

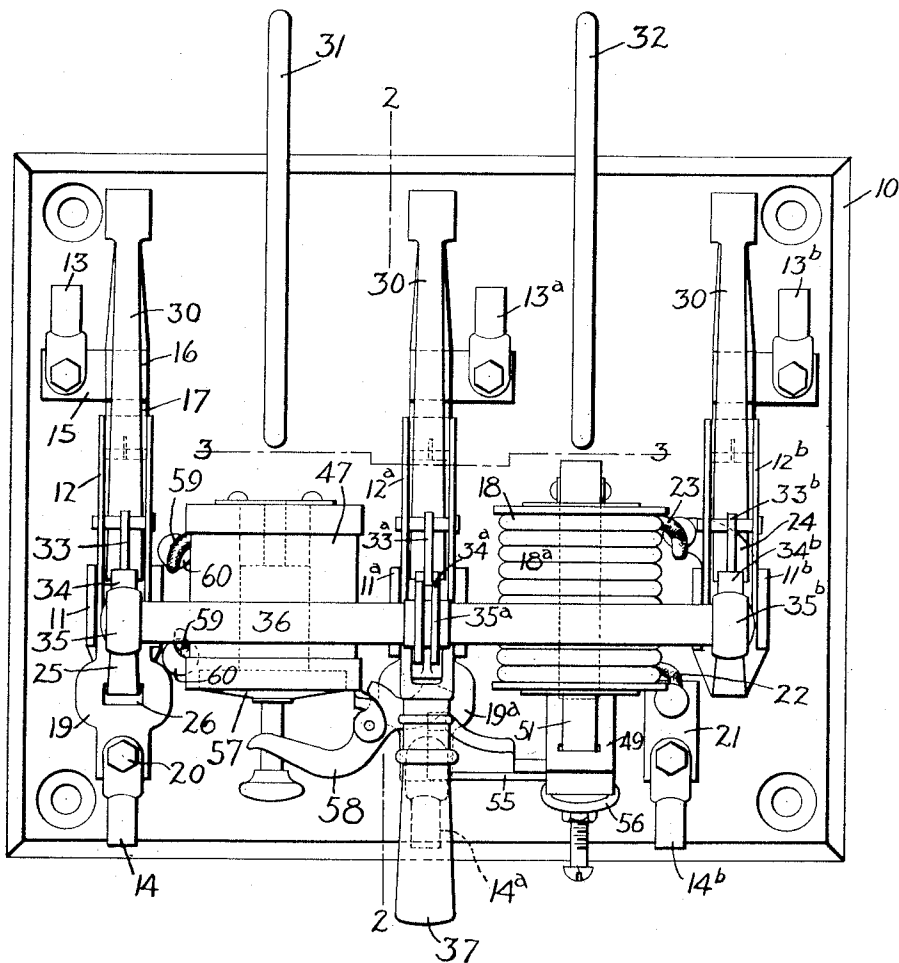
C. H. HILL.
CIRCUIT BREAKER.
APPLICATION FILED NOV. 9, 1905.

1,011,785.

Patented Dec. 12, 1911.

3 SHEETS—SHEET 1.

Fig. 1



Witnesses.

