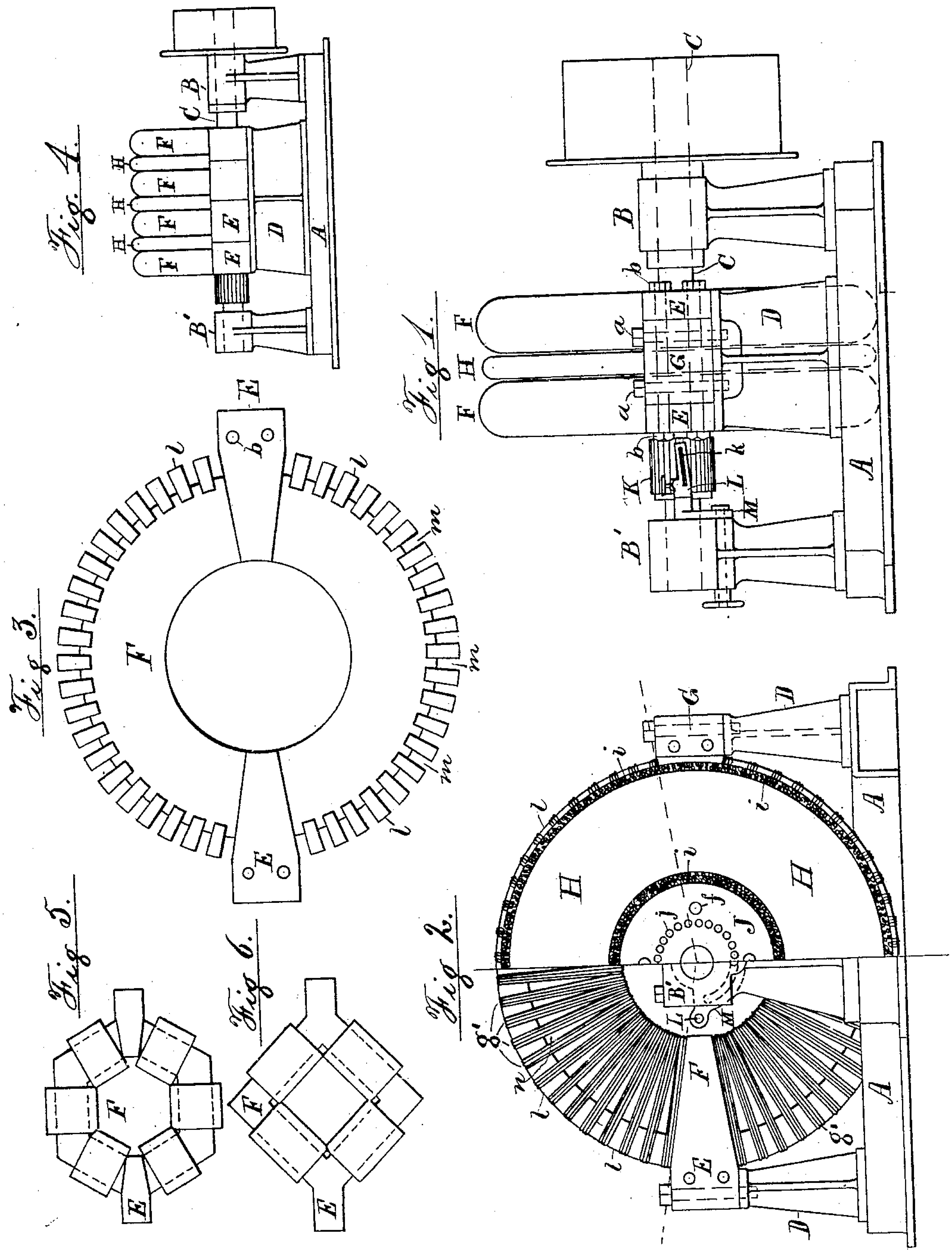
(No Model.)

2 Sheets—Sheet 1.

W. BAXTER, Jr.

DYNAMO ELECTRIC MACHINE.

No. 271,972. Patented Feb. 6, 1883.



Attest:

Chas A Atkinson

Wm. F. D. Crane

Inventor.

Wm. Baxter, Jr. per

Thos. S. Crane, Atty.

(No Model.) 2 Sheets—Sheet 2.

