No. 701,621. Patented June 3, 1902.

B. P. RUCKER.

CIRCUIT BREAKER.

(Application filed Nov. 26, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

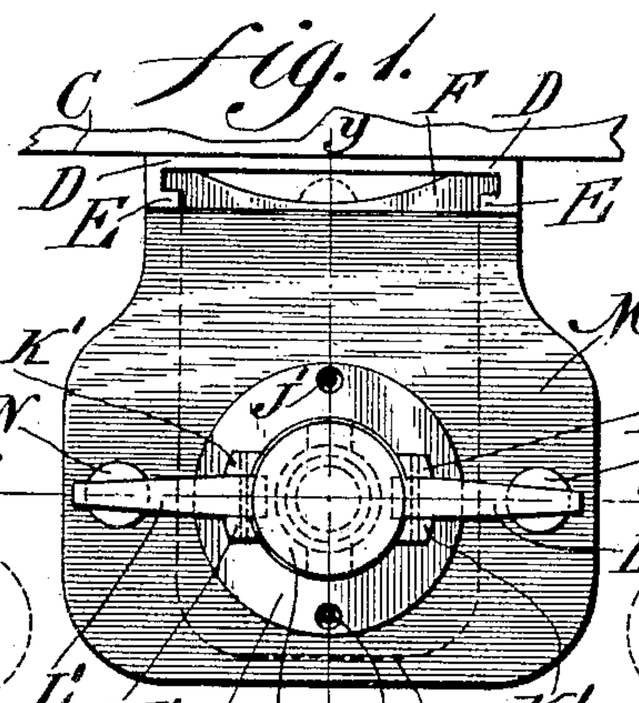


Fig. 2.

