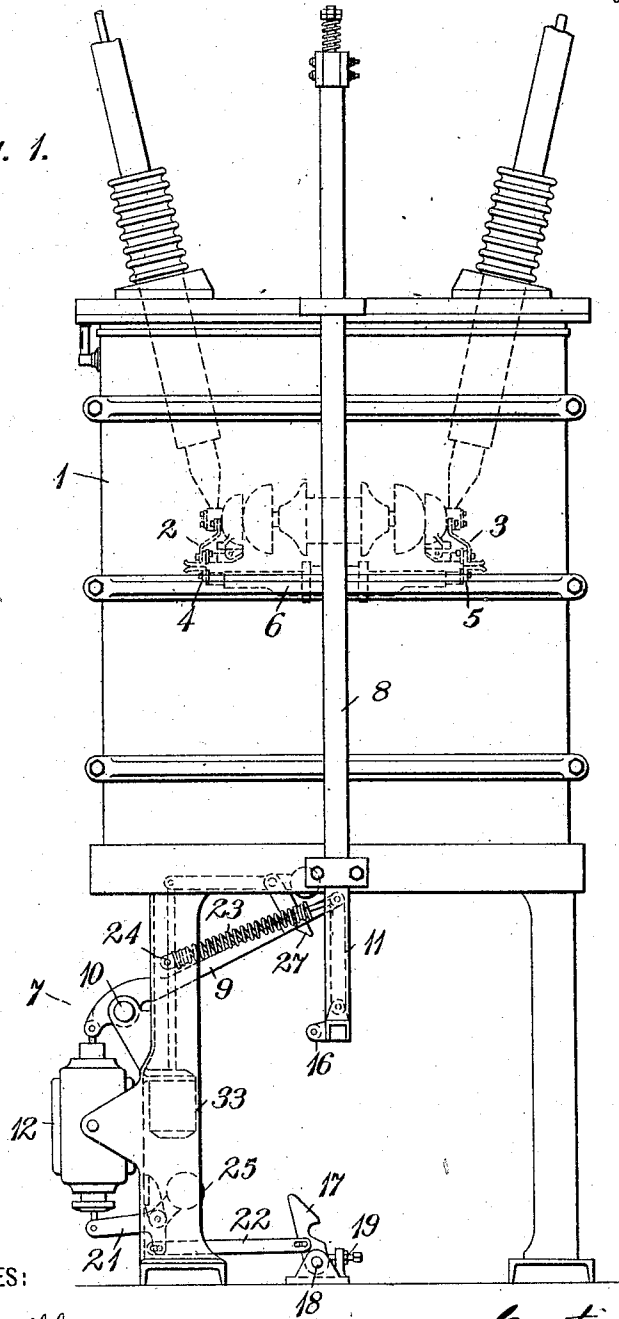


C. A. TUCKER.
CIRCUIT BREAKER.
APPLICATION FILED SEPT. 3, 1907.

934,482.

Patented Sept. 21, 1909.
3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

Fred H. Miller
R. J. Carbons.

