

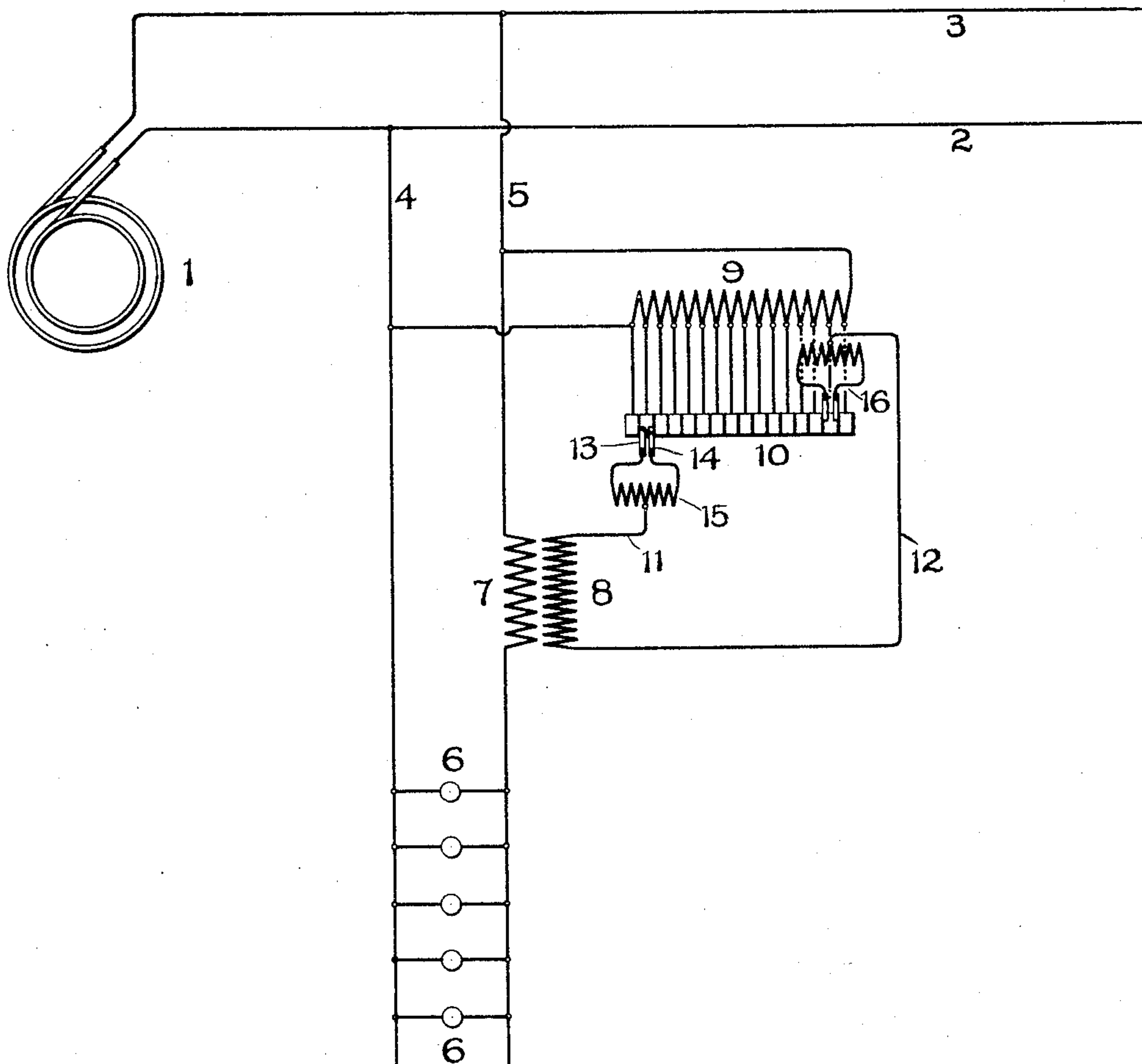
No. 687,147.

Patented Nov. 19, 1901.

R. FLEMING.  
REGULATOR.

(Application filed July 20, 1900.)

(No Model.)



Witnesses:

*Lewis P. Abell.*  
*Alexander S. Hunt.*

Inventor:

Richard Fleming,  
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Atty.

# UNITED STATES PATENT OFFICE.

RICHARD FLEMING, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## REGULATOR.

SPECIFICATION forming part of Letters Patent No. 687,147, dated November 19, 1901.

Application filed July 20, 1900. Serial No. 24,308. (No model.)

