Dec. 31, 1935. M. GUETT 2,025,857

CIRCUIT BREAKER

Filed Feb. 15, 1933 2 Sheets-Sheet 1

Fig. 1.

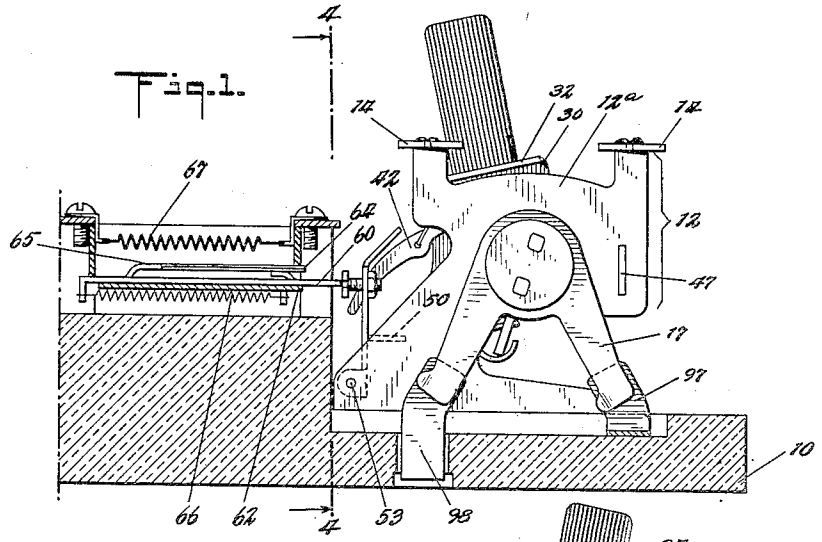


Fig. 2.

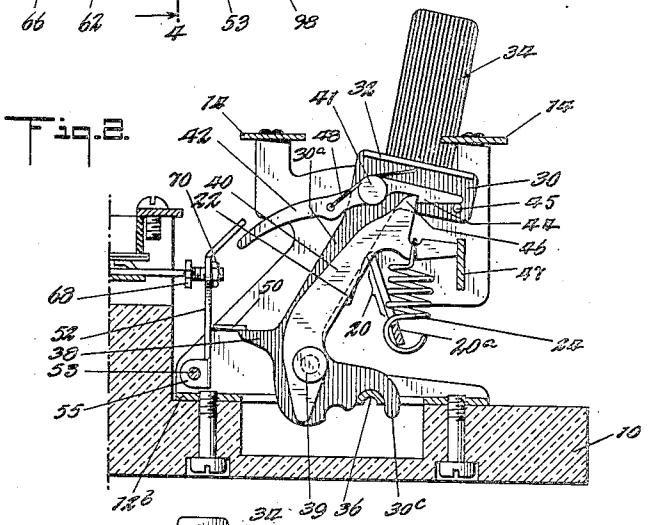
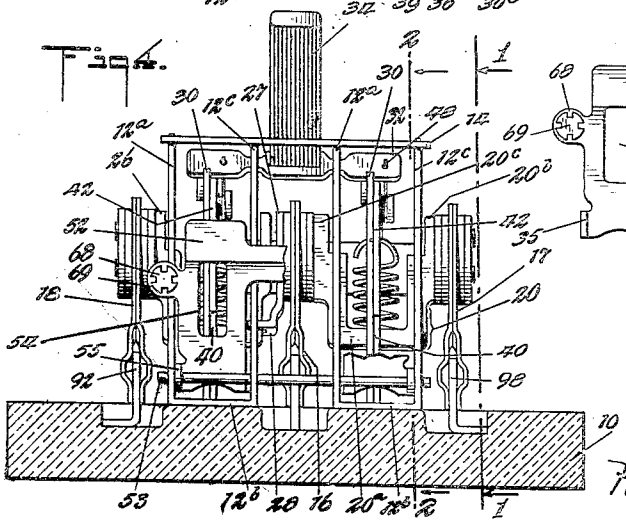


Fig. 4.