INVENTOR

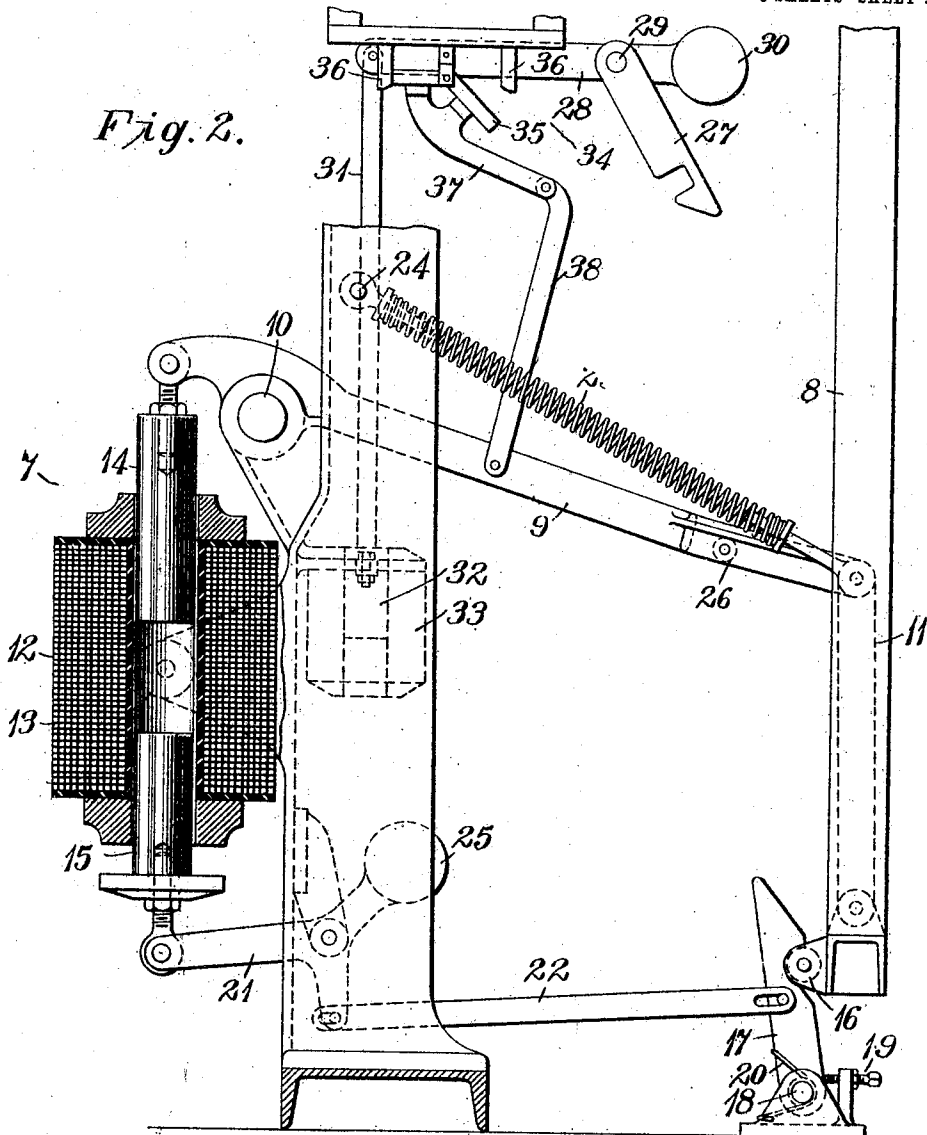
Curtis A. Tucker
BY
Wesley S. Sears
ATTORNEY

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3 SHEETS—SHEET 2.



WITNESSES:

Fred H. Miller
R. F. Dearborn.

