(No Model.)

E. THOMSON.

AUTOMATIC COMMUTATOR ADJUSTER FOR DYNAMO ELECTRIC MACHINES.

No. 323,976. Patented Aug. 11, 1885.

Fig. 1.

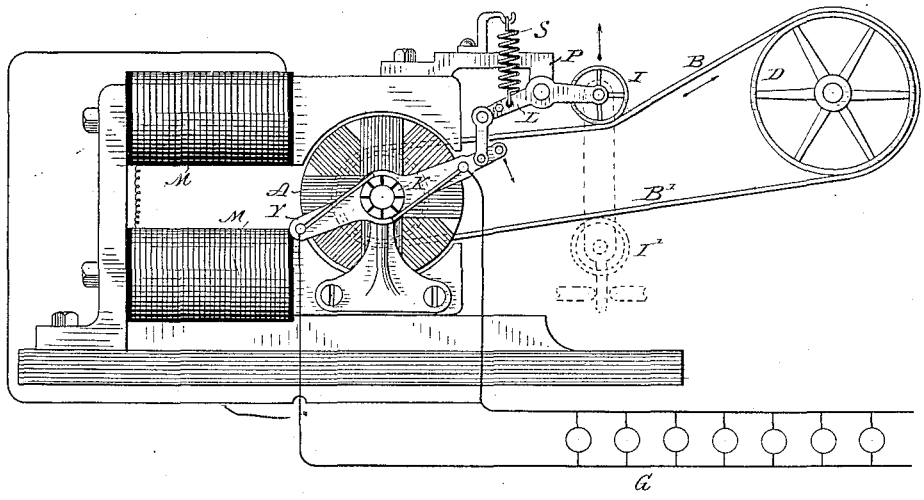


Fig. 2.

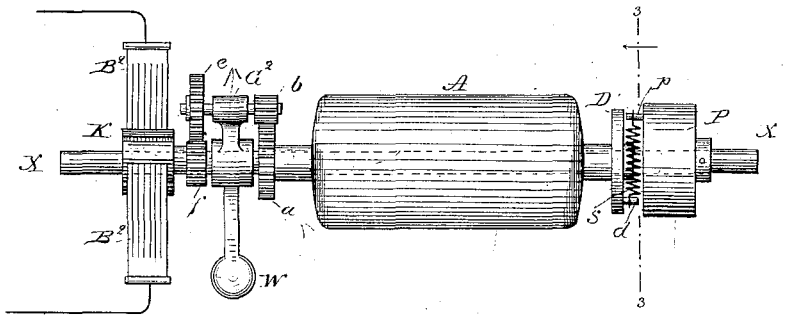
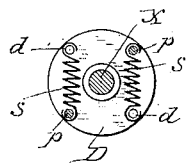


Fig. 3.



Witnesses:
Ernest Abshagen
Michael Canfield

Inventor:
Elihu Thomson
By his Attorney: H. G. Townsend

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS.

AUTOMATIC COMMUTATOR-ADJUSTER FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 323,976, dated August 11, 1885.

Application filed April 2, 1885. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented a certain new and useful Automatic Commutator-Adjuster for Dynamo-Electric Machines, of which the following is a specification.

The object of my invention is to prevent sparking at the commutators of dynamo-electric machines. It is well known in the operation of such machines that when the strength of the current delivered from the armature of the machine changes through any difference in the resistance of the circuit due to differences in the number of lamps or other devices in operation, the so-called "neutral" line shifts, and if the brushes be unadjusted to follow such shifting a sparking will occur at the commutator.

My invention consists in automatically shifting the brushes, to follow the shifting neutral line, through the agency of a load or strain detector applied to the driving-power of the machine in such way that the increase of load put upon the driving-power by increase in the current delivered from the armature shall be felt, and shall cause an automatic adjustment of the commutator-brushes or commutator-cylinder in the proper direction to avoid spark.

