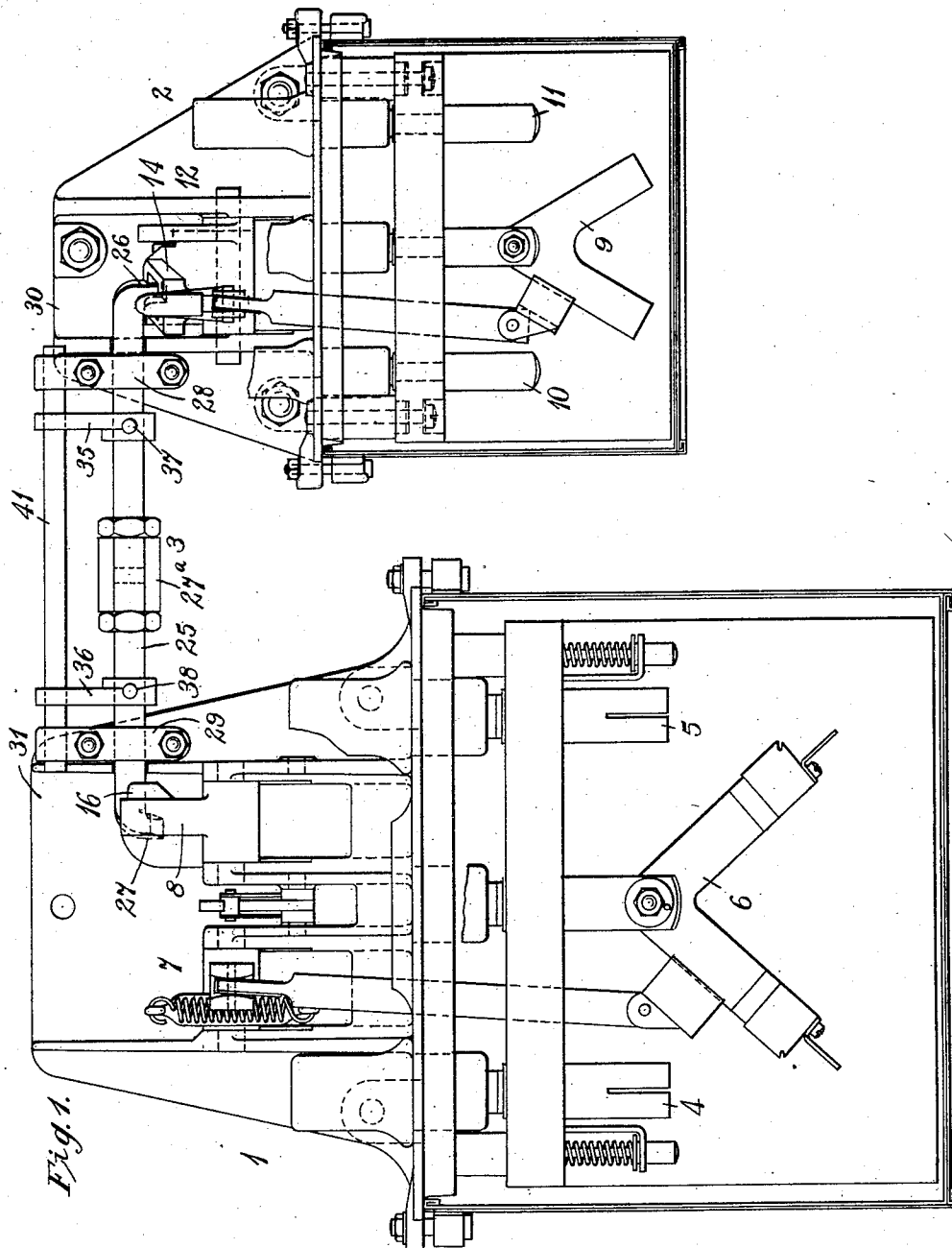


C. AALBORG.
INTERLOCKING DEVICE.
APPLICATION FILED JULY 13, 1910.

1,070,936.

Patented Aug. 19, 1913.

