

July 23, 1929.

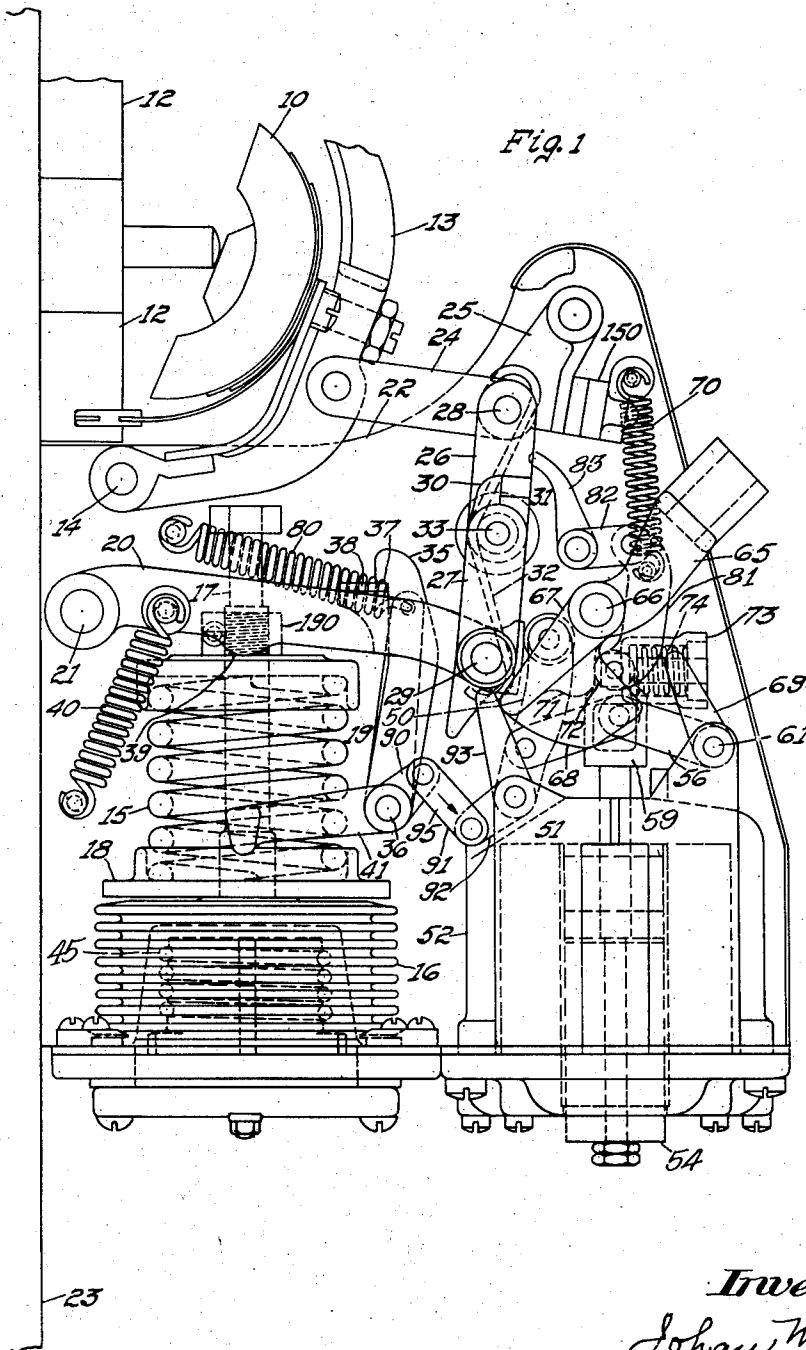
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1,721,584

CIRCUIT BREAKER

Filed Jan. 24, 1927

5 Sheets-Sheet 1



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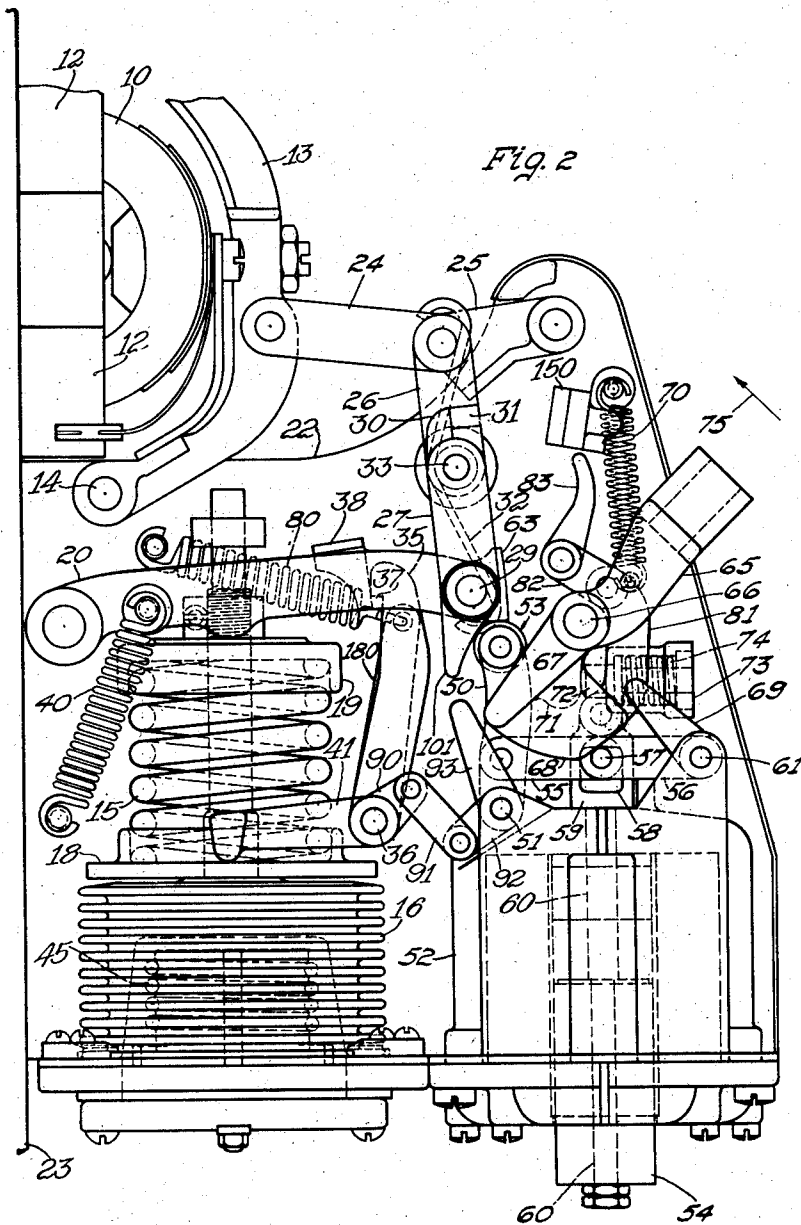
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CIRCUIT BREAKER

