

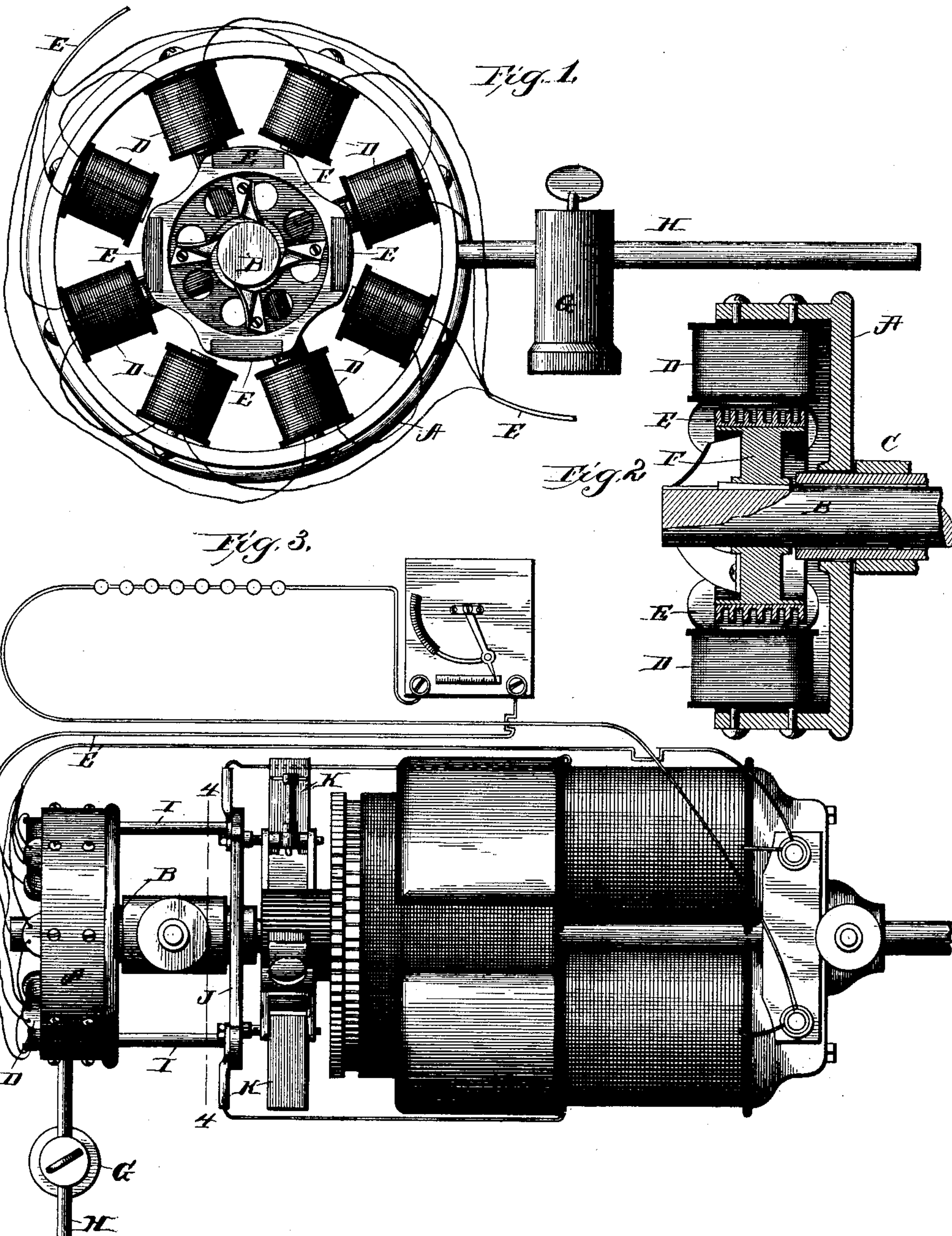
(No Model.)