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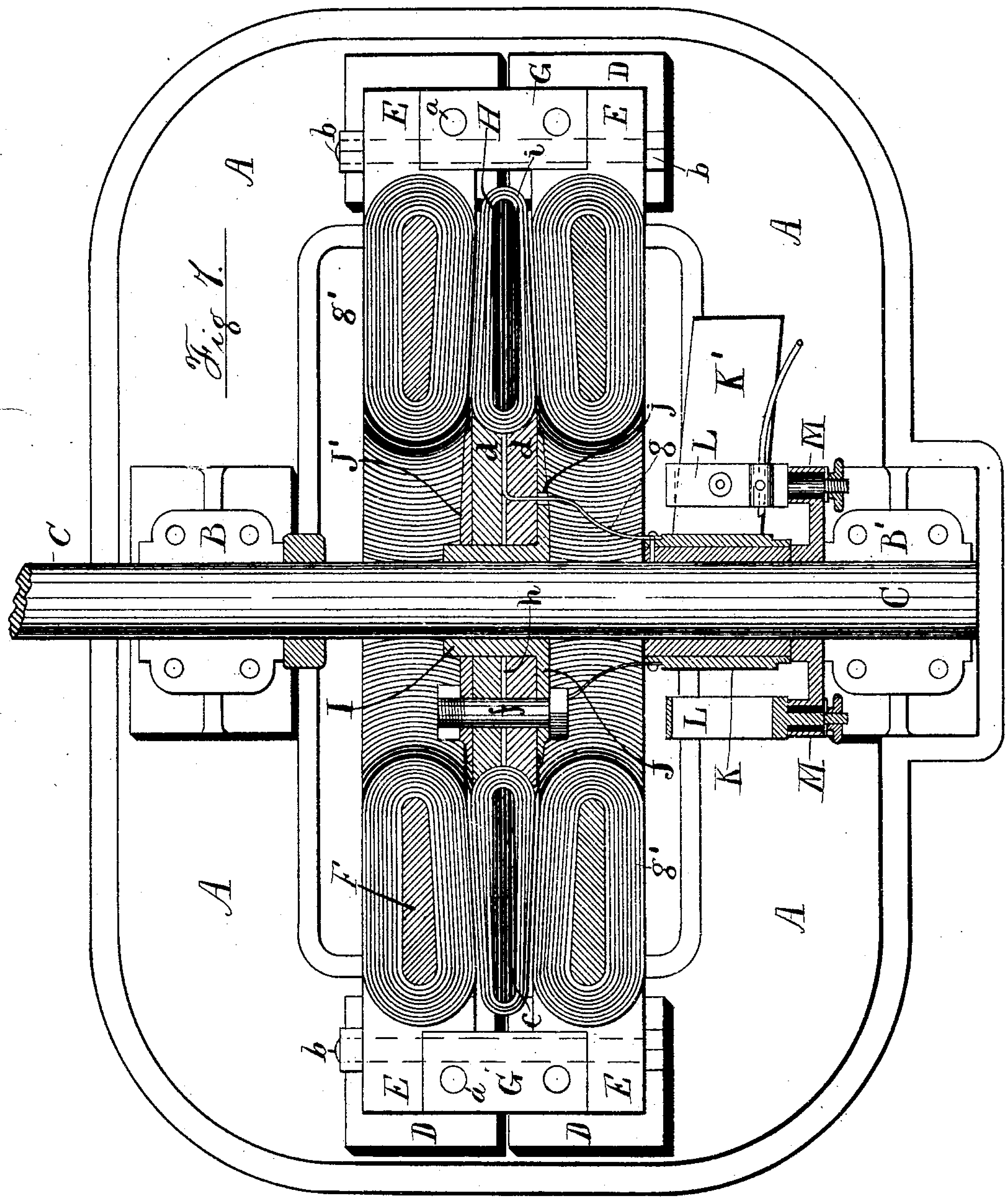

Attest:

Chas. A. Hennion

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Inventor.

Wm. Baxter, Jr., per

Thos. S. Crane, Atty.

UNITED STATES PATENT OFFICE.

WILLIAM BAXTER, JR., OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO JEAN BAXTER, OF SAME PLACE.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 271,972, dated February 6, 1883.

Application filed April 6, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BAXTER, Jr., a citizen of the United States, residing in the city of Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Dynamo-Electric Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

My improvements consist in an improved construction for the magnets, whereby the construction is simplified, close and expensive fittings avoided, and a close and more uniform contact secured, with the peculiar armature used; in a special construction for the armature, whereby the use of thin plates of wrought-iron and their facility for demagnetization are secured and complicated and expensive means of mounting the same are avoided; in the means for mounting and rotating the armature by clamping its inner circumference between disks of wood or other suitable non-conductor, the latter being carried and driven by brass plates secured to the revolving spindle; in the means for removably and adjustably mounting the magnets upon insulating-standards for supporting the brushes obliquely to the cylindrical commutator, and in other points of construction.

