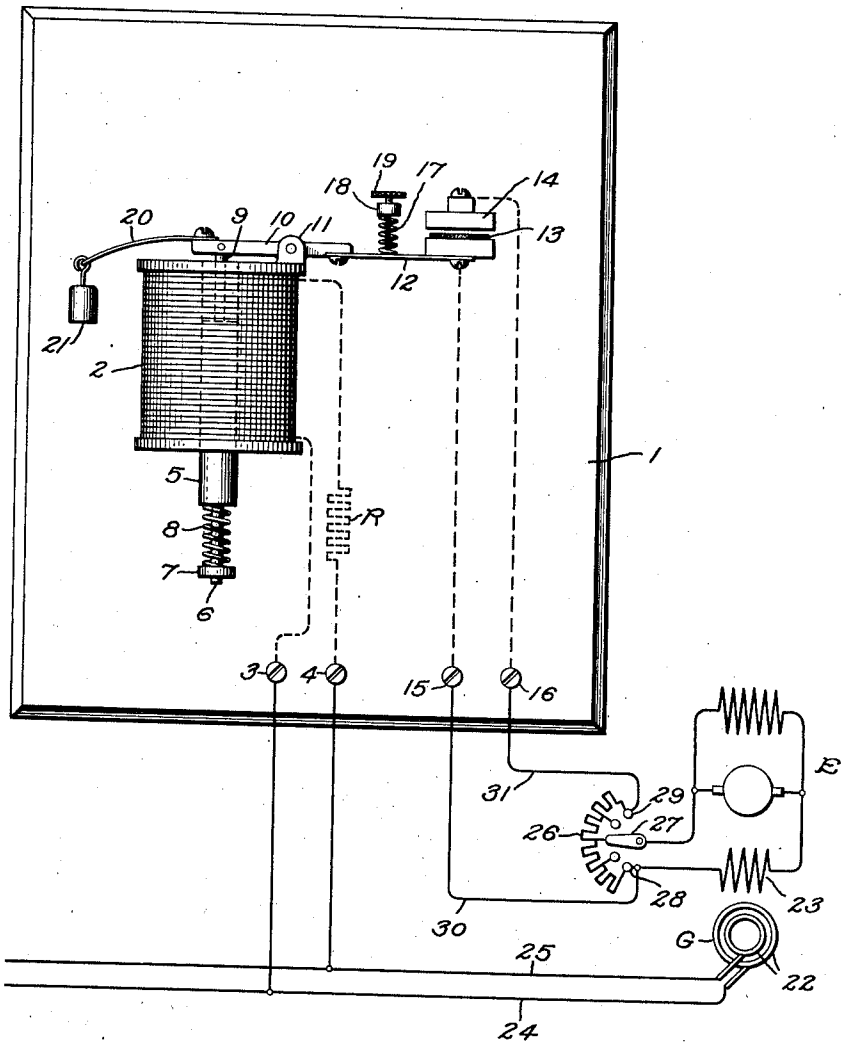
L. W. THOMPSON.

ELECTRICAL REGULATOR.

APPLICATION FILED JAN. 4, 1917.

1,316,983.

Patented Sept. 23, 1919.



Inventor:
Louis W. Thompson,
by Albert G. Davis
His Attorney

UNITED STATES PATENT OFFICE.

LOUIS W. THOMPSON, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRICAL REGULATOR.

1,316,983. Specification of Letters Patent. Patented Sept. 23, 1919.

Application filed January 4, 1917. Serial No. 140,637.

To all whom it may concern:

Be it known that I, LOUIS W. THOMPSON, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Electrical Regulators, of which the following is a specification.

My invention relates to the regulation of alternating current circuits and more particularly to the voltage regulation of alternating current generators.

The object of my invention is to devise a simplified and inexpensive regulator for regulating without hunting an alternating current circuit. To this end I employ a regulator having a vibratory member for controlling a condition of an alternating current circuit in accordance with the character of its vibrations and means for vibrating said member at the frequency of said circuit. Other features of my invention will hereinafter appear.

My invention will be more readily understood by reference to the drawing, in which the preferred construction of the regulator and the electrical connections thereof are illustrated. With special reference to the construction of the regulator, upon the panel 1, which is preferably of insulating material, is fixed an electromagnet 2 having a movable core 5 of soft iron. The leads from the electromagnet are connected between the terminals 3 and 4 and in one of the leads is connected a resistance R. The movable core 5 is provided with a reduced extension 6 at its lower end which coöperates with the apertured member 7, which is fixed to the panel 1 and serves as a guide for said core. Between the core 5 and said member 7 is located a spiral spring 8. The core 5 is also provided with a reduced extension 9 to the upper end of which is pivotally connected the lever 10 which in turn is pivotally supported in the fixed lugs 11. To one end of said lever is resiliently attached, by means of the flat spring 20, a weight 21. To the other end of said lever is secured, by means of the flat spring 12, a movable contact 13 which is adapted to coöperate with the stationary contact 14 which is fixed to the panel 1. The movable contact 13 is electrically connected to the terminal 15 and the stationary contact 14 is electrically connected to the terminal 16. The contact 13 is preferably made of carbon, and the contact 14 may be made of metal. A spring 17, the tension of which may be adjusted by the screw 19 which has threaded engagement with the supporting member 18, is adapted to bear upon the spring 12.