My invention is particularly applicable to dynamo-electric machines when used for incandescent lighting or other purposes where, through the variations in the number of translating devices in use, the current strength of the machine is subject to changes. Any device whereby the load imposed upon the driving-power in operating the dynamo may be detected or felt may be employed in carrying out my invention, it only being necessary to connect such load or strain detector through suitable intermediate mechanism with the moving parts of the adjustable commutator in such way that the movement of the load or strain detector, consequent upon an increase in the power required to drive the dynamo, shall effect an adjustment of the commutator.

Some of the ways in which my invention may be carried out are illustrated in the accompanying drawings.

Figure 1 is an elevation of apparatus simply formed, in which the devices are combined according to my invention for the purpose of moving the commutator-brushes. Fig. 2 illustrates an arrangement whereby an adjustment of the commutator-cylinder may be effected in obedience to changes in the load put upon the driving-power. Fig. 3 is an elevation of a detail of construction.

Referring to Fig. 1, A indicates the armature of a dynamo electric machine; K, the commutator; Y, the yoke that carries the commutator-brushes, and that may, as usual, be shifted to move the brushes backward and forward upon the commutator-cylinder.

G indicates an outside or working circuit connected to the commutator and supplying incandescent lamps or other devices in multiple arc after the usual manner.

The field-of-force magnet of the machine is indicated at M, and is here shown as connected in a derived circuit of high resistance to the outside or working circuit after a well-known manner.

The commutator K is of any desired type, and is connected, as usual, to the coils upon the armature A. The winding of the field-magnets M is immaterial, and may be a "series" winding, "shunt" winding, or "compound" winding.

The yoke Y is connected by a link with the lever L, carrying an idler-pulley, I, that bears upon the belt B, and serves to move the yoke and brushes in obedience to varying strains put upon the belt through variations in the load. The spring S, applied to the lever, causes the pulley to bear upon the belt, so that the varying tension of the belt may move the lever.

It is desirable to have a second idler, I′, (indicated in dotted lines,) carried from a frame suspended from the lever L, so as to take up the slack of the belt on the side B′ when the idler I yields to the increased strain on the side B. The adjustments are made such through change of leverage or otherwise that when the load is light, due to the number of lights or other devices upon the circuit G being small, the driving strain on the belt B being correspondingly small, the brushes carried upon the yoke Y will be upon the proper neutral line of the commutator to prevent sparking. When, however, the number of

lights or other devices supplied in multiple arc from the circuit G is increased, thus decreasing the resistance for the armature, demanding more current and putting more load upon the machine, the belt B will become more tense, and the idler-pulley I will be raised, so as to move the lever L and shift the commutator-brushes forward, so as to follow the shifting neutral line, which, as is well understood, will move forward with the increased current and load. In a similar way a backward movement will occur through the action of the spring S when the load decreases, so as to follow the shifting neutral line in a backward direction.

Fig. 1 is an example only of a way of applying my invention, and I do not by any means confine myself to the particular set of devices there shown.

In Fig. 2 I have illustrated another construction of load or strain detector and another way of applying the same to the commutator so as to effect an adjustment of the latter in correspondence with variations of load. In the latter instance the arrangement is such that the commutator-cylinder may be adjusted instead of the commutator-brushes. In either case, however, it is to be understood that the commutator is adjusted, and by "adjustable commutator" I mean any commutator so constructed that either the brush or commutator cylinder may be adjusted so as to follow the shifting neutral line.

The brushes B^2 B^2 are supposed to be fixed and set by hand in the position required for normal work. The commutator-cylinder K is, however, loose upon the shaft, and is connected with devices, to be presently described, whereby it may be shifted backward on increase of load, so as to produce the same adjustment in effect as would be produced by shifting the brushes forward in the direction of revolution.

The armature A is loose upon the driving-shaft X, and the connections from the coils thereof to the commutator-cylinder K are made flexible, so as to permit the movement of one with relation to the other. The armature is driven from a pulley, P, fixed upon the shaft X through the springs S S or other flexible yielding devices, which connect said pulley with a disk, D, or other device secured to the armature. This arrangement constitutes a load or strain detector, and permits an angular movement of the armature-shaft X and pulley P with relation to the armature upon an increase of the load. The springs S are connected to pins or studs borne by disks, which are respectively fastened rigidly to the armature A and the pulley P.