Benjamin B. Hill
Allen Clifford

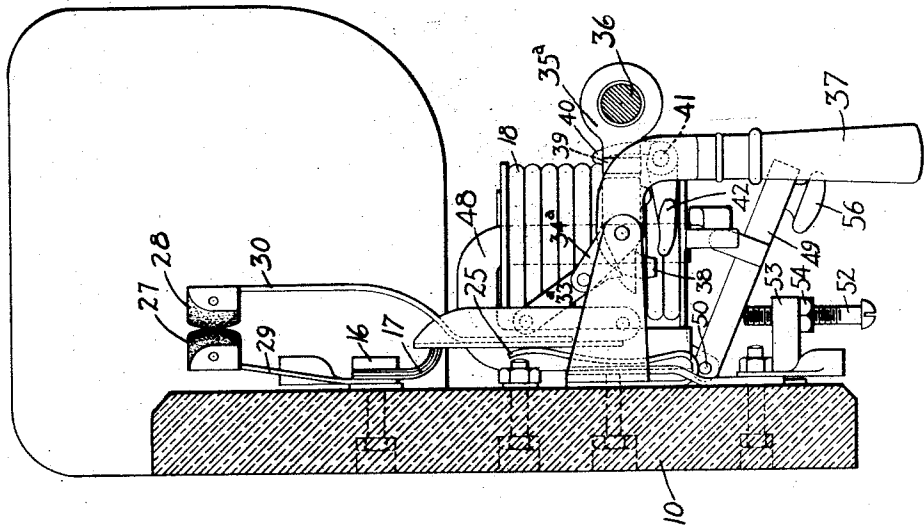
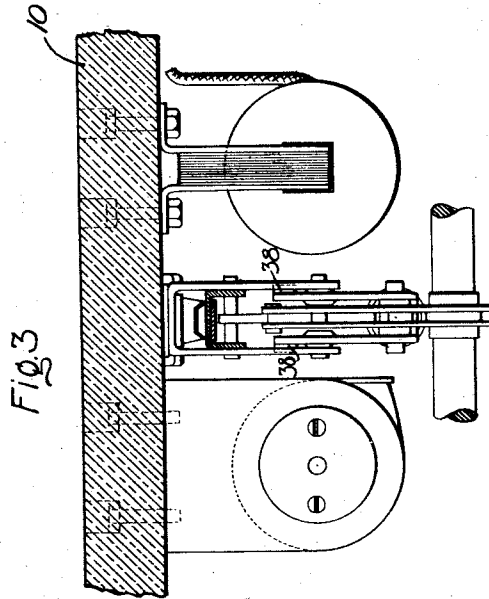
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3 SHEETS—SHEET 2.



Witnesses.

William B. Hill
Allen Oxford

Inventor

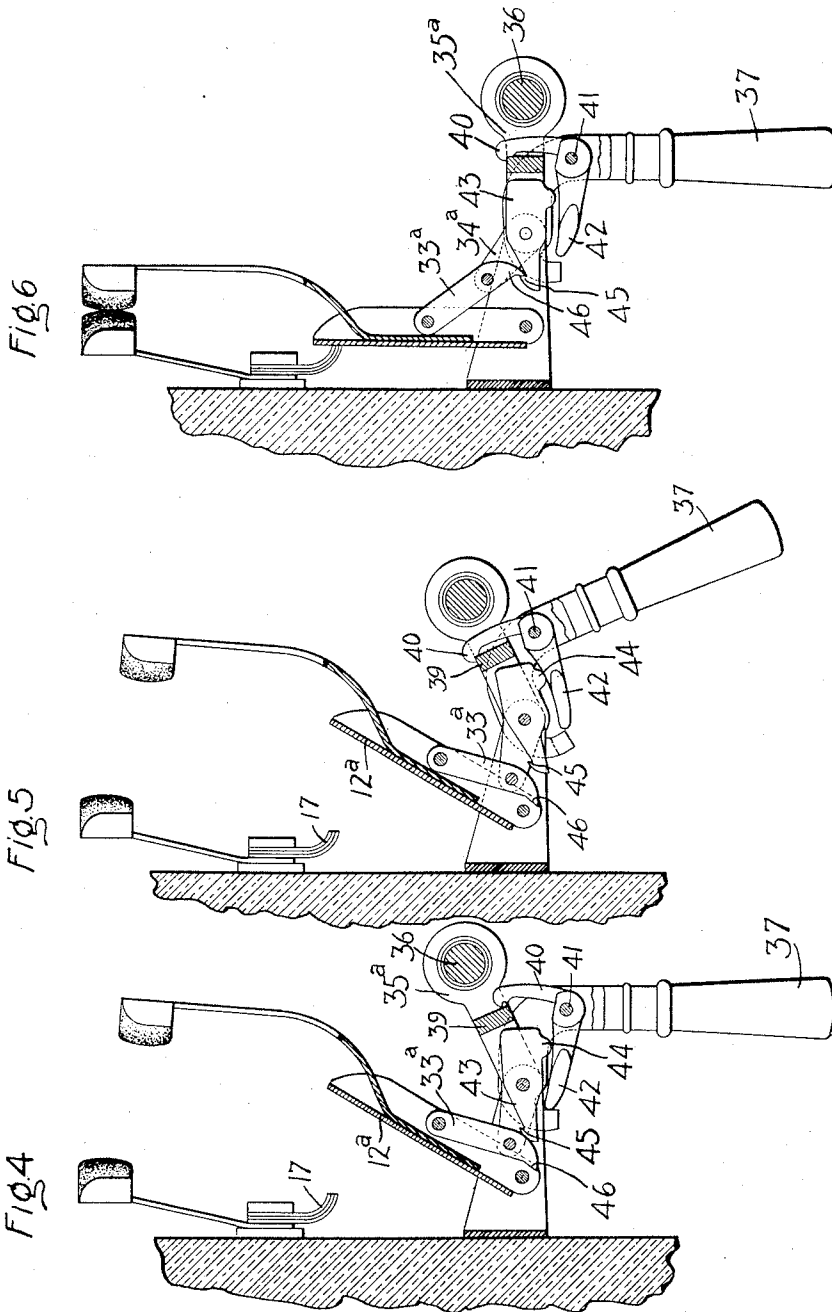
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3 SHEETS—SHEET 3.



