

June 16, 1931.

E. H. W. ULLRICH

1,810,861

CIRCUIT BREAKER

Filed April 30, 1928

2 Sheets-Sheet 1

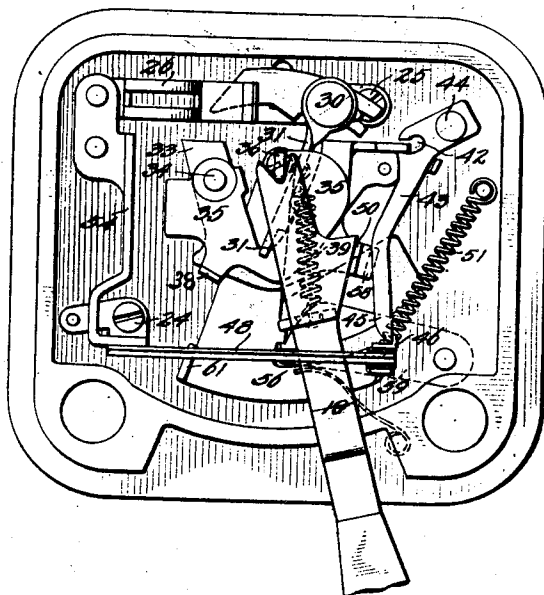
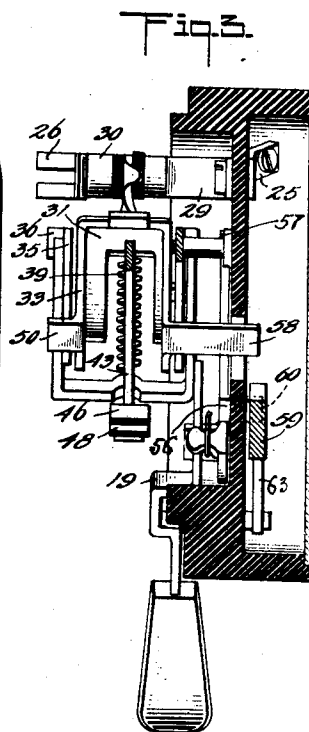
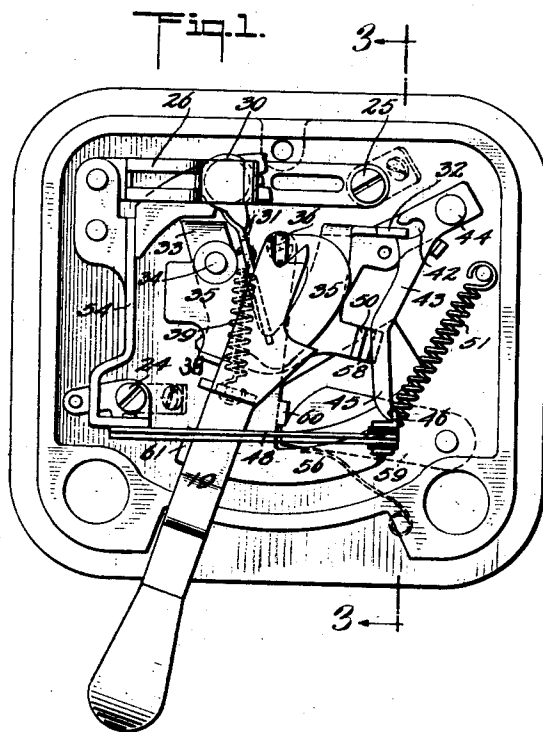


Fig. 2.

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by his attorneys

Howan and Howan

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2 Sheets-Sheet 2

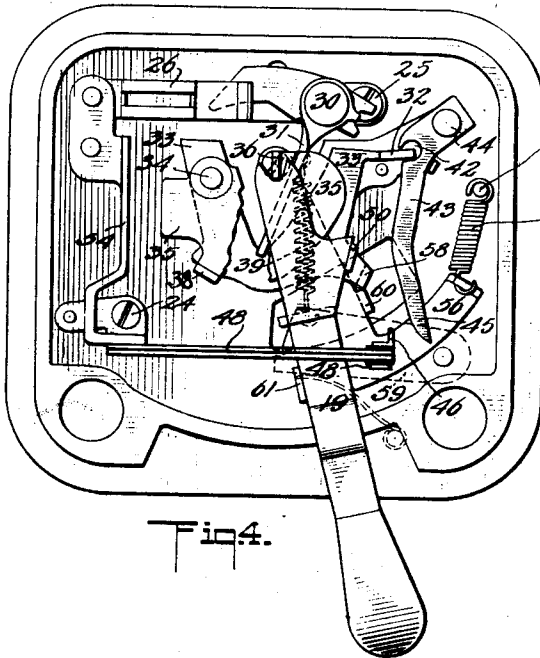


Fig. 4.