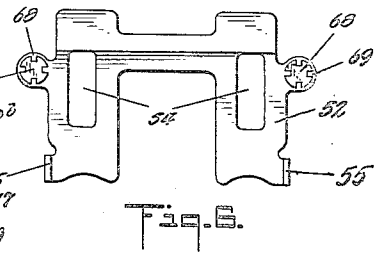


Fig. 6.

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Dec. 31, 1935. M. GUETT 2,025,857

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Filed Feb. 15, 1933 2 Sheets-Sheet 2

Fig. 3.

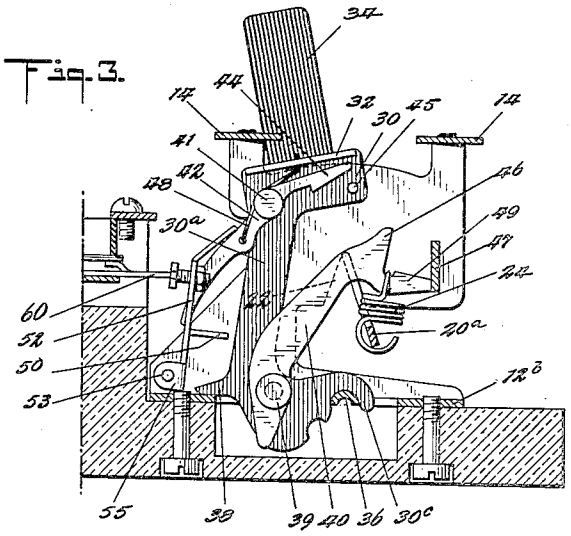
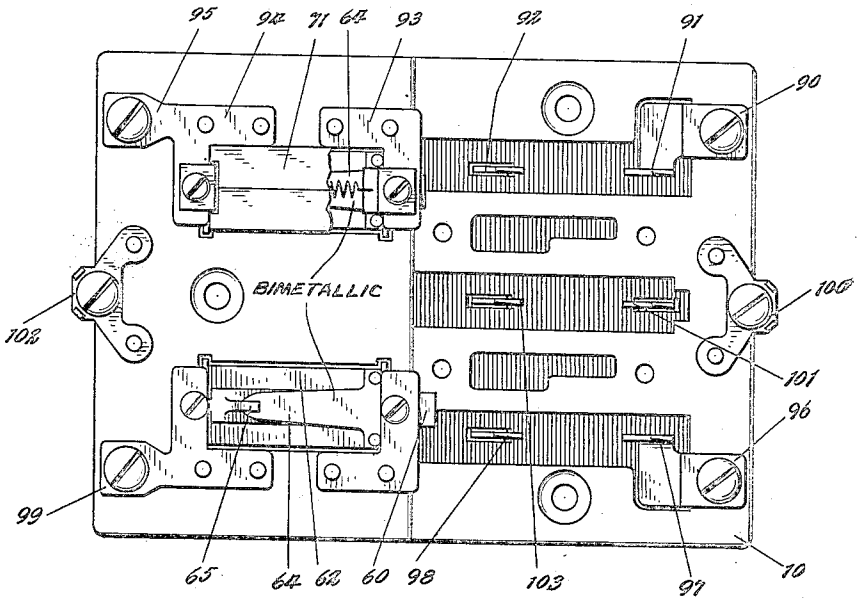


Fig. 5.



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Patented Dec. 31, 1935

2,025,857

UNITED STATES PATENT OFFICE

2,025,857

CIRCUIT BREAKER

Monroe Guett, Hartford, Conn., assignor to The Arrow-Hart & Hegeman Electric Company, Hartford, Conn., a corporation of Connecticut

Application February 15, 1933, Serial No. 656,934

28 Claims. (Cl. 200—116)

This invention relates to lever operated circuit breakers which are adapted to be released automatically upon overload conditions occurring in the circuit controlled. In my copending application, Serial No. 500,352, filed December 5, 1930 patented May 30, 1933, No. 1,911,893, I have described and claimed a circuit breaker having a mechanism somewhat similar to the present invention and the present invention is a development of my previous construction.

