March 7, 1939. G. N. LEMMON 2,150,102

CIRCUIT BREAKER

Filed May 31, 1932 2 Sheets-Sheet 1

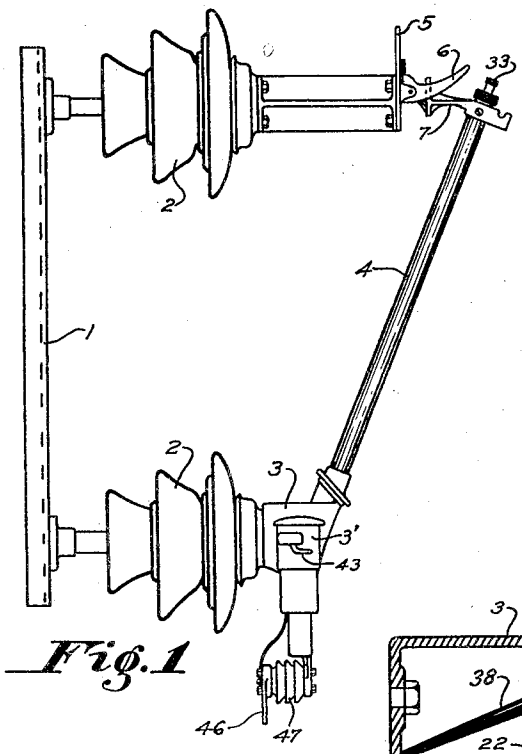

Fig. 1

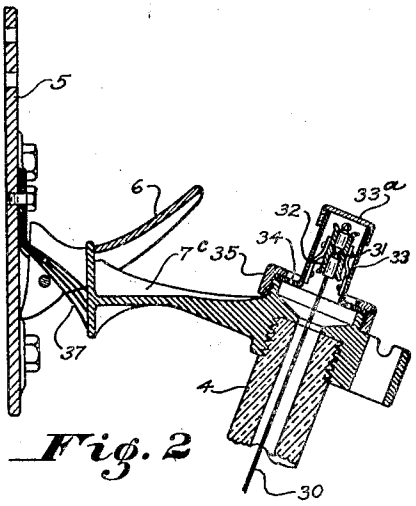

Fig. 2

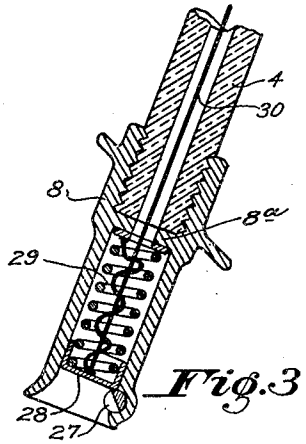

Fig. 3

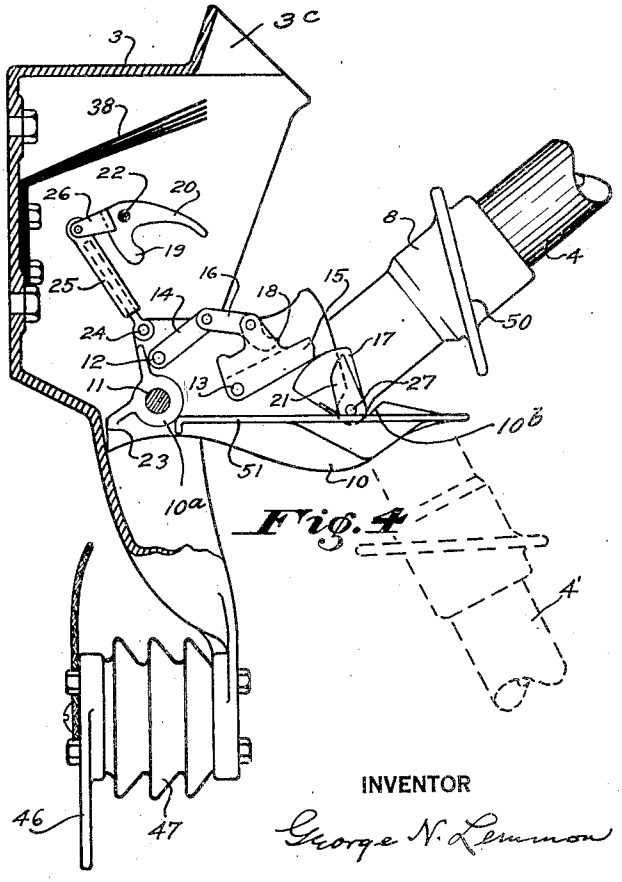

Fig. 4

INVENTOR

George N. Lemmon

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CIRCUIT BREAKER

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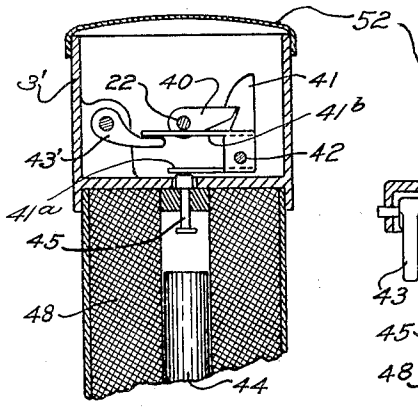