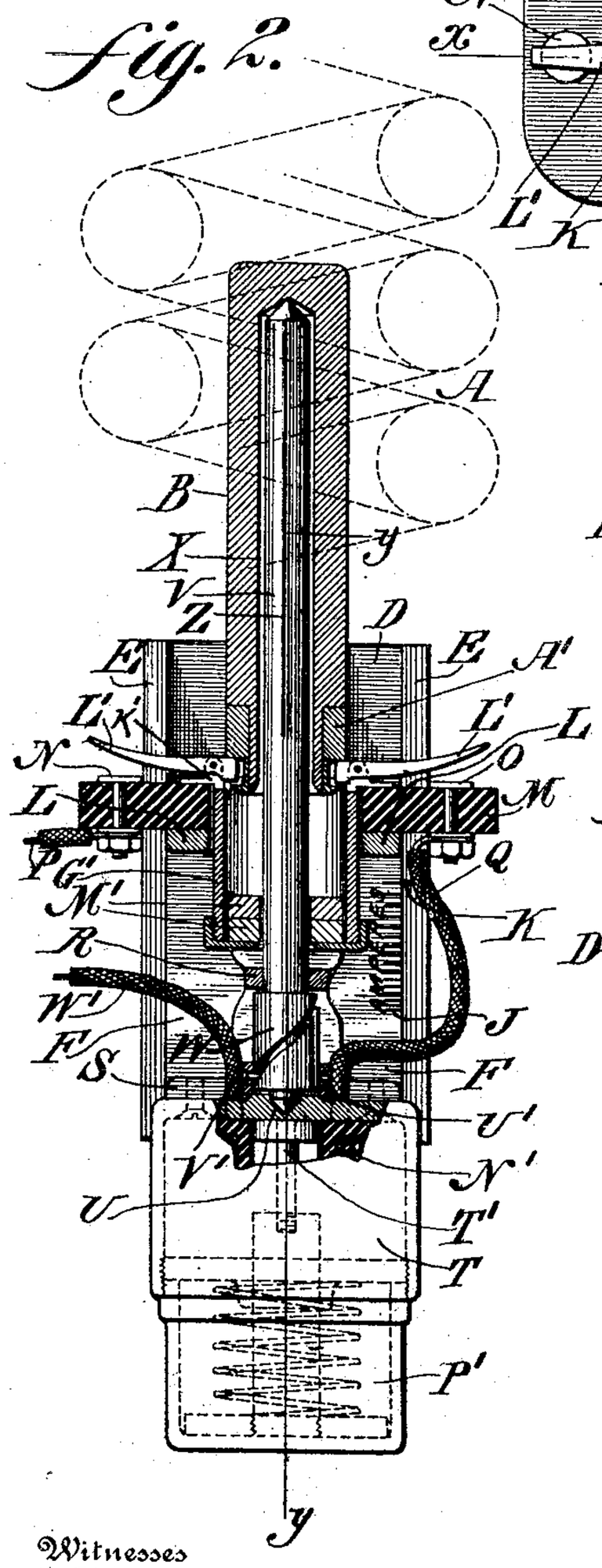


Fig. 4.

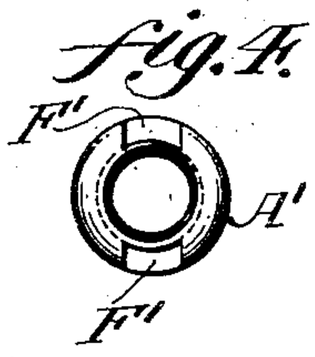


Fig. 5.

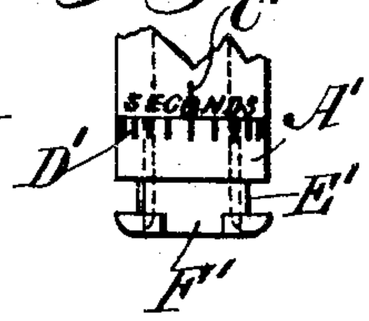
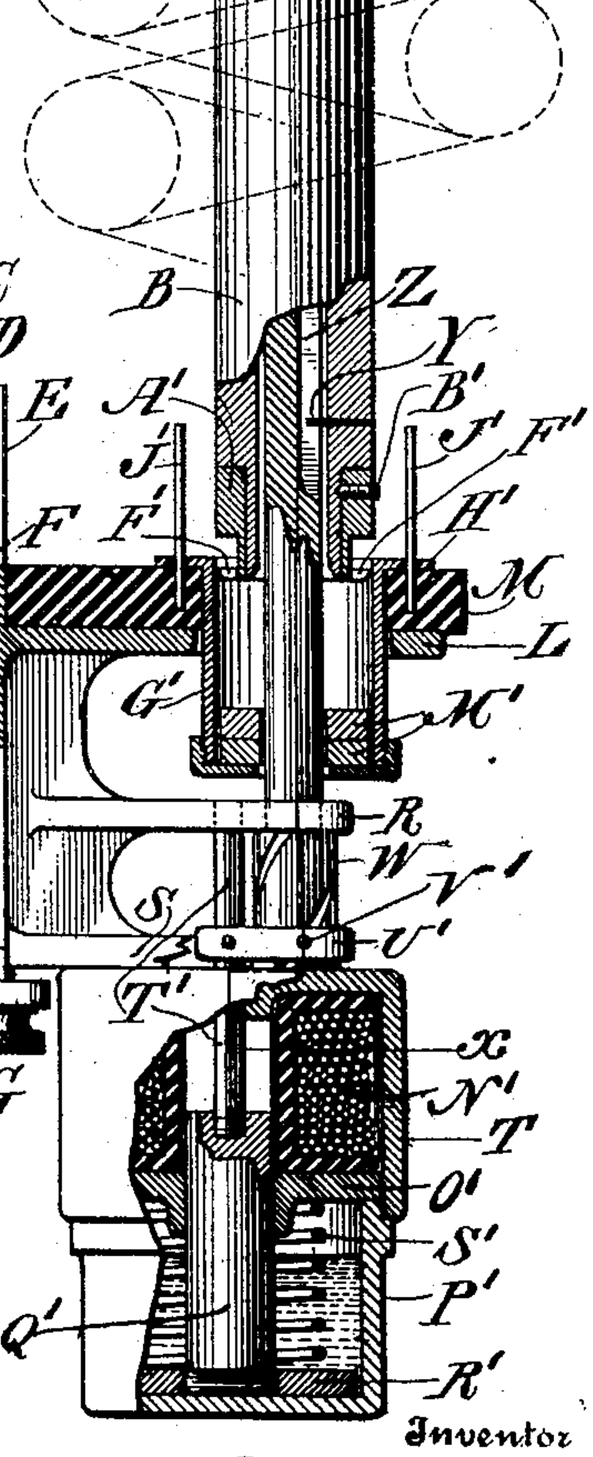