2 SHEETS-SHEET 1.



WITNESSES:
Fred H. Miller
D. H. Mace

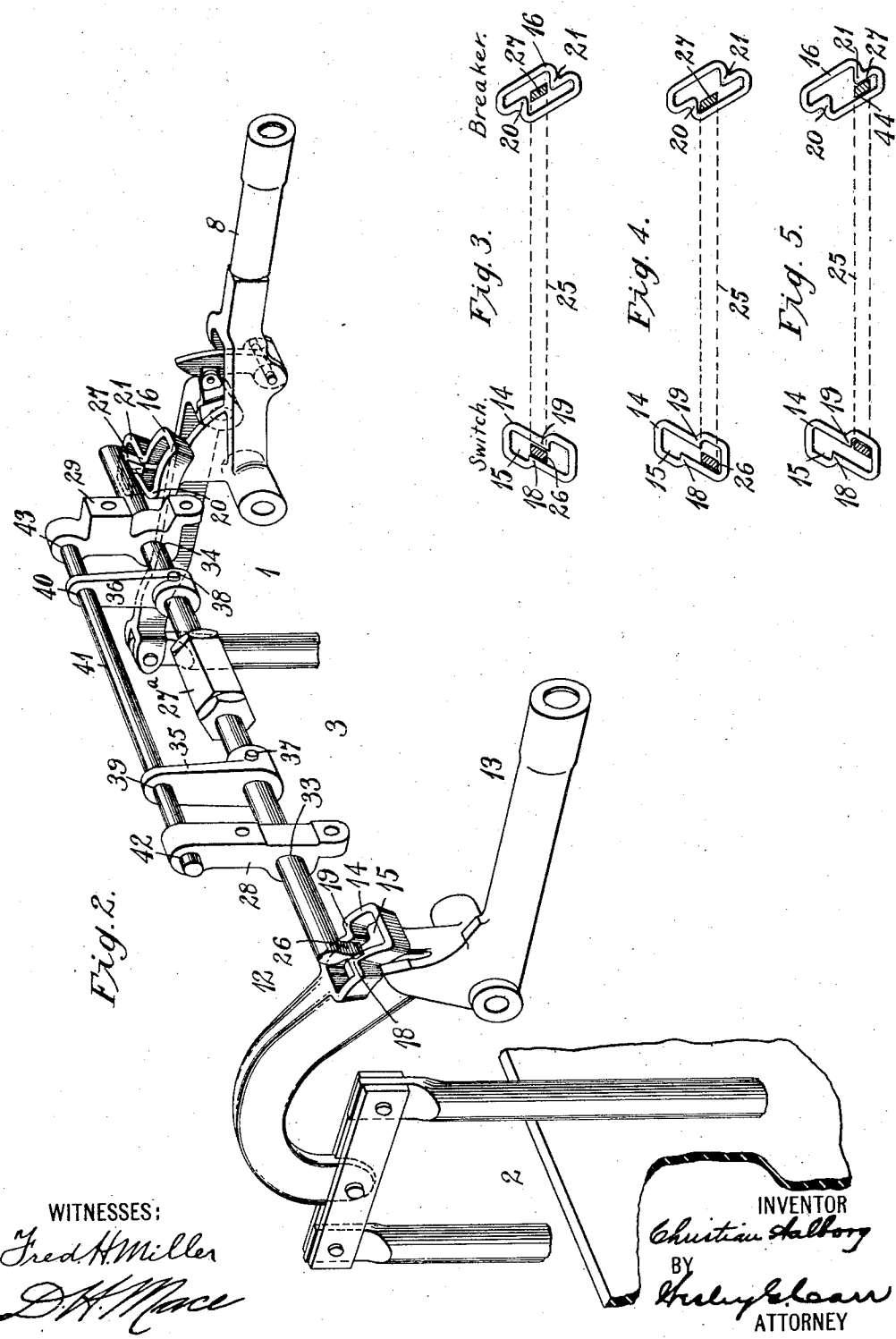
INVENTOR
Christian Aalborg
BY
W. H. H. H. H.
ATTORNEY

C. AALBORG.
INTERLOCKING DEVICE.
APPLICATION FILED JULY 13, 1910.

1,070,936.

Patented Aug. 19, 1913.

2 SHEETS-SHEET 2.



WITNESSES:
Fred H. Miller
D. H. Mace

INVENTOR
Christian Aalborg
BY
W. H. K. K. K.
ATTORNEY

UNITED STATES PATENT OFFICE.

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

INTERLOCKING DEVICE.

1,070,936.

Specification of Letters Patent.

Patented Aug. 19, 1913.

Application filed July 13, 1910. Serial No. 571,782.

To all whom it may concern:

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

My invention relates to mechanical interlocking devices and it has special reference to such devices as are adapted to control the sequence of operation of switching apparatus for electric circuits, although, of course, its application is not confined to such apparatus.

The object of my invention is to provide a device of the above indicated class that shall be simple and durable in construction, reliable in operation and particularly adapted to prevent the disastrous results which are often caused by reason of a closure of switches in an improper order.

