C. AALBORG.

CIRCUIT INTERRUPTER.

APPLICATION FILED OCT. 17, 1918.

1,371,536.

Patented Mar. 15, 1921.

2 SHEETS—SHEET 1.

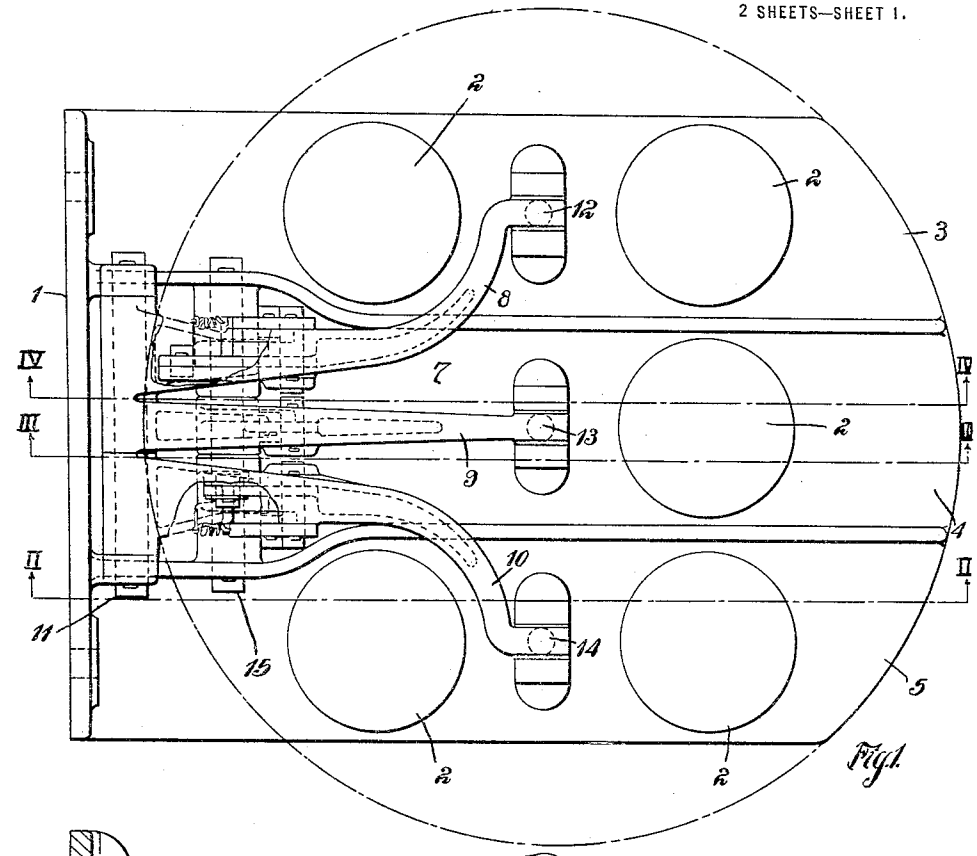


Fig. 1.

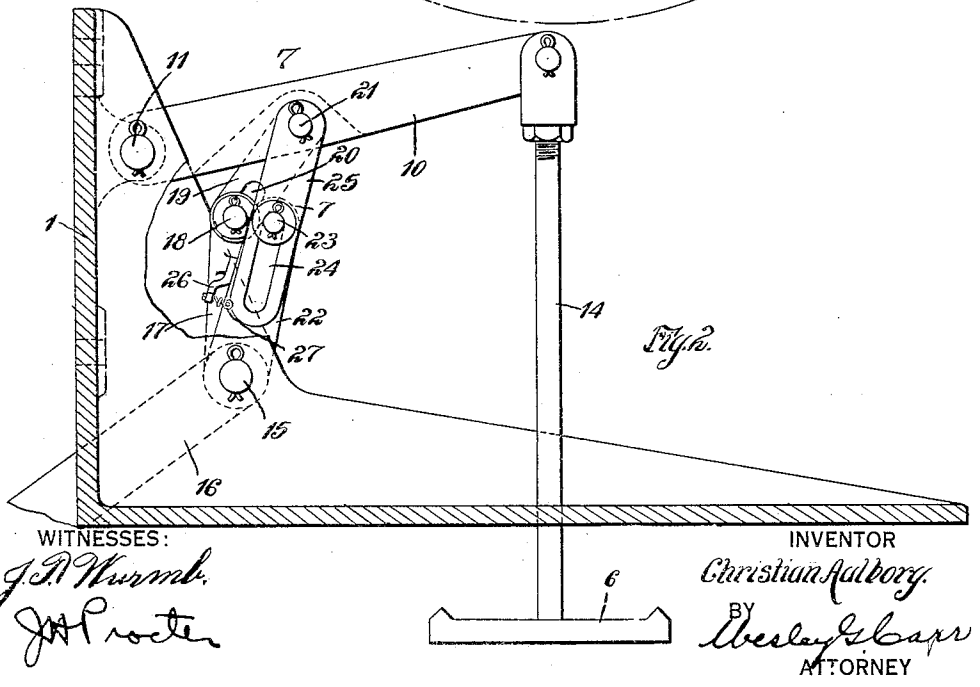


Fig. 2.