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

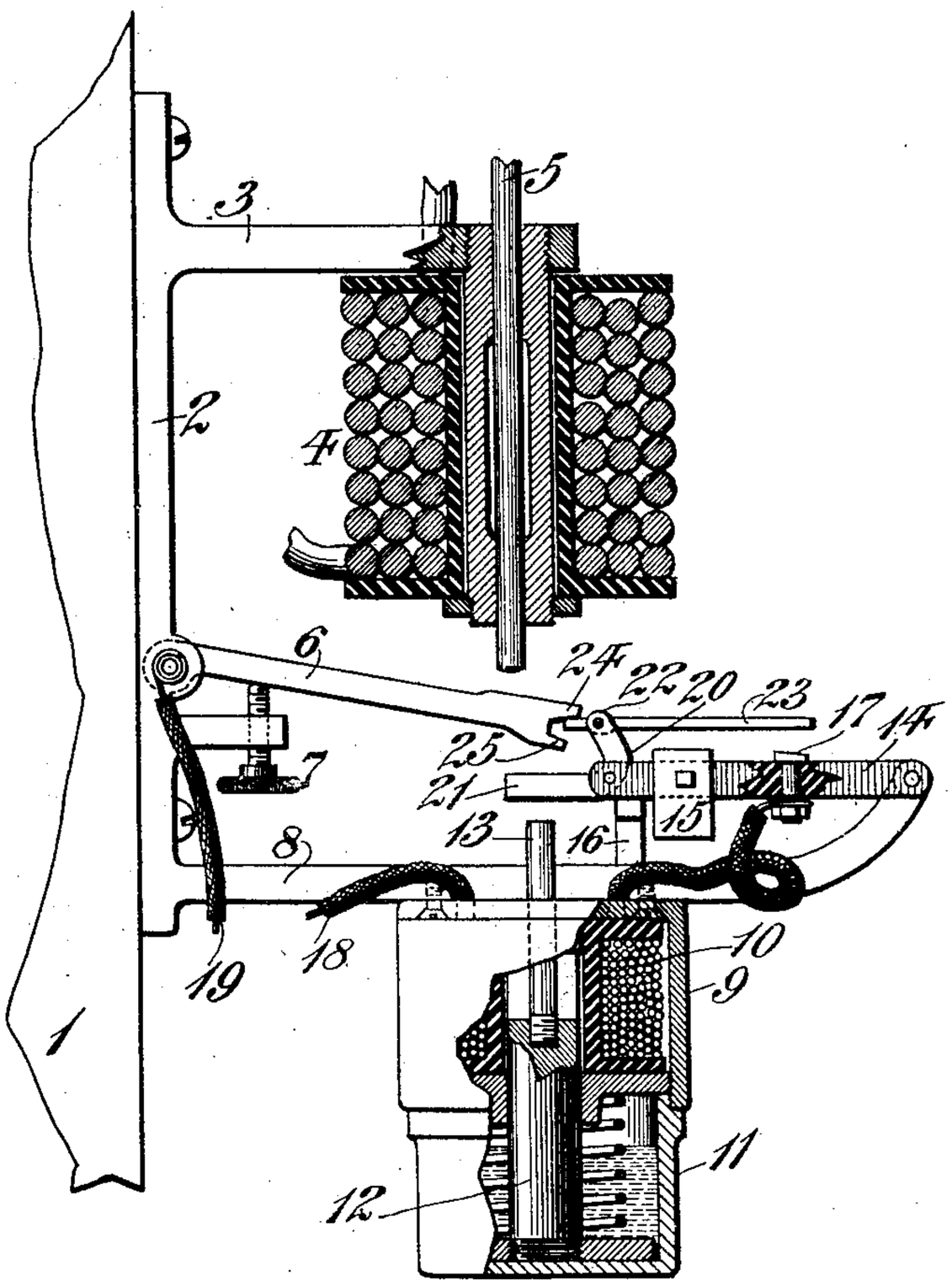

fig. 6.

