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T. J. MURPHY.

ELECTRICAL INTERRUPTER.

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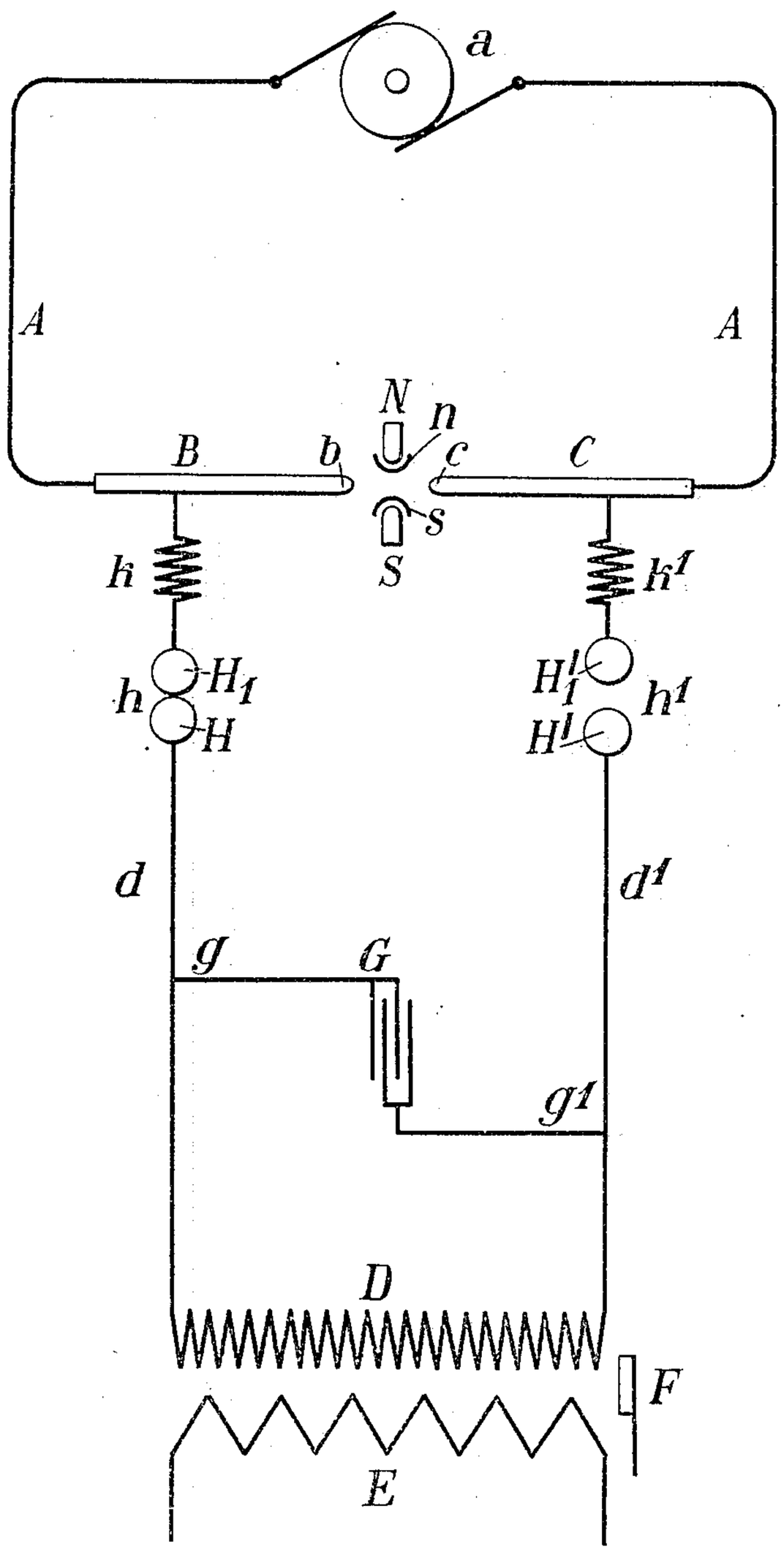

Witnesses:

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UNITED STATES PATENT OFFICE.

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ELECTRICAL INTERRUPTER.

SPECIFICATION forming part of Letters Patent No. 787,990, dated April 25, 1905.

Application filed September 14, 1903. Serial No. 173,213.

To all whom it may concern:

Be it known that I, THOMAS J. MURPHY, electrical engineer, a subject of the King of Great Britain, residing in New York, State of New York, have invented certain new and useful Improvements in Electrical Interrupters, of which the following is a specification.

It is well known that the successive and repeated interruptions and completions of circuits traversed by an electric current are very difficult to operate even when the intensity of the current is very low and that the operation becomes practically impossible with existing means as soon as the intensity of the current attains a moderate degree, more especially if the interruptions and completions of the circuit are numerous and at frequent intervals.

The object of the present invention is to provide a means for affecting these successive and frequent interruptions even in the case of powerful currents at comparatively high voltages.

