

Jan. 21, 1930.

A. H. BAKKEN

1,744,200

CIRCUIT BREAKER

Filed April 12, 1921

6 Sheets-Sheet 1

Fig. 1.

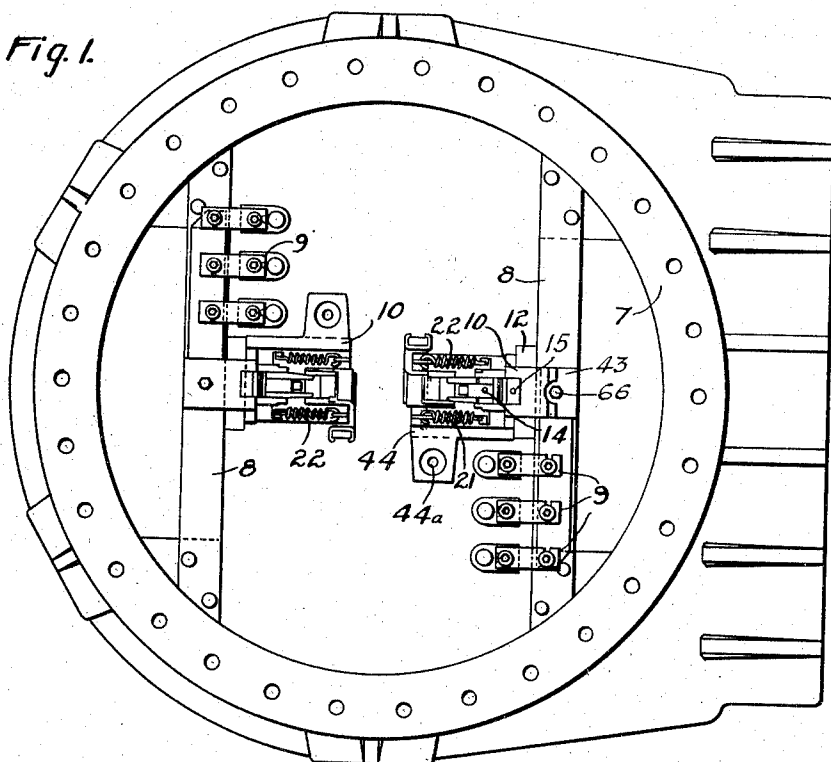
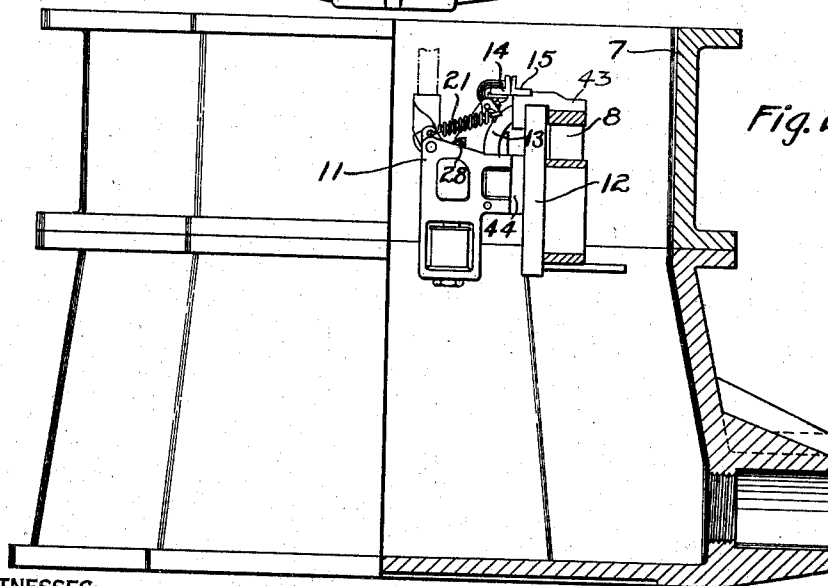


Fig. 2.