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UNITED STATES PATENT OFFICE.

BENJAMIN PARKS RUCKER, OF BROOKLYN, NEW YORK.

CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 701,621, dated June 3, 1902.

Application filed November 26, 1901. Serial No. 83,700. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN PARKS RUCKER, a citizen of the United States, residing in the city of New York, borough of Brooklyn, Kings county, State of New York, have invented a new and useful Improvement in Circuit-Breakers, of which the following is a specification.

My invention consists of an instantaneous and a time-element trip for electric-circuit breakers, the same being conveniently combined in one apparatus and being capable of independent use, suitable devices being provided to operate either the instantaneous or time-element mechanism, according to the degree and character of the abnormal current.

My invention further consists of the details of construction hereinafter fully described and claimed.

Figure 1 represents a top plan of a trip for electric-circuit breakers constructed in accordance with my invention. Fig. 2 represents a vertical section of certain parts, taken on the line $x\ x$ of Figs. 1 and 3 with certain parts shown in elevation. Fig. 3 represents a vertical section of certain parts, taken on the line $y\ y$ of Figs. 1 and 2 with certain parts in elevation. Fig. 4 represents an elevation of the lower end of a core of one form of circuit-breaker that operates in conjunction with my improved trip mechanism. Fig. 5 represents a side elevation of the same. Fig. 6 represents a view, partially in side elevation and in vertical section, of a modified construction embodying my invention.

Similar letters of reference indicate corresponding parts in the figures.

My invention is applicable to automatic circuit-breakers in which is employed an electromagnetic device, a movable member of which is actuated by the passage of abnormal current to operate suitable devices to disrupt the current. Automatic circuit-breakers of this class are so well known that I have not illustrated the same, but for the purpose of illustration have selected well-known forms thereof—namely, in one instance, a solenoid and core, the core being the movable member of such electromagnetic device, and in another instance an electromagnet and armature, the armature being the movable member, although it is understood that my invention is not limited in its application to the circuit-breakers shown so long as the operative parts hereinafter described are dependent upon the movement of such movable member of an electromagnetic device forming part of a circuit-breaker. In accordance with the above, therefore, I have shown in Figs. 1 to 5 a solenoid A in dotted lines and the core B thereof to illustrate such movable member. This movable member forms part of the trip device forming the subject of this application, said device being suitably mounted upon a wall or other support C, usually a marble slab, by means of the non-magnetic base D, that is suitably secured to the latter. The said base D is provided with upright guides E, in which is slidingly mounted the non-magnetic slide F, the latter consisting of a plate that is engaged at its lower end by the set-screw G, carried by a lug upon the base D, by means of which slide F and tripping device carried thereby can be vertically adjusted to regulate the amperage under which the core will be actuated by the solenoid A.

In Fig. 2 I have shown an ampere-scale J upon the face of the slide and an indicating-point K upon one of the guides E.

From the upper end of the slide F extends a plate or support L, suitably apertured and upon which is secured the insulating-plate M, carrying the electrical contacts N and O, the former being connected with a circuit-wire P, leading from one pole of the source of electrical energy, while the latter is connected with a circuit-wire Q, leading to an electromagnetic device, hereinafter described, and which is connected with the other pole of said source of electrical energy. Situated below the plate L and projecting from the slide F are the arms or brackets R and S, to the latter of which is secured the casing T of an iron-incased magnet and in a suitable bearing U, in the upper side of which rests the lower end of a rotatable non-magnetic spindle V, said spindle also passing through an opening in the arm or bracket R, by means of which it is held in position. Situated between the casing T and arm or bracket R and rigid with the spindle is the cam or worm W, hereinafter referred to.

