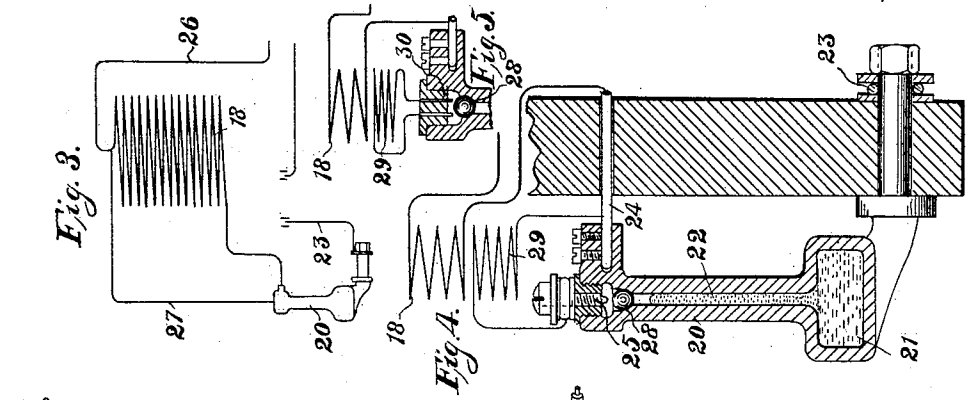
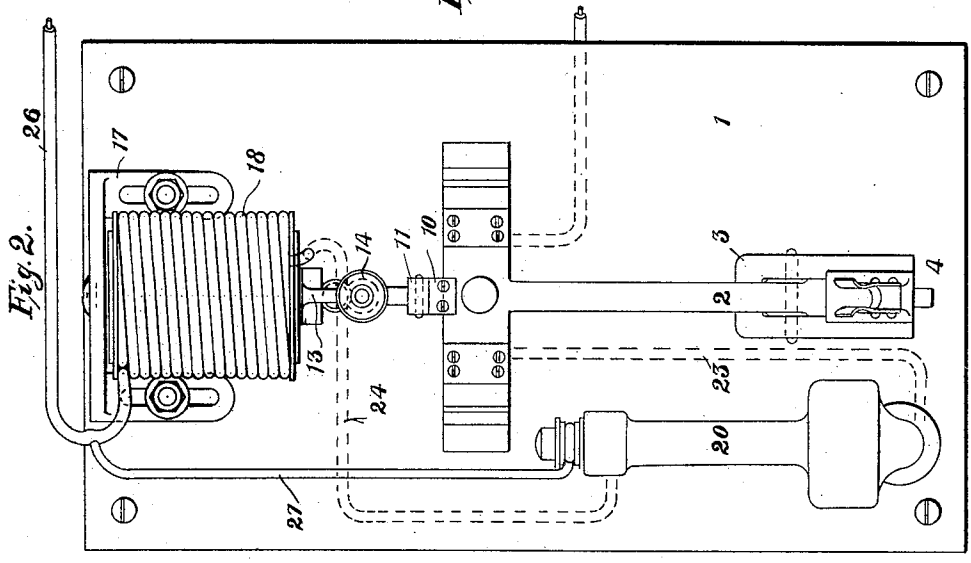
(No Model.)

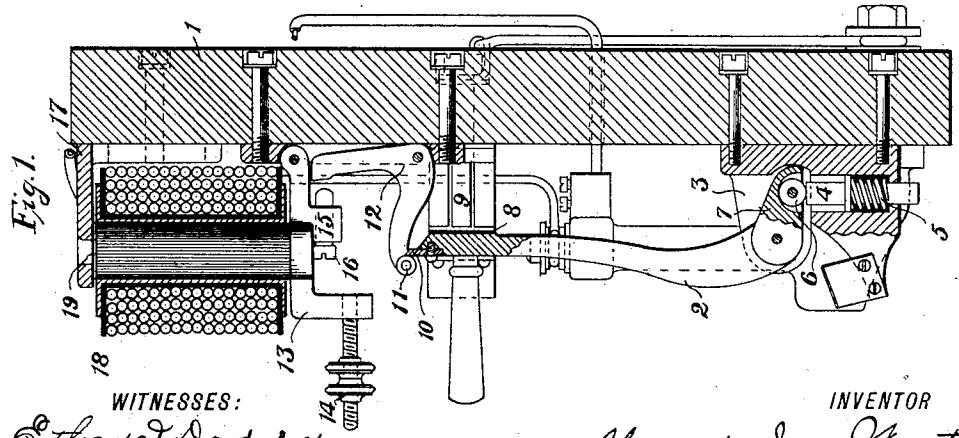
A. J. WURTS.

CIRCUIT BREAKER.

No. 570,415. Patented Oct. 27, 1896.







WITNESSES:

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UNITED STATES PATENT OFFICE.