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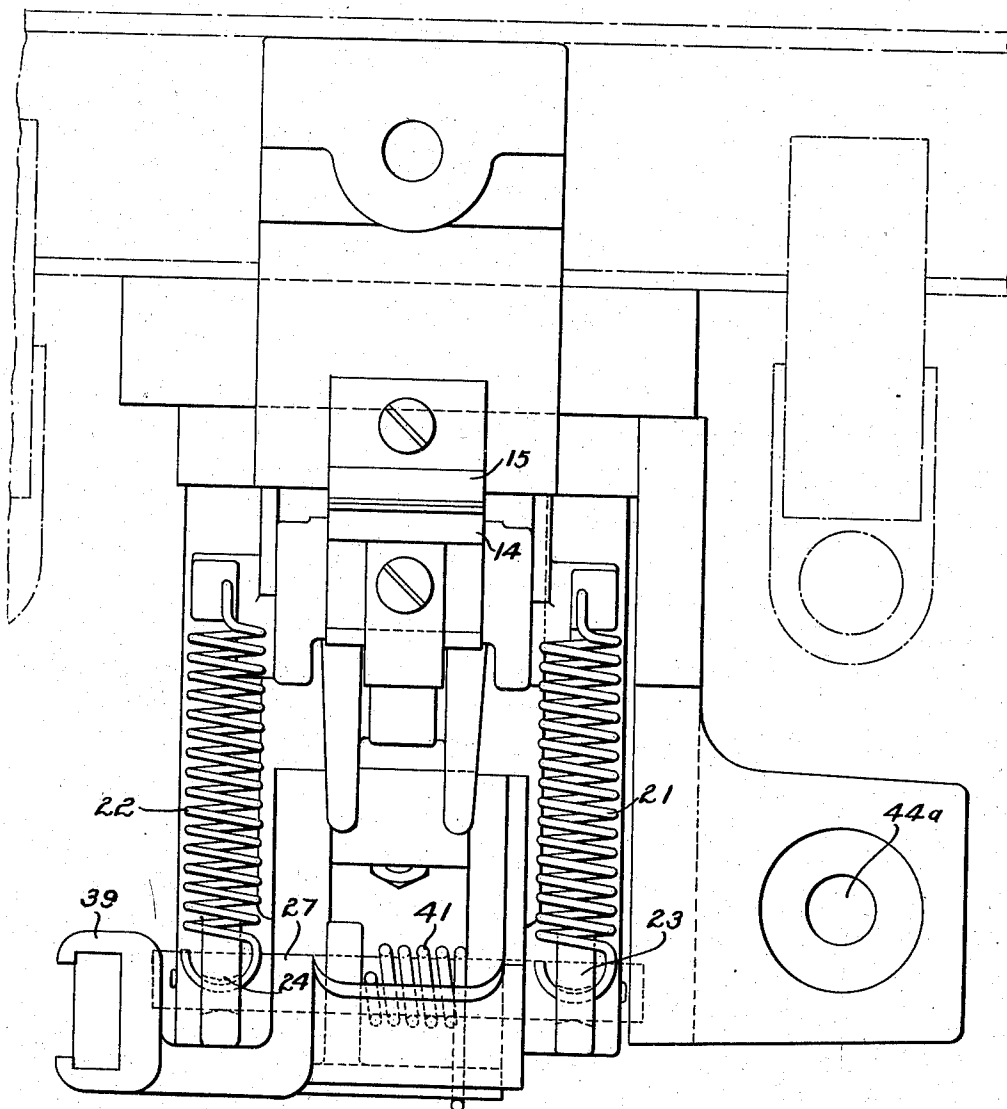
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Fig. 3.



