(No Model.) 4 Sheets—Sheet 1.

J. GRAY.

DYNAMO ELECTRIC MACHINE.

No. 285,027. Patented Sept. 18, 1883.

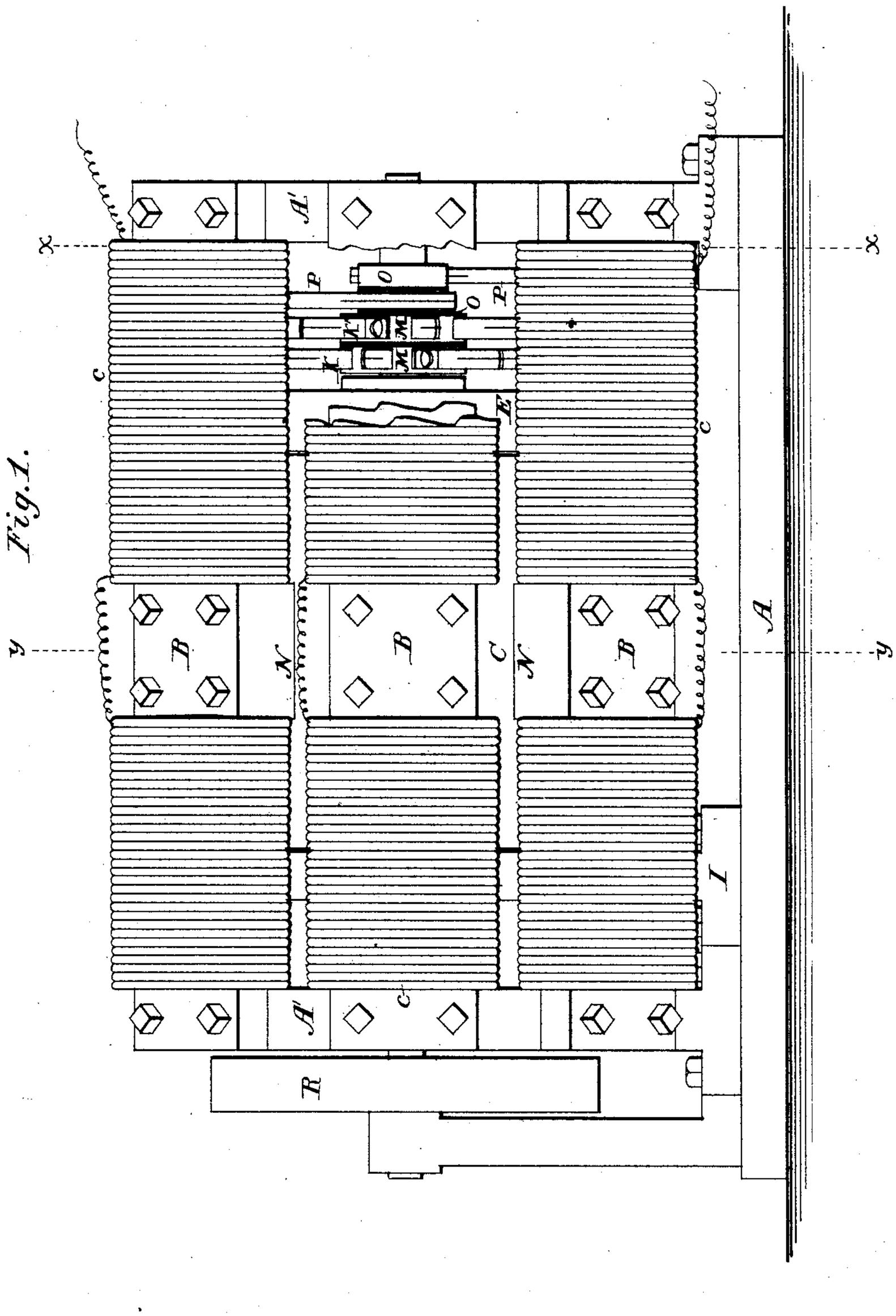


Fig. 1.

