(No Model.) 2 Sheets—Sheet 1.

D. McF. MOORE.

APPARATUS FOR PRODUCING LUMINOUS OR SIMILAR EFFECTS.

No. 604,686. Patented May 24, 1898.

Fig. 1.

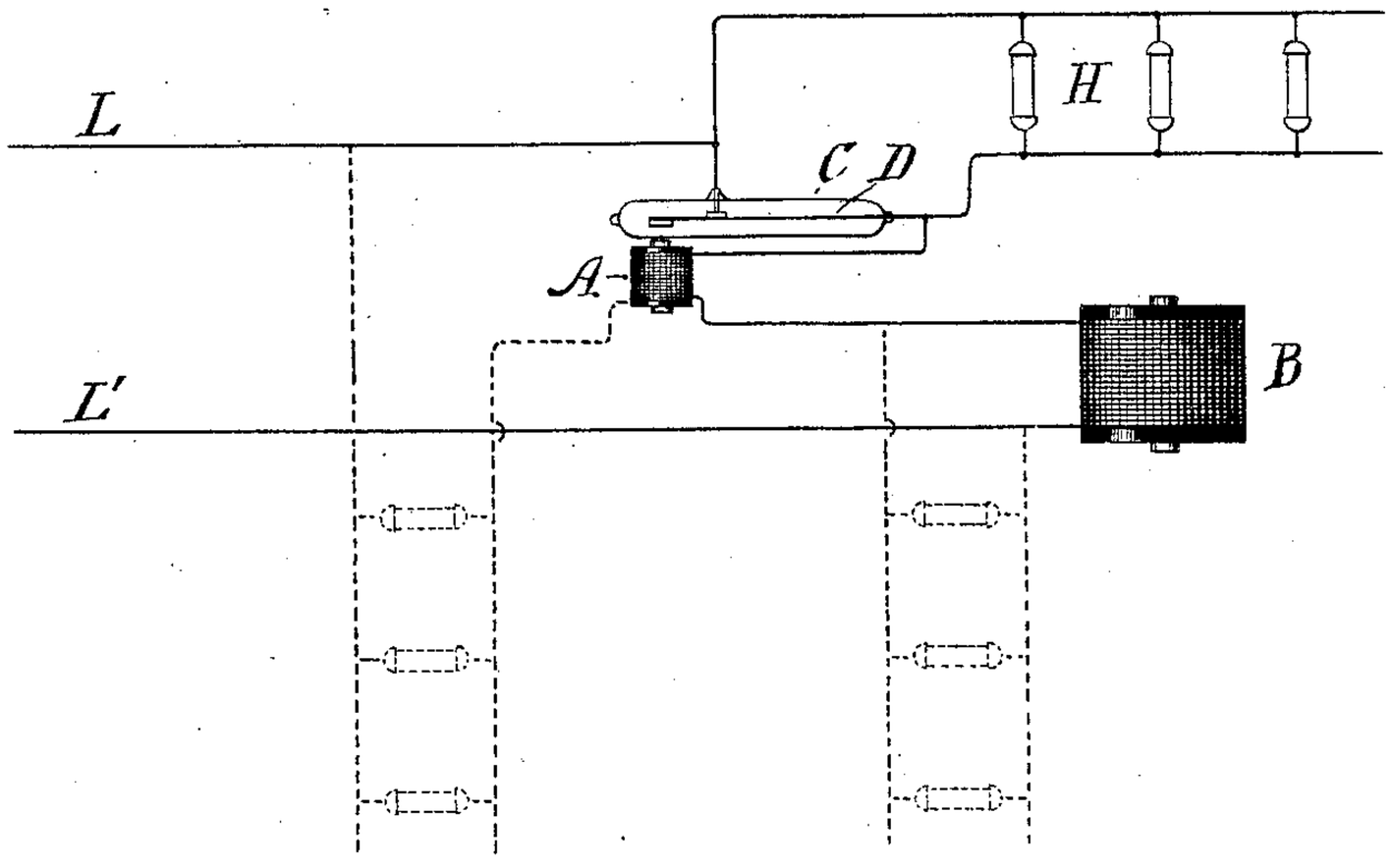
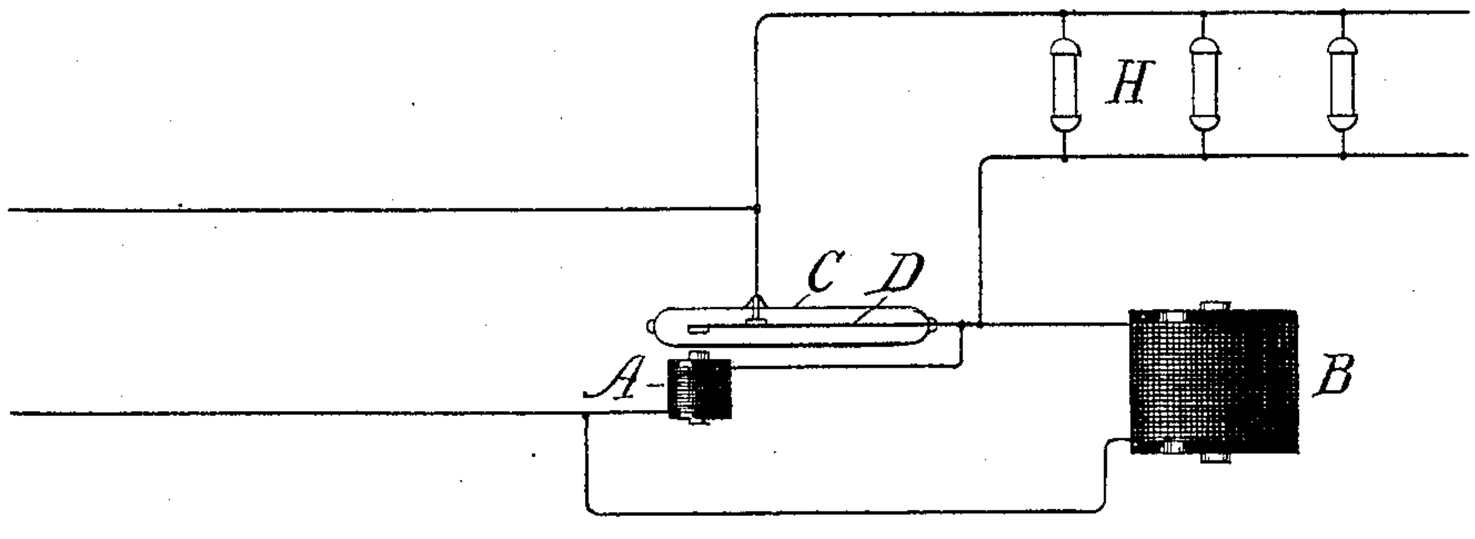