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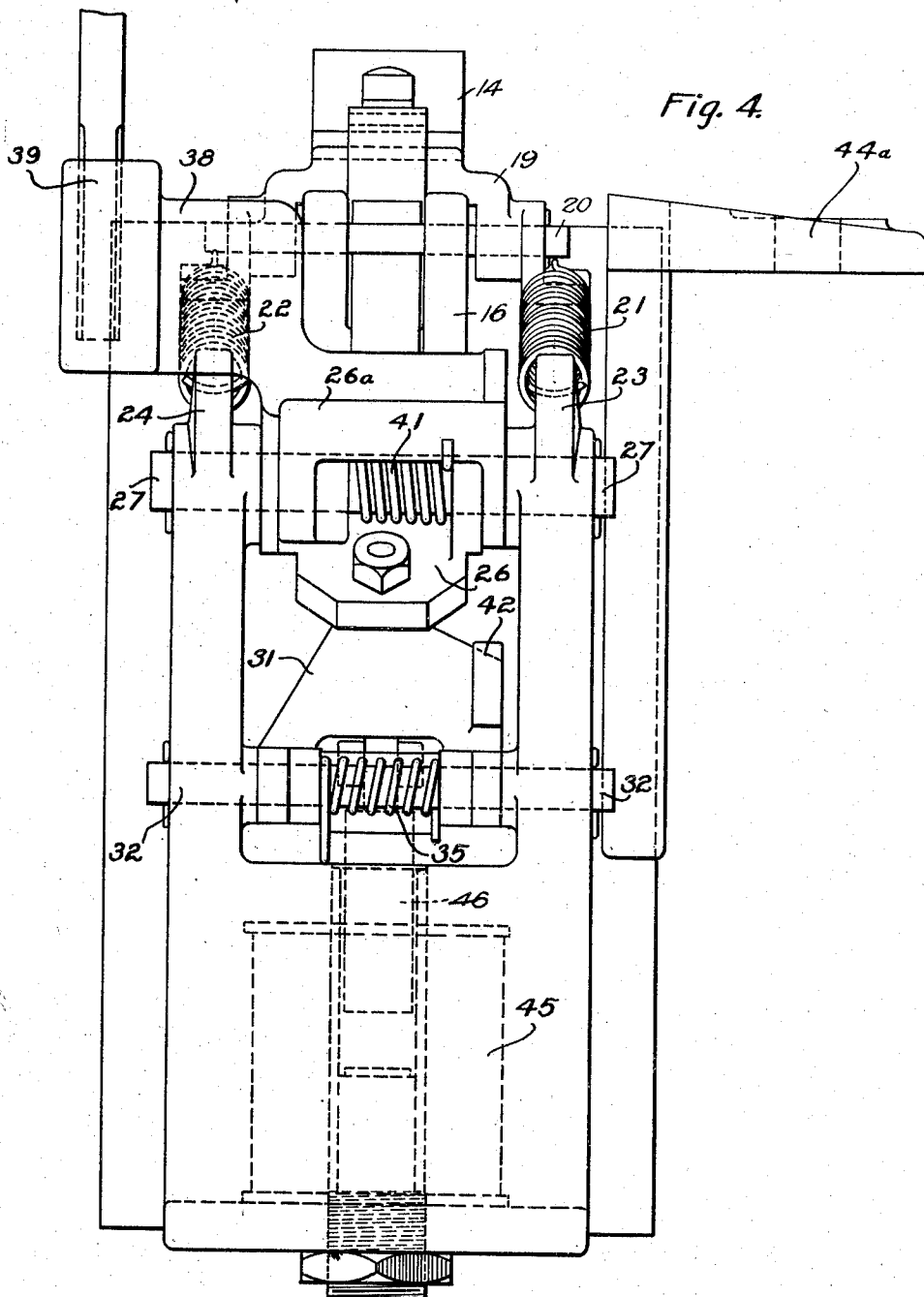
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