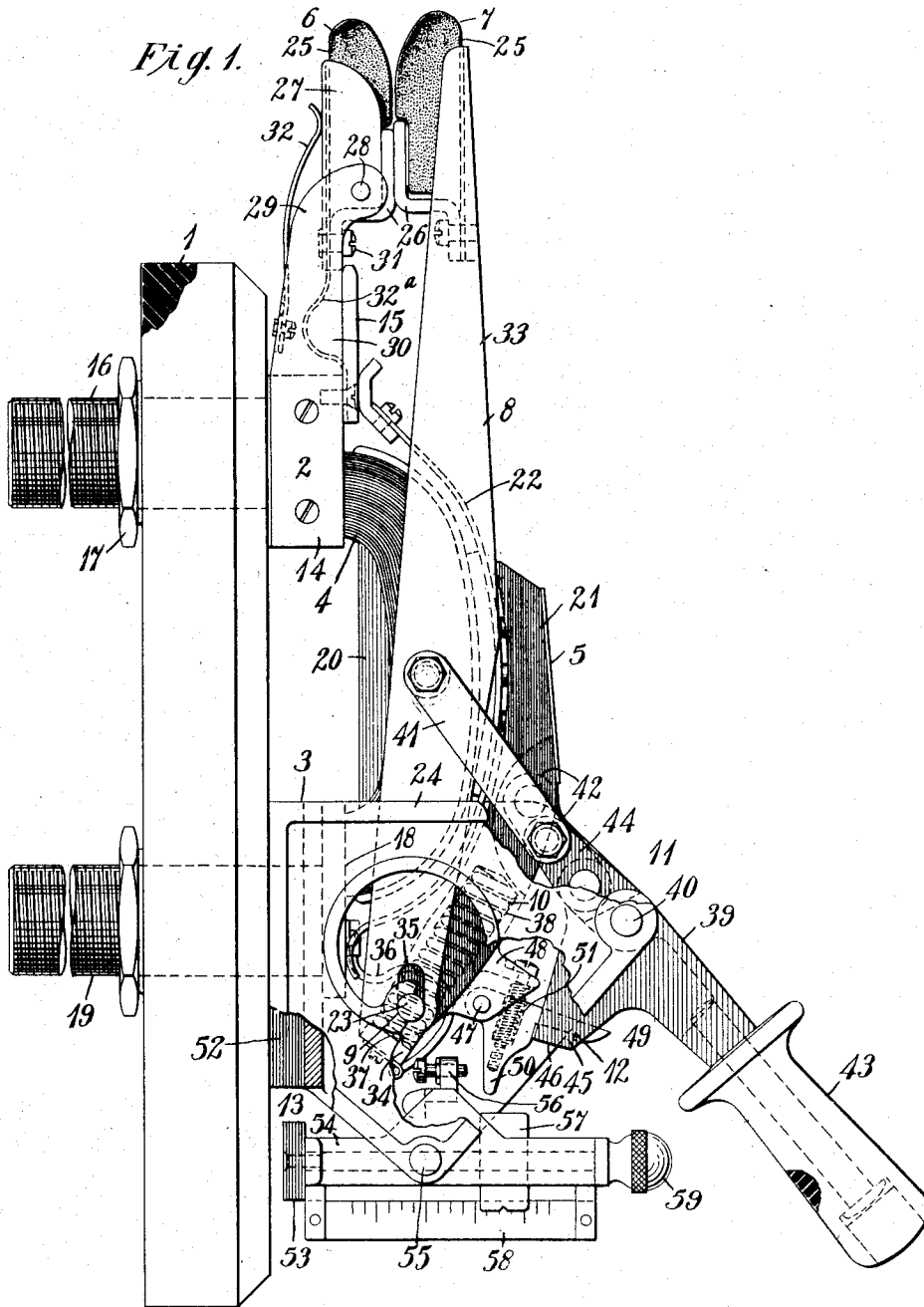


C. AALBORG & T. S. PUKERUD.
CIRCUIT INTERRUPTER.
APPLICATION FILED JULY 24, 1911.

1,189,392.

Patented July 4, 1916.