2 Sheets—Sheet 1.

M. S. CONLY.
GOVERNOR FOR DYNAMOS.

No. 459,810.

Patented Sept. 22, 1891.



Witnesses:
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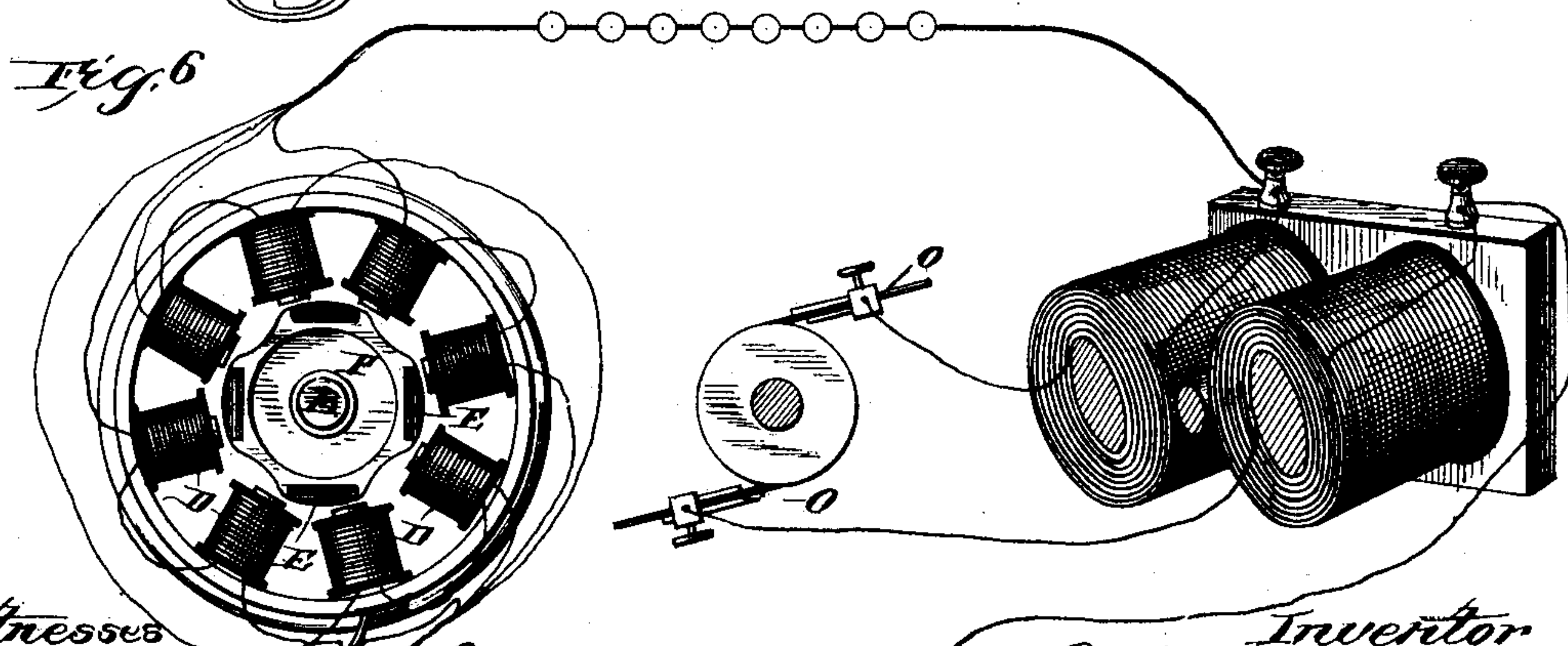
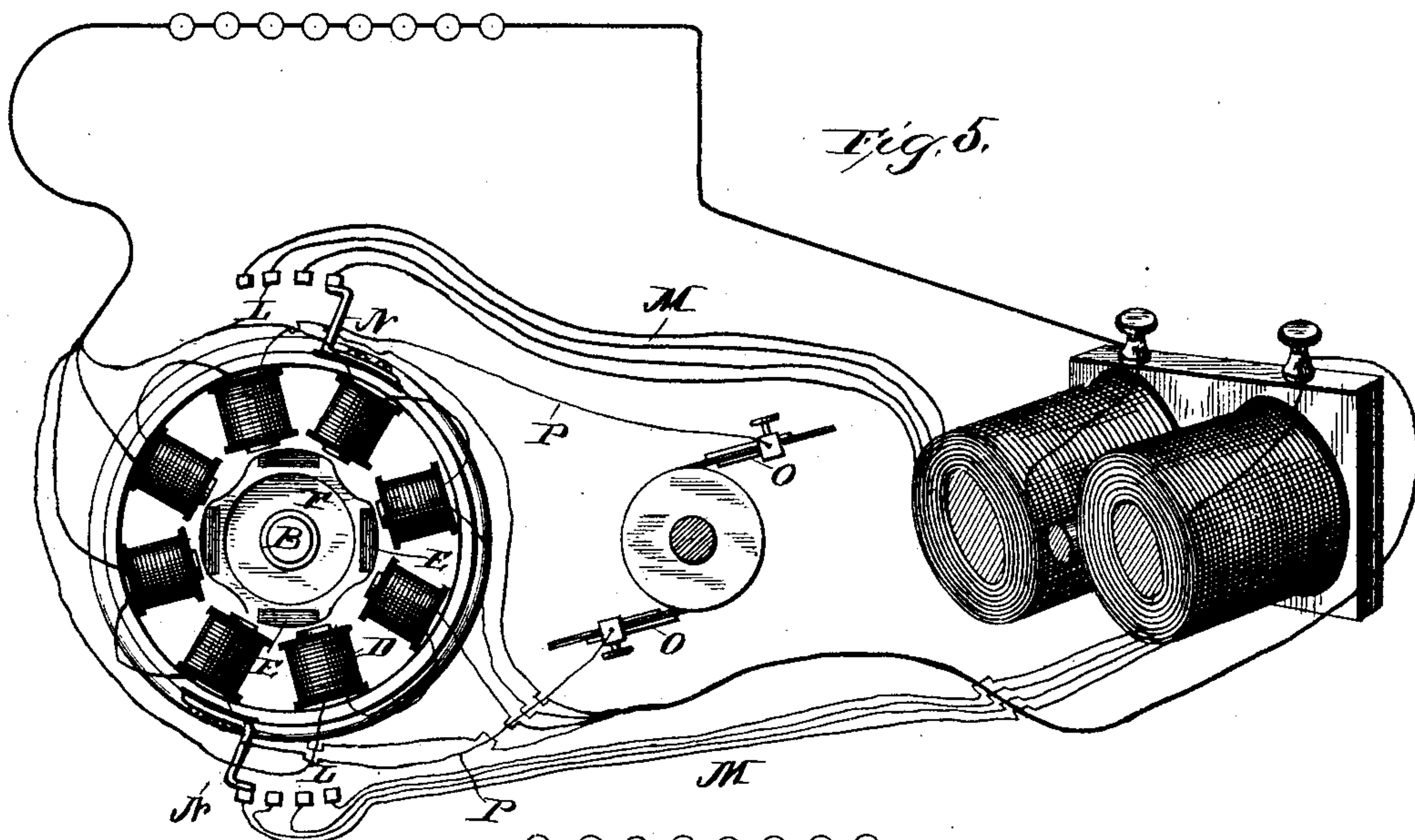
