

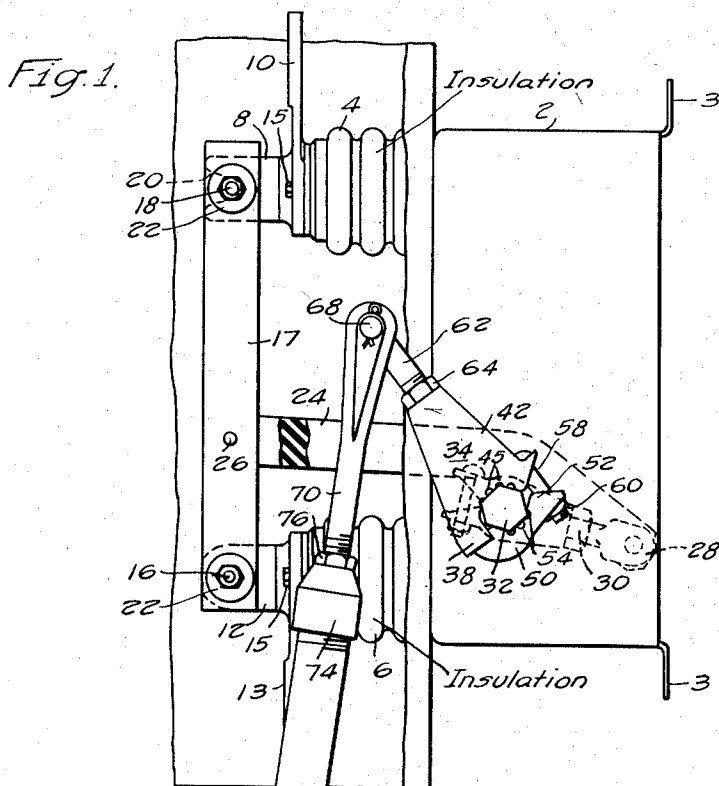
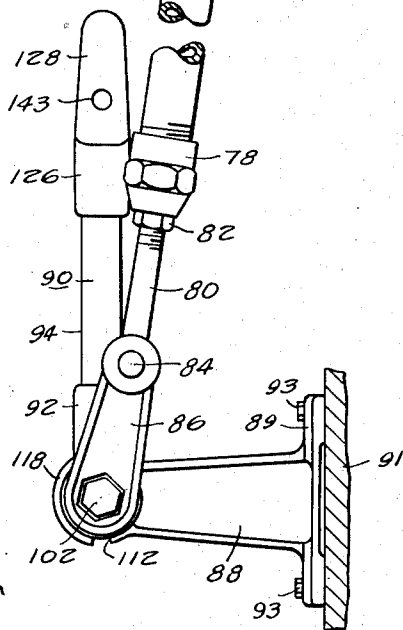
Dec. 25, 1951

H. J. CRABBS
OPERATING MECHANISM

2,579,798

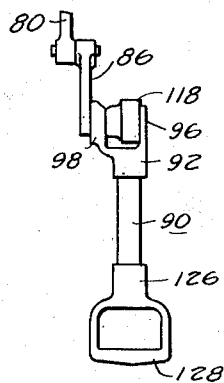
Filed April 30, 1945

3 Sheets-Sheet 1



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Fig. 10.



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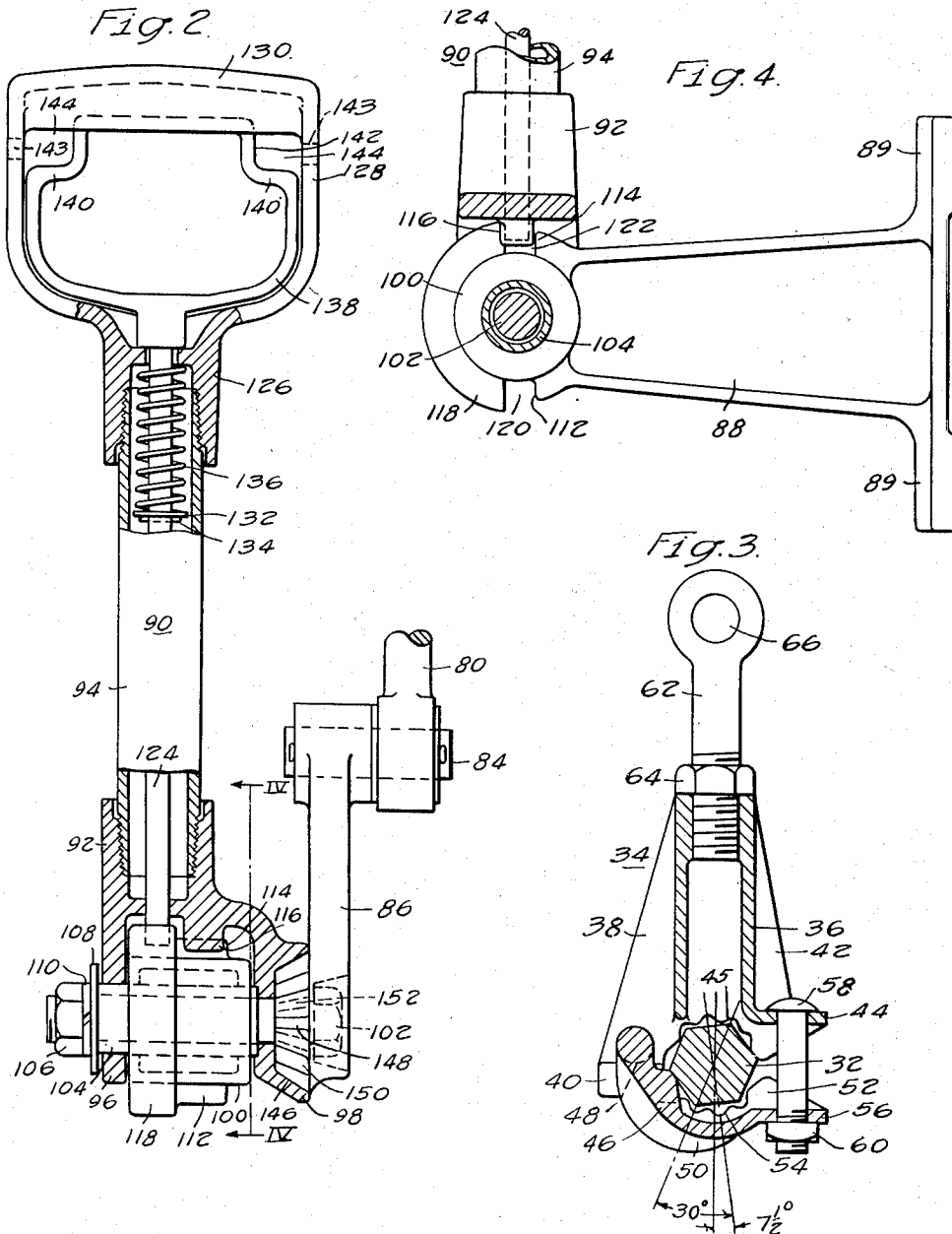
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OPERATING MECHANISM