2 SHEETS—SHEET 1.



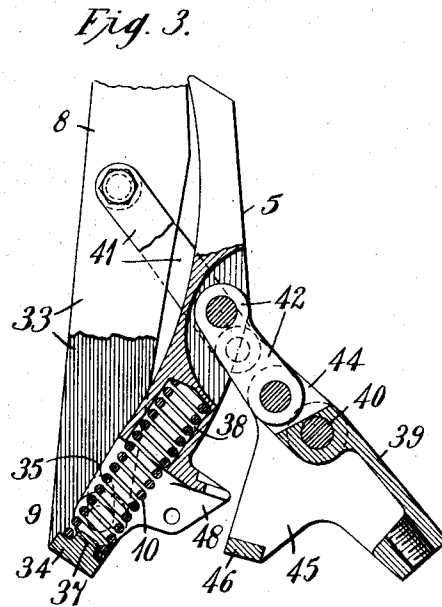
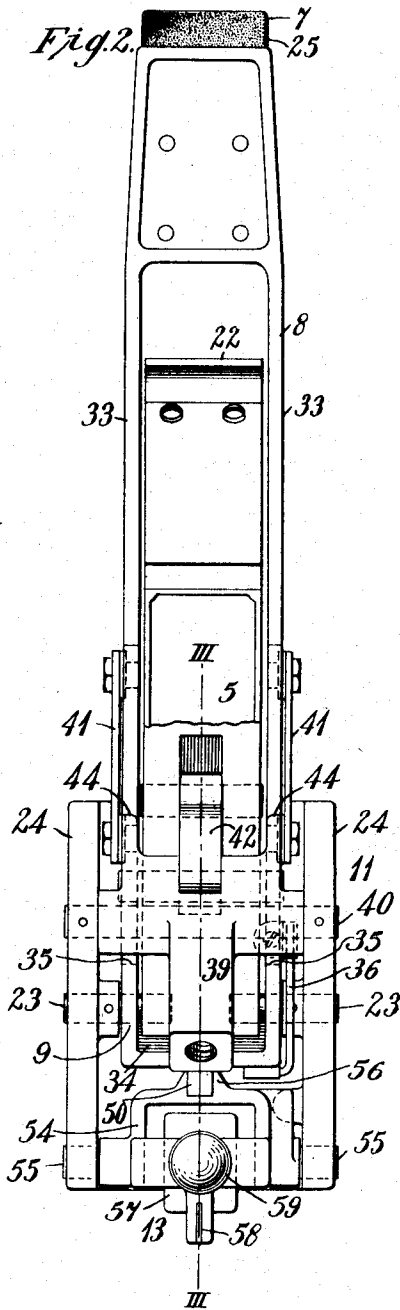
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UNITED STATES PATENT OFFICE.

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CIRCUIT-INTERRUPTER.

1,189,392.

Specification of Letters Patent.

Patented July 4, 1916.

Application filed July 24, 1911. Serial No. 640,192.

To all whom it may concern:

Be it known that we, CHRISTIAN AALBORG and THOMAS S. PUKERUD, citizens of the United States, and residents 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.

Our invention relates to interrupters for electric circuits and it has particular reference to such devices as are provided with auxiliary arcing terminals.

One object of our invention is to simplify and improve the construction and operation of devices of the above-indicated class and to provide a circuit-interrupter which shall be compact, durable and inexpensive in construction, and reliable and effective in operation.

Another object of our invention is to provide a circuit-interrupting device of this general class having a main movable contact member and an auxiliary movable arcing terminal which are independently mounted upon separate supporting arms, and means for positively interconnecting said arms and associating them definitely with the operating lever in such manner that the engagement and separation of the movable contact members with respect to their cooperating stationary members must necessarily be effected in a predetermined order. Furthermore, we provide a suitable lost-motion connection for the purpose of obtaining a sufficient time element between the engagement or separation of the cooperating main and auxiliary contact members to insure effective and reliable operation, said means also acting in conjunction with the operating mechanism for effecting a wiping contact between the cooperating arcing terminals.

Our invention may best be understood by reference to the accompanying drawings, in which—

Figure 1 is a view in side elevation of a device constructed in accordance with our invention, a portion being broken away for the sake of clearness. Fig. 2 is a front elevation of the device shown in Fig. 1, the operating handle being removed. Fig. 3 is a sectional view of a portion of the inter-

rupter taken along the line III—III of Fig. 2.