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5 Sheets-Sheet 2



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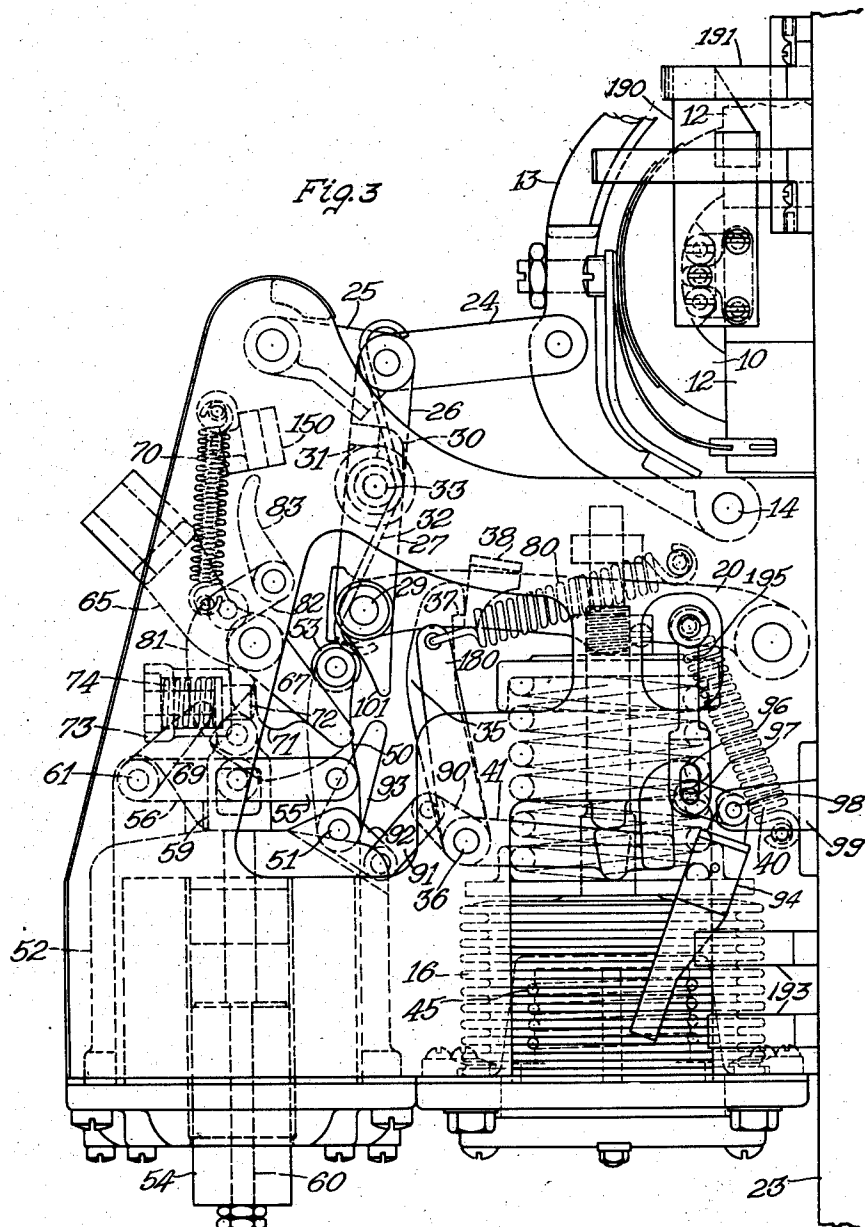
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CIRCUIT BREAKER