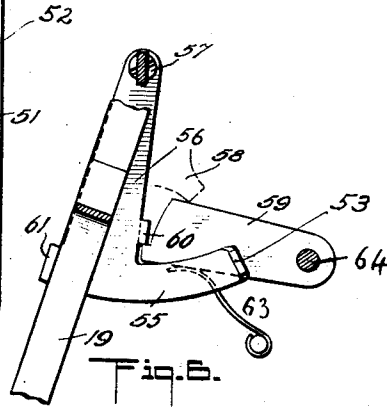


Fig. 6.

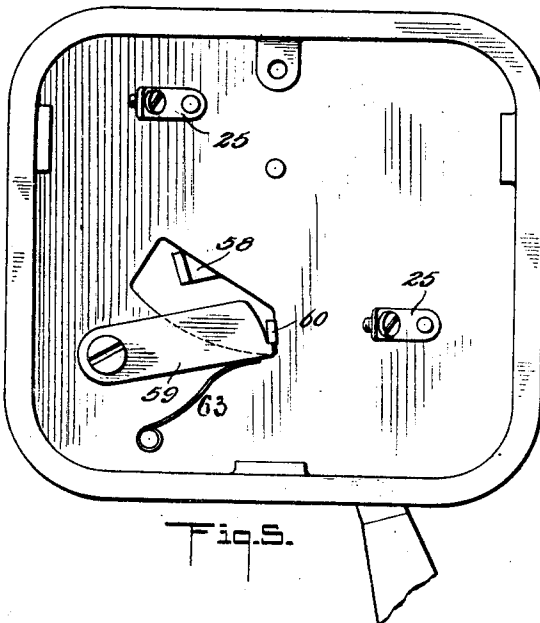


Fig. 5.

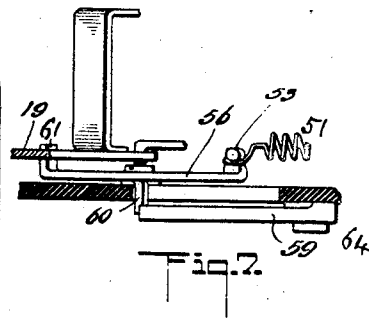


Fig. 7.

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UNITED STATES PATENT OFFICE

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CIRCUIT BREAKER

Application filed April 30, 1928. Serial No. 274,036.

My invention relates to circuit breakers and especially to circuit breakers of the type in which the circuit may be opened and closed at will by hand, and which is also automatically opened on overload.

My invention also includes the thought of manually resetting the mechanism, after automatic operation, by means of the lever which is employed for the manual actuation of the mechanism. Various features of novelty, construction and operation will be pointed out in the following specification, or as shown in the accompanying drawings in which—

Fig. 1 is a section through a circuit breaker in which my invention is embodied in one form and showing the parts in closed circuit position;

Fig. 2 is a similar view showing the parts in open-circuit position following manual operation of the operating lever;

Fig. 3 is a section on the line 3—3, Fig. 1;

Fig. 4 is a view showing the open-circuit position of the breaker following automatic operation;

Fig. 5 is a rear view, with the parts in the position shown in Fig. 1; and

Figs. 6 and 7 are views of certain details.

The present mechanism will be recognized in its specific form as a development of the circuit breaker which forms the subject of Patent No. 1,656,851, dated January 17, 1928. One of the features of the mechanism disclosed in said patent, is the fact that on the automatic trip following overload, the manually operated actuator is shifted only partially from its circuit-closing position toward the position which it assumes in open-circuit position when manually operated. This has the advantage of affording a graphic indication of the automatic opening of the circuit. It has the disadvantage that in order to reset the mechanism and close the circuit again, two movements are necessary, viz., one which shifts the operating member to the full open-circuit position which it occupies when manually operated, followed by a return of the operating member to closed-circuit position.

My present invention eliminates one of the

motions heretofore necessary in order to reset the mechanism and close the circuit, these operations being now performed by the single movement of the operating member to circuit-closing position.

If an indication of the automatic opening of the circuit be desired, this is readily afforded by a member independent of the operating lever.