Referring to the drawings, the device shown comprises an insulating panel or slab 1, main stationary contact members 2 and 3, a cooperating movable contact member 4, a supporting arm 5 therefor, a stationary arcing terminal 6, a cooperating movable arcing terminal 7, a supporting arm 8 for the said movable terminal, a lost-motion connection 9, a spring 10, an operating mechanism 11, a latch 12, and a releasing mechanism 13.

The main stationary contact terminal 2 comprises a contact block 14 and an auxiliary contact plate 15, said contact block constituting the head of a stud 16 that projects through an opening in the insulating panel 1 and is secured thereto by a nut 17. The stationary contact member 3 also comprises a contact block 18 which forms an integral part of a stud 19 that projects through the insulating panel 1 to form the other terminal of the interrupting device.

The movable contact member 4 comprises a plurality of strips of conducting material which are held in position between curved clamping plates 20 and 21, and is adapted to cooperate with and bridge across the main stationary contact members 2 and 3. An auxiliary conducting member 22 is resiliently associated with the main bridging contact member 4 and is adapted to cooperate with the auxiliary contact plate 15 and the contact member 3 in a manner that is old and familiar to those skilled in the art. The outer clamping plate 21 constitutes the supporting arm 5 for the movable contact member 4, and its lower end is pivotally supported upon pins 23 that project from bracket members 24, which are suitably secured to the insulating panel 1.

The arcing terminals 6 and 7 comprise carbon tips 25 and metal plates 26. The carbon tip 25 of the stationary terminal 6 is securely fastened within its retaining member 27, which is pivotally mounted upon a pin 28 between upwardly projecting arms 29 of a U-shaped supporting member 30, the latter being suitably attached to the contact member 2. The conducting plate 26 constitutes the lower portion of the stationary arcing terminal 6 and is secured to the sup-

porting member 30 by means of screws 31. A spring 32 is provided and rests against the back of the retaining member 27 in such manner as to maintain the arcing terminal 6 in engagement with its cooperating movable arcing terminal 7. Furthermore, a flexible shunt 32^a is employed to electrically connect the arcing terminal 6 with the main contact member 2.

10 The movable arcing terminal 7 is similar in construction to that hereinbefore described and is rigidly mounted at the upper end of the supporting arm 8 which comprises substantially parallel side members 33, the upper ends of which are united to receive the arcing terminal 7 and the lower ends of which are connected by means of a cross piece 34. The lower ends of the side members 33 are pivotally mounted upon the pins 23 and a substantially vertically disposed slot or recess 35 is provided for the purpose of permitting a vertical sliding movement of the arm 8. A flexible conducting member 36 electrically connects the supporting arm 8 with the stationary contact member 3.

In assembling the parts of the interrupter, the movable contact member 4 and its supporting arm 5 are disposed between the side members 33 of the supporting arm 8 and, in order to maintain said arm 8 in its lowermost position with respect to the pin-and-slot connection 9, the spring 10 is interposed between the cross piece 34 of the supporting arm 8 and the supporting arm 5, one end of the spring being held in position by a projection 37 on said cross piece and the other end being disposed within a recess 38 in the supporting member 5.

40 The operating mechanism 11 comprises an operating lever 39 that is pivotally mounted upon a pin 40 between the bracket members 24 and a plurality of links 41 and 42 which are respectively connected between the operating lever 39 and the supporting arms 8 and 5. The lever 39 comprises a handle 43, upwardly projecting side arms 44 which are connected to the links 41, and downwardly projecting arms 45 that are connected by cross piece 46.

The lever 39 and the links 41 constitute the operating toggle for actuating the supporting arm 8, while the lever 39 and the link 42 constitute the operating toggle for the supporting arm 5, said toggles occupying an approximately dead center position when the interrupter is closed, as shown in Fig. 1. The links 41 are disposed outside of the side members 33 of the supporting arm 8, while the link 42 is centrally disposed with respect to the operating lever 39 of the supporting arm 5.

The latch 12 is pivotally mounted upon a pin 47 between projecting members 48 which form integral parts of the supporting arm

5, said latch comprising a catch 49 which is adapted to engage the cross piece 46 and to restrain the operating mechanism in its closed position, and a downwardly projecting striking member 50. A spring 51 is suitably interposed between the projecting members 48 and the latch member 12 for the purpose of maintaining the catch 49 in engagement with the cross piece 46.