Heretofore, serious accidents to operators and apparatus have sometimes occurred by reason of the closure of switches and circuit breakers in the wrong sequence of operation, and, in order to avoid such accidents, I provide a simple and reliable means which is adapted to interlock a plurality of switches in such a manner as to render them inoperative except in a predetermined order.

In the accompanying drawings, Figure 1 is a rear elevation of a circuit breaker, a disconnecting switch and an interlocking device constructed in accordance with my invention. Fig. 2 is a front perspective view of the interlocking device shown in Fig. 1, a portion of the operating mechanisms of the associated circuit breaker and disconnecting switch being shown. Figs. 3, 4 and 5 illustrate diagrammatically three positions in the operation of the interlocking device, as applied to the apparatus shown in Fig. 1.

It will, of course, be understood that the circuit breaker and disconnecting switch shown in Fig. 1 form no part of my invention, except as they perform functions of an operative combination and they may therefore be replaced by any other suitable devices, the proper action of which depends upon a predetermined sequence of operations. Inasmuch as the specific structures of the aforesaid circuit breaker and disconnecting switch are of minor importance, and such types of apparatus are old in the art, I

deem it unnecessary to describe the same in detail.

Referring to the accompanying drawings, a double-throw circuit breaker 1, of the oil immersed type, and a double throw disconnecting switch 2, of a similar type, are rendered interdependent by means of an interlocking mechanism 3 which embodies my invention. The circuit breaker 1 comprises stationary contact terminals 4 and 5, pivotally supported V shaped movable contact members 6, which are adapted to cooperate therewith, and an operating mechanism 7 which is provided with an operating lever 8. The disconnecting switch 2 is of similar construction and comprises pivotally supported V-shaped movable contact members 9 which are adapted to cooperate with stationary contact terminals 10 and 11, and an operating mechanism 12 which is provided with an operating lever 13.

A cam member 14 is rigidly associated with the operating lever 13 and the recess 15 within said cam member is of such a form as to accomplish certain specific results, to be hereinafter described. A similar cam member 16 is provided upon the operating lever 8 of the circuit breaker 1 for a similar purpose. The general shape of the cam members 14 and 16 is that of a rhomboid, the long sides of which are substantially parallel to the operating levers, said sides being provided with projecting portions 18, 19 and 20 and 21, respectively. The long sides of the cam members, however, are not exactly parallel to the operating levers, but are arranged in such manner that the long sides of the respective members are divergent, as illustrated in Figs. 3, 4 and 5.

The interlocking mechanism 3 comprises a connecting rod 25, the opposite ends of which are provided with laterally extending projections 26 and 27 which are respectively adapted to cooperate with the cam members 14 and 16. The connecting rod 25 is preferably constructed in two pieces which are secured together by a suitable coupling 27^a, by means of which, the length of said rod may be adjusted as desired. Bracket members 28 and 29 are bolted, respectively, to frames 30 and 31, of the switch 2 and the circuit breaker 1, and said bracket members are provided with holes 33 and 34 to receive the connecting rod 25.

In order to maintain the projecting mem-

bers 26 and 27 in a proper position to co-operate with the cam members 14 and 16, arms 35 and 36 are provided which are fastened to the connecting rod 25 by means of pins 37 and 38. The upper ends of the arms 35 and 36 are provided with holes 39 and 40 to receive a guide rod 41 which projects through holes 42 and 43 in the upper ends of bracket members 28 and 29.

Assuming the various parts of the structure to be in the positions shown in Figs. 1 and 2, the relative positions of the connecting rod 25 and the cooperating cam members 14 and 16 are illustrated diagrammatically in Fig. 3. In this position, the circuit breaker 1 and the disconnecting switch 2 are in their open positions and, the breaker is locked in said position, inasmuch as the projecting member 27 is located between the projections 20 and 21. The switch 2, however, may be operated in either direction. If it is desired to move the switch members 9 into engagement with stationary contact terminals 11, the operating lever 13 is raised to force the projecting member 26 of the connecting rod 25 into the position shown in Fig. 4, and, at the same time, to cause the projecting member 27 to be drawn into the position shown in Fig. 4, by reason of the inclination of the side of projecting portion 19. In these positions, only two operations may be effected, viz: Disconnecting switch 2 may be again opened, or the circuit breaker may be closed upon the stationary contact terminals 5, closure of the circuit breaker 1 in the opposite direction being prevented by the projecting portion 20. If the operating lever 8 of circuit breaker 1 is raised to move the members 6 into engagement with the stationary contact terminals 5, the relative positions of the cam member 16 and the projecting member 27 are shown in Fig. 5. By reason of the inclination of side 44 of cam member 16, the projecting member 26 of the rod 25 is drawn into the position indicated in Fig. 5, in which position the disconnecting switch 2 is locked by means of projecting portion 19. Inasmuch as the switch 2 is securely locked, it is evident that the only possible operation is to open the breaker 1 and thereby release the disconnecting switch 2 from its locked position, as will be readily understood. Those skilled in the art will experience no difficulty in understanding the operation of said circuit breaker and disconnecting switch in the opposite direction, on account of similarity to the operation just described. It is evident, therefore, that, with both circuit breaker and switch in open position, the only possible sequence of operation is the closure of said switch in either direction, as desired, and the subsequent closure of the circuit breaker in the same direction. With both circuit breaker and switch closed in either

