Aug. 11, 1931. A. ALSAKER ET AL 1,817,904

SWITCH OPERATING MECHANISM

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Fig. 1.

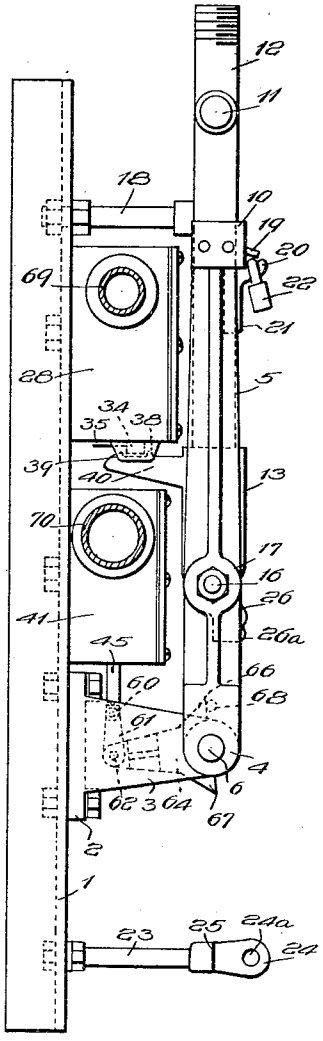
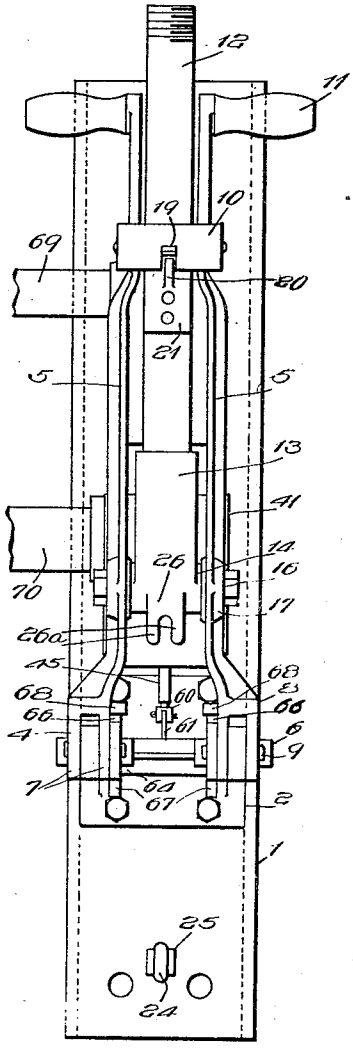


Fig. 2.



Witness:
William P. Kilroy

Inventors
Alfred Alsaker
Eric Nordhem

Brown Bortners & Dennes

Atty's.

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Fig. 3.