The releasing mechanism 13 comprises a stationary magnetizable core 52, a movable cooperating armature 53 and a movable tripping member 54. The stationary core 52 comprises a plurality of U-shaped punchings that surround the stud 19 and are suitably secured to the insulating panel 1. The movable armature 53 is fastened to one end of the tripping member 54, which is pivotally mounted upon pins 55 between the bracket members 24 and is provided with an adjustable trigger member 56 to engage the latch 12 in the usual manner. A weight 57, a calibrated scale 58, and an adjusting knob 59 are also associated with the tripping member 54 in order that the circuit-interrupter may be adapted to be released when any desired predetermined amount of current traverses the stud 19, said stud constituting the single turn of the exciting winding of the core 52.

The operation of the interrupting device is as follows: Assuming the various parts to occupy the positions shown and that sufficient current traverses the interrupter to cause the movable armature 53 to be attracted to its stationary core 52, the trigger member 56 delivers a blow to the latch 12, thereby withdrawing the catch 49 from the cross piece 46. Thereupon, the operating toggles hereinbefore set forth are allowed to collapse and, in so doing, the supporting arm 5 is moved outwardly, thereby causing the separation of the main movable contact member 4 from the stationary contact members 2 and 3 and also effecting the disengagement of the auxiliary conducting member 22 from the contact plate 15 and contact member 3, as will be readily understood. Concurrently with this operation, the supporting arm 8 is forced downwardly, through the agency of the spring 10, into its lowermost position with respect to the pin-and-slot connection 9, thereby effecting a wiping contact between the cooperating arcing terminals 6 and 7. Subsequent to this operation, the conducting arm 8 is moved outwardly and the disengagement of the cooperating arcing terminals 6 and 7 is effected, it being understood that the final interruption of the circuit takes place between the carbon tips 25 of the arcing terminals so that the arcing is confined thereto.

It should be understood that the proportions and locations of the various parts are so chosen that the separation of the main

cooperating contact members 2, 3 and 4, the auxiliary conducting member 22 and conducting plate 15 and the contact member 3, the cooperating conducting plates 26, and the cooperating arcing tips 25, takes place in the order named. It will also be understood that, by reason of the pin-and-slot connection hereinbefore referred to, the movable contact member 4 is well separated from the cooperating contact members 2 and 3 prior to the final interruption of the circuit through the arcing terminals. Moreover, inasmuch as the supporting members 5 and 8 are positively connected together and to the operating lever 39, it is evident that there is no possibility of the various cooperating contact members opening in an improper order.

Assuming the interrupter to be open, the closing operation is as follows: The handle 43 is forced downwardly, thereby forcing the operating toggles hereinbefore mentioned toward their dead center positions. In so doing, the cooperating arcing terminals 6 and 7 are first closed, after which the supporting arm 8 is raised into its uppermost position with respect to the pin-and-slot connection, thereby effecting a wiping contact, as will be readily understood. At the same time, the supporting arm 5 is rotated in such manner as to effect the closure of the movable contact member 4 and the stationary contact members 2 and 3. However, by reason of the pin-and-slot connection and the particular proportions and arrangement of parts, the final closure of the circuit through the movable contact member 4 is effected last, after which the latch 12 engages the cross piece 46 and restrains the operating mechanism in its closed position. It is evident that, by reason of the link connections between the supporting arms 5 and 8 and the operating lever 39, the contact members are positively actuated in a predetermined order.

Although we have shown and described our invention as embodying specific structural details and as illustrating a single-pole circuit interrupter, it will be understood that it is also applicable to multipolar interrupters. Furthermore, such modifications as may be effected in the arrangement and location of parts by those skilled in the art without materially changing the operation or the results secured are to be understood as included within the spirit and scope of our invention.

We claim as our invention:

1. In a circuit interrupter, the combination with main stationary contact terminals, a movable contact member to cooperate therewith, an auxiliary stationary contact terminal and a movable cooperating contact terminal, of an operating mechanism comprising a handle lever and a plurality

of links severally associated with said movable member and terminal for positively and successively actuating said member and said terminal in unison, and means for effecting a wiping contact between said cooperating auxiliary contact terminals.

2. In a circuit interrupter, the combination with main and auxiliary movable contact members and supporting arms therefor, of an operating mechanism embodying a handle and a plurality of links severally pivotally connected to said handle and to said supporting arms.

