(No Model.)

T. A. EDISON.

METHOD OF MAKING ARMATURES FOR DYNAMO ELECTRIC MACHINES.

No. 435,690. Patented Sept. 2, 1890.

Fig. 1.

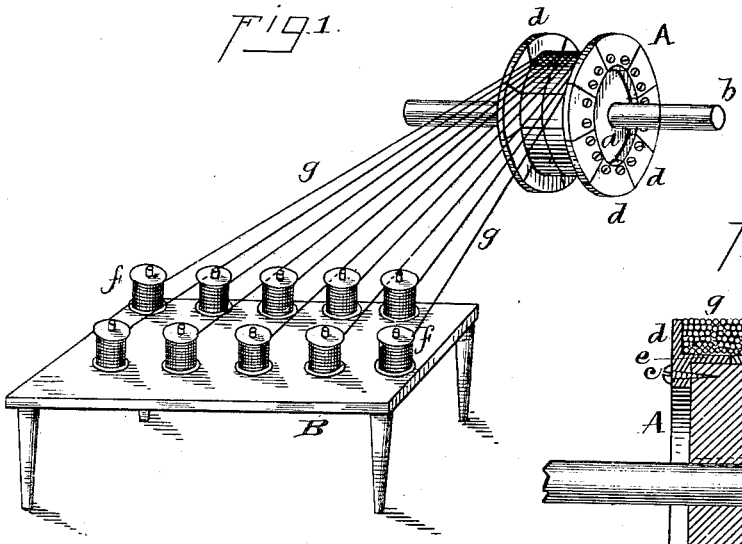


Fig. 2.

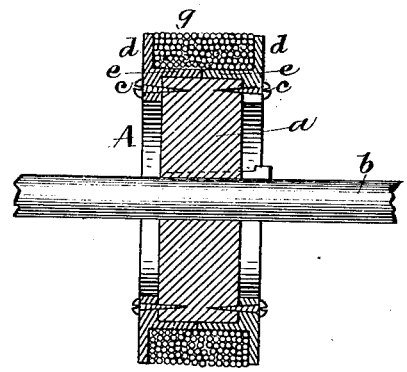


Fig. 3.

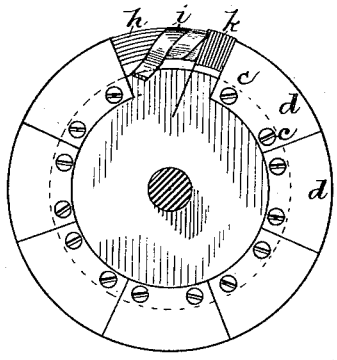


Fig. 4.

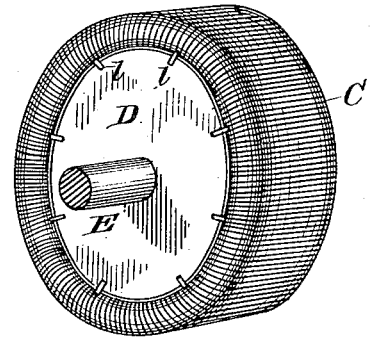
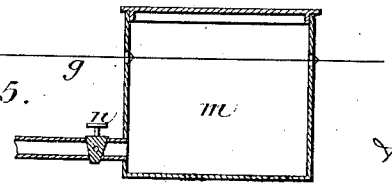


Fig. 5.



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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

METHOD OF MAKING ARMATURES FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 435,690, dated September 2, 1890.

Application filed September 15, 1888. Serial No. 285,526. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex, in the State of New Jersey, have invented a certain new and useful Improvement in the Method of Making Armatures for Dynamo-Electric Machines, (Case No. 800,) of which the following is a specification.

The object of my invention is to provide a cheap and expeditious method of making armatures of that class known as "ring-armatures," whereby an exceedingly cheap and effective form of armature is produced.

The main feature of my invention consists in forming the core of the armature by winding simultaneously into an annular coil a large number of separate iron wires, such wires being insulated from each other in a simple manner, which will be hereinafter explained. It will be seen that in this way the core is constructed very quickly, and I find that in a core so made the local currents are greatly diminished in comparison with those in a core formed by winding a single length of wire. I wind the iron wire on a wooden bobbin made in removable segments, and, after the bobbin is full I remove the segments one at a time and wind the spaces with copper wire at right angles to the iron wire of the core. I then force the armature thus formed onto a wooden hub, securing the edges by slips of vulcanized fiber or other tough material to prevent the core from turning on the hub.

My invention is illustrated in the accompanying drawings.

Figure 1 illustrates the method of winding the iron wires on the temporary hub. Fig. 2 is a sectional view of said hub with the wire wound upon it. Fig. 3 illustrates the method of winding the copper wire upon the core, and Fig. 4 is a perspective view of the completed armature. Fig. 5 shows a cross-section of an oxidizing-chamber.

The temporary wooden bobbin A consists of a hub *a*, mounted on a shaft *b*, to the circumference of which hub is secured by screws *c* a number of segmental wooden pieces *d*, each of which has an inward flange *e*, extending to the middle of the periphery of the hub. I provide a suitable number of spools *f* of iron wire, which may be mounted, as shown, upon a table, or other support B. Enough spools *f* are provided to furnish wires enough to cover the whole width of the flange *s e*, which is the width desired for the armature. Thus if the armature is to be six inches wide and the wire of one-fiftieth of an inch in diameter I will employ three hundred spools *f*. The ends of all the wires *g* extending from the spools *f* are secured in a line across the bobbin A, and this bobbin is then revolved, whereby the wires will be wound in consecutive layers upon the bobbin, each turn of an individual