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3 Sheets-Sheet 2



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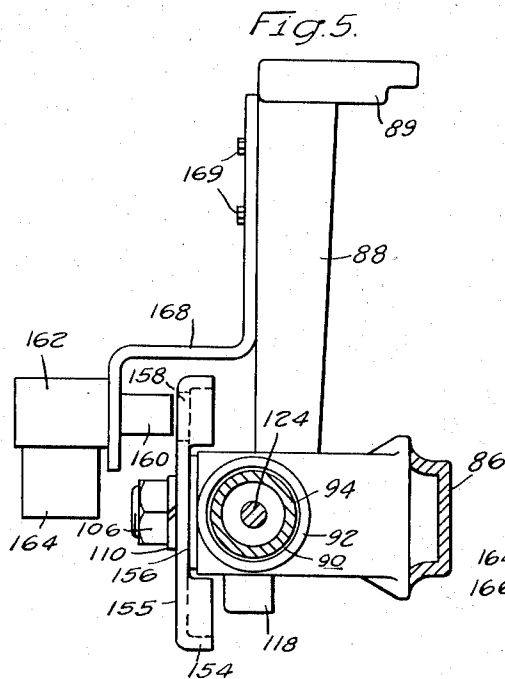
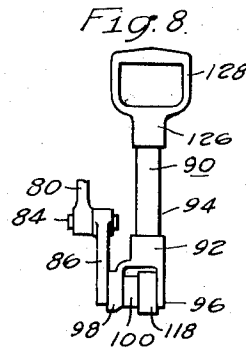
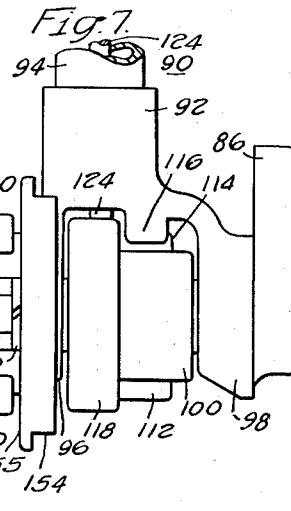
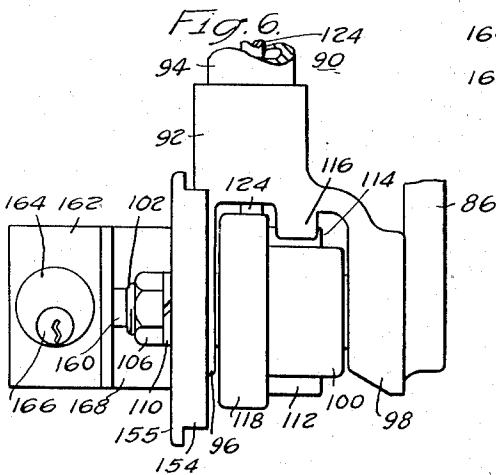
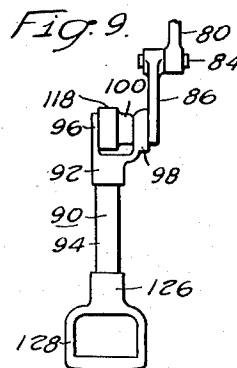
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3 Sheets-Sheet 3



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2,579,798

OPERATING MECHANISM

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Application April 30, 1945, Serial No. 591,077

18 Claims. (Cl. 200-162)

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This invention relates to electric switching mechanism in general, and especially to operating mechanism for disconnect switches.