It is an object of the present invention to provide a circuit breaker suitable for motor starting and adapted to control either two-wire or three-wire circuits.

Another object of my invention is to provide a circuit breaker of the above type, which will be tripped upon occurrence of an overload in either of the power lines.

Another object of my invention is to provide a circuit breaker containing two similar contact operating mechanisms which operate jointly and have separate tripping mechanisms which are released simultaneously upon overload.

Another object of my invention is to provide an automatically operable circuit breaker, containing one or more normally latched current-responsive tripping devices, with novel means operated upon manual opening of the circuit breaker to reset the current-responsive devices.

Other objects and advantages of my invention will become apparent as it is described in connection with the accompanying drawings.

In the drawings:—

Figure 1 is a side elevation of my invention with the supporting base shown in section taken on line 1—1 of Figure 4.

Figure 2 is a vertical sectional view taken on line 2—2 of Figure 4 of my invention. In this figure the parts are shown in open circuit position.

Figure 3 is a view similar to Figure 2 but showbut showing the position taken by the parts when the circuit breaker is tripped upon overload.

Figure 4 is an end elevation of my invention with the supporting base shown in section, taken on line 4—4 of Figure 1.

Figure 5 is a plan view of the base for my switch mechanism with the mechanism removed but with the current responsive devices for tripping the mechanism mounted on the base.

Figure 6 is a detail view of the member which causes simultaneous tripping of the two latches.

Referring to the drawings, the circuit breaker mechanism is mounted upon a base 10 of porcelain or other suitable insulating material, the base being preferably rectangular in plan and being provided with suitable wells and raised portions as may be necessary to facilitate mounting of the mechanism as will hereinafter more fully appear. The operating mechanism for the circuit breaker is mounted upon a switch frame, denoted generally by the numeral 12. This frame is formed of a pair of identical members which are stamped from sheet metal and bent into U-shape providing narrow horizontal base portions 12*b* and parallel vertical arms 12*a* and 12*c*. The free (upper) ends of the parallel arms 12*a* and 12*c* are secured together parallel to each other in spaced relation by a pair of strips of sheet metal 14 which extend parallel to each other across the tops of the arms and have extensions of the arms extending through apertures in them (the strips) and peened over. Within the two portions of the frame formed by the two members 12, are mounted two separate operating mechanisms which are joined for operation in unison. Each operating mechanism has its own tripping means but these latter are operated simultaneously by one or another of two current responsive devices upon overload. For convenience in describing the construction to which this paragraph refers the two operating mechanisms will be called the right and left mechanisms, referring to Figure 4 of the drawings.

The right mechanism comprises a flat U-shaped switching member 20 which is pivotally mounted in registering inverted V-notch bearings 22 formed in the frame arms 12*a* and 12*c*. The switching member 20 is held seated against the bearing surfaces by means of a coiled spring 24, the lower end of which is looped around the transverse portion 20*a* of the switching member while the upper portion is looped around an auxiliary switch operator 40, hereinafter more fully described.

Secured in insulated relation upon the upper part of the outer edges of the side arms 20*b* and 20*c* of the switching member, by any suitable means, are movable contacts 16, 17 lying in planes of movement parallel to the frame arms 12*a* and 12*c*. A satisfactory way of mounting the movable contacts on the switching member is shown and described in my Patent No. 1,911,893. Obviously the right and left parts of the circuit breaker frame (i. e., the two members, 12) must be spaced far enough apart to permit the mounting and movement between them of the contact 16.

The left operating mechanism has a switching member 26 like member 20 and has a movable contact 18 mounted on and insulated from the outer edge of its outer arm (left arm in Figure 4) in manner like unto the mounting of the contacts 16, 17, on the member 20. Switching member 26 differs from switching member 20 only in the respect that its inner arm (right arm in Figure 4) has no provision for mounting a contact thereon. In a similar manner to member 20, member 26 is held seated in the V-notch bearings of the left part of frame 12, by another switch spring 24.

