

July 21, 1953

R. L. STRATTON
UNIVERSAL INTERLOCK

2,646,474

Filed Dec. 7, 1949

4 Sheets-Sheet 1

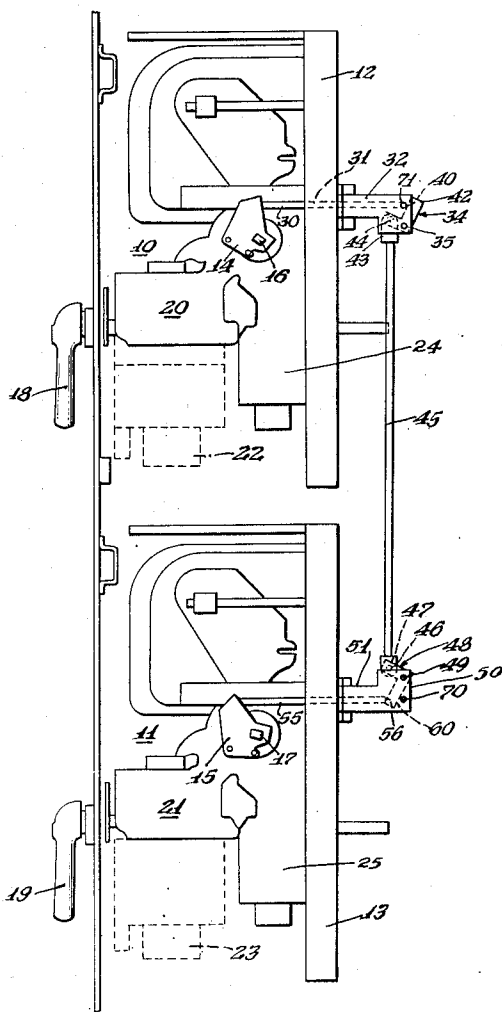


FIG. 1.

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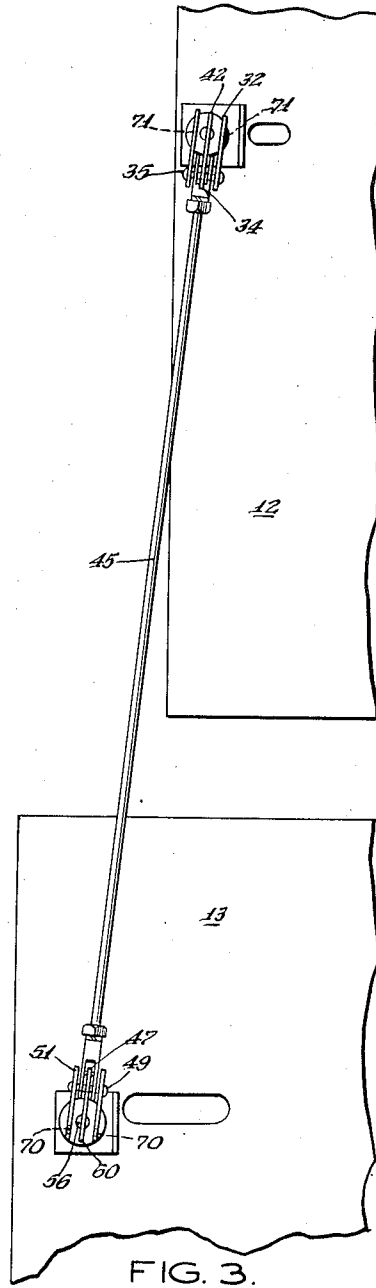
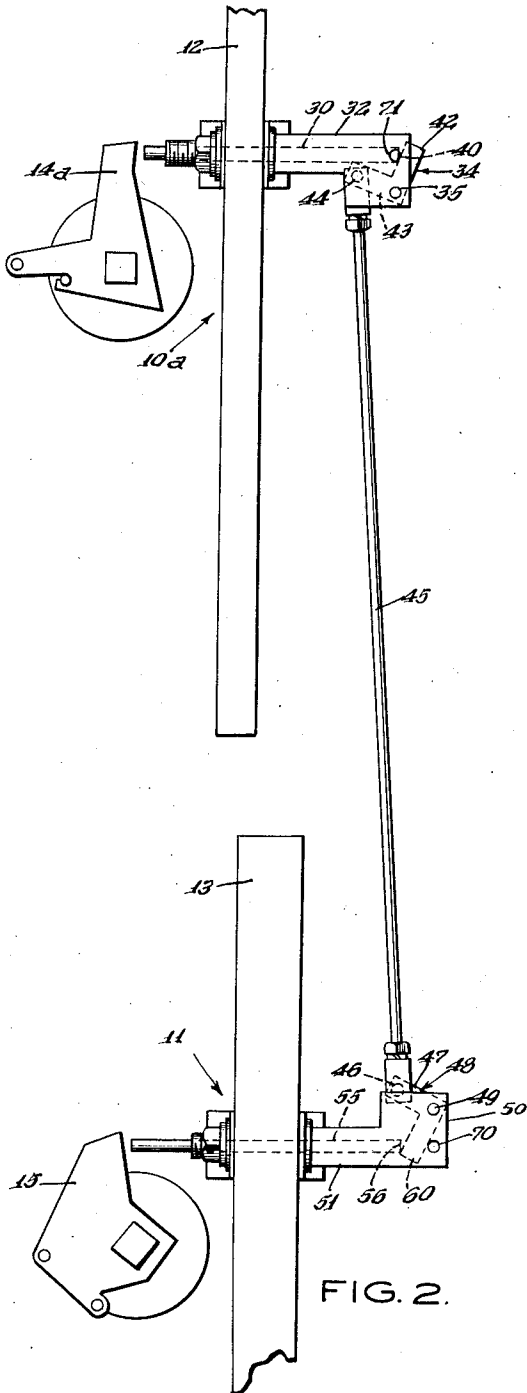
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4 Sheets-Sheet 3