The invention is based on the following observation: Given a circuit A, (see accompanying drawing,) in which is inserted a source *a* of electric currents and having a gap of the proper dimensions from *b* to *c* the current generated by *a* will not pass between *b* and *c;* but if an electric spark be caused by any means to leap from *b* to *c* the current generated by *a* will also traverse the gap *b c*. The spark forms, so to speak, a "conducting-bridge" between *b* and *c* so long as it lasts. The current will pass when it ceases. The circuit is interrupted, provided always that when the spark has started the passage there is in the gap *b c* sufficient resistance to prevent a continuous flow afterward. Thus every time a spark is made to leap from *b* to *c* the current will pass, but will suffer interruption in the interval between two successive sparks. Hence by this means it is possible to create any desired number of interruptions in the circuit A *b c* whatever the intensity of the current and that, too, for a great variety of applications.

To prevent the current continuing to flow from *b* to *c* for an indefinite period once the spark has bridged the passage, a magnet N S is mounted in such a manner that the strong magnetic field thus created reacts upon the said current, thereby interrupting or causing its cessation. This magnet may of course be replaced by any other equivalent device offering resistance to the passage of the current, such as a jet of air, a jet of carbon dioxid, or other suitable gas, an oil-bath, &c.

To prevent the deviation of the sparks launched between *b* and *c* toward the poles N and S of the magnet, these latter may be protected by plates of mica or some other dielectric *n s*.

The points *b* and *c* are the ends of two conductors B and C, preferably of carbons, which can be adjusted so as to vary the gap *b c*. Means may also be provided whereby the distance between electrodes *b c* is maintained constant—as, for example, by an arc-lamp mechanism or other known means.

The carbons B and C may be covered with a metallic sheath to insure good conductivity and in addition be protected by a sheathing of some highly-refractory insulating material. They may be likewise entirely inclosed in a vessel or the like where an insufficiency of air or partial vacuum obtains.

The method of producing the sparks between *b* and *c* is as follows: The conductors B and C are connected to the secondary circuit D of an induction-coil that may be grounded by a suitable conductor, the primary E of which receives current from any convenient source. The interruptions of the current may be regulated by a trembler F. The induction-coil herein mentioned may be replaced in some cases by an alternate-current transformer or frictional machine.

A suitable condenser G is intercalated in a bridge *g g* of the secondary circuit D. The wires *d d* from the secondary to the conductors are broken between *g* B and *g* C, respectively—for example, at *h* and *h'* by means of pairs of terminal balls or points H H and H' H'—the intervals between which can be adjusted at will. In some cases it may be of advantage to replace the gaps H H H' H' by a suitable condenser.

The wires *d d'* may be coiled, as at *k k'*, in a form varying according to circumstances. Coils *k k'* on circuit *d d'* may in some cases be dispensed with entirely.

The device operates in the following manner: Assuming that a current passes in the primary E of the induction-coil and that the trembler F is in vibration, assuming also that the balls or points H H H′ H′ or one pair at least are separated in order not to have a close circuit between *d* and *d′* by way of the main conductor A, so that the potential in the secondary D may attain a maximum, sparks will then pass through the gap *b c* without any inconvenience being caused by the presence of the main conductor A since the reactance of the section A to the discharges of the condenser G will be so great that the difference of potential between the two conductors *d d′* will always equalize by way of *b c*. If then the generator *a* sends a current into the circuit A, this current will traverse the gap *b c* along with the sparks and there will be as many interruptions of the main current as there are oscillations in the secondary D of the coil. The condenser G serves to intensify and its action is so well known as to render further explanations unnecessary.

Although the condenser is extremely useful its presence is not entirely indispensable in certain cases, as the capacity of the coil and parts of the apparatus is sometimes found to be sufficient.

If, contrary to what is indicated in the drawing, the secondary wires from *h* to B and from *h′* to C were straight, the arrangement of the sparking between *b* and *c* would be solely determinated by the characteristics of the induction-coil and condenser; but when these wires are coiled, as at K K′ in the drawing, the oscillations of current in the secondary may be prolonged by the presence of these coils, the effect of which is well known.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

1. The means of obtaining rapid interruptions of electric currents; comprising a gap in a circuit of relatively low self-induction; a circuit containing a condenser, means whereby the disruptive discharge of said condenser renders said gap conductive for the passage of currents in the circuit of relatively low self-induction, means for disrupting the currents established between said electrodes, and further means for preventing currents from the circuit of relatively low self-induction from interfering with the functions of said condenser-circuit, as shown and described.

2. In an electric interrupter the combination of a gap in a circuit having a low coefficient of self-induction, a condenser arranged to be discharged across said gap, an induction-coil to renew the charge of said condenser, and a magnetic field arranged to react upon electric current in the gap, substantially as set forth.

3. In an interrupter of electric currents, the combination of a spark-gap in a circuit of small self-induction to be interrupted and restored; a condenser arranged to be discharged across said gap to render it conductive together with means of renewing charge of said condenser, and further means of rupturing principal current flowing through the gap, as set forth.

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Witnesses:
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