Witnesses.

William B. Hill
Helen Oxford

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UNITED STATES PATENT OFFICE.

CHARLES H. HILL, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CIRCUIT-BREAKER.

1,011,785.

Specification of Letters Patent.

Patented Dec. 12, 1911.

Application filed November 9, 1905. Serial No. 286,516.

To all whom it may concern:

Be it known that I, CHARLES H. HILL, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Circuit-Breakers, of which the following is a specification.

The present invention relates to electric circuit breakers or switches and has for its object the production of a device of this class which shall be simple, compact and durable in construction, inexpensive to manufacture and effective in operation.

In carrying out the invention novel mechanism for disconnecting the operating lever from the switch parts is provided so that the same cannot be held closed by the operator during the existence of an overload or other predetermined electrical condition of the circuit. These and certain other structural and mechanical details will be more fully understood upon reference to the following description taken in connection with the accompanying drawings and the scope of the invention will be particularly pointed out in the appended claims.

Referring to said drawings, Figure 1 is a front elevation of a triple pole switch constructed in accordance with the present invention; Fig. 2 is a sectional elevation of the same, the section being taken on a plane indicated by the line 2 2 of Fig. 1; Fig. 3 is a partial plan view of the same with parts shown in section taken on a plane indicated on the line 3 3 of Fig. 1; and Figs. 4, 5 and 6 are diagrammatic views illustrating different operative positions of the switch parts.

Throughout these figures like characters refer to like parts.

Referring in detail to the drawings, 10 designates an insulating panel or base of porcelain, marble or other suitable fire-proof insulating material to which the switch parts are secured. Firmly secured to the face of the base are three U-shaped supporting brackets 11, 11^a, 11^b, between whose arms are pivoted the channeled members 12, 12^a and 12^b which constitute the movable bridging switch elements of the three legs of the circuit. These bridging contacts 12, 12^a and 12^b are adapted to complete the circuit between the terminals, 13 14, 13^a 14^a, 13^b and 14^b, respectively. Each of the terminals 13 13^a and 13^b is secured to a plate

15 which in turn is secured to the face of the panel 10 by a stud 16 and which forms a conducting path to the bundle of laminae 17 which makes direct contact with the corresponding bridging contact 12, 12^a or 12^b. The lower terminals 14, 14^a and 14^b are electrically connected to the brackets 11, 11^a and 11^b, respectively, the connection between the terminals 14 and 14^a with the brackets 11 and 11^a being substantially identical, while that between the terminal 14^b and bracket 11^b is modified somewhat to permit the overload magnet 18 to be readily included in circuit between the terminal 14^b and the bracket 11^b. Referring to the construction of the connection between the terminal 14 and the bracket 11, it will be noted that the terminal is connected to the lower end of a plate 19 by a bolt 20 which also serves to securely attach the terminal and the plate to the panel 10. The upper end of the plate 19 passes between the arms of the bracket 11 and is secured to its central portion so as to make good electrical contact therewith. The circuit is completed between the terminal 14^a and the bracket 11^a by a similarly connected plate 19^a. On the other hand, the terminal 14^b is similarly connected to a plate 21 to which is electrically connected the lead 22 of the winding of the overload magnet 18. The other lead 23 of this coil is connected to a plate 24 which extends at its lower end over the central portion of the bracket 11^b and is connected therewith so as to form good electrical contact in the same manner that the plate 19 is connected to the bracket 11. Each of the moving contact members 12, 12^a, 12^b is forced outward by a reflexed leaf-spring 25 which is secured at one end between the corresponding brackets 11, 11^a and 11^b and the panel 10, while its opposite end bears against the interior face of the movable switch member. In case of the contact members 12 and 12^a the spring 25 extends through an opening 26 in the plates 19 and 19^a, while in the case of the moving contact 12^b the plate 24 extends above the bracket 11^b and there is no occasion for a corresponding opening.