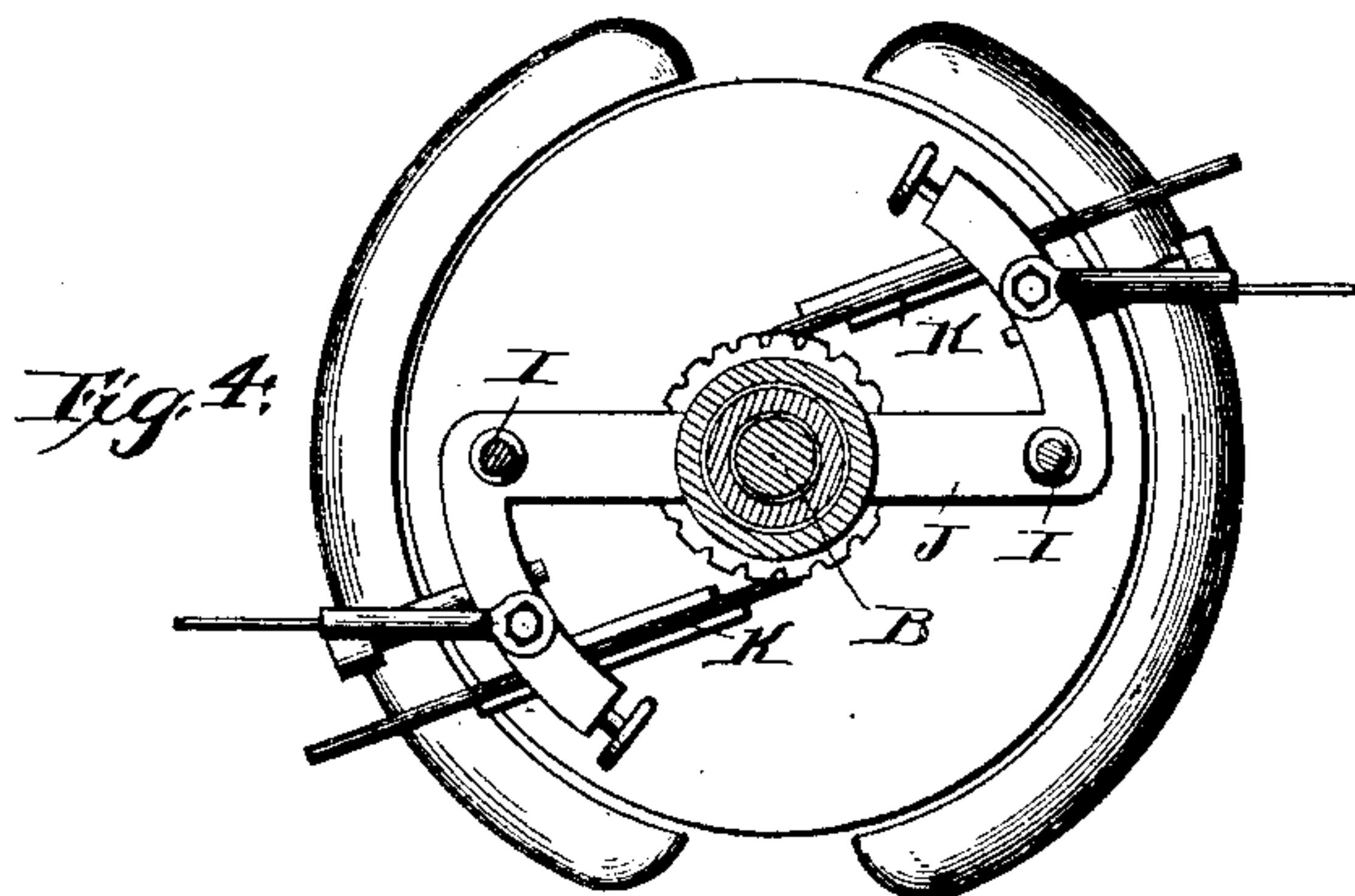
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UNITED STATES PATENT OFFICE.