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

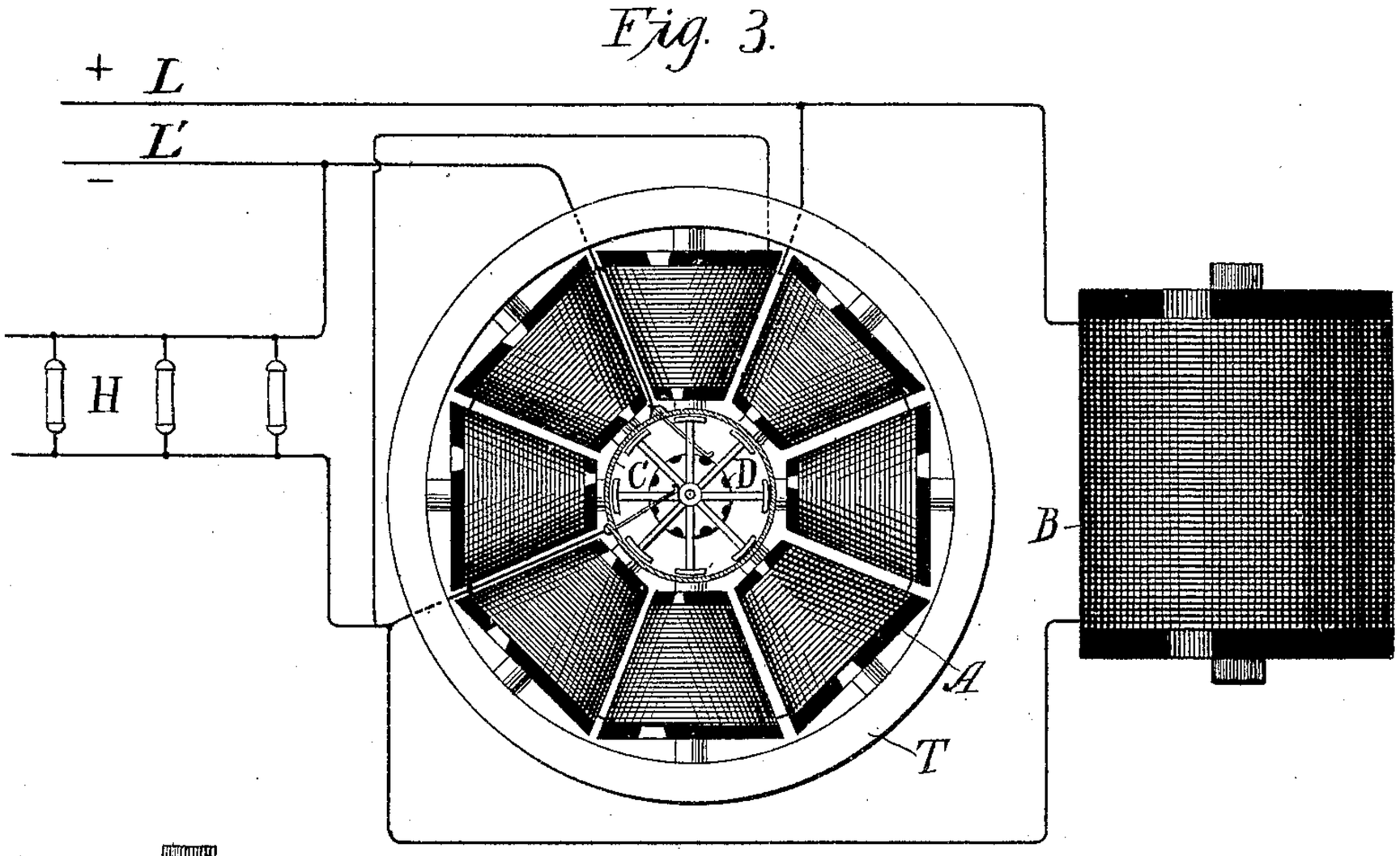
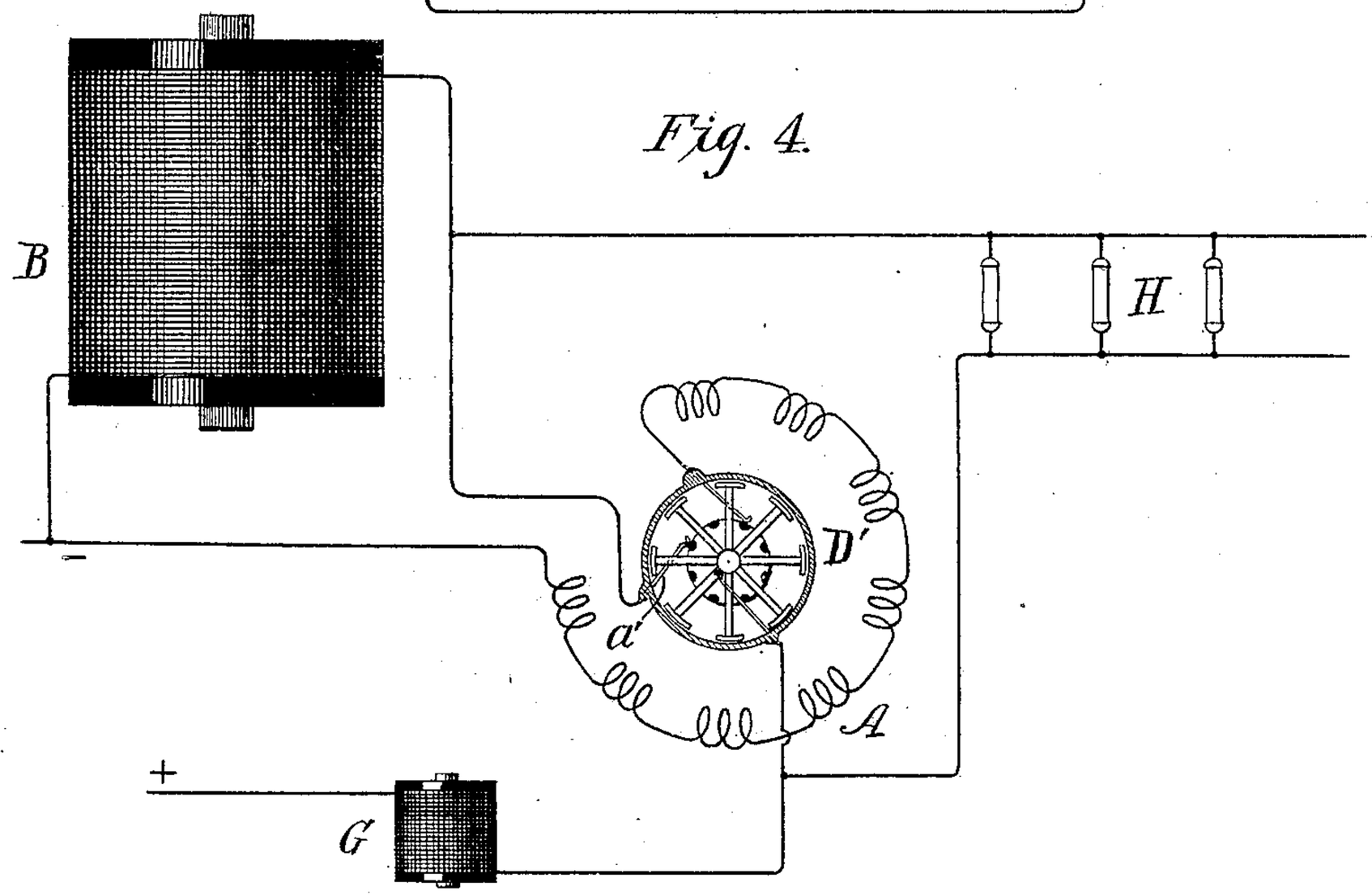


