

No. 637,474.

Patented Nov. 21, 1899.

D. L. MOORE, JR.
CIRCUIT BREAKER.

(Application filed Mar. 18, 1899.)

(No Model.)

2 Sheets—Sheet 2.

FIG. 5.

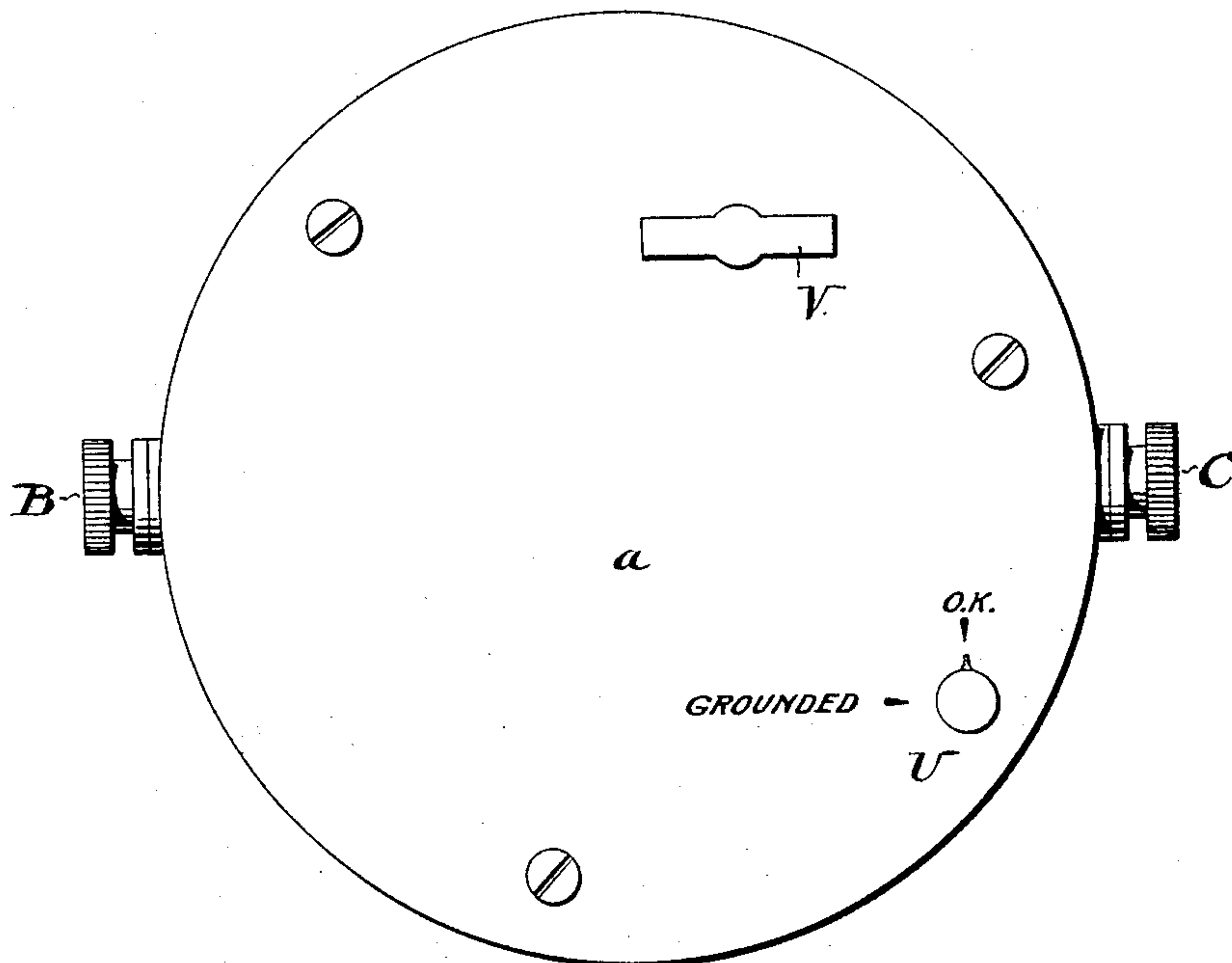
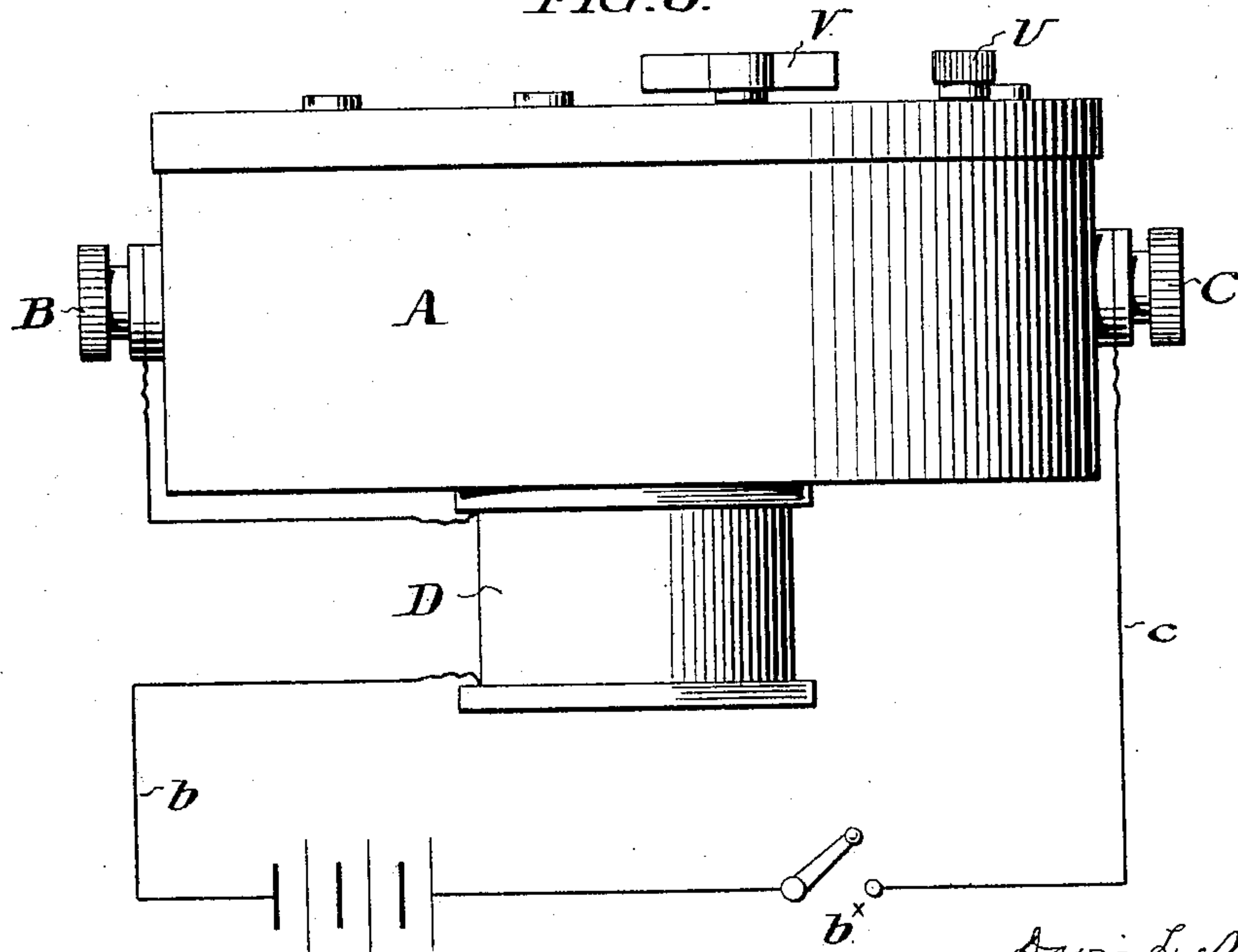


FIG. 6.



