(No Model.) 2 Sheets—Sheet 1.

C. M. JORDAN.

ELECTRIC CURRENT REGULATOR.

No. 536,530. Patented Mar. 26, 1895.

Fig. 1

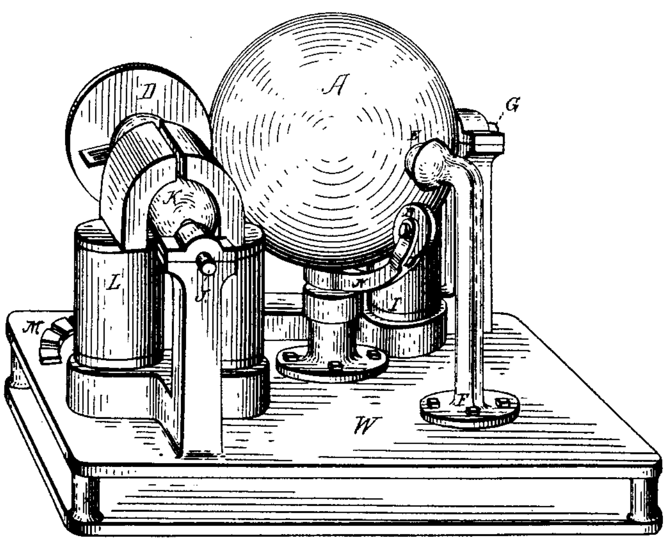
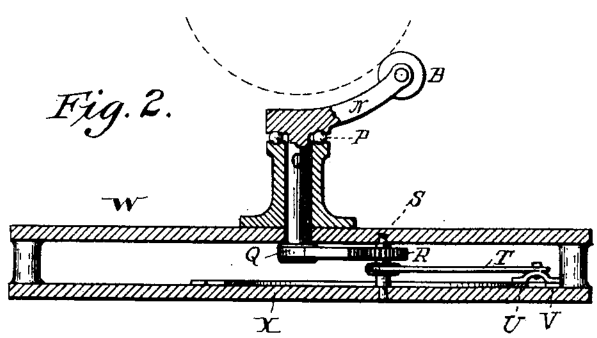


Fig. 2.



WITNESSES

Severance
G. A. Dessez

INVENTOR

Charles M. Jordan
per Patterson & Nesbitt
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 3.