In order to cause the switching members 20 and 26 to move as a unit there is provided a joiner

stamped from sheet metal with a flat portion 27 secured to member 20 in a position adjacent to but insulated from contact 16. This joiner has a bifurcated end 28 bent laterally at right angles to the main body of the joiner and straddling the edge of the switching member 26.

In order to manually operate the circuit breaker, a fabricated manual operating lever is provided. This manual operating lever is formed of a pair of identical members 30 stamped from sheet metal and connected together at their tops or head portions by a transverse sheet metal member 32. On the central portion of the member 32 is secured a handle 34 which extends outwardly from the circuit breaker mechanism in position to be engaged by the fingers of the person operating the circuit breaker. The manual operating lever is pivotally mounted upon the switch frame by the lower ends of the members 30 rocking upon an arched portion 36 in the central part of the bases 12b of the frame in a manner about to be described. The identical side members 30 of the manual operating member are of irregular form as may be best seen in Figures 2 and 3. These side members 30 comprise shanks 30a at the ends of which are enlarged head and feet portions. The head portion is substantially rectangular as shown in Figures 2 and 3 while the feet are provided with curved toes 30c which fit around an arched portion 36 in the base portions 12b of the switch frame. This arched portion is formed by stamping holes in the bases 12b of the frame and at the same time stamping the metal between these holes into semi-cylindrical form. Behind the heel of the foot portion of the members 30, extensions 38 are formed which are adapted to engage with the inner face of the base portion 12b of the switch frame when the manual actuating member is in closed circuit position as shown in Figure 3. The other face of these extensions 38 is adapted to engage with a lug 50 upon a tripping member 52 for the purpose of resetting current responsive devices as will hereinafter be more fully described.

For releasing the circuit breaker on overload there are pivoted upon the foot portions of each of the members 30 by pins 39, identical auxiliary operating members 40 which may be stamped from sheet metal into the form shown in Figures 2 and 3. Pivoted in the heads of each of the members 30 by pivot pins 41 are identical latch members 42 having noses 44 under which are adapted to engage extensions or latch lugs 46 that are formed upon the auxiliary switch operating members 40. Coil springs 48 are coiled around the heads of the pivot pins 41 each having one end anchored in the transverse member 32 of the manual operating lever and the other end engaged with the latch member 42 in order to constantly urge the latch 42 in clockwise direction. A stop-pin 45 may be provided in the head for engagement by the nose 44 of the latch member to prevent over-travel of the latch member. Due to the action of the spring 48 the latch member is constantly urged in position to engage and hold the auxiliary operator 40 so that it will move as a unit with the manual operating lever. The auxiliary operator 40 is provided with a lateral extension 49 around which is looped the upper end of the switch spring 24 and the parts of the switch mechanism are so sized and positioned that when the manual operating member is in open circuit position as shown in Figure 2, the switch spring 24 will urge the switching member 20 counterclockwise, as the mechanism is viewed in Figures 2 and 3. Transverse bars 47 engaged with the side arms 12a and 12c in each of the two parts of the switch frame serve as stops for the auxiliary operator when it moves on overload. When the manual operator is moved into closed circuit position (Figure 1) the line of action of the switch spring, as the spring passes from open position (Figure 2), moves through the plane of the switching member 20 and thereafter the spring causes snapping of and constantly urges the switch member 20 in clockwise direction.

The pivot pin 39 by which the auxiliary operator 40 is mounted upon the manual operator is so located that when the manual operator is in closed circuit position as shown in Figure 1 the switch spring 24 while tending to retain the manual operator in that position will at the same time tend to rotate the auxiliary operator in a clockwise direction, such rotation being restrained by the latch member 42. Upon occurrence of an overload in the circuit, the latch members 42 will be rotated in a counter-clockwise direction against action of the spring 48 thereby disengaging the latch nose 44 from the auxiliary operator and causing the auxiliary operator to move in clockwise direction to the position shown in Figure 3. In so doing the line of action of the switch spring 24 passes through the plane of the switching member 20 and thereafter the spring 24 causes snapping and urging of the switching member into open circuit position, as shown in Figure 3. This movement of the switching members is accompanied by the corresponding movement of the movable contacts by reason of the fact that these contacts are mounted upon the switching members.

