

(No Model.)

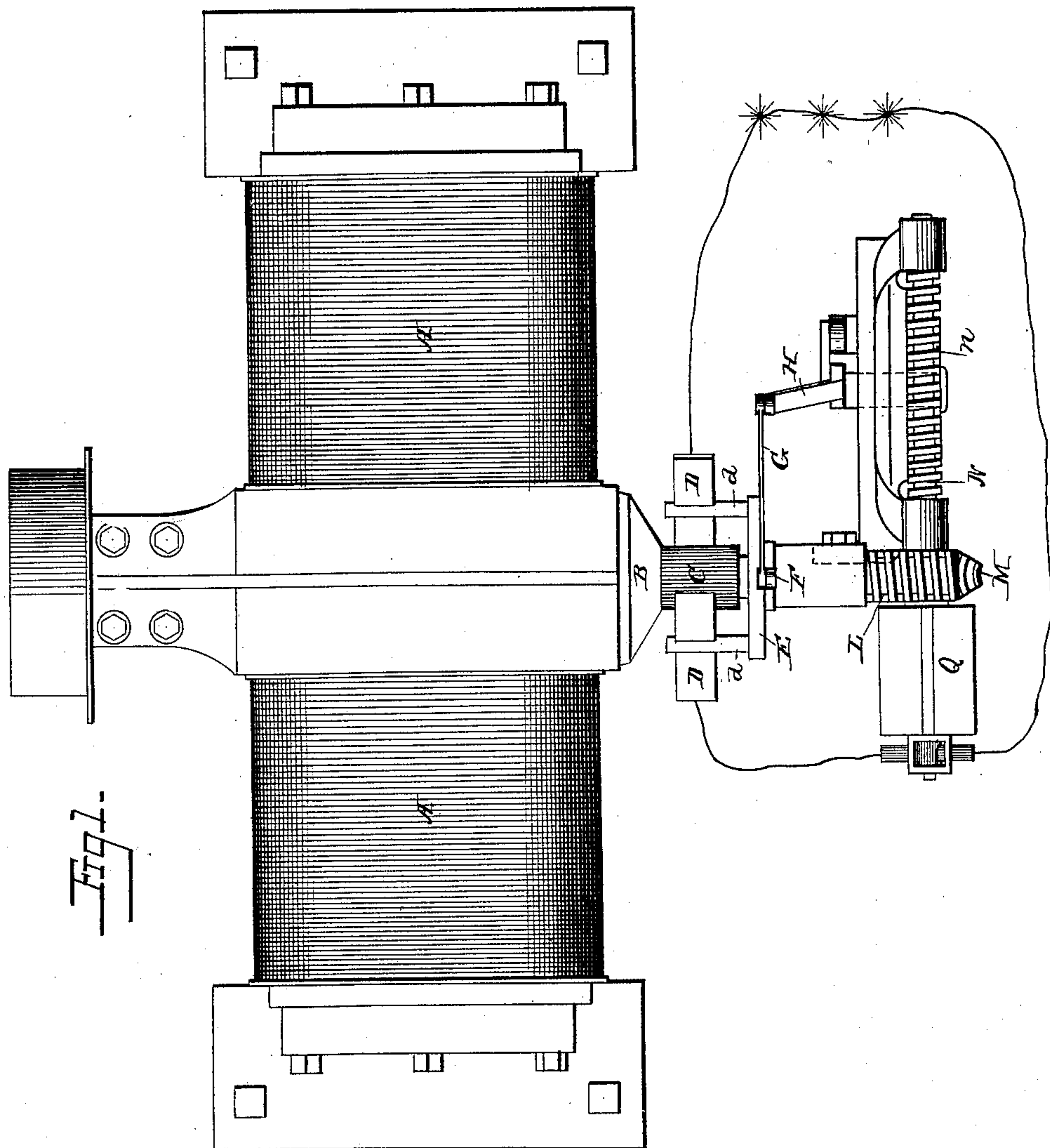
2 Sheets—Sheet 1.