Attest:
Chas. A. Cooper.
A. E. Hansmann.

Inventor:
Joshua Gray
by Foster & Freeman Attys

(No Model.)

4 Sheets—Sheet 2.

J. GRAY.

DYNAMO ELECTRIC MACHINE.

No. 285,027. Patented Sept. 18, 1883.

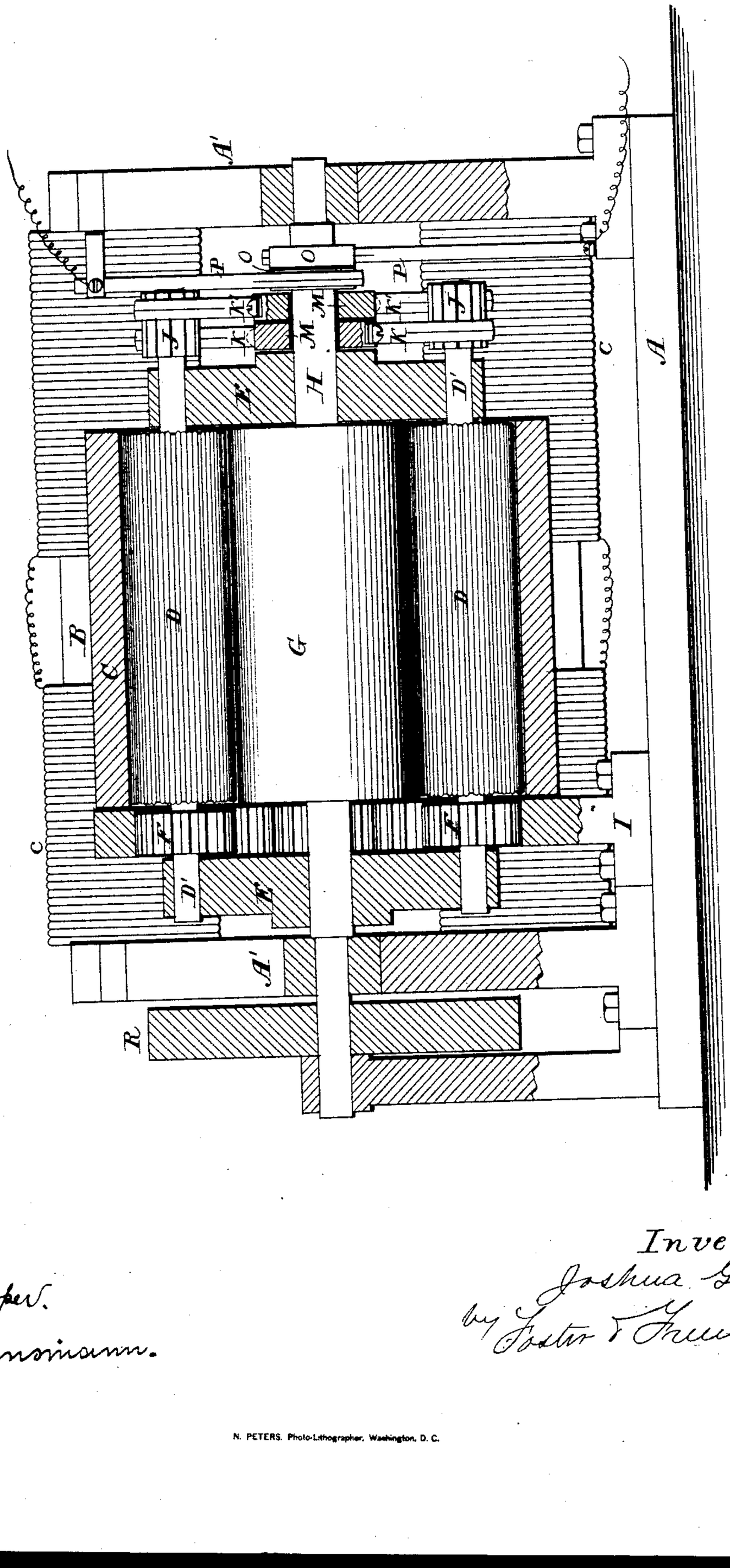


Fig. 2.