MAHLON S. CONLY, OF CHICAGO, ILLINOIS, ASSIGNOR OF TWO-THIRDS TO
EDWIN O. ABBOTT AND FREDERICK H. KILBOURN, OF SAME PLACE.

GOVERNOR FOR DYNAMOS.

SPECIFICATION forming part of Letters Patent No. 459,810, dated September 22, 1891.

Application filed December 23, 1890. Serial No. 375,587. (No model.)

To all whom it may concern:

Be it known that I, MAHLON S. CONLY, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Governors for Dynamos, of which the following is a specification.

This invention relates to improvements in that class of governors for dynamos which are automatically operated through the influence of the dynamo-current to change or alter the voltage or electro-motive force of such current with each change in the condition of the circuit operated thereby. Such governors may be employed in connection with dynamos operating line-circuits for any use, but are especially designed and adapted for use upon dynamos operating arc-light circuits, and it is therefore this use which is illustrated in the drawings and will be instanced in the specification for clearness of description and to afford a perfect understanding of the purpose of the invention.

It is well known that substantially the same amprage of current is required to operate one or two arc lights that is required for a dozen or more lights; but the voltage or electro-motive force required is considerably less and unless changed with each change in the condition or resistance of the line-circuit great wastage of energy occurs, besides involving danger of injury to apparatus included in the line and to the dynamo, as well as to persons and property. It is therefore the purpose of this class of regulators or governors to automatically increase or decrease the voltage or electro-motive force of the current produced by the dynamo in proportion to the work to be performed by such current, so that when once the current is proportioned for operating a circuit of a given resistance any change in the resistance or any change in the speed of the armature which results in a change in the amprage of the current will be almost instantly compensated for by a corresponding change in the voltage or electro-motive force of the current through the instrumentality of the regulator or governor, thus automatically adjusting the current to the new conditions of the circuit. This result has been accomplished more or less ef-

fectually by many different forms of apparatus, some of which operate to shift or change the position of the commutator-brushes, some to introduce resistance in the circuit corresponding with the unused apparatus, and others to change the field-magnet, while still others operate to change the speed of the armature; but none of the prior forms of apparatus are capable of accomplishing the desired result, except through the instrumentality of the particular organisms with which they are especially designed to co-operate, beside which the prior devices, so far as I am aware, are more or less complicated and expensive in addition to being uncertain in operation, for the actuating power in all cases is indirectly applied through the intervention of spring-actuated levers, magnets, and movable contact-points, all of which contribute to the uncertainty of the operation of the device.

The prime object of this invention is to have a governor capable of use in connection with any dynamo-electric machine that is capable of controlling or regulating the electric current in any manner in which that result has heretofore been accomplished, and which applies the power directly to the part to be affected or actuated without the intervention of levers or any equivalent device.

Another object of this invention is to have a governor comprising a series of electro-magnets constantly energized by the current from the dynamo and an armature common to all of said magnets and co-operating with the same, so as to increase or decrease the voltage or electro-motive force of the current with each change in the line-circuit.

A further object is to have a governor comprising a series of electro-magnets constantly energized by the dynamo-current and an armature common to all of said magnets, one of which organisms is normally stationary but rotatable and the other continuously rotating, whereby with every change in the line-circuit, producing a corresponding change in the magnetism of said magnets, the normally stationary organism will be influenced to partially rotate by the continuously-rotating organism, thus instantly operating to produce a corresponding change in the voltage or electro-motive force of the dynamo-current.

A still further object is to have the governor of such character that it may be readily adjusted to any initial current and so sensitive as to be instantly operated by any change
 5 in the initial current to change the voltage or electro-motive force of the current to compensate for the variation in the initial current, whereby a constant and uniform current is produced, notwithstanding; but, on
 10 the contrary, corresponding with changes in the initial current. These objects are attained by the devices illustrated in the accompanying drawings, in which—

Figure 1 represents a face view of a governor embodying my invention; Fig. 2, a central vertical section thereof; Fig. 3, a plan
 15 view of a dynamo with my governor applied thereto for governing the current through the intermediary of the commutator-brushes; Fig. 4, a transverse vertical section on the
 20 line 4-4 of Fig. 3; Fig. 5, a diagram showing the government of the current through the fields of a dynamo, and Fig. 6 a similar view showing the current governed by resistance
 25 introduced into or cut out of the line-circuit by the governor.

