(No Model.)

O. OFFRELL.

DEVICE FOR REGULATING CONSTANT CURRENT DYNAMO ELECTRIC MACHINES.

No. 501,532. Patented July 18, 1893.

FIG. 1.

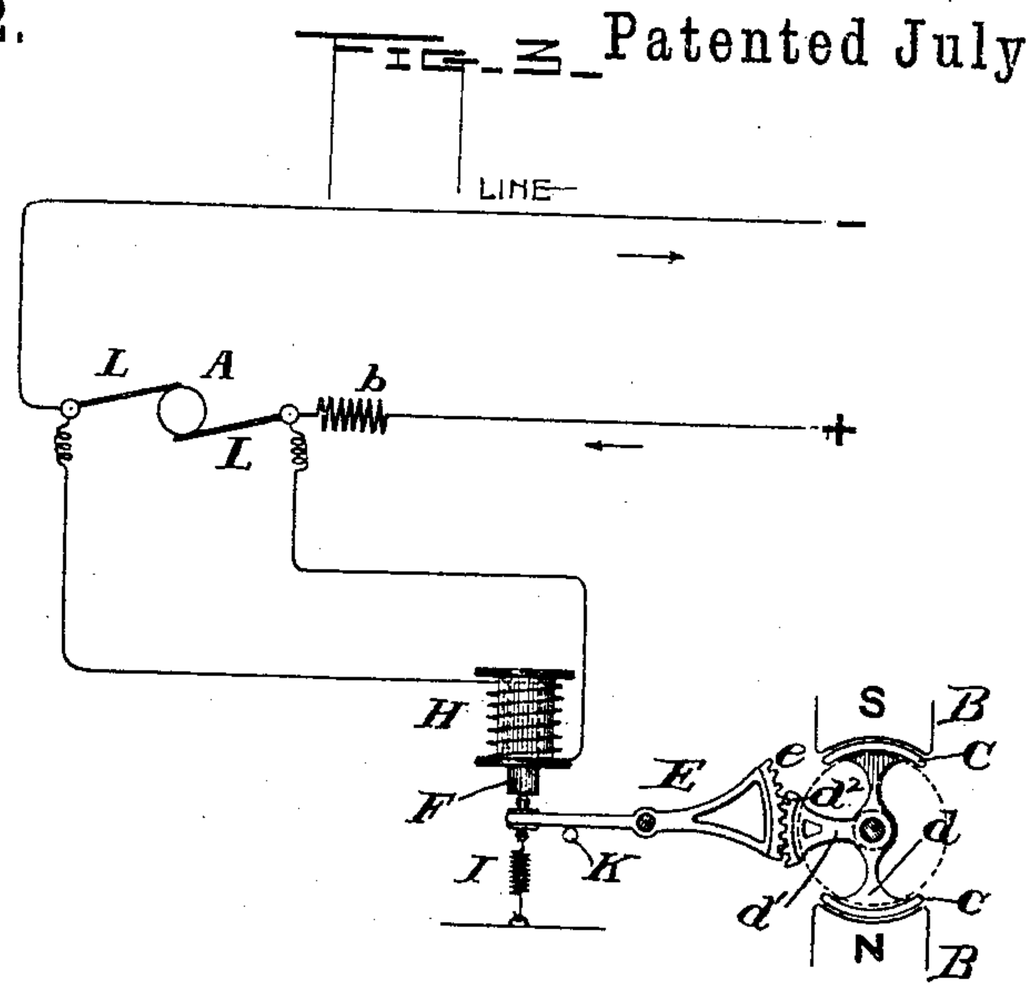


FIG. 2.