WITNESSES:

Arthur E. Paige
Thos. K. Lancaster.

Davis L. Moore, Jr.
INVENTOR:

By his attorneys
Wm. C. Shawbridge
H. Norman Dixon

UNITED STATES PATENT OFFICE.

DAVIS L. MOORE, JR., OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF
TWO-FIFTHS TO JOHN E. GENSEMER, OF SAME PLACE.

CIRCUIT-BREAKER.

SPECIFICATION forming part of Letters Patent No. 637,474, dated November 21, 1899.

Application filed March 18, 1899. Serial No. 709,578. (No model.)

To all whom it may concern:

Be it known that I, DAVIS L. MOORE, JR., a citizen of the United States, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Circuit-Breakers, of which the following is a specification.

My improvements relate to a class of devices known as circuit breakers, ordinarily employed in connection with bell circuits and gas lighting circuits, although applicable in connection with circuits of any character, and designed to automatically break the circuits in connection with which they are used after the latter have remained closed a predetermined period of time.

The importance of devices of this character is due to the fact that during the time the circuit remains closed a very rapid consumption or destruction of the battery force takes place, with the result that the battery becomes so worn in a short time as to be inoperative.

In the normal use of electrically actuated bells, gas lighting appliances, and similar devices, the closing of the circuit for but a few seconds at most, involving but slight demands on the battery, is all that is necessary for their operation, and my invention provides improved means by which when the circuit remains closed by accident or otherwise beyond a predetermined number—for instance thirty—of seconds the circuit will be automatically broken and the battery be protected against excessive consumption.

The principal object of my invention is to provide a device of this character which shall be simple in construction, inexpensive in first cost, and reliable in operation.

In the accompanying drawings I show, and herein I describe, a good form of a convenient embodiment of my invention, the particular subject-matter claimed as novel being hereinafter definitely specified.

In the accompanying drawings,
Figure 1 is a view in top plan of my improved circuit breaking apparatus, the exterior cover plate being supposed removed and the working parts beneath the inner frame plate being shown in dotted lines.

Figure 2 is a view in side elevation of my

improved circuit breaker, the inclosing casing being shown in section.

Figure 3 is a view in side elevation of the tilting stay piece, the cam controlled trip wheel which operates it, and the pivoted follower which it normally holds in position.

Figure 4 is a view in side elevation of the pair of spring jaws which receive the pivoted follower.

Figure 5 is a top plan view, and,

Figure 6 is a view in side elevation, of the apparatus as viewed from the exterior.

Figure 7 is a view in top plan of the rocking spring controlled lever.

Similar letters of reference indicate corresponding parts.

In the accompanying drawings,

A is a cylindrical box like casing of any preferred form and dimensions, provided with a cover plate *a*, a pair of terminals B C, with which the line wires *b*, *c*, make connection, and with a spool D mounted upon its under face, and about which one of the line wires, for instance *b*, is coiled.

E E' are a pair of frame plates of slightly less diameter than the casing, supported in position therein by the posts E^x.

F is a boxing for a coiled wire main spring, not shown, mounted on and rotating with respect to an arbor *f* supported between the frame plates, connected with which spring-boxing is a gear F^x rotating in unison with it.

A pawl *f*^x mounted upon the boxing is controlled by a band spring *f*['] to engage with the ratchet *f*² mounted on said arbor, the arrangement being that usual in the mounting of the main springs of watches and similar mechanisms.

A double gear G, mounted on an arbor *g*, is in mesh as to its smaller member *g*['], with the gear F^x, so as to be driven thereby, while its larger member *g*² is engaged with and drives an escapement train as follows:

H, I, J, are a series of double gears, arranged in the sequence indicated, the last mentioned of which is provided with an escapement pawl K.