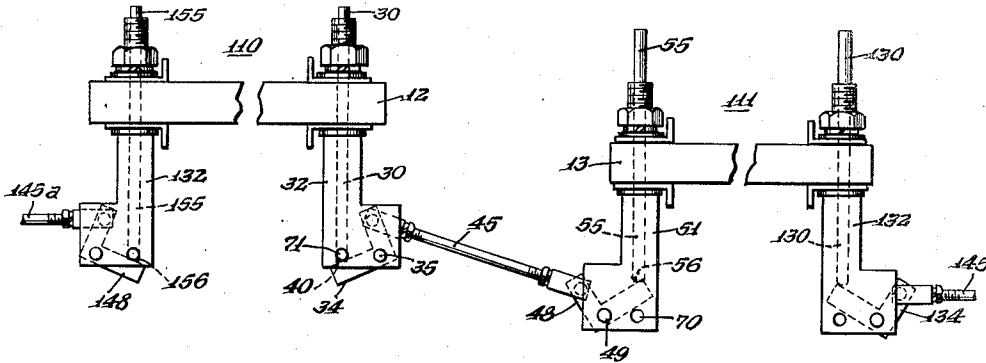


FIG. 4.

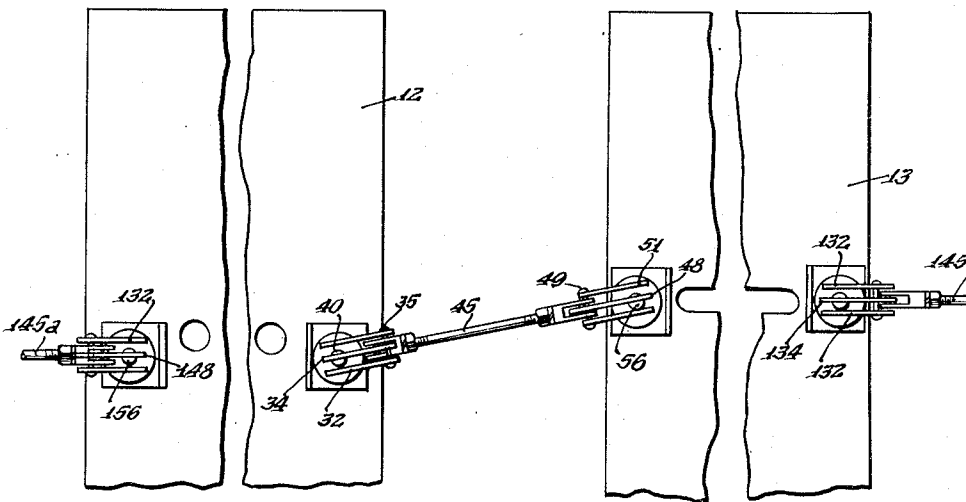


FIG. 5.

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