Fig. 7

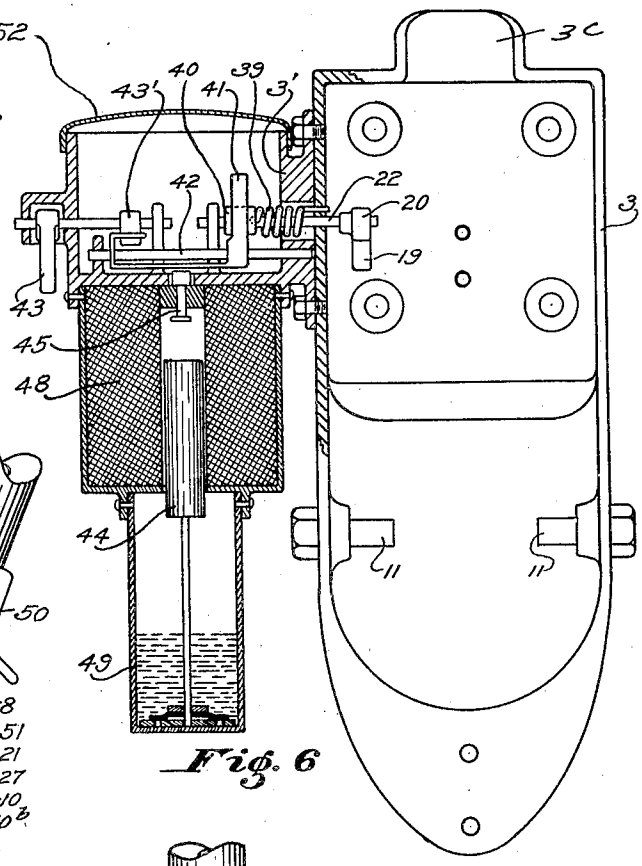

Fig. 6

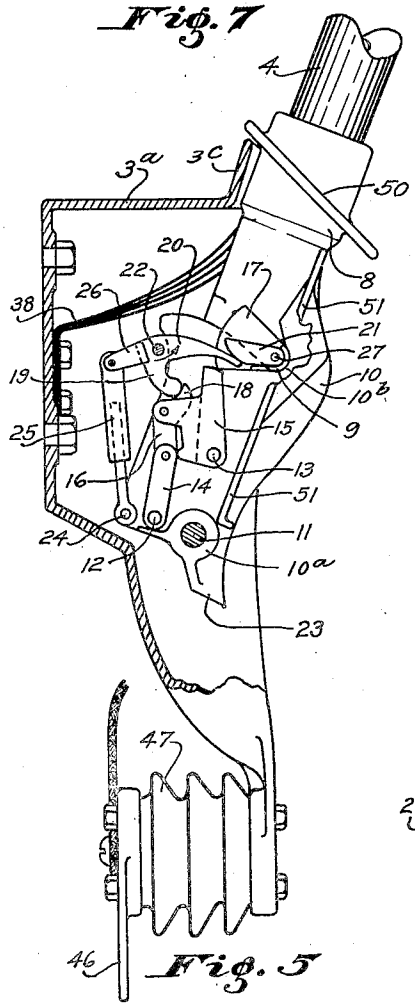

Fig. 5

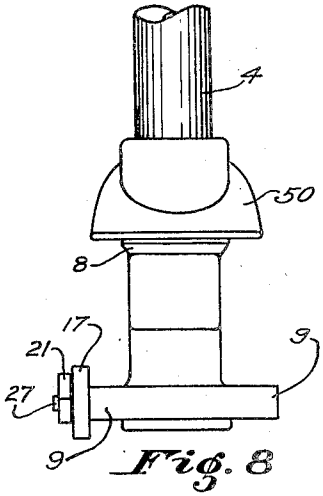

Fig. 8

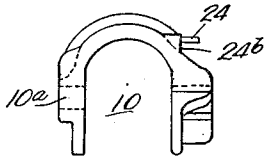

Fig. 9

INVENTOR

George N. Lemmon

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UNITED STATES PATENT OFFICE

2,150,102

CIRCUIT BREAKER

George N. Lemmon, Homewood, Ala., assignor to The Southern States Equipment Company, Birmingham, Ala., a corporation of Alabama

Application May 31, 1932, Serial No. 614,319

30 Claims. (Cl. 200—89)

The present invention is a further development of the copending applications Nos. 279,757 and 412,430 and discloses features not previously shown nor described.

It is an object of my invention to provide an expulsion tube circuit breaker which is operable under overload conditions by a solenoid coil, which can be manipulated entirely by an insulating switch-stick, and which can be manually tripped so that it opens the circuit inside of the expulsion-tube even though there is not an overload upon the line at that time.

In the accompanying drawings of my invention:

Figure 1 is a side view of the invention.

Figure 2 is a midsection view taken lengthwise of the top part of the expulsion tube and its latch.

Figure 3 is a midsection view taken lengthwise through the lower end of the tube.

Figure 4 is an elevation view showing the housing for the tube mounting in section, and the tripping mechanism in open circuit position. The tube is shown in dotted lines in full open position and in full line in intermediate position.

Figure 5 is a view similar to Figure 4 but with the parts in closed circuit position.

Figure 6 is a front view of the solenoid mechanism and the housing for the tube mounting showing the housing mechanism in full section.

Figure 7 is a transverse section view of the parts of the solenoid mechanism.

Figure 8 is a front end of the tube and its terminal.

Figure 9 is an end view of the carriage looking toward the carriage from line 9—9 of Figure 5.