In addition to the paths formed between the terminals 13, 13^a, 13^b on the one hand, and the corresponding terminals 14, 14^a and 14^b on the other, as above outlined, shunt paths are provided in each leg of the cir-

5 cuit by shunt contacts 27 and 28 of any de-
 sired material, such as carbon. These con-
 tacts are carried at the upper end of spring
 arms 29 and 30, respectively, which are
 10 secured at their lower ends to the studs 16
 on the one hand, and to movable switch
 members 12, 12^a or 12^b on the other. As is
 well known, in operation these carbon con-
 tacts remain in engagement until the bridg-
 15 ing member has moved far enough away
 from the laminated contacts 17 to prevent
 any jumping of an arc and then they sepa-
 rate and the final arcing is taken between the
 carbon surfaces. For the purpose of pre-
 20 venting the occurrence of arcs between the
 stud 16 of the different legs of the circuit,
 suitable barriers 31 and 32 of fiber or other
 suitable fire-proof insulating material are
 secured to the face of the panel 10 and ex-
 tend outward between said studs in a well
 known manner.

Each of the bridging contact members
 12, 12^a and 12^b is forced into its closing
 position by means of a toggle comprising
 25 the links 33 34, 33^a 34^a, and 33^b 34^b. Each
 of the links 34, 34^a, 34^b, in addition to being
 pivoted to the links 33, 33^a and 33^b is
 pivoted between the outer ends of the arms
 of the brackets 11, 11^a and 11^b, respectively,
 30 and is provided with an extension beyond
 said pivotal point. These extensions 35, 35^a
 and 35^b are rigidly connected by an insulat-
 ing rod 36 of wood or other suitable ma-
 terial, so that any movement transmitted
 35 to one of the toggles is also transmitted to
 the others, and all the legs of the circuit
 are made and broken simultaneously. For
 the purpose of transmitting movement to
 these toggles so as to set the breaker, an
 40 operating lever 37 is arranged to be oper-
 ated in connection with the toggle com-
 prising the links 33^a and 34^a. The upper
 end of this lever is bifurcated and each of
 the bifurcated ends is pivoted to the outer
 45 end of the bracket 11^a concentric with the
 link 34^a of the toggle. The bifurcations ex-
 tend somewhat beyond the pivot and are
 provided at their extremities with oppo-
 sitely-extending projections 38 which are
 50 adapted to engage the under side of the
 arms of the bracket 11^a to limit the down-
 ward movement of the lever 37. As clearly
 illustrated, the link 34^a, together with its
 projections 35^a, consists of two similar
 55 plates or punchings rigidly connected and
 held apart by a space block 39 located ad-
 jacent to the connecting rod 36; the opposite
 ends of the plates passing on opposite sides
 of the link 33^a and being spaced thereby.