INVENTOR

Curtis A. Tucker

BY

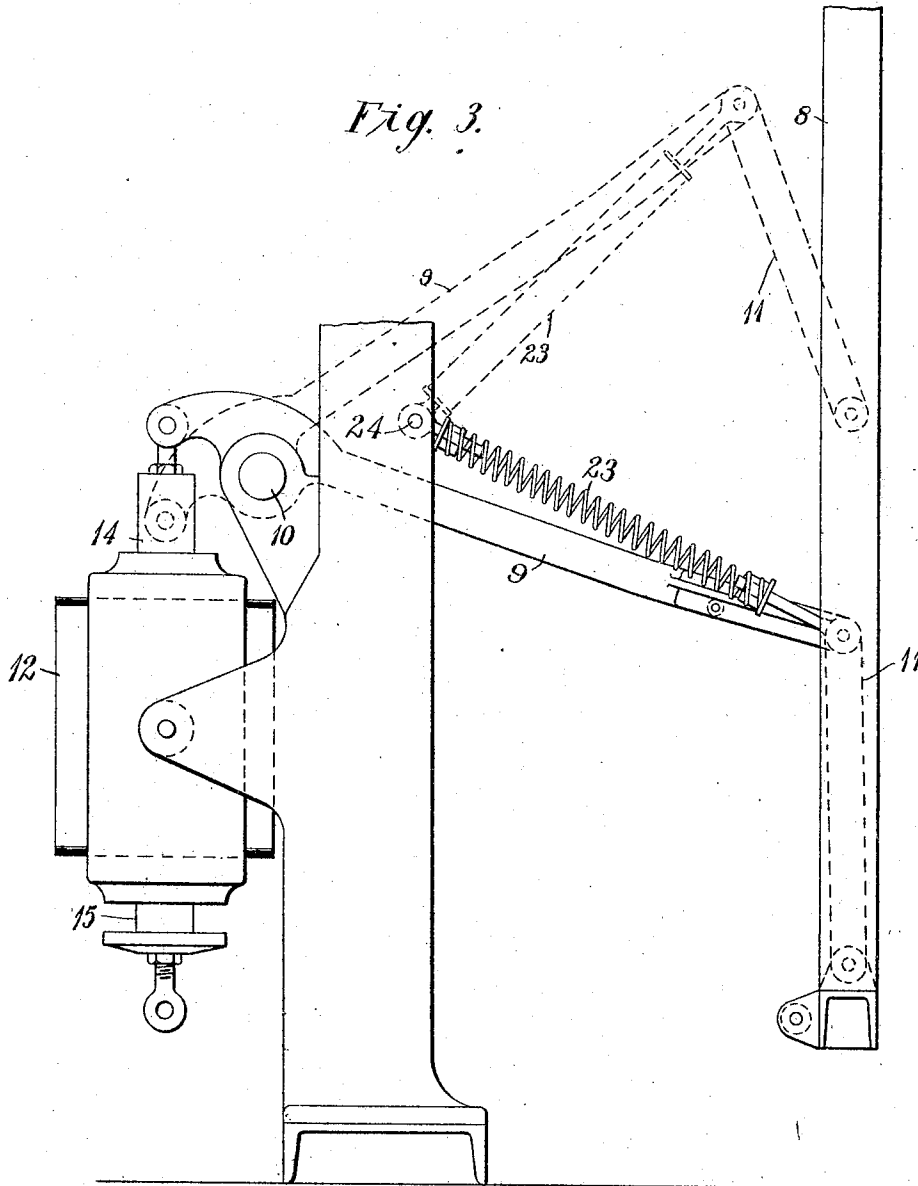
Wesley E. Carr
ATTORNEY

934,482.

Patented Sept. 21, 1909.

3 SHEETS—SHEET 3.

Fig. 3.



WITNESSES:

Fred H. Miller
W. J. Dearborn

Curtis A. Tucker INVENTOR
BY *Wiley S. Law*
ATTORNEY

UNITED STATES PATENT OFFICE.

CURTIS A. TUCKER, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

CIRCUIT-BREAKER.

934,482.

Specification of Letters Patent. Patented Sept. 21, 1909.

Application filed September 3, 1907. Serial No. 391,202.

To all whom it may concern:

Be it known that I, CURTIS A. TUCKER, a citizen of the United States, and a resident of Edgewood Park, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Circuit-Breakers, of which the following is a specification.

My invention relates to electric circuit interrupters and it has for its object to provide a simple and durable device of this character which shall embody electro-responsive operating means requiring a minimum amount of electrical energy.

The movable parts of electrically operated circuit interrupters comprising stationary and movable contact members, are often sufficiently heavy to effect their separation from the stationary parts as soon as they are released. The operating magnets for these circuit interrupters usually comprise stationary and movable core members which are separated by very small air gaps when the interrupters are closed and which are separated by considerable air gaps when the interrupters are open. With an arrangement of this kind, the electro-magnet must obviously be so designed as to have a starting capacity considerably in excess of the average demand upon it, by reason of the inertia of the movable parts which are at rest and the length of the air gap existing between the stationary and movable core members at starting.