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5 Sheets-Sheet 3



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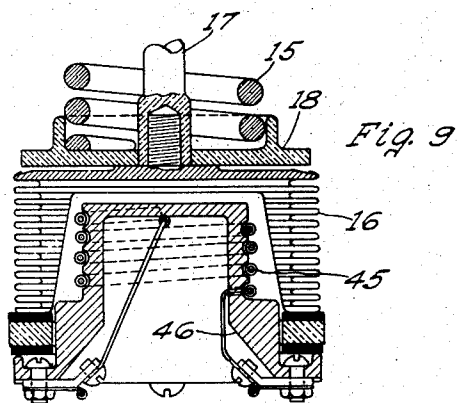
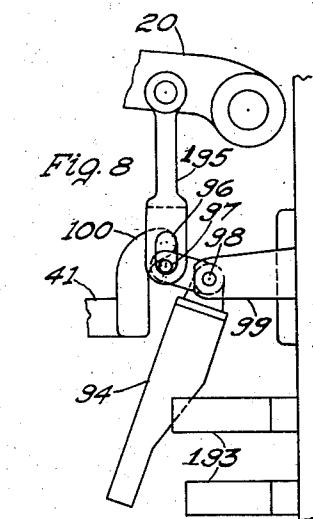
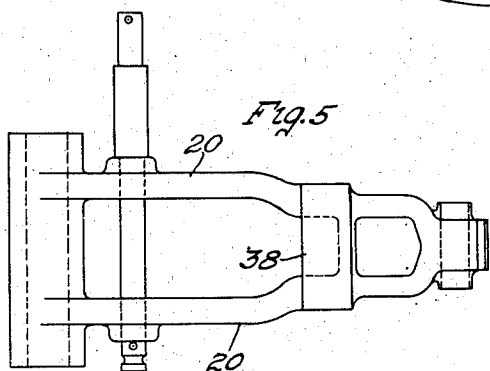
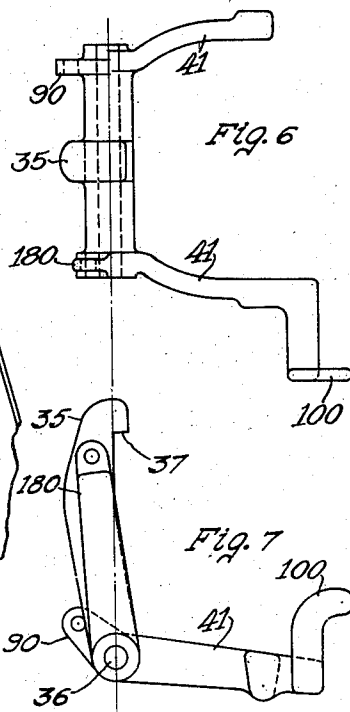
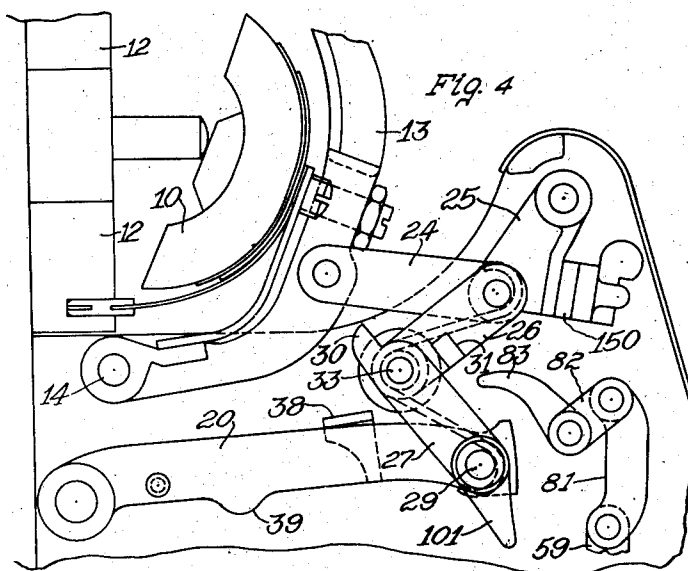
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CIRCUIT BREAKER