60 From the description thus far it will be
 apparent that the operating lever 37 is
 movable independently of the member 35^a
 and the other parts connected to the bar 36
 In order to establish positive connection be-
 65 tween the lever 37 and the movable elements

of the circuit breaker, an L-shaped latch 40 is
 provided. This latch is pivoted at 41 between
 the bifurcations of the operating lever 37 and
 is adapted to engage the upper face of the
 space block 39 carried by the member 35^a. 70
 The opposite end of the latch 40 is weighted,
 as at 42, so that its tendency is to hold the
 latch in engaging position. When the oper-
 ating lever 37 is drawn out so as to allow
 the latch 40 to engage the member 35^a it 75
 may be then pressed downward and inward,
 and when so operated will carry the outer
 end of the member 35^a and the bar 36 down-
 ward and thereby straighten out the toggles
 connected to the bridging members 12, 12^a 80
 and 12^b and force them into engagement
 with their respective fixed contacts 17. In
 order to maintain the breaker in closed posi-
 tion when thus closed, a second latch 43 is
 pivoted concentrically with the lever 37 and
 the toggle link 34^a. This latch is weighted 85
 near its outer end at 44 and is provided
 with an engaging shoulder 45 at its inner
 end which is adapted to engage a coöperat-
 ing projection 46 on the adjacent end of the
 link 33^a. The latches 40 and 43 overlap 90
 each other and are so closely related that a
 blow delivered to the former will through
 it actuate the latter. This is for the pur-
 pose of tripping the breaker and, as is well 95
 known, may be accomplished either man-
 ually or automatically upon the occurrence
 of predetermined electrical conditions in the
 circuit. For the latter purpose the over-
 load magnet 18, previously referred to, and
 the no-voltage release magnet 47 located on 100
 opposite sides of the bridging contact mem-
 ber 12^a are employed. Both of these are of
 well known construction. The overload
 magnet comprises the U-shaped magnet 10
 frame 48 having one leg firmly secured to
 the panel 10 and the other provided with
 the winding 18^a. An armature 49 is pivot-
 ally secured at 50 to one leg of the frame 11
 48 and is adapted to be drawn upward by
 the magnetism of the coil into engagement
 with the other leg. A scale plate 51 ex-
 tends downward from the outer leg of the
 frame 48 in a curved direction, and the 11
 armature 49 is apertured so as to embrace
 the scale plate. A set-screw 52 threaded
 through a fixed bracket 53 and having a
 lock-nut 54, engages the under side of the
 armature 49 to determine its adjustment. 12
 The adjustment is indicated on the scale
 plate 51 by the upper edge of the armature
 opening. A horizontal arm 55 extends
 laterally from the armature 49 far enough
 to engage the weighted end of the latch 40
 when the overload magnet is energized suffi-
 12
 ciently to raise the armature 49. Manual
 operation may be obtained through the
 agency of the button 56 carried by the outer
 end of the armature 49 which may be pushed
 upward to trip the breaker. 13

The no-voltage release magnet 47 is of well-known construction and comprises a weighted armature 57 which is normally held in the position illustrated but is adapted to drop against the pivoted lever 58 and thereby force the opposite end of the lever which is directly beneath the weighted end of the latch 40 into engagement therewith to trip the breaker. Leads 59 from the winding of the magnet 47 are secured to studs 60 which pass through the panel 10 and are suitably connected on the rear of the board between two legs of the circuit in a manner well known in the art.

For the purpose of clearly illustrating the operation of the device, and the relative position of the parts, attention is called to Figs. 4, 5 and 6 where the switch is shown in its open, intermediate and closed positions. With the parts in the open position in order to close the switch it is necessary to draw the operating lever upward until the latch 40 engages the upper face of the space block 39 on the member 35^a, and to then force the lever downward and inward. This latter movement will actuate the member 35^a and all the parts connected to the bar 36 and will straighten out the several toggles and force the bridging members 12, 12^a and 12^b into engagement with their respective contacts 17, thus completing the three legs of the circuit. When this position is reached the parts will occupy the position illustrated in Fig. 6 and the latch 43 will engage the extension 46 on the toggle lever 33^a and hold the parts in the closed position. Now upon the occurrence of an overload in the circuit sufficient to draw up the armature 49 of the overload trip magnet, or upon the occurrence of a drop in potential sufficient to allow the armature 57 of the magnet 47 to drop into engagement with the lever 58, the weighted end of the latch 40 will be forced upward into engagement with the latch 43 and the latter thrown out of engagement with the projection 46 thus allowing the circuit breaker to fly open under the action of gravity and the leaf-springs 25. It will be impossible to close the breaker if either of the above electrical conditions exists, since the weighted end of the latch 40 in all positions of the parts lies in the path of movement of the lever 58 and the arm 55 of the armature 49. On attempt to close the breaker under such conditions the armature 49 will either be drawn up forcibly as soon as a slight contact between the fixed and movable switch elements is made and the connection thereby broken between the operating lever 37 and the member 35^a and the other movable parts of the breaker, or, on the other hand, if the potential upon such closure is insufficient to raise the armature 57 of the no-voltage release magnet 47, the latch 40 will be obstructed by the lever 58

and thereby prevented from moving into engaging position.