Similar letters of reference indicate the same parts in the several figures of the drawings.

30 As before stated, my governor is not only capable of use in connection with any dynamo-electric machine, but is adapted for governing the current in many different ways, in fact, in any way in which the current has heretofore
 35 been governed. This governor comprises a disk wheel or ring A of any suitable construction, mounted concentrically with the axis of the armature-shaft B, either upon a separate journal or upon an extension of the bushing
 40 C, which lines the bearing of the armature-shaft in order that the wheel may not be affected by the rotation of the armature-shaft, the latter method of journaling the wheel being preferable on account of the compactness
 45 and simplicity of the construction, which avoids the employment of separate and extra parts involving additional expense and uncertainty of operation through poor or disturbed adjustment. To this wheel, ring, or
 50 disk is secured a series of electro-magnets D, projecting inwardly and radially therefrom and terminating at equal distances from the axis of the wheel, which latter constitutes a common heel-piece for all of the magnets,
 55 the coils of which are so connected with the line-wires E of the outside or line circuit that the polarities of the magnets alternate with each other. Thus it will be seen that each magnet has on each side of it a magnet of op-
 60 posite polarity—that is to say, if its pole is north the poles of the magnets on each side of it will be south—so that each magnet serves to co-operate with the magnets at each side thereof, to successively form an ordinary electro-magnet of two poles, and operating to at-
 65 tract an armature when current is flowing through the magnet; and as all the coils are

connected in and in fact form part of the line-circuit operated by the dynamo, all of the current generated by the machine necessarily
 70 passes through the coils and energizes the electro-magnets; but in large machines where heavy currents are generated a shunt may be used and only a part of the current taken. For these electro-magnets I provide
 75 a series of armatures E, which become common to all of the magnets of the series by being revolved or traveled past them continually in rapid succession, each armature being
 80 successively acted upon by each pair of magnets. These armatures preferably consist of segmental iron pieces, laminated and having a comb-like structure in cross-section, for the purpose of providing air-spaces for cooling
 85 them. They are mounted upon and carried by a wheel F, which is keyed to the armature-shaft and revolves therewith, being of such diameter that the armatures carried thereby travel in close proximity to but without actually making contact with the poles of all the
 90 magnets in successive order. Hence whenever the current is flowing the electro-magnets are energized, and their attraction for the rapidly-revolving armatures induces a partial rotation of the wheel carrying the electro-magnets,
 95 which partial rotation differs in degree with the strength or amprage of the current, which increases and decreases the attractive force of the magnets for the armatures. This partial rotation or movement of the governor-wheel
 100 is utilized for operating the different devices employed for controlling or governing the voltage or electro-motive force of the current, and in order that different and in fact any desirable voltage or electro-motive force may
 105 be selected for the normal current, the partial rotation of the governor-wheel should be opposed by some adjustable force, such as a spring or the counterpoise or weight G, adjustable upon the arm H, projecting radially
 110 from one side of the governor-wheel, by means of which the attractive force of the governor-magnets with any desirable initial current may be exactly counterbalanced and practically nullified so far as its effect upon
 115 the wheel with relation to the devices operated thereby is concerned. Hence after the counterpoise is adjusted to balance the attractive force of the magnets, this balance will not be disturbed as long as the resistance
 120 in the line-circuit and the speed of the armature remains the same, for the strength of the current produced by the machine will remain substantially the same, but immediately the resistance in the line-circuit is changed, (the
 125 speed of the armature being maintained,) although the electro-motive force of the current will remain the same, the quantity or amprage of the current will be changed, causing a corresponding increase or decrease
 130 in the attraction of the electro-magnets of the governor sufficient to disturb the balance between such attraction and the counterpoise, either by acting against so as to overcome the