According to my present invention, I provide mechanical means for assisting the initial movement of the contact members, other means for holding the contact members in a position of maximum separation, and electro-responsive means which is adapted to release the holding means and to act in conjunction with the mechanical means in effecting the closing of the breaker.

Figure 1, of the accompanying drawings, is an elevation of a circuit interrupter constructed in accordance with my invention and Fig. 2 is a detail view of the operating mechanism embodied in the interrupter shown in Fig. 1. Fig. 3 is a view similar to Fig. 2 but illustrating a slight modification.

Referring to the drawings, the device here illustrated comprises a fluid-containing tank 1, stationary contact members 2 and 3, movable contact members 4 and 5, a bridging contact arm 6 and an operating mechanism 7.

The movable contact members are adapted to cooperate with the stationary contact members and are moved into and out of engagement therewith by operating rods 8 which are connected to the bridging contact member 6 at one end and to the operating mechanism 7 at the other end.

The operating mechanism 7 comprises a lever 9 which is fulcrumed upon a stationary shaft 10, a link 11 which connects one extremity of the lever 9 with the lower end of the rod 8, and an electro-magnet 12. The electro-magnet 12 comprises a winding 13 and a pair of core members 14 and 15, the member 14 being pivotally attached to the free end of the lever 9.

The lower extremity of the rod 8 is provided with a lateral projection 16 which may be engaged by a latch 17 when the stationary and movable contact members are separated to a maximum degree. The latch 17 is rotatably mounted on a stationary shaft 18 and its motion is limited in one direction by an adjustable stop 19. Under normal conditions, the latch is held in engagement with the stop by a spring 20.

The movable core member 15 is adapted to release the latch 17 when the winding 13 is energized, the two parts being connected by a bell-crank lever 21 and a connecting rod 22.

The bell-crank lever 21 is provided with a counter-weight projection 25 which substantially balances the core member 15 and thus facilitates the upward movement of the said member.

A helical tension-spring 23 is connected to a stationary rod or pin 24 at one end and to the outer extremity of the lever 9 at the other, the arrangement of parts being such that the spring is under considerable tension when the circuit interrupter is open. The outer extremity of the operating lever 9 is forked and supports a roller 26 which is engaged by a latch 27 when the breaker is closed. The latch 27 is a part of a bell-crank lever 28 that is fulcrumed upon a stationary shaft 29 and is normally held in one position by a weight 30.

The bell-crank lever 28 is connected by a link 31 to the movable core member 32 of an auxiliary magnet 33 which serves, when energized, to release the latch 27 and thus permit the circuit breaker to open. A switching device 34 is mounted on the stationary parts of the circuit breaker and com-

prises a rocking blade 35, stationary contact members 36 and an operating arm 37 which projects from the blade 35. The arm 37 is operatively connected to the lever 9 by a link 38 and is so arranged that when the circuit breaker is open the switching device occupies one position in which current may be supplied to the magnet winding 13 and when the circuit breaker is closed the circuit of the magnet winding 13 is interrupted.

The operation of the device is as follows: Assuming that the circuit interrupter is closed, the latch 27 being in engagement with the roller 26, as shown in Fig. 1, and the movable and stationary contact members being in engagement with each other; if the auxiliary magnet winding 33 is energized by an over-load or by the action of an attendant, the latch 27 will be withdrawn from the roller 26 and the movable contact members, by reason of their weight, will quickly become separated from the stationary contact members to a maximum degree. Although the spring 23 is relatively strong, the momentum of the moving parts is sufficient to put it under tension, and the latch 17, which is held against the adjustable stop 19 as long as the magnet winding 13 is de-energized, engages the projection 16 on the rod 18 and holds the rod in its lowermost position. When it is desirable to close the circuit interrupter, energy is supplied to the magnet winding 13 and, since the core member 14 is prevented from moving by reason of the latch 17, the core member 15 will be so moved as to decrease the air gap between the members. This movement serves to release the latch 17 and, since the core member 15 has now reached the limit of its movement, the core member 14 will be attracted and will act in conjunction with the spring 23 to move the contact members into engagement with each other.