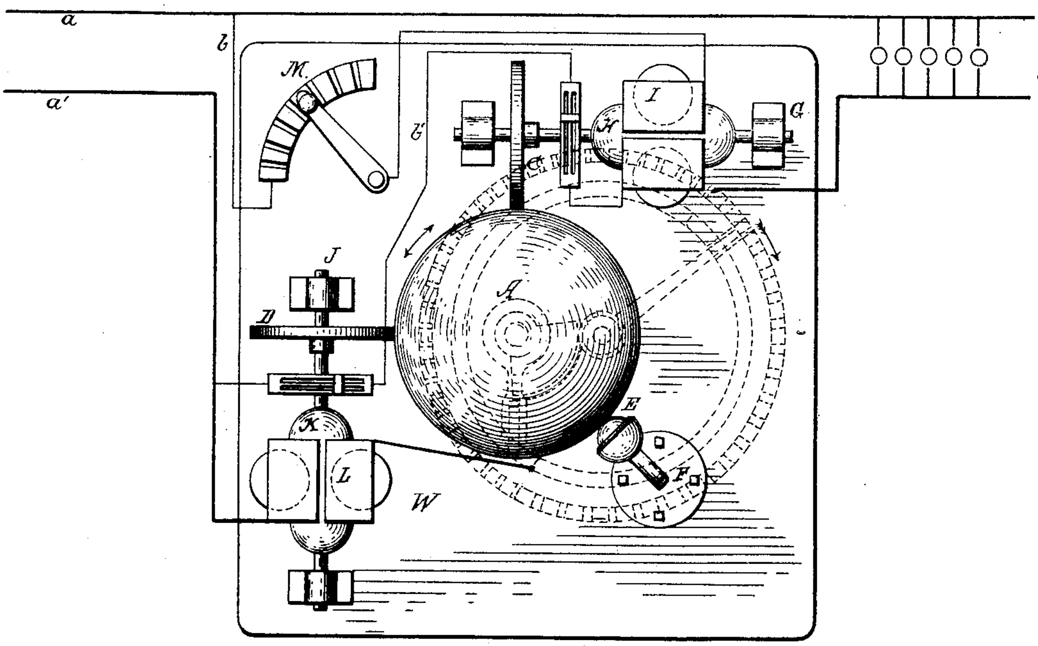
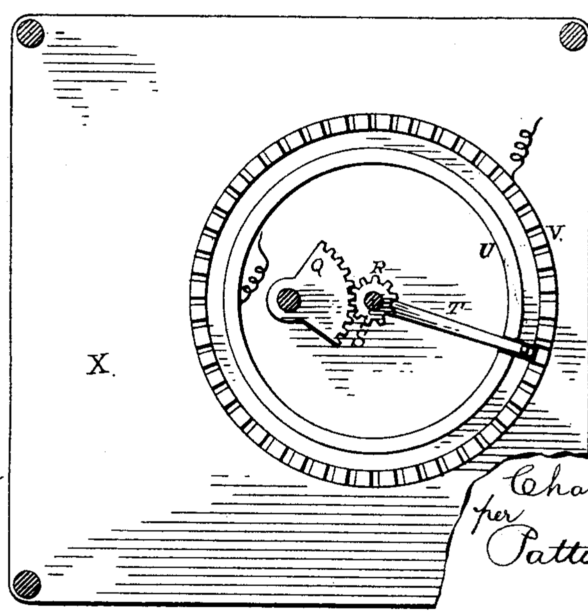


Fig. 4.



WITNESSES

INVENTOR

Charles M. Jordan
per
Pattison & Nesbit
attys.

UNITED STATES PATENT OFFICE.

CHARLES M. JORDAN, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTRIC-CURRENT REGULATOR.

SPECIFICATION forming part of Letters Patent No. 536,530, dated March 26, 1895.

Application filed February 13, 1895. Serial No. 538,249. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. JORDAN, of Washington, in the District of Columbia, have invented certain new and useful Improvements in Electric-Current Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to the method and apparatus for regulating either continuous or alternating electric current circuits.

The primary object of my invention is to provide motors, one driven by a circuit not subject to the fluctuations of the working circuit, and the other subject to the fluctuations of the working circuit, the two motors operating in opposition to each other for moving or controlling an electric current regulator within the working circuit.

Another part of my invention relates to the construction of the moving part of the apparatus which is based upon a well known principle of kinematics and is applied by the action of two wheels or disks movable around axes approximately at right angles to each other, on a sphere free to move in all directions by which the sphere will take on a combined motion around a third horizontal axis, forming a certain angle with each of the two others. The velocity of the rotation of the sphere will depend upon the absolute velocity of the two motions, but the direction of its axis will depend upon their relative velocity.

Another feature of my invention consists in the introduction in the circuit of two motors, the field and armature of one being acted upon by the constant strength of current, while in the other the armature is made to carry the current of constant strength, the field being excited by the current which varies with consumption.

In the drawings I have illustrated the regulator as connected up in the manner preferable when it is to be employed for controlling the consumption of energy on a continuous circuit, although the mechanical features and constructions hereinafter described, are applicable to alternating currents as well.

In the accompanying drawings, Figure 1, is a perspective or isometrical projection of an automatic regulator. Fig. 2 is a sectional view of the satellite wheel, its arm and vertical shaft, with the gear wheels and arm acting on the segments of the resistance coils. Fig. 3 is a plan view of the apparatus. Fig. 4 is a plan view of the segment and lever connected therewith, also the segmental gear-wheel attached to the bottom of the vertical shaft.