WITNESSES:

J. R. Wurmb.

J. W. Procter

INVENTOR

Christian Aalborg.

BY

Wesley G. Capp

ATTORNEY

C. AALBORG.

CIRCUIT INTERRUPTER.

APPLICATION FILED OCT. 17, 1918.

1,371,536.

Patented Mar. 15, 1921.

2 SHEETS—SHEET 2.

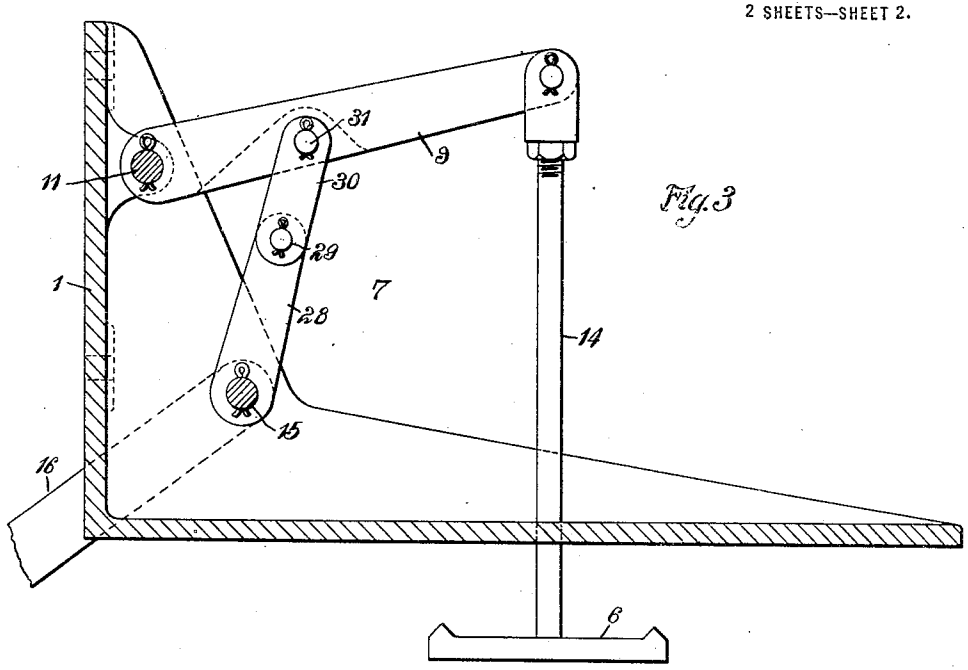


Fig. 3

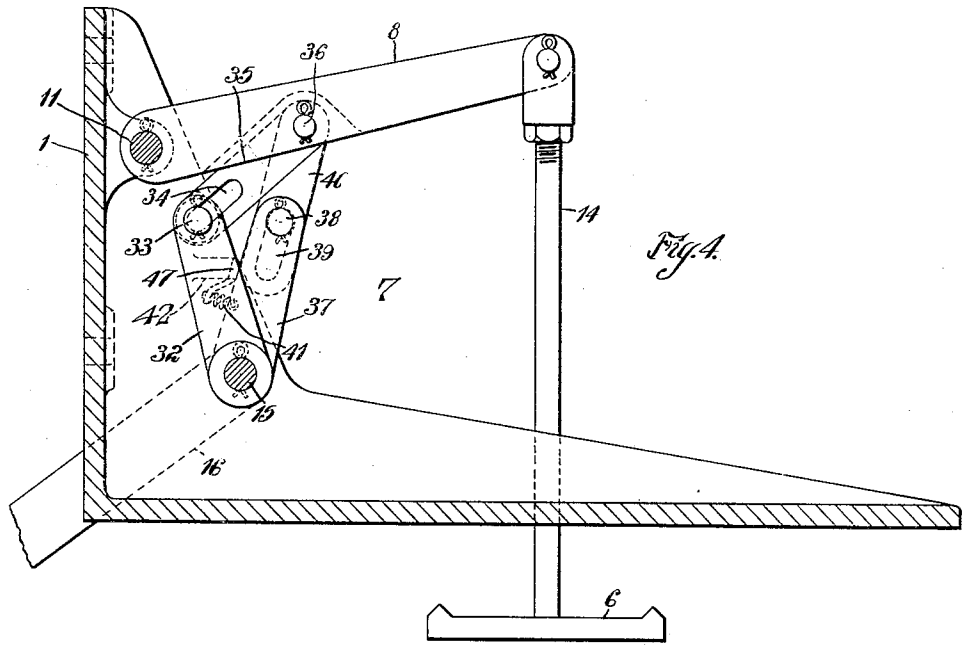


Fig. 4

WITNESSES:

J. P. Murmb.

J. A. Proctor

INVENTOR

Christian Aalborg.