In Fig. 3, I have shown the rod or pin 24 as so located with reference to the lever 9 that the spring 23 will have the double function of assisting the operating magnet to close the circuit-breaker and of supplementing the action of gravity in separating the contact members. The magnet 13 is de-energized by the change in position of the switch 34 as soon as the breaker is closed; consequently, the injury which might otherwise result from the continual energizing of the magnet windings is avoided and the energy consumed in the breaker operation is reduced to a minimum.

Variations in size and arrangement of parts may be effected within the scope of my invention and I desire that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. In a circuit-breaker, the combination with means for holding the movable mem-

ber of the breaker in open position, and means tending to close it, of an electro-magnet winding and devices successively actuated thereby to withdraw said holding means and to supplement said closing means.

2. In a circuit-breaker, the combination with stationary and movable contact members, a mechanical means tending to effect engagement of said members, and a latch for holding the movable member in a position of maximum separation from the stationary member, of an electro-magnet winding and devices successively actuated thereby to withdraw said latch and to supplement said mechanical means.

3. In a circuit-breaker, the combination with stationary and movable contact members, a resilient means tending to effect engagement of said members, and a latch for holding the movable member in a position of maximum separation from the stationary members, of an electro-magnet and devices successively actuated thereby to withdraw the latch and to supplement the resilient means.

4. In a circuit-breaker, the combination with stationary and movable contact members, a starting spring tending to effect engagement of said members, a latch for holding the movable member in a position of maximum separation from the stationary member, a stop for limiting the movement of the latch in one direction and a resilient means for holding the latch against the stop, of an electro-magnet and devices successively actuated thereby to withdraw the latch and to supplement the action of the starting spring.

5. In a circuit-breaker, the combination with stationary and movable contact members, a starting spring tending to effect the engagement of the members, a latch for holding the movable member in a position of maximum separation from the stationary member, a stop for limiting the movement of the latch in one direction and a spring for holding the latch against the stop, of an electro-magnet having a winding and two movable core members, one of said members being adapted to withdraw the latch and the other member being adapted to supplement the starting spring.

6. A circuit-breaker having a latch for holding its movable member in one of its extreme positions in combination with a magnet comprising a winding and a pair of movable core members one of which serves to withdraw the latch and the other to move said movable member to its other extreme position.

7. In an electrical apparatus, the combination with a movable contact member, and means for normally holding it in one of its extreme positions, of a solenoid and a pair of movable core members one of which is

adapted to release said contact member and the other of which serves to move it to its other extreme position.

5 8. In a circuit interrupter, the combination with stationary and movable contact members, latches for holding the movable member in its respective extreme positions, a spring tending to effect an initial movement of the movable member when it is released from either position, and a tripping magnet for actuating one of the latches, of an operating magnet for actuating the other latch and closing the breaker.

10 9. In a circuit interrupter, the combination with stationary and movable contact members, means for transmitting the movement of the movable member, latches for holding said member in its respective extreme

positions, a starting spring for effecting an initial movement of the member in either direction when the corresponding latch is withdrawn, and a magnet for withdrawing one of the latches, of an electro-magnet having a winding and two movable core members, one of said members being adapted to withdraw the second latch and the other being adapted to supplement the starting spring in closing the breaker. 20 25

In testimony whereof, I have hereunto subscribed my name this 21st day of August, 1907. 30

CURTIS A. TUCKER.

Witnesses:

J. J. ARNSFIELD,
BIRNEY HINES.