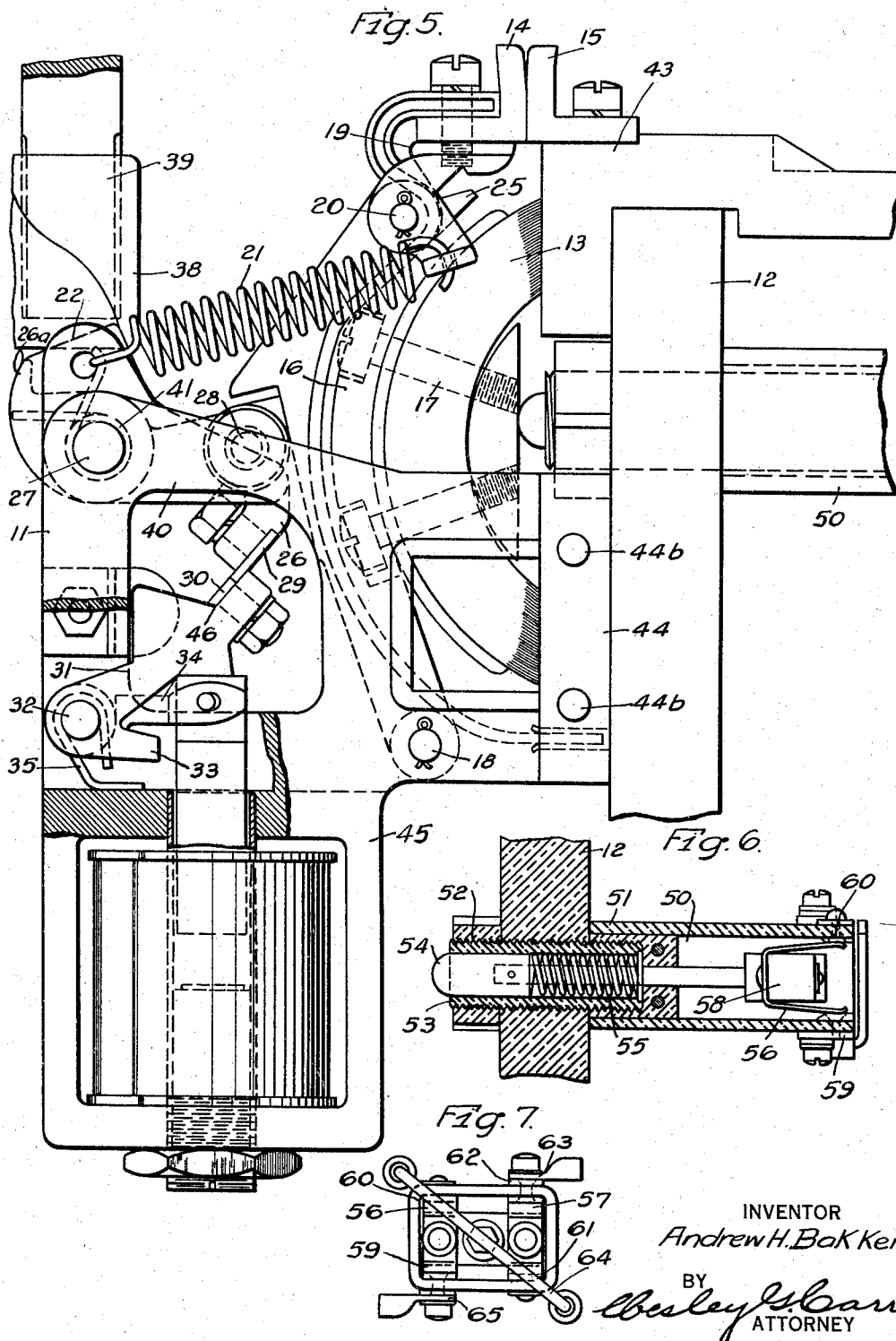
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CIRCUIT BREAKER