*To all whom it may concern:*

Be it known that I, RICHARD FLEMING, a subject of the Queen of Great Britain, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Regulators, (Case No. 1,665,) of which the following is a specification.

In practice the regulation of alternating-current circuits is frequently secured by the use of a transformer-winding in series with the circuit to be regulated, the desired variation of voltage being effected by corresponding variation in the active length of such winding. In cases, however, where either the current or voltage in the circuit is high difficulties arise due to the arcing which takes place in shifting the connections of the circuit from point to point in said winding. This objection, as well as others of a related nature, I have found may be obviated by using a regulating-transformer and securing the desired variation in electromotive force of the regulating-winding by varying the electromotive force impressed on the regulating-transformer.

In the particular embodiment of the invention which I have shown in the drawing the electromotive force impressed upon the primary winding of the regulating-transformer is made variable as well as reversible by shifting the primary terminals or leads of the regulating-transformer across a series of contacts connected at suitably-graduated intervals to a compensator-winding supplied from the main circuit.

The drawing illustrates this arrangement, while the claims appended hereto set forth its points of novelty.

For the sake of simplicity I have shown my invention as applied to a single-phase alternating-current system; but it is of course to be understood that it may, if found desirable, be applied to a multiphase system.

At 1 I have conventionally indicated a source of single-phase current connected to mains 2 3. From these mains any suitable consumption circuit or circuits may be fed.

At 4 5 are shown the feeders of a branch circuit supplying current to translating devices, (indicated at 6.) In order to regulate

the electromotive force impressed upon these translating devices, I make use of a regulating-transformer having a secondary winding 7 and primary winding 8, the secondary winding being in series with one of the feeders of the circuit to be regulated—as, for example, the feeder 5—while the primary winding is excited from a compensator 9, the terminals of which are connected across the feeder-circuit 4 5. To secure a variable electromotive force from the compensator, a series of contacts 10 are connected to points in the compensator-winding separated from each other by suitably-chosen intervals. The terminals 11 12 of the regulating-transformer are connected, respectively, to contact devices adapted to slide back and forth along this set of contacts 10. Each contact device consists of two contact-fingers placed side by side and joined through the winding of an inductance-coil. The regulator-terminal is connected to a point situated midway between the ends of this winding. This arrangement is indicated in diagram in the drawing, in which 13 14 represent the co-operating contact-fingers of a contact device, these contact-fingers being joined electrically to the terminals of the winding of an inductance-coil 15. The terminal 11 of the regulating-circuit is connected with the central point in this winding. The other terminal 12 of the regulating-circuit is connected to a similar contact device 16. The inductance-coil of each contact device prevents short-circuiting when a pair of contacts are bridged by co-operating contact-fingers, but does not oppose the regulating-current, since the latter divides and flows in opposite directions through the winding.

In the operation of the device described the regulating effect may be varied by simultaneously moving the two contact devices in opposite directions. If moved toward each other from the positions indicated in the drawing, it is evident that the electromotive force impressed upon the primary of the regulating-transformer will gradually decrease until the contact devices come opposite each other, at which time the electromotive force will be zero. A continued movement of the contact devices will cause the electromotive force to



gradually increase, but in a direction the opposite of that which before existed. By suitable manipulation of the contact devices it will therefore be evident that the electromotive force of the regulating-transformer may be varied from a maximum in one direction through zero to a maximum in the other direction, thereby rendering it possible to obtain a maximum boosting effect and also a maximum depressing effect. Since the contact-shifting apparatus is not connected directly in the circuit to be regulated, it is evident that the parts may be so designed as to obviate any difficulty due to arcing and burning at the contacts regardless of what may be the voltage or current in the circuit to be regulated.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination of a source of alternating current, conductors supplied thereby with alternating current, a compensator connected to said conductors, a series of fixed contacts

connected to points in the winding of said compensator, a transformer having one of its windings in series with one of said conductors, and means for adjustably connecting another of the windings of the transformer to said series of fixed contacts.

2. The combination of a source of alternating current, conductors supplied thereby with alternating current, a compensator connected to said conductors, a series of fixed contacts connected to points in the winding of said compensator, a transformer having one of its windings in series with one of said conductors, and means for adjustably and reversibly connecting another of the windings of the transformer to said series of fixed contacts.

In witness whereof I have hereunto set my hand this 18th day of July, 1900.

RICHARD FLEMING.

Witnesses:

DUGALD MCKILLOP,  
HENRY O. WESTENDARP.