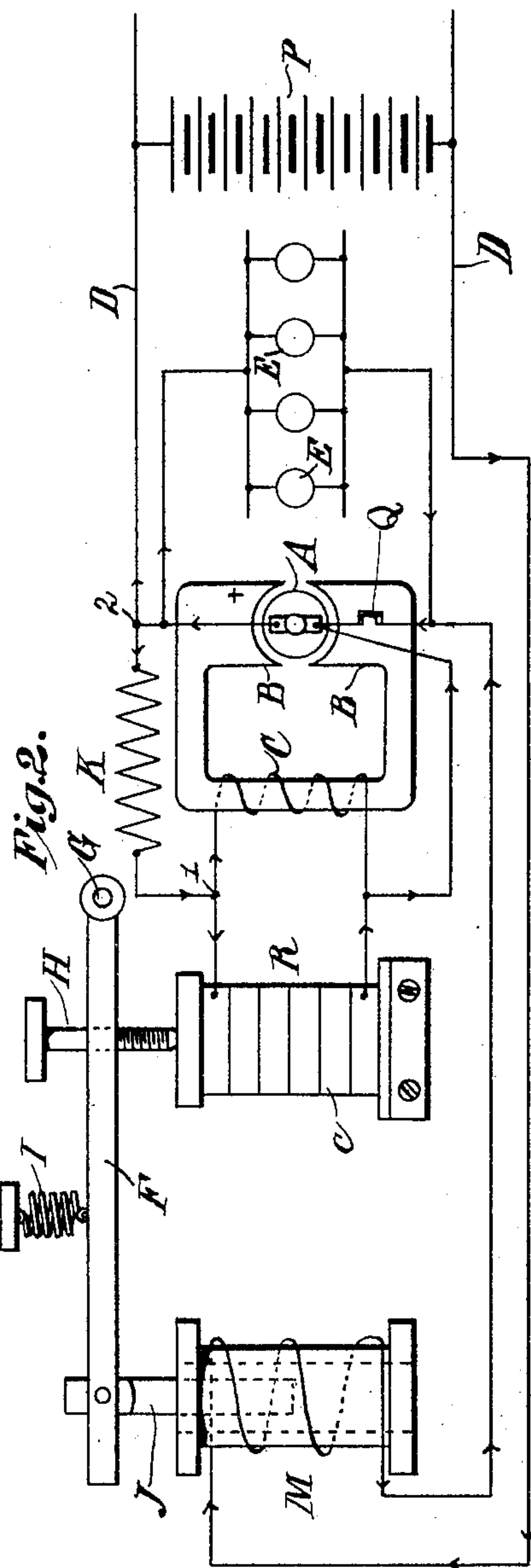
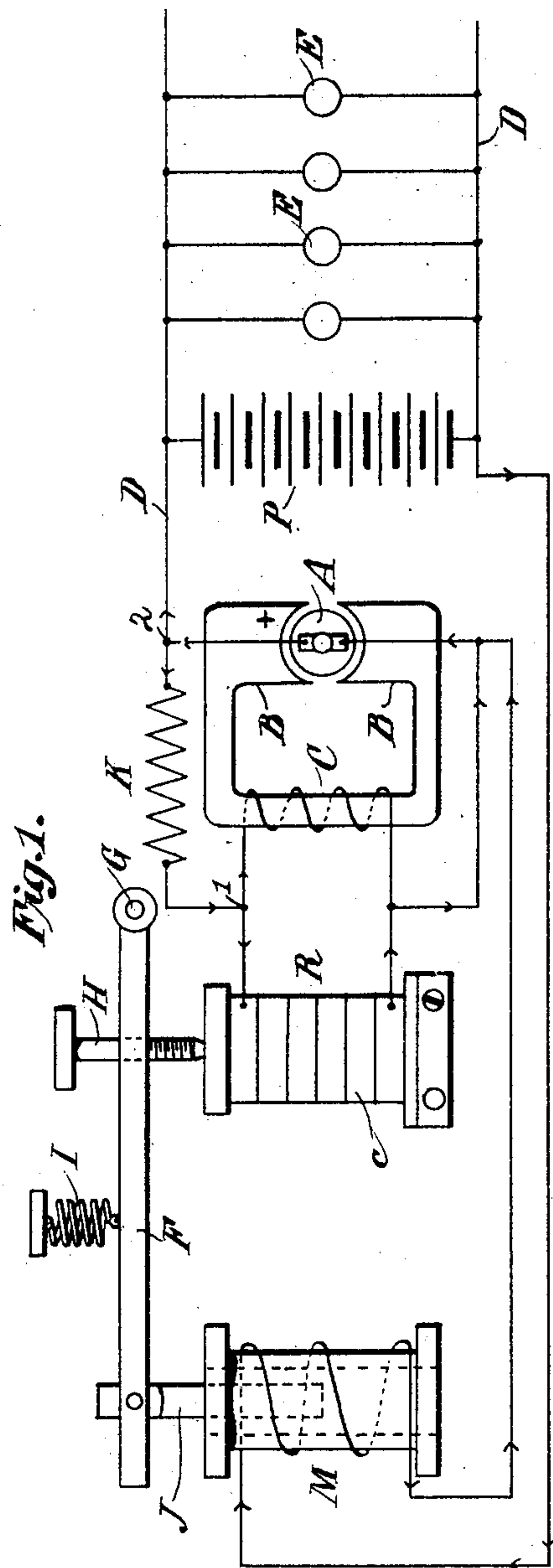


M. MOSKOWITZ.
SYSTEM OF ELECTRICAL REGULATION.

APPLICATION FILED JAN. 21, 1903.