My improvements will be understood by reference to the annexed drawings, Figure 1 being an edge view of the machine; Fig. 2, an end elevation, with one-half in section at the center of the armature; Fig. 3, an elevation of one magnet before winding; Fig. 4, an end elevation of a machine constructed with four magnets and three armatures; and Figs. 5 and 6, alternative forms for the magnet, the former being hexagonal and the latter square. Fig. 7 is a plan of the machine, shown in nearly horizontal section through the center of the armature on line *x x* in Fig. 2.

A is the bed-plate, formed with an opening in the middle, into which the armature and magnet partly descend.

B B′ are pedestals for the armature-shaft C.

D D are brass standards, upon the tops of which rest lugs E, formed upon the opposite sides of the magnets F.

G G are blocks bolted between the magnet-lugs, and *a a* are bolts securing the blocks to the tops of the standards.

b b are bolts clamping the lugs and blocks together.

H is the armature, consisting of plain rings of thin sheet-iron separated by layers of paper or other non-conductor, as at *c*, and entirely enveloped in the circuit-wires *i*, which are wound radially upon the mass of insulated plates, and thus lap over one another at the inner aperture of the ring, as seen in the drawings. The core of the armature is thus entirely hidden, and the mounting of the armature is necessarily affected by contact with the wrapping-wires at the interior of the ring. To secure a large surface opposed to the faces of the adjacent magnets, the sheet-iron rings are proportioned so as to produce, when wound, a flattened annular armature, somewhat thicker upon its inner than its outer edge from the piling of the wires *i*, as described. To mount the same removably upon the shaft C, I employ the following construction:

I is a brass hub secured to the shaft C, and provided with a flange, J. Two disks of wood, *d d*, are fitted over the hub and clamped to the flange J by a loose flange, J′, and bolts *f*. The rim of the wooden disks is turned out concave to fit the inner circle of the armature when wound with its wires *i*, and the latter is secured between the edges of the wooden disks by removing one of them from the hub I and placing it outside the armature when the latter is held against the other disk. Bolt-holes are formed in the flanges J and J′ between the inner circle of the armature and the hub I, and the bolts can thus be used without any penetration of the armature-plates or their wrappings. The loose flange J′ and the bolts *f* then bind the wood and armature firmly in place, an open joint, *h*, being formed between the wooden disks to secure a binding-pressure upon the armature.

g g are the wires leading from the armature to the communtator, the former being wound in sections, the opposite ends of the several section-wires being connected with the blocks upon the periphery of the commutator in any desired manner. The wires *g* are shown led from between the wooden disks to openings *j* formed in the brass flange J, and thence to the commutator K, near the stand or pedestal B′.

The brush-holders L are shown secured to an adjustable swing-bracket, M, in the usual way; but the slots are shown at *k* in Fig. 1 as inclined to the axis of the shaft C, and therefore standing obliquely to the surface of the commutator.

The brush K′ is also shown, at the right-hand side of the pedestal B′ in Fig. 7, as clamped obliquely to the line of the holder, thus still further affecting the divergence of the brush from the axis of the commutator. These arrangements produce an oblique bearing of the brush upon the blocks of the commutator, and secure the desired contact with several of the latter, and at the same time obviate the formation of the commutator with spirally-fitted blocks.

The circuit-wires of the magnet F may be prevented from overlapping upon its inner side by wrapping them in parallel sections and keeping their outer ends separated by lugs *l*, as shown in Fig. 2, either cast upon the periphery of the magnet or secured thereto. The shape of the lugs is fully shown in the said figure and in the detached view shown in Fig. 3.

The wires *g′*, being wound in the spaces *m m* between the several lugs, open channels, *n*, of tapering shape, are formed between the groups of wires, affording passage for air-currents generated by the rotation of the armature. As the wires upon the armature extend in radially, their projecting surfaces tend to increase such currents, and thus serve to cool the entire machine.

Owing to the construction shown, it is found in practice that no heat whatever is produced by the rotations or induced electric currents, and it is therefore obvious that the force applied to operate the machine is all effective in generating electricity.