The spindle extends upwardly through openings in the plate L and insulating-plate M, and the core B receives the upper end of the spindle, being provided with a socket X

for this purpose, while said core B and spindle V are connected together, so that they are capable of relative longitudinal movement, but incapable of relative rotary movement, the same being conveniently secured, by means of a pin Y, within the bore of the core that is situated within a longitudinal groove Z in the spindle. On the lower end of the core is an adjustable member to regulate the time element, the same consisting of a collar A′, rotatably mounted upon the reduced lower end of the core and being adapted to be held rigid with the core by means of a screw B′. Upon the core is an indicating-mark C′, while upon the collar or member A′ is the scale D′, conveniently indicating seconds, so that the time-element device can be regulated to disrupt the circuit at any desired interval. At the lower end of the member or collar A′ is a groove E′, forming the upper and lower shoulders, the latter being broken away at diametrically opposite points by notches F′. It is noted that the core B normally rests upon the upper end of the spindle V, as shown in Fig. 2.

The non-magnetic cup G′ passes through the apertures in the plates L and N and is provided at its open upper end with an outwardly-extending flange H′, normally resting upon the insulating-plate M, and extending upwardly from the insulating-plate M are the guide-points J′ and extending through openings in the flange H′ and serving to guide said cup G′ in its upright movement. At diametrically opposite points and radial with the contacts N and O the said flange H′ is provided with lugs K′, between which are pivoted switches L′, the inner ends of which are situated within the groove E′ of the collar A′ when the parts are in their normal position, while the outer ends of these switches L′ are situated over the contacts N and O. In the drawings I have shown the notches F′ as situated at a quarter-turn from the switches L′ when the parts are in their normal position, although this can be varied according to the interval desired in the time-element devices. It is understood that the flange H′ of the cup normally rests upon the insulating-plate M and that the switches are held in the position shown in Fig. 2 by reason of the contact of their inner ends with the upper shoulder formed by the groove E′. The spindle of course passes through the bottom of the cup G′, and in the cup I may place one or more annular weights M′. It is further understood that I am not confined to the employment of two switches L′, as one or a plurality may be employed.

The electromagnetic device N′ is inclosed within the casing T, the plate O′ closing the lower end of said casing, while suspended from the lower end of the casing is the non-magnetic pot P′, into which extends the core Q′ of said electromagnetic device N′, said core passing through a suitable aperture in the plate O′. The core Q′ is provided with a suitable speed-retarding device, a convenient form of which comprises the dasher R′, which is a little smaller than the interior of the pot P′ and upon which bears a spring S′. Within the pot is placed a suitable fluid—oil, for instance—and it is necessary when the core rises that the oil pass between the periphery of the dasher R′ and the walls of the pot, which will retard the movement of the core in an obvious manner. With the upper end of the core is connected a stem T′, that passes upwardly from the end of the casing T and is guided in the brackets or arms R and S, said stem T′ being provided with a bifurcated bracket U′, having pins or projections V′, that engage the grooves in the cam W, so that when the core Q′ and stem T′ move longitudinally the spindle V is rotated. The circuit-wire Q connects with one end of the coil of the electric magnetic device N′, while from the other end of the coil leads a circuit-wire W′, that connects with the other pole of the source of electrical energy.

The operation is as follows: By means of the thumb-screw G the slide F, carrying the tripping device and core, is adjusted to the desired position, and the parts normally stand in the position shown in said drawings, with the core B and solenoid A in the desired relative position. When the device is used as an instantaneous circuit-breaker, the core B can be weighted, if desired, by means of the weights M′ in the cup sufficiently to prevent the core from being moved by the solenoid, except when the predetermined overload or abnormal circuit occurs. When this takes place, the core is drawn instantaneonsly into the solenoid, and in doing so first raises the switches and cup connected therewith until the lower shoulders formed by the groove E′ pass by the inner ends of the pivoted switches, whereupon the cup is released and falls to the position shown in the drawings, while the core actuates the circuit-breaker in a familiar manner, it being understood that the movement of the core is so quick that although the switches L′ connect the contacts N and O the time-element devices do not come into operation, because the core is released from the switches and the cup immediately thereafter, and the cup falling as described the circuit between the contacts N and O is broken. When the time-element devices come into play, the overload in the main circuit and solenoid is not such that the core B is raised to its full extetn; but as soon as the core begins to rise the outer ends of the switches L′ connect the contacts N and O and complete the circuit therethrough, the movement of the latter being retarded by the retarding devices described. As the core rises the pins V′ turn the cam W and likewise the spindle V and core B. Should the circuit regain its normal condition, a reverse movement occurs, and the core and switches regain the position shown in the drawings. If, however, the overload continues or increases, the continuous upward movement of the core Q′ and the rotation of