Attest:
Court. A. Cooper.
A. E. Tannimann.

Inventor:
Joshua Gray
by Foster & Freeman
attys

(No Model.) 4 Sheets—Sheet 3.

J. GRAY.

DYNAMO ELECTRIC MACHINE.

No. 285,027. Patented Sept. 18, 1883.

Fig. 4.

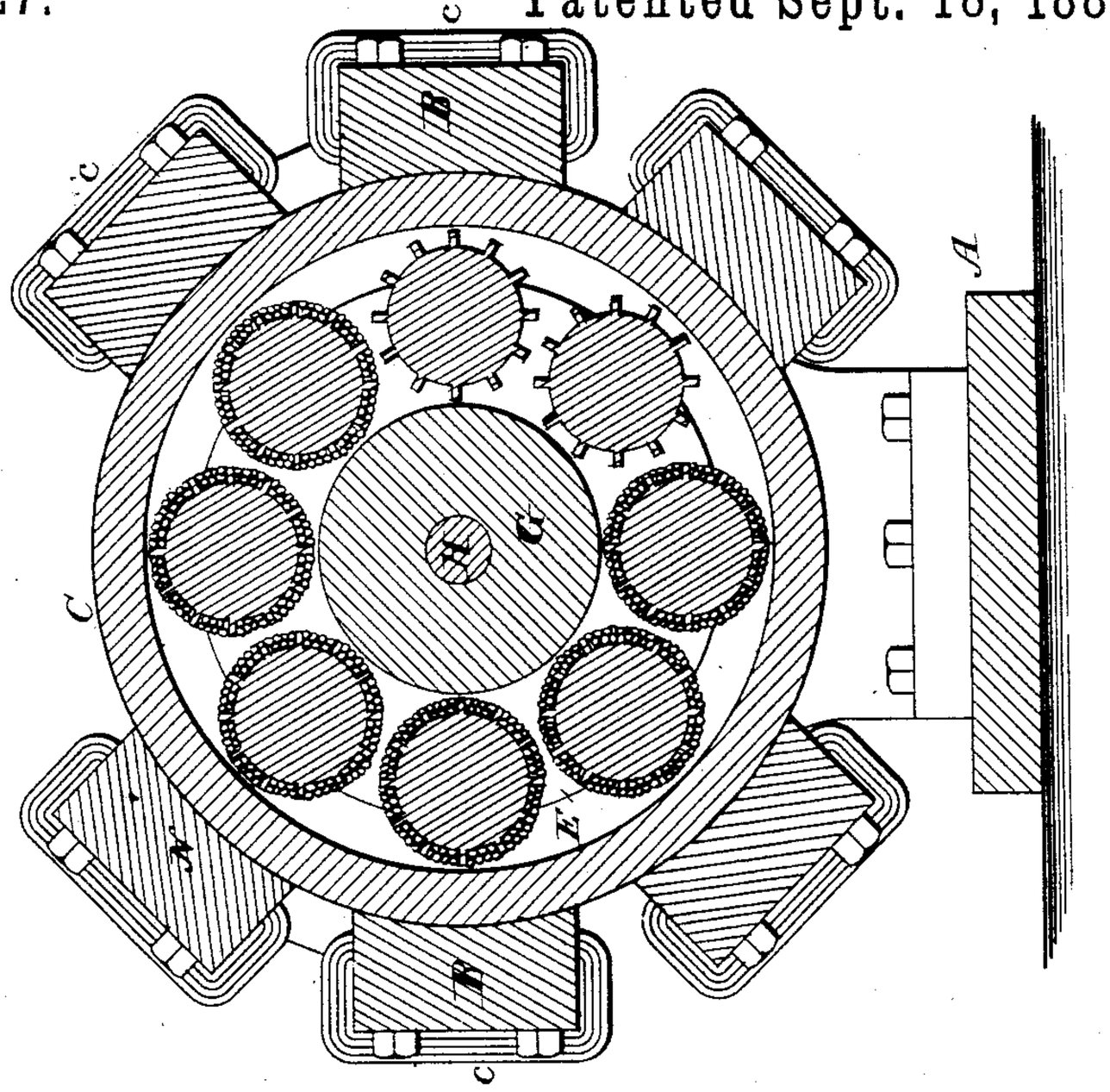
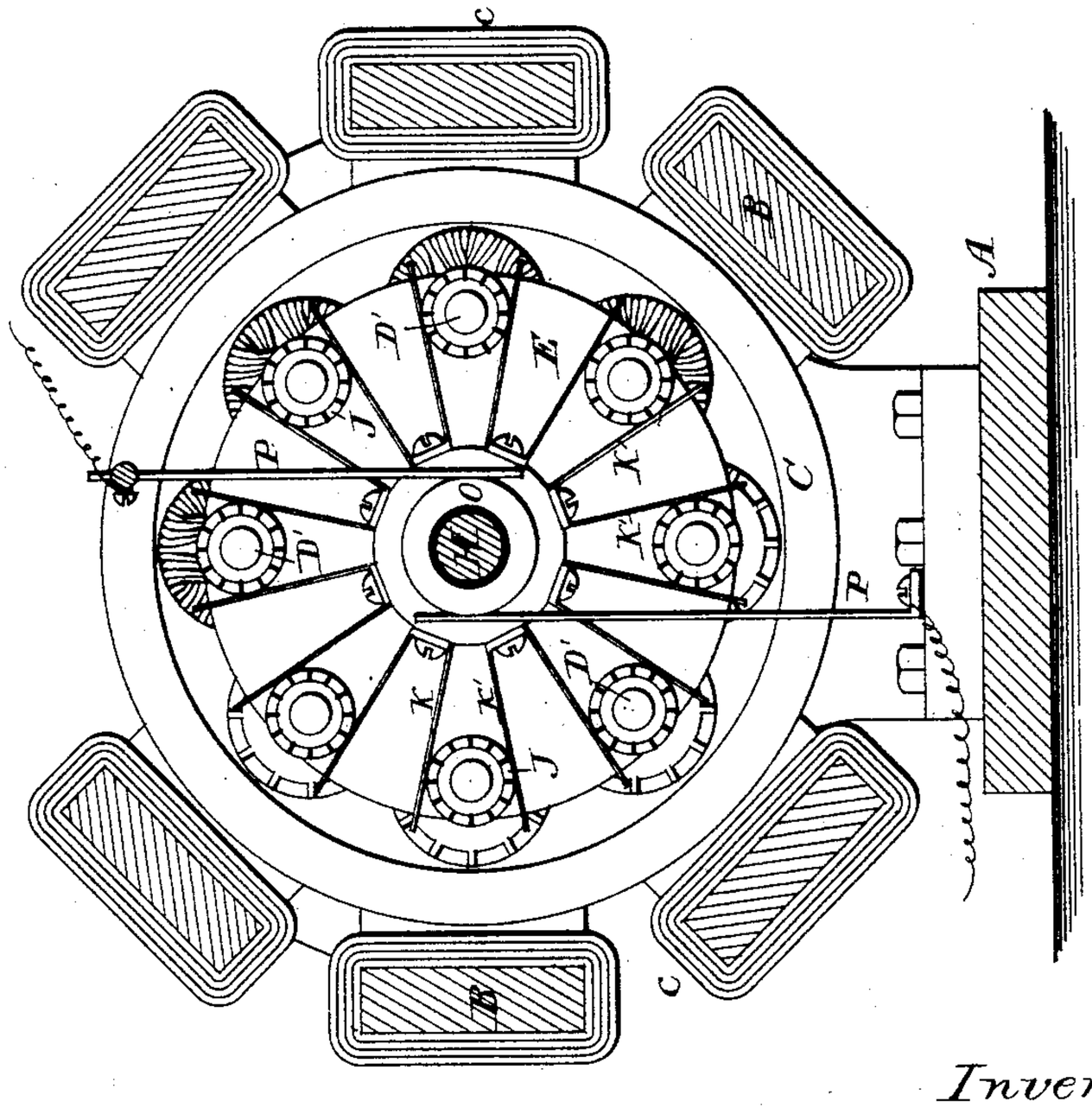