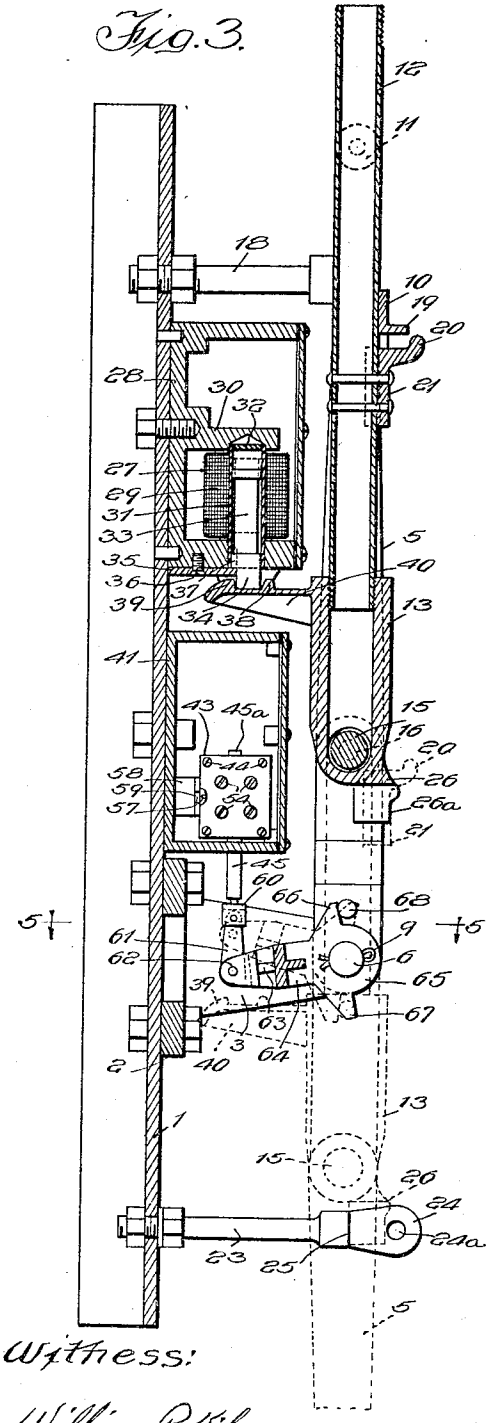


Fig. 4.

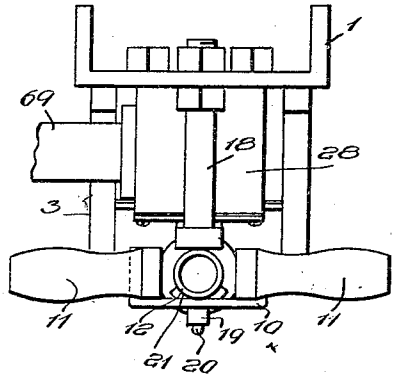
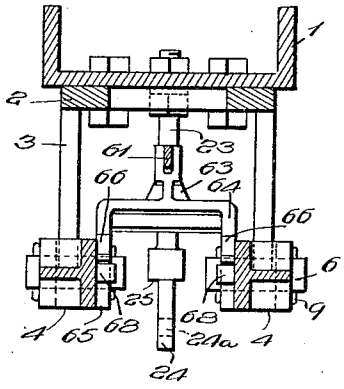


Fig. 5.



Witness:

William P. Kilroy

Inventors
Alfred Alsaker
Eric Nordhem

By Brown Boveneer & Dennis

Attys.

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Fig. 6.

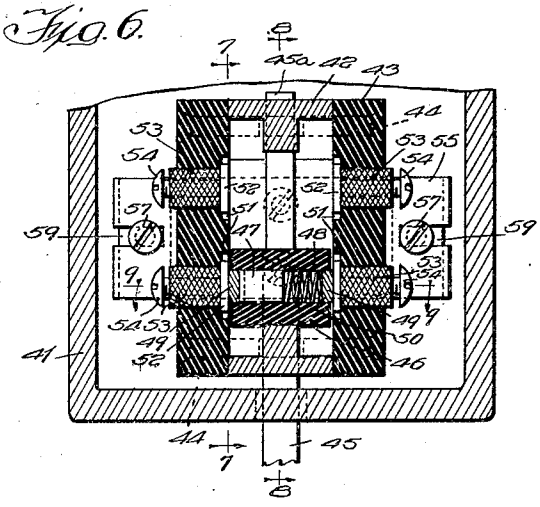


Fig. 7.

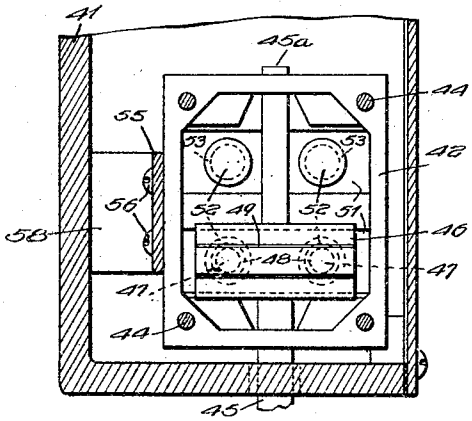


Fig. 8.