Referring to the drawings the base 1 supports two pin type insulators 2—2. The lower insulator carries a housing or support 3 within which is pivotally mounted a carriage 10 the structural details of which are hereinafter described. Upon this carriage is pivotally mounted an insulating tube 4. At the lower end of the insulating tube is a supporting terminal 8 which has two hollow trunnions 9 that fit into bearing notches 10*b* in the carriage 10 for pivotally mounting the tube in the carriage 10. On the upper end of the insulating tube is a terminal 7 having a catch portion 7*c* laterally extending from and formed integral with it. This catch portion is engageable by a latch 6 pivoted on a terminal 5 which is mounted on a post secured to the head of the upper insulator 2.

As shown in Figure 5, the housing 3 is formed as a hollow casting with parallel side walls which are joined at their upper ends by an end wall 3*a*. This casting is quite deep at the upper end and becomes shallower as the lower end is approached, terminating in a mounting for an insulator 47 which bears a terminal 46.

In order to keep dirt and moisture from the parts contained within the housing, the edge of the upper end wall is formed into a half collar 3*c* partially surrounding the lower terminal 8 of the insulating tube when the tube is in closed circuit position as shown in Figures 1 and 5. For the same purpose a flange 50 is formed on the terminal 8 to cooperate with and cover the collar 3*c*.

In order to provide a good electrical contact between the housing 3 and the terminal 8 of the insulating tube there is provided within the housing 3 a conducting brush 38 which is secured to the bottom or back of the housing and engages the terminal 8 when the tube is in closed circuit position.

The carriage 10 is formed as a U-shaped casting having substantially parallel side walls each with a longitudinal fin 51 extending laterally out from it. This fin assists the housing 3 in protecting the mechanism from moisture and dirt. The outline of the side walls is irregular as may be seen in Figures 4 and 5. Suitable bosses may be provided on one side of the carriage for the pins 12, 13 and 24.

For pivotally mounting the carriage in the housing 3, bearing bosses 10*a* are provided at one end (the lower end as shown in Figure 5) into which bosses fit pins 11 that extend inwardly from the sides of the housing 3 in coaxial position. To limit the downward rotation of the carriage it is extended beyond the bosses 10*a* to form a stop 23 which abuts against the back of the housing 3.