Referring now to the drawings, A is a metal sphere which is placed upon and supported by the small wheel B, the disks C and D and the small ball E said ball being held in a receptacle in the standard F, and is free to move in any direction, it serving solely for maintaining the sphere A in place, while the disks C and D communicate motion to it.

The disk C is attached to the shaft G of the armature H of the motor I, said motor being in a branch circuit b and b' of high resistance across the mains a and a' as indicated, so that it will be traversed by a current constant in amount.

The disk D is attached to the shaft J of the armature K of the motor L. The said armature K is in the same branch b and b' of high resistance as the field and armature of the motor I, while the field exciting coils of the motor L are included in the main electric circuit with the translating devices, as shown in Fig. 3, so that the strength of the field will vary with the consumption of energy on the circuit.

M is an artificial resistance in the circuit of the motor I, and the armature K of the motor L.

The disk C, actuated by the motor I, gives a rotation of uniformity to the sphere A, while the rotation of disk D, actuated by motor L, is dependent upon the consumption of energy in the circuit a and a', and deflects the instantaneous axis of rotation of the sphere A at a point between said disk, to a degree so much the greater or lesser in proportion as the revolutions of the armature K is increased or diminished by the amount of current passing through the circuit.

A sphere A rests upon the small wheel B, which carries the bulk of its weight and is free to revolve with it so that the wheel B will seek to economize work, and will so place itself as to roll over the sphere without slid-

ing, and its axis will then be parallel with the instantaneous axis of rotation of the sphere A.

The wheel B is mounted on an arm N (Fig. 2) movable around a vertical axis O, placed beneath the center of the sphere A, said arm N resting on the ball bearings P, to reduce friction.

At the bottom of the shaft or axis O is attached a segment or gear-wheel Q (Figs. 2 and 4) which meshes with a smaller gear-wheel R on the shaft S, and to the same shaft is attached an arm T, at the terminal end of which is an arch shaped piece which makes contact with the ring U and segments V of the resistance coils interposed in the main circuit.

The working parts of the apparatus rest on a sub-base W while the ring U and segments V rest on the base X.

I will now briefly describe the working of the regulator. The disk C revolving, but no current passing through the main line to translating devices and consequently the disk D being quiet, the sphere A will revolve in the same plane as the disk C. The small wheel or satellite B will also be in the same plane and the arm T will be on the segment of the resistance coils V representing the highest resistance. When the current on the main line is turned into a translating device or devices the current passing through the field coils of the motor L will set the disk in motion and the plane of revolution of the sphere A will be changed to a point between and representing the mean of the velocities of the disks C and D. At the same time the small wheel B will move to the same plane and turn the arm T to a segment representing less resistance and so on as more current is turned on. In turning off current the reverse of this will take place, the disk D will gradually revolve slower, the sphere A gradually approach the plane of revolution of the disk C the wheel B also, and the arm turn to segments representing greater resistance.

It is obvious that the resistance V could consistently be placed in the field magnet circuit of the dynamo if circumstances so dictated.

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

1. The method of controlling electric currents, consisting in driving a motor subject to the fluctuations of the controlled current, driving a motor not subject to the fluctuations of said current, and in causing said motors to act upon a current controlling device in angularly displaced relation, whereby the movement of the controller is conformed to the resultant action of said motors.

2. The method of controlling electric working currents, consisting in driving a motor at approximately a uniform speed, driving a motor at varying speeds according to the fluctuations in intensity of the controlled current and in causing said motors to act in opposition upon a current controlling device, whereby the movement of the controller is conformed to the resultant action of said motors.

3. The method of controlling electric currents, consisting in driving a motor subject to the fluctuations of the controlled current, driving a motor by a shunt circuit of a predetermined fixed intensity or strength, deriving said shunt current from the controlled circuit, and in causing said motors to act in opposition upon a current controller, whereby the movement of the controller is conformed to the resultant action of said motors.