3. In a circuit interrupter, the combination with main stationary contact terminals, a cooperating movable contact member, a stationary arcing contact terminal, a cooperating movable arcing terminal and an arm for supporting said movable arcing terminal, of an operating mechanism separately associated with said movable contact member and said supporting arm to effect concurrent operation thereof, and means associated with said supporting arm and cooperating with said operating mechanism for effecting a wiping contact between said cooperating arcing terminals.

4. In a circuit interrupter, the combination with main stationary contact terminals, a cooperating movable contact member, a stationary arcing contact terminal, a cooperating movable arcing terminal, and an arm for supporting said movable arcing terminal, of an operating lever, positive means for pivotally connecting said lever to said movable contact member and to said supporting arm, and a lost-motion connection associated with said supporting arm for permitting a wiping contact between said cooperating arcing terminals.

5. In a circuit interrupter, the combination with a movable contact member, a movable arcing terminal, and an arm for supporting the movable arcing terminal, of positive means embodying linkage mechanisms severally associated with said movable contact member and said supporting arm for actuating said member and said arm in unison with said positive means, and resilient means disposed between said movable contact member and said supporting arm.

6. In a circuit interrupter, the combination with main and auxiliary movable contact members and separate supporting arms therefor, of a lost-motion connection associated with one of said supporting arms, and an operating mechanism embodying a handle, and a plurality of links severally pivotally connected to said handle and to said supporting arms.

7. A circuit interrupter comprising a pivotally mounted member, a movable arcing terminal, a supporting arm therefor, an operating lever, positive means for severally

connecting said lever with said pivotally mounted member and said supporting arm to effect concurrent operation thereof with said lever, a pin-and-slot connection for pivotally mounting said supporting arm and for permitting a sliding movement thereof, and a spring disposed between said pivotally mounted member and said arm and tending to maintain said arm in a definite position with respect to its pivotal mounting.

8. A circuit interrupter comprising main cooperating stationary and movable contact members, auxiliary cooperating stationary and movable contact members, separate arms for pivotally supporting said movable members, positive means embodying a handle, and rigid members severally pivotally associated with said arms and said handle for actuating said supporting arms in a predetermined order, and a sliding connection associated with one of said supporting arms.

9. A circuit interrupter comprising a main movable contact member, an auxiliary movable contact terminal, means for pivotally supporting said movable members, an operating lever separately associated with said supporting means for actuating said means in unison therewith, a sliding connection associated with one of said supporting means for permitting a longitudinal movement of one of said supporting means, and a spring tending to oppose said movement.

10. In a circuit interrupter, the combination with a movable contact member, a movable arcing terminal and an arm for supporting the movable arcing terminal, of positive means for connecting and actuating said movable contact member and said supporting arm in unison, and resilient means associated with said arm for influencing its movement.

11. In a circuit interrupter, the combination with a movable contact member, a movable arcing terminal and a supporting arm for said movable arcing terminal, of a lost-motion pin-and-slot connection for pivotally mounting said supporting arm, and a compression spring interposed between substantially the lower end of said arm and said

movable contact member and tending to maintain said arm in its lowermost position.

12. A circuit-interrupter comprising a pivotally mounted contact member, a movable arcing terminal, a supporting arm therefor, an operating lever, links for positively and severally connecting said lever to said bridging member and said supporting arm, a pin-and-slot connection for pivotally supporting said arm and for permitting a sliding movement thereof, and a compression spring interposed between said arm and bridging member for maintaining said arm in a predetermined position with respect to its pivotal mounting.

13. In a circuit interrupter, the combination with main and auxiliary movable contact members and separate movable means for supporting said members, of means for actuating said supporting means and associated contact members comprising a positively connected linkage mechanism the parts of which move in unison.

14. In a circuit interrupter, the combination with main and auxiliary contact members, a movable supporting arm for one of said members, a similar arm for the other of said members comprising a plurality of side members severally disposed on the opposite sides of said first mentioned arm and mounted on the same pivotal support, and an operating mechanism positively and separately associated with said supporting arms, of a lost motion connection associated with one of said arms and permitting longitudinal movement thereof, and a compression spring longitudinally and centrally disposed between the side members of one of said arms, the opposite ends thereof engaging, respectively, the several arms.

In testimony whereof, we have hereunto subscribed our names this 19th day of July, 1911.

CHRISTIAN AALBORG.
THOMAS S. PUKERUD.

Witnesses:

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B. B. HINES.