The mounting of the magnets upon brass or diamagnetic standards D secures the retention of the magnetism in the disks F, which are so wound that similar poles are produced upon the upper and lower halves thereof at the opposite sides of each ring. By suitable arrangements of the wrapping-wires *g′* the half of the magnet above the two lugs E is thus converted into a horseshoe-magnet having its north pole at one side and its south pole at the other. The lower half is also formed into a similar magnet having similar poles in contact with those upon the upper half. By casting the ring all on one piece of iron a perfect connection of such poles is secured and the necessity of fine joints is avoided. The magnet is thus shown in Fig. 3, but may be made in halves, if desired, to avoid the application of the wire with a loose bobbin, as is required with a solid ring. As each ring is thus complete in itself, there is no need of fine connections with the blocks G, the latter serving merely as stationary armatures between the adjacent magnets. As each ring presents but one side to the revolving armature, it is obvious that the power of the machine can be increased much faster than the cost of its production by lengthening the shaft C and adding another armature and magnet upon its outer side. As the same commutator can be utilized with such a construction, it will be seen that my construction presents especial advantages in augmenting the power of such machines without increasing the diameter and aggravating the centrifugal force developed by rotation.

In Fig. 4 I have shown a machine thus extended, four magnets F being shown therein, and three armatures H located between them, and when thus constructed one of the armatures can be used to magnetize all the four magnets and the currents from the other armatures employed for other purposes. Such a machine is especially appropriate for telegraphing, as the various breaks in the armature-currents would not occur at the same period of the revolution, and the resulting current would be peculiarly uniform.

It is obvious that the wires from the various sections of the armature can be connected with the blocks upon the commutator in any manner preferred, and a current secured of either quantity or intensity as desired. Such arrangements being common, I have not attempted to show any of them specifically herein, having merely indicated in Fig. 7 the course of the circuit-wires from the armature-ring through the openings *j* to the commutator K.

In Fig. 5 is shown an alternative form for the magnet, the view presenting merely the flat side of the same with the circuit-wires wrapped thereon. Instead of circular arcs, the several sections form a six-sided figure, which, if used as described above, would be thin and flat, so as to expose the wires to the armature in the manner described.

In Fig. 6 four sections are arranged to show a magnet of square outline, and other forms could be used to secure advantages of manufacture or facility of winding the circuit-wires. All these forms would be equivalent to that first described if flattened so as to present the disk-like character desired, as they would all expose the wires to the armature in substantially the same way and secure the desired intensity in the magnetic field.

I am aware that in English Patent No. 5,139 of 1878 constructions resembling mine are shown, and I do not therefore claim a flattened annular armature, broadly; but, having devised a construction of more simplicity than that referred to, and having shown the advantages of that construction in retaining the magnetism in the magnets, I consider the said construction as new. Thus the magnets shown in the English Patent No. 5,139 are constructed to contain a series of polar points around their circumference, and are re-enforced by cylindrical extensions, as is common with such constructions. My construction is free from all these complications, and in practice produces the most satisfactory results in proportion to the power applied, which I attribute partly to the fact that none of the force is dissipated in the production of heat. I therefore disclaim the use of annular magnets having such extensions as are shown in said Patent No. 5,139, and all other special features claimed in said patent, my improvement in the magnet consisting in simplifying the same to such a degree that there are no parts in the construction except the flattened ring (formed either with or without the lugs l) and the supporting-lugs for holding the same upon a suitable frame. I am aware that lugs have been used in other constructions than mine, and therefore disclaim them except in the combination herein shown and claimed. My construction therefore consists in the use of the flattened annular magnets exclusively with flattened annular armature, constructed as described.

It will be noticed in Figs. 1 and 7 that the thickness of the blocks G determines the nearness of the magnets to one another and their proximity to the revolving armature. As the wires, when wrapped upon either magnet or armature, vary somewhat in bulk in different machines, these blocks G afford during the process of construction a very convenient means of compensating for such irregularities in the thickness of the several disks. By making the block thicker or thinner the magnets may be adjusted in relation to the armature to any desired degree of proximity, and the force of the magnetism utilized to the utmost degree.

In Fig. 7 is shown the peculiar construction adapted for the magnets to secure a uniform distance between the armature and magnets throughout, the latter being dished or shaped with a suitable concavity before winding to compensate for the increased thickness of the armature-wrappings at the inner part. By this construction the action of the inducing-currents upon the armature-wires is rendered more effective and uniform throughout and the simple construction and continuous wrapping of the armature maintained.

I am aware that it is not new to make the armature of wires or thin metal plates to secure a rapid discharge of induced magnetism, and I do not claim the same, broadly; but such plates have heretofore been formed with projections upon their inner and outer edges, as in English Patent No. 3,658 of 1878 and United States Patent No. 249,017, between which the insulated circuit wires were wound. My construction differs from these in its extreme simplicity and cheapness, as the plates I use are mere washers, while those heretofore made have been of irregular form and required costly dies for their convenient production. My construction also differs from others in having the sheet-metal core entirely covered by wires uniformly applied throughout its perimeter, and in having a mounting applied exclusively to its interior opening for securing it by means of a friction-clamp to the central driving-shaft.

