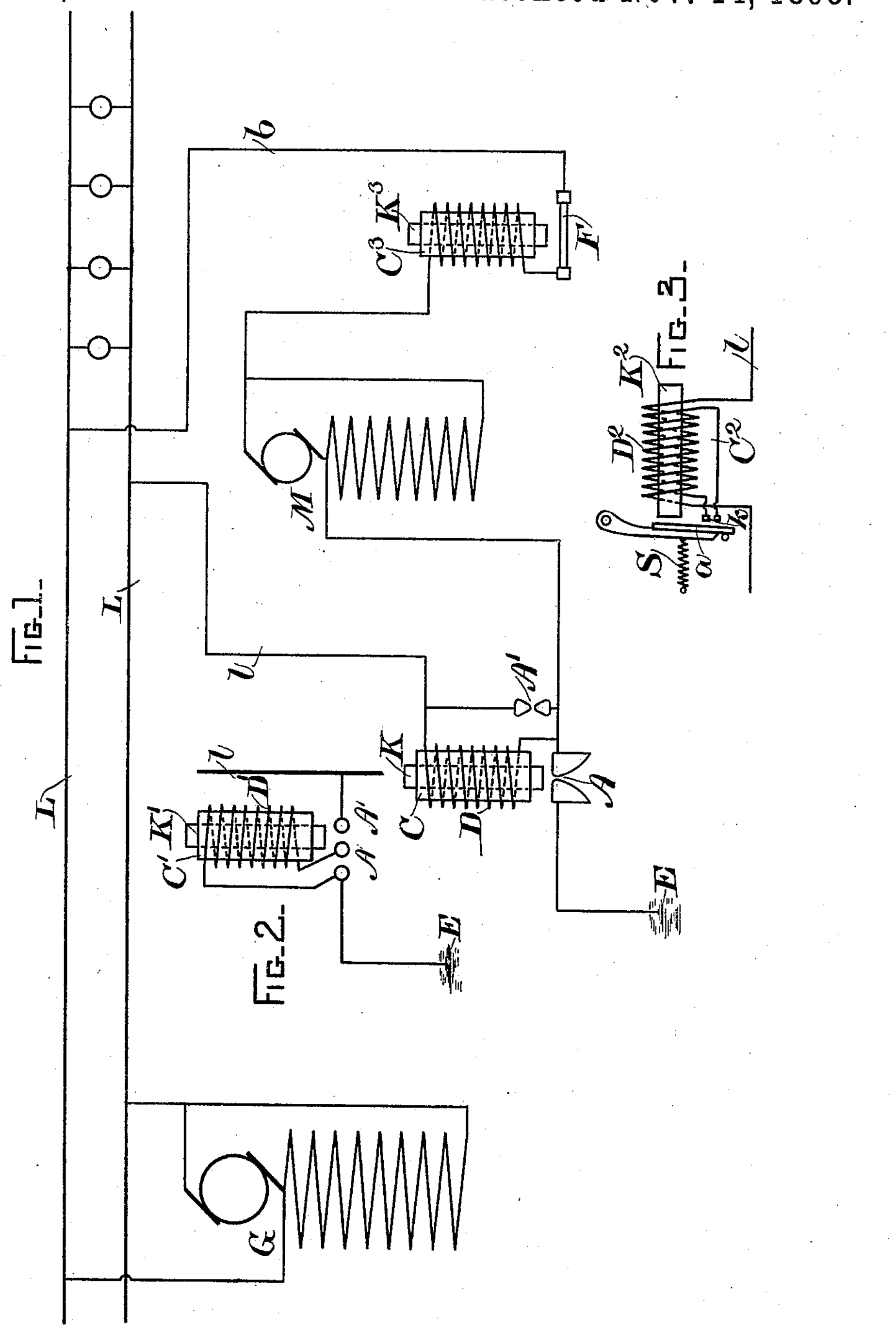
(No Model.)

W. B. POTTER.

ELECTRIC ARC DISRUPTER.

No. 508,632. Patented Nov. 14, 1893.



WITNESSES.

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ELECTRIC-ARC DISRUPTER.

SPECIFICATION forming part of Letters Patent No. 508,632, dated November 14, 1893.

Application filed July 13, 1893. Serial No. 480,410. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. POTTER, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented a certain new and useful Improvement in Electric-Arc Disrupters, of which the following is a specification.

The invention has for its object to increase the effectiveness of such apparatus wherein a blow-out magnet is used upon the principles set out in certain patents granted to Elihu Thomson, particularly No. 283,167, dated August 14, 1883, and No. 401,608, dated April 16, 1889, where a magnetic field is employed to blow out the arc at lighting arrester terminals, between fuse terminals when the fuse blows, at switch or circuit breaker terminals, &c. To this end I apply to the core of a magnet a closed circuit conductor, either permanently closed or closed in accordance with the magnetization, whereby a drop in the field strength of the magnet is prevented and the breaking of the arc is accelerated.

The accompanying drawings show diagrammatic views of means of applying my invention, Figure 1 being a view of a lightning arrester protecting a motor to which my invention is applied and an electro-magnet operating to blow out the arc between the fuse terminals, while Figs. 2 and 3 show modifications.

