(No Model.) 2 Sheets—Sheet 1.

D. McF. MOORE.

ELECTRIC LIGHTING APPARATUS.

No. 604,685. Patented May 24, 1898.

Fig. 1.

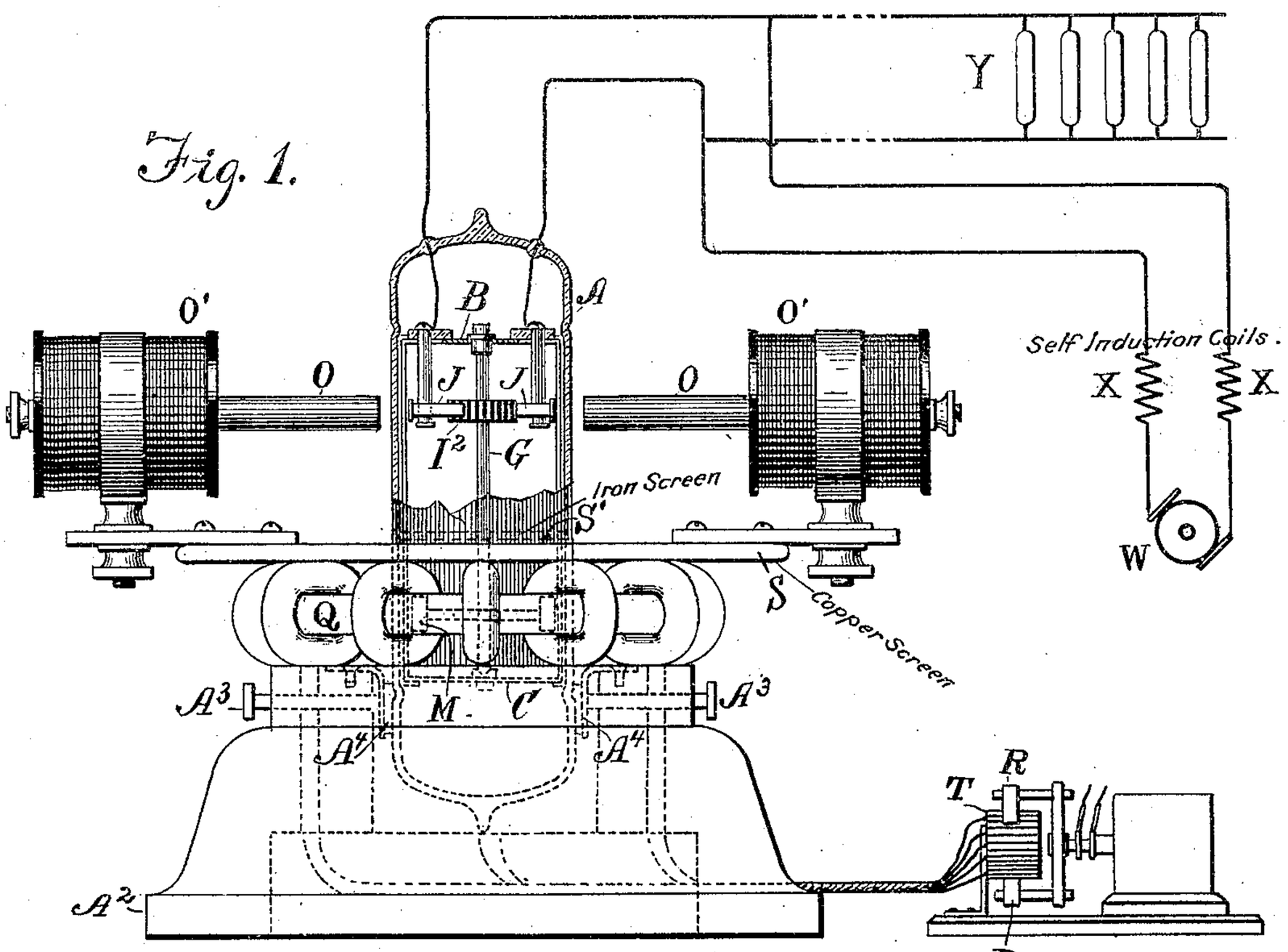
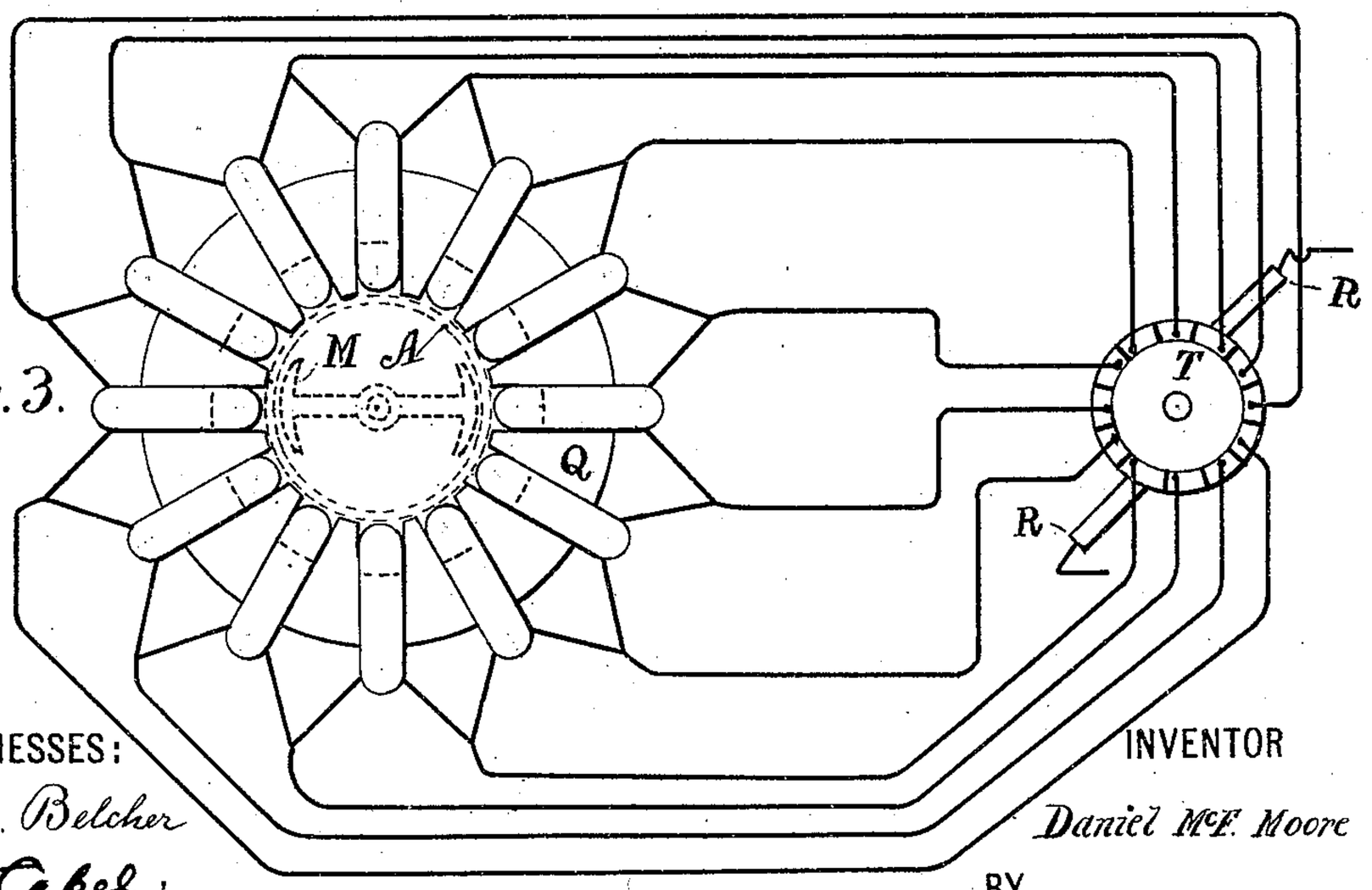


