(No Model.)

E. THOMSON.

AUTOMATIC COMMUTATOR ADJUSTER.

No. 363,184. Patented May 17, 1887.

Fig. 1.

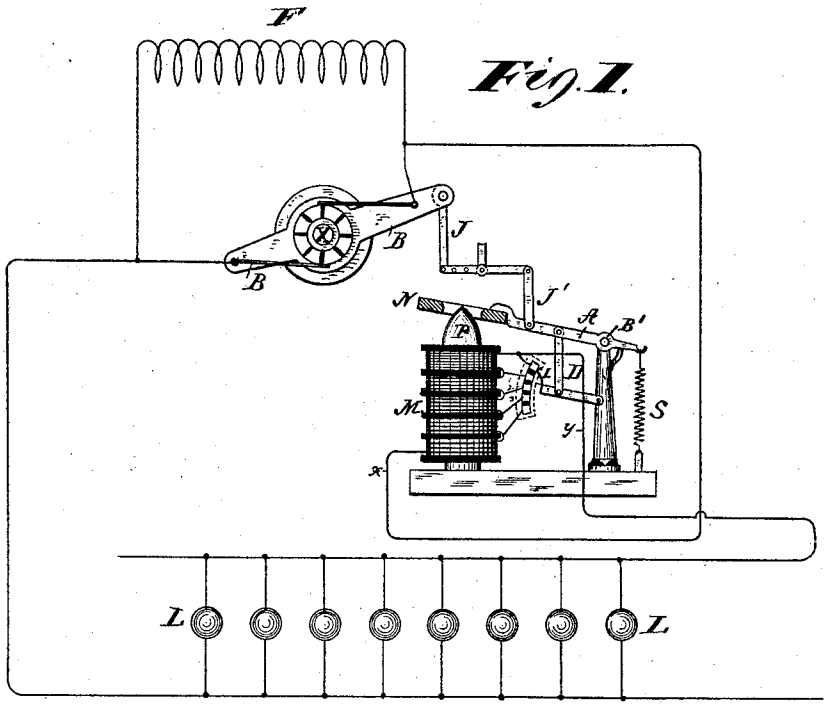


Fig. 2.

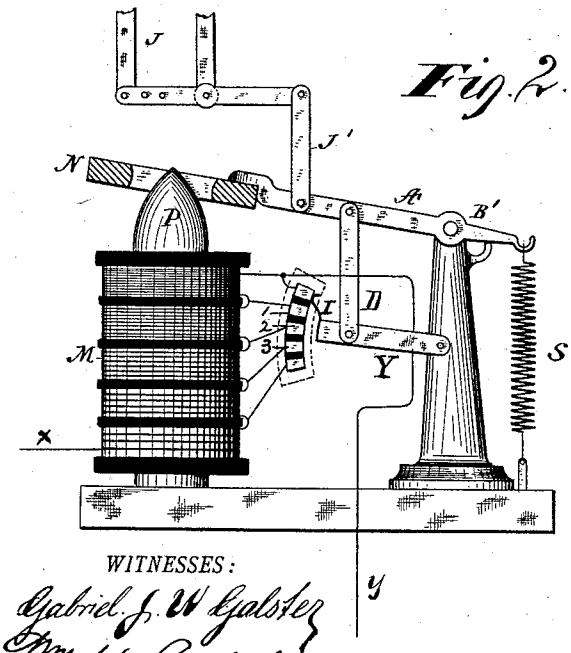
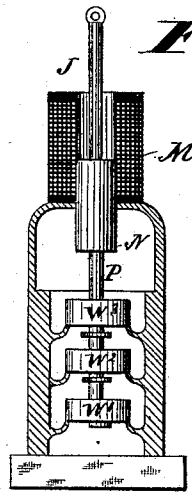


Fig. 3.



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ELIHU THOMSON, OF LYNN, MASSACHUSETTS.

AUTOMATIC COMMUTATOR-ADJUSTER.

SPECIFICATION forming part of Letters Patent No. 363,184, dated May 17, 1887.

Application filed August 25, 1886. Serial No. 211,856. (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, of which the following is a specification.

The object of the present invention is to effect an adjustment of the commutators of a machine used for supplying currents to resistances—such as incandescent lamps in multiple arc whose number may be varied—and to effect the adjustment in such way as will cause the brushes to follow the changes in the neutral line by steps or jumps of few or greater number, according to the construction and use of the apparatus.

It is often the case in operating dynamo-electric machines of improved type that there is no necessity, or very little necessity, for the adjustment of the commutator until the load reaches a determined amount, or until the current delivered has exceeded a certain limit, in which cases an adjustment may be quickly made, which will be good up to the limit of capacity of the apparatus. On taking off the load the same will be true, but in the reverse way. In other cases and with different apparatus it will be necessary to make a graduated or step by-step adjustment of the commutator in order to secure the best results. It is this graduated or step-by-step adjustment of the commutator which is the object of the present invention.

To this end my invention consists, generally speaking, in mounting the brushes upon a holder movable around the axis of the commutator and armature of the machine, a definite movement of revolution being given to the holder and brushes in the direction of revolution of the commutator and armature upon a determinate increase of current yield or load by means of an armature or equivalent portion of a translating device—such as an electro-magnet—which armature is subjected to a continued pull by the influence of the magnet, and moves with the commutator-brushes through a series of consecutive steps of adjustment.

The drawings filed with the present case illustrate one way of carrying my said invention into effect by causing the movement of the holder and brushes to be controlled by the armature of an electro-magnet located upon the main circuit, or in a part thereof, or in a branch from the same. It is evident, however, that the general purpose of my invention may be attained in other ways.