Specifically the double gear H has its smaller member *h* in mesh with the gear *g*² and its larger member *h*['] in mesh with the smaller

member i of the gear I,—the larger member i^x of which latter gear is in mesh with the smaller member j of the gear J.

K is a double escapement pawl pivotally mounted in adjacency to and operating upon the teeth of the larger member j^x of the said gear J.

This escapement train may, of course, be altered in its general form and arrangement without departure from the spirit of my invention.

L is a rocking lever mounted on the pivot l , and which under the actuation of a spring L^x connected to it and to one of the posts, is normally in engagement with one of the wheels of the escapement train,—for instance, as shown, the wheel I,—and locks said train against movement.

M is an armature plate of soft iron, or other suitable material, pivotally mounted upon the exterior of the frame plate E' in adjacency to the magnet D, and provided with a tongue m passing through an opening in said frame-plate and engaging in a suitable opening in the rocking lever.

Upon the post N, Figures 1 and 2, are mounted two gears, n' and n^2 respectively, one of which, n^2 , is in constant mesh with the teeth of the member g^2 of the wheel G. The wheel n' hereinafter termed the trip wheel, is loosely mounted upon said post and is provided on its upper surface with a cam surface n^3 , which opposes and is normally in contact with a correspondingly opposite cam face n^4 connected with the wheel n^2 .

A spiral spring N' mounted on said post and engaged in a collar N^2 on said post or other fixed point of support, and also engaged with the wheel n' , normally retains said wheel n' in position with its cam surface against the cam surface of the wheel n^2 .

O is an upright supported upon the frame plate E' and provided with an extending arm O^x upon which as a pivot is mounted a tilting stay piece P the inner end of which normally presents against the under face of the trip wheel n' and the outer end of which normally rests in an open topped recess r formed in the adjacent face of a pivoted follower R.

A spiral spring S mounted on the arm O^x engages as to one end in a recess conveniently formed in a nut or other enlargement on the outer end of said arm,—and as to its other end in an opening in the tilting stay piece, and serves to maintain the same normally in the position described and shown in the drawings.

The pivoted follower R is controlled by a spring R^x secured to the edge or side wall of the casing and bearing against the face of said follower, so as to constantly press it outward or away from said wall.

The outer or free end of the pivoted follower is normally engaged in a pair of spring jaws T mounted on the inner end of the screw C^x which secures the terminal C to the wall

of the casing, as shown particularly in Figure 1.

That part of the shank of the terminal C which passes through the wall of the casing is suitably insulated from the casing wall by a washer of paper or other material, not shown.

The parts as shown in the drawings are in their ordinary or set position. When the circuit is closed at the point b^x , Figure 6, the current passes first through the terminal C and thence to the terminal B, through the metal of the casing and the contained devices, only after passing through the spring jaws T, and the follower R,—owing to the fact hereinbefore set forth that said terminal C is insulated from the wall through which it passes,—with the result that if the connection between said follower and spring jaws be interrupted the circuit within which the device is placed will be broken.

The pivot upon which the follower is mounted turns with said follower, and is provided upon the exterior of the casing with a pointer U which, when the parts are in the position shown in Figure 1, is directed to the symbol "O. K.," and when the circuit is broken in the circuit breaker, is directed to the word "Grounded."

When the circuit is closed at the point b^x , the magnet D becomes energized and attracts the plate M which through its arm m swings the rocking lever L against the stress of its spring L^x out of engagement with the wheel I and into engagement with the trip wheel n' , with the result that under the actuation of the main spring the various gears described begin to rotate.

As the said gears revolve the wheel G occasions the revolution of the wheel n^2 and its cam surface, but the trip wheel n' , which is loose on its arbor, is, as described, held against rotation by the temporary engagement with it of the rocking lever L.