4. An electric current controller or regulator comprising a motor driven at approximately a uniform speed, a motor driven at varying speeds according to the intensity or strength of the working circuit or current, a current controller within the working circuit, and a differential mechanism for operating the current controller which is driven by the said motors.

5. An electric current controller or regulator comprising a motor within a branch or shunt circuit of high resistance whereby it is driven at approximately a predetermined uniform speed, and a motor within driven by and subject to the fluctuations of the working circuit, the current regulator or controller within the working circuit, and a differential mechanism between the current regulator and the said motors, the said differential mechanism being driven by the motors.

6. An electric regulator or controller for working circuits, comprising in the working or main circuit a branch or shunt circuit, a high resistance within the branch or shunt circuit, a motor within and driven by the said shunt or branch circuit, a motor within and driven by and subject to the fluctuations of the working circuit, a current controller, and a differential mechanism operated by and between the motors, and a current controller.

7. A current regulator or controller for working circuits, comprising a branch or shunt circuit deriving its current from the working circuit and having a current of a pre-determined fixed strength of intensity a motor within and driven by said branch or shunt circuit, a current regulator or controller with the working circuit, a motor within driven by and subject to the fluctuations of the working circuit, and a differential mechanism driven by and between the said motors and the current regulators.

8. An electric regulator or controller for working circuits comprising a branch or shunt circuit receiving its current from the working circuit, a high resistance within the shunt or branch circuit, a motor wholly within the branch or shunt circuit and operated thereby at an approximately pre-determined fixed speed, a current controller or regulator within the working circuit, and a motor having its armature within one circuit and its field within another circuit, and a mechanism driven by the motors and between them and the electric regulator or controller.

9. An electric regulator or controller for currents, comprising a current regulator or controller within a working circuit, two motors carrying disks, a sphere freely rotatable in all directions and resting upon said motor disks and the current regulator, the motor disks operating the sphere for the purpose described.

10. A current regulator or controller comprising two electrically propelled motors having disks, the one of said motors being run at approximately a uniform velocity, and the other at varying velocities, and a sphere freely rotatable in all directions resting upon said motor disks, and the electric controller or regulator whereby the axis of the sphere is shifted to a point between the said disks according to the difference in velocity of said motors.

11. A current regulator or controller comprising two motors carrying disks at approximately right angles to each other, a current controller for a circuit, and a sphere freely rotatable in all directions driven by the motors and resting upon them, and engaging the said current regulator.

12. An electric regulator or controller comprising rotating disks placed at an angle to each other, a sphere resting upon and driven by the said disks, and a satellite arm or lever having one end adapted to engage the said sphere and its opposite end operating a current controller.

13. A current regulator or controller comprising rotating disks journaled at right angles to each other, a sphere freely rotatable in all directions partly resting upon and driven by the said disks, a vertical shaft journaled below and approximately at the center of the said sphere, an outwardly extending arm at the upper end of said shaft carrying a wheel engaging the said sphere, and an electric regulator or controller operatively connected with said vertical shaft.

14. An electric regulator or controller rotating disks journaled at an angle to each other, a sphere resting upon and driven by the said disks, a freely swinging arm or lever adapted to engage and be operated by the said sphere, and an electric regulator or controller operatively connected to the said arm or lever.

15. An electric current controller comprising a continuously operating motor driven at approximately a uniform speed, a continuously operating motor driven at various speeds according to the intensity of the controller current, and a current controlling device operated by said continuously operating motors.

16. An electric current controller comprising a motor within and driven by and subject to the fluctuations of the controlled circuit, a motor within and driven by a shunt circuit of the controlled circuit and having an approximately uniform intensity, for the purpose described, and a current controlling device for said controlled circuit operated by said motors.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES M. JORDAN.

Witnesses:
A. S. PATTISON,
JAMES W. BERAN.