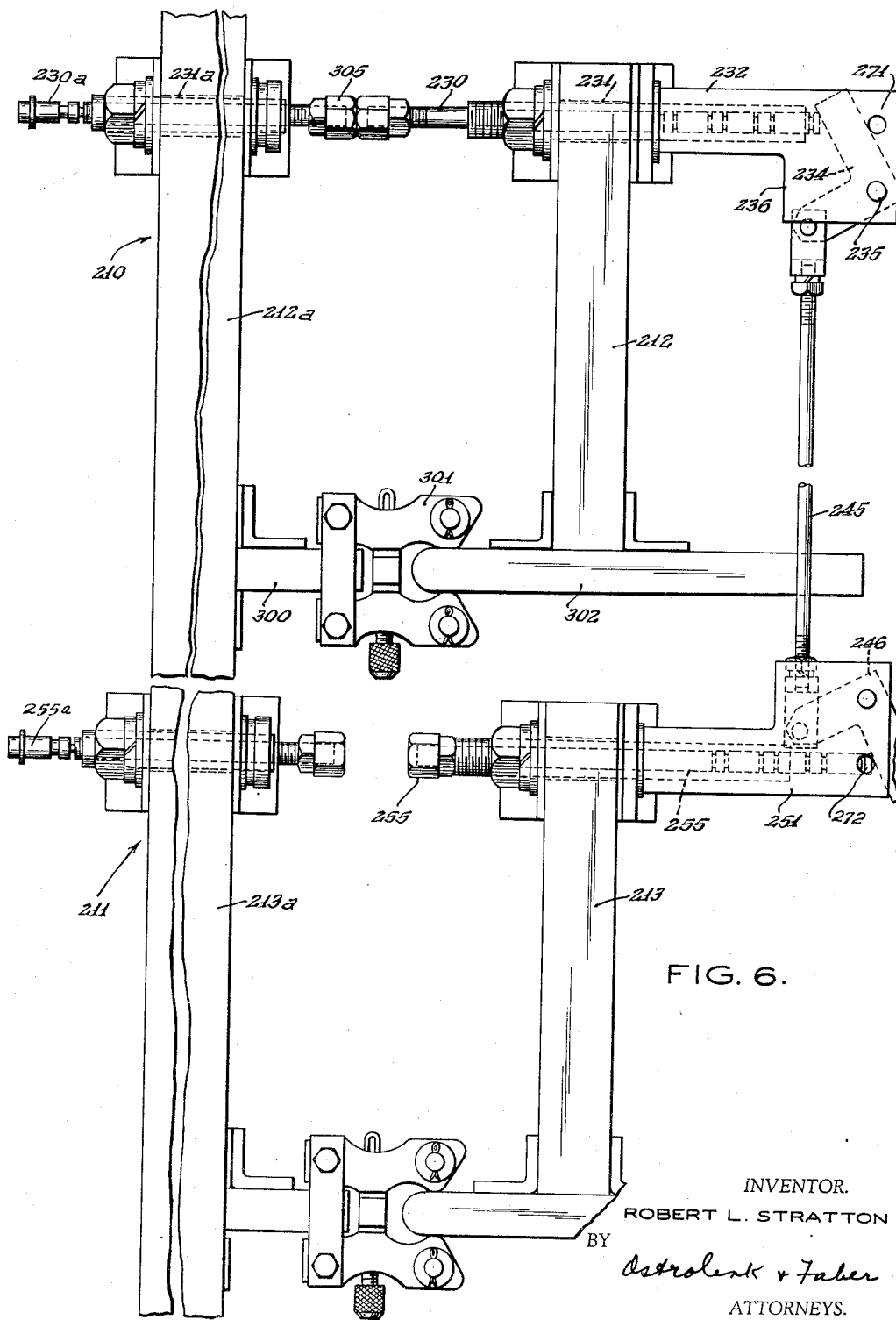
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4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