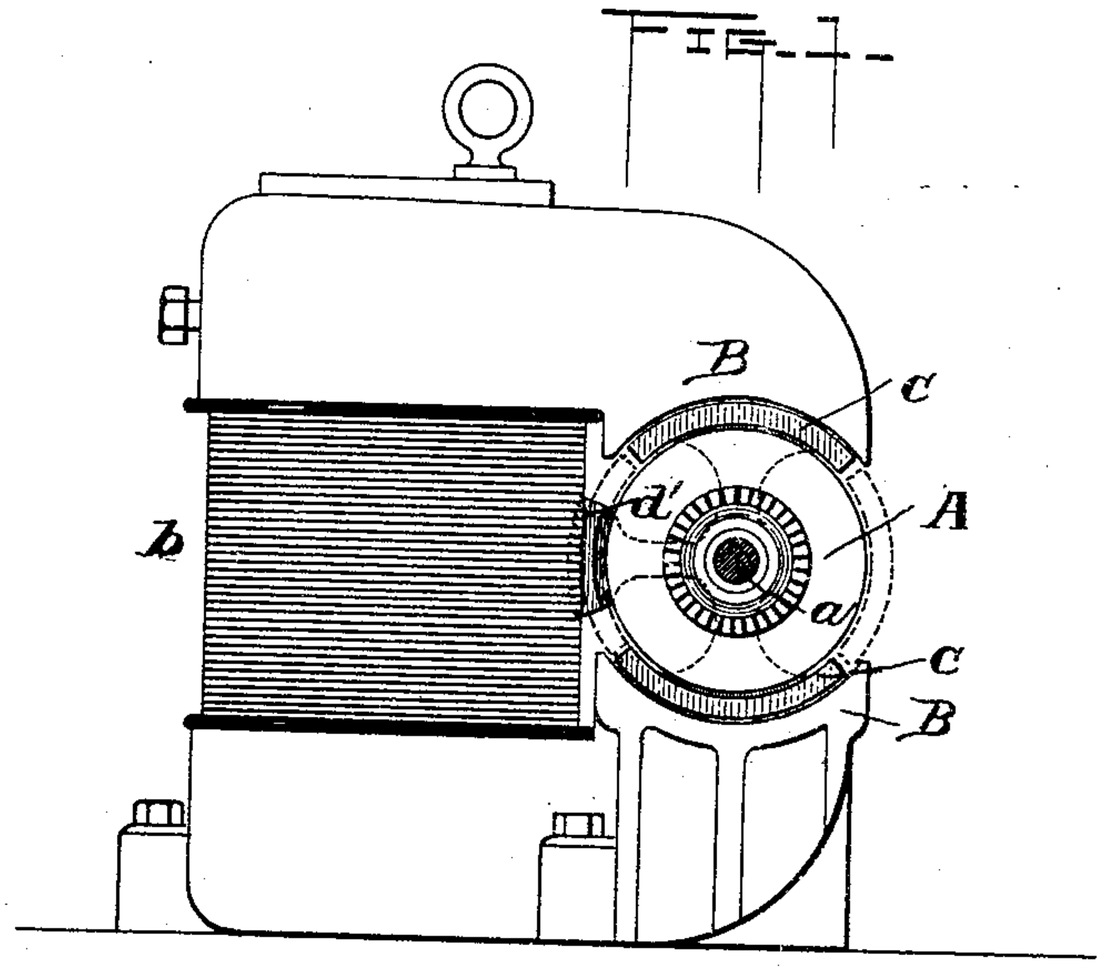
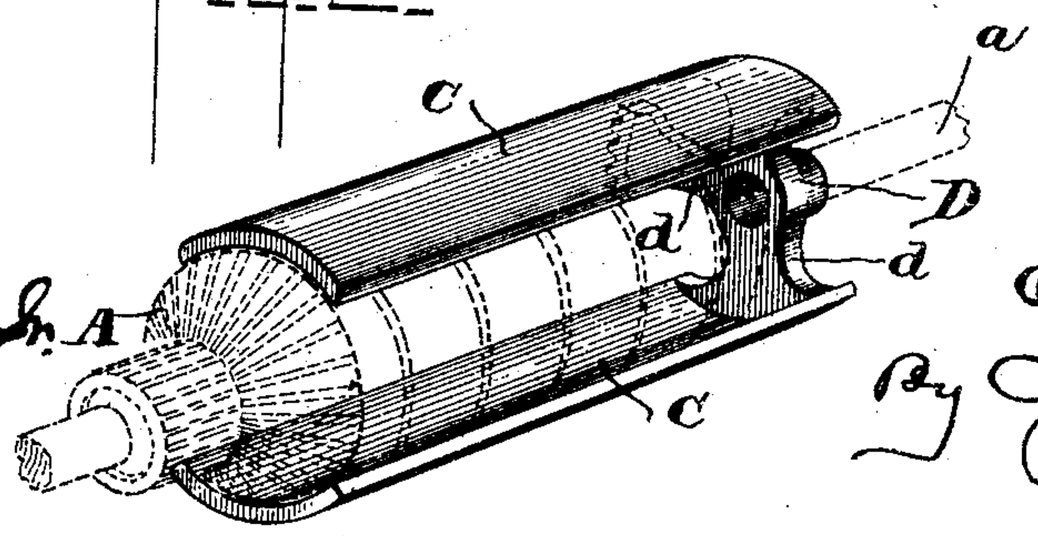


FIG. 3.



Witnesses
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UNITED STATES PATENT OFFICE.

OLOF OFFRELL, OF MIDDLETOWN, CONNECTICUT, ASSIGNOR TO THE SCHUYLER ELECTRIC COMPANY, OF CONNECTICUT.

DEVICE FOR REGULATING CONSTANT-CURRENT DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 501,532, dated July 18, 1893.

Application filed December 12, 1892. Serial No. 454,899. (No model.)

To all whom it may concern:

Be it known that I, OLOF OFFRELL, a citizen of the United States, residing at Middletown, in the county of Middlesex and State of Connecticut, have invented certain new and useful Improvements in Devices for Regulating Constant-Current Dynamo-Electric Machines; 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 appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to dynamo electric machines, and its objects are to prevent waste of power, and enable the speed of the motor to be accurately and, if desired, automatically regulated.