According to my invention the carriage 10 and the tube 4 may be releasably locked together so as to move as a unit into closed circuit position, and unlocked, automatically or manually, upon opening of the circuit. The locking mechanism is of the toggle linkage type as will now be described.

The locking linkage is preferably mounted on the outside of one of the carriage walls between that wall and the wall of the housing 3. One end of a link 14 is pivotally connected by a pivot pin 12 to the end of the carriage 10 near the bearing bosses 10*a*. The other end of this link 14 is pivotally connected with one end of a toggle link 16 which in turn is pivotally connected at its central portion with a two armed link 15. The link 15 is also pivoted upon the carriage 10 by a pin 13, located in the central portion of one side of the carriage.

That trunnion 9 of the terminal 8 which is at

the side of the carriage which bears the toggle linkage 14, 15, 16, has upon it a segmental arm 17 which is sized and positioned to cooperate with the link 15 and when so engaging said link to lock the tube and carriage together so that they are movable as a unit about the carriage pivots 11 as the tube is raised into closed circuit position. It will be noticed by a referring to Figure 5 that when the links of the toggle mechanism are in closed circuit position, the links 14 and 16 are overcenter with relation to the line of action between the pivot 12 and the connection between the links 15 and 16, so that any effort to rotate the link 15 in counter-clockwise direction is resisted by the links 14 and 16. While the parts are in closed circuit position, the tendency is for the carriage 10 to move in clockwise direction due to the fact that the trunnions 9 which support the insulating tube exert a vertical force to the right of the carriage pivots 11. But accompanying any movement of the carriage 10 in clockwise direction must be a corresponding movement of the segmental arm 17 in a counter-clockwise direction relative to the carriage. This counter-clockwise movement of arm 17 cannot take place without the link 15 also moving counter-clockwise. Since this counter-clockwise movement of the link 15 is prevented by the links 14 and 16, as before stated, the carriage and insulating tube are locked to move as a unit.

In order to release the toggle mechanism there is provided in the side of the housing 3 adjacent the linkage mechanism a shaft 22 upon which is fixedly mounted a releasing member having three arms 19, 20 and 26 extending in directions approximately at right angles to one another as illustrated. The arm 26 is bifurcated and to its end is pivotally connected one member of a two part slip joint 25, the parts of which are connected together but slidable longitudinally relatively to one another. The other member of this slip joint is pivotally connected by a pin 24 to the carriage 10 at a point at the end of the carriage near the pivots 11 and 12. The arm 19 of the releasing member extends to engage with the free end 18 of the link 16 in such a way as to cause the link 16 to rotate about its pivotal connection with the link 15 when the shaft 22 is rotated counter-clockwise (in Figure 5) by overload mechanism as hereinafter described. The arm 20 of the releasing member extends to engage with a lever 21 mounted fixedly upon a rod 27 which is coaxial with the trunnion 9 and extends within the trunnion to the central portion of the terminal 8. Upon rotation of the axle 22 upon overload as hereinafter described the toggle mechanism is released and simultaneously the rod 27 is rotated.

Referring to Figure 3 it will be noted that the terminal 8 has a cylindrical bore which is separated into two parts by a partition 8a which partition has an aperture through its central portion. Into one part of the central bore the lower end of the insulating tube 4 is threaded. In the other part of the cylindrical bore there is located a coil spring 29 which presses upon a cup 28 that has a sliding fit with the walls of the bore, the spring tending to press the cup out of the end of the bore. The action of this spring is normally limited by the engagement of the cup with the rod 27 which is cut away adjacent the bore so that when the rod is rotated through a small angle the cut away portion of the rod will allow the cup to move past the rod under the action of the spring 29.

Secured to the cup is one end of a flexible conductor 30 which extends through the insulating tube 4 and has its other end suitably fixed at the upper end of the insulating tube as hereinafter described. To form a more perfect electrical connection between the cup 28 and the terminal 8 a conductor may be soldered to the cup and also to a washer which may be located between the spring and the partition 8a.