the spindle and core B bring the notches F′ in the collar A′ opposite the inner ends of the switches L′. This releases the core B, and being freed from the weight of the cup G′ said core is quickly drawn into the solenoid and breaks the main circuit, while the cup falls to its former position and breaks the circuit through the electromagnetic device N′. Of course when the core falls to its original position the lower end of the collar A′ passes by the inner end of the switches L′, and the parts again assume the position shown in the drawings. It is understood that the interval consumed in breaking the circuit when the time-element devices are in play is regulated by the adjustment of the collar A′, so that the notches F′ are brought opposite the switches at a shorter or longer interval after the core Q′ begins to turn the spindle V and core B.

It is understood that in accordance with the broad principle involved in my invention I am not confined, except to the claims for the specific construction, to the details herein shown and that my invention comprises, broadly, the means of separating the movable member of an electromagnetic device from the switch that controls the auxiliary current by any suitable form of time-element device under the control of the electromagnetic device in such auxiliary circuit and that I have shown the means for accomplishing this by the rotation of the core as a practical and convenient embodiment, although it will be understood that the core could remain stationary and the contacts be rotated or that the switches could be withdrawn from engagement with the core by the auxiliary magnetic device without rotation of either of said parts, and in Fig. 6 I have illustrated the manner in which this can be accomplished. In said figure, 1 designates the wall or other support, and 2 a suitable bracket having an arm 3, carrying an electromagnet 4, through the core of which extends a pin 5, that actuates the devices that disrupt the current, it being understood that an abnormal current in magnet 4 raises the armature 6, the latter raising the pin 5 in a familiar manner. A set-screw 7 regulates the normal position of armature 6. Mounted upon an arm 8 at the lower end of bracket 2 is casing 9, electromagnetic devices 10, dash-pot 11, core 12, and pin 13, similar in construction to like parts shown in Fig. 3. Pivoted upon the arm 8 is a lever 14, of insulating material, having an adjustable weight 15 and normally resting upon a stop 16. A contact 17 upon said lever 14 is electrically connected with the electromagnetic device 10, the other terminal 18 of the latter and a terminal 19, connected with lever 6, leading to a suitable source of electricity. Pivoted upon the free end of the lever 14 is a trip 20, having one limb 21 situated in the path of pin 13 and another limb 22 extending upwardly and carrying the pivoted switch 23, the outer end of the latter being adapted to engage the contact 17. The switch 23 is normally held out of contact with the contact 17 by the armature 6, the face end of the latter having upper and lower noses 24 and 25 and said upper nose 24 normally engaging the end of switch 23, as shown. The lower nose 25 is shorter than the upper nose 24, so that after the armature 6 has been raised by the magnet 4 and released from the switch 23 it can after being released from the magnet regain the position shown in Fig. 6, the lower nose 25 passing by the end of the switch 23, while the upper nose 24 will engage the same.

In operation it is understood that when an abnormal current occurs—for instance, a short circuit where it is desired to disrupt the circuit instantaneously—the armature 6 will be drawn quickly upward, and while the lower nose will engage the switch 23, yet the upward movement will be so rapid that it quickly lifts the lever 14 and releases itself from said switch 23. On the other hand, however, when the time-element devices come into play the abnormal current from the magnet 4 will lift the armature 6, so that its lower nose engages the switch 23, and said switch is thrown in contact with the contact-piece 17. The weight 15 holds the lever 14 from rising, and the auxiliary circuit then being complete through the electromagnetic device 10 the core 12 and pin 13 rise, the latter engaging the limb 21 of the trip 20. This turns the trip upon its pivot until it is disengaged from the nose 25, whereby the armature 6 is released and rises and actuates the pin 5.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric-circuit breaker a movable member, means controlled by the movement of said member for releasing said member instantaneously under a predetermined excess of current and for releasing said member after the duration of another predetermined excess of current.

2. In combination with a movable member of an electric-circuit breaker, means for releasing said member instantaneously under a predetermined excess of current, and an electromagnetic device controlled by the movement of said member and adapted to release the latter after the duration of another predetermined excess of current.

