

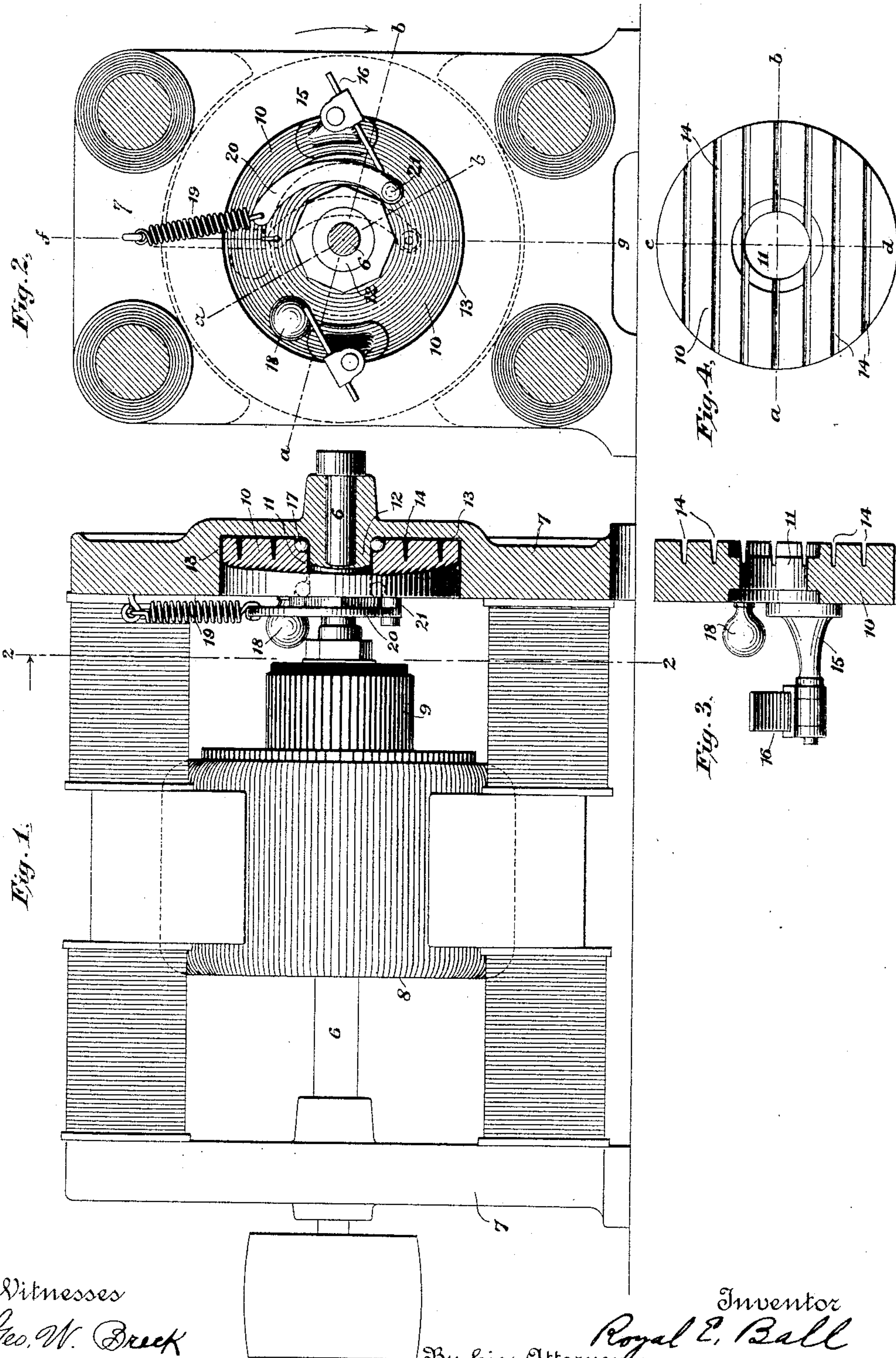
(No Model.)

R. E. BALL.

REGULATOR FOR DYNAMO ELECTRIC MACHINES.

No. 444,587.

Patented Jan. 13, 1891.



Witnesses
Geo. W. Breck
Edward Thorpe.

Inventor
Royal E. Ball
By his Attorneys
Fowler & Fowler

UNITED STATES PATENT OFFICE.

ROYAL E. BALL, OF NEW YORK, N. Y.

REGULATOR FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 444,587, dated January 13, 1891.

Application filed February 26, 1890. Serial No. 341,885. (No model.)

To all whom it may concern:

Be it known that I, ROYAL E. BALL, a citizen of the United States, residing at New York, county and State of New York, have invented certain new and useful Improvements in Regulators for Dynamo-Electric Machines, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the drawings forming part of this specification.

My invention relates to a method of and means for, regulating dynamo-electric machines, and has for its object the provision of a new and simple way of automatically regulating the same by the movement of the brushes or current-collectors relative to the commutator-cylinder.

Heretofore all dynamos in which the current has been regulated by the change of position of the brushes have been provided with mechanism commonly called the "yoke," which carried the brushes and their holders. By the movements of this yoke the positions of the brushes were shifted in relation to the commutator and the pressure or volume of current delivered was thereby altered. In plain machines this yoke was moved by hand when conditions of load required it. In the automatically-regulated machines this yoke was moved by means of various electrical or mechanical devices, and they in turn were in some cases actuated and subjected to some external electric controller.