It will be observed that each of the operating mechanisms is provided with its own latch member 42 and auxiliary operator 40. By reasons of this fact if the latch of one of the mechanisms (for example, the left one) is moved to release the auxiliary operator of that mechanism, there will be a tendency for the switch spring of that mechanism to pull its switching member into open circuit position while at the same time the spring of the right mechanism will be urging the switching member of the right mechanism to closed circuit position. The switch springs will therefore tend to neutralize each other. The friction between the stationary and movable contacts is normally sufficient to keep them in engagement with each other, until both of the switch springs tend, at the same time, to move the contacts to open circuit position. Thus it is essential that both of the latches be operated at one time whenever an overload occurs in the circuit. In order to accomplish this I have provided means for simultaneously operating the latches. This means comprises a symmetrical H-shaped member 52 stamped from sheet metal and pivotally mounted, at the same end of the switch frames from which the latches 42 project. The pivot for member 52 is an axle 53 passing through the side arms 12a and 12c of the frames near and parallel to the base portion 12b, and, at the same time passing through a pair of lugs 55 extending at right angles to the legs of the member 52, from the sides and adjacent the ends of said legs.

The member 52 is provided also with a pair of lugs 50 which are pressed out of the central portions of the legs (one in each leg) of the member 52 so as to extend substantially perpendicularly thereto and into the path of movement of the extensions 38 of the manual operating member.

The pressing out of the lug 55 forms an opening 54 in each leg of member 52, into which openings the ends of the latch members 42 extend, touching the top ends of the openings.

Any suitable type of thermally or electromagnetically operated current responsive device may be employed to strike against the member 52 to cause it to simultaneously actuate the latches 42 and thereby bring about the opening of the circuit breaker. For the purpose of illustration I have shown a bimetallic type of thermal release.

Two of these current responsive devices are mounted upon the switch base behind the member 52, that is, to the left of the member 52 in Figures 1, 2 and 3. These current responsive devices may be of the type shown in the application of David W. Johnson, Serial No. 629,224, patented November 27, 1934, No. 1,982,521. Or, as shown herein, each may comprise a spring pressed plunger 60 which slides in a channel formed in a metallic supporting member 62 and is held normally inactive by a bimetallic thermo-bar 64. This thermo-bar is secured at one end to the supporting member 62 at the end thereof across the channel therein. The other end of the thermo-bar engages a lug 65 bent up out of the plunger 60. The thermo-bar will bend down upon an increase in temperature to allow the plunger to move forward under the action of spring 66 and rotate the member 52. These triggers may be reset, after the thermo-bar has cooled, by moving the manual operating member of the circuit breaker into open circuit position, which will cause the extension 38 on the manual operating member to engage the lug 50 on the member 52 and will rotate the member 52 in counterclockwise direction as viewed in Figures 1, 2 and 3, thereby pressing against the plungers and moving them to the left in these figures until the thermo-bar can snap up in front of the plunger lug 65. In Figures 3 and 5 one of the plungers is shown in tripped position and the other in retracted or normal position.

Preferably the heating of the bimetallic element is accomplished by means of a heater coil 67 of high resistance wire which is connected in one of the outside lines of the three wire system. The heater element of the other thermal trip will be connected in the other outside line of the system so that if an overload occurs in either of these lines it will cause tripping of the circuit breaker. The heater coils will be housed in suitable insulating housings 71 to protect them and to confine their heat.

Adjustment between the member 52 and the tripping devices, so that very exact positioning and proportioning of the parts may not be necessary, is accomplished by a pair of bolts 68 having screw threaded engagement with the member 52 and located on it at opposite sides in lugs 69 extending laterally outward from the sides. The position of adjustment of these bolts 68 may be maintained by screwing nuts 70 upon the ends of them.

Under some conditions it may be desired to use only one contact actuating mechanism or one tripping device. A circuit breaker of such design can readily be made from the foregoing disclosure by eliminating the extra parts. The operation of the circuit breaker with a single contact actuating mechanism or a single current-responsive device, or both, will be substantially the same in principle as the operation already described.