In my copending application, Serial No. 591,078, filed April 30, 1945, on a Switch, and assigned to the same assignee as this invention, there is illustrated certain mechanism for operating electric switches from a countershaft located adjacent the switches, together with manually operable means for rotating the countershaft. It is often desirable, however, that provision be made for operating the switches from a remote point, for example when the switches are mounted on an elevated support, and for this purpose an operating handle is usually provided at the operating location suitably connected with the switch operating shaft by suitable motion transmitting means, such as linkage or the like.

One object of this invention is to provide novel simplified remotely operated mechanism for electric switching means.

Another object of this invention is to provide remotely operated mechanism for electric switching means embodying relatively few parts which are capable of being assembled in a plurality of different relations in a novel manner, to readily effectuate a plurality of different mounting arrangements of the mechanism.

Another object of this invention is to provide novel remotely operated toggle linkage for actuating electric switch means, which linkage is readily adjustable in a novel manner.

Another object of this invention is to provide a novel operating mechanism for electric switching means remotely located with respect to the switching means, and which is relatively simple in form yet incorporates means for defining spaced positions of the mechanism corresponding to open and closed positions of the switching means, and may also include latch or lock means for retaining the mechanism at said spaced positions.

Another object of this invention is to provide a novel remote operating handle structure having latch means associated therewith for latching the handle at a plurality of different positions.

These and other objects of this invention will become more apparent upon consideration of the following description of preferred embodiments thereof, when taken in connection with the attached drawings, in which:

Figure 1 is a side elevation view partially in section, of a disconnect switch and its operating

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mechanism constructed in accordance with this invention.

Fig. 2 is an enlarged front view partially in section, of the operating handle and crank structure shown in Fig. 1.

Fig. 3 is a longitudinal sectional view of the remote operating crank for the disconnect switch countershaft shown in Fig. 1.

Fig. 4 is an enlarged sectional view of the operating handle support and a portion of the handle structure, taken substantially on the line IV-IV of Fig. 2.

Fig. 5 is a partial transverse section taken through the lower end of an operating handle structure similar to that shown in Figs. 1, 2 and 4, but illustrating an optional form of lock device.

Fig. 6 is a front view of the support and lower end of the operating handle structure and lock device shown in Fig. 5.

Fig. 7 is a view similar to Fig. 6, but illustrating a modified lock arrangement.

Fig. 8 is a schematic view of a modified arrangement of operating handle and actuating mechanism.

Fig. 9 is a schematic view of still another arrangement of operating handle and actuating mechanism, and

Fig. 10 is a schematic view of still another arrangement of operating handle and actuating mechanism.

The disconnect switch structure and its unitarily associated operating mechanism, including the common countershaft, is substantially identical with that disclosed and claimed in the aforementioned copending application. This structure in general comprises a hollow support of sheet metal 2 or the like, having mounting flanges 3 adapted to be secured to a suitable support, and supporting, at the side opposite mounting flanges 3, insulators 4 and 6 of porcelain or the like. Insulator 4 is adapted to have secured at its outer end a break contact tongue 8 having a terminal pad 10 integral therewith for the connection of a line conductor thereto. Insulator 6 has a hinge contact tongue 12 secured at its outer end, and provided with a terminal pad 13 integral therewith for the connection of another line terminal thereto. The contact tongues may be secured to the outer ends of insulators 4 and 6, respectively, by any desired means, for example by bolts 15.

A split switch blade 17 is adapted to have the split sides thereof positioned at opposite sides of the contact tongues at the closed position of the switch, with the blade being pivotally

mounted on hinge contact tongue 12 as by a pivot bolt 16, and the other ends of the blade sides are connected by a bolt 18 which is adapted to be received in a notch 20 provided in the outer end of the break contact tongue 8 at the closed position of the switch. Preferably, bolts 16 and 18 are provided with cup-shaped spring washers 22 for urging the sides of blade 17 towards each other into pressure engagement with the contact tongues.

As disclosed in the previously mentioned depending application, a plurality of identical disconnect switch structures may be mounted in side by side relation, with each switch blade 17 adapted to be actuated by a link 24, preferably of insulating material such as fiber or a molded insulating material, in order to insulate the switch from the switch actuating mechanisms. Link 24 is pivotally connected between the sides of its split blade 17 by a pivot pin 26, and, in turn, is pivoted at its other end on a connecting rod 28 which connects a plurality of actuating cranks 30 mounted on a countershaft 32.

It will be observed that at the closed position of the switch illustrated in Fig. 1, connecting link 24 and actuating cranks 30 form toggle levers substantially at or slightly beyond an over-center position. The switch blades are thus locked by this toggle at their closed circuit positions, and in order to open the switches, countershaft 32 must be rotated in a counterclockwise direction, as viewed in Fig. 1, to thus move the switch blades in a similar manner to a position wherein they are spaced from break contact tongues 8. The switch blades may be moved to closed circuit position by rotation of the countershaft 32 in the opposite direction to the position shown in Fig. 1.