Fig. 3.



WITNESSES:

C. L. Belcher

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(No Model.)

2 Sheets—Sheet 2.

D. McF. MOORE.

ELECTRIC LIGHTING APPARATUS.

No. 604,685. Patented May 24, 1898.

Fig. 2.

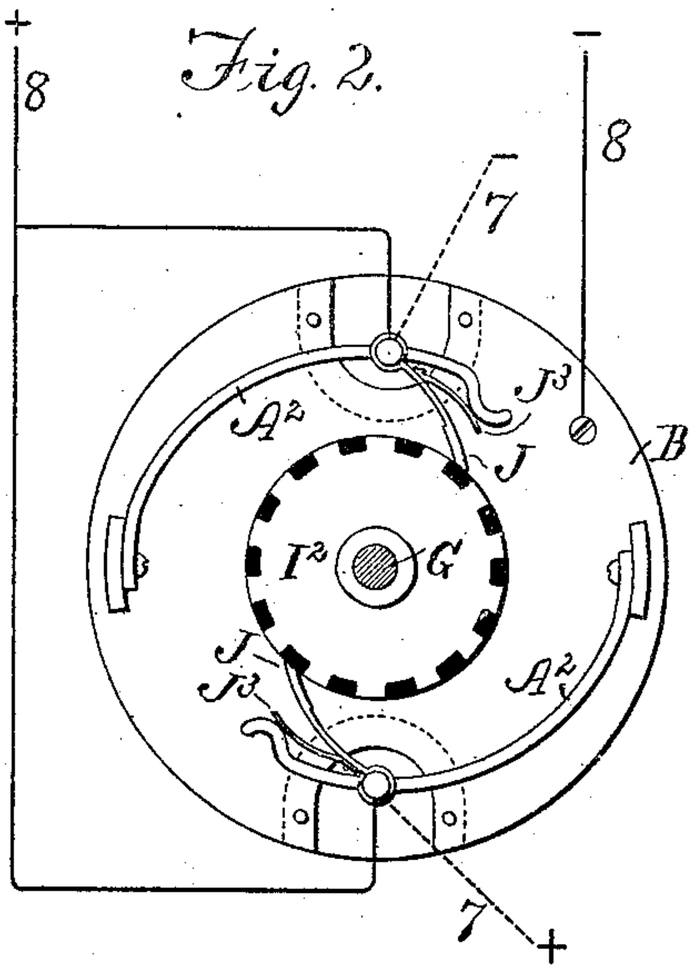


Fig. 4.

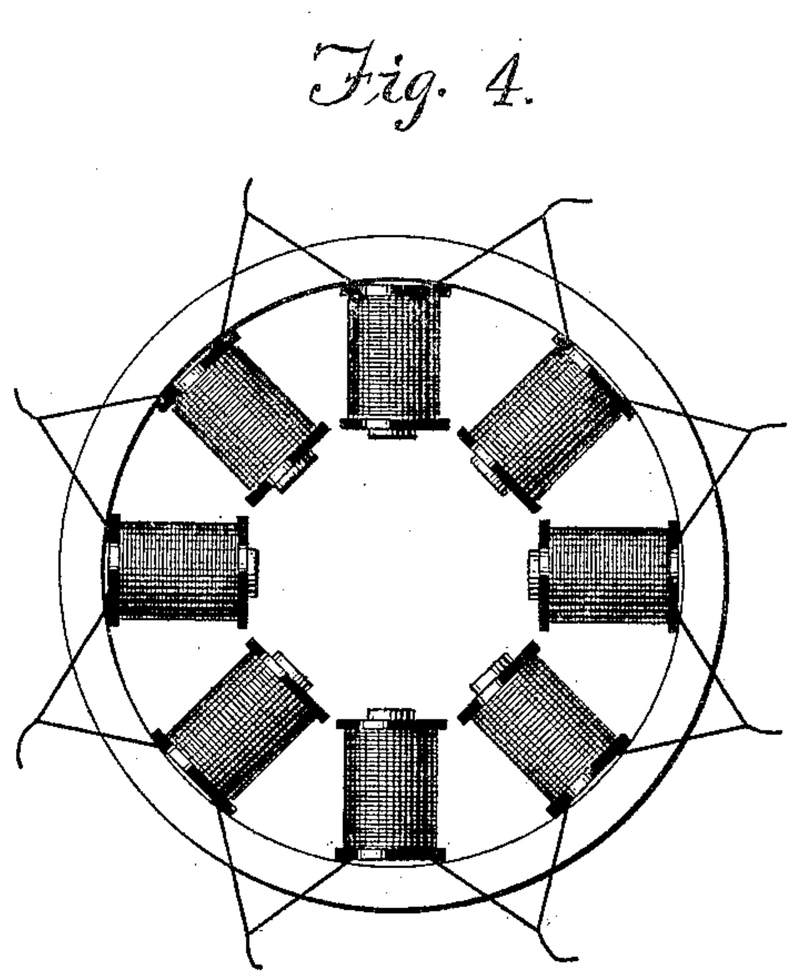


Fig. 5.

