(No Model.)

D. McF. MOORE.

MAGNETIC CIRCUIT BREAKER.

No. 593,230. Patented Nov. 9, 1897.

Fig. 1.

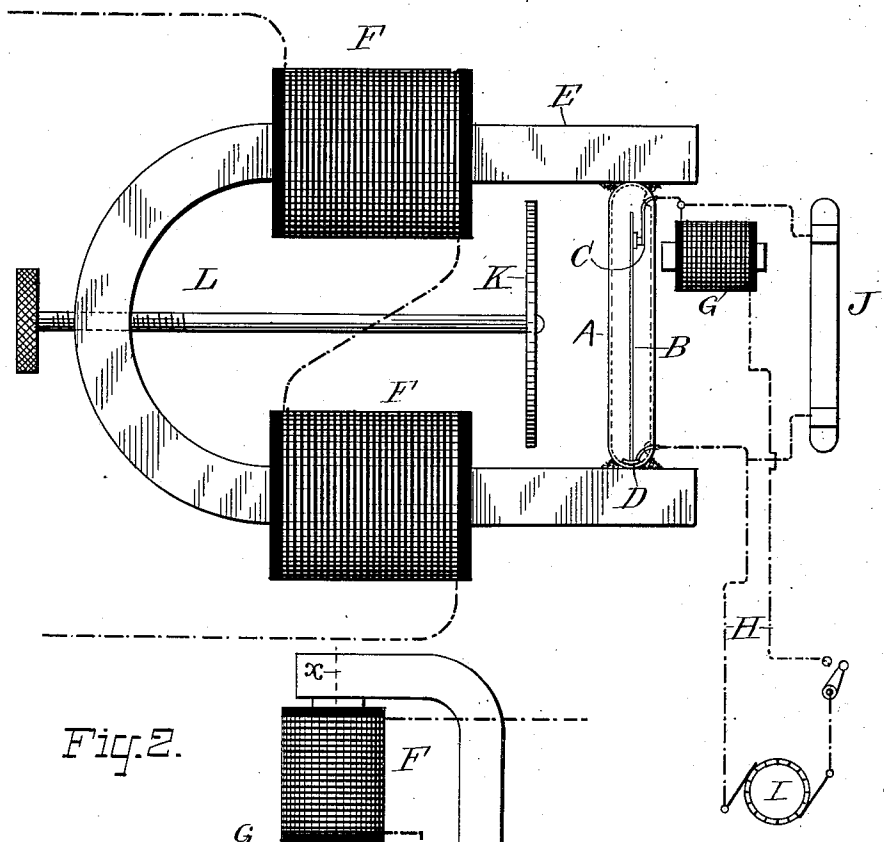
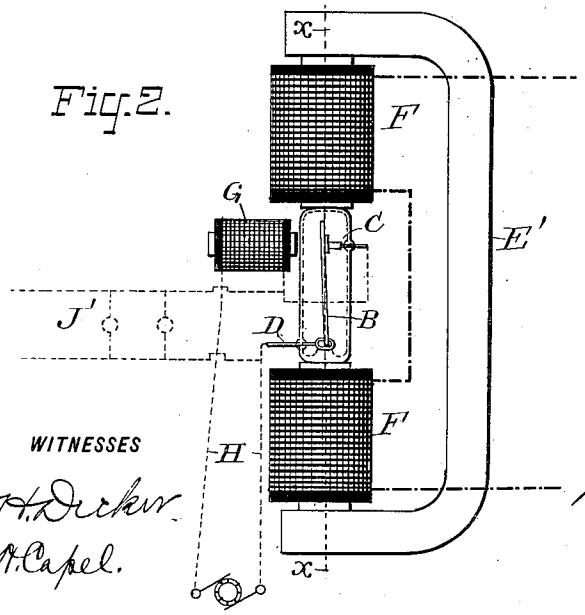


Fig. 2.



WITNESSES

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MAGNETIC-CIRCUIT BREAKER.

SPECIFICATION forming part of Letters Patent No. 593,230, dated November 9, 1897.

Application filed June 24, 1896. Serial No. 596,679. (No model.)

To all whom it may concern:

Be it known that I, DANIEL McFARLAN MOORE, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented a certain new and useful Magnetic-Circuit Breaker, of which the following is a specification.

My invention relates to an improvement in circuit breakers or interrupters, and particularly to those operating in vacuo, as set forth in patents previously granted to me. In such interrupters I have either depended upon a spring to return the contacts to engagement, as in Patent No. 547,127, dated October 15, 1895, or upon a rotary circuit-breaker, also shown in said patent. The former construction has so far proven more satisfactory than the other. The main difficulty met with in its use, however, resides in the change in tension and consequent change in amplitude of vibration in the spring-contact, which is due to the wearing back of the stationary contact-point. This difficulty is increased on account of the impracticability of adjusting said point in receivers of such high vacuum as those in which these interrupters operate. This change in amplitude of vibration not only changes the frequency of the circuit interruptions, and consequently the desired ratios between the several factors of my lighting system, but it impairs the electrical contact between the parts of the interrupter. To overcome these difficulties, I have constructed an interrupter in which the vibrating part or tongue is located in a magnetic field in such position with relation to the lines of force that it is in stable equilibrium or, as may be said, in magnetic equipoise, so that it will immediately return to this position when moved aside by any means whatever. The tongue thus located is of magnetic material and is preferably moved from the normal position by a magnet acting laterally thereon, and which has its circuit controlled in a manner such as to intermittently and rapidly move the tongue from its position of equilibrium, the magnetic field acting to restore it to said position. The tongue may, therefore, be said to be or to have a magnetic spring.