In accordance with this invention, countershaft 32 for operating the switch blades is provided at one end with a remote operating crank 34 of special construction. Referring particularly to Figs. 1 and 3, it can be seen that crank 34 comprises a tubular portion 36 having spaced flanges 38 at one side thereof terminating in laterally inwardly extending spaced pivot ledges 40. Tubular portion 36 of crank 34 is provided with spaced flanges 42 at the opposite side thereof having adjacent their lower ends a laterally outwardly extending apertured ledge 44, for a purpose to be described. Flanges 38 and 42 merge and below tubular portion 36 are notched, as at 45, for a purpose to be described. Crank 34 also includes a clamp member 46 which is generally arcuate in form and provided at one end with outwardly extending trunnions 48 adapted to be seated on pivot ledges 40 when clamp member 46 is inserted between the ledges. The outer surface of clamp member 46 is provided with ribs 50, and the inner surface has spaced flanges 52 which are notched as at 54, in a manner similar to flanges 38 and 42. The end of clamp member 46 opposite trunnions 48 is directed outwardly to form a flat apertured ledge 56 which cooperates with ledge 44 to receive a clamping bolt 58 having a nut 60 thereon, for pivotally moving clamp member 46 toward tubular portion 36 of the crank structure into clamping engagement with countershaft 32. Crank 34 also includes an extensible portion 62 threadedly engaged in the outer end of tubular portion 36, and having a lock nut 64 to secure it at an adjusted position. The outer end of extensible portion 62 of the crank structure is provided with an opening 66

for pivotal connection thereof to the remotely operated mechanism.

The special structure of crank 34 described above is for the purpose of permitting easy mounting thereof on countershaft 32, which is hexagonal in form, by means of a single clamp bolt 58. Notches 45 and 54 are provided in the separate clamping parts of the crank structure for the purpose of permitting interlocking of the crank structure and countershaft in a non-rotatable manner at a relatively large number of different angular positions of the crank relative to the shaft. For this purpose, it will be noted in Fig. 3 that notches 45 and 54 are provided spaced at an angle of 30°, thus permitting mounting of the crank at twelve different angular positions on countershaft 32 when the crank is applied thereto in the manner shown. However, it will be noted that the line passing through the opposed notches closest to the longitudinal axis of crank 34 is displaced at an angle of 7½° from the longitudinal axis of the crank. This means that if the crank is removed from countershaft 32 and turned over it can then be applied in a non-rotatable manner to the countershaft at twelve different angular positions, each of which lies intermediate the twelve positions at which the crank can be mounted when applied in the manner previously described. The purpose of providing a relatively large adjustment for crank 34 will become more apparent hereafter.

Crank 34 is adapted to be connected to remotely located manual operating mechanism by a pivot pin 68 connecting it with an extensible rod 70 of a tubular drive link 72. A tubular fixture 74 is threaded on the upper end of link 72, and, in turn, has rod 70 threaded therein and secured at an adjusted position by the lock nut 76. The other end of drive link 72 is provided with a tubular fixture 78 which, in turn, has threaded therein one end of an extensible rod 80 which is secured in adjusted position by a nut 82. Extensible rod 80 of link 72 is pivotally connected as by a pivot pin 84 with a drive crank 86 rotatably mounted on a supporting bracket 88. The supporting bracket is provided with a base flange 89 adapted to be secured to any suitable support 91, as by bolts 93.

An operating handle structure 90 is provided at its lower end with a mounting fixture 92 having at one end a tubular portion in which is threadedly received an elongated tube 94. The other end of mounting fixture 92 is fork-shaped to present spaced legs 96 and 98 which are adapted to receive therebetween the enlarged substantially cylindrically shaped outer end 100 of supporting bracket 88. The handle structure is adapted to be mounted on bracket 88 by means of a single pivot bolt 102 which extends through a close fitting bearing aperture in leg 98 of mounting fixture 92, through a bearing sleeve 104 provided in a bearing aperture in the outer end of bracket 88, with both the bolt and bearing sleeve extending through an aperture in leg 96 of mounting fixture 92, with a nut 106 for the bolt to secure the parts in assembled relation. Preferably, a washer 108 is provided on the bolt adjacent nut 106, and a lock washer 110 may also be provided.

The outer end 100 of support bracket 88 is provided with abutments 112 and 114 extending substantially entirely across the cylindrical portion 100 and positioned opposite each other slightly more than 180° apart. Abutments 112

and 114 are adapted to cooperate with stop lug 116 provided on mounting fixture 92 between legs 96 and 98 thereof, so as to be engageable with one end of each abutment 114 and 112 to limit rotation of the handle structure to an arc of substantially 180°. The cylindrical portion 100 of supporting bracket 88 is also provided at one end with a semi-circular flange 118, the ends of which terminate at points spaced from abutments 112 and 114, respectively, to provide latch recesses 120 and 122 therebetween. The latch recesses are adapted to receive a latch plunger 124 slidably mounted within handle tube 94.

The outer end of tube 94 of the handle structure is provided with a tubular fitting 126 threadedly mounted on the end of the tube, and having integral therewith a bail-like handle 128 provided with a transverse hand grip portion 130 which is channel-shaped in form with the channel opening inwardly, or towards tube 94. Latch plunger 124 is provided with a washer 132 within handle tube 94 which is maintained in position by a pin 134 extending through the latch plunger, for supporting a coil compression spring 136, which reacts between washer 132 and fixture 126, to continually bias the latch plunger towards support 88. At its outer end the latch plunger has an integral bail-like portion 138 adapted to be positioned within the bail-like handle 128 and includes transverse hand grip portions 140 provided with an extension 142 received in the channel of hand grip 130, to slidably guide bail-like portion 138. Guide extension 142 of the latch hand grip portion does not extend entirely across the interior of handle 128, so that openings 144 are provided at each side so that a padlock or the like may be inserted in openings 143 provided in opposite sides of handle 128 to prevent upward latch releasing movement of portion 138, as viewed in Fig. 2, and thus prevent unauthorized movement of handle 90.