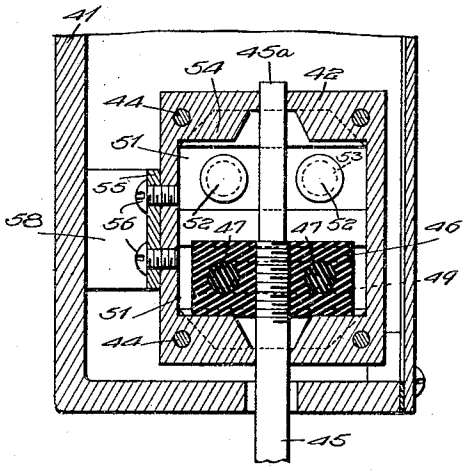
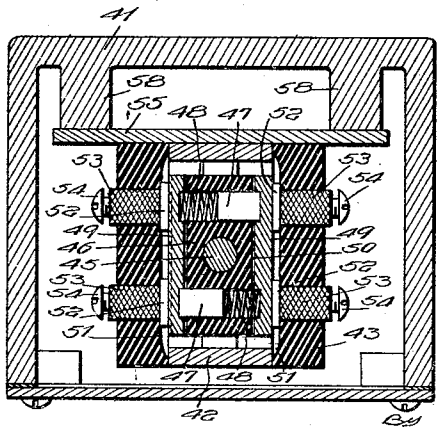


Fig. 9.



Witness:
William P. Kilroy

Inventors
Alfred Alsaker
Eric Nordhem
By Brown Boettcher & Dennis
Attys

Patented Aug. 11, 1931 1,817,904

UNITED STATES PATENT OFFICE

ALFRED ALSAKER AND ERIC NORDHEM, OF CHICAGO, ILLINOIS, ASSIGNORS TO THE DELTA-STAR ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

SWITCH OPERATING MECHANISM

Application filed April 29, 1927. Serial No. 187,670.

This invention relates to switch operating means, and more particularly to a handle structure for operating disconnect switches.

This device is intended more particularly for outdoor use for operating disconnect switches remote from the handle structure and connected thereto through a suitable system of links and levers. The structure includes an operating handle and a connecting rod connected thereto in such manner that the handle exerts a relatively great leverage effect upon the rod, facilitating operation of the switch. An additional feature of our invention is simple and efficient means whereby the handle may be locked in either of its operative positions, means being also provided for normally locking the handle in switch closing position and for preventing opening of the switch, the last mentioned locking means being capable of being controlled from a point remote from the handle. We also provide control or signaling means operated by the handle as it approaches the limit of its movement in either direction for signaling the condition of the disconnect switch to parties at a point remote therefrom. Further objects and advantages will appear from the detail description.

In the drawings:

Figure 1 is a side view of a switch operating handle and associated parts constructed in accordance with our invention;

Fig. 2 is a front view;

Fig. 3 is a central vertical sectional view through the mechanism taken from front to back;

Fig. 4 is an upper end view of the mechanism;

Fig. 5 is a section taken substantially on line 5—5 of Fig. 3;

Fig. 6 is a fragmentary transverse sectional view through the auxiliary switch and its housing;

Fig. 7 is a section taken substantially on line 7—7 of Fig. 6;

Fig. 8 is a section taken substantially on line 8—8 of Fig. 6; and

Fig. 9 is a section taken substantially on line 9—9 of Fig. 6.

The handle structure is mounted on a suitable base or support 1, such as a channel bar, which may be secured to a supporting structure in any preferred manner. A bracket 2 is secured to the support 1 by bolt and nut means, this bracket 2 being of rectangular shape and provided at each side with an outwardly projecting standard 3 having its outer or forward end thickened to form a bearing eye 4. A handle structure including two parallel levers 5 is mounted upon the standard 3 by means of pivot pins 6 passing through eyes 4 and through fingers 7 of forks 8 at the lower or inner ends of the levers. The pins 6 are held against endwise movement by cotter pins 9 passing therethrough, or in any other suitable or preferred manner. The levers 5 are of stepped formation with their upper portions disposed more closely adjacent than their lower or inner portions, the upper portions of these levers being connected by a U-brace 10 riveted thereto. At its upper or free end each lever is provided with a suitable handle 11 secured thereto in a known manner. This provides a simple and inexpensive handle structure which possesses great strength and is capable of exerting a great leverage effect.