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Jan. 21, 1930.

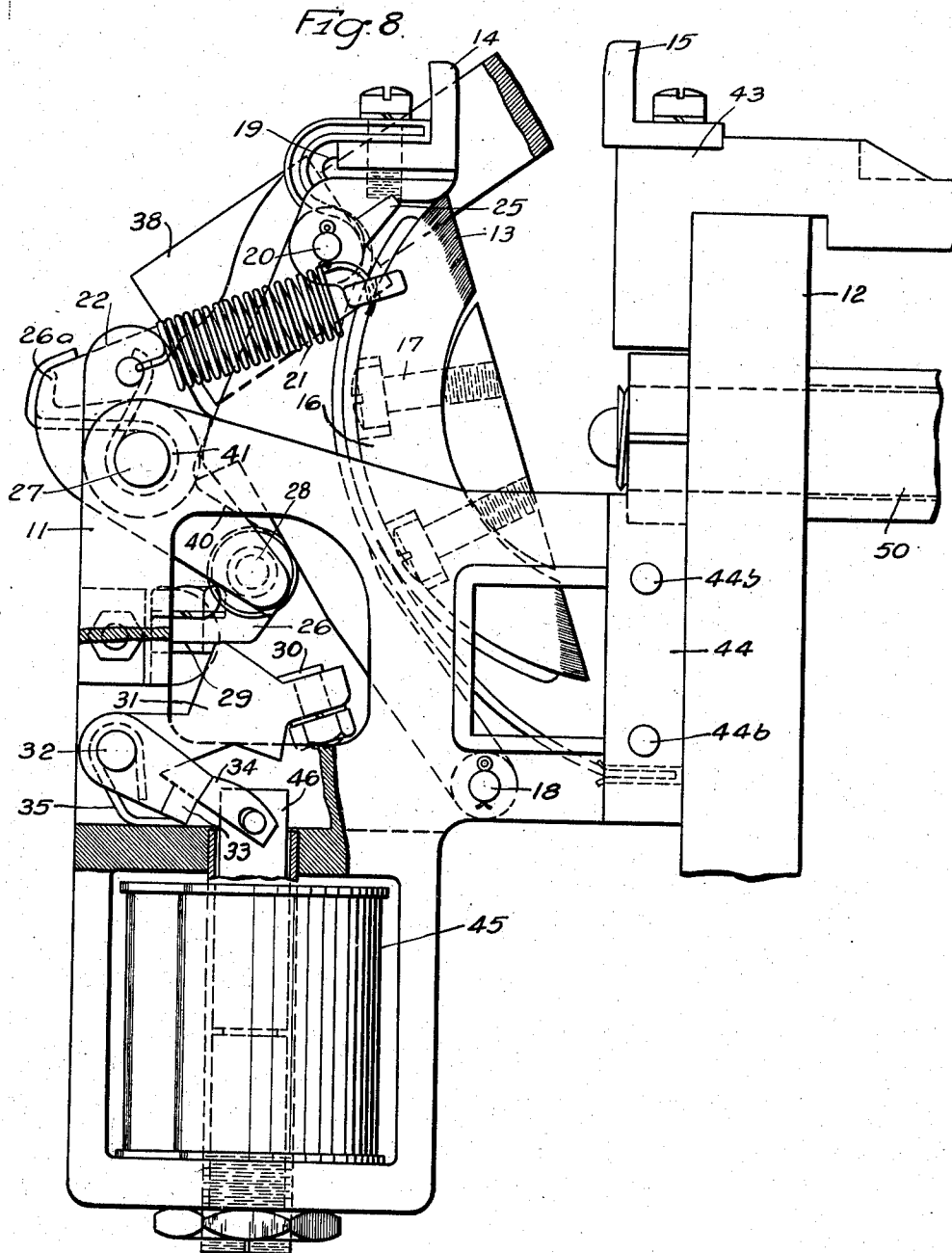
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6 Sheets-Sheet 5



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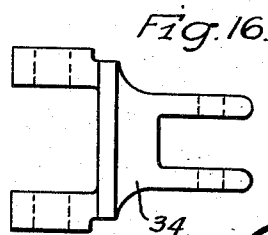
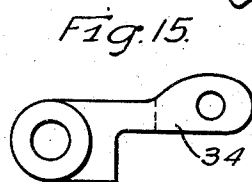
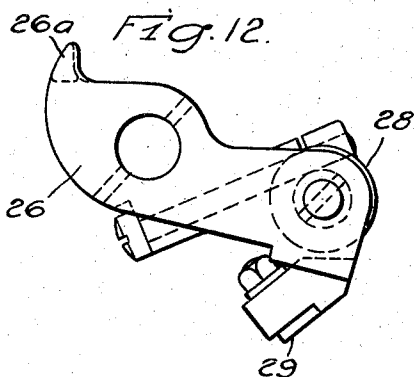
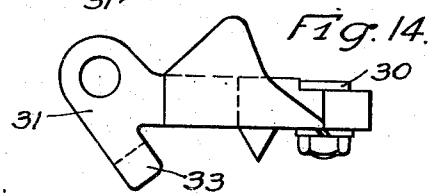
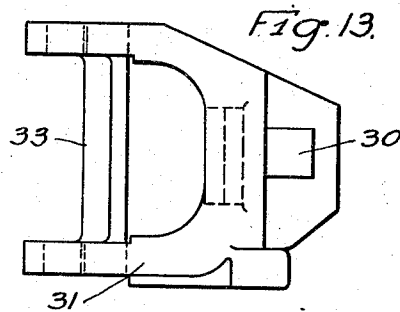
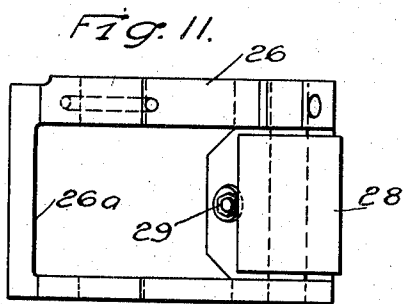
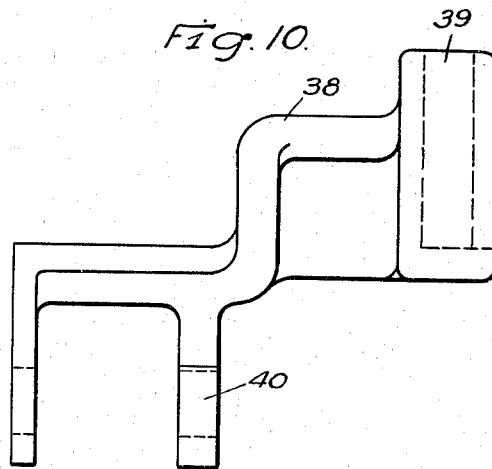
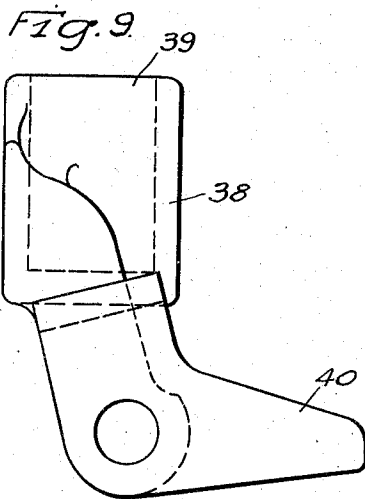
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CIRCUIT BREAKER