By my invention I dispense with all mechanism for the movement of the yoke, and by changing the position and shape of the yoke cause it to furnish its own means and power of motion. It is well known that if a movable magnetic body be included within a magnetic circuit it will tend to place itself so that its axis of least resistance will become parallel to the resultant magnetic line traversing the magnetic circuit, and that the force with which it will tend to take this position will be dependent upon the number of magnetic lines of force passing through it. I utilize this principle by making the yoke of magnetic material, and constructing it so that it has two axes of different magnetic resistances at

right angles to each other, and then place the yoke, or the portion of it which has the different magnetic axes of resistance, in a position perfectly free to move in some part of the magnetic circuit of the dynamo—that is, I make a portion of the magnetic circuit of the dynamo-electric machine movable, and make it also of different magnetic resistances as measured on different axes. This movable part of the magnetic circuit of the machine while serving as a regulator is also preferably made to carry the brushes or act as a yoke.

In the accompanying drawings, illustrating a type of my invention, Figure 1 is a view of a well-known form of a dynamo-electric machine provided with my invention, the right-hand end of the same being shown in vertical central section. Fig. 2 is a sectional view taken on a plane indicated by the line 2 2 in Fig. 1 and looking in the direction of the adjacent arrow. Fig. 3 is a transverse central sectional view of the movable magnetic portion of the circuit, as hereinafter described; and Fig. 4 is a side view of the same.

Referring to the drawings, in which like numbers of reference indicate like parts throughout, 6 is an armature-shaft mounted in the end pieces 7 7 of the machine-frame. 8 is the armature, and 9 the commutator-cylinder. A magnetic part 10 of the end frame 7, which is in magnetic circuit of the machine, being the piece which connects the field-magnets, is made movable. This movable magnetic piece 10 has two axes *a b* and *c d*, at right angles to each other and of different resistances. In the present construction the movable magnetic part 10 is in the form of a circular plate, which is provided with a central opening 11, and has a bearing upon a sleeve 12 extending inwardly from the end frame 7, the piece being set in a corresponding cavity 13, cut out of the end piece for its reception. To obtain the axes of different resistances I cut away portions of the plate 10 on either face thereof. In the present construction this is accomplished by forming parallel grooves 14 upon one face of the plate. The axis of highest resistance will, therefore, be at right angles to these grooves, as indicated by a line *c d*, while the axis of least re-

sistance will be parallel to the grooves, as indicated by line *a b*.

Since the body 10 is magnetic and forms a portion of the magnetic circuit of the machine, it will tend to move so as to place its axis of least resistance—namely, the axis *a b*—parallel to the axis of the magnetic circuit of the machine, which is indicated by the line *f g*, in accordance with the principle above referred to, and this tendency of force to move bears a relation to the strength of magnetic current. I utilize this automatic movement of the body 10 as a regulating means for the machine by connecting, preferably, directly thereto the brush-holders 15, having brushes 16, as indicated in the drawings, so that as the body 10 shifts its position in accordance with the condition of load the brushes may likewise be shifted or displaced, so as to maintain the requisite lead and thereby prevent sparking.

The force which tends to move the yoke or magnetic body 10 is balanced by a combination of a weight 18 and a spring 19, which is connected to the yoke by means of a curved link 20 and a stud 21. The full lines in Fig. 2 represent one extreme movement of the yoke 10, and the dotted lines represent the other extreme.

In order to reduce the friction to the lowest possible amount, I provide the magnetic portion 10 with ball-bearings 17. This bearing of course may take any of the well-known forms of ball-bearings, and I find that such bearing is especially efficient in this connection, since by virtue of it the part 10 is rendered more sensitive in responding to the magnetic action thereon.

Having thus described my invention, I claim, without limiting myself to the construction shown—

1. As a means for shifting the brushes to regulate a magneto-electric machine, a movable magnetic body carrying the commutator-brushes and arranged in the yoke-piece

of the field-magnets adjacent to the commutator, substantially as described.

2. As a means for shifting the brushes to regulate a magneto-electric machine, a movable magnetic body carrying the commutator-brushes and arranged in the yoke-piece of the field-magnets adjacent to the commutator, and a sleeve extending from said yoke-piece around the armature-shaft for supporting said body, substantially as described.

3. As a means for shifting the brushes to regulate a magneto-electric machine, a movable magnetic body having axes of different magnetic resistances carrying the commutator-brushes and arranged in the yoke-piece of the field-magnets adjacent to the commutator, and a sleeve extending from said yoke-piece around the armature-shaft for supporting said body, substantially as described.

4. As a means for shifting the brushes to regulate a magneto-electric machine, a movable magnetic body suitably counterbalanced and having axes of different magnetic resistances and arranged in the yoke-piece of the field-magnets adjacent to the commutator, supports for the commutator-brushes carried by said magnetic body, and a sleeve extending from said yoke-piece around the armature-shaft for supporting said body, substantially as described.

5. As a means for shifting the brushes to regulate a magneto-electric machine, a movable magnetic body carrying the commutator-brushes and supported about the armature-shaft by anti-friction ball-bearings in the yoke-piece of the field-magnets adjacent to the commutator, substantially as described.

In testimony whereof I have hereunto set my hand and seal, this 21st day of February, 1890, in the presence of two subscribing witnesses.

ROYAL E. BALL. [L. S.]

Witnesses:

PAUL F. C. TUCKER,
WILLIS FOWLER.