M is an electric motor connected in a circuit from a generator G so as to be driven thereby. To protect the system from injury by lightning discharges or static discharges from the line, it is customary to bring the circuit near an earth connection so as to form an air gap, or spark gap, as at A, over which currents of high potential can leap to reach earth, and to place this gap so that it will be within the field of a magnet D, which displaces the arc formed by the passage of the dynamo currents following the discharge across the gap. The static discharge from the line L passes by the conductor *l* across the gap A′, and then the gap A to reach earth at E. The dynamo current now follows this path, but the arc at A′ is at once interrupted because the current leaves this circuit to go through the coils of the magnet D, which circuit is of less resistance than that through the gap A′; the magnet D blows out the arc at A, and the current follows its original circuit. The gap A′ is provided to avoid the self-induction of the magnet D to a static discharge, as it is well known that comparatively few turns of wire offer considerable resistance by induction to static discharges. Upon the occurrence of a discharge, the current is diverted from the magnet D and through the gap A′; the magnet then loses strength, and is therefore not so effectual in expelling the arc. By my invention this difficulty is overcome by placing upon the core K of the magnet D a closed copper band C, or closed circuit conductor consisting of a number of turns of wire. This closed conductor has a double function; first, it acts to largely reduce the opposition, by self-induction, of the coils of the magnet D to the passage of a static discharge, in accordance with well known principles, so that in some cases the spark gap A′ might be dispensed with; second, it also acts to sustain the magnetism of the core K when the current is diverted from the coils of the magnet across the spark gap A′, so that the arc at A is more quickly expelled and broken.

Fig. 2 shows a modified form of my invention in which two arc gaps are placed in series and the winding of the magnet is in shunt to one of the end electrodes and the middle electrode. In this case the magnet D′ is normally not energized and only becomes energized upon the existence of an arc across the spark gaps, when current is diverted through the coils of the magnet in the same way as from the gap A′ in Fig. 1. The closed conductor C′ upon the core K′ of the magnet acts, as before, to maintain the magnetization of the core when it has become energized; but it also delays the magnetization of the core somewhat at the start, and is therefore not so good an arrangement as that shown in the preceding figure, although there is still some advantage obtained by its use. The auxiliary conductor upon the magnet core may, however, be so arranged that it will form a closed circuit only when the magnet is in its energized condition, so that there is

no opposition to magnetization, but the opposition to the magnetization will still exist. This I accomplish by controlling the circuit of the auxiliary conductor by an armature *a*, Fig. 3, placed near the core of the magnet D^2, which closes the contacts *k* and makes the conductor C^2 a closed circuited conductor, so that when the magnet has once been energized it loses its charge slowly. In the unattracted position of the armature *a*, in which it is held by the spring S, the circuit C^2 is open and has then no effect in delaying the magnetization of the core K^2. Such a magnet is adapted for use in cases where it is normally unenergized and must become energized on the formation of an arc; and it is constructed, as stated, to prevent rapid demagnetization, but is capable of being magnetized quickly, there being no retarding effect during its charging.

The application of the invention to a magnet used to blow out an arc formed when a fuse melts is shown on the right in Fig. 1. K^3 is the iron core and C^3 the closed band of conducting material, preferably of copper, placed thereon; it may be a solid copper shield or may be composed of a number of turns of copper wire. The circuit from the motor M passes through the coils wound upon the core K^3 and then through the fuse F, returning to the line through the conductor *b*. The object of the fuse is to protect the motor from the effects of heavy currents, and the office of the magnet is to blow out the arc formed when the fuse melts, as shown in the patents to Elihu Thomson named above. Here the magnetism of the core K^3 will begin to fall off the moment the fuse melts, and as the arc resistance increases with its length, the magnet becomes weaker and less effective in disrupting the arc. This difficulty is overcome by my invention by placing the copper shield or closed conductor C^3 upon the core K^3, as shown. The rapid demagnetization of the core K^3 is prevented, as the collapsing magnetic lines set up currents in the conductor C^3 which tend to maintain the original magnetization.

Although the current flowing through the coils of the magnet may be very much diminished when the fuse melts, the magnetic field does not fall off correspondingly, but is maintained for a time at or near its maximum strength, thus disrupting the arc more rapidly than a magnet not constructed according to my invention can do.

Having thus described my invention, what I claim as new, and wish to protect by Letters Patent of the United States, is—

1. The combination with terminals at which an arc may be formed, of a blow-out magnet provided with a closed conductor surrounding its core.

2. The combination with terminals at which an arc may be formed, of a blow-out magnet comprising a core, a closed conductor surrounding such core and an energizing coil surrounding the closed conductor.

3. The combination with terminals at which an arc may be formed, of a blow out magnet comprising a core and a conductor surrounding such core adapted to be closed circuited when the core is energized.

4. In combination with terminals at which an arc may be formed, a blow-out magnet comprising a core as K, a closed circuited conductor as C, and an energizing coil, substantially as described.

5. In combination, a plurality of spark-gaps in series, a blow-out magnet comprising a core, a closed circuited conductor surrounding such core, and an energizing coil surrounding the closed-circuited conductor and in shunt to one of the spark gaps.

Signed at Lynn, Massachusetts, July 10, 1893.

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Witnesses:
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