Filed Jan. 24, 1927

5 Sheets-Sheet 4



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CIRCUIT BREAKER

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5 Sheets-Sheet 5

Fig. 10

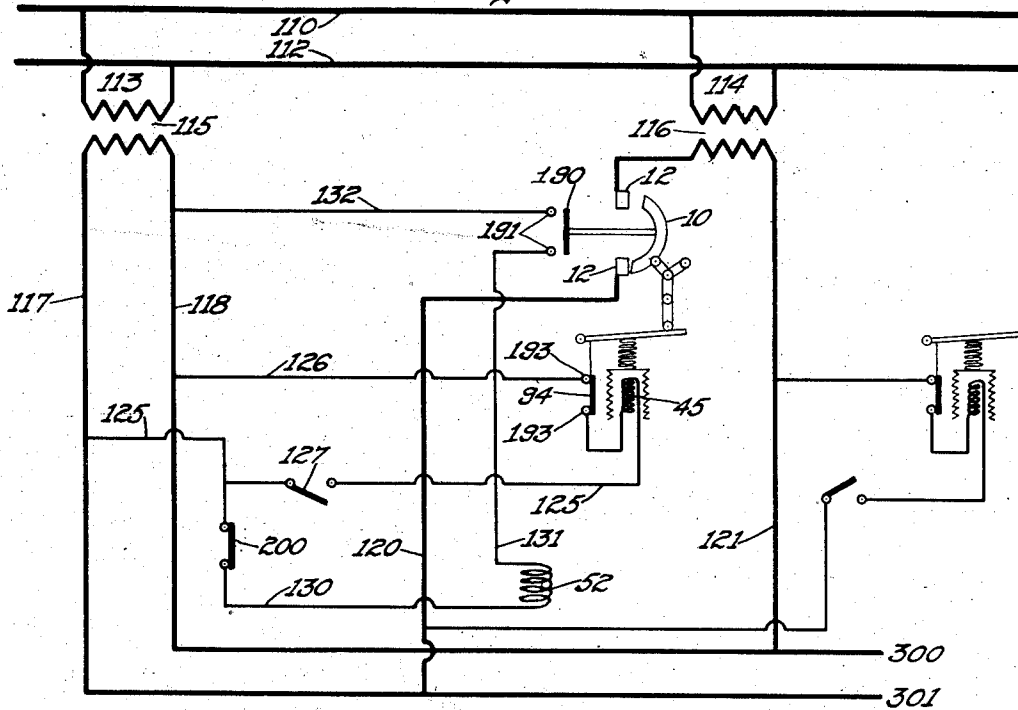
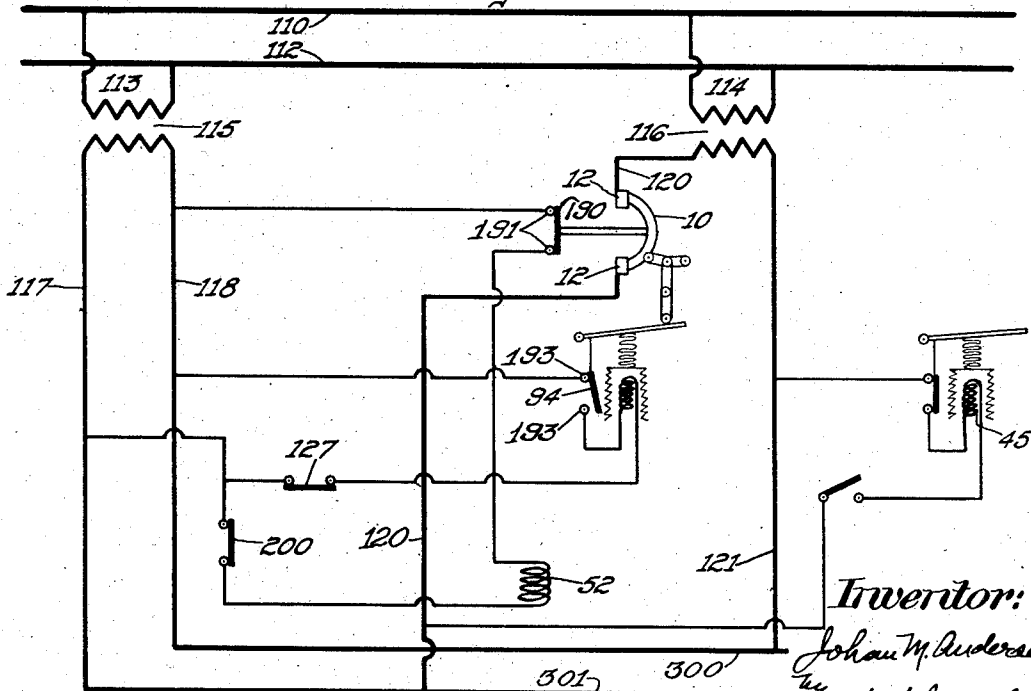


Fig. 11



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UNITED STATES PATENT OFFICE.

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CIRCUIT BREAKER.

Application filed January 24, 1927. Serial No. 163,021.

This invention relates to a circuit controller and is herein shown as embodied in an electric circuit controller of the character known as a circuit breaker.

5 The invention has for its object to provide a circuit controller in which the movable member thereof is locked in both its opened and its closed positions and is released or unlocked therefrom under conditions of use, as will be described.

10 The invention further has for its object to provide a circuit controller of the character described which is thermostatically operated, as will be described.

15 The invention also has for its object to provide for opening the circuit breaker substantially as soon as closed under certain conditions of use, as will be described.

20 The invention also has for its object to provide a circuit breaker which may be included in the secondary circuit of a transformer and be responsive to current conditions of the secondary circuit of another transformer.

25 The invention further has for its object to provide a circuit breaker in which pressure is employed to close the breaker, and is accumulated while the breaker is locked in its open position.

30 These and other features of the invention will be pointed out in the claims at the end of this specification.

Fig. 1 represents in side elevation a circuit breaker embodying this invention, the breaker being shown in its open position;

35 Fig. 2, a view like Fig. 1 with the breaker in its closed position;

Fig. 3, an opposite side elevation with the breaker in its closed position;

40 Fig. 4, a detail showing the breaker open with its operating lever in its raised position;

Fig. 5, a plan of the operating lever shown in Figs. 1 and 4;

Fig. 6, a plan, and

45 Fig. 7, a side elevation, of the locking lever for the operating lever;

Fig. 8, a detail of the heater switch and its operating mechanism;

50 Fig. 9, a section of the thermostatic device and its heater shown in Fig. 1, and

Figs. 10 and 11, diagrammatic views to illustrate the working of the invention.

Referring to the drawings 10 represents

the movable contact member, and 12, the stationary contact members of a circuit breaker 55 or controller embodying this invention.

The movable contact member 10 is secured to a movable carrier, shown as a lever 13 pivoted at 14 to a suitable supporting frame, which may be of any desired or standard construction, and comprises a metal frame 22 60 attached to a panel or slab 23 of insulating material.

Provision is made for automatically moving the contact member 10 into its closed position in contact with the stationary contact members 12, which is effected by a thermostatically operated device, herein shown as a relatively strong helical spring 15 co-operating with a metallic bellows 16 containing 70 ethylchloride or like medium capable of being expanded at a relatively low temperature.

The metallic bellows 16 has fast to its upper head a guide rod 17 on which is mounted a seat member 18 for the lower end of the 75 spring 15 and a cap member 19 for the upper end thereof.

The cap member 19 is loose on the guide rod 17 and has co-operating with it a lever 20, pivoted at 21 to the framework 22 and 80 forming part of the operating mechanism for the movable circuit controlling member 10.

The operating mechanism also comprises two toggles, one of which consists of the levers 85 24, 25 connected with the carrier lever 13 and the framework 22, and the other toggle consisting of levers 26, 27, the lever 26 being connected with the center pin 28 of the toggle 24, 25, and the lever 27 being connected by 90 the pin 29 with the lever 20.