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UNIVERSAL INTERLOCK

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Application December 7, 1949, Serial No. 131,524

4 Claims. (Cl. 200—50)

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My present invention relates to circuit breakers and more particularly to interlocking devices for use in connection therewith, the said interlocking device being so arranged that the operation of one circuit breaker will effect or control the operation of another circuit breaker.

A specific object of my invention is the provision of an interlocking device which may be used in any designed grouping of circuit breakers operating in respect to horizontally adjacent or vertically adjacent circuit breakers and even with respect to circuit breakers which are diagonally arranged with respect to each other.

Another object of my invention is the provision of a novel interlocking device which may be used in connection with stationary mounted circuit breakers or truck mounted removable circuit breakers.

Another object of my invention is the arrangement of an interlocking device so that the interlocking element positively blocks the movable contact arm in the open position and prevents it from closing the circuit breaker regardless of any tampering with the circuit breaker or its accessories.

My invention contemplates the arrangement of a push rod adjacent a movable contact arm of a circuit breaker, the push rod being so positioned that when the circuit breaker is closed, the push rod is moved longitudinally. A dog leg or bell crank lever, a link and an additional dog leg or bell crank lever are connected to another push rod so that when the first push rod is moved longitudinally by the closing of its associated circuit breaker, the other push rod is moved longitudinally in the opposite direction to block the contact arm of the other circuit breaker.

The latch and other mechanism which thus holds the first circuit breaker closed also holds the second push rod in position so that the second circuit breaker cannot be closed.

The foregoing and many other objects of my invention will become apparent in the following description and drawings in which:

Figure 1 is a schematic side view showing the interlock of my invention applied to vertically adjacent circuit breakers.

Figure 2 is an enlarged side view of the push rod interlock construction of Figure 1.

Figure 3 is a rear view of the push rod interlock construction of Figures 1 and 2.

Figure 4 is a schematic top view showing the utilization of my novel interlock construction as applied to circuit breakers arranged side by side.

Figure 5 is a rear view of the horizontal interlock construction of Figure 4.

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Figure 6 is a detailed view showing the application of my novel interlock construction as applied to a draw-out type of circuit breaker.

Referring first to Figure 1, the circuit breakers 10 and 11 are mounted on their vertically adjacent panels 12 and 13. Each circuit breaker is provided with its movable contact arm 14, 15 rotatably mounted on their respective cross shafts 16, 17 and being operated in any suitable manner either by the operating handle 18, 19 through the operating mechanism 20, 21, the solenoid closing coil 22, 23 or the overload trip units 24, 25.

The type of circuit breaker here shown is in general of the type disclosed in Patents Nos. 2,311,699, 2,348,228, 2,311,701, 2,375,328, although any other type of circuit breaker having a movable contact arm having either angular or translatory motion may be utilized in connection with my novel interlock mechanism. Virtually every circuit breaker or switch is so constructed as to adapt it for cooperation with my interlock mechanism.

Push rod 30 is slidably mounted in opening 31 in panel 12 and is slidably carried by the additional bracket 32 secured in any suitable manner to the rear of panel 12. The dog leg or bell crank lever 34 is secured in any suitable manner on the pivot 35 at the downwardly directed extension 36 of bracket 32 so that it may rotate with respect thereto.

Reference should also be made to Figures 2 and 3 since Figure 2 shows the construction of Figure 1 greatly enlarged with a slight modification hereinafter referred to, and Figure 3 shows the rear view of the units of Figures 1 and 2.