counterpoise and move the governor-wheel in one direction, so as to actuate the governing devices to reduce the electro-motive force or voltage of the current, or else acting with and permitting the counterpoise to move the governor-wheel in the opposite direction and thereby actuate the current-controlling devices to increase the electro-motive force or voltage of the current. Thus it will be understood that any change in the strength or amprage of the current from any cause whatever will be almost instantly compensated for by a change of electro-motive force or voltage, the governor-wheel assuming a new position with each change of the current, in each of which positions it is balanced by the counterpoise, although the latter remains out of its normal position until the resistance is restored to the normal for the initial current; but there is no limit to the number of changes in the position of the governor-wheel, which may take place continually in one direction according to the continued increase or decrease of the current-strength, due to changing conditions in the line-circuit or armature-speed or alternately in opposite directions, for the governor will respond to every change of the current-strength.

As before mentioned, there are many ways in which the voltage or electro-motive force of the current may be controlled and changed, and the movement of my governor may be utilized to effect this result. For instance, as illustrated in Figs. 3 and 4, the governor-wheel may be connected by rods I with the yoke J, carrying the brushes K of the dynamo, so that with each change in the strength of the current the position of the brushes upon the dynamo will be shifted either toward or away from the neutral point, according to whether the strength of the current is increased or decreased, causing a corresponding change in the voltage or electro-motive force of the current.

To govern the current by changing the strength of the field-magnets, I provide two series of contact-points L, connected, respectively, by branch wires M with different sections or coils of the field-magnet coils, and successively engaged by moving contact-points N, carried by but insulated from the governor-wheel, and connected with the respective brushes O by wires P. When the governor-wheel moves as a result of a change in the current-strength, the contact-points carried thereby move from one stationary contact-point to the other, according to the direction in which the wheel moves, thus cutting out or into the circuit more or less of the coils or sections of the field-magnets, which, as in the movement of the commutator-brushes, produces a corresponding change in the voltage or electro-motive force of the current.

In Fig. 6 I have illustrated the introduction of resistance into the line-circuit by means

of a moving contact-point Q, carried by but insulated from the governor-ring, and with which is connected the line-wire, this contact being adapted and arranged to successively engage a series of stationary contact-points R, each connected with a resistance-coil S, which coils are connected with one another, and one of them connected with the line-wire T, much after the arrangement of an ordinary rheostat or "resistance-box." While this arrangement does not serve to change the voltage or electro-motive force of the current according to the changes of the current-strength, it accomplishes the same end by introducing resistance into the line-circuit corresponding with the cut-out or unused lights or other instruments. It is also obvious that the movement of the governor-wheel may be readily adapted by one skilled in the art to operate the governor of the engine driving the dynamo, and thus by changing the armature-speed effect the desired result, and in fact this movement of the governor-wheel, which takes place with every change in the current-strength, may be utilized to govern the current in any manner in which it is possible to effect such regulation.

Beside the simplicity and durability of its construction a governor construed in accordance with my invention possesses the advantages of certainty of operation and of a sensitiveness that enables it to promptly respond to the slightest change in the strength of the current governed thereby, due to changing conditions of the line-circuit or for any other reason.

Obviously different arrangements of the elements or organisms of my invention may be effected without departing from the spirit thereof—such, for instance, as revolving the magnets and leaving the armature stationary—which is a reversal of the present arrangement, or by having the armature work upon the outside instead of the inside of the series of magnets, an obvious modification which would produce the same result; nor is it necessary that either the armature or the governor-wheel should be supported by or mounted upon and driven by the armature-shaft for any other means of supporting and operating these organisms, so that one is revolved in proximity to the other, would come within the scope of my invention.

In an application filed by me August 25, 1890, Serial No. 363,000, which said application was allowed on the 19th day of September, 1890, I have described and claimed my governor when employed for controlling the current through the medium of the commutator-brushes; but in this application I desire to claim, broadly, the governor when combined with a dynamo in any manner by which a change in the current strength will produce a corresponding change in the voltage or electro-motive force of the current produced by the dynamo.