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6 Sheets-Sheet 6



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CIRCUIT BREAKER

Application filed April 12, 1921. Serial No. 460,711.

My invention relates to circuit breakers and particularly to those of the so called "air-break" type which are adapted to automatically open under predetermined electrical conditions in the circuit.

One of the objects of my invention is to provide a circuit breaker of simple and compact form that is adapted to be placed in comparatively inaccessible locations and still be capable of convenient manual operation.

Another object of my invention is the provision of means for automatically protecting the electrically operated tripping devices, in circuit breakers of this kind, from overloads on the main circuit while the circuit breaker is open.

As shown in the accompanying drawings:—

Figure 1 is a plan view of a man-hole for conduits in which two of my circuit breakers are mounted;

Fig. 2 is a side view thereof, partially in elevation and partially in section;

Figs. 3 and 4 are plan and front elevational views respectively, of one of the breakers;

Fig. 5 is a view of the breaker, partially in side elevation and partially in section;

Fig. 6 is a sectional view of a cut-out switch employed in connection with the apparatus;

Fig. 7 is an end view of the cut-out switch;

Fig. 8 is a view similar to Fig. 5 showing the breaker in open position, and

Figs. 9 to 16 are views of details of the operating mechanism of my circuit breaker.

The circuit breaker is shown as located in a man-hole of an underground transmission system. The man-hole is supplied with a framework 7 to which bars 8 are secured to serve as supports for usual cable lugs or carriers 9 and circuit breakers 10.

Each circuit breaker 10 which is mounted in a frame 11 that is supported on a panel 12 secured to the bar 8, consists of a brush 13 and arcing tips 14 and 15, all of which function in the usual manner. The brush 13 is secured to a bracket 16 by means of bolts 17, and the bracket is pivoted to the frame 11 at 18. The arcing tip 14 is carried on a

bracket 19 that is pivoted, at 20, to the brush-supporting bracket 16. A pair of springs 21 and 22 are secured to the bracket 19 at a point below the pivot 20 and to the lugs 23 and 24 of the frame 11. The springs 21 and 22 serve to maintain the arcing tip 14 in engagement with the arcing tip 15 during the time that the brush, during its opening or closing movement, is in such position with relation to the contacting plate 44 that arcing would ordinarily occur between the brush and the contacting plate.

The entire operating mechanism, the bridging member with the tripping and operating means are assembled in the frame 11, which is supported by four bolts (not shown) to lower contact block 44. The upper contact terminal 43 and the lower contact terminal 44 are the only parts of the circuit interrupter that are mounted on the panel 12. The panel 12 is the means, therefore, of uniting the two members, i. e., the upper and lower contact plates 43 and 44 to make one complete unit or circuit interrupter 10.

The springs 21 and 22 also exert a constant pull on the brush-supporting bracket 16 and move the brush to open position when the locking member, hereinafter to be described, releases the bracket 16.

The pivotal movement of the arcing tip bracket 19, with respect to the brush-carrying bracket 16, is limited by a stop member or lug 25 carried on the bracket 16. The lug 25 will not interfere with the pivotal movement of the arcing tip 14 until the brush 13 is far enough away from the contacting plate 44 to permit of safely breaking the engagement between the tips 14 and 15.