The circuit through the device will be from one power line through the wire terminal 90, the stationary contact 91 formed integrally therewith, then through the movable contact 18 to the other stationary contact 92 of the pair with which contact 18 engages and disengages. The current then passes through a bus bar (not shown) under the insulating base 10 to the mounting plate 93 on which one end of the heater coil 67 is mounted. The current after passing through the heating coil 67 goes through the mounting plate 94 at the other end to which is electrically connected the wire terminal 95 for the load line. In a similar manner current passes through the wire terminal 96 for the other power line, stationary contact 97 movable contact 17, stationary contact 98, the heater—and its mountings—of the terminal responsive device, and finally to the load wire terminal 99.

Connection of the neutral wire is facilitated by line wire terminal 100 which is electrically connected under base 10 to fixed circuit breaker contact 101, and by load wire terminal 102 which is electrically connected under base 10 with stationary circuit breaker contact 103, contacts 103 and 101 being engaged and disengaged by movable contact 16.

Many modifications within the scope of my invention will occur to those skilled in the art, therefore I do not limit myself to the specific form of the invention illustrated.

I claim:—

1. An electric circuit breaker comprising a plurality of contact-actuating mechanisms each having its own actuating spring, said mechanisms being operable to move the contact sets to both open and closed circuit position with a snap motion, a plurality of contact sets movable upon operation of said mechanisms, and current responsive means to cause simultaneous operation of said mechanisms.

2. An electric circuit breaker comprising a plurality of contact-actuating mechanisms each having its own actuating spring, said mechanisms being operable to move the contact sets to both open and closed circuit position with a snap motion, a plurality of contacts operable by said mechanisms, means to cause simultaneous operation of said mechanisms, and a plurality of current responsive means each of which is capable of independently actuating said operating means.

3. An electric circuit breaker comprising a plurality of contact-actuating mechanisms connected for joint operation each having its own actuating spring, said mechanisms being operable to move the contact sets to both open and closed circuit position with a snap motion, a plurality of contact sets operable by said mechanisms, a plurality of means to release said mechanisms on overload, and a plurality of current responsive means to cause actuation of said releasing means.

4. An electric circuit breaker comprising a plurality of contact operating mechanisms each having its own actuating spring, said mechanisms being operable to move the contact sets to both open and closed circuit position with a snap motion, a plurality of contact sets simultaneously movable by said mechanisms, means for causing simultaneous operation of said mechanisms and a plurality of current responsive means each of which is capable of independently actuating said operating means.

5. An electric circuit breaker comprising a plurality of contact operating mechanisms each

having its own actuating spring, said mechanisms being operable to move the contact sets to both open and closed circuit position with a snap motion, a plurality of contact sets simultaneously movable by said mechanisms, a plurality of separately operable current responsive means each of which is capable of causing actuation of said switch operating mechanisms in unison.

6. An electric circuit breaker comprising a plurality of contacts and contact actuating mechanisms each having its own actuating spring, said mechanisms being operable to move the contact sets to both open and closed circuit position with a snap motion, a plurality of independent tripping devices, means causing said tripping devices to be tripped simultaneously, and a plurality of separately actuable current responsive devices acting on said means.

7. An electric circuit breaker comprising a plurality of contact-actuating mechanisms connected for joint operation each having its own actuating spring, said mechanisms being operable to move the contact sets to both open and closed circuit position with a snap motion, a plurality of contact sets simultaneously movable upon operation of said mechanisms, separate means for releasing said mechanisms upon overload, and a plurality of current responsive means to cause operation of said releasing means.

8. An electric circuit breaker comprising a plurality of contact-actuating mechanisms connected for joint operation each having its own actuating spring, said mechanisms being operable to move the contact sets to both open and closed circuit position with a snap motion, a plurality of contact sets simultaneously movable upon operation of said mechanisms, separate means for releasing said mechanisms upon overload, means for simultaneously operating said separate means, and a plurality of current responsive means actuable independently of one another for actuating said operating means.