Fig. 4.



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UNITED STATES PATENT OFFICE.

DANIEL McFARLAN MOORE, OF NEWARK, NEW JERSEY.

APPARATUS FOR PRODUCING LUMINOUS OR SIMILAR EFFECTS.

SPECIFICATION forming part of Letters Patent No. 604,686, dated May 24, 1898.

Application filed July 3, 1897. Serial No. 643,338. (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 Apparatus for Producing Luminous or Similar Effects, of which the following is a specification.

My invention relates to apparatus for producing luminous or similar effects, such as Roentgen rays, from exhausted receivers or other devices operated by the electric vibrations or disturbances generated through rapidly-repeated interruptions of a circuit of induction. By "circuit of induction" I mean any circuit in which electric current flows and which is adapted by its self-induction or by its induction upon a parallel circuit at the moment of interruption to generate an electromotive force or electric potential or energy suited to the production of the luminous or similar effects.

For simplicity I shall illustrate my invention as carried out with a circuit of self-induction to which the lamps or other devices are connected conductively or inductively, as well understood in the art. I herein show them as directly or conductively connected.

My invention relates mainly to those systems in which the circuit-interrupting device is worked in a vacuum, as heretofore patented to me, and the interrupter is maintained in operation by a magnet or magnets whose power is made to rapidly vary for the purpose of operating the interrupter by means of a circuit-breaker in the vacuum. Prior to my present invention it was the practice to use the operating-magnet of the interrupter as the self-induction coil furnishing self-induction for the circuit to be interrupted. With the vibrating type of interrupter difficulty frequently arises when this arrangement is employed owing to the fact that the type of magnet or coil best suited for the self-induction action is not well suited for automatically operating the armatures of the interrupter at a rapid rate. Sometimes, for instance, it will happen that the discharge from the self-induction coil will cause a prolonged arc across the contacts in the vacuum and the armature will remain attracted. This would be especially the case if the attempt be made to increase the size of the magnet so as to produce therefrom a larger self-induction discharge. The same difficulty is met with in a different form in the rotary forms of interrupters, and owing to the fact that the operating-magnets would not lose their power at the proper time when the interrupter spring or contact reached the break-point. If the attempt were made to obviate the difficulty by modifying the size of the operating-magnet, its action as a self-inductive coil is necessarily interfered with. To obviate these and other objections arising from the attempt to use the same magnet as the operating and the self-inductive magnet and to obtain a more certain, economical, and steady action of the apparatus is the object of my present invention, which consists, substantially, in operating the automatic interrupter by a magnet or magnets properly constructed or adjusted with sole reference to the production of the desired mechanical and rapidly-repeated actions under the varying influence of a current modified at the interrupter-contacts in the inclosed space or vacuum and obtaining the desired or required self-induction from a separate coil or magnet, one or more, in the circuit of said interrupter specially constructed as a self-inductive coil and adapted to supply energy to the mains, to which the vacuum-tube or other light-giving or similar devices are connected, preferably, in multiple.

In the following description the first-named magnets will be called the "operating" and the last-named the "inductive" magnets or coils.

In carrying out my invention the two kinds of magnets may be connected in series with one another through the contacts of the interrupter, or preferably they are connected in multiple. By the latter connection the current adapted to the proper operation of each may be better adjusted. The magnets may be both in the circuit of the same interrupter-contacts; but it is preferable to use separate contacts, and thereby permit the discharges of the self-inductive magnets to take place over interrupter-contacts without interfering with the action of the interrupter for the circuit of the operating magnet or magnets.

In the accompanying drawings, Figure 1 is

a general diagram of apparatus embodying my invention. Fig. 2 illustrates a modification in the connection of the operating and inductive magnets or coils as used with a vibrating interrupter. Fig. 3 shows my invention as applied to a form of rotary interrupter. Fig. 4 is a modification of the connections applicable either to a vibratory or rotary interrupter, but illustrated as applied to the rotary form.

Referring to Fig. 1, C is the exhausted receiver, made of glass and containing the contacts of the vibratory interrupter D, which is operated by means of a magnet A, whose pole is presented to the armature carried by the vibrating interrupter. The operating-magnet A is of small size and constructed specially with reference to the rapid response to interruptions of its circuit produced at the interrupter-contacts in whose circuit said coil is placed, as well understood in the art. Adjustments of said magnet to change the reaction between its pole and the armature may be made at will to obtain the best vibratory action.

L L′ are the mains over which electric energy is supplied to the interrupter-contacts within the tube C and to an inductive coil or magnet B, the discharges of which, produced by the interruptions of circuit within C, are conveyed directly or indirectly by suitable connections to the lamps or other devices H. These lamps are here shown as of the ordinary form heretofore employed by me—that is to say, as sealed tubes of glass exhausted to the proper degree and furnished with metal caps connecting to the supply-circuit. This supply-circuit may be connected in shunt or branch to the coil of induction B in any of the ways indicated, and said discharges may be conveyed directly without the intervention of any induction coil to said lamps or other devices H. The coil B is constructed solely with reference to its self-inductive capacity, as manifested by the discharges which take place from it through interruptions in the flow of the electric energy supplied from line L L′ and passing through said coil.

In the arrangement illustrated in Fig. 1 the current flowing in coil A flows also in coil B; but it is preferable to arrange them in the manner indicated in Fig. 2, wherein they are shown in shunt relation to one another. Each is by this arrangement rendered more fully independent of the other, and the current adapted for the best operation of each may be adjusted thereto without interference from the other. In both arrangements, however, it will be seen that the coil A may be constructed and operated with reference to its action as the operating-magnet of the interrupter and the coil B, constructed and operated as the source of energy for supplying the lamps or other devices H. Coil A may be made of a size sufficient only to provide the mechanical power necessary for the interrupter, and the coil B may be made of any desired dimensions and of any size of wire or core and of any desired shape best adapted to the function which it is to perform as the source of energy for operating the lamps H.