NO MODEL.



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UNITED STATES PATENT OFFICE.

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SYSTEM OF ELECTRICAL REGULATION.

SPECIFICATION forming part of Letters Patent No. 746,558, dated December 8, 1903.

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To all whom it may concern:

Be it known that I, MORRIS MOSKOWITZ, a citizen of the United States, and a resident of the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Systems of Electrical Regulation, of which the following is a specification, accompanied by drawings.

My invention relates to improvements in systems of electrical regulation, but more particularly to the regulation of dynamo-electric machines, such as generators, although my system may be used in any connection in which it is applicable.

The objects of my invention are to enable the current of a generator to be readily and efficiently controlled and to secure such control without undue fluctuations.

Further objects of my invention will hereinafter appear; and to these ends my invention consists of the circuits and apparatus embodying the features of construction, combinations of elements, and arrangement of parts having the general mode of operation substantially as hereinafter fully described and claimed in this specification and shown in the accompanying drawings, in which—

Figure 1 is a diagrammatic representation of circuits and apparatus embodying my invention, and Fig. 2 is a diagrammatic representation embodying a modified form of apparatus.

Referring to the drawings, A represents the armature of a generator, of which B represents the pole-pieces, and C the shunt field-winding. The generator is connected in circuit with the mains D for supplying current to suitable translating devices, shown in this instance as incandescent lamps E, connected in parallel across the mains D.

According to my invention means are provided for regulating the current of the generator by varying the field magnetism, and, as shown in the drawings, a suitable variable resistance is connected in shunt to the field C of the generator, and means are provided for varying the said shunt resistance in accordance with variations in the speed or load of the armature A. Any suitable resistance

R may be connected in shunt to the field-winding C; but I have found that a carbon resistance consisting of the carbon blocks *c* operates efficiently and well. The resistance R is varied by changing the pressure upon the block *c*.

A permanent resistance K, as shown, is connected between the points 1 and 2, or, in other words, between the resistance R and field C and the brushes of the generator. The function of the resistance K is to determine the maximum amount of current which can flow through the field-circuit, or, in other words, the permanent resistance K establishes a circuit or path for a current through the field of a certain current-carrying capacity, and then more or less of this current is shunted away by means of the variable resistance R.

Any suitable means may be provided for varying the pressure between the blocks *c* to vary the resistance R, but as shown in this instance there is a lever F pivoted at G and provided with an adjustable set-screw H, adapted to bear upon the carbon blocks *c*. A spring I normally tends to retract the lever F, while a magnet M attracts the core J, attached to the lever F, to pull the lever in an opposite direction against the tension of the spring I.

The magnet M, as shown, is connected in series with the line and with the armature of the generator A, so that said magnet varies in accordance with variations of the current in the armature. When the speed of the generator increases beyond a predetermined amount, the magnet M will attract its core J with increasing strength, thus pressing the carbon blocks *c* more tightly together, reducing the resistance R, and thereby shunting current away from the field C of the generator to weaken the said field and bring the current in the external circuit back to approximately its normal condition, or, in other words, to maintain the current constant.

One of the objects of my invention is to prevent sudden and jerky movement of the lever F, and this is accomplished electrically by what may be termed "electrical damping" means. I have found that by connecting the

battery P across the line the effect of a mechanical dash-pot is obtained upon the lever F to damp out fluctuations. This is due to the fact that the battery P absorbs the fluctuations of current, and thereby maintains the voltage constant across the lamps E or other translating devices. By thus maintaining the voltage constant the operating-current for the magnet M is prevented from fluctuating excessively.

Referring to Fig. 2, it will be seen that the lamps E or other translating devices are connected in a circuit in this instance directly across the brushes of the generator, while the battery P and magnet M are in another circuit across the brushes.

Referring again to Fig. 1, it will be seen that the current through the lamps E is a part of the regulating-current, and as a number of lamps, for instance, is decreased those remaining receive the full benefit of the voltage necessary to charge the battery. In Fig. 2, however, it will be seen that the number of lamps in circuit may be varied without affecting the voltage at the remaining lamps, while the battery still remains as a balance to the regulating apparatus. In Fig. 2 it will also be seen that by cutting out the generator by means of a suitable switch Q the battery may discharge back through the magnet M and lamps.

Obviously some features of my invention may be used without others, and my invention may be embodied in widely-varying forms.