BY

Wesley G. Carr

ATTORNEY

UNITED STATES PATENT OFFICE.

CHRISTIAN AALBORG, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

CIRCUIT-INTERRUPTER.

1,371,536. Specification of Letters Patent. Patented Mar. 15, 1921.

Application filed October 17, 1918. Serial No. 258,600.

To all whom it may concern:

Be it known that I, CHRISTIAN AALBORG, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Circuit-Interrupters, of which the following is a specification.

My invention relates to circuit interrupters and particularly to multi-pole interrupters, the poles of which are adapted to be successively operated.

One object of my invention is to provide a multi-pole interrupter that shall have a single operating device for successively actuating its various sets of contact members.

A further object of my invention is to provide an interrupter, of the above indicated character, that shall be simple and inexpensive to construct and effective in its operation.

In practising my invention I provide three lever arms that are operatively connected to the respective bridging contact members of the interrupter. A single actuating shaft is provided with three sets of actuating toggle mechanisms that are connected between the shaft and the respective lever arms. The toggle mechanisms are displaced with respect to each other and are of such construction that, when the shaft is actuated, the lever arms are moved successively to operative positions. By this arrangement, resistance may be inserted gradually upon completing a circuit to thus prevent excessive stress on the circuit during the switching operation.

Figure 1 of the accompanying drawings is a top plan view of a circuit interrupter embodying my invention; and Figs. 2, 3 and 4 are views showing the switch in closed position taken along the lines II—II, III—III and IV—IV, respectively, of Fig. 1.

A circuit interrupter embodying my invention comprises, in general, a supporting member 1, a plurality of stationary terminal members 2 that are arranged to constitute units 3, 4 and 5; movable bridging contact members 6 for the respective units and an operating mechanism 7 for successively actuating the bridging contact members 6.

The operating mechanism 7 comprises three lever arms 8, 9 and 10 that are pivotally mounted, at one end, on a shaft 11 and are operatively connected through rods 12, 13 and 14, to the respective bridging contact members 6. A main shaft 15 is pivotally supported on the member 1 and is provided with a lever arm 16 for actuating the same.

A lever 17, having a pin 18 therein, is secured to the shaft 15, and a link 19, having a slot 20 therein, is secured to the lever arm 10 by a pin 21 at a point intermediate its ends. The pin 18 is disposed in the slot 20 and is adapted to assume the position shown in Fig. 2 of the drawings when the unit 5 of the interrupter is in its closed position. A link 22 is loosely mounted on the shaft 15 and is provided with a pin 23 that is disposed in the slot 24 of a link 25 which is pivotally mounted, at its upper end, to the pin 21. The links 22 and 25 are adapted to assume a slightly off-center position when the interrupter is closed, as shown in Fig. 2, and are held in this position by a projection or stop member 26 mounted at the side of the lever 17. During the opening operation, the shaft 15 is turned in the clockwise direction. This moves the projection 26 against the link 22 to move the links 22 and 25 to the other side of the center line between the shaft 15 and the pin 21, but the lever arm 10 will not be released from its closed position until the links 17 and 19 have also crossed their dead-center position. A spring 27 is disposed between the lever 17 and the link 22 for actuating the latter when the shaft 15 is turned to close the interrupter. The toggle mechanism, comprising the lever 17 and the link 19, constitutes an actuating toggle device, and the links 22 and 25 constitute a holding toggle device for maintaining the lever arm 10 in its upper or closed position.

As shown in Fig. 3 of the drawings, a lever 28 is secured to the shaft 15 and is operatively connected, through a pin 29, a link 30 and a pin 31, to the lever arm 9. This device constitutes a toggle mechanism for actuating and holding the lever arm 9.

As shown in Fig. 4 of the drawings, a lever 32 is secured to the shaft 15 and is provided with a pin 33 that is movable in the slot 34 of a link 35 the upper end of which is operatively secured, through a pin 36, to the lever arm 8. A link 37 is loosely mounted

on the shaft 15 and is provided with a pin 38 that is disposed in the slot 39 in a link 40 which is pivotally secured, by the pin 36, to the lever arm 8. The lever 32 and the link 35 constitute an actuating toggle mechanism which, through a spring 41, is adapted to actuate the holding mechanism comprising the links 37 and 40. A projection or stop device 47, on the link 32, is provided for limiting the movement of the link 37 in one direction and for moving it in the opposite direction. A stop member 42 may be employed on the supporting member 1 to limit the movement of the link 32 and, consequently, to limit the closing movement of all of the toggle devices.