The toggle 26, 27 may be designated a toggle link, and provision is made so that under one condition of use, as will be described, it will act as a rigid link for connecting the 95 lever 20 with the toggle 24, 25, and under another condition of use, it will function as a toggle to permit the breaker to open.

To these ends the lever 27 is provided at one end with a finger 30, which is held against 100 a lug or stop 31 on the lever 26 by a spring 32 having its center portion engaging the center pin 33 of the toggle 26, 27, and having one end engaging the center pin 28 of the toggle 24, 25 and the other end engaging the pin 29 105 on the lever 20.

The ends of the spring 32 engage the pins 28, 29 on one side of the longitudinal center line of the toggle 26, 27 in its closed position, and the center portion of the spring engages the center pin 33 on the opposite side of said center line, as shown in Fig. 1.

The circuit breaker is closed by moving the toggle 24, 25 into its closed or straightened position, shown in Fig. 2, and this is effected by movement of the lever 20, with the toggle 26, 27 acting as a rigid link.

In accordance with this invention, the circuit breaker is normally open, as shown in Fig. 1, and is locked or retained in this position by a latching or locking lever or arm 35 fast on a rockshaft 36 and provided with a latch 37, which is engaged with a cross bar 38 of the lever 20, which latter is shown separately in Fig. 5.

The lever 20 is provided on its under side with a nub or projection 39, which bears on the cap member 19, as shown in Fig. 1, and is held in engagement therewith by a spring 40.

The latching lever 35 is designed to be automatically disengaged from the lever 20 by the thermostatic device, and for this purpose the rockshaft 36 is provided with an arm 41 whose free end co-operates with the seat member 18 for the spring 15.

The metallic bellows 16 is expanded in response to a rise in temperature, as will be described, and the seat member 18 gradually compresses the spring 15 against the lever 20 until the latter is released by the latching lever 35, whose latch 37 is disengaged from the cross bar 38 by the metallic bellows 16 lifting the arm 41 and rocking the shaft 36.

The lever 20 is unlatched or released when the metallic bellows has been expanded a predetermined amount under a condition of use, as will be described.

The cap member 19 has co-operating with it a nut 190 screwed upon the guide rod 17, and by means of said nut, the initial tension on the spring 15 may be determined, and thereby determine the length of time the thermostat 16 must be heated before the lever 20 will be unlatched and released.

While the metallic bellows is being expanded, the spring 15 is being compressed against the locked operating lever 20, and energy is stored up in said spring, so that when the latch 37 is disengaged from the lever 20, the free end of the latter is elevated by the spring 15, and the toggle 26, 27 acting as a rigid link straightens or closes the toggle 24, 25 and moves the lever 13 to close the breaker, as represented in Figs. 2 and 3.

The thermostatic device 16 is rendered active by a thermal unit, shown in section in Fig. 9, and consisting as herein shown of a coil 45 of wire wound on an insulator 46 and located within the thermostat or metallic bellows 16.

When the thermal unit produces sufficient heat to expand the thermostat 16 the proper amount, the breaker is closed as above described.

The thermal unit may be supplied with current from any suitable source of current and particularly from the secondary circuit of a transformer, whose primary is included in the main line of an alternating current system, as will be described.

Provision is made for locking the breaker in its closed position and for automatically unlocking the same.

The breaker is locked in its closed position, shown in Fig. 2, by means of a lever 50 having its lower end pivoted at 51 to a tripping coil or electromagnet 52 and having its upper end arranged to be moved under and be engaged with the free end of the lever 20.

The upper end of the locking lever 50 preferably carries a roller 53 for engaging the lever 20.

The tripping coil 52 is mounted on the frame 22 in proper position to have the locking lever 50 function properly to lock the operating lever 20 in its elevated or operative position and to unlock the same.

The locking lever 50 is connected with the core 54 of the tripping coil 52 by a toggle comprising the levers 55, 56 having their center pin 57 extended into a slot 58 in the head 59 of a rod 60 to which the core 54 is fastened.

The lever 55 is connected with the locking lever 50, and the lever 56 is fast on a rockshaft 61 mounted on the magnet 52.

In the present instance, the toggle 55, 56 is closed or straightened by the weight of the core 54, and is broken when the tripping coil 52 is energized.

The locking lever 50 normally bears against the end face 63 of the lever 20, when the latter is in its lowered position and the breaker is open, as shown in Fig. 1, and under these conditions, the locking lever 50 is held by the lever 20 from movement under the influence of gravity.

When however, the lever 20 is elevated into its operative position, gravity acting on the core 54 straightens the toggle 55, 56 and moves the lever 50 under the lever 20 and locks the latter in its elevated position, until the locking lever 50 is moved from under the lever 20 and into its inoperative position.

The movement of the locking lever 50 into its inoperative position may be effected automatically or manually.

The automatic action is effected by energizing the tripping coil or magnet 52, which moves its armature or core 54 upwardly from the position shown in Fig. 2 into that shown in Fig. 1, causing the head 59 to break the toggle 55, 56 and thereby move the locking lever 50 from under the lever 20.

The manual action is obtained by means

of a hand-operated lever 65 pivoted at 66 to the frame 22 and having its short arm 67 provided with a lug or projection 68, which co-operates with a crank or arm 69 on the rock-shaft 61 to which the toggle lever 56 is fastened to move therewith.

The hand-operated lever 65 is provided with a suitable handle (not shown) and the handle of said lever is normally held elevated by a spring 70, which holds a second lug or projection 71 on the short arm 67 of the lever 65 against a yielding back stop or plunger 72, movable in a suitable housing 73 on the frame 22 and normally pressed forward by a spring 74.