Referring to the accompanying drawings, I have indicated at 24 a wire connection from which current is led to one leg of the U-shaped thermostatic element 48 the current returning through the other leg thereof and passing by strap 54 to one of the fixed contacts 26 of the circuit breaker. The other fixed contact 29 (Fig. 3) is in turn electrically connected with a wire terminal 25 at the other side of the line.

The circuit is closed between the contacts 26 and 29 by an oscillating switch block 30 carried by but insulated from the rock lever 31. The free ends of the rock lever 31 are shaped to pivot in the angle of the double V-frame 33. One leg of this V-frame is pivoted at 34 in the fixed standard 35. The other leg of the V-frame 33 is provided with a foot piece 32 which projects into a notch 42 of the trip lever 43 pivoted at 44 to the base plate of the standard 35. The free end of the trip lever 43 is provided with a nose 45 which in the normal position of the parts is engaged with the insulated trip flange 46 at the closed end of the thermostatic U-bar 48. This engagement of the trip lever by the thermostat is constant during normal current conditions, and the opening or closing of the switch must be accomplished during this period solely by manual operation of the circuit breaker.

The manual operating member here employed for this purpose comprises a lever 19 forked at its inner end to straddle the head and foot pieces of the fixed standard 35 and having a rocking bearing on outwardly offset lugs 36 on the respective head and foot pieces of the standard 35. The throw of the lever 19 to circuit-closing position may be limited by the stop lugs 38 on the standard 35. The manual throw of the lever to open-

circuit position is limited by stop lugs 50 on the pivoted V-frame 33. The operating connection between the switch lever 31 and operating lever 19 is established by the pull
 5 spring 39 connected to the respective cross bars of these members, 31 and 19, the relation of the parts being such that when the operating lever 19 is manually swung toward open-circuit position, the stress of the
 10 spring is carried over center with respect to the pivotal axis of the switch lever 31, Fig. 2. The parts so far described are substantially similar to those shown and described in the prior patent hereinabove referred to, and in this description I have for the most
 15 part used the same reference numerals.

The automatic operation of the circuit breaker which follows the warping of the thermostatic element out of engagement
 20 with the nose 45 of the trip lever 43, is occasioned by a relatively heavy coiled spring 51 anchored at 52 to the base, and at its other end to the lug 53 at the end of arm 55 of a plate 56, which is pivoted at 57 substantially
 25 in register with the pivot 36 of the operating lever. A lug 61 upstanding from this plate engages one margin of the operating lever 19 and may cooperate with or take the place of lugs 38 to form a stop for the lever
 30 19 in circuit-closing position. In order to hold the plate 56 normally in fixed position, I provide a detent 59 pivoted at 64 and adapted at its opposite end to engage the lug
 35 60 at the adjacent margin of the member 56. A spring 63 normally holds the detent 59 in position to engage the lug 60, thus sustaining the member 56 in fixed position against the constant stresses of the spring 51.

When the thermostatic bar 48 is warped
 40 by current overload until the engagement of offset 46 with the nose 45 of the trip lever 43 is broken, the V-frame 33 is thereupon freed for displacement under the stress of the spring 39. The effort of this switch
 45 spring 39 exerted through the switch lever 31 against the V-frame 33, tends constantly to press the foot piece 32 against the lower jaw of the notch 42 of the trip lever 43. Consequently, when the detent engagement
 50 between the thermostat and trip lever is broken at 45—46, the effort of the spring 39 displaces the rocking V-frame 33 on its pivotal axis 34. The trip lever 43 is forced outwardly (Fig. 4) on its pivot 44, while the
 55 V-frame 33 is rocked downwardly on its pivot 34. The rocking of the V-frame downwardly throws the lug 58 thereof into engagement with the latch 59 and thus kicks the latter out of engagement with the
 60 stop lug 60 on the plate 56. The latter is now free to move under the stress of the heavy coil spring 51 to the position shown in Fig. 4. Inasmuch as the lug 61 of the plate 56 engages the operating lever 19, the throw of
 65 the plate 56 under the stress of heavy spring

51, swings the operating lever to open-circuit position, the stress of the spring 51 being sufficient to overcome the opposing effort of the spring 39. At the same time that the lug 58 kicks the detent 59 out of engagement with the lug 60 on the plate 56, it comes
 70 into proximity with the plate lug 60, (Fig. 4) and is in a position to be engaged by the latter as the plate swings on its axis.

