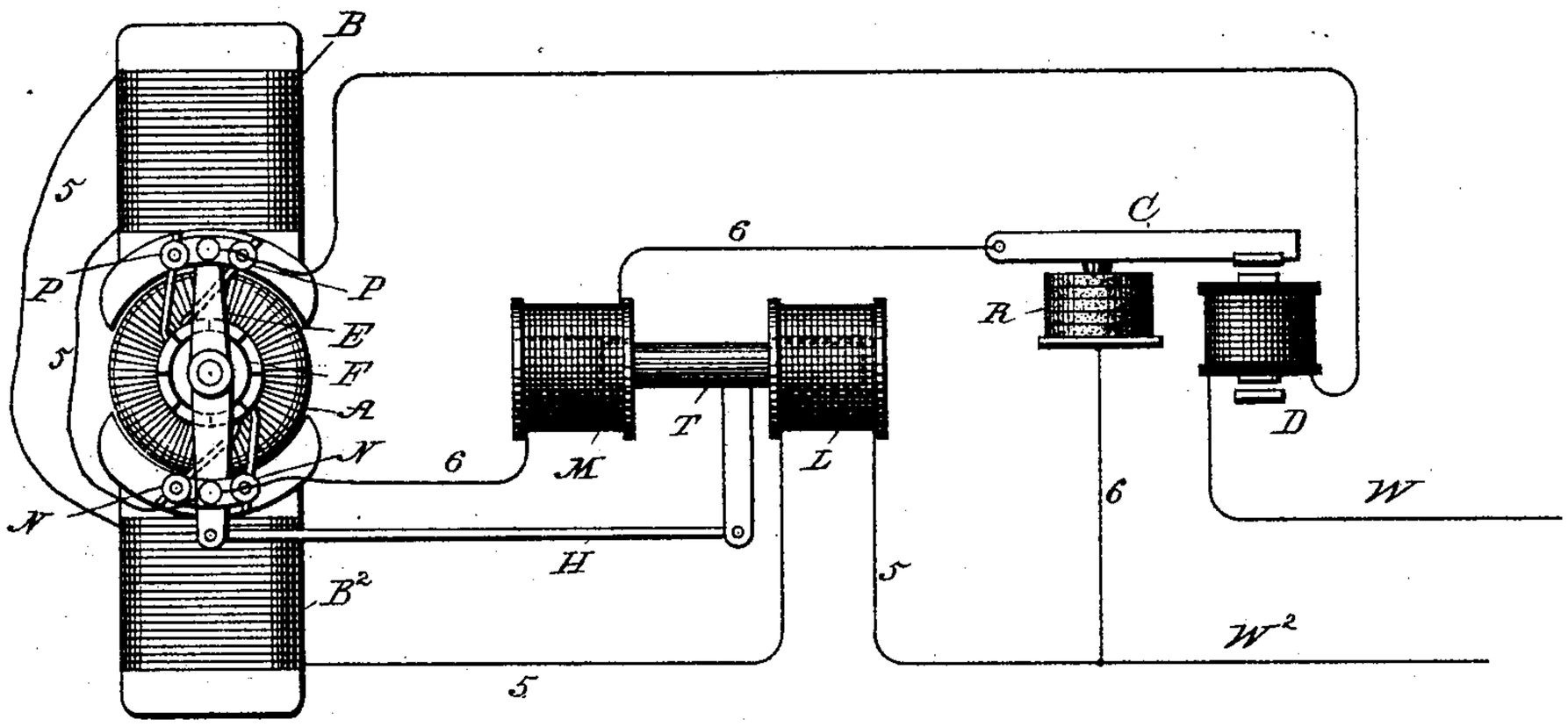
(No Model.)

C. L. BUCKINGHAM.

REGULATOR FOR DYNAMO ELECTRIC MACHINES.

No. 359,770. Patented Mar. 22, 1887.



Witnesses:
Wm. A. Cabell
Gabriel J. W. Galster

Inventor:
C. L. Buckingham
By Townsend & MacArthur
Atty's

UNITED STATES PATENT OFFICE.

CHARLES L. BUCKINGHAM, OF NEW YORK, N. Y.

REGULATOR FOR DYNAMO-ELECTRIC MACHINES.

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Application filed August 5, 1886. Serial No. 210,150. (No model.)

To all whom it may concern:

Be it known that I, CHARLES L. BUCKINGHAM, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Regulators for Dynamo-Electric Machines, of which the following is a specification.

My invention relates to dynamo-electric machines with which are combined a variable resistance placed in a branch around the field-magnet coils of the machines and employed for the purpose of regulating or varying the strength of the magnetic field, and, as a consequence, the efficiency of the machine.

The object of my invention is to provide an improved means whereby the commutator-brushes of the machine may be automatically adjusted to follow the changes in position of the so-called "neutral line" produced by changing the strength of the magnetic field in which the armature revolves, so that the branches shall be always in the best position for absence of sparks, flashing, &c.

