprising chassis means provided with stationary contacts, carriage means provided with companion movable contacts and mounted for movement on said chassis for effecting engagement and disengagement, respectively, of said contacts, and cooperating means on said chassis and carriage for releas-

ably latching the latter in predetermined positions thereof, relative to said chassis, said cooperating means comprising spaced detent elements provided on said chassis and a releasable latch member provided on said carriage for engagement with said detent elements, one of said detent elements when engaged by said latch member locking said carriage means in fully inserted position thereof on said chassis means for engagement of said movable contacts with said stationary contacts, and another of said detent elements locking said carriage means in a partially withdrawn position thereof in which the companion contacts are disengaged, and an additional detent element preventing inadvertent disengagement of said carriage from said chassis.

10. A drawout switchgear comprising mounting means provided with stationary contacts, carriage means mounted for movement on said mounting means and provided with circuit breaker means having movable contacts engageable with said stationary contacts, respectively, cooperating means on said mounting means and said carriage for releasably latching said carriage in predetermined positions thereof on said mounting means, and means for automatically tripping said circuit breaker means upon release of said carriage from said positions, respectively, thereof, said mounting means being provided with a door for access to said carriage means, and interlock means operable to automatically trip said circuit breaker means in response to the opening of said door.

11. A drawout switchgear comprising mounting means provided with stationary contacts, carriage means mounted for movement on said mounting means and provided with circuit breaker means having movable contacts engageable with said stationary contacts, respectively, cooperating means on said mounting means and said carriage for releasably latching said carriage in predetermined positions thereof on said mounting means, and means for automatically tripping said circuit breaker means upon release of said carriage from said positions, respectively, thereof, said automatic tripping means including a trip member for said circuit breaker means and means for preventing manual operation of said circuit breaker means when said cooperating means are conditioned for release of said carriage from said positions, respectively, thereof, said mounting means being provided with a door for access to said carriage means, and interlock means operable to automatically trip said circuit breaker means in response to the opening of said door, said interlock means including a member operable upon said trip member for preventing manual operation of said circuit breaker means when said interlock means is conditioned to trip said circuit breaker means.

12. A drawout switchgear comprising chassis means provided with stationary contacts, carriage means provided with companion movable contacts and mounted for movement on said chassis for effecting engagement and disengagement, respectively, of said contacts, and cooperating means on said chassis and carriage for releasably latching the latter in predetermined positions thereof, relative to said chassis, said cooperating means comprising spaced detent elements provided on said chassis and a releasable latch member provided on said carriage for engagement with said detent elements, said latch member being a member extending longitudinally from a position accessible from outside said carriage means to a position within said carriage and being pivotally mounted on said carriage, the end of said latch member within said carriage having a latching surface adapted to engage said detent elements for releasably latching said carriage in said predetermined position, one of said detent elements when engaged by said latch member locking said carriage means in fully inserted position thereof on said chassis means for engagement of said movable contacts with said stationary contacts, and another of said detent elements locking said carriage means in a partially withdrawn posi-

tion thereof in which the companion contacts are disengaged, and an additional detent element preventing inadvertent disengagement of said carriage from said chassis.

13. A drawout switchgear comprising chassis means provided with stationary contacts, carriage means provided with companion movable contacts and mounted for movement on said chassis for effecting engagement and disengagement, respectively, of said contacts, and cooperating means on said chassis and carriage for releasably latching the latter in a predetermined position, said cooperating means comprising a detent element on said chassis and a latch member provided on said carriage for engagement with said detent element, said latch member being a member extending longitudinally from a position accessible from outside said carriage means to a position within said carriage and being pivotally mounted on said carriage, the end of said latch member within said carriage having a latching surface adapted to engage said detent element for releasably latching said carriage in said predetermined position, said latch member being operable to unlatch said cooperating means by manipulation of said end accessible from outside said carriage.

14. A drawout switchgear comprising a chassis unit provided with stationary contacts, a carriage unit mounted for movement in a predetermined direction on said chassis and provided with movable contacts engageable with said stationary contacts, respectively, and guide means for retaining said carriage unit against movement transversely of said predetermined direction, whereby to align said movable contacts with said stationary contacts as the former are moved to engage the latter, said means comprising laterally aligned rollers provided on the carriage, spaced guides provided on said chassis in which said rollers are disposed, respectively, a guide member provided on said carriage between said rollers thereof and extending in the direction of said movement thereof and guide means in said chassis for retaining said member against lateral movement, said last mentioned guide means comprising a pair of rollers laterally spaced apart a distance substantially equal to the width of said guide member, said pair of rollers being positioned adjacent the front of said chassis and between said spaced guides so that said guide member is disposed between said pair of rollers, whereby to engage and retain said guide member therebetween whereby to provide triangularly related guide points for said carriage constituted by the points of engagement of said laterally aligned rollers with said spaced guides and the point of engagement of said guide member with said pair of rollers.

15. A drawout switchgear comprising a chassis unit provided with stationary contacts, a carriage unit mounted for movement in a predetermined direction on said chassis and provided with movable contacts engageable with said stationary contacts, respectively, and guide means for retaining said carriage unit against movement transversely of said predetermined direction, whereby to align said movable contacts with said stationary contacts as the former are moved to engage the latter, said means comprising laterally aligned rollers provided on the carriage, spaced guides provided on said chassis in which said rollers are disposed, respectively, a guide member provided on said carriage between said rollers thereof and extending in the direction of said movement thereof and guide means in said chassis for retaining said member against lateral movement, said last mentioned guide means comprising a pair of rollers laterally spaced apart a distance substantially equal to the width of said guide member, said pair of rollers being positioned adjacent the front of said chassis and between said spaced guides so that said guide member is disposed between said pair of rollers, whereby to engage and retain said guide member therebetween whereby to provide triangularly related guide points for said carriage constituted by the points of engagement of said laterally aligned rollers with said spaced guides and the point of engagement of said guide member with said pair of rollers and cooperating latch and detent means on said carriage and chassis for releasably holding said carriage in predetermined positions thereof.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

|           |                 |                |
|-----------|-----------------|----------------|
| 1,591,609 | Campbell        | July 6, 1926   |
| 1,624,361 | Ow              | Apr. 12, 1927  |
| 1,691,290 | Judelson        | Nov. 13, 1928  |
| 1,768,535 | Ainsworth       | July 1, 1930   |
| 1,929,293 | Saint-Germain   | Oct. 3, 1933   |
| 1,957,642 | Hansen          | May 8, 1934    |
| 1,963,152 | Schlesinger     | June 19, 1934  |
| 2,128,149 | Linde           | Aug. 23, 1938  |
| 2,129,723 | Wood            | Sept. 13, 1938 |
| 2,151,756 | Fletcher et al. | Mar. 28, 1939  |
| 2,298,828 | Mahoney         | Oct. 13, 1942  |
| 2,388,934 | Pearson         | Nov. 13, 1945  |
| 2,443,669 | Tusing          | June 22, 1948  |
| 2,544,314 | Hebbel          | Mar. 6, 1951   |
| 2,554,510 | Spicer          | May 29, 1951   |