The spring 74 is capable of being compressed by the operator moving the lever 65 upwardly beyond its normal position in the direction indicated by the arrow 75 in Fig. 2, and to such extent as to engage the lug 68 with the crank or arm 69 and rock the shaft 61 so as to break the toggle 55, 56, and thereby manually move the locking lever 50 into its inoperative position, shown in Fig. 1, which permits the spring 40 to move the lever 20 downward and through the toggle link 26, 27 break the toggle 24, 25 and open the breaker, providing that the thermostat 16 is cool so as to permit the lever 20 to be so moved.

When the operating lever 20 is lowered by its spring 40 into its starting position, shown in Fig. 1, it is locked or latched in this position by the lever 35, which is moved by a spring 80 so as to engage the latch 37 with the cross bar 38 on the lever 20, as shown in Fig. 1.

The spring 80 is anchored at one end and connected with a crank or arm 180 on the rockshaft 36.

Provision is also made for automatically opening the breaker with the actuating lever 20 in its elevated position, and held in such position by the thermostatic device 16, if the latter has not had opportunity to cool sufficiently to allow the lever 20 to be lowered by its spring 40, but is held elevated by the spring 15 and the expanded metallic bellows 16.

To this end, the head 59 of the core of the tripping coil 52, is connected by a link 81 with an elbow lever 82 pivotally mounted on the frame 22 and having its long arm 83 arranged with relation to the toggle link 26, 27 so as to strike the link 27, and break the toggle link, as represented in Fig. 4, when the tripping coil 52 is energized, thus allowing the breaker to open with the lever 20 in its elevated position.

After the breaker has been opened and the thermostatic device has cooled, the lever 20 is moved by the spring 40 into its lowered or starting position, and at such time, the spring 32 straightens the toggle 26, 27 and brings it into its normal position, wherein it functions as a rigid link.

Provision is made for manually unlock-

ing the actuating lever 20 with the breaker in its open position whereby the breaker may be manually closed.

To this end, the rockshaft 36 to which the latching lever 35 is fast, is provided with a crank or arm 90, which is connected by a link 91 with a bell crank lever 92 mounted on the pivot pin 51 carried by the tripping coil 52, said bell crank having an arm 93 of sufficient length to have its upper end in the path of movement of the short arm 67 of the hand-operated lever 65, with the latter in its normal or elevated position, in which the lug 71 carried by the lever 65 engages the plunger 72 of the yielding back stop, as represented in Fig. 1.

Under these conditions, the breaker may be manually closed, for on the initial downward movement of the hand-operated lever 65, the short arm 67 thereof acts on the arm 93 of the bell crank 92 and turns the latter so as to move the link 91 in the direction indicated by the arrow 95 and thereby rock the shaft 36 so as to move the latching lever 35 out of engagement with the cross bar 38 and thus unlock the lever 20, which is then elevated by further downward movement of the hand-operated lever 65, whose short-arm 67 is further elevated and engaged with the free end of the lever 20 to lift the latter into its breaker-closing position, shown in Fig. 2, in which position the lever 20 is locked by the lever 50.

It will thus be seen that when the breaker is open and the thermostat 16 is cold, as represented in Fig. 1, the breaker is locked in its open position by the latching lever 35 engaging the lever 20.

It will also be seen that the breaker may be automatically unlocked and then closed by the thermostatic device, and may be manually unlatched and then closed by the hand-operated lever 65.

It will further be seen that when the breaker is closed, the breaker is locked in its closed position by the locking lever 50, and may be automatically unlocked by energizing the tripping coil 52, and if the thermostat is sufficiently cooled, the breaker may then be opened by the spring 40 moving the lever 20 downward so as to break the toggle 24, 25.

Under the same thermostatic conditions, the breaker may be manually unlocked by moving the hand-operated lever 65 upwardly beyond its normal elevated position so as to cause the toggle 55, 56 to be broken and the locking lever 50 to be moved from under the lever 20.

It will also be seen that the breaker may be automatically opened substantially as soon as it has been closed and with the lever 20 held elevated by the thermostat 16 in a heated condition, which is effected by energizing the tripping coil 52 and breaking the toggle link 26, 27 by the bell crank 83, 82, and that this

result may be manually effected by the hand-operated lever in its elevated position.

The tripping coil 52 may be constructed to respond to the closing of a switch, or to respond to an abnormal current condition in the circuit, such, for instance, as an overload or a reverse current.

The tripping coil 52 may be controlled by a switch operatively connected with the movable member 10 of the breaker, which switch is conventionally represented in Fig. 3 as comprising a movable blade or member 190 and stationary contact members 191.

It will thus be seen that the circuit of the tripping coil 52 is open at the switch 190, 191 when the breaker is open and is closed at the switch 190, 191 when the breaker is closed.

The heater coil 45 is controlled by a switch comprising stationary contacts 193 and a movable blade or member 94 (see Figs. 3 and 8).

The movable blade 94 is operatively connected with the lever 20 by a link 195, pivoted to the lever 20 and having a slot 96 into which is extended a pin 97 on the movable member 94, which is pivoted at 98 to a stationary arm or bracket 99.

The pin 97 has co-operating with it a hooked finger 100 attached to the arm 41 of the latching lever 35.

The finger 100 extends over the pin 97 and serves to move the switch member 94 into engagement with the stationary contacts 193 and thus close the heater switch when the latching lever 35 is moved into its operative position.

It will thus be seen that when the thermostatically operated lever 20 is latched or locked in its lowered position with the breaker open, as shown in Fig. 1, the switch member 94 of the heater switch is in its closed position, and cannot be opened until the lever 20 is unlocked whereupon it is opened at or about the time the breaker is closed, which opening of the switch is effected by the lever 20 through the link 195.