The upper end of the flexible conductor 30 terminates in a cylindrical circumferentially grooved plug contact 31 which is held by friction between spring contact members 32 that are mounted upon the inner walls of a short tubular member 33. The upper end of the tubular member 33 is covered with a screw cap 33a. The lower end of the tubular member 33 is flanged and is secured by a soldered joint 34 to an annular member which thereby increases the extent of the flange and provides means by which the member 33 may be secured to the upper terminal 7 of the insulating tube. A removable flanged screw collar 35 engages with a screw neck on the terminal 7 and clamps between it and the neck the outer rim of the flange of the member 33. Thus, the outer part or rim of the flange of the member 33 is held to the terminal and the soldered joint joins the inner part of the flange or lower end of the member 33 thereto. This soldered joint being weak will be broken under circuit breaking conditions such as the development of an excessive pressure inside of the insulating tube. Such pressure will rupture this soldered joint 34 and so open that end of the tube to the atmosphere. A new tube cover can be installed readily by merely removing and replacing the screw collar 35.

The means for releasing the insulating tube manually or upon overload and opening the circuit, that is to say extinguishing the arc, within the insulating tube will now be described. Secured to the outside of the housing 3 adjacent the linkage mechanism is a cylindrical housing 3' containing a solenoid 48 with a core armature 44 whose action is retarded by a dash pot 49 in a conventional fashion. The housing 3' is divided into three graduated parts, the lower part containing the dash pot, the intermediate part containing the solenoid and the upper part containing the mechanism for releasing the toggle linkage.

One line conductor is attached to the terminal 46 of the insulator 47 and thence connects through the solenoid coil 48 to the housing 3 and so to the brush 38 and the conductor 30. The other end of the conductor 30 connects with the line conductor through the brush 37 and the terminal 5.

The shaft 22 upon which the toggle releasing member is mounted extends into the upper part of the housing 3' and has fixedly mounted upon its end a catch 40. This catch 40 engages with the latch member 41 that is loosely mounted upon a shaft 42 supported in the upper part of the housing 3'. The latch member 41 has an arm 41a extending over the axis of the core armature 44 in position to be engaged by a pin 45 which extends through the bottom of the upper part of the housing 3'. There is another arm 41b upon the latch 41 which is adapted to be engaged by a lever 43' that is fixedly mounted upon an axle which extends through the opposite side of the housing 3' from the shaft 22. Upon the outer end of this axle is mounted a trip arm 43.

Upon occurrence of a sudden overload the ar-

mature 44 is attracted by a solenoid and strikes against pin 45 which is thus caused to strike arm 41*a*. This rotates latch 41 to disengage it from catch 40.

For manual release of the switch, the outer trip arm 43 is rotated by a person with an insulated switch stick, causing the inner lever 43' to rotate counter-clockwise (Figure 7) to engage arm 41*b* and disengage the latch 41 from catch 40, thereby releasing shaft 22 for rotation.

The shaft 22 is constantly urged in counter-clockwise direction (Figure 7) by a spring coiled around it and anchored at one end to the housing 3 while pressing with its other end against catch 40. The strength of the spring is sufficient to cause the releasing member (by its arm 19) to rotate the link 16 of the toggle linkage to thus break the toggle, and (by its arm 20) to rotate the rod 27 by means of lever 21 to thus release cup 28 and the spring 29, the releasing of the spring 29 and breaking of the toggle occurring simultaneously. The coil spring 29 will then jerk the upper end of the flexible conductor from the frictional holding of the contacts 32 which draws an arc between the contacts and the plug 31, while the conductor is jerked out of the opposite end of the tube. The arc is extinguished by the well known expulsion effect. On excessive overloads, the arc develops a pressure within the tube of sufficient magnitude to break the soldered joint 34 and blow off the member 33 from the end of the tube, thereby reducing the pressure in the tube. The release of the toggle mechanism permits the segmental arm 17 to slip by the link 15 and thus permits the carriage 10 to rotate about the pivot 11 in clockwise direction urged by gravity and the pressure of contact brush 38, from the position shown in Figure 5 to the position shown in Figure 4. This causes the insulating tube to move in an approximately longitudinal direction, thereby causing the catch portion 7*c* of the terminal 7 to become disengaged from the latch and allow the tube to swing in clockwise direction to open circuit position.

As the carriage swings open, the pin 24 and the slip joint members 25 push up the arm 26 and so rotate the shaft 22, stressing the catch spring 39 until the latch 41 engages with the catch 40, thereby holding the releasing member with the arms 19 and 20 again in position to release the mechanism. A spring not shown also latches the toggle members 14, 15, 16 in their original positions.