3. In combination with a movable member of an electric-circuit breaker, means for releasing said member instantaneously under a predetermined excess of current, means for releasing said member after the duration of another predetermined excess of current, an electromagnetic device controlling said latter means, said electromagnetic device being actuated by an electric circuit controlled by the movement of the member due to an excess of current in the circuit controlled by the circuit-breaker.

4. In combination with a movable member

of an electric-circuit breaker, means for releasing said member instantaneously under a predetermined excess of current, means for releasing said member after the duration of another predetermined excess of current, an electromagnetic device controlling said latter means and being situated in a normally open circuit, and devices actuated by the movement of the member for closing said circuit.

5. In combination with a movable member of an electric-circuit breaker, an electromagnetic device, means actuated by the movement of said member for controlling the circuit of said electromagnetic device, said electromagnetic device being adapted to release the member after the duration of a predetermined excess of current, and means for instantaneously releasing said member from the devices controlling the current under a predetermined excess of current of a different degree.

6. In combination with a movable member of an electric-circuit breaker, an electromagnetic device for releasing said member after the duration of a predetermined excess of current, a switch controlling the circuit of said electromagnetic device adapted to be engaged and operated by the movement of the member, said member being adapted to be instantaneously released from said switch under another predetermined excess of current of a different degree.

7. In combination with a movable member of an electric-circuit breaker, an electromagnetic device for releasing said member after the duration of a predetermined excess of current, switches for controlling the circuit of said electromagnetic device situated in the path of said member and adapted to be engaged and operated thereby, said member being adapted to be instantaneously released from said switches upon a predetermined excess of current of a different degree.

8. In combination with a movable member of an electric-circuit breaker, an electromagnetic device for releasing said member after the duration of a predetermined excess of current, pivoted switches situated in the circuit controlling said electromagnetic device, and in the path of said member, said switches being normally engaged and held open by contact with the member, said member forming part of the circuit of the electromagnetic device, and said switches being adapted to be released from said member by the movement thereof upon a predetermined excess of current of a different degree.

9. In combination with a movable member of an electric-circuit breaker, an electromagnetic device, gearing between said electromagnetic device and said member for rotating the latter, the circuit of said electromagnetic device being controlled by a switch operated by the movement of said member, and means for disengaging said member and switch upon the rotation of said member.

10. In combination with a movable member of an electric-circuit breaker, an electromagnetic device, gearing between said electromagnetic device and said member for rotating the latter, the circuit of said electromagnetic device being controlled by a switch operated by the movement of said member, and means for disengaging said member and switch upon the rotation of said member, said member being also adapted to be released from said switch by reason of the longitudinal movement of said member under an excess of current greater than that which rotates said member.

11. In combination with a movable member of an electric-circuit breaker, an electromagnetic device, connections between the same and said member for rotating the latter, a switch controlled by the longitudinal movement of the latter, and means for disengaging the member and switch by reason of either the longitudinal or rotary movement of said member.

12. In combination with a movable member of an electric-circuit breaker, of an electromagnetic device, the movable member of said electromagnetic device being connected with the circuit-breaker member to rotate the same, retarding devices for said electromagnetic-device member, a switch controlling the circuit of said electromagnetic device, said circuit-breaker member engaging said switch and adapted to operate the same when the circuit-breaker member moves longitudinally, said circuit-breaker member being adapted to be disengaged from said switch by a longitudinal or rotary movement of said member.

13. In combination with a movable member of an electric-circuit breaker, provided with annular shoulders, an electromagnetic device connected with said member for rotating the same, a switch in the circuit of said electromagnetic device adapted to be engaged by said shoulders and operated by the longitudinal movement of the member, one of said shoulders terminating so as to disengage the member and switch by the rotary movement of the member, and said member being also adapted to be released from the switch by reason of the longitudinal movement of said member.

14. In combination with a movable member of an electric-circuit breaker, a rotatable member mounted thereon and provided with shoulders, an electromagnetic device connected with said member for rotating the latter, a switch controlling the current of said electromagnetic device, and adapted to be engaged by said shoulders and operated by the longitudinal movement of the member, one of said shoulders being terminated so as to disengage the member and switch by the rotary movement of the member, and said member being also adapted to be released from the switch by reason of the longitudinal movement of said member.