An operating rod 12 is disposed between the two members or levers 5 of the handle structure and has its lower end secured in a socket 13 extending from a hub 14 which is secured between the levers 5 by a pivot pin 15 passing through the hub and secured in position by cap screws 16 which thread into the ends of the pivot pin, these cap screws passing through thickened eyes 17 formed in the levers 5. It will be noted that the rod 12 is thus connected to the handle structure eccentrically thereof and the distance between the pivot axis of the handle structure and the rod is comparatively short, so that, by swinging the handle about its pivot, a very decided leverage effect is exerted upon the rod 12 for operating the disconnect switch which is connected to this rod by a system of links and levers, as previously noted.

Movement of the rod 12 towards support 1 when the lever structure is swung upwardly into switch closing position is limited by an adjustable stop member 18 secured to the sup-

port and disposed to contact with the rod adjacent the upper end of the handle structure. A finger 19 projects from brace 10 and, when the handle structure is in full switch closing position, is disposed adjacent an angle finger 20 projecting from a plate 21 riveted to the rod 12. These two fingers, when the handle structure is in switch closing position, define an opening for reception of the shackle of a padlock 22. Due to the eccentric relation between the mounting of the handle structure and the operating rod 12, this provides simple and efficient means for locking the handle in switch closing position. An eye bolt 23 is secured to support 1 below the bracket 2 and is provided with a flat head 24 forming shoulders 25 adapted for contact with the fingers of a bifurcated lug 26 projecting from hub 14. When the handle structure is in its lowered or switch opening position the lug 26 straddles head 24 of eye bolt 23 and fingers 26*a* of this lug contact with shoulders 25 limiting movement of the rod 12 towards the support. With the parts in this position, by inserting the shackle of lug 22 through opening 24*a* of head 24, the handle and rod assembly is locked in inoperative or switch opening position.

To prevent opening of the disconnect switch when the line switch is closed, we provide means controlled from a sub-station or other point remote from the handle structure for locking the handle in switch closing position. In the form illustrated this means includes an electromagnet of suitable type indicated generally by 27 mounted in a suitable housing 28 secured to the support 1 adjacent the stop member 18. The coil 29 of this magnet is confined between the lower end wall of housing 28 and an arm 30 extending inwardly from the rear wall of the housing. This arm is recessed from its under face to receive the upper end of a brass tube 31, in the upper end of which is disposed a washer 32 of fiber or other suitable material. A steel plunger 33 is slidably mounted in sleeve 31 which extends through the lower end wall of housing 28, as illustrated. The lower end portion 34 of this plunger is squared and reduced in thickness. A key plate 35 is secured to the lower end of housing 28 by screws 36 and has its forward end closely adjacent the inner flattened face of portion 34 of the plunger so as to hold the plunger against turning movement, this face also contacting with the shoulder 37 at the upper end of portion or element 34 to limit downward movement of the plunger. When the plunger is in its normal lowered position the element or nose 34 thereof is disposed to engage between projections or lugs 38 and 39 on a hook or latch member 40 integral with socket 13, when the handle and rod assembly is in raised or switch closing position. The latch member and the plunger thus provide a lock which prevents opening of the disconnect switch so long as the electromagnet 27 is unenergized, even though the padlock 22 be removed. When the line has been opened by means of the usual oil switch and conditions are proper for opening of the disconnect switch, the electromagnet is energized so as to raise the plunger 33, permitting opening of the disconnect switch.