The bracket 16 and the brush 13 carried thereby are maintained in closed position, against the tension of the springs 21 and 22, by means of an operating lever 26 shown in Figs. 11 and 12 which is pivoted at 27 to the frame 11 and carries, at its upper end, a roller 28 in position to roll up and down the flat surface of the bracket 16. As the lever 26 swings about its pivot 27, the roller 28 moves along the flat surface of the bracket 16 to force said bracket to closed position,

against the tension of the springs 21 and 22, or to permit the bracket to move outwardly, as may be desired.

At its lower end, the lever 26 is provided with a bolt which has a head 29 adapted to abut against a bolt 30 that is carried on a trigger lever 31, as shown in Fig. 5, where-
 5 in the parts are shown in locked position, and the roller 28 is held against the bracket 16 to maintain it in closed position.

The lever 31 shown in Figs. 13 and 14 is pivoted at 32 to the frame 11 and is provided with a shelf-like extension 33. A trigger 34 shown in Figs. 15 and 16 is also pivoted at 32,
 10 and a spring 35 surrounds the pivot 32 and has its ends positioned to yieldingly maintain the trigger 34 in its upper position and in spaced relation with respect to the extension 33 to thereby normally yieldingly main-
 15 tain a movable core member 46 in position against the underside of the lever 31 and the trigger 31 in locking engagement with the operating lever 26. A handle lever 38 shown in Figs. 9 and 10 is pivoted to the frame 11
 20 at 27 and has a handle socket 39 into which a pole or handle may be placed by a workman standing on the roadway above the man-hole.

A spring 41 surrounds the pivot 27 and has its ends arranged in position to normally
 25 maintain the handle lever 38 in the position shown in Fig. 5 and also engages the operating lever 26 to limit the pivotal travel thereof when the circuit breaker parts are in re-
 30 leased position.

When in closed position, the circuit through the circuit breaker is completed from a termi-
 35 nal 43, through the brush 13, plate 44 and a terminal 44^a that is bolted to plate 44 in the bolt holes 44^b machined therein.

The electric circuit is completed between the current-carrying cables 9 that are elec-
 40 trically connected to the conducting bar 8 and the circuit interrupter 10 by means of the supporting terminal 43 clamped to conduct-
 45 ing bar 8 by the bolt 66. The terminal 43 thereby not only functions as an electrical conductor but as the supporting member for the entire circuit interrupter unit 10. The removal of the one bolt 66 disconnects the
 50 electric circuit from the contact plate 44 which thereby entirely disconnects the circuit interrupter unit 10 from the electrical conducting bar 8, which is the sole support for the circuit interrupter unit 10. This
 55 single bolt mounting feature is desirable, as it would be difficult to bolt the panel 12 to a frame support disposed in such a limited space as that in the aforesaid framework 7. To open the circuit breaker manually, the
 60 lever 38 is moved towards the panel until the extension 40 thereof (Fig. 5) engages a boss 42 (Fig. 4) formed on the trigger lever 31. This movement forces the trigger lever 31
 65 downwardly against the compression of the spring 35, causing the bolt 30 to be forced

out of locking engagement with the bolt head 29, thus permitting the lever 26 to swing about its pivot 27 under the opening action of the springs 21 and 22 and the brush-sup-
 70 porting bracket 16.

It will be noted that the handle lever 38 acts as a trigger, and that, after it has tripped the head of bolt 30 out of engagement with the bolt head 29, it has no engagement with the moving parts. This permits the moving
 75 parts to open freely.

As the circuit breaker is being opened, the bracket 19 has sufficient pivotal movement to maintain the arcing tips in engagement for the requisite length of time. The positions
 80 occupied by the principal moving parts of the circuit breaker, when in open position, are shown in dotted lines in Fig. 5.

In order to close the circuit breaker, the handle lever 38 is moved in the reverse di-
 85 rection to that just described and, by engaging a lug 26^a (Fig. 4), causes the inner end of the lever 26 to move upwardly along the flat face of the bracket 16, thereby bringing the roller 28 to the position shown in Fig. 5
 90 and forcing the bracket 16 and the brush 13 into closed position.

The means for automatically tripping the circuit breaker under predetermined current conditions consists of the usual form of trip
 95 coil 45 that is provided with the movable core 46. The core 46 is loosely connected to the trigger 34 and is normally maintained in its upper position, as shown in Fig. 5.