Handle structure 90 is secured to drive crank 86 of the operating mechanism by pivot bolt 102, and may be secured thereto in a non-rotatable fashion at a plurality of different angular positions. For this purpose, leg 98 of handle mounting fixture 92 is provided with a substantially conically-shaped socket on the outer side thereof for cooperation with a conically-shaped boss 148 provided on drive crank 86. Boss 148 on the drive crank is provided with a plurality of ribs on the periphery thereof spaced a uniform predetermined distance apart, for example at an angle of 45°. Conical socket 146 is provided with a plurality of angularly spaced grooves 152 for receiving ribs 150 on the drive crank, and preferably grooves 152 are spaced apart a fraction of the angular spacing of ribs 150, for example one-half the spacing, or 22½°. With the spacings specifically mentioned, it is obvious that drive crank 86 may be non-rotatably secured to the handle structure by pivot bolt 102 at a plurality of equally spaced different angular positions 22½° apart.

In the closed switch position shown in Fig. 1, crank 86 and link 72 form a toggle which is at or just beyond an overcenter position. When it is desired to operate the switch by the mechanism described above from the closed circuit position illustrated in Figs. 1, 2 and 4 of the drawings, hand grip portions 130 and 140 are manually grasped, thus causing outward movement of the grip portion 140 to withdraw latch plunger 124 from recess 122 and release handle structure 90

for pivotal movement in a counterclockwise direction, as viewed in Figs. 1 and 4. The handle structure 90 may then be moved 180° to a depending position to thereby move switch blades 17 to their open circuit positions through the linkage 86, 72 and 34 to countershaft 32, and then to the switch blades as previously described. At the open circuit position, when hand grip portions 140 are released, the biasing spring 136 will automatically move latch plunger 124 into recess 120 and thus latch the handle structure 90 at the open circuit position of the switch. As previously described, stop lug 116 on the handle fixture 92 cooperates with abutments 112 and 114 to limit movement of the switch and thus define the extreme positions thereof at which it will be latched by latch plunger 124.

The particular operating mechanism disclosed renders installation thereof very easy, in that no drilling or tapping of any of the parts is required, as they may all be assembled in an extremely simple manner and secured at their proper adjusted positions by a single bolt or the like. Moreover, the particular mounting of the handle structure and its connection with drive crank 86 permits these parts to be mounted in a variety of different modes. Thus Fig. 2 illustrates a mode of mounting where, at the closed circuit position of the switches, handle 90 extends upwardly with drive crank 86 also extending upwardly at one side of the handle. In Fig. 8, there is illustrated a similar arrangement but with drive crank 86 mounted at the opposite side of the handle. This is easily done by merely removing the single bolt 102 if the parts are mounted in the positions shown in Fig. 2, and turning the handle structure and support 88 180° about their longitudinal axes, and reassembling the parts. The arrangement shown in Fig. 9 differs from that shown in Fig. 2 only in that operating handle structure 90 is in its lower position at the closed circuit position of the switches. The operating handle structure 90 may be either at its upper or lower position when the switches are closed, and this adjustment may be made merely by loosening bolt 102, and then tightening it when the handle has been moved to the desired position. In Fig. 10, the arrangement is similar to Fig. 8 except that the handle is at its lower rather than its upper position. Any of the arrangements shown in Figs. 2, 8, 9 and 10 may be easily obtained with the structure disclosed, merely by properly assembling handle structure 90 and drive crank 86 on support 88 by means of the single bolt 102. When the switches and mechanism are mounted in actual practice, the switches will usually be separately mounted and adjusted to their closed circuit position. The handle structure 90 will be mounted separately with the handle and drive crank located in the position desired at the closed circuit position of the switches. Drive link 72 is then attached to drive crank 86 and crank 34, with the latter crank, due to its capability of being mounted on countershaft 32 at a relatively great number of different angular positions, being then clamped by bolt 58 on to the shaft at a position very closely approximating that which will obtain the desired throw of the disconnect switches from closed to open circuit position with the available throw of drive crank 86. If any finer adjustment is necessary, this can be accomplished by adjusting extensible rods 70 and 80 at the ends of link 72 or by adjusting the length of crank 34.

It is also possible to provide the handle struc-

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ture 90 with key interlocks in a relatively simple manner as disclosed in Figs. 5, 6 and 7, by merely providing a lock plate 155 on bolt 102 at the side of the handle structure opposite drive crank 86. Lock plate 155 has a peripheral flange 154 which is interrupted at opposite points to form recesses 156 for receiving mounting fixture 92 of the operating handle structure. Accordingly, when lock plate 155 is secured in position as shown in Figs. 5, 6 and 7 by bolt 102, it is non-rotatably secured relative to handle structure 90. Lock plate 155 is provided with at least one aperture 158 adapted to be engaged in one position of the switch, for example, the closed circuit position, by a lock plunger 160 controlled by a lock 162 secured on the outer end of an angular supporting bracket 168, which may be mounted directly on supporting bracket 88, for example as by bolts 169. Lock plunger 160 is adapted to be extended and retracted by rotation of a tumbler cylinder 166 when a key is inserted therein and turned, with the tumbler cylinder being mounted in the usual lock barrel 164. Lock plunger 160 is illustrated in the drawings as being in its retracted position, permitting operation of handle structure 90.