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

1. The combination, with a dynamo, of a governor comprising a series of electro-magnets included in the dynamo-circuit or a shunt thereof, and an armature common to all of said magnets, one of said organisms being normally stationary but rotatable and the other continuously rotating, whereby with every change of current strength the voltage or electro-motive force of the current produced by the dynamo will be correspondingly altered, substantially as and for the purpose described.

2. The combination, with a dynamo and a current-controlling apparatus, of a governor comprising a series of electro-magnets included in the dynamo-circuit or a shunt thereof, and an armature common to all of said magnets, one of said organisms being normally stationary but rotatable and the other continuously rotating, and a connection between the normally-stationary organism and the current-controlling apparatus, whereby every change in the current strength produces a corresponding change in the voltage or electro-motive force of the current, substantially as described.

3. The combination, with a dynamo, of a governor comprising a rotatable but normally-stationary series of electro-magnets included in the dynamo-circuit, and a continuously-rotating armature common to all of said magnets and working in proximity thereto, substantially as described.

4. The combination, with a dynamo and a current-controlling apparatus, of a governor comprising a rotatable but normally-stationary series of electro-magnets included in the dynamo-circuit, a continuously-rotating armature common to all of said magnets and working in proximity thereto, and a connection between the support for the series of magnets and the current-controlling apparatus, whereby every change in the current strength produces a corresponding change in the current produced by the dynamo, substantially as described.

5. The combination, with a dynamo and a current-controlling apparatus, of a governor comprising a rotatable but normally-stationary series of electro-magnets included in the dynamo-circuit, a rotating armature common to all of said magnets mounted upon and carried by the armature-shaft of the dynamo in proximity to the poles of said magnets, and a connection between the support of said series of magnets and the current-controlling apparatus, substantially as described.

6. The combination, with a dynamo and a current-controlling apparatus, of a governor comprising a series of electro-magnets included in the dynamo-circuit, a rotatable but normally-stationary support therefor mounted upon an axis common to the armature-shaft of the dynamo, an armature common

to all of said magnets mounted upon the armature-shaft of the dynamo and working in proximity to the poles of said magnets, and a connection between the support for said magnets and the current-controlling apparatus, substantially as described.

7. The combination, with a dynamo, of a governor comprising a wheel connected with the dynamo, but loosely journaled upon the armature-shaft and carrying a circumferential series of electro-magnets included in the dynamo-circuit, and an armature common to all of said magnets mounted upon and carried by the armature-shaft of the dynamo in proximity to the poles of said magnets, substantially as described.

8. The combination, with a dynamo, of a governor comprising a wheel connected with the dynamo, but loosely journaled upon the axis of the armature-shaft and carrying a circumferential series of electro-magnets included in the dynamo-circuit, for which the wheel constitutes a common heel-piece, and an armature common to all of said magnets mounted upon and carried by the armature-shaft of the dynamo in proximity to the poles of said magnets, substantially as described.

9. The combination, with a dynamo, of a governor comprising a wheel connected with the current-controlling apparatus, but loosely journaled upon the axis of the armature-shaft and carrying a circumferential series of electro-magnets, for which the wheel constitutes a common heel-piece, said magnet having alternate polarities, and an armature common to all of said magnets mounted upon and carried by the armature-shaft of the dynamo in proximity to the poles of said magnets, substantially as described.

10. The combination, with a dynamo, of a governor comprising a wheel connected with the current-controlling apparatus, but loosely journaled upon the axis of the armature-shaft and carrying a circumferential series of electro-magnets included in the dynamo-circuit, a counterpoise for said wheel, and an armature common to all of said magnets mounted upon and carried by the armature-shaft of the dynamo in proximity to the poles of said magnets, substantially as described.

11. The combination, with a dynamo, of a governor comprising a wheel connected with the current-controlling apparatus, but loosely journaled upon the axis of the armature-shaft and carrying a circumferential series of electro-magnets included in the dynamo-circuit, an adjustable counterpoise for said wheel, and an armature common to all said magnets mounted upon and carried by the armature-shaft of the dynamo in proximity to the poles of said magnets, substantially as described.

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