W. S. HILL.

# REGULATOR FOR ELECTRIC GENERATORS.

No. 378,547.

Patented Feb. 28, 1888.



*Attest:*

Wm A Harris

A. E. J. Farnham.

V. S. Hill

Inventor:

By Foster & Freeman.

a hypo.

(No Model.)

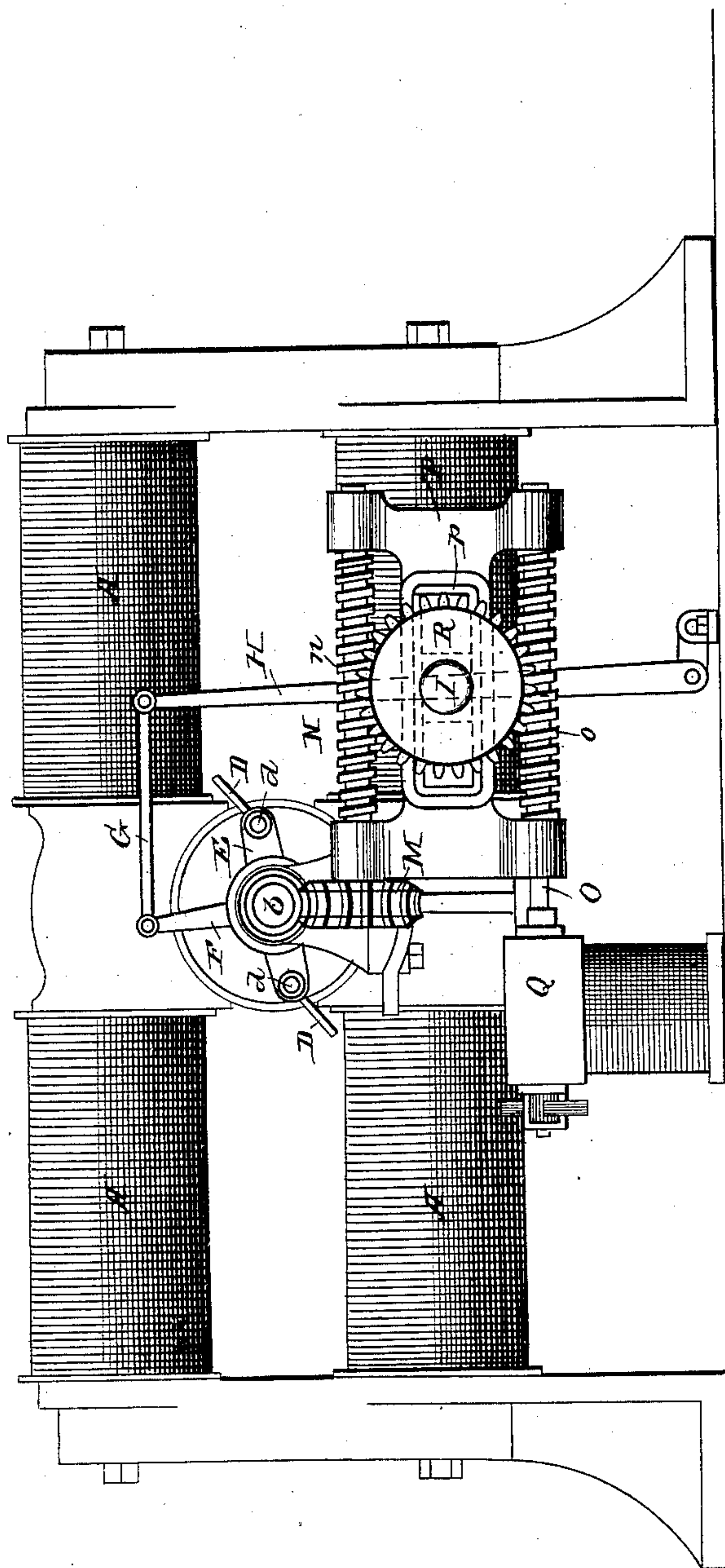
2 Sheets—Sheet 2.