ALEXANDER JAY WURTS, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, OF SAME PLACE.

CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 570,415, dated October 27, 1896.

Application filed August 31, 1895. Serial No. 561,119. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER JAY WURTS, a citizen of the United States, and a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Circuit-Breakers, (Case No. 663,) of which the following is a specification.

My invention relates to automatic circuit-breakers, and has particular reference to devices of this character which are employed in connection with multiphase circuits, though not limited to such use.

The object of the invention is to provide an automatic circuit-breaker which shall open either upon open circuit or overload, and which when opened by reason of an overload is adapted to be operated only after a suitable predetermined interval of time, it being desirable that all of the above-named characteristics should be present in automatic circuit-breakers used in connection with multiphase circuits.

It is obvious without explanation that every circuit supplying current to translating devices should be provided with means for interrupting it in case an overload should occur, and it will be readily understood that if such overload is only momentary it may not be desirable to have the circuit opened. Hence the desirability of a time element which shall insure the lapse of a suitable interval before the interruption of the circuit takes place. It is also important that the circuit-breaker should be actuated in the event of an accidental interruption of the circuit from any cause, for the reason that it is not desirable that the circuit after having once been opened should be again closed on a dead and loaded motor or motors.

In the accompanying drawings, Figure 1 is a view, partially in section and partially in side elevation, of a circuit-breaker constructed in accordance with my invention; and Fig. 2 is a front elevation of the same. Fig. 3 is a diagram of the circuits through the device. Fig. 4 shows a modified arrangement of circuits in connection with a longitudinal sectional view of the time-element circuit-closing device. Fig. 5 is a detail view showing a still further modification of circuits.

Reference being now had to the drawings in detail, 1 is the insulating slab or base, on which the operative parts of the apparatus are mounted, and 2 is the movable contact-arm, pivoted at its lower end to a block 3. This block 3 is bolted to the base 1 and is provided with a recess in which fits a pin 4, provided with a collar between which and the end of the recess is placed a coiled spring 5. The upper end of the pin 4 impinges against a roller 6, mounted in an extension 7 of the arm 2, projecting beyond its pivot. The arm 2 is provided at its upper end with with the usual contact devices 8, which engage with the stationary contacts 9, mounted upon the base 1. Projecting slightly beyond the end of the movable contact-arm is a catch 10, with which engages a roller 11, mounted upon the end of a latch 12, which has the form of a bell-crank lever, this latch being pivoted at its middle portion to a suitable projection on the base 1. Pivoted also to the base 1, or a suitable projection thereon, is an armature 13, normally extending horizontally outward from this pivoted end and supported in that position by the magnet.

The armature is provided at its outer free end with an adjustable weight or weights 14, in the present instance shown as a screw provided with nuts, which may be moved inward or outward thereon, and thus made to serve as variable weights. The armature 13 is also provided at its under side with a lug 15, in which is mounted a screw 16 in such position as to come into contact with the upper end of the latch 12 when the armature swings downward under the action of gravity, this screw 16 being adjustable in order to regulate the position of its point with reference to the end of the latch 12, with which it engages.

Supported by a suitable bracket or plate 17, adjustably mounted upon the base 1, is an electromagnet 18, having the usual laminated core 19. Mounted upon the base 1 is a receptacle 20, formed of conducting material, preferably iron, and having a bulb 21 of considerable capacity at its bottom and a

vertical chamber 22 of small diameter extending upward therefrom. This chamber is partially filled with a liquid which has a high degree of expansion when heated, mercury being preferred for this purpose. One of the stationary contacts of the circuit-breaker is connected to the lower end of this receptacle by means of a conductor 23, and the magnet-coil is connected to the upper end of the receptacle by the conductor 24. A contact device 25 projects into the upper end of the receptacle 20 and is insulated therefrom. This contact device is connected to the main circuit-conductor 26 by a conductor 27, as shown in Fig. 2.

When the current through the main circuit, the magnet, and the device 20 increases to such an extent as to heat and expand the mercury in the latter, it will rise in the channel 22 and carry the metal ball 28 into engagement with the contact 25, and thus complete the circuit around the magnet. The magnet being thus short-circuited, the armature 13 will swing into contact with the latch 12 and move it out of engagement with the catch 10.

It is obvious that the armature will also drop, as above indicated, if the main circuit is accidentally interrupted from any cause.

In Figs. 4 and 5 I have shown a modification suitable for alternating-current circuits, a secondary coil 29 being provided for the magnet 5, the circuit through which is closed by means of the liquid, its containing vessel, and the supplemental contacts. In Fig. 5 two supplemental stationary contacts 30 are provided in lieu of the single contact 25. With this arrangement of contacts it is obvious that any liquid may be employed which is sufficiently expansible under the influence of heat, since the circuit is closed entirely through the ball 28.