In Fig. 3 the studs *d d* are supposed to be those carried by the disk D, and the studs *p p* are attached to the disk carried by the pulley P. The springs S S are attached at one end to the studs *d*, and at the other to the studs *p*. The obvious result of attempting to rotate the pulley P will be to extend the springs S with a force depending on the opposition of the armature to rotation in its magnetic field.

The relative angular movement of the shaft X and pulley P with relation to the armature is imparted, through a set of gears (indicated at G^2) analogous to the back gear of a lathe, to the commutator-cylinder. Other devices than those shown may be employed for imparting such movement; but those indicated form an effective and simple device, and also provide for imparting a magnified movement to the commutator-cylinder K.

The gear-wheels *e b* are carried upon a shaft mounted in an arm extending from the driving shaft X and gear, respectively, with a wheel, *f*, connected to the commutator-cylinder, and with a wheel, *a*, connected to the armature. A counterpoise-weight, W, for keeping the parts balanced during rotation, is preferably provided. The wheel *e* is made larger in diameter than the wheel *b*.

The operation of this arrangement is as follows: When an increased current is developed in the armature A from any cause—as, for instance, by increasing the number of devices in multiple arc upon the circuit from said armature—an extension of the springs S S to a greater degree is caused, and a movement of the shaft X with relation to the armature occurs, thus causing a movement of the arm carrying the gears *e b* and a rotation of said gears in such direction as to move the commutator-cylinder backward in a direction opposite to the direction of rotation, thus bringing the point of neutrality into coincidence with the fixed brushes, assuming them to have been correctly set at the start.

In dynamo-electric machines of most types a shifting of the neutral line takes place in a forward direction corresponding to the direction of rotation of the armature upon an increase of the current or load due to increase of the number of lamps in multiple arc.

My invention provides an effective means of weighing the increased load, and imparting to the commutator an adjustment in the proper direction to measurably compensate for the shifting of the line upon which brushes should bear, in order that little or no sparks may occur upon the commutator-cylinder.

By the term "load or strain detector" I mean any mechanical devices whereby the increased resistance of the armature to rotation may be indicated, or may work a movement of parts from which movement may be communicated to the commutator in proper direction to compensate for shifting of the neutral line.

I claim as my invention—

1. The combination, substantially as described, of an adjustable commutator and a load or strain detector combined with said commutator and controlling the adjustment thereof in accordance with the shifting in position of the neutral line, so that on a shifting of the neutral line by difference in strain or load the commutator shall be automatically set or adjusted to follow such shifting.

2. The combination, with a dynamo-electric machine, of an adjustable commutator, a load or strain detector, and devices controlled thereby for varying the set or adjustment of the commutator in the proper directions to compensate for the shifting of the neutral line.

3. The combination, with a dynamo-electric machine whose armature supplies electric lamps or other devices in multiple arc, of an adjustable commutator, a load or strain detector, and mechanism operated thereby and connected with the commutator, as described, and controlling the set or adjustment of the same, in the manner described, so as to follow the shifting of the neutral line.

4. The combination, with a dynamo-electric machine or generator supplying lamps or other devices in multiple arc, and having its field-magnet coils in a derived circuit, of an adjustable commutator, a load or strain detector, and mechanism connected with the same and with the commutator, in the manner described, to cause an adjustment in a forward direction, to compensate for a shifting forward of the neutral line when an increase in the current delivered by the armature takes place.

5. The combination, with the armature and its driving-shaft or pulley, movable with relation to one another in an angular direction, of an intermediate spring or springs and a commutator-cylinder loose upon the driving-shaft, and connected with said shaft through devices whereby it may be adjusted in a backward direction on an increase of load.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 27th day of March, A. D. 1885.

ELIHU THOMSON.

Witnesses:
M. L. THOMSON,
W. O. WAKEFIELD.