9. An electric circuit breaker comprising a plurality of contact-actuating mechanisms connected for joint operation each having its own actuating spring, said mechanisms being operable to move the contact sets to both open and closed circuit position with a snap motion, a plurality of contact sets simultaneously movable upon operation of said mechanisms, separate means for releasing said mechanisms upon overload, current responsive means operable to simultaneously release said separate means.

10. An electric switch comprising a plurality of contact-actuating mechanisms each having its own actuating spring, said mechanisms being operable to move the contact sets to both open and closed circuit position with a snap motion, a plurality of contact sets movable by said mechanisms, separate means for releasing said mechanisms upon overload, means for simultaneously operating said separate means, and a plurality of current responsive means actuable independently of one another for actuating said operating means.

11. An electric switch comprising a plurality of contact-actuating mechanisms each having its own actuating spring, said mechanisms being operable to move the contact sets to both open and closed circuit position with a snap motion, a plurality of contact sets movable by said mechanisms, separate means for releasing said mechanisms upon overload, current responsive means operable to simultaneously release said separate means.

12. An overload circuit breaker comprising a plurality of current-responsive tripping devices each including a spring pressed plunger and a latch therefor releasable on overload, fixed and movable contacts, means for manually operating said movable contacts to open and to closed positions, means operable independently of said manual means for releasing said movable contacts on overload and means actuated by said last-named means for preventing said contacts from being held closed by said manual means during overload conditions, each of said current responsive devices being adapted to operate said automatic releasing means.

13. An overload circuit breaker comprising a plurality of current-responsive tripping devices each including a spring pressed plunger and a latch therefor releasable on overload, fixed and movable contacts, means for manually operating said movable contacts to open and to closed positions, means operable independently of said manual means for releasing said movable contacts on overload, each of said current responsive devices being adapted to operate said automatic releasing means, and means causing said manual means to reset said current responsive devices on movement of said manual means to open position.

14. An overload circuit breaker comprising a plurality of current-responsive tripping devices adapted to be connected in different lines of a power circuit and each including a spring-pressed plunger, fixed and movable contacts, means for manually operating said movable contacts to open and to closed positions, means operable independently of said manual means for releasing said movable contacts on overload, means cooperating with said plungers and said releasing means for causing movement by any of said plungers to accomplish automatic opening of said circuit breaker.

15. An overload circuit breaker comprising a plurality of current-responsive tripping devices adapted to be connected in different lines of a power circuit and each including a spring-pressed plunger, fixed and movable contacts, means for manually operating said movable contacts, means operable independently of said manual means for releasing said movable contacts on overload, means cooperating with said plungers and said releasing means for causing movement by any of said plungers to accomplish automatic opening of said circuit breaker, said cooperating-means being moved by said manual means, upon opening movement of said manual means, to cause resetting of said plungers.

16. An overload circuit breaker comprising a plurality of current-responsive tripping devices each including a spring-pressed plunger, fixed and movable contacts, means for manually operating said movable contacts, means operable independently of said manual means for releasing said movable contacts on overload, means cooperating with said plungers and said releasing means for causing movement by any of said plungers to accomplish opening of said circuit breaker, said manual means upon movement to open-circuit position causing said cooperating means to reset any and all of said plungers which may have been released.

17. An overload circuit breaker comprising a plurality of current-responsive tripping devices each including a spring-pressed plunger, fixed and movable contacts, means for manually operating said movable contacts, means operable independently of said manual operating means for automatically releasing said movable contacts on

overload, and a rockable member engageable by all of said plungers for causing actuation of said automatic means.

18. An overload circuit breaker comprising a plurality of current-responsive tripping devices each including a spring-pressed plunger, fixed and movable contacts, means for manually operating said movable contacts, means operable independently of said manual operating means for automatically releasing said movable contacts on overload, and a rockable member engageable by all of said plungers for causing actuation of said automatic means, said manually operable means upon movement to open-circuit position causing said member to reset said plungers.

19. An overload circuit breaker comprising a plurality of current-responsive tripping devices each including a spring-pressed plunger, fixed and movable contacts, means for manually operating said movable contacts, means operable independently of said manual operating means for automatically releasing said movable contacts on overload and means actuated by said last-named means for preventing said contacts from being held closed by said manual means during overload conditions, and an adjustable connection between said plungers and said automatic releasing means.