Upon energization of the coil 45 to an ex-
 100 tent sufficient to overcome the tension of the spring 35, the core 46 moves downwardly, carrying with it the trigger 34 which abuts against the extension 33 of the trigger lever 31, thus moving the trigger lever 31 out of
 105 locking engagement with the lever 26. The space between the members 33 and 34 is sufficient to permit of the core 46 and the member 34 acquiring sufficient momentum to strike the extension 33 a hammer blow and to thus
 110 render the tripping action more certain.

When the circuit breaker is open, it is not desirable that the trip coil should be ener-
 115 gized and, for this reason, I provide means for automatically breaking the trip-coil circuit when the circuit breaker is open. This means consists of a plunger switch 50 secured to the panel 12, as shown in Figs. 5 and 6.

The switch consists of two sleeve members 51 and 52 of insulating material, into which
 120 is screw-threaded a plug 53 forming part of the connection between the members 51 and 52 and the panel. A plunger 54 is adapted to be moved to retracted position by a com-
 125 pression spring 55. The inner end of this plunger carries a pair of movable contact members 56 and 57 mounted on an insulat-
 130 ing block 58.

When the switch 50 is in closed position, as indicated, the movable contact member 56

bridges the space between stationary contact members 59 and 60, and the movable contact member 57 bridges the space between stationary contact members 61 and 62.

5 The foregoing connections permit current to flow from a terminal 63, through the contact member 57, stationary contact member 61, connector bar 64, stationary contact 60, movable contact member 56 and stationary
10 contact 59, to a terminal 65 that leads through the trip coil 45.

The switch 50 is maintained in its closed position, as illustrated in Figs. 5, 6 and 7, during the time that the brush 13 is in closed position, but, when such brush is moved to open position, the plunger 54 is free to be moved to its outward or retracted position, under the action of the compression spring 55, thus breaking the circuit of the trip coil.

20 The utility of providing a four-point break in the switch 50 resides in the fact that, for a given length of travel by the movable contact member, twice the air gap between such member and the stationary contact members is secured over the gap which would be secured if the movable contact member simply bridged across the stationary contacts 57 and 59 instead of bridging across the stationary contacts 57, 61, 60 and 59.

30 The circuit breaker is designed to supplant the fuses now commonly employed in connection with underground transmission lines but may be used in conjunction with such fuses when desired and provides means whereby short-circuited or ground cables may be quickly and conveniently disconnected while, at the same time, serving as an ordinary circuit breaker.

40 Various modifications may be made in the construction without departing from the spirit of the invention, as defined in the accompanying claims.

I claim as my invention:

1. A circuit interrupter comprising a pair
45 of contact members mounted upon a panel, a bridging member therefor, and means of support for the said circuit interrupter comprising a portion of one of the contact members.

2. A circuit interrupter comprising a panel,
50 current-carrying means mounted thereon and a bridging member, the means for supporting said circuit interrupter comprising a part of said current-carrying means.

3. A circuit interrupter comprising a panel,
55 a pair of conducting members and a bridging member, the support means for said circuit-interrupter structure being integral with one of said conducting members.

4. A unitary circuit interrupter comprising
60 a panel, terminal members mounted thereon and a bridging member, and means on one of the said terminals adapting it to support the said current interrupter and the panel.

5. The combination in a circuit interrupter,
65 of a base member of insulating material, a

lower contact current-carrying member attached to the center portion of the said base member, an operating mechanism, a bridging member and a terminal member mounted on the lower contact member, and an upper current-carrying contact member mounted on and extending beyond the rear of the base member forming a terminal adapted to support the entire circuit interrupter unit.

6. The combination forming a circuit interrupter comprising a base member, a lower contact member having mounted thereon an operating mechanism, a bridging member and a terminal member, and an upper contact member having a portion extending in the rear of the panel and adapted to be a single means of support for the unit circuit interrupter.

7. A circuit interrupter comprising, in combination, a frame forming a magnetic circuit, a base of insulating material, a lower contact member mounted on the base and supporting the frame, an upper contact member extending to the rear of the base to form a supporting member, and a bridging member pivoted to the frame for bridging the said contact members.

In testimony whereof, I have hereunto subscribed my name this 31st day of March, 1921.

ANDREW H. BAKKEN.