W. S. HILL.  
REGULATOR FOR ELECTRIC GENERATORS.

No. 378,547.

Patented Feb. 28, 1888.

Fig 2.



Attest:

Wm A. Harris  
A. E. G. Farnmann.

W. S. Hill

Inventor:

By Josiah Freeman,  
Att'y.



# UNITED STATES PATENT OFFICE.

WARREN S. HILL, OF BOSTON, MASSACHUSETTS.

## REGULATOR FOR ELECTRIC GENERATORS.

SPECIFICATION forming part of Letters Patent No. 378,547, dated February 28, 1888.

Application filed April 21, 1887. Serial No. 235,686. (No model.)

*To all whom it may concern:*

Be it known that I, WARREN S. HILL, a citizen of the United States, and a resident of Boston, Suffolk county, Massachusetts, have invented certain new and useful Improvements in Regulators for Electric Generators, of which the following is a specification.

This invention relates to a novel mechanism adapted to be used in connection with a dynamo or magneto electric generator to regulate the force of the current taken therefrom in order that it may be kept as nearly uniform as possible; and it relates particularly to that class of regulators in which the brushes of the commutators are mounted loosely upon the axis thereof, and are adapted to be automatically shifted toward or from the neutral points of the commutators as the amount of work required of the machine is varied.

In order that the details of my invention may be better understood, I have illustrated the mechanism whereby it is carried out in the accompanying drawings, wherein—

Figure 1 is a top view of a dynamo electric generator having a regulator embodying my invention applied thereto. Fig. 2 is a side view of the same.

In the drawings, wherein similar letters of reference indicate like parts, A designates the field-magnets, between the poles of which revolves the armature B, the shaft of which is suitably journaled in standards or uprights.

C represents the commutator, which is borne upon by the brushes D D, carried by arms *d*, projecting from a cross head or yoke, E, which is loosely mounted upon the shaft *b* of the armature, so as to have a limited movement thereon in order that the brushes may be shifted upon the commutator, so that they may be made to engage therewith more or less nearly along the neutral lines. The immediate devices for moving the cross-head E, and through it the brushes, I have shown as consisting of an arm, F, projecting from the cross-head, a link, G, connected therewith and uniting it with a link or lever, H, pivotally connected to and extending upward from the floor or standard of the machine.

Mounted upon a short shaft or arm, I, projecting about centrally from lever H, is a worm-wheel, K, meshing above and below with worm-threaded shafts, presently to be described.

Upon the outer end of the shaft of the armature is a worm, L, which in turn gears with a worm-wheel, M. This wheel is keyed to a shaft, N, upon the central portion of which is the worm-thread *n*, meshing with wheel K. O is another shaft similar to the one N, and having formed centrally thereon a worm, *o*, engaging with the wheel K at a point diametrically opposite the point of engagement with worm *n*. The two shafts are suitably journaled in a frame, P, whereby they are held in constant and fixed relations to each other. This frame is provided between the two shafts with ways or guides *p*, parallel to the shafts, and in which is fitted and slides a box (shown in dotted lines, Fig. 2) carried upon the shaft or arm I. This box serves to maintain the wheel K in uniform mesh with both worms *n* and *o*, whether it be shifted in one direction or the other longitudinally of the shafts.

It will be seen from the above description that if the shafts N and O turn with uniform speed in opposite directions the wheel K will simply be turned upon its axis without there being any tendency whatever for it to travel longitudinally of the shafts; but should one shaft be made, from any cause, to revolve more rapidly than the other, a rectilinear movement will be given the wheel K, as well as a rotary, to the left if shaft N rotates the faster, and to the right if shaft O. Such rectilinear movement, which is rendered parallel to shafts N and O by the ways *p* and the box engaging therewith, results through intermediate parts, I, H, G, and F, in rocking the cross-head, and hence shifting the contact-points of the brushes with the commutator.