The action of the spring 29 is much faster than the motion of the heavy tube away from its closed position and the effect is that the circuit is first opened inside the tube and then the tube drops to the open position. A much heavier high voltage current can be opened inside an expulsion tube than can be interrupted by an air-break switch. Therefore my device when operated as just described can be used to open manually a load which would cause a destructive arc if an air-break disconnecting switch were used for the same purpose.

While the tube is in open circuit position it can be removed from the carriage and a new conductor 30 put in position. Then it can be replaced.

With a new conductor 30 in place, the tube 4 is then pushed up to the position shown in Figure 1. As this is being done, the segmental arm 17 engages with link 15 so that tube and carriage move together as a unit up to the original closed position.

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 embodiment shown.

I claim:

1. In a circuit breaker, an expulsion tube, a flexible conductor within the tube and completing a circuit therethrough, automatic means to open the circuit within the tube upon overload conditions in the circuit together with non-automatic means operable at will to break the circuit within the tube without rupturing said conductor.

2. In a circuit breaker, a tubular insulating container, a flexible conductor within the container and completing a circuit therethrough, spring means operable to remove the flexible conductor from its normal position, automatic means operable upon overload in the circuit to initiate the action of the said spring means, together with non-automatic means operable at will to initiate the action of the said spring means and to break the circuit through the container.

3. In a circuit breaker, a pivotally mounted carriage movable between inoperative and operative positions, and insulating tube which is pivotally mounted upon the carriage, a flexible conductor wtihin said tube, means to lock the tube and the carriage together and means to lock them both in operative position, means operable upon overload in the circuit to move the flexible conductor from its normal position within the tube, and means operable immediately thereafter to release the tube from its operative position.

4. In a circuit breaker, a pivotally mounted insulating tube with a flexible conductor therein, movable latch-means to engage and hold the tube in operative position, and means to release the tube from the latch by the bodily movement of the said tube, and without the necessity of motion of the said latch-means.

5. In a circuit breaker, an insulating tube which is movable between operative and inoperative positions, a flexible conductor within said insulating tube, means to latch the tube in operative position by an approximately lateral motion of the tube, and means to release the tube from operative position by an approximately longitudinal motion of the tube.

6. In a circuit breaker, latch means to hold the breaker in operative position, spring means automatically operable upon overload in the circuit to release the said latch means, and automatic means operable upon the opening of the breaker to reset the said spring means.

7. In a current interruptor, an insulating tube, a flexible conductor within said tube, a hinge-joint about which the tube is movable between closed-circuit and open-circuit positions, the hinge-joint comprising two pivoted joints locked by a toggle mechanism during movement of the tube into closed circuit position, and retaining means to hold the tube in closed-circuit position, and means operable upon overload in the circuit to release the toggle mechanism and subsequently to release the tube from said retaining means.

8. In a circuit breaker, a tubular insulated container which is movable into and out of operative position, a conductor within said container, a double-jointed support at one end of the tube, means to lock one of the said joints during movement of the container into operative posi-

tion, and automatic means to release both of said joints when overload has occurred.

9. In a circuit breaker, an unbroken insulating tubular container, a flexible conductor within the container, movable latch means at each end of the container cooperating to hold the container in closed position under normal circuit conditions and to release the container under overload conditions in the circuit.

10. In a circuit breaker, an unbroken insulating tubular container pivotally mounted and movable between closed-circuit and open-circuit positions, a flexible conductor within the container, latch means at each end of the container which means are operable to hold the container in closed-circuit position under normal circuit conditions and to release the container under overload conditions in the circuit.

11. In apparatus of the class described, a cartridge comprising terminal engaging elements, a tube connecting said elements, said tube having an end open for the expulsion of arc gases, a link passing through said tube and emerging from said open end, spring means exteriorly of said open end adapted to withdraw said link from the tube, means restraining the withdrawing action of said spring means, said last-named means being manually releasable while the apparatus is in normal operation.

12. A switch comprising terminal engaging elements, conducting means connecting said elements, spring means for removing said conducting means from said tube, and means for manually releasing said spring means and separating said conducting means from both of said terminal engaging elements.

13. A switch comprising line terminals, terminal engaging elements, an enclosure having at least one opening and upon which said engaging elements are mounted, a conductor joining said engaging elements and positioned in said enclosure, means withdrawing the conductor from said enclosure, and means for normally manually releasing said withdrawing means while the conductor is electrified and projecting the conductor through said opening from the enclosure.