The slots 20, 24, 34 and 39 are of such dimensions as to permit sequential movement of the pins therein. That is, the slot 20 is substantially as long as the radial distance between the centers of the pins 18 and 23 in the positions shown in Fig. 2 of the drawings to permit the links 17 and 19 to pass their dead-center position while the weight of the lever arm 10 is still exerted between the pins 21 and 23 through the link 25, while the length of the slots 34 and 39, for similar reasons, is substantially equal to one half the radial distance between the centers of the pins 33 and 38, as shown in Fig. 4 of the drawings. The length of the slot 24 is substantially equal to the radial distance between the centers of the pins 33 and 38 to compensate for the similar distances which the pins 33 and 23 must move before all of the toggle mechanisms are finally released.

If it is desired to close the interrupter, the handle lever 16 is moved downwardly to turn the shaft 15, and thus the levers 32, 17 and 28 that are angularly disposed about the shaft will become effective in succession.

When the lever arm 32 is actuated, its pin 33 first moves toward the upper end of the slot 34 and thus constitutes a toggle mechanism for actuating the lever arm 8 and the movable bridging member 6. Of course, when the toggle mechanism passes over its dead-center position the links 37 and 40 will have been moved to such positions and so held by the projection 42 that the lever arm 8 is maintained in its closed position.

When the pin 33 begins to move toward the lower part of the slot 34, the pin 18 of the lever arm 17 will be in such position with respect to its slot 20 as to actuate the lever arm 10, and the links 22 and 25 will serve to hold the lever arm 10 in its closed position.

Further movement of the shaft 15 causes the pin 18 to move to the position shown in Fig. 2, and the toggle mechanism, comprising the lever 28 and link 30, is actuated to the position shown in Fig. 3 of the drawing. Thus, the units 3, 5 and 4 are actuated successively to close the various contact members of the interrupter.

If it is desired to successively open the various units, the handle lever 16 is released, and the toggle mechanism comprising the lever 28 and link 30 buckle to permit the lever arm 9 to move downwardly. After the shaft 15 has turned a sufficient distance, the projection 26 will move the links 22 and 25 over their dead-center positions and further movement will cause the lever 17 and the link 19 to permit the lever arm 10 to move downwardly. Similarly, further movement of the shaft 15 will cause the links 37 and 40 to release the lever arm 8 and, after the pin 33 has reached the end of its upward movement path in the slot 34, the toggle mechanism, comprising the lever 32 and link 35, will permit the lever arm 8 to move downwardly.

With my invention, successive operation of various units of an interrupter may be obtained by means of a single operating device.

My invention is not limited to the specific structure illustrated, as it may be variously modified without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim as my invention:

1. In a circuit interrupter, the combination with a plurality of movable contact members, and a single operating member, of a plurality of toggle devices operatively connected between the movable contact members and the single operating member for actuating the contact members in a predetermined sequence in response to a single movement of the operating member.

2. In a circuit interrupter, the combination with a plurality of movable contact members, and a single operating member, of a plurality of toggle devices connected to the operating member at all times for so connecting the movable contact members to the operating member that the contact members shall be actuated in a predetermined sequence.

3. In a circuit interrupter, the combination with three movable members and a single operating member, of three dissimilar toggle mechanisms for so operatively connecting the respective movable members to the operative member that the movable members shall be actuated in a predetermined sequence.

4. In a circuit interrupter, the combination with three movable members and a single operating member, of three dissimilar holding toggle mechanisms for so operatively connecting the respective movable members to the operating member that the movable members shall be latched closed in a predetermined order.

5. In a circuit interrupter, the combination with three pivotally mounted contact-carrying lever arms, and a rotatable actuating shaft, of a toggle device connected between the shaft and one lever arm, and two lost-motion toggle devices connected between the shaft and the other lever arms, said toggle devices being displaced with respect to each other to obtain sequential operation of the lever arms.

6. In a circuit interrupter, the combination with a plurality of contact-carrying lever arms and a common actuating device therefor, of a plurality of displaced toggle devices connected at all times between the actuating device and the respective lever arms for effecting the successive operation thereof.

7. In a circuit interrupter, the combination with three contact-carrying lever arms and a common actuating shaft therefor, of a toggle mechanism connected between one lever arm and the shaft, and two pin-and-slot lost-motion toggle mechanisms connected between the shaft and the other lever arms.

In testimony whereof, I have hereunto subscribed my name this 25th day of Sept., 1918.

CHRISTIAN AALBORG.