I am also aware that it is not new to clamp an armature by means of bolting devices to the driving-shaft, as such a construction has been employed in machines different from mine. The clamp I employ differs from others in having the metallic flanges re-enforced with wooden disks, which serve both to insulate the armature and to hold it by an elastic grip.

I am aware that armatures have been made with projecting lugs to separate the coils of wire, as in Maxim's patent, No. 228,544, and I do not therefore claim broadly the application of lugs to a magnet; but in such cases the purpose to be secured was different from mine, and such lugs were used both upon the inner and outer sides of the armature and radial passages thereby produced entirely through the coils for the passage of air, whereas the lugs are in my construction applied only to the periphery of the magnet, to compensate for the superior circumference of the magnet's outer circle and to prevent the overlapping of the wires upon the inner circle, and the passage of air in such openings is only an incidental feature.

I am also aware that an arrangement of brushes has been made to operate with parallel sections upon a cylindrical commutator, as in British Patent No. 3,964 of 1880; but in such case the holders were not pivoted in the ordinary bracket parallel with the commutator-shaft, as mine are; nor had they an open slot, as K, for the insertion of a long and durable brush; nor was the slot parallel with the sections at the open mouth and merely having the brush-bearing inside the slot at an angle with the joints between the sections, like mine, and I therefore regard my form as more simple and cheap in construction.

In a compound machine constructed with several armatures each armature may be used to magnetize its own field-magnet; or all the armatures and field-magnets may be connected in one circuit. The use of one armature to magnetize the whole machine and the production of separate currents from each of the others afford especial advantage in operating a large number of electric lights, as a small number can thus be connected in each of the separate circuits from the several armatures, and the use of currents of high intensity, which tend to produce a blue light, be altogether obviated.

Although the construction I have invented has been described herein as if the machine were operated by power for the generation of electric currents, it is obvious that it is equally adapted for use as a motor by transmitting the current thereto and properly connecting the circuit-wires. In such case the power of a compound machine such as is shown in Fig. 4 can be modified at pleasure by including two, three, or all of the magnets in the electric circuit, as the power derived from the current would depend upon the number of magnets acting upon their included armatures. Such a machine may be said to contain a series of flattened annular armatures and magnets, and, as the same presents a peculiarly economical construction for operating the machine in various modes and with especial efficiency from the intensity of the magnetic field about each armature, I regard the same as both new and useful.

I am aware that one annular armature has been operated between magnetic rings arranged upon both sides thereof, as in British Patent No. 5,139 of 1878; but I am not aware that a greater series of flattened annular armatures and magnets like that shown in Fig. 4 of my drawings has ever been constructed, and I do not therefore limit myself in such a compound machine to the precise construction herein shown for the separate elements thereof, but claim my invention as follows:

1. The combination of the armature H with flattened annular magnets arranged at each side thereof, as described, the magnets being provided with lugs E and l, and the wires g' being wrapped upon the magnet in parallel coils, forming triangular air spaces or channels n, substantially as shown and described.

2. The combination of the flattened annular armature H, constructed of thin plates and enveloped in the circuit-wires, as described, with the disks d d, flanges J J′, hub I, and shaft C, the whole arranged and operating to rotate the armature with the shaft, substantially as shown and described.

3. The combination, with the two annular magnets formed with lugs E at their polar-points, of the adjusting-blocks G, and means, as bolts b b, for securing the magnets together with the blocks between them, substantially as and for the purpose set forth.

4. The combination, with the cylindrical commutator K, having circumferential sections disposed parallel to its axis, of the brush-holders L, pivoted in the bracket M by shanks parallel with the shaft of the commutator and extending from the bracket parallel with the sections thereon, and formed with slots k at an angle with the joints between the sections, substantially as shown and described.

5. The combination, with flattened annular armature, wound, as described, so as to be thicker toward the center, of the flattened annular magnets, dished or concaved, as described, to secure a uniform distance between the opposed faces, substantially as shown and described.

6. The combination, in a magneto-electric motor or generator, of a series of alternate flattened annular armatures and magnets, the arrangement containing two or more armatures having magnets arranged upon both sides thereof, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WM. BAXTER, Jr.

Witnesses:
THOS. S. CRANE,
WM. BAXTER.