We also provide, in conjunction with the electromagnetic inter-lock, an auxiliary signaling circuit control switch which may be used to control one or more inter-locking circuits for indicating the condition of either the disconnect switch, or the line switch, or both, the circuits having associated therewith suitable signaling means which may be situated adjacent the operating handle or at a point a distance therefrom, as desired. An auxiliary switch housing 41 is secured to the support 1 below the housing 28 and contains a suitable switch structure for controlling inter-locking or signaling circuits of the character above stated. The detail construction of this switch is illustrated in Figs. 6 to 9. The switch includes a rectangular frame 42 of phosphor-bronze or other suitable material, the opposite sides of this frame being closed by cap or closure plates 43 of any suitable electrical insulating material, such as the synthetic resin commercially known as bakelite. These closure plates are secured by screws 44 which thread into the thickened collar portion of frame 42. An operating rod 45 is slidably mounted through the lower end of housing 41 and a block 46 of insulating material is threaded onto this rod. The rod is also provided with a reduced upper portion 45*a* which slides through the upper end of frame 42. This block is provided, adjacent each end thereof, with a bore which extends through the block from one lateral face to the other lateral face thereof. Each of these bores receives a short pin 47 and an expansion spring 48. The outer portions of the spring and the pin seat in grooves in the inner faces of contact strips 49 of copper or other suitable electrical conducting material which, in turn, seat in grooves 50 extending from front to back of the lateral faces of the block. As illustrated in Fig. 9, the springs and pins of the two bores in the block are oppositely related so that each strip 49 is held against endwise movement by one pin and one spring. The pins 47 are of fiber or other suitable electrical insulating material and the springs and the pins co-act to hold the contact strips 49 pressed outwardly against the inner faces of the plates 43. Each plate 43 is provided, adjacent each end thereof, with a groove 51 knurled out of its inner face. These grooves receive contact heads 52 at the inner ends of tubular terminal elements 53 extending through the plates and bored and threaded for reception of screws 54 for connection of

the ends of wires or conductors to the terminal elements. When the block 46 is shifted into either of its operative positions, the pairs of terminal elements are electrically connected in proper relation through the contact strips 49. This provides simple and efficient means for closing and opening the inter-locking or signaling circuits controlled by the auxiliary switch. Movement of the block 46 in either direction beyond full operative position is prevented by stop elements 54 extending inwardly from the ends of the frame 42, and the switch structure, as a whole, is held rigidly in position in the housing by means of a supporting strip 55 secured to the inner or back side of frame 42 by screws 56, the ends of this strip being secured by screws 57 to bosses 58 projecting forwardly from the back wall of housing 41. As illustrated in Fig. 6, the supporting strip 55 is preferably provided with slots 59 in its ends which receive the screws 57 and permit slight adjustment of the switch structure when positioning the same accurately in the housing.

The lower end of rod 45 is bored and threaded for reception of the threaded shank of a clevis 60 in which is pivotally secured the upper end of a link 61, the lower end of which is pivotally secured in a bifurcated head 62 at the inner end of a neck 63 formed integrally with the bight portion of a U-shaped yoke 64 provided at the outer end of each arm with an eye 65 through which passes the pivot pin 6. This yoke is thus mounted for rocking movement about an axis coincident with the pivotal axis of the handle structure. Each eye 65 is provided with upper and lower shoulders 66 and 67, respectively, projecting beyond the eye radially thereof and disposed for contact with a stud 68 projecting inwardly from the inner face of the inner finger 7 of each fork 8 at the pivoted end of each of the lever elements 5. The shoulders 66 and 67 and the studs 68 are so related that the studs contact with the shoulders as the handle structure approaches the limit of its movement in either direction, thus rocking the yoke 64 about the pins 6 and shifting the block 46 of the switch structure into its corresponding operative position. This provides a lost motion connection between the operating rod and handle assembly in the auxiliary switch such that the switch is not actuated until the handle approaches its extreme position in either direction, and the switch controls the interlocking or auxiliary signaling circuit in such manner as to indicate accurately the condition of the disconnect switch.

To permit of the electromagnet and the terminal element of the auxiliary switch to be connected into their proper circuits, the housings 28 and 41 are provided with openings through which extend conduits 69 and 70 through which the wires or conductors are led in a known manner. As illustrated in Figs. 1 and 2, when the handle and operating rod assembly is in its normal or switch closing position, the handle structure and the rod are disposed in front of the housings 28 and 41 to protect the same from injury by blows from the front thereof. The handle and switch assembly also render the housings comparatively inaccessible when in switch closing position, and serve to prevent tampering therewith.

As will be understood, and as above indicated, changes in details of construction and arrangement of parts of the invention may be resorted to without departing from the field and scope of the same, and we intend to include all such variations, as fall within the scope of the appended claims, in this application in which the preferred form only of our invention is disclosed.

What we claim is:—

1. In switch operating means, a support, a handle structure pivotally mounted on the support, an operating rod pivotally connected to the handle structure eccentric to the pivot axis thereof, cooperating means carried by the handle structure and the rod and adapted for reception of a lock shackle for locking said rod and said structure together and in operative position, and cooperating means carried by the support and the handle structure and rod assembly and adapted for reception of a lock shackle for locking said rod in inoperative position.