The speed of a series motor depends upon the electromotive force of the current and the resistance of the circuit. When the current and the resistance of the circuit remain constant, the speed can be controlled only by varying the strength of the field, that is, the number of lines of force passing through the armature. This is usually done by switching in or out coils of the field magnet; but it has been proposed to use a magnetic shunt, to divert some of the lines of force from their normal path through the armature. My deflector is such a device, being based upon the fact that the lines of force in a magnetic field tend to follow the path of least magnetic resistance, and the invention consists in a movable iron shunt, or deflector, arranged between the armature and the pole pieces. The lines of force follow the deflector when it is moved out of line with the armature and pole pieces, thereby decreasing the number of lines passing through the armature and weakening the counter-electromotive force. When the deflector is moved back into line with the pole pieces, more lines of force pass through the armature.

In the drawings,—Figure 1 is an elevation of a motor embodying my invention. Fig. 2 shows the deflector in perspective; and Fig. 3 is a diagram of an automatic regulator.

Between the armature A and the faces of the pole pieces B of the field magnet, are interposed two plates C of iron, preferably wrought iron. The plates are segments of a cylinder whose axis coincides with that of the armature shaft. They each include about a quarter of the circle, and are carried on arms d projecting from a sleeve D, which is free to turn on the armature shaft a, or other suitable bearing concentric therewith. The plates extend preferably from one end of the armature to the other.

The operation of my invention is as follows: When the load on the motor is decreased, the armature tends to increase in speed, or "race." This develops an increased counter-electromotive force, tending to cut down the current. In order to keep the current constant, this counter-electromotive force must be reduced, and this can be accomplished by weakening the field, that is, the number of lines of force cut by the armature coils. My invention effects this by enabling the operator to deflect some of the lines of force away from the armature, by turning the deflector so as to move the plates C partially or wholly out from between the pole pieces and the armature: since the lines of force seek the path of least magnetic reluctance, and will follow the plates out around the armature. The result is the same as though the current flowing through the coils of the field magnets had been weakened. The armature coils cut fewer lines of force, and thus the counter-electromotive force is diminished. By varying the position of the deflector to correspond with the changes in load, a regular speed may be maintained.

The deflector may be moved by hand, suitable locking devices being used to hold it when adjusted. I prefer, however, to render it automatic in its action, in order to keep the motor at a constant speed under variations in the load. To this end, an arrangement such as is shown in Fig. 3 may be used. An arm d' projects from the sleeve D, carrying a segment gear d^2, with which meshes a segment gear e on the end of a lever E, the other end of which is attached to the movable core F of a solenoid H. A spring I keeps the lever normally against a stop K, in which position the deflector lies between the pole pieces and the armature. The solenoid is in shunt from the

brushes L L of the motor armature A, *b* being the field magnet coil. The solenoid is responsive to the counter-electromotive force generated by the armature, and when this increases upon a decreasing of the load, the solenoid attracts its core, thereby moving the lever and swinging the deflector out of line with the pole pieces, in order to weaken the field and reduce the counter-electromotive force, as above set forth. The tension of the spring may be adjusted to render the regulating action of the solenoid automatic within given limits.

The effect due to the shunting of the magnetic lines is augmented by the increased width and consequent greater magnetic resistance of the air-gap between the armature and the pole pieces, when the plates are swung out from between them.

I have described the regulator as applied to a motor but it is equally well applicable to a dynamo.

Having thus described my invention, what I claim is—

1. A regulator for a dynamo electric machine, consisting of an iron plate adapted to be moved between the armature and the pole of the field magnet, substantially as described.

2. A regulator for a dynamo electric machine, consisting of an iron plate adapted to be moved from one pole of the field magnet toward the other pole, substantially as described.

3. A regulator for a dynamo electric machine, consisting of an iron plate lying between the armature and one pole of the field magnet, and adapted to be moved out toward the other pole, substantially as described.

4. A regulator for a dynamo electric machine, consisting of a curved iron plate parallel with the armature, and mounted to move concentrically therewith, substantially as described.

5. A regulator for a dynamo electric machine, consisting of two curved iron cylindrical quadrants mounted to move concentrically with the armature, substantially as described.

6. An automatic regulator for a dynamo electric machine, comprising a movable magnetic shunt around the armature, and a solenoid adapted to move said shunt and responsive to changes in the counter-electromotive force of the armature, substantially as described.

7. An automatic regulator for a dynamo electric machine, comprising a curved iron plate lying between the armature and a pole of the field magnet, and a solenoid connected in shunt around the armature and adapted to move said plate, substantially as described.

8. The combination with a dynamo electric machine, of curved plates mounted concentric with the armature shaft and between the armature and the pole pieces, segment gears for operating said plates, a solenoid having a core attached to one of said gears, and a spring for retracting said core, said solenoid being in shunt around the armature, substantially as described.

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

OLOF OFFRELL.

Witnesses:

ERNST LUNDGREN,

W. J. MORGAN.