Inasmuch as the pivotal axis 34 of the V-frame 33 is not co-incident with the axis 57
 75 of the plate 56, the engagement between the lug 60 on the plate 56, and the lug 58 of the V-frame, is a sliding engagement but is maintained during the swing of the plate
 80 56 under the influence of spring 51 until the V-frame 33 is returned to substantially normal position. Therefore, while the switch lever 19 remains in open-circuit position, to which it has been shifted by the plate 56,
 85 the return of the V-frame 33 to its normal position through the engagement of lugs 58 and 60 respectively, simultaneously effects the return of the trip lever 43 to its normal position by reason of the engagement of the
 90 footpiece 32 of the V-frame 33 in the open jaw 42. Consequently, when the heat has sufficiently radiated from the legs of the thermostat bar to permit the latter to resume its normal position, the engagement of
 95 its lip 46 with the nose 45 of the trip lever 43, will thereby be re-established on the normal operation of the lever 19.

When it is desired to re-close the circuit, it is merely necessary to throw the switch
 100 lever 19 to circuit-closing position. The V-frame 33 is stationary, and the lever operates in precisely the same fashion with respect to the switch lever 31 that it does on any manual operation of the switch. However, in addition to overcoming the stress of the switch spring 39 during this movement, it is necessary to overcome the resistance
 105 also of the coil spring 51 since the lug 61 of plate 56 is engaged by the lever 19, and the plate 56 must be swung on its pivot 57 (Fig. 6) to reset position during this stroke of the operating lever. When, however, the operating lever has reached normal circuit-closing position, lug 60 on plate 56 is re-engaged by the dog 59, thus holding the
 110 plate 56 and its associated parts in fixed position (Fig. 6) until the next succeeding overload with the resultant kicking of the dog 59 out of contact with the lug 58 of the
 115 V-frame (Fig. 1).

It being my purpose to reset the V-frame 33 in normal position at the end of the movement of the plate 56, following thermostatic release, it is obvious that the position which
 120 the lever 19 assumes is the position to which it is shifted on the opening of the circuit breaker, either manually or automatically.

It is obvious that after automatic operation of the circuit breaker, the parts can-
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not be returned to normal position until the thermostat 48 has sufficiently cooled to restore its latch 46 to position for cooperating with the nose 45 of the trip lever 43. This will be the more obvious when it is considered that the foot piece 32 of the V-frame 33 is engaged in the jaw 42. This is an added feature of safety, although of minor importance, since the immediate warping of the thermostat following return to closure position, would in case of overload, automatically release the mechanism.

It may also be pointed out that it is impossible to hold the mechanism in circuit-closing position by maintaining the operating lever 19 manually against the pull of the spring 51 following the thermostatic release of the trip lever 43. The warping of the thermostatic element and the disengagement of its lip 46 from the nose 45 of the trip lever 43, permit the V-frame to rock under the stress of spring 39, as above pointed out. This movement is sufficient to throw the stress of the switch spring 39 across the axis of oscillation of the switch bar 31, with the result that even though the operating lever 19 be held positively in circuit-closing position, the circuit is opened by the throw of the switch block 30, following the rocking of the V-frame 33 and the consequent throw of the switch block 30 in open-circuit position.

It will be understood of course that the mechanism shown illustrates but an embodiment of the thoughts which underlie my invention, and that various modifications of structure may be made which still embody the characteristics which I claim as my invention.

I claim—

1. In an automatic circuit breaker, a spring-stressed operating lever manually movable between a single open circuit and a closed-circuit position, a spring-stressed element engaging the lever to move it to open-circuit position, a detent normally holding said element in fixed location enabling said lever to occupy either of its positions, and a thermostatically controlled means acting on overload to open the circuit independently of the said operating lever and to free said detent.

2. In an automatic circuit breaker, an operating lever manually movable between a single open circuit and a closed-circuit position, a spring stressing said operating lever, a spring-stressed element engaging the lever to move it to open-circuit position, a detent normally holding said element in fixed location, and a thermostatically controlled element actuated by the operating lever spring for freeing said detent on overload.

3. In a circuit breaker, a rocking frame, a fixed support for said rocking frame, a switch lever pivoted on said rocking frame,

a manually controlled operating lever to throw the switch lever to open- or closed position, a spring operatively interposed between said operating lever and switch lever, the effect of said spring being exerted through the switch lever to displace the rocking frame to put the switch lever in open circuit position, in combination with a thermostatically controlled means for latching said frame normally and for releasing it on overload, and a spring-stressed member serving to shift the operating lever to open-circuit position upon displacement of said frame.