Key interlocks such as that disclosed in Figs. 5, 6 and 7 are adapted for use in a well known manner with keys which also control similar key interlocks applied to other electrical apparatus, such, for example, as circuit breakers or the like, in the same circuit. Briefly, where key interlocks are applied to a disconnect switch and circuit breaker in the same circuit, the arrangement may be such that the key cannot be removed from the circuit breaker interlock when the breaker is closed, but can be removed when the breaker is opened for use in the disconnect switch interlock such as interlock 162, to unlock the disconnect switch and permit it to be opened. Similarly, when the disconnect switch is open plunger 160 is retracted and cannot be extended because it is blocked by plate 155, consequently, the key cannot be removed from lock 162 to permit operation of the breaker until the disconnect switch has been locked closed. Various other arrangements may be employed, for example, it may be desirable to provide a pair of key interlocks for locking the disconnect switch open as well as closed. This arrangement is shown in Fig. 7 wherein the lock plungers of both locks are adapted to cooperate with a single aperture provided in lock plate 155.

The locks arrangements shown in Figs. 5, 6 and 7 are more particularly described and claimed in my copending application, Serial No. 251,172, filed October 13, 1951, on Disconnecting Switch Operating Mechanism, as a continuation in part of this application, and assigned to the same assignee as this application.

It is apparent from the foregoing that the switch operating mechanism disclosed herein comprises but a relatively few parts to obtain a plurality of different mounting arrangements of the mechanism which results in a considerable saving in the number of stock parts and spare parts which must be kept to supply these mechanisms from stock. Furthermore, the various parts may be easily assembled in a relatively simple manner because no drilling, tapping, or other machining operations are required during installation, except for drilling and tapping holes for mounting bolts 93 and for bolts to mount support 2. As a matter of fact, but a single bolt 102 is required for mounting the operating handle structure 90 and to drivingly secure it to the

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operating mechanism at any of a plurality of different angular positions. In the same manner, the mechanism may be secured to switch countershaft 32 by a single bolt 58 at any of a relatively large number of different angular positions. Provision is made for relatively small angular and linear adjustment changes throughout the mechanism in order to simplify the installation and insure proper operation of the switches. Releasable latching and padlocking for various operating handle positions is arranged for, as well as the addition of key interlocks when desired. Although in the structure specifically disclosed but two releasable latching and padlocking provisions are disclosed, it is obvious that additional provisions may be included if desired, merely by providing additional recesses in flange 118 on support 88. Such an additional latching and padlocking position would be desirable if the switches are double throw switches, in which case a latching and padlocking position would be necessary intermediate the two positions disclosed defined by recesses 120 and 122 in the outer end of support 88. Moreover, the handle and mechanism is fully adjustable to any of the positions shown in Figs. 2, 8, 9 and 10 in a simple manner due to their assembly with but a single bolt 102.

Having disclosed preferred embodiments of the invention in accordance with the patent statutes, it is desired that the invention be not limited to these particular embodiments inasmuch as it will be apparent to persons skilled in the art that many changes and modifications may be made in these particular embodiments without departing from the broad spirit and scope of this invention. Accordingly, it is desired that the invention be interpreted as broadly as possible and that it be limited only as required by the prior art.

I claim as my invention:

1. Electric switching apparatus comprising, switch means adapted to be operated to open and closed circuit positions, an operating shaft connected to said switch means for operating the same, an operating crank for said shaft, an operating handle rotatably supported at a remote point, toggle linkage connecting said handle and crank, means for connecting one link of said linkage to said handle at a plurality of different relative angular positions comprising interfitting projection and recess means on said handle and link with means to clamp said interfitting means in engagement at any one of a plurality of different relative angular positions to positively lock them in engagement, and means for mounting said operating crank at a plurality of different angular positions on said operating shaft comprising interfitting projection and recess means on said crank and shaft with means to clamp said interfitting means in engagement at any one of a plurality of different relative angular positions to positively lock them in engagement, whereby said switch means and handle may be separately mounted for operation as desired, and thereafter said link and crank adjusted and locked on said handle and shaft so that said linkage will go overcenter at the closed circuit position of said switch means to prevent opening thereof.

2. Electric switching apparatus comprising, switch means adapted to be operated to open and closed circuit positions, an operating shaft for said switch means, an operating crank for said shaft, an operating handle rotatably supported at a remote point, toggle linkage connecting said

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handle and crank, one link of said linkage being adjustable in length, means for connecting one link of said linkage to said handle at a plurality of different relative angular positions, and means for mounting said operating crank at a plurality of different angular positions on said operating shaft, whereby said switch means and handle may be separately mounted for operation as desired, and thereafter said link and crank adjusted and mounted on said handle and shaft so that said linkage will go overcenter at the closed circuit position of said switch means to prevent opening thereof.