Fig. 3.



Attest:
Chas. A. Cooper
H. C. Hanaman.

Inventor:
Joshua Gray
by Foster & Freeman, Attys

(No Model.) 4 Sheets—Sheet 4.

J. GRAY.

DYNAMO ELECTRIC MACHINE.

No. 285,027. Patented Sept. 18, 1883.

Fig. 5.

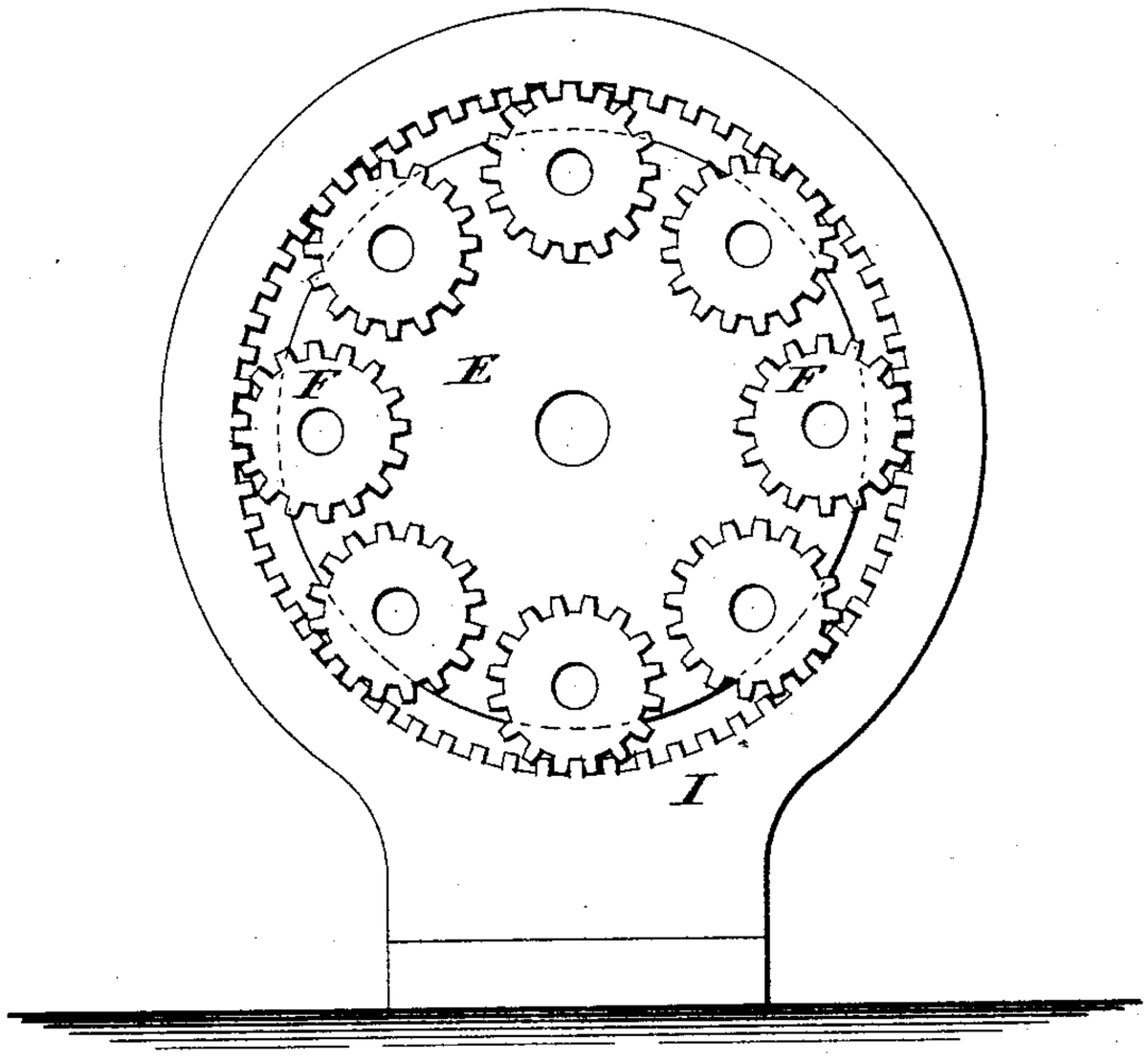


Fig. 6.

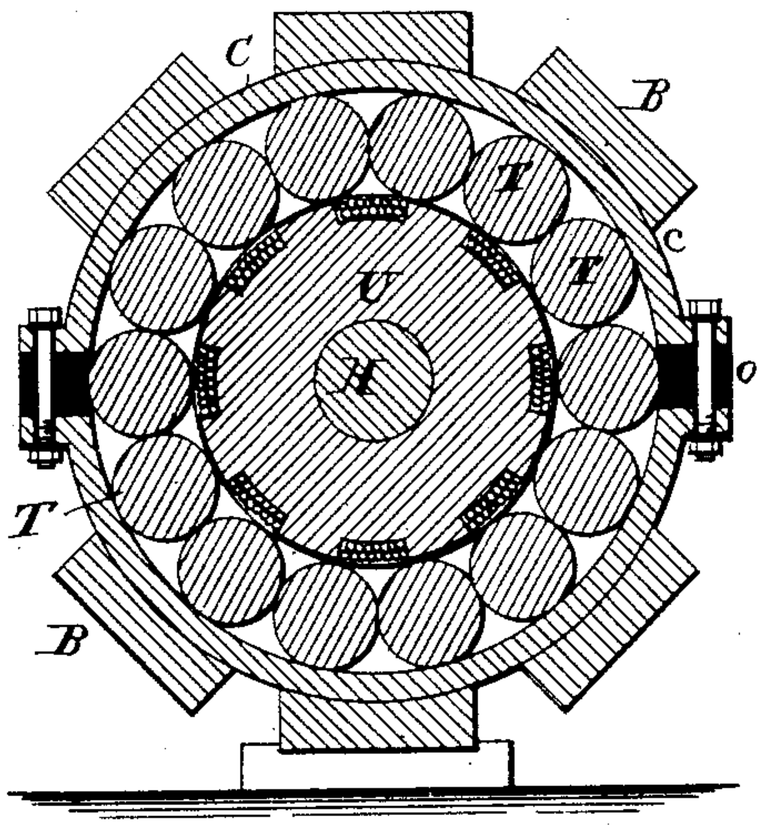


Fig. 7.

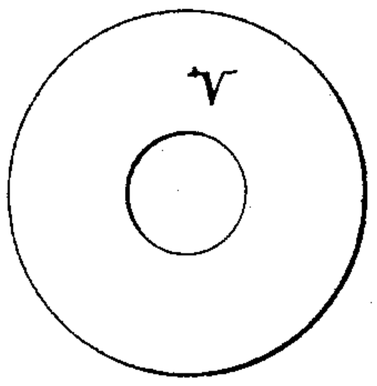
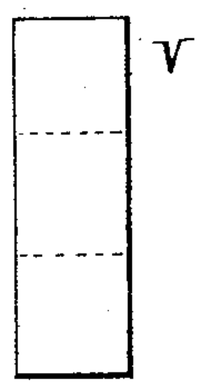


Fig. 8.



Attest:
Court. A. Cooper.
H. C. Hansmann.