direction, the operation is restricted to the opening of said breaker prior to that of the switch, thereby eliminating all danger from an improper sequence of operation.

While I have shown and described an interlocking mechanism having a specific structure, arrangement and location of parts, it is evident that many modifications may be effected therein without departing from the spirit and scope of my invention and such modifications are intended to be covered by the appended claims.

I claim as my invention:

1. The combination with a plurality of switching devices, of an interlocking mechanism comprising unlike cam members associated with the respective switching devices, and a connecting member having projections that are engaged by said cam members to shift said connecting member to extreme positions for locking one of the switching devices and to an intermediate position for locking the other switching device.

2. The combination with a plurality of switching devices and operating handles for said devices, of unlike cam members associated with said operating handles and a movable connecting member provided with projections that are engaged by said cam members to shift said connecting member to extreme and intermediate locking positions.

3. The combination with a plurality of electrical switching devices adapted for operation in two directions, of an interlocking mechanism, comprising unlike cam members and a connecting member having projections that are engaged by the cam members to shift the connecting member and thus prevent operation of said devices in an improper order and for restricting the operation thereof to the same direction as that of the first device operated.

4. The combination with a plurality of switching devices, of interlocking means comprising unlike cam members associated with the respective switching devices and a movably mounted connecting means that is shifted to extreme and intermediate locking positions by said cam members, the corresponding operating surfaces of said cam members being angularly disposed with reference to each other to effect the shifting action.

5. The combination with a circuit breaker and a disconnecting switch for electrical circuits, of an interlocking mechanism comprising locking cams and a connecting member that is shifted by said cams to extreme and intermediate positions for preventing the closure of the breaker prior to that of the switch and for preventing the opening of the switch prior to that of the breaker.

6. The combination with a double-throw circuit breaker and a double-throw disconnecting switch for electrical circuits, of an

interlocking mechanism comprising unlike cam members associated with the respective circuit-controlling devices and a cooperating connecting member that is shifted to extreme and intermediate positions by said cam members for restricting the operation of said devices to a predetermined sequence and for preventing the closure of one device in a different direction from that of the other.

7. The combination with a plurality of operating mechanisms, of recessed cam members associated rigidly with said mechanisms, the outline of each cam member being substantially that of a rhomboid having corresponding projecting portions on each of two parallel sides, said parallel sides of each member being at an angle to the corresponding parallel sides of the adjacent member, and a movably mounted connecting member provided with cam-engaging projections adapted to cooperate therewith.

8. The combination with two switching devices for electric circuits, each comprising a supporting frame, stationary contact terminals, movably cooperating contact members and an operating mechanism therefor, of cam members carried by said operating mechanisms, a connecting member having cam-engaging projections and adapted to be actuated in a line parallel to its axis by means of said cam members, bracket mem-

bers secured to said supporting frames and serving to support said connecting member, and means for maintaining said cam-engaging projections in cooperative relation to said cam members, said cam members being of such form as to restrict the order of operation of said switching devices to a predetermined sequence.

9. The combination with two double-throw, switching devices and operating mechanisms for said devices, of an interlocking means comprising unlike cam members and a connecting member for interconnecting said operating mechanisms and adapted, in a normal open position, to lock one of said switching devices and to allow closure of the other in either direction, said interlocking means being also adapted to allow subsequent closure of the first named switching device only in the same direction as that of the second named switching device and still further adapted to prevent the opening of the second named switching device prior to that of the first named switching device.

In testimony whereof, I have hereunto subscribed my name this 27th day of June, 1910.

CHRISTIAN AALBORG.

Witnesses:

R. C. BOOZER,

B. B. HINES.