14. A switch comprising line terminals, terminal engaging elements, an enclosure having at least one opening and upon which said engaging elements are mounted, a conductor joining said engaging elements and positioned in said enclosure, means withdrawing the conductor from the enclosure, means for normally manually releasing said withdrawing means while the conductor is electrified and projecting the same through said opening from the enclosure and means automatically separating the entire conductor from the device after said manual release.

15. In a circuit breaker, an expulsion tube of insulating material, spaced conducting means fixedly attached on said tube, current-carrying means within said tube carrying full line current while said tube is in normal closed circuit position and electrically connecting said conducting means and operable to cause the circuit to be opened within said tube on overload, means to mount said tube in an approximately vertical closed-circuit position comprising pivotal supporting means at one end of the tube and latching means at the other end of the tube, means released by the occurrence of an overload to cause movement of said tube to open circuit position by approximately longitudinal movement of said tube away from said latching means followed by pivotal movement about said pivotal supporting means.

16. In a circuit breaker, an expulsion tube of insulating material, current-carrying means within said tube carrying full line current in normal closed-circuit position of said tube and for causing the circuit to be opened within said tube on overload, spaced conducting means fixedly attached on said tube, two insulated supporting means, means to pivotally mount said tube in an approximately vertical closed-circuit position between said supporting means, means on said supporting means to engage the conducting means at one end of said tube to latch said tube as it is moved into said position, means released by the occurrence of an overload to cause movement of said tube to open circuit position by releasing said tube from said latching means by approximately longitudinal movement of said tube followed by swinging movement of said tube to open-circuit position.

17. In a circuit breaker, an expulsion tube of insulating material, spaced conducting means fixedly attached on said tube, current-carrying means within said tube carrying full line current while said tube is in normal closed circuit position and electrically connecting said conducting means and for causing the circuit to be opened within said tube on overload, means for mounting said tube comprising a plurality of separate pivot means at one end of said tube, means holding said tube against pivotal movement about one of said pivot means during movement to closed-circuit position, latching means at the other end of said tube, said holding means being releasable by an overload current to cause said tube to pivot about each of said pivot means and to be released from said latching means by approximately longitudinal movement of said tube, whereupon the tube may move to open-circuit position.

18. In a circuit breaker, an expulsion tube of insulating material, spaced conducting means fixedly attached on said tube, current-carrying means within said tube carrying full line current while said tube is in normal operative position and electrically connecting said conducting means and for causing the circuit to be opened within said tube on overload, means for mounting said tube comprising a plurality of separate pivot means at one end of the tube, means holding said pivot means in fixed relation to the tube and causing pivoting of said tube about only one of said pivot means during movement into operative position, said holding means being releasable by an overload current to cause said tube to pivot about each of said pivots and subsequently to move into inoperative position.

19. In a circuit breaker, an expulsion tube of insulating material, spaced conducting means fixedly attached on said tube, current-carrying means within said tube carrying full line current while said tube is in normal closed circuit position and electrically connecting said conducting means and for causing the circuit to be opened within said tube on overload, means to mount said tube comprising fixed and movable pivotal supporting means at the one end of the tube and latching means at the other end of the tube, said tube pivoting only about said fixed pivotal means on movement to closed circuit position, means operable by the occurrence of an overload to cause release of said tube from said latching means by approximately longitudinal movement and thereafter to allow pivotal movement of said tube about

said pivotal supporting means into open-circuit position.

20. In a circuit breaker, an expulsion tube of insulating material, spaced conducting means fixedly attached on the end portions of the tube, current-carrying means within said tube carrying full line current while said tube is in normal closed circuit position and electrically connecting said conducting means and for causing the circuit to be opened within the tube on overload, insulated supporting means for said tube, latch means on one of said insulated supporting means for engaging the conducting means at one end of said tube, plural pivot means associated with the conducting means at the other end of said tube for pivotally mounting said tube upon the other of said insulated supporting means, link means connecting said pivot means, and means to maintain said link means in fixed relation to said tube during closing movement of said tube, said last-named means being disabled by the occurrence of an over-load current from maintaining said fixed relation.