End 40 of the push rod 30 bears against leg 42 of the bell crank lever 34. The opposite leg 43 of the bell crank lever 34 is pivotally connected at 44 to the link 45. The lower end of link 45 is pivotally connected at pin 46 to the leg 47 of dog leg or bell crank lever 48 which is pivotally mounted at 49 on the upwardly directed extension 50 of the bracket 51 secured to panel 13 and which slidably supports the push rod 55.

End 56 on the rear end of the push rod 55 extends behind the leg 60 of the bell crank lever 48 and is engaged thereby.

It will now be seen that when the movable contact arm 14 of the circuit breaker 10 is rotated to the closed position and therefore is rotated to the right and clockwise, it pushes the push rod 30 to the right, thereby pushing the end 40 of the push rod 30 to the right and rotating the bell crank lever 34 in a clockwise direction.

This in turn raises the pivot 44 of link 45 drawing up link 45 and also rotating bell crank

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lever 48 in a clockwise direction driving the leg 60 thereof to the left. The rotation of the bell crank lever 48 in a clockwise direction therefore drives the push rod 55 to the left into blocking relation with the contact arm 15. Thus the contact arm 15 cannot be moved to closed position since, in order to do so, it must move the push rod 55 to the right, but the push rod 55 is held in position by the linkage connection to push rod 30 which in turn is held against movement to the left by the closed position of contact arm 14.

In other words, the push rods 30 and 55 are arranged so that one will move to the left while the other moves to the right and if the closing of one circuit breaker which requires a movement to the right of the push rod is blocked by reason of the fact that the other push rod cannot move to the left owing to the closing of the second circuit breaker, then the circuit breakers are completely interlocked and one cannot close unless the other is opened.

Thus as seen in Figures 1, 2 and 3, the lower circuit breaker 11 cannot close owing to the fact that the other circuit breaker 10 is open. Nothing interferes, however, with the opening of the other circuit breaker 10.

When the contact arm 14 of the upper circuit breaker 10 has moved to the left to open position, then the push rod 30 is free to move to the left and will do so when the lower contact arm 15 is moved to closed position, moving the push rod 55 to the right. This operation will reverse the condition shown in Figure 1 and Figure 2 so that push rod 30 will be moved to the left to hold the contact arm 14 locked in the open position.

There is thus no way by which, when the circuit breakers are connected by this kind of interlock that one circuit breaker can be closed while the other remains closed. While they are thus connected for alternate operation, an operator who may desire to make some adjustments with respect to one of the circuit breakers can be certain that as long as the other circuit breaker is closed, the circuit breaker on which he is working will remain open.

In order to ensure this, the operator may pass a hasp of a padlock through opening 70 or 71 on the respective brackets 51 and 32 to block the movement of the dog legs 48 or 34 with the associated circuit breaker in the open position and with the push rod moved to a position where the opening 70 or 71 as the case may be is on the right side of the dog legs 34 or 48.

In this case, the push rod 30 or 55 as the case may be will be locked in the lock open position with the particular circuit breaker. Either circuit breaker, as will be obvious, may be tripped to the open position while the other circuit breaker is open but the arrangement is such that both circuit breakers cannot be closed at the same time.

In Figure 1 I have shown my interlock mechanism applied to two identical circuit breakers. In Figure 2, I have shown two different types of circuit breakers thus interlocked with the contact arm 14a of circuit breaker 10a being of a different construction from the contact arm 15 of circuit breaker 11.

It will be obvious that the circuit breakers or switch gear thus interlocked need not have identical construction but need only have some angular or translatory movement between the closed and the open position to make my novel interlock operable.

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It will also be obvious that circuit breakers may be successively interlocked or one circuit breaker may be interlocked with a number of others, either horizontally or vertically or diagonally adjacent so that when any one of a number of circuit breakers is closed, the particular circuit breaker which is interlocked with all of them must necessarily remain open.

In Figures 4 and 5 I have shown the arrangement of my invention for operation in connection with horizontally adjacent circuit breakers and also where circuit breakers are successively interlocked. Thus the circuit breaker 110 may have all of the constructional attributes of the circuit breaker 10 of Figure 1 and the circuit breaker 111 may be correspondingly similar to the circuit breaker 11 of Figure 1.