Inventor:
Joshua Gray
by Foster & Freeman
Attys.

UNITED STATES PATENT OFFICE.

JOSHUA GRAY, OF MEDFORD, MASSACHUSETTS.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 285,027, dated September 18, 1883.

Application filed November 13, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOSHUA GRAY, of Medford, county of Middlesex, and State of Massachusetts, have invented a new and Improved Dynamo-Electric Machine; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to dynamo or magneto electric machines; and it has for its object to construct a machine wherein the greatest amount of electric energy may be produced by the smallest expenditure of mechanical force; and to this end my invention consists in arranging the field-of-force magnets and armature in such relations to each other that the resistance to the armature in passing through or cutting the lines of magnetic force or the resistance caused by the attraction of the field-magnets for the armature is reduced to a minimum, thereby enabling electric currents of high intensity to be produced with a comparatively small expenditure of power.

In carrying out this invention the armature is rolled, so to speak, through the magnetic field or lines of force, as well as rotated through it, thus taking advantage of the fact that an armature, when circular in form, may be rolled away from the magnetic field much easier than it can be pulled away.

As an embodiment of my invention into practical form, I have made a machine like that shown in the accompanying drawings, forming part of this specification, and to which reference is made, and in which Figure 1 is a side elevation of the machine, some parts being cut away to show others. Fig. 2 is a longitudinal section of the machine. Fig. 3 is a transverse section on lines *x x*, Fig. 1. Fig. 4 is a transverse section on lines *y y*, Fig. 1. Fig. 5 is a side view of the gear-plate for rotating the armatures, and Figs. 6, 7, and 8 show a modified form of machine.

The machine consists of a substantial bed, A, to which is bolted at each end an upright standard, A′ A′. To these standards are secured, by bolts or otherwise, six electro-magnets, B, having coils of insulated wire wound upon their opposite ends, and at their centers are polar extensions N, to which is secured the iron cylinder C, forming the outer magnetic pole of the machine.

Upon the shaft H, journaled in bearings in the standards A′ A′, is loosely mounted the iron tube or roll G, which may or may not be wound with coils of wire, and which constitutes the inner magnetic pole of the machine, and obviously should be of a polarity of opposite kind to that of the cylinder C, forming the other pole of the machine. When the tube or roll G does not have a separate coil to magnetize it, it becomes magnetic by induction. The electro-magnets B are so wound that their polar extensions N are of one polarity, and the shaft upon which the tube or roll G is mounted becomes of an opposite polarity, being magnetically connected to the magnets B. Consequently the tube or roll G, resting on the shaft, also becomes magnetic and of a polarity opposite to that of the polar projections N; but, as before stated, a separate coil or coils may be used to energize the roll G.

Fixed to the shaft H are two plates, E, into which are journaled the shafts D′ of the armatures D, of which there are in this instance eight. These armatures may be of any well-known type or form; but I prefer to construct them of cores or series of notched rings, around which are wound coils of insulated wire, the terminals of which are connected to the commutator-plates J, placed upon one end of the armature-shafts D′, in the usual manner.

Upon the opposite ends of the armature-shafts D′ are secured gear-wheels F, arranged to engage with the stationary internally-toothed plate or standard I, bolted to the base A. From this construction it will be seen that if power be applied to the shaft H by the pulley R or otherwise the armatures will be revolved through the magnetic field produced by the outer and inner magnetic poles, C G, by the plates E, and at the same time the armatures will be rotated upon their axes in the magnetic field by the gear-wheels F on their shafts meshing with the internally-toothed plate I. As shown, the armatures will rotate on their axes four times to each revolution through the magnetic field, thus giving a sort

of continuous rolling movement to the armatures. It will be noticed that the armatures are rotated and revolved through the magnetic field in close proximity to the field-magnets, but without actual contact therewith. In this manner I avoid unnecessary friction due to the mechanical contact and retardation due to the actual contact of two magnetic bodies. The internal field-magnet, G, will also rotate on its shaft H, forming a floating field magnet or pole.