With special reference to the system in which my regulator is employed, the alternating current generator G is connected by means of slip rings 22 and the usual brushes to conductors 24 and 25, to which are electrically connected by suitable leads the terminals 3 and 4. The field 23 of the generator is excited by means of the exciter E. In circuit with said field winding 23 and the exciter E is connected a resistance 26. The terminals 28 and 29 of said resistance are connected by means of leads 30 and 31 to terminals 15 and 16. By means of the movable contactor 27 the amount of variation in the resistance of the circuit including the field winding 23 may be adjusted.

By reason of the connections between the coöperating contacts 13 and 14 and the resistance 26, it is apparent that upon the engagement of said contacts the resistance terminals 28 and 29 are bridged and hence the portions of the resistance 26 extending between the contactor 27 and the terminals 28 and 29 will be connected in parallel and inserted in the circuit of the field winding 23. On the other hand, when the contacts 13 and 14 are disengaged, only that portion of the resistance 26 which extends between the member 27 and terminal 28 will be inserted in the circuit of the winding 23. Consequently, by the closing and opening of the contacts 13 and 14, the energization of the field 23 of the generator will be varied between maximum and minimum values. The maximum field energization and the minimum field energization respectively would, if continued, give generator voltages above and below the desired generator voltage.

I at present understand the operating of my regulator, as applied to the system disclosed to be as follows: The tension of the spring 17 will first be adjusted so that the core 5 of the electromagnet will vibrate with the frequency of the generator voltage. In other words, my regulator is tuned to the frequency of the generator voltage. Consequently the movable contact 13 will vibrate with the frequency of the generator voltage

and the amplitude of its vibration will depend upon the maximum values of the generator voltage wave. The relative periods during which the contacts 13 and 14 are engaged and during which they are disengaged, will depend upon the amplitude of vibration, and therefore upon the generator voltage. Hence, if the maximum value of the generator voltage wave is above the desired value, contacts 13 and 14 will be disengaged for such periods that the maximum value of the generator voltage wave will be decreased, whereas, if the maximum value of the generator voltage wave is below the desired value, said contacts 13 and 14 will be engaged for such periods that the maximum value of the generator voltage wave will be increased.

In the operation of the regulator, the spring 12 permits the lever 10 to continue its movement, even though contacts 13 and 14 are engaged. The spring 17 not only constitutes means whereby the regulator may be readily tuned, but also apparently prevents a too violent engagement of the contacts 13 and 14. The resiliently supported weight 21 by reason of its inertia effect gives a more uniform and steady vibration to the moving parts of the regulator. The spring 8 functions to cushion the downward movement of the core 5 and to assist in reversing the movement thereof.

Although I have disclosed my regulator applied to the control of a single phase generator, it is of course obvious that it may be employed to control a polyphase generator if the terminals 3, 4 be connected across one phase of the generator.

I conceive that various modifications of the particular arrangement herein outlined might readily be made, and I therefore do not desire to be limited to the exact arrangement shown and described, but seek to cover in the appended claims all those modifications which fall within the scope and spirit of my invention.

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

1. The combination with an alternating current circuit, of an automatic regulator therefor comprising a vibratory member tuned to the frequency of said circuit and arranged to control a condition of said circuit in accordance with the character of its vibrations, and means responsive to an electrical condition of said circuit for causing said member to vibrate.

2. The combination with an alternating current generator, of an automatic regulator comprising a vibratory member tuned to the frequency of said generator and arranged to control the excitation of said generator in accordance with the amplitude of its vibrations, and means for vibrating said member with an amplitude dependent upon an electrical condition of said generator.

3. An automatic regulator for alternating current circuits comprising a winding adapted to be connected with the circuit to be regulated, a vibratory member adapted to be actuated by said winding, a contact connected to said member by means of a resilient member and means coöperating with the vibratory member and the resilient member whereby the frequency of vibration of the vibratory member may be made to correspond with the frequency of the circuit.

4. An automatic regulator for regulating the voltage of an alternating current circuit comprising a winding adapted to be connected across a phase of the circuit, a member adapted to be vibrated by said winding, a weight resiliently supported by said member, a contact connected to said member by means of a resilient member, an adjustable spring adapted to coöperate with said resilient member and a stationary contact adapted to coöperate with the first named contact to control the circuit voltage.

5. The combination with an alternating current generator, of means for exciting the field thereof, a plurality of coöperating contacts for controlling the excitation of said field in accordance with their relative periods of engagement and disengagement, a vibratory member tuned to the frequency of said generator and arranged to cause said contacts to alternately engage and disengage, the duration of the engagements of said contacts being dependent upon the amplitude of the vibrations of said member, and means for vibrating said member with an amplitude dependent upon an electrical condition of said generator.

6. The combination with an alternating current generator of a source of direct current adapted to excite the field thereof, and means for automatically maintaining the voltage of said generator substantially constant comprising a regulator having an electromagnet connected across a phase of said generator and provided with a movable core, a balancing spring adapted to coöperate with said core, a pivoted member connected to said core, a weight resiliently supported from one end of said member, a contact supported from the other end of said member by means of a resilient member, an adjustable spring adapted to coöperate with said resilient member and a stationary contact adapted to coöperate with the first named contact to control the generator field excitation.

In witness whereof I have hereunto set my hand this 3rd day of January 1917.

LOUIS W. THOMPSON.