Push rod 30 passing through the panel 12 will be operated in the manner previously described and will operate the angle member 34 in a counterclockwise direction about its pivot 35. This will in turn through link 45 operate the angle member 48 in a counterclockwise direction to drive the push rod 55 inwardly.

The operation here is identical with that previously described in connection with Figures 1 to 3, except that the operation is performed in a horizontal direction.

Here the circuit breaker 110 is shown closed and circuit breaker 111 has its push rod 55 extended towards the front to lock the circuit breaker 111 open. The circuit breaker 111 also has the additional push rod 130 operating from another of the poles of the movable contact arm of the circuit breaker 111 and through the dog leg 134 and connecting link 145 to an adjacent circuit breaker.

Thus the closing of the adjacent circuit breaker on the right side also locks circuit breaker 111 open and the opening of circuit breaker 111 will leave the circuit breaker on the right side, not shown, in position to open or close freely as is the circuit breaker 110 on the left side.

Similarly push rod 155 of circuit breaker 110 is pushed towards the rear by the closing of circuit breaker 110 and operates through the horizontal bracket 132 and the dog leg 148 and connecting link 145a to lock the adjacent circuit breaker on the left side open.

By this means not only may a horizontal interlock be achieved, but also a multiple interlock in series may be achieved. It is also obvious that the link 145 may extend vertically to a vertically adjacent circuit breaker and link 145a may extend laterally to a horizontally adjacent circuit breaker and that other multiple arrangements may be provided.

In Figure 6, I have shown the application of my invention to a draw-out type of circuit breaker having a stationary panel 212 and a movable truck mounted panel 212a carrying a back connection stud 350 and a back disconnect contact 301 engaging the stationary back disconnect contact 302 on the stationary panel 212. The push rod 230 is slidably mounted in opening 231 in stationary panel 212 extending out past the bracket 232 which carries the dog leg 234 pivotally mounted at 235 downwardly directed extension 236 of bracket 232.

When the circuit breaker 210 on the truck mounted panel 212a is racked into position, the push rod 230 operates in exactly the manner previously described in connection with push rod 30 of Figure 1.

Push rod 230 is appropriately extended for this purpose either as an integral piece or by the

coupling 305 which extends the push rod through opening 231a in panel 212a so that the extension 233a of push rod 230 may operate in connection with the moving contact arm of the circuit breaker 210.

Thus when all of the circuit breakers are racked in position, the interlock operates through the connecting link 245 in exactly the manner previously described in connection with Figure 1.

When the circuit breaker 210 is opened, the operator by passing the hasp of a padlock through opening 271 of bracket 232 may lock the push rod 230 in a circuit blocking or circuit opening position for circuit breaker 210. When the circuit breaker 210 is thereafter racked out, the padlock in opening 271 will ensure that the circuit breaker 210 cannot be racked in in closed position.

Assuming that after various operations on the circuit breaker 210 in the upper compartment in Figure 6, it happens to remain in closed position before it is racked in, then as it is racked in, the push rod 230 will engage the moving contact arm thereof before the movable disconnect contact 301 engages the stationary disconnect contact 302 and prevent the further racking in of the circuit breaker unless the circuit breaker is tripped open. By this means, therefore, the operator by placing a padlock through opening 271 of the upper compartment of Figure 6 from which the circuit breaker has been racked out, will be assured that said circuit breaker may not be racked into said compartment in a closed position and that said circuit breaker after being racked in may not be closed until he has removed the padlock from the opening 271.