Therefore without limiting myself to the construction shown and described or enumerating equivalents I claim, and desire to obtain by Letters Patent, the following:

1. A system of electrical regulation comprising a generator having a shunt-field through which a circuit of a given current-carrying capacity is established by means of resistance independent of the field, and variable means connected to shunt away a part of the current in said field-circuit, for substantially the purposes set forth.

2. A system of electrical regulation comprising a generator, its shunt field-winding and connections in addition to the field-winding for determining the maximum amount of current in the field, with independently-connected variable means for shunting away a part of the current from said field-winding, for substantially the purposes set forth.

3. A system of electrical regulation, comprising a generator having a shunt field-circuit including circuits and devices in addition to the field-winding for determining the maximum amount of current in the field, with variable means independent of said devices and operatively connected to shunt away part of the current from said field-winding, for substantially the purposes set forth.

4. A system of electrical regulation comprising a generator having a shunt field-circuit including circuits and devices in addition

to the field-winding for determining the maximum amount of current in the field, with variable means independent of said devices and operatively connected to automatically shunt away part of the current from said field-winding in accordance with the speed of the generator, for substantially the purposes set forth.

5. In a system of electrical regulation, the combination with a generator and its shunt field-winding, of a resistance in the field-circuit independent of the field-winding for determining the maximum amount of current in the field, and means for shunting away part of the current from said field-winding, for substantially the purposes set forth.

6. In a system of electrical regulation, the combination with a generator and its shunt field-winding, of a resistance in the field-circuit independent of the field-winding for determining the maximum amount of current in the field, and a variable resistance connected in shunt to the field-winding for shunting away part of the current from the field-winding, for substantially the purposes set forth.

7. In a system of electrical regulation, the combination with a generator and its shunt field-winding, of a resistance in circuit with said winding, a variable resistance in shunt to said field-winding, and means for changing said variable resistance in accordance with the speed of the generator, for substantially the purposes set forth.

8. In a system of electrical regulation, the combination with a generator and its shunt field-winding, of a resistance in circuit with said field-winding, a variable resistance in shunt to said winding, and means for decreasing or increasing said variable resistance as the speed on the generator increases or decreases beyond a predetermined amount, for substantially the purposes set forth.

9. A system of electrical regulation comprising a generator, having a shunt field-circuit including means in addition to the field-winding connected to determine the maximum amount of current in the field, a variable resistance connected in shunt to said field for shunting away a portion of the current from the field, and means for varying said resistance inversely with the speed of the generator, for substantially the purposes set forth.

10. In a system of electrical regulation, the combination with a generator and its shunt field-winding, of a resistance in series with the field-winding, a variable resistance in shunt to said field-winding, and an electromagnet connected to operate in accordance with variations of speed on the generator and arranged to control said variable resistance.

11. In a system of electrical regulation, the combination with a generator and its shunt field-winding, of means in addition to the field-winding connected in the field-circuit for controlling the maximum amount of current in the field, means for shunting away part of the

current from the field-winding, and a battery connected across the line to absorb the fluctuations of current on the line and maintain the line voltage substantially constant, for substantially the purposes set forth.

12. In a system of electrical regulation, the combination with a generator and its shunt field-winding, of a resistance in series with said winding, a variable resistance in shunt to said winding, an electromagnet connected to operate in accordance with variations of the speed of the generator and arranged to control the said variable resistance, and a battery connected across the line to absorb the fluctuations of current on the line and maintain the line voltage substantially constant, for substantially the purposes set forth.

13. In a system of electrical regulation, the combination with a generator and its shunt field-winding, of means in addition to the field-winding connected in the field-circuit for controlling the maximum amount of current in the field, a variable resistance for regulating said field connected to shunt away a portion of the current from said field-winding, an electromagnet connected in series with the armature and arranged to control said resistance, and a battery connected across the line to absorb the fluctuations of current and maintain the line voltage substantially constant, for substantially the purposes set forth.

14. In a system of electrical regulation, the combination with a generator and its shunt field-winding, of means in addition to the field-winding included in the field-circuit for controlling the maximum amount of current in the field, a variable resistance for regu-

lating said field connected to shunt away a portion of the current therefrom, a work-circuit connected across the brushes of the machine and translating devices therein, another circuit in parallel to said work-circuit and including a battery and a magnet, said magnet being connected to control the said resistance in shunt to the field of the generator, for substantially the purposes set forth.

15. In a system of electrical regulation, the combination with a generator and its shunt field-winding, of a resistance in circuit with said winding, a variable carbon-block resistance in shunt to said field-winding, and means for changing said variable resistance in accordance with the speed of the generator, for substantially the purposes set forth.

16. A system of electrical regulation comprising a generator having a shunt field-winding with a variable resistance connected in parallel with said field-winding and a controlling resistance connected in series with both said field-winding and the variable resistance whereby a circuit of a given current-carrying capacity is established through the field-winding and a portion of the current in said winding may be shunted away by means of the variable resistance, for substantially the purposes set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

MORRIS MOSKOWITZ.

Witnesses:

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