In order to collect the currents from the various armatures, two metal rings or collectors, M M, are secured to the main shaft H, being properly insulated from each other and the shaft. To each of these collectors is attached a series of metal brushes, K and K′, respectively, one brush of each series being arranged so as to bear upon one side of each commutator J. Also placed upon the shaft H, adjacent to the collectors M M, are two copper rings, O O, properly insulated, one of which is electrically connected to each of the collectors M, and from these the combined current of all the armatures is taken off for use by the metal springs or brushes P P, forming the terminals of the circuit. The current may be utilized in any of the well-known forms.

In Figs. 6, 7, and 8 I have shown one modified form of embodying my invention. Upon the shaft H is mounted a magnetic core, U, upon which the coils of the armature are wound. Also on the shaft H, at the extremities of the armature, are secured rings, of metal, V, made a trifle larger in diameter than the armature. A series of electro-magnets, B, are secured to the iron ring C, which ring is made up of two parts joined together with insulating substance *o* between them. Inside of this cylinder and resting upon the inner surface thereof are a series of fourteen soft-iron rollers, T. These rollers are supported against the inside of the cylinder C by the rings V on the shaft H, and are thereby kept out of contact with the armature V. The operation of this arrangement will be readily understood. Power being applied to the shaft H the armature and rings V are rotated and the rolls T, bearing upon the rings V, are also rotated and rolled around the inside of the cylinder C.

I do not wish to confine myself to any particular form of mechanism, for that can be varied in many ways, as is obvious to one skilled in the art. One of the most important features of my invention consists in the rotation and revolution of the armatures at the same time in the magnetic field of a magneto or dynamo electric machine. In this way it will be seen that the rolling action is maintained and the machine is driven by the smallest amount of power.

I do not herein claim the modification shown in Figs. 6, 7, and 8, as I intend to make it the subject of a separate application. Nor do I disclaim other features shown or described, but not specifically claimed, as I reserve the right to embody them in other applications.

What I claim is—

1. The method of operating dynamo or magneto electric generators, which consists in causing their armatures and field-magnets to pass with a rolling motion in close proximity to but out of contact with each other, substantially as described.

2. The method of operating magneto or dynamo electric machines, which consists in rotating and revolving the armatures through the field of magnetic force and in close proximity to but not in contact with the field-magnets.

3. In dynamo or magneto electric generators, the combination, with the field-magnets, of armatures and means for causing the field-magnets and armatures to pass each other with a rolling motion in close proximity to but out of contact with each other, substantially as described.

4. The combination, in a magneto or dynamo electric machine, of the field-magnets and armatures and means for rotating and revolving said armatures in close proximity to but out of contact with the field-magnets, substantially as described.

5. The combination, with an external and internal field magnet or pole, of rotating and revolving armatures, substantially as described.

6. The combination, with an external and internal field magnet or pole, of a series of rotating and revolving armatures, and means for rotating the armatures and for collecting the current from the several armatures, substantially as described.

7. The combination, with an external field-magnet, of a series of armatures revolving inside the magnet, and an internal field-magnet loose upon its supporting-shaft, substantially as described.

8. The combination, with the magnets having polar extensions and the cylinder attached thereto, forming the external field, of the internal field-magnet, the rotating and revolving armatures, the commutators, and collecting brushes and rings, substantially as described.

9. The combination of a frame supporting the electro-magnets and cylinder forming the external pole, of a shaft supporting the internal pole and carrying the armature-supporting pieces or plates, and a gear-plate for rotating the armatures, substantially as described.

10. The combination, with the external field-magnet, the internal field-magnet, the rotating and revolving armatures, and means for rotating and revolving the same, of the commutators, collecting-brushes, and rings M M, and of the rings O O and brushes P P, substantially as described.

JOSHUA GRAY.

Witnesses:
SYLVENUS WALKER,
A. E. LEAVITT.