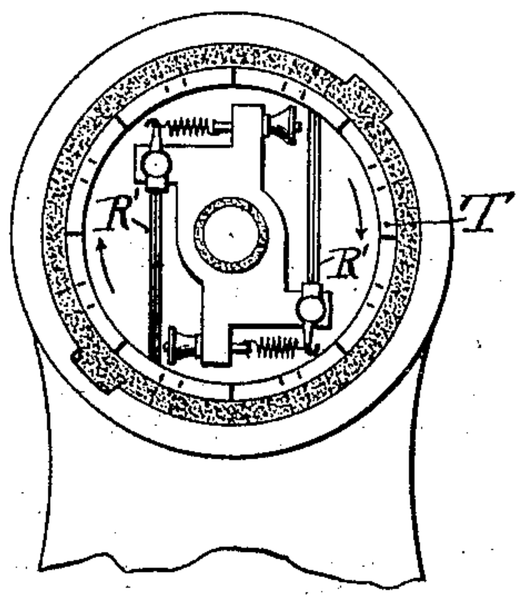
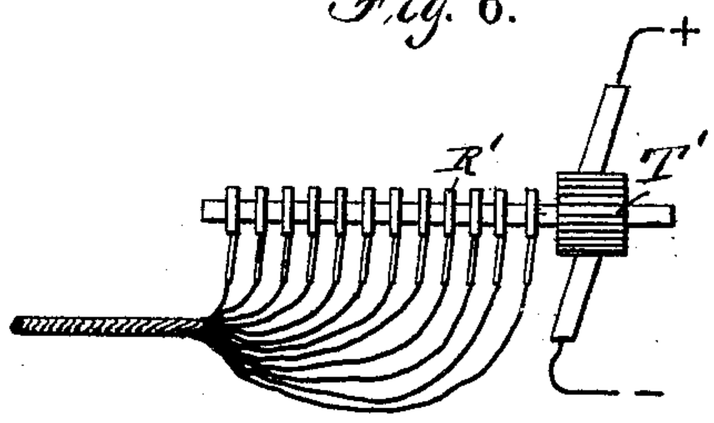


Fig. 6.



WITNESSES:

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UNITED STATES PATENT OFFICE.

DANIEL McFARLAN MOORE, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE MOORE ELECTRICAL COMPANY, OF NEW YORK, N. Y.

ELECTRIC-LIGHTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 604,685, dated May 24, 1898.

Application filed February 15, 1897. Serial No. 623,369. (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 Improvement in Electric-Lighting Apparatus, of which the following is a specification.

My invention relates to apparatus designed to generate electric vibrations or disturbances by rapidly-repeated interruptions of a circuit supplied with currents from any suitable source, and is more particularly designed for use in the system heretofore invented by me, in which such waves or disturbances are produced by interruptions of a circuit having considerable self-induction, the discharges of said circuit being delivered into another circuit or conductor for operation upon a vacuum-tube for lighting or upon other devices. The invention is, however, also applicable to systems wherein the circuit interrupted is the primary of an induction-coil or other circuit.

My present invention relates more particularly to a rotary circuit-interrupter working in a sealed receptacle, as has been heretofore proposed by me; and the special object of the invention is to secure a very rapid and uniform rate of revolution of the inclosed parts of the device without rotation of exterior masses surrounding the receptacle and without the use of motor-commutators within the inclosed space.

To this end my invention consists, essentially, in the combination, with the rotating element within the receptacle, of an armature secured thereto and an exterior means for producing a rotary magnetic field by which said armature shall be caused to rotate, said means consisting, preferably, of a stationary system of windings of any desired type, such as is used for the armature system of a dynamo-electric machine or motor surrounding the receptacle and inclosed armature and a rotary commutating device suitable for the particular system employed, whereby a magnetic field may be caused to rotate around the receptacle and thereby carry the inclosed armature and circuit-interrupter with it. The system of armature-winding may be either of the closed-circuit or open-circuit type. I shall, however, show and describe the invention as carried out with a closed-circuit winding, and have selected for that purpose the Gramme winding. The windings are preferably in any case disposed upon an iron core or structure, which intensifies the effects, though I do not limit myself to the use of an iron core.