The slot 96 in the link 195 permits the switch member 94 to remain unacted upon for the greater part of the movement of the breaker-operating lever 20, which enables the heater switch 94 to remain closed on the upward movement of the lever 20, until about the time the breaker is closed, and enables the heater switch to remain open, on the downward movement of the lever 20 until the latching lever 35 is free to be engaged with the cross bar 38 to lock the lever 20 in its lowered position.

The lever 27 of the toggle link is provided with a tail piece 101, which co-operates with the locking lever 50 so as to move the said lever out of the path of the lever 20, when the breaker is opened by the tripping coil with the lever 20 in its elevated position, and

prevents the locking lever 50 interfering with the descent of the lever 20.

The tail piece 101 becomes effective on the locking lever 50 when the toggle link 26, 27 is broken.

A circuit controller or breaker of the character described is especially adapted among other uses to be employed in alternating current systems, and particularly for controlling the secondaries of a plurality of transformers, which secondaries it is desired to cut in or cut out of the system to meet the requirements of use.

Figs. 10 and 11 diagrammatically represent an alternating current system whose main lines 110, 112 have connected with them the primary windings 113, 114 of two transformers 115, 116.

The secondary circuit 117, 118 of the transformer 115 is represented in Fig. 10 as in service, whereas the secondary circuit 120, 121, of the transformer 116 is provided with the breaker above described, which in Fig. 10 is represented as open, and consequently the secondary circuit of the transformer 116 is not in service.

In Fig. 11 the breaker is represented in its closed position, and the secondary circuit of the transformer 116 has been cut into service.

As represented in Fig. 10, the heater coil 45 is in a circuit tapped off from the secondary circuit 117, 118 of the transformer 115.

The circuit of the heater coil 45 may be traced as follows: from the line 117 by wire 125 to the heater coil 45, thence by switch 193, 94 and wire 126 to the other line 118 of the secondary circuit of the transformer 115.

This circuit is provided with a switch 127, which may be manually or automatically operated. It is represented as manually operated.

It will thus be seen that when the switch 127 is closed, the circuit of the heater coil 45 is closed.

The tripping coil 52 is also supplied with current from the secondary or secondaries connected in the service line, and as represented in Fig. 10, the secondary 117—118 is in service, and the circuit of the tripping coil from this secondary may be traced as follows: from the wire 117 by wires 125, 130, coil 52, wire 131, switch 190, 191 and wire 132 to wire 118.

This circuit is normally open at the switch 190, 191, as shown in Fig. 10 and is closed at the said switch when the breaker member 10 is closed as represented in Fig. 11, and the tripping coil in such case remains inactive until operated by an overload or a reverse current condition. On the other hand, if the tripping coil is a straight magnet, its circuit is provided with a switch 200, which may be manually or automatically operated.

In Figs. 10 and 11 the service line from 130

which current is supplied to the customers is represented by the lines 300, 301.

The breaker has its stationary contacts 12 included in the line 120 of the secondary circuit of the transformer 116, and normally this secondary circuit is open at the breaker, as represented in Fig. 10.

When the breaker is closed as above described, the secondary circuit of the transformer 116 is completed and cut into service, as shown in Fig. 11.

When the breaker is closed as represented in Fig. 11, the switch 94, 193 for the heater coil 45 is opened, and the circuit for the tripping coil is closed, so that the latter will automatically respond to the abnormal current condition to which the tripping coil is constructed to respond.

Any desired number of transformers may thus be successively cut into and cut out of service, and in Figs. 10 and 11, the heater coil 45 of a breaker for an additional transformer (not shown) is represented as connected with the secondary circuit 120, 121 of the transformer 116.

The circuit of the thermal unit or electric heater 45 is represented in Figs. 10 and 11 as controlled by a manually operated switch 127, but in practice the switch 127 may be closed by a synchronizing relay of known construction and not herein shown, which operates to close the switch 127 when the frequency of the alternating current in the primary of the transformer 116 is synchronous with the current in the secondary circuit of the transformer in service, which in the present instance is the transformer 115.

The opening movement of the contact member 10 is limited by a back stop 150 on the frame 22, with which the toggle lever 25 co-operates, as shown in Fig. 1.

One embodiment of the invention is herein shown, but it is not desired to limit the invention to the particular construction illustrated.

What is claimed is:

1. In a circuit controller, in combination a stationary contact member, a movable contact member, a thermostatic device for effecting movement of said movable contact member from its open position, means for locking said movable contact member in its open position against movement by said thermostatic device, means actuated by said thermostatic device when heated for unlocking said movable contact member, and manually operated means for unlocking said movable contact member independently of said thermostatic device.

2. In a circuit controller, in combination a stationary contact member, a movable contact member, a lever operatively connected with said movable contact member, a latching lever co-operating with said operating lever, a thermostatic device for effecting movement

of said contact member, an electric heater for said thermostatic device, and a circuit controller for said heater operatively connected with said latching lever to be closed when said operating lever is latched and said movable contact member is in its open position.

3. In a circuit controller, in combination a stationary contact member, a movable contact member, a thermostatic device for effecting movement of said movable contact into its closed position, and means for moving said movable contact member into its open position independently of said thermostatic device and with said thermostatic device in its heated operative condition.

4. In a circuit controller, in combination, a movable contact member, a hand-operated lever for moving said contact member into its closed position, a spring to normally elevate said lever, a yielding stop cooperating with said lever to position it in its normal elevated position, a device for locking said contact member in its closed position, and means co-operating with said locking device and with said lever to be actuated by movement of the lever beyond its normal elevated position and effect unlocking of said movable contact member in its closed position.