The shaft N, as above described, is driven by the armature B, and for the purposes of this description its speed may be considered as being uniform. The other shaft, O, is driven by the armature-shaft of a small motor, Q, situated in and driven by the current in the circuit of the generator either in shunt or direct. As the strength of the current in this working-circuit is subject to variation—as, for instance, by the cutting out or in of more or less lamps, supposing it to be used to operate an electric light system—the speed of this motor Q will be correspondingly varied in a manner well understood by those skilled in the art.

From the above detailed description of one



way of carrying out my invention the operation will be understood without further description, and it will be seen that the principle of my invention depends upon the fact that I  
 5 have two driving mechanisms operating upon a single device in such a manner that when the speed of said mechanisms is the same and produces an equal amount of motion on the brush-operating device the brushes will remain fixed  
 10 in their relations to the commutator; but as soon as the relative speed of the mechanisms is varied, so that the device is moved to a greater or less extent by one or the other of such mechanisms, the brushes will be shifted in  
 15 accordance with such movement, and will thus automatically change the relation of the mechanisms and restore them to their normal condition.

From this it will appear that my invention,  
 20 broadly stated, may be said to consist in a mechanism driven by the armature direct and another mechanism driven by the current produced by the machine, both of which mechanisms operate upon a device connected with the  
 25 brushes of the machine in such a manner that when the speed of these mechanisms is the same the brushes will remain stationary, but when the relations between the speed of the worms are varied the device operates to move  
 30 the brushes in accordance therewith and to vary the amount of current in the circuit of the machine.

It is obvious that there are other well-known mechanical devices which operate upon the  
 35 same principle as the one illustrated and which are included in the scope of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

40 1. The combination, with an electric generator, of a mechanism driven by the armature thereof, and another mechanism driven by a motor included in the circuit of the machine, and connections between said mechanisms and the brushes, whereby the position of  
 45 the brushes may be regulated in accordance with the relations of the speed of said mechanisms, substantially as described.

50 2. The combination, with an electric generator and brush-operating mechanism, of connections between said brush-operating mechanism and the shaft of the armature, and other connections between said brush-operating mechanism and a motor included in the cir-

cuit of the machine, the arrangement being 55 such that when said connections operate normally the brushes will be maintained in their proper position upon the commutator, and when the relations of the connections vary the brush-operating device will vary the position 60 of the brushes in accordance with such variations, substantially as described.

3. The combination, with an electric generator and brush-operating mechanism, of a worm connected with the shaft of the arma- 65 ture of the machine, and another worm connected with a motor included in the external circuit of the machine, the said worms operating to control the position of the brush upon the armature in accordance with their relative 70 speeds, substantially as described.

4. The combination, with an electric generator and movable brushes, of a system of levers connected to the brushes, connections be- 75 tween the levers and the armature-shaft, a motor connected in the circuit of the generator, and connections between the motor and said system of levers, whereby the position of the brushes may be changed in accordance with the variations of the current in the circuit, sub- 80 stantially as described.

5. The combination, with an electric generator and movable brushes thereon, of a system of levers connected with said brushes, a wheel operating said levers, a worm gearing 85 with the said wheel and connected with the armature-shaft, and another worm also gearing with the said wheel and connected with the motor in the external circuit of the machine, substantially as described. 90

6. The combination, with an electric generator and movable brushes, of a system of levers connected with said brushes, a wheel connected with said levers, a frame forming a guide for said wheel, a worm-gearing mounted 95 in said frame and connected with the armature-shaft of the generator, and another worm-gearing also mounted in the frame and connected with a motor included in the circuit of said generator, substantially as described. 100

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WARREN S. HILL.

Witnesses:

CHARLES M. BARNES,  
 FRANCIS B. TIFFANY.