In the rotary interrupter illustrated in Fig. 3 the mechanical operation of the device is produced by the action of a series of magnets A, assembled in the circumference of a circle around the cylindrical tube C and with their poles in close proximity to the wall of the tube. The armatures of said magnets are mounted or secured to the shaft which carries the interrupter-wheel D′, divided at its periphery into conducting and non-conducting spaces selected or arranged in such manner that when the armatures come to the dead-points opposite the poles of the magnets the circuits will be interrupted and by momentum the wheel will be carried around to position where the armatures will be attracted each by the next magnet in the series and the operation repeated to secure a rapid rotation. The starting of the device, if it should be upon a dead-point when at rest, may be secured by rotating or shifting the series of magnets A circumferentially around the tube, or by other means.

The magnets A are preferably constructed with fine wire and with comparatively small cores to produce a concentration of the magnetism upon the armatures, and in order to get the strongest magnetic effects the whole circumferential space is filled in with magnetizing-wire, giving the coils a conical shape, as shown.

The inductive coil B is constructed, as before, with reference to the production of the best effects by its discharge at interruption of the circuit and is wound with large wire symmetrically disposed upon the core, which is also large. The coil B is in a shunt to the interrupter-magnets A, as shown; but the energy supplied by the mains L L′ and flowing through coil B flows thereto over the interrupter-wheel, and its flow is broken in obvious manner to secure the effects produced by the self-induction of the coil or magnet B. In this form of my invention, as in the form illustrated in Fig. 2, the flow of current through the operating-magnets and through the inductive magnet or coil is interrupted at the same contacts within the tube C.

As it sometimes happens that the armatures of the operating-magnet are held at the dead-point through the establishment of an arc at the contacts of the interrupter, due to the discharge of the coil B across said contacts, it is generally preferable to employ the arrangement illustrated in Fig. 4, in which the inductive coil or magnet B, instead of being connected so that its discharge may take place over the contact-spring which produces the intermittent action of the rotator magnets, is connected to an independent or separate contact spring or brush A′, which can rest upon the same or an auxiliary wheel.

It is preferable to wind and connect the coils

of the magnets A, Figs. 3 and 4, in such way that the poles which act upon the armatures for the rotator shall be alternately north and south, the magnetic circuits for each pair being thus completed through the armatures and spokes carrying them, which parts are of some magnetic material, like iron, and at the opposite ends of said poles pass through the laminated ring T, of iron, in which the cores are secured in any desired manner.

In the main, through which energy is supplied to the apparatus, it is desirable to insert a coil G to prevent the discharge from the self-inductive coil B from running back onto the line.

What I claim as my invention is—

1. The combination, substantially as described, in an apparatus for producing luminous or similar effects by interruptions of a circuit of induction, of a vacuous receptacle, interrupter-contacts located therein, a magnet or coil in the circuit of the interrupter-contacts and constructed solely for the operation of said contacts, and a separate coil or magnet in the circuit of the interrupter constructed to produce inductive effects in said circuit, as and for the purpose described.

2. In an apparatus for producing luminous or similar effects, as described, by interruptions of a circuit of induction supplied from any suitable source of energy, the combination, substantially as described, of a circuit-interrupter in an exhausted receiver, a magnet or magnets for the operation of the interrupter and devoid of inductive effects upon said circuit, and a separate magnet or magnets acting inductively upon said circuit, said operating and inductive magnets being placed in branches of the circuit but both in circuit with a contact or contacts of the interrupter, as and for the purpose described.

3. In an apparatus for producing luminous or similar effects, as described, by interruptions of a circuit of induction, the combination, substantially as described, of an operating magnet or magnets in the circuit of an interrupter inclosed in an exhausted receiver, and a separate inductive magnet or coil in a branch or circuit through a separate interrupter brush or contact in said receiver, as and for the purpose described.

4. The combination, substantially as described, with the rotary interrupter, of a series of operating-magnets arranged on the exterior of the receptacle containing the interrupter and having their poles presented to armatures within said receptacle, said magnets being included in a circuit of the interrupter, and a separate inductive coil B, in a branch of the circuit controlled by said interrupter, as and for the purpose described.

Signed at New York, in the county of New York and State of New York, this 25th day of June, A. D. 1897.

DANIEL McFARLAN MOORE.

Witnesses:

WM. H. CAPEL,

C. L. BELCHER.