It will be readily understood from the illustration and the foregoing description that an excessive current in the main circuit, in which are included the coil 18, the receptacle 20, and the mercury and movable contact 28 therein, will generate sufficient heat to expand the mercury and close the secondary circuit through the coil 29, which will act in opposition to the coil 18, and thus render the magnet as a whole inactive, the result being the same as if a single magnet-coil were employed and a short circuit were established around it by means of the mercury and its inclosing vessel.

It will also be understood that a device which will operate to close a short circuit or a secondary circuit having a different construction from that shown may be employed, and I do not wish to limit my invention in this particular. The ball 28 may also be dispensed with, if desired, but I regard it as useful in order to prevent oxidation of the mercury by the arc which may form when the circuit is broken at this point.

I claim as my invention—

1. In an automatic circuit-breaker, a controlling-magnet having a coil in the circuit to be interrupted, in combination with circuit-closing means for rendering said magnet inactive, said circuit-closing means being independent of said magnet and located in and forming a part of the main circuit, whereby an excessive current in said circuit serves to actuate said means.

2. In an automatic circuit-breaker, a controlling-magnet having a main coil permanently included in the circuit to be interrupted and a secondary coil in inductive relation to said main coil and in a normally open circuit, in combination with means for automatically closing said secondary circuit, said means being actuated by excessive current in the main circuit.

3. In an automatic circuit-breaker, a controlling-magnet having a main coil included in the circuit to be interrupted and a secondary coil in inductive relation to said main coil and included in a normally open circuit, in combination with means for closing said secondary circuit included in the main circuit and operating automatically a predetermined interval after the occurence of an excessive current in the main circuit.

4. In a circuit-breaker, stationary and movable contacts, a latch engaging said movable contact and means for moving the latter when the latch is withdrawn, in combination with a gravity-actuated armature for withdrawing said latch, an electromagnet normally supporting said armature and means for rendering the magnet inactive when the current in the main circuit becomes excessive.

5. The combination with an automatically-opening switch and a latch therefor, of an armature for withdrawing said latch, an electromagnet normally supporting said armature and circuit-closing means energized by an excessive current in the circuit to render the magnet inactive, whereby the armature is released to effect the withdrawal of the latch.

6. In an automatic circuit-breaker, the combination with the main contacts, a latch and a latch-releasing device, of an electromagnet for holding the releasing device in its inactive position when the main circuit is carrying a normal current, and circuit-closing means actuated by an excessive current in said circuit to render said magnet inactive, whereby the releasing device is put in motion to effect the withdrawal of the latch.

7. An automatic circuit-closing device comprising a receptacle formed of conducting material and a body of mercury therein, said receptacle and mercury forming part of an electric circuit, a stationary contact projecting into and insulated from said receptacle, the expansion of the mercury by the heat generated by an abnormal current passing through it and its receptacle serving to close the circuit between the same and the stationary contact.

8. A circuit-closing device comprising a re-

ceptacle provided with a stationary contact at or near the upper end thereof, a body of liquid partially filling said receptacle and a movable contact device in said receptacle which is moved into engagement with said stationary contact when an abnormally-heavy current flows through the main circuit.

9. A circuit-closing device comprising a metal tube connected in an electric circuit, a body of expansible liquid partially filling said receptacle, a stationary contact projecting into said receptacle at or near the top thereof, and a contact device movable into engagement with said stationary contact by the expansion of said liquid.

10. In an automatic circuit-breaker, the combination with the main circuit separable contacts, a latch and an armature for withdrawing the same, of an electromagnet for holding the armature out of engagement with the latch when the circuit is carrying a normal current, and means operating at a predetermined interval after the occurrence of an abnormally-heavy current in the circuit to render the magnet inactive.

11. In an automatic circuit-breaker, the combination with stationary and movable contacts, and a latch for normally retaining the latter in engagement with the former, of an electromagnet, a latch-withdrawing armature supported by said magnet in an invariable fixed position while a normal current is flowing in the main circuit and means actuated by an excessive current to effect the release of the armature, whereby its movement in one direction away from the magnet and into engagement with the latch is insured, both when the current in the main circuit becomes excessive and when it fails.

12. In an automatic circuit-breaker, the combination with stationary and movable contacts, and a latch for fastening the latter in closed position, of an electromagnet, a latch-withdrawing armature supported by said magnet in an invariable, fixed position while a normal current is flowing in the main circuit, and means actuated by an excessive current to effect the release of the armature, said armature being movable away from the magnet and into engagement with the latch by gravity when released either by the failure of the current in the main circuit or by reason of an excessive main current, and means for actuating the movable contact device when the latch is withdrawn.

In testimony whereof I have hereunto subscribed my name this 29th day of August, A. D. 1895.

ALEXANDER JAY WURTS.

Witnesses:
JNO. A. SCHIMPF,
H. C. TENER.