In the accompanying drawings, Figure 1 is a general view of one form of apparatus for carrying my invention into effect. Fig. 2 is an enlarged view of the electro-magnet and controlling-armature with the circuit connections thereof. Fig. 3 shows a modified form of electro-magnet and armature.

Referring to Fig. 1, B B indicate the adjustable brushes and holders movable around the axis X of the commutator of a dynamo-electric machine. Such machine may have a derived-circuit field, as indicated at F, its main current being fed to the lights L L in multiple arc (or other similar resistances) in varying numbers, or the machine may be compound wound or otherwise. In the main circuit, or in a part of it, or in a branch from the same, is an electro-magnet, M, of prolonged pulling power. The armature N, mounted upon a support, B′, gives movement to the holder and brushes through the connecting-links J J′. The armature is held retracted by the spring S when no current is on.

The helix of the magnet M is made up of several coils of wire of progressively larger diameter, beginning with a coil of fine wire next the armature end up to a large wire at the other end, which will carry the full current to which the apparatus is to respond. These coils are in series, from the finest to the coarsest, in regular order, the ends being connected into the circuit, as *x* and *y*. From the junction of the adjacent coils a connection is taken to one of a series of contacts, 1 2 3, traversed by a sliding contact connected to lever Y, and indicated at I. The sliding contact I is controlled by an attachment, D, from the armature-lever A of the armature N.

When the armature is fully retracted, all the coils of which the magnet M is made up from X to Y are in circuit and traversed by the current.

The operation of the device is as follows: An increase of current yield or load causes the armature N to be drawn down, thereby giving motion to the movable holders and brushes.

When a definite movement of the armature N has taken place, the sliding contact I, controlled thereby, reaches the contact 1, thereby shunting the fine-wire coil from the circuit, whereupon the further movement of the armature N is arrested until a considerable further increase of current yield or load, when a further movement occurs and the next finest wire is shunted at 2, and so on until only the last coarse coil is left unshunted. I thus secure a magnet which will respond to variations of current from two to three units up to one hundred to two hundred units by virtue of the increasing section and decreasing convolutions brought into action as the current is on and the lessening section and increasing convolutions when the current is diminished.

It is evident that the desired variations in the strength of the magnet M may be produced in other ways besides shunting definite lengths of wire of the magnet-coil. Thus I may attain the same object by causing the determinate changes in the current yield to cut out certain definite lengths of wire successively, or the reverse upon the decrease of the current; or I may cause these changes of current yield to reverse the direction of the current in definite lengths of wire, the general purpose being merely to increase or decrease the strength of the magnet M a definite amount upon determinate changes of current yield or load. It is evident that this arrangement is useful for other purposes beside commutator adjustment, and may be applied to any case where larger variations of current are to be applied to effect graduated movements.

In the modified form of my invention shown in Fig. 3 the magnet M is axial, and the core N is provided with a part, J, for attachment to the movable holder and brushes, and a part, P, suitably constructed to successively pick up the restraining-weights W' W^2 W^3 as the increasing load or strength of current causes the core N to be drawn into the magnet-coil M, thus giving a regular increase of restraining power, whose effects may be varied by changing the relative size and position of the weights so lifted by the core. It is evident that the axial magnet in this illustration can be replaced by magnets with prolonged pulling power with restraining forces of greatly-increased amounts, the purpose of each arrangement being to give to the commutator-brushes upon increase of load a number of successive readjustments due to the increased effects of the current in the coils of N, which respond to variations in the main current, whose main varies very greatly under different conditions of load.

I do not claim in this application giving to the commutator of a dynamo-machine a single adjustment, as that invention is the subject of another application; but

What I claim as my invention is—

1. The combination, with a dynamo-machine whose current yield or load varies within wide limits, of a movable commutator, an electro-magnet and armature responding to determinate changes in current yield or load, and means whereby said armature may impart a corresponding step-by-step movement to the commutator, said armature being in continued connection with the commutator-support and exerting a continued pull on the same through a series of consecutive changes of position.

2. The combination, with a dynamo-machine whose current yield or load varies within wide limits, of an armature, an electro-magnet of prolonged pulling power, and means whereby determinate changes of such current yield automatically effect corresponding changes in the power of such magnet in the reverse sense, thereby giving a step-by-step movement to such armature, as and for the purpose set forth.

3. The combination, with a dynamo-machine whose current yield or load varies within wide limits, of an armature, an electro-magnet of prolonged pulling power, and means whereby definite lengths of wire may be shunted in or out of the coil of the magnet upon determinate changes in the current yield or load, thereby imparting a step-by-step movement to the armature, as and for the purpose described.

4. The combination, with a dynamo-machine whose current yield or load varies within wide limits, of a movable commutator, an electro-magnet of prolonged pulling power, an armature, and means whereby definite lengths of wire may be shunted in or out of the coil of the magnet upon determinate changes of current yield or load, whereby said armature may impart a step-by-step movement to the commutator, as and for the purpose described.

5. The combination, with a dynamo-machine whose current yield or load varies within wide limits, of an armature, an electro-magnet of prolonged pulling power whose helix is composed of sections of wire of progressively larger or smaller diameter arranged in series, and means whereby such sections may be successively shunted in or out of circuit upon determinate changes of current yield or work, thereby imparting a step-by-step movement to the armature, as and for the purpose described.

6. The combination, with a dynamo-machine whose current yield or load varies within wide limits, of an electro-magnet or other translator of electric energy responding to determinate changes in such current yield or load, and imparting a graduated movement to the armature or corresponding part that is constantly within the attractive influence of such magnet or translator through a series of consecutive changes of position, as and for the purpose described.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 19th day of August, A. D. 1886.

ELIHU THOMSON.

Witnesses:
J. W. GIBBONEY,
E. WILBUR RICE, Jr.