3. Electric switching apparatus comprising, switch means adapted to be operated to open and closed circuit positions, an operating shaft for said switch means, an operating crank for said shaft, an operating handle rotatably supported at a remote point, toggle linkage connecting said handle and crank, means for connecting one link of said linkage to said handle at a plurality of different relative angular positions, comprising means on said link and handle adapted to interfit at said plurality of different angular positions and a single bolt for securing said link to said handle at any of said positions, and means for mounting said operating crank at a plurality of different angular positions on said operating shaft comprising means on said crank and shaft adapted to interfit at said plurality of different angular positions and a single bolt for securing said crank on said shaft at any of said positions, whereby said switch means and handle may be separately mounted for operation as desired, and thereafter said link and crank adjusted and mounted on said handle and shaft so that said linkage will go overcenter at the closed circuit position of said switch means to prevent opening thereof.

4. Electric switching apparatus comprising, switch means adapted to be operated to open and closed circuit positions, a hexagonal operating shaft connected to said switch means for operating the same, an operating crank for said shaft, an operating handle rotatably supported at a remote point, toggle linkage connecting said handle and crank, means for connecting one link of said linkage to said handle at a plurality of different relative angular positions comprising interfitting projection and recess means on said handle and link with means to clamp said interfitting means in engagement at any one of a plurality of different relative angular positions to positively lock them in engagement, and means for mounting said operating crank at a plurality of different angular positions on said operating shaft comprising a shaft encircling portion on said crank having recesses angularly spaced not more than 60° for engagement with corners of said shaft, whereby said switch means and handle may be separately mounted for operation as desired, and thereafter said link and crank adjusted and mounted on said handle and shaft so that said linkage will go overcenter at the closed circuit position of said switch means to prevent opening thereof.

5. Electric switching apparatus comprising, switch means adapted to be operated to open and closed circuit positions, an operating shaft connected to said switch means for operating the same, an operating crank for said shaft, an operating handle rotatably mounted on a support at a remote point, toggle linkage connecting said handle and crank, means for connecting one link of said linkage to said handle at a plurality

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of different relative angular positions, means for mounting said operating crank at a plurality of different angular positions on said operating shaft, whereby said switch means and handle may be separately mounted for operation as desired, and thereafter said link and crank adjusted and mounted on said handle and shaft so that said linkage will go overcenter at the closed circuit position of said switch means to prevent opening thereof, and releasable latch means on said handle engageable with said support at least at the position of said handle corresponding to the closed circuit position of said switch means to lock said toggle linkage at said overcenter position and thus positively lock said switch means at closed circuit position.

6. Switch operating mechanism, comprising, motion transmitting mechanism for actuating switch means from a remote point, a supporting bracket including means for mounting the same at said remote point, an operating handle adapted to be rotatably mounted on said bracket by a single bolt, and said bolt also adapted to secure a part of said mechanism against one side of said handle, means on said one side of said handle for preventing relative motion of said mechanism part when secured thereto, whereby said mechanism may be secured to said handle for operation thereby at either side of said bracket mounting means by mounting said handle and bracket with said one side of the handle positioned on the same side with said mechanism.

7. Switch operating mechanism, comprising, motion transmitting mechanism for actuating switch means from a remote point, a supporting bracket including means for mounting the same at said remote point, an operating handle adapted to be rotatably mounted on said bracket by a single bolt, interfitting means on one side of said handle and a part of said mechanism for preventing relative rotation thereof when secured together, and said bolt also adapted to secure said part of said mechanism against said one side of said handle, whereby said mechanism may be secured to said handle for operation thereby at either side of said bracket mounting means by mounting said handle and bracket with said one side of the handle positioned on the same side with said mechanism.

8. Switch operating mechanism, comprising, switch means adapted to be operated to open and closed circuit positions, motion transmitting mechanism for actuating said switch means from a remote point, a supporting bracket at said remote point, an operating handle adapted to be rotatably mounted on said bracket by a single bolt, cooperating stop means on said handle and bracket for limiting rotation of said handle between positions corresponding to the open and closed circuit positions of said switch means, releasable latch means on said handle engageable with said support substantially at the extreme limits of handle movement, and means on said handle cooperating with said latch means for receiving a padlock to prevent release of said latch means when the padlock is in place.

9. Electric switching apparatus comprising, switch means adapted to be operated to open and closed circuit positions, an operating shaft for said switch means, an operating crank for said shaft, an operating handle rotatably supported at a remote point, toggle linkage connecting said handle and crank, means for connecting one link of said linkage to said handle at a plurality of different relative angular positions.

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said shaft being non-circular in section, said crank having separate portions for engagement with said shaft, said portions configured so as to be substantially pivotally engageable, and a single bolt for moving said portions toward each other into clamping engagement with said shaft.

10. Electric switching apparatus comprising, switching means adapted to be operated to open and closed circuit positions, an operating shaft for said switch means, an operating crank for said shaft, an operating handle rotatably supported at a remote point, toggle linkage connecting said handle and crank, means for connecting one link of said linkage to said handle at a plurality of different relative angular positions, said shaft being in the form of a regular polygon, said crank having separate portions for engagement with said shaft, said portions configured so as to be substantially pivotally engageable, a single bolt for moving said portions toward each other into clamping engagement with said shaft, said crank portions having their shaft engaging parts configured so as to non-rotatably engage said shaft at a plurality of different angular positions, and the longitudinal axis of said crank being at an angle relative to a normal axis of said polygon such that when said crank is turned over it can be non-rotatably secured to said shaft at a plurality of different angular positions lying intermediate said first-mentioned positions.