4. In a circuit breaker, a rocking frame, a switch lever pivoted therein, a thermostatically controlled trip mechanism holding said rocking frame normally in fixed position, said frame being adapted to put said lever in open circuit position, a manually operated lever to throw the switch lever to closed- or open-circuit position, a member tending constantly to throw the operating lever to open-circuit position and to move said frame to its normal position engaging said trip, and a detent restraining said member against operation, together with thermostatically released means actuating said rocking frame and thereby effecting release of said detent, on overload.

5. In a circuit breaker, an oscillating frame, a switch lever pivoted therein, and a spring to thrust the lever against the frame, in combination with an operating lever, a member adapted to cooperate therewith to shift the operating lever to open-circuit position, thermostatically controlled means for maintaining the oscillating frame in fixed position, a detent for holding against movement the member for throwing the operating lever to open-circuit position, said oscillating frame upon escape from the thermostatically controlled member having a movement in one direction under the influence of the switch spring to release the detent, and a restoring movement in the opposite direction on the throw of the oscillating lever to open-circuit position under the influence of said lever-operating means when the latter are freed by the release of the detent.

6. In a circuit breaker, an oscillating switch lever, an oscillating frame in which it is supported, a spring to act upon the lever, an operating lever having operative connection with the contact lever to shift the latter to open-circuit position, a thermostatically controlled support for the rocking frame, normally maintaining the latter in fixed position, but permitting the same to rock in one direction under the stress of the circuit-closing spring following release of the spring by operation of the thermostat on overload, in combination with detent-controlled means released by said movement of the rocking frame, and simultaneously

throwing the operating lever to open-circuit position.

7. In a circuit breaker, an oscillating switch lever, an oscillating frame in which it is supported, a spring to act upon the lever, an operating lever having operative connection with the contact lever to shift the latter to open-circuit position, a thermostatically controlled support for the rocking frame, normally maintaining the latter in fixed position but permitting the same to rock in one direction under the stress of the circuit-closing spring following release of the spring by operation of the thermostat on overload, in combination with detent-controlled means released by said movement of the rocking frame and simultaneously throwing the operating lever to open-circuit position, said operating lever being ineffective to return the contact lever to closed-circuit position until the return of the thermostatic element to normal position.

8. In a circuit breaker, an oscillating switch lever, an oscillating frame in which it is supported, a spring to act upon the lever, an operating lever having operative connection with the contact lever to shift the latter to open-circuit position, a thermostatically controlled support for the rocking frame, normally maintaining the latter in fixed position but permitting the same to rock in one direction under the stress of the circuit-closing spring following release of the spring by operation of the thermostat on overload, in combination with detent-controlled means released by said movement of the rocking frame and simultaneously throwing the operating lever to open-circuit position, and a one-way engagement between said operating lever and detent controlled device, whereby the return of said lever to closed-circuit position re-establishes the mechanism in normal position only if the thermostatic element has returned to normal position.

9. In a circuit breaker, a switch lever, an operating lever therefor manually shiftable to open and closed-circuit positions, a normally restrained means automatically released on overload for putting the switch lever in open circuit position independently of the operating lever, and a spring means, rendered operative by the action of said means in putting the switch lever in open circuit position, for restoring said means to its normal position and for shifting said operating lever to open circuit position.

10. In a circuit breaker, a switch lever, an operating lever therefor manually shiftable to open and closed-circuit positions, a normally restrained means automatically released on overload for putting said switch lever in open circuit position independently of said operating lever, a spring stressed device tending when released to put said op-

erating lever in open-circuit position and to restore said means to its normal position, a detent normally holding said spring device, said detent being released when said means puts the switch lever in open-circuit position and being reset by movement of said operating lever toward closed circuit position.

11. In a circuit breaker, a switch lever, an operating lever therefor manually shiftable to open and closed-circuit positions, a rocking frame for putting said switch lever in open-circuit position independently of said operating lever, a spring for moving said switch lever upon shifting of said operating lever and tending to put said frame in position to open the circuit, a latch normally holding said frame against the effort of said spring and a thermostatic trip for said latch, in combination with a spring stressed member acting when released to move said operating lever to open-circuit position and to reset said frame and latch ready for re-engagement by said trip, a detent normally holding said member free of said operating lever, said detent being released by said frame in its rocking and reset by said operating lever in its movement toward closed-circuit position.

In testimony whereof I have signed my name to this specification.

EMIL H. W. ULLRICH.

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