By my invention I lessen the difficulties incident to the high centrifugal forces when a rotary structure surrounding the receptacle is rotated at high speed for the purpose of carrying the contained armature around with it, since the only rotating structure is the exterior commutating device for the armature system, and said device not being of necessity of a size to surround the receptacle may itself be made very small circumferentially, and may be therefore rotated at extremely high speeds without danger of disruption from centrifugal forces, which in the case of a rotating structure surrounding the receptacle would be destructive to the devices.

My invention relates, further, to details in the means for keeping the brushes of the interrupter in continuous and uniform contact with the revolving wheel within the receptacle and for preventing the rotating field from interfering with the action of the device which holds said brushes in contact.

In the accompanying drawings, Figure 1 is a general diagram and side elevation of the apparatus. Fig. 2 is an enlarged detail. Fig. 3 is a diagram more in detail. Fig. 4 shows a modification in the winding and application of the coils of the armature system. Fig. 5 shows a modification of the commutating device. Fig. 6 illustrates a modification in the manner of connecting the revolving commutating device to the armature system.

A is a bulb or receptacle of glass sealed and preferably exhausted to a high degree of vacuum. Within this bulb are mounted the parts of the interrupter which rotate and which break the circuit of a generator W, of any

suitable kind, connected with the interrupter through self-induction coils X or other means for giving self-induction to the circuit to be interrupted.

The vacuum-tubes or other devices are indicated at Y as connected across the working circuit, which is connected in shunt to the circuit leading through the interrupter.

Within the bulb A the interrupter-wheel which rotates to produce the interruptions is indicated at I^2 and the brushes which bear thereon by J. Two brushes are shown, and the circuit may be, as indicated by dotted lines 7 7, Fig. 2, from one to the other through the wheel I^2, upon whose periphery they bear and which periphery is divided into conducting and non-conducting spaces, as indicated. The parts are mounted within a suitable frame, the heads of which are indicated at B C, which frame is anchored within the walls of the receptacle in any desired way, as by compressing said walls above and below the heads in the manner described in my previous application, Serial No. 615,970, filed December 17, 1896.

The shaft which carries the wheel I^2 is indicated at G, and the armature secured to said shaft and which is carried around by the rotating exterior magnetic field by the letter M. The brushes J are held in contact within the wheel by the action of magnet-poles O, extending from suitable electromagnets O′ and adjustable to and from the exterior surface of the receptacle A. These poles operate on armatures carried by levers A^2, mounted to turn independently of brushes J on a suitable stud carried by one of the heads B C and engaging by a tailpiece, as indicated, with a spring-arm J^3, fastened to the brush J, preferably near the pivotal point thereof. By this device an even pressure is put upon the brushes and they make and break circuit with great uniformity.

The receptacle A is seated in a socket or support in the base A^2, which may have suitable clamp-screws A^3, bearing against padded springs A^4, for holding the receptacle in place. Mounted upon the base is the system of armature-winding before referred to and here shown as a Gramme-wound ring Q, disposed horizontally upon the base, with its interior close to the walls of the bulb A, and therefore in close proximity to the armature M, the outer periphery of which is made to revolve with a small gap between it and the interior surface of the bulb or receptacle A.

The armature system of winding upon Q is shown more clearly in the diagram Fig. 3 as a continuous or closed-circuit winding, which is tapped at the junctions between the coils for connection to its commutator.

The commutating device is shown at T as an independent structure. The separate segments of the commutator-cylinder are individually connected to the junctions of the coils, and the cylinder itself is in the preferred form of my invention stationary, while the brushes of the commutating device revolve. As shown in Fig. 1, the brushes R R are supported upon the arms of a revolving shaft driven by any suitable motive power, and the current from two poles of a supply-circuit is conveyed to said brushes through a pair of continuous contact rings and brushes insulated from one another and secured to the shaft, so as to revolve with the brushes R. The brushes R rest upon the commutator-cylinder at such points as to produce in the system of winding at Q north and south poles, respectively, opposite the ends of armature M, so that as the commutator-brushes revolve the rotating poles of Q will carry the armature M around with them and cause the interrupter to rotate. As will be obvious, the rate of rotation of the shaft G corresponds to that of the shaft carrying the brushes R of the commutator.