To this end my invention consists in combining with either or both of the branches containing, respectively, the field-magnet coils and the variable resistance a suitable differential electro magnet or magnets, which are employed as either the controller or motor magnet for effecting an adjustment or movement of the commutator-brushes to follow the neutral line when the same shifts through the operation of the devices for varying the strength of the field-magnet.

I have in the present instance shown my invention as applied to a dynamo-machine in which the variations in strength of the field are effected automatically by means of an electro-magnet connected to the working-circuit, so as to be responsive to variations in the current thereof. This combination of devices constitutes what is well understood in the art as an "automatic current-regulator." It will be readily understood, however, that the invention may be likewise applied to dynamos in which the variable resistance is adjusted by hand instead of by the operation of an electro-magnet.

Referring to the accompanying drawing, the figure is a diagram of circuits and apparatus embodying my invention.

Referring to the figure, A indicates the armature of a dynamo-machine of any type, and F the commutator-cylinder, upon which bear the usual commutator-brushes, P P N N, mounted upon a movable yoke or other support, E, by which the position of the brushes circumferentially upon the cylinder may be adjusted.

B B^2 indicate the field-magnet coils of the machine.

W W^2 indicate, respectively, the wires or conductors of the outside circuit, and R is typical of a variable resistance of any desired kind. That here shown is supposed to consist of a pile of carbon blocks, upon which a lever, C, bears with greater or less force, so as to decrease or increase the resistance.

The brushes P are connected to the circuit W in any usual way, while the brushes N are connected to the wire W^2 through two branches, as indicated, one of which, 5, contains the field-magnet coils, while the other of which (indicated by the numeral 6) contains the artificial resistance R.

As is well understood in the art, the amount of the resistance R determines the amount of current which shall flow in the field-magnet coils B B^2, and as a consequence the strength of the magnetic field in which the armature revolves and the electro-motive force of the current developed by the armature.

M indicates an electro-magnetic coil in the branch 6, containing the resistance; and L, an electro-magnetic resistance in the branch 5, containing the field-magnet coils.

T indicates a core of iron for the coil M, which coil tends to move the core axially in a direction to cause the link H, connected with the core and with the yoke E, to shift the brushes backward. The coils L tend to move the core in the opposite direction, or in a way to move the brushes forward when the neutral line shifts in the direction of revolution. The action of these coils is, therefore, to pull the cores against one another, and their effects are to be so adjusted, having regard to the comparatively small current normally flowing in the branch 6, that under normal conditions the core will be maintained in a position with regard to the neutral line.

As illustrated in the figure, the coils L have a stronger attraction than the coils M, this

being due to the fact that less current flows in the coils M, inasmuch as the resistance of R, including that of the coils M, the magnet P, and making up the resistance in branch 6, is normally much greater than the resistance in branch 5, consisting of coils L and field-magnet coils B B^2.

Assuming that the parts are normally in the position shown in the figure, and that it is desired to diminish the electro-motive force of the machine, the lever C would be moved in a direction to decrease the resistance R, so as to divert current from the field-magnet coils. The result of this would be to cause the neutral line to move backward in a direction opposite to the direction of revolution of the armature; and the brushes should also be moved backward, in order that they may maintain the same position with regard to the neutral line which they had before the electro-motive force was changed. This adjustment is produced through the action of the electro-magnet coils M L L, coils M through the act of adjustment receiving more current, inasmuch as they are in the branch 6, while coils L, being in the branch 5 with the field-magnet coils, receive less current, and the core T is therefore moved to the left, or farther into the coils M. This movement will continue until the balance between the pull of coils M and L on the core is established.

The extent of movement of the core T and of the commutator under the action of the same will obviously depend upon the extent to which the resistance R is diminished by the operation of the lever C. If the lever C be moved in the opposite direction, so as to again increase the flow of current in the field-coils by increasing the resistance in the branch 6, the commutator will be moved in the proper direction—that is to say, forward—through the increase of current flowing in branch 5 and the decrease of current flowing in branch 6.

The lever C may be moved by any means—as by hand or by an electro-magnet, D, of any desired kind, placed in the general circuit, so as to feel the effects of any increase of current on said circuit, produced either by variations of resistance or by changes in the speed of running of the dynamo.

I have herein shown one form of electro-magnet; but it will be obvious to those skilled in the art that other forms might be employed without variation from the general operation and principle of action as herein set forth.

What I claim as my invention is—

The combination, with a dynamo-electric machine, of two branches, one containing the field-magnet coils and the other a variable resistance, an adjustable commutator, and a controlling or operating electro-magnet for the latter, having two coils included, respectively, in the two said branches and acting differentially, in the manner described, to effect an adjustment of the commutator in both directions.

Signed at New York, in the county of New York and State of New York, this 30th day of July, A. D. 1886.

CHARLES L. BUCKINGHAM.

Witnesses:

WM. H. CAPEL,

WM. ARNOUX.