I claim:

1. In combination, a first circuit breaker, a second circuit breaker, each of said circuit breakers having a fixed contact and a movable arm carrying a movable contact engaging and disengaging with its associated fixed contact, a panel, a movable disconnect contact, a stationary disconnect contact mounted on said panel and engageable with its associated movable disconnect contact when the circuit breaker is racked into position therefor, a push rod slidably mounted on said panel, a bell crank, one arm of said bell crank being engageable by one end of its associated push rod, a connecting link connecting the other arm of the bell crank for adjacent circuit breakers, a bracket secured to said panel, said push rod extending through said bracket, said bell crank being pivotally mounted on said bracket for movement about its pivot when operated by its associated push rod, means for supporting said bracket on its associated panel, a coaxial rod for said push rod, one end of said auxiliary rod engaging said push rod and the other end being engageable with the movable arm of the associated circuit breaker, the push rod, its auxiliary rod, and its bell crank having one position for the circuit closed position of its associated circuit breaker and having a second position for the circuit open position of its associated circuit breaker, means for locking the bell crank in the position corresponding to the circuit open position of the circuit breaker, the end of the auxiliary rod engaging its associated push rod when it is in the position corresponding to the closed position of its associated circuit breaker before the associated movable disconnect contact engages the associated fixed disconnect contact to prevent further racking of said circuit breaker while said circuit breaker is closed, the push rod of one of said circuit breakers being

operated by the closing of its associated movable arm to rotate its associated bell crank about its pivot and moving through said connecting rod the other of said bell cranks and the push rod of the other of said circuit breakers to the position corresponding to the circuit open position of the movable arm of said other circuit breaker.

2. In combination, a first circuit breaker, a second circuit breaker, each of said circuit breakers having a fixed contact and a movable arm carrying a movable contact engaging and disengaging with its associated fixed contact, a panel, a movable disconnect contact, a stationary disconnect contact mounted on said panel and engageable with its associated movable disconnect contact when the circuit breaker is racked into position therefor, a push rod slidably mounted on said panel, a bell crank, one arm of said bell crank being engageable by one end of its associated push rod, a connecting link connecting the other arm of the bell crank for the adjacent circuit breakers, a coaxial auxiliary rod of said push rod, one end of said auxiliary rod engaging said push rod and the other end being engageable with the movable arm of the associated circuit breaker, the push rod, its auxiliary rod, and its bell crank having one position for the circuit closed position of its associated circuit breaker and having a second position for the circuit open position of its associated circuit breaker, the end of the auxiliary rod engaging its associated push rod when it is in the position corresponding to the closed position of said first circuit breaker before the associated movable disconnect contact engages the associated fixed disconnect contact to prevent further racking of said circuit breaker while said circuit breaker is closed.

3. In combination, a first circuit breaker, a second circuit breaker, each of said circuit breakers having a fixed contact and a movable arm carrying a movable contact engaging and disengaging with its associated fixed contact, a panel, a movable disconnect, a stationary disconnect mounted on said panel and engageable with its associated movable disconnect when the circuit breaker is racked into position therefor, a push rod slidably mounted on said panel, a bell crank, one extension of said bell crank being engageable by one end of its associated push rod, a connecting link connecting the other projection of the bell crank for adjacent circuit breakers, a bracket secured to said panel, said push rod extending through said bracket, said bell crank being pivotally mounted in said bracket for movement about its pivot when operated by its associated push rod, means for pivotally supporting said bracket on its associated panel for permitting rotation of said bracket and its associated bell crank through different angular distances, means for locking the bell crank in the position corresponding to the circuit open position of the circuit breaker, the push rod of each of said circuit breakers being operated by the closing of its associated movable arm to rotate its associated bell crank about its pivot and moving through said connecting rod the other of said bell cranks and the push rod of the other of said circuit breakers to the position corresponding to the circuit open position of the movable arm of said other circuit breaker.

4. In combination, a first circuit breaker, a second circuit breaker, each of said circuit breakers having a fixed contact and a movable arm carrying a movable contact for engaging and disengaging its associated fixed contact, a push rod and bell crank for each circuit breaker, a rotat-

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ably mounted support for said bell crank, said bell crank being pivotally mounted in said support for movement about said pivotal mounting by its associated push rod, means for mounting said support for rotation on said push rod as a center to provide a plurality of planes for the pivotal movement of said bell crank and a connecting link extending from said bell crank in directions depending on the angular position of said support.

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