11. Switch operating mechanism, comprising, switch means adapted to be operated to open and closed circuit positions, motion transmitting mechanism for actuating said switch means from a remote point, a supporting bracket at said remote point, an operating handle adapted to be rotatably mounted on said bracket by a single bolt, the inner end of said handle being forked for receiving said bracket with said bolt passing through openings in the forked ends of said handle and said bracket, cooperating stop means on said handle and bracket for limiting rotation of said handle between positions corresponding to the open and closed circuit positions of said switch means, releasable latch means on said handle engageable with said support substantially at the extreme limits of handle movement, and said latch and stop means located within said forked portion.

12. In a device of the type described, a support, an operating handle adapted to be pivotally mounted at one end on said support, releasable latch means carried by said handle and being engageable with said support to releasably latch said handle at predetermined positions, a hand grip portion adjacent the other end of said handle, latch release means having at least one part positioned adjacent to but spaced from said hand grip portion so as to be manually moved relative to said hand grip portion when said portion and parts are manually grasped to thereby release said latch means, and portions of said latch release means at opposite sides of said spaced part positioned closely adjacent said hand grip portion to form an opening for receiving a padlock to prevent release of said latch means when said padlock is in place.

13. In a device of the type described, a support, an operating handle adapted to be pivotally mounted at one end on said support, releasable latch means carried by said handle and being engageable with said support to releasably latch said handle at predetermined positions, a rigid bail-like hand grip portion adjacent the other end of said handle, latch release means having

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a bail-like portion guided for movement in said hand grip portion so as to move outwardly to release said latch means when said bail-like portions are manually grasped, said latch release means being biased inwardly to a latching position, and said portions having a space therebetween for receiving a padlock to prevent release of said latch means.

14. In a device of the type described, a support, an operating handle adapted to be pivotally mounted at one end on said support, releasable latch means carried by said handle and being engageable with said support to releasably latch said handle at predetermined positions, a rigid bail-like hand grip portion adjacent the other end of said handle, the outer end of said portion having an inwardly facing groove, latch release means having a bail-like portion the outer end of which is guided for movement in said hand grip portion so as to be moved outwardly to release said latch means when said bail-like portions are manually grasped, said latch release means being biased inwardly to a latching position, and said portions having a space between the outer ends of said portions at least at one side thereof for receiving a padlock to prevent release of said latch means.

15. Electric switching apparatus comprising, switch means adapted to be operated to open and closed circuit positions, a hexagonal operating shaft connected to said switch means for operating the same, an operating crank for said shaft, an operating handle rotatably supported at a remote point, linkage connecting said handle and crank, means for connecting one link of said linkage to said handle at a plurality of different relative angular positions comprising interfitting projection and recess means on said handle and link with means to clamp said interfitting means in engagement at any one of a plurality of different relative angular positions to positively lock them in engagement, and means for mounting said operating crank at a plurality of different angular positions on said operating shaft comprising a shaft encircling portion on said crank having recesses annularly spaced 30° apart for engagement with corners of said shaft, whereby said switch means and handle may be separately mounted for operation as desired, and thereafter said link and crank adjusted and mounted on said handle and shaft so that the desired throw of said switch means is obtainable with the available handle movement.

16. Switch operating mechanism, comprising, a supporting bracket, a hollow operating handle having a forked portion at one end receiving said bracket and being rotatably mounted thereon by a single pivot bolt passing through the legs of said forked portion and said bracket, actuating mechanism secured to one outer side of said handle by said pivot bolt to be operated by said handle, releasable latch means in the forked portion of said handle cooperable with means on the part of said bracket received in said forked portion for releasably holding said handle at least at one predetermined position, and latch release means extending through said handle into proximity with the free end of said handle.

17. Switch operating mechanism comprising, a supporting bracket, a tubular operating handle which is joined at one end to the bight portion of a U-shaped mounting portion which is adapted to receive said bracket and be rotatably mounted thereon by a single pivot bolt, an actuating crank having an opening for receiving said bolt so as

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to be secured thereby to the outside of one leg of said mounting portion, releasable latch means including a rod extending through said handle into the space between the leg portions of said mounting portion so as to be engageable with said bracket to releasably latch said handle at a plurality of different positions, a hand grip at the other end of said handle, latch release means associated with the other end of said rod and being located adjacent said hand grip, and co-operating stop means on said handle and bracket also located in the space between said leg portions for limiting pivotal movement of the handle.

18. Switch operating mechanism comprising, a supporting bracket, a tubular operating handle which is joined at one end to the bight portion of a U-shaped mounting portion which is adapted to receive said bracket and be rotatably mounted thereon by a single bolt, releasable latch means including a rod extending through said handle into the space between the leg portions of said mounting portion so as to be engageable with said bracket to releasably latch said handle at a plurality of different positions, a rigid ball-like hand grip portion at the other end of said handle, latch release means secured to the other end of said rod and having a ball-like portion guided for movement in said hand grip portion so as to move outwardly to release said latch means when said ball-like portions are manually grasped, said latch release means being biased inwardly to a latching position, and said portions having a space

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therebetween for receiving a padlock to prevent release of said latch means.

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