15. In combination with a movable member

of an electric-circuit breaker, having annular shoulders, an electromagnetic device connected with said member for rotating the latter, a pivoted switch controlling the circuit of said electromagnetic device and having one end situated between said shoulders of the member so as to be operated by the longitudinal movement of the latter, one of said shoulders terminating so that the member and switch are disengaged by the rotary movement of the member, and said switch being also adapted to turn upon its pivot and to be disengaged from said member upon the longitudinal movement of the latter.

16. In combination with a movable member of an electric-circuit breaker, an electromagnetic device connected therewith for rotating the same, switches situated to engage contacts in the circuit controlling said electromagnetic device, said member engaging said switches and normally holding the same away from said contacts and adapted to move them in contact therewith upon the longitudinal movement of the member, said member forming part of the circuit, and means for disengaging said member and switches by the rotary movement of said member.

17. In combination with a movable member of an electric-circuit breaker, an electromagnetic device for rotating the same, a switch operated by the longitudinal movement of the member for controlling the circuit of said electromagnetic device, said member and switch being adapted to be disengaged by the rotary movement of the former, and said switch being carried by a member movable longitudinally to a limited extent with said member.

18. In combination with a movable member of an electric-circuit breaker, an electromagnetic device for rotating the same, a pivoted switch controlling the circuit of said electromagnetic device and engaged by said member, said switch being carried by a member movable longitudinally to a limited extent with said member, said member and switch being adapted to be disengaged either by the rotary or longitudinal movement of the member.

19. In combination with a movable member of an electric-circuit breaker having shoulders, an electromagnetic device for rotating the same, a circuit for said electromagnetic device having contacts, a longitudinally-movable member carrying pivoted switches adapted to engage said contacts, said switches being engaged by said shoulders of the member, one of the shoulders of said member being broken away whereby the same can be disengaged from the switches upon the rotary movement of the member.

20. In a device of the kind specified, a longitudinal and rotatable circuit-breaker member controlling a switch for the purpose described, said switch being carried by a member longitudinally movable to a limited extent with said circuit-breaker member, and means for increasing and decreasing the weight of said member.

21. In a device of the kind specified, a longitudinal and rotatable circuit-breaker member controlling a switch for the purpose described, said switch being carried by a cup longitudinally movable to a limited extent with said member and adapted to receive a removable weight.

22. In combination with a member of an electric-circuit breaker, a rotatable spindle supporting the same and with which said member rotates and upon which it moves longitudinally, an electromagnectic device for rotating said spindle, a switch controlling the circuit of said electromagnetic device engaged by said member and from which it is adapted to be disengaged either by the longitudinal or rotary movement of said member.

23. In combination with a movable member of an electric-circuit breaker, a rotatable spindle supporting the same and with which said member rotates and upon which it moves longitudinally, a cam upon the said spindle, an electromagnetic device, the movable member of which engages said cam to rotate the same, a switch controlling the circuit of said electromagnetic device and engaged by said circuit-breaker member and from which it is adapted to be disengaged either by the longitudinal or rotary movement of said member.

24. In combination with a movable member of an electric-circuit breaker, an electromagnetic device, the movable member of said electromagnetic device being connected with said circuit-breaker member for rotating the same, a pot into which said electromagnetic device extends, said pot containing a fluid, a dasher upon said electromagnetic-device member, a spring acting upon said dasher, a switch controlling the circuit of said electromagnetic device engaged by said circuit-breaker member and from which it is adapted to be disengaged either by the longitudinal or rotary movement of said member.

25. In combination with a movable member of an electric-circuit breaker, provided with annular shoulders, an insulating-plate, an electromagnetic device for rotating said member, the circuit of said electromagnetic device having contacts in said insulating-plate, pivoted switches carried by a longitudinal non-rotatable member normally supported by said insulating-plate, said switches adapted to engage said contacts, the inner ends of said switches being engaged by said shoulders of the member, one of said shoulders being cut away so as to disengage said member and switches by reason of the rotary movement of the member, and said member and switches being adapted to be disengaged by reason of the longitudinal movement of said member.

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Witnesses:
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