20. An overload circuit breaker comprising a plurality of current-responsive tripping devices each including a spring pressed plunger, fixed and movable contacts, means for manually operating said movable contacts, means operable independently of said manual operating means for automatically releasing said movable contacts on overload, and an adjustable connection between said plungers and said automatic releasing means, said manually operable means upon movement to open-circuit position causing said adjustable connection to reset said plunger.

21. An overload circuit breaker comprising a current-responsive tripping device including a spring-pressed plunger and a latch therefor releasable upon overload, fixed and movable contacts, means for manually operating said movable contact, means operable independently of said manual means for releasing said movable contact upon overload and means actuated by said last-named means for preventing said contacts from being held closed by said manual means during overload conditions, said current responsive device being adapted to operate said automatic releasing means.

22. An overload circuit breaker comprising a current-responsive tripping device including a spring-pressed plunger and a latch therefor releasable upon overload, fixed and movable contacts, means for manually operating said movable contact, means operable independently of said manual means for releasing said movable contact upon overload, said current responsive device being adapted to operate said releasing means, means causing said manual means to reset said current-responsive device on movement of said manual means to open circuit position, said current responsive device being separable from the circuit breaker without interfering with the manual operation of the breaker.

23. An overload circuit breaker comprising a current-responsive tripping device including a spring-pressed plunger, fixed and movable contacts, means for manually operating said movable contact, means operable independently of said manual means for releasing said movable contact on said overload, means cooperating with said plunger and said releasing means for causing movement by said plunger to accomplish automatic opening of said circuit breaker said current responsive device being separable from the circuit breaker without interfering with the manual operation of the breaker.

24. An overload circuit breaker comprising a current-responsive tripping device including a spring-pressed plunger, fixed and movable contacts, means for manually operating said movable contact, means operable independently of said manual means for releasing said movable contact on overload, means cooperating with said plunger and said releasing means for causing movement by said plunger to accomplish opening of said circuit breaker, said manual means upon movement to open circuit position causing said cooperating means to reset said plunger said current responsive device being separable from the circuit breaker without interfering with the manual operation of the breaker.

25. An overload circuit breaker comprising a current-responsive tripping device including a spring-pressed plunger, fixed and movable contacts, means for manually operating said movable contact, means operable independently of said manual operating means for automatically releasing said movable contact on overload, and a rockable member rockable by said plunger to actuate said automatic means.

26. An overload circuit breaker comprising a current-responsive tripping device including a spring-pressed plunger, fixed and movable contacts, means for manually operating said movable contact, means operable independently of said manual operating means for automatically releasing said movable contact on overload and means actuated by said last-named means for preventing said contacts from being held closed by said manual means during overload conditions, and an adjustable connection between said plunger and said automatic releasing means.

27. An overload circuit breaker comprising a current-responsive tripping device including a spring-pressed plunger, fixed and movable contacts, means for manually operating said movable contact, means operable independently of said manual operating means for automatically releasing said movable contact on overload, and an adjustable connection between said plunger and said automatic releasing means, said manual operating means upon movement to open circuit position causing said adjustable connection to reset said plunger.

28. An overload circuit breaker comprising a current responsive tripping device, fixed and movable contacts, means for manually operating said movable contact, means operable independently of said manual operating means for automatically releasing said movable contact on overload, and an adjustable connection between said tripping device and said automatic releasing means, said manual operating means upon movement to open circuit position causing said adjustable connection to reset said tripping device.

MONROE GUETT.

DISCLAIMER

2,025,857.—*Monroe Guett,* Hartford, Conn. CIRCUIT BREAKER. Patent dated December 31, 1935. Disclaimer filed March 17, 1937, by the assignee, *The Arrow-Hart & Hegeman Electric Company;* the patentee consenting.

Hereby enters this disclaimer to claims 3 and 7 of said Letters Patent.

[*Official Gazette April 13, 1937.*]