In carrying out the invention, punched parts have been employed as far as possible so as to reduce the cost of construction and also render as compact a structure as possible.

By the arrangement of parts in the manner disclosed it will be seen that the toggles and the latch mechanism are quite well inclosed between the side walls of the bridging contact members and the arms of the supporting brackets thereby protecting them against injury and accidental operation.

What I claim as new, and desire to secure by Letters Patent of the United States, is,—

1. In an electric circuit breaker, the combination of cooperating fixed and movable contacts, a toggle for cramping said movable contact into closed position, an operating lever movable independently of said toggle, a latch for establishing a positive closing connection between said lever and toggle, a latch for holding the toggle in cramping position and means for tripping the latches in succession.

2. In an electric circuit breaker, the combination of cooperating fixed and movable contacts, a toggle for cramping said movable contact into closed position, an operating lever movable independently of said toggle, a latch for establishing a positive closing connection between said lever and toggle, a second latch for holding the toggle in cramping position, and means for tripping the first latch before the second.

3. In an electric circuit breaker, the combination of cooperating fixed and movable contacts, a toggle for cramping said movable contact into closed position, an operating lever movable independently of said toggle, a latch for establishing a positive closing connection between said lever and toggle, a second latch for holding the toggle in cramping position overlying the first latch, and means for engaging the first latch to trip the second.

4. In an electric circuit breaker, the combination of cooperating fixed and movable contacts, a toggle for cramping said movable contact into closed position, an operating lever movable independently of said toggle, a latch for establishing a positive closing connection between said lever and toggle, a second latch for holding the toggle in cramping position, said first latch overlying the second latch in every position of the operating lever, and means in operative relation to the first latch in every position of the operating lever for moving said latch into engagement with said first latch to trip it.

5. In an electric circuit breaker, the combination of cooperating fixed and movable contacts, a toggle for cramping said contacts into engagement, an operating lever

movable independently of said toggle, a latch for establishing a positive connection between said lever and toggle, a second latch for holding the toggle in cramping position, 5 a projection on said first latch overlapping the second latch in every position of the operating lever, and means in operative relation to the first latch in every position of the operating lever for moving said latch to bring said projection into engagement with 10 said first latch to trip it.

6. In an electric circuit breaker, the combination of a channeled sheet metal movable contact, a two legged supporting post therefor, a bifurcated operating lever having its 15 bifurcations pivoted to the outer ends of said post and a cramping toggle acting between said lever and contact and housed within the side walls of said movable contact, the legs of said post and the bifurcations of said lever, and a latch pivoted concentric with said operating lever to engage 20 one link of said toggle to hold it extended.

7. In an electric circuit breaker, the combination of a movable contact, a two legged 25 supporting post therefor, a bifurcated operating lever having its bifurcations pivoted

to the outer ends of the legs of said post, a cramping toggle having one of its links pivoted concentric with said bifurcations, 30 and a latch pivoted at the same point to engage the other link of said cramping toggle.

8. In an electric circuit breaker, the combination of a movable contact, a two legged supporting post therefor, a bifurcated operating lever movable independently of said 35 movable contact and having its bifurcations pivoted to the outer ends of the legs of said post, a cramping toggle having one of its links pivoted concentric with said bifurcations, means for establishing a positive closing connection between said operating lever 40 and said toggle, and a latch pivoted concentric with said bifurcations to engage one of the links of said toggle and mounted in operative relation to said means for establishing 45 a closing connection.

In witness whereof, I have hereunto set my hand this 8th day of November, 1905.

CHARLES H. HILL.

Witnesses:

BENJAMIN B. HULL,
MARGARET E. WOOLLEY.