With the above objects and purpose in view my invention consists in a circuit breaker or interrupter, consisting of a tongue-contact normally in stable equilibrium in a magnetic field, and means for automatically moving it from said position to make and break circuit with a coöperating contact.

The invention further consists in a vibrator-tongue freely mounted in an exhausted receiver and located in a position of magnetic equipoise, and magnetic means for intermittently and repeatedly moving it from said position.

The invention further consists in the construction, combination, and arrangement of parts hereinafter fully described, and set forth in the claims.

In the accompanying drawings, which form a part of this specification, Figure 1 represents one way of carrying out the invention. Fig. 2 represents another way in which the same may be carried out.

I have illustrated the invention in connection with my particular system of lighting, although it is obviously adapted to many other purposes in which the contacts of the circuit-breaker may or may not be inclosed in an exhausted receiver.

In the drawings, A indicates an exhausted receiver, which may be made from glass or any other material which will sustain a high vacuum.

B represents the vibrating part or tongue of the circuit breaker or interrupter which constitutes or carries the movable contact.

C indicates the fixed contact. The points of engagement between the tongue and the fixed contact are generally faced or provided with platinum, iridium, or some similar enduring material.

The tongue B consists of some magnetic material and is secured or suitably mounted at one end to or upon a piece of conducting material, to which one end of the circuit through the interrupter may be connected, the other end being connected to the end of the strip carrying contact C, which strip protrudes through the wall of the receiver.

The manner of supporting the tongue upon the contact-strip D may be greatly varied, and in Fig. 1 said tongue is shown simply as balanced upon said strip, while in Fig. 2 it is

shown as connected to an eye formed in the end of the strip D.

The circuit-breaker thus formed is located in a magnetic field in such position that the tongue shall rest in magnetic equipoise or maintain in said field a position of stable equilibrium.

In Fig. 1 the interrupter is shown as secured between the lateral faces of the poles of the horseshoe-magnet E, as by placing cement or any other suitable securing means between its ends and the magnet. It may also be adjustably secured in place by any suitable non-magnetic material.

In Fig. 2 the receiver is located between the ends of the horseshoe-magnet E'. These magnets may be simple electromagnets energized by means of coils F, or they may be permanent magnets and the coils F used to intensify them and keep them at saturation.

To interrupt the engagement betweeen contacts B and C any suitable means may be employed, particularly when said contacts are supported in the open air, but when they are supported within an exhausted receiver, as illustrated, the best means for moving the tongue B is an electromagnet, as indicated at G. This may be so located as either to repel or attract the tongue B.

In Fig. 1 magnet G is intended when energized to repel the tongue B and break the circuit between it and the contacts C, said tongue returning to contact C by virtue of its magnetic equipoise as soon as G is demagnetized. By locating magnet G in the circuit H through the vibrator, which circuit may be supplied with current from any suitable source, as indicated at I, it will be demagnetized immediately upon the tongue being repelled thereby, and again magnetized upon the return of the tongue to equilibrium.

In the form just described the tongue is so located as normally to engage the contact C and is, as stated, repelled by the magnet G when the latter is energized. Obviously the magnet G may be so located as to attract the tongue B instead of repelling it. Such an arrangement is illustrated in Fig. 2. Also, to insure a better contact between the tongue and the contact C the upper end of the tongue may be pressed slightly out of equilibrium, as indicated in Fig. 2, where the dotted line *x x* indicates the line of magnetic equilibrium.

In carrying out the application of this circuit-breaker to my lighting system I have indicated at J J' the connection of tubes or lamps to the circuit. In some cases it may be advisable to regulate the field of force in which the tongue is located, and for this purpose I provide the plate K, mounted adjustably upon the screw-threaded rod L, which passes through or is suitably mounted upon the magnet E, so that the plate K may be moved to or from the interrupter.

Other arrangements of the magnet G than those shown, and also other forms of the tongue B and its coöperating contact, also other forms of the receiver A, may be made and used without departing from my invention, the gist of which resides in utilizing the magnetic equipoise of a plate or bar of magnetic material as the movable element of a circuit-breaker, and thereby overcoming the disadvantages above set forth resulting from the use of a spring for returning said tongue to contact position. The tendency to hold the tongue in magnetic equilibrium and to return it when displaced gives it the same effect as though it were moved by a spring outside the magnetic field. Therefore the tongue when in magnetic equipoise may be considered a magnetic spring, and the simplest means for moving it from the position of stable equilibrium is the additional magnet, as illustrated and described.

What I claim as my invention is—

1. A circuit-breaker having a tongue or vibrating part in magnetic equipoise, and means for intermittently moving it from equipoise for the purpose set forth.

2. A circuit-breaker consisting of a fixed contact, the latter being normally in stable equilibrium in a magnetic field, and means for intermittently moving it from said field for the purpose set forth.

3. A circuit-breaker consisting of a vibrating tongue engaging with a fixed contact and both inclosed in an exhausted receiver, the tongue being located in stable equilibrium in a magnetic field, and means for intermittently moving the tongue out of equilibrium, as and for the purpose specified.

4. In a circuit-breaker, the combination with a magnet, of a vibrating tongue placed in equipoise in the field of said magnet, an exhausted receiver inclosing said tongue and its coöperating contact, and means for magnetically moving said tongue from the position of equipoise for the purpose set forth.

5. The combination with a magnet, of a vibrating circuit-interrupter *in vacuo* so located that the vibrating tongue is normally in stable equilibrium in the field of the magnet, and a magnet for disturbing this equilibrium, substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 22d day of June, A. D. 1896.

DANIEL McFARLAN MOORE.

Witnesses:
WM. H. CAPEL,
D. H. DECKER.