As the rotation of the wheels continues, the cam face of the wheel n^2 operating against the cam surface of the trip wheel n' depresses said last named wheel against the stress of its spring N' , with the result that after a number of seconds, predetermined by the pitch of the cam surfaces and the proportion of the parts, the movement of said trip wheel downwardly along its arbor will tilt the tilting stay piece, elevating the outer end of the latter out of the recess r in the follower R, whereupon the follower will, by the force of its spring R^x , be carried out of engagement with the spring jaws, thus breaking the circuit.

To restore the parts to their working condition after the current has been broken in the circuit breaker, the pointer U must be rotated to the right to carry it back from the word "Grounded" to the symbol "O. K." and this rotation of said pointer will carry the follower back into engagement with the spring jaws.

In the meantime the spring N' has forced the trip wheel up along its arbor, at the same time rotating it, until it reassumes the position shown particularly in Figure 3.

5 The outer end of the tilting stay piece is forced by the spring S back into the recess r.

Of course if the current is broken at b^x , Figure 6, before the predetermined number of seconds for which the circuit breaker is set
10 have elapsed, the parts restore themselves to the respective positions shown in the drawings, and no manipulation is required.

My improved circuit breaker begins to run as soon as the circuit is closed at the line, and
15 unless the circuit is opened again at the line within a predetermined number of seconds, will itself break the circuit as described.

While, therefore, my circuit breaker is set in incipient operation, so to speak, every time
20 the circuit is closed, it is without effect upon the circuit unless the latter remains closed so long as to indicate an abnormal condition at the part b^x whereupon my device breaks the circuit.

25 The key V, Figures 2 and 5, must be rotated periodically to keep the mainspring wound in operative condition.

Having thus described my invention, I claim and desire to secure by Letters Pat-
30 ent—

1. In a circuit breaker, in combination, a motor mechanism controlled by an escapement, means for normally locking said mechanism against movement, a pair of conduct-
35 ing devices, one of which is movable, normally maintained in contact, and mechanism adapted to be operated by the motive mechanism when released for throwing said devices out of contact, and comprising a pair of
40 gear wheels mounted on a common axle, one of which wheels is directly connected by a train of gearing with the motor mechanism and the rotation of which wheel occasions the movement, lengthwise of the axle, of the
45 other member of said pair of gear wheels, substantially as set forth.

2. In a circuit breaker, in combination, a motor mechanism controlled by an escapement, means for normally locking said mechanism against movement, a pair of conduct-
50 ing devices, one of which is movable, normally maintained in contact, mechanism adapted to be operated by the motive mechanism when released for throwing said devices out of contact, and comprising a pair
55 of gear wheels mounted on a common axle, one of which wheels is directly connected by a train of gearing with the motor mechanism and the rotation of which wheel occasions the movement, lengthwise of the axle, of the other
60 member of said pair of gear wheels, and means for occasioning the automatic return of said wheels to their original position after they have been operated without breaking the con-
65 tact of the pair of conducting devices, substantially as set forth.

3. In a circuit breaker, in combination, the

casing, the terminals, the magnet, the motive mechanism, the escapement train, the rock-
70 ing lever, the armature, the connection between said armature and lever, a conducting device connected with one of the terminals, a movable follower adapted to make contact with said conducting device, a tilting stay
75 piece adapted to maintain said follower in contact with said conducting device, an arbor, a trip wheel mounted on said arbor and adapted to travel along the same to throw the tilting stay piece, and means actuated by the
80 motive mechanism for causing said movement of the trip wheel, substantially as set forth.

4. In a circuit breaker, in combination, the casing, the terminals, the magnet, the motive mechanism, the escapement train, the rock-
85 ing lever, the armature, the connection between said armature and lever, a conducting device connected with one of the terminals, a movable follower adapted to make contact with said conducting device, a tilting stay
90 piece adapted to maintain said follower in contact with said conducting device, an arbor, a trip wheel mounted on said arbor, a cam associated in operation with said trip wheel, a gear wheel mounted and secured on said ar-
95 bor, driven by the motive mechanism, and adapted to act against the cam associated with the trip wheel, to cause the movement of the latter along the arbor, substantially as set forth.