In Figs. 1 and 3 the winding is shown as a ring-winding; but the coils might be disposed upon cores projecting radially inward from a ring, as indicated in Fig. 4, but connected up in the same manner.

It is preferable sometimes when very high velocities are employed that the brushes R should revolve within the commutator-cylinder, as they may be then made smaller in circumferential extent, and centrifugal power may assist in holding them in contact with the segments. This modification I have indicated in Fig. 5.

It is quite obvious that instead of revolving the brushes I may revolve the cylinder; but in this case it would be necessary to use a continuous ring and contact-brush, as at R′, for each one of the connections from the armature-coil system Q, as more particularly indicated in Fig. 6.

In order to prevent any action of the rotating magnetic field upon the magnetic devices which hold the brushes J against the interrupter-wheel I^2, I interpose the screen S between the armature-coil system and said brushes. This screen may be a disk of copper resting upon the top of the armature-coil system, as shown more clearly in Fig. 1. I also place within the bulb A a horizontal disk of iron S′, which affords a path for any stray lines of force that otherwise might affect the iron parts of the break-wheel and its brushes.

As above stated, the circuit interrupted may pass in series through the brushes and break-wheel; but it is preferable to pass it in multiple through the brushes, as indicated in full lines at 8 8, Fig. 2, the positive terminal being connected to the brushes and the negative to the wheel through the frame in which it is journaled. In this arrangement any building up is done upon the brushes instead of on the wheel, as is apt to be the case under one of the brushes in the series arrangement.

It is also found advisable to insert in each of the connections between the coils of the Gramme ring and the commutator an amount of German-silver wire about equal in resist-

ance to each of the coils, as by this means sparking at the commutator is materially decreased.

I have herein shown circuit-interrupting devices arranged to break the circuit simultaneously at two or more points in multiple; but I do not herein claim, broadly, the simultaneous break nor the break in multiple, as they form the subject of claims in an application for patent filed by me April 15, 1898, Serial No. 677,706.

What I claim as my invention is—

1. In a rotary interrupter having its working parts inclosed within a sealed receptacle, the combination with an armature secured to the rotator and stationary armature-coil system surrounding said receptacle, of a rotating commutating device to which the said system is connected, and a circuit of self-induction exterior to the sealed receptacle and connected through the walls thereof to the contacts of the interrupter.

2. In a rotary interrupter contained within a sealed receptacle, the combination with the armature in said receptacle, of means for producing a rotating field to rotate said armature, said means comprising a fixed system of windings similar to the armature system of a dynamo-electric machine or motor, a rotating commutating device for said system, and a circuit of self-induction exterior to the sealed receptacle and connected through the walls thereof to the contacts of the interrupter, as and for the purpose described.

3. In a rotary interrupter, the combination with a vacuous chamber, of the armature attached to the interrupter-shaft and mounted within said chamber, a stationary system of closed-circuit windings surrounding said armature and outside of said chamber, a rotating commutating device to which said closed-circuit system is connected in the ordinary way, and a circuit of self-induction exterior to the vacuous chamber and connected through the walls thereof to the contacts of the interrupter.

4. In a rotating interrupter, the combination, substantially as described, of a vacuous chamber, an armature secured to the rotator-shaft and both mounted in said chamber, a fixed system of closed-circuit windings, the fixed commutator-cylinder with which said windings are connected after the manner of the windings for the armature of a dynamo-electric machine or motor, rotating brushes moving on said cylinder, and a circuit of self-induction exterior to the vacuous chamber and connected through the walls thereof to the contacts of the interrupter.

5. In a rotary circuit-interrupter, having magnetic devices for holding the parts of the interrupter in contact, and means for producing a rotating magnetic field to rotate the interrupter, of a magnetic screen interposed between the latter devices and the devices which act magnetically upon the interrupter-contacts, as and for the purpose described.

6. In a rotating circuit-interrupter having its parts inclosed in a sealed receptacle, the combination with a commutator-brush carrying a spring, of a lever having an arm bearing on said spring so as to force the brush against its contacts and armature carried by said lever, and an exterior magnet, as and for the purpose described.

Signed at New York, in the county of New York and State of New York, this 5th day of February, A. D. 1897.

DANIEL McFARLAN MOORE.

Witnesses:

WM. H. CAPEL,

DELBERT H. DECKER.