21. In a circuit breaker, two insulated supporting means, a single swingable connection bridging the gap between said supporting means comprising an expulsion tube of insulating material and a current-carrying means within said tube carrying full line current in normal closed-circuit position operable to cause opening of the circuit within the tube on overload, a metallic terminal member fixedly attached at the swinging end of the tube, latch means on one of said supporting means to engage with said metallic terminal member and to hold said tube in closed-circuit position, plural pivot means associated with the other end of the tube for pivotally mounting the tube on the other supporting means, link means connecting said pivot means, and means to maintain said pivots in fixed relation to the tube during movement of the tube to closed-circuit position, said last-named means being disabled by the occurrence of an overload current from maintaining said fixed relation.

22. In a circuit breaker, two insulated supporting means, a single swingable connection bridging the gap between said supporting means comprising an expulsion tube of insulating material, and current-carrying means within the tube carrying full line current in normal closed-circuit position and operable to cause opening of the circuit within the tube on overload, a conducting terminal member at the swinging end of the tube, engaging means on one of said supporting means to engage with said terminal member and to hold the tube in closed-circuit position, a plurality of spaced pivot means for connecting the other end of the tube with the other supporting means, means holding the tube against pivotal movement about one of said pivot means during movement to closed-circuit position, said holding means being releasable by an overload current to cause said tube to pivot about each of said pivot means and to remove said terminal member from said engaging means by approximately longitudinal movement of the tube, whereupon the tube may move to open-circuit position.

23. In a circuit breaker, an expulsion tube, terminal engaging elements mounted on said tube, a flexible conductor electrically connecting said elements and having separable frictional engagement with one of them, spring means adjacent one end of said tube operable to withdraw the whole of said conductor through said end of the tube, and means manually releasable while the conductor is electrified to cause said spring means to withdraw said conductor from said tube.

24. In a circuit interrupter, an expulsion tube, spaced terminal engaging elements mounted on said tube, a flexible conductor within the tube for connecting said terminal elements and having a separable frictional connection with a terminal element at one end of said tube, spring means adjacent the other end of the tube operable to withdraw said conductor through said other end of the tube, and means manually releasable while the conductor is electrified to cause said spring means to separate said conductor from said terminal engaging elements.

25. In a circuit breaker, a pivotally mounted expulsion tube movable into and out of operative position between two insulated terminals, a flexible conductor within the tube, one end of the tube being releasably sealed and the other end of the tube allowing substantially free expulsion of arc gases from the tube, means to open the circuit within the tube and automatic means then operable to remove the tube from its operative position.

26. In a circuit breaker, a pivotally mounted expulsion tube movable into and out of an operative position between two insulated terminals, a flexible conductor within the tube, the swing end of the tube being releasably sealed and the hinge end of the tube allowing substantially free expulsion of gas from the tube, means to open the circuit within the tube and automatic means then operable to remove the tube from its operative position.

27. In a current-interrupting device, an expulsion tube of insulating material, conductive means within said tube for causing the circuit to be opened within the tube, spaced conducting means fixedly attached on the tube, spaced conductive terminal means, means to pivotally mount said tube in an approximately vertical operative position between said terminals, means on at least one of said terminal means to maintain said tube in said operative position, means released by the occurrence of a predetermined current to cause movement of said tube to an inoperative position by an approximately longitudinal movement of said tube followed by swinging movement.

28. In a circuit-interrupting device, an expulsion tube of insulating material, spaced conducting means fixedly attached on said tube, conductive means within said tube for causing the circuit to be opened within said tube, means for mounting said tube comprising a plurality of separate pivot means at one end of the tube, means holding said pivots in fixed relation to the tube and causing pivoting of the tube about only one of said pivot means during movement into operative position, said holding means being releasable upon occurrence of a predetermined current to cause said tube to pivot about each of said pivots and subsequently to move into inoperative position.

29. In a current-interrupting device, an expulsion tube of insulating material, spaced conducting means fixedly attached on said tube, conductive means within said tube operable to cause the circuit to be opened within said tube, means to mount said tube in an approximately vertical operative position comprising pivotal supporting means at one end of said tube, latching means, and means released by the occurrence of a predetermined current to cause movement

of said tube to inoperative position by approximately longitudinal movement of the tube to disengage said latching means followed by pivotal movement about said pivotal supporting means.

30. In a circuit breaker an insulating tube which is movable between an inoperative position and an approximately vertical operative position, conducting means within said tube for causing the circuit to be opened within the tube, mounting means to cause movement of the tube into operative position to be in an arcuate path, and means to release the tube from operative position by an approximately longitudinal motion of the tube.

GEORGE N. LEMMON.