5. In a circuit breaker, in combination, the casing, the magnet, the motive mechanism, the escapement train, the arm provided arma-
100 ture, a rocking lever, the spring jaws, the follower, the arbor having two gear wheels one secured to the arbor and the other mov-
105 able, and a cam located between said two wheels, and a device operative between the movable gear wheel and the follower, substantially as set forth.

6. In a circuit breaker, in combination, the casing, the magnet, the motive mechanism, the escapement train, the arm provided arma-
110 ture, a rocking lever, the spring jaws, the spring controlled follower, the spring controlled tilting stay piece, the arbor having the two gear wheels, one of which is capable of movement endwise of the arbor, a separating
115 device located between said two wheels, and a spring connected with said movable gear wheel, substantially as set forth.

7. In a circuit breaker, in combination, the casing, the magnet, the motive mechanism, the escapement train, the arm provided arma-
125 ture, a rocking lever, the spring jaws, the insulated terminal connected with said jaws, the spring controlled follower, the tilting stay piece, the arbor having two gear wheels one capable of longitudinal movement thereon, a cam located between said two wheels, and a
130 spring connected with said tilting stay piece, substantially as set forth.

8. In a circuit breaker, in combination, the casing, the terminals, the magnet, the motive

mechanism, the escapement train, the arm provided armature, a rocking lever, the spring jaws, the spring controlled follower, the spring controlled tilting stay piece, the arbor having the two gear wheels one fixed and the other movable, a cam surface on each of said wheels, and a spring which holds said wheels in contact, substantially as set forth.

9. In combination, the casing, the magnet, the motive mechanism, an escapement train, the arbor having two wheels, one of which is adapted to act as a tripping wheel, provided with co-acting cam surfaces, a rocking lever which alternately locks the escapement train and the tripping gear wheel against rotation, the armature, the arm connecting said armature to said rocking lever, a pair of conducting devices normally in contact, mechanism through which the tripping gear wheel is adapted to throw said conducting devices out of contact, substantially as set forth.

10. In combination, the casing, the magnet, the motive mechanism, an escapement train, the arbor having a tripping gear wheel provided with a cam surface, a second gear wheel on the same arbor, a rocking lever which alternately locks the escapement train and the tripping gear wheel against rotation, the armature, the arm connecting said armature to said rocking lever, a pair of conducting devices normally in contact, a spring which normally maintains the rocking lever in engagement with the escapement train, and a spring which normally maintains the tripping gear wheel against its companion gear wheel and mechanism through which the tripping gear

wheel is adapted to throw said conducting device out of contact, substantially as set forth.

11. In combination, the casing, the magnet, the motive mechanism, an escapement train, the arbor having two wheels one fixed and the other a movable tripping wheel, and provided with co-acting cam surfaces, a rocking lever which alternately locks the escapement train and the tripping gear wheel against rotation, the armature, the arm connecting said armature to said rocking lever, a fixed conducting device consisting of a pair of spring jaws, a movable contact device consisting of a swinging arm embodying a recess, a tilting spring-controlled stay piece one end of which enters said recess and the other of which is in contact with the trip wheel, substantially as set forth.

12. In a circuit breaking device, in combination with a motive mechanism and an escapement train, an arbor provided with a fixed gear wheel and a movable tripping gear wheel, two cam surfaces one connected with each of said wheels, a spring which maintains said wheels in contact, a spring controlled tilting stay piece, a swinging follower embodying a recess, and a pair of spring jaws adapted to receive said follower, substantially as set forth.

In testimony that I claim the foregoing as my invention I have hereunto signed my name this 15th day of March, A. D. 1899.

DAVIS L. MOORE, JR.

In presence of—

EDWARD FELL LUKENS,
F. NORMAN DIXON.