5. In a circuit controller, in combination a stationary contact member, a movable contact member, a toggle lever connected with said movable contact member, an operating lever, a toggle link connecting said toggle lever with said operating lever, a spring to move said operating lever and effect closing movement of said movable contact member, a lever for locking said operating lever in its inoperative position, a thermostatic device co-operating with said spring to compress the same and with said locking lever to release the operating lever and permit said spring to move the operating lever and said movable contact member when said spring has been compressed to a predetermined point by said thermostatic device.

6. In a circuit controller, in combination a stationary contact member, a movable contact member, a toggle lever connected with said movable contact member, an operating lever, a toggle link connecting said toggle lever with said operating lever, a spring to move said operating lever and effect closing movement of said movable contact member, a lever for locking said operating lever in its inoperative position, a thermostatic device co-operating with said spring to compress the same and with said locking lever to release the operating lever and permit said spring to move the operating lever and said movable contact member when said spring has been compressed to a predetermined point by said thermostatic device, a locking device co-operating with said operating lever to maintain it in its operative position, and a tripping coil operatively connected with said

locking device to release said operating lever.

7. In a circuit controller, in combination a stationary contact member, a movable contact member, a toggle lever connected with said movable contact member, an operating lever, a toggle link connecting said toggle lever with said operating lever, a spring to move said operating lever and effect closing movement of said movable contact member, a lever for locking said operating lever in its inoperative position, a thermostatic device co-operating with said spring to compress the same and with said locking lever to release the operating lever and permit said spring to move the operating lever and said movable contact member when said spring has been compressed to a predetermined point by said thermostatic device, a locking device co-operating with said operating lever to maintain it in its operative position, and a hand-operated lever co-operating with said locking device to release said operating lever.

8. In a circuit controller, in combination, a stationary contact member, a movable contact member, a toggle lever connected with said movable contact member, an operating lever, a toggle link connecting said toggle lever with said operating lever, a spring to move said operating lever and effect closing movement of said movable contact member, a lever for locking said operating lever in its inoperative position, a thermostatic device co-operating with said spring to compress the same and with said locking lever to release the operating lever and permit said spring to move the operating lever and said movable contact member when said spring has been compressed to a predetermined point by said thermostatic device, a tripping coil, and a device operated by said tripping coil and co-operating with said toggle link to break the same and permit said movable contact member to be moved into its open position with the operating lever in its operative position.

9. In a circuit controller, in combination a stationary contact member, a movable contact member, a toggle connected with said movable contact member, an operating lever, a toggle link connecting said toggle lever with said operating lever, a lever for locking said operating lever in its inoperative position, and a hand-operated lever co-operating with said locking lever to release said operating lever and permit it to be moved into its operative position.

10. In a circuit controller, in combination a stationary contact member, a movable contact member, mechanical means for moving said contact member, a coiled spring for moving said mechanical means, a locking device for said mechanical means and a pressure creating thermostatic device co-operating with said mechanical means and operating when heated to compress said coiled spring

against said mechanical means and to release said locking device and permit the compressed spring to expand and move said mechanical means to effect closing movement of said movable contacting member.

11. In a circuit controller, in combination, a stationary contact member, a movable contact member, a lever connected with said movable contact member, means for locking said lever with the movable contact member in its open position, a compressible member co-operating with said lever, a thermostatic device co-operating with said compressible member to compress the latter against the said lever when the said lever is locked, and co-operating with the locking means to unlock the said lever and permit it to be moved by expansion of the compressible member, when the latter has been compressed to a predetermined point.

12. In a circuit controller, in combination, a stationary contact member, a movable contact member, a thermostatic device, mechanism operatively connecting said thermostatic device with said movable contact member to effect movement of the said contact member into its closed position by said thermostatic device when the latter is heated, said mechanism being constructed to permit movement of said movable contact member into its open position independently of said thermostatic device, and means co-operating with said mechanism to move it into a position wherein the said movable contact member is capable of being moved into its open position independently of said thermostatic device and while the latter is in its heated operative condition.

13. In a circuit controller, in combination, a stationary contact member, a movable contact member, a coiled spring to move said movable contact member into its closed position, means for locking said movable contact member in its open position, means for unlocking said movable contact member, and a thermostatic device co-operating with said coiled spring and acting when heated to compress the same and co-operating with said unlocking means for releasing said coiled spring and permitting the latter to expand and move said movable contact member into contact with said stationary member.

14. In a circuit controller, in combination, a movable contact member, a compressible device, means for operatively connecting said compressible device with said contact member, a thermostatic device having a member expansible by heat co-operating with said compressible member to compress the same, an electric heater for said expansible member, and a circuit controller for said electric heater operatively connected with said compressible member to be opened thereby when said contact member is closed.

15. In a circuit controller, in combination, a stationary contact member, a movable contact member, a lever connected with said movable contact member, means for locking said lever with the movable contact member in its open position, a compressible member co-operating with said lever, a device co-operating with said compressible member to compress the latter against the said lever when the said lever is locked, and co-operating with the locking means to unlock the said lever and permit it to be moved by expansion of the compressible member when the latter has been compressed to a predetermined point.
16. In a circuit controller, in combination, co-operating contact members, one of which is movable, compressible means for moving said movable contact member into its closed position, mechanical means operatively connecting said compressible means with said movable contact member, means for locking said movable contact member in its open position, and means for automatically compressing said compressible means and for actuating said locking means to release said movable contact member after said compressible means has been compressed a predetermined amount and permit said compressible means to actuate said mechanical means and move said movable contact member into its closed position.

In testimony whereof, I have signed my name to this specification.

JOHAN M. ANDERSEN.