2. In switch operating means, a pivotally mounted handle structure, an operating rod connected to said structure for operation thereby, and electro-responsive means for normally releasably securing the handle and the rod in operative switch closing position.

3. In switch operating means, a support, a handle structure pivotally mounted on the support for movement toward and away from the same, an operating rod pivotally connected to the handle structure eccentric to the pivot axis thereof, a stop limiting movement of the rod toward the support when the handle is turned into switch closing position, and means intermediate the stop and the pivot of the rod for releasably securing the rod against movement away from the support.

4. In switch operating means, a support, a handle structure pivotally mounted on the support for movement toward and away from the same, an operating rod pivotally connected to the handle structure eccentric to the pivot axis thereof, cooperating means carried by the handle structure and rod assembly for releasably securing the same against movement toward or away from the support when said assembly is moved into switch closing position, and means for securing the assembly in full switch opening position.

5. In switch operating means, a support, a handle structure pivotally mounted on the support, an operating rod pivotally connected to the handle structure eccentric to the pivot axis thereof, stop means limiting movement of the rod toward the support in switch closing direction, a hook member secured to the rod and extending toward the support when said rod is in switch closing position, said hook being disposed between the stop means and the pivot axis of the rod, and means cooperating with said hook for releasably securing the rod against movement away from the support.

6. In switch operating means, a support, a handle structure pivotally mounted on the support, an operating rod pivotally mounted on said structure eccentric to the pivot axis thereof, stop means limiting movement of the rod toward the support in switch closing direction, a hook member secured to the rod, and an electromagnet on the support having a movable plunger projecting beyond the core of the magnet, the hook member engaging the projecting portion of said plunger and holding the rod against movement away from the support when said rod is in full switch closing position, the plunger being moved out of hook engaging position when the electromagnet is energized.

7. In switch operating means, a support, a handle structure pivotally mounted on the support, an operating rod pivotally connected to the handle structure eccentric to the pivot axis thereof, stop means limiting movement of the rod toward the support in switch closing direction, a latch member secured to the rod between the pivot axis thereof and the stop member, an electromagnet on the support having a slidable core having an end portion adapted and disposed for engagement with the latch member when the core is lowered, the plunger having a projection adjacent the upper end of said end portion, and means co-acting with said projection and the lower end portion of the core for holding the core against turning and limiting its downward movement.

8. In switch operating means, a support, housings mounted on said support, a handle structure pivotally mounted on the support, an operating rod pivoted to the handle structure eccentric to the pivot axis thereof, the handle and rod assembly overlying the housing when in operative switch closing position, signaling circuit controlling means in one of the housings and actuated by the handle structure, electro-responsive latch means in the other housing, and a latch member carried by said assembly and cooperating with said means.

9. In a switch operating means, a support, a handle structure pivotally mounted on the support, an operating rod pivotally mounted on said structure eccentric to the pivot axis thereof, stop means limiting the movement of the rod in the switch closing direction, a hook member secured to the rod, and an electromagnet on the support, said electromagnet having a magnetically controlled element projecting beyond the core of the magnet, the hook member engaging the projecting portion of said element and holding the rod against movement when said rod is in the full switch closed position.

10. In a switch operating means, a support, a handle structure pivotally mounted on the support, an operating rod pivotally connected to the handle structure eccentric to the pivot axis thereof, stop means limiting the movement of the rod in the switch closing direction, a latch member for locking the rod against movement, and electromagnetic means carried by the support and located between the support and the operating rod for controlling the latch member.

11. In a switch operating means, a support, a handle structure pivotally mounted on the support, an operating rod pivotally connected to the handle structure eccentric to the pivot axis thereof, stop means limiting the movement of the rod in the switch closing direction, a latch for locking the rod against movement, and an electromagnet on the support and located between the support and the operating rod, said electromagnet having means normally disposed for engagement with the latch member when the winding of the electromagnet is deenergized and moved out of position for freeing the same when the winding is energized.

In witness whereof, we hereunto subscribe our names this 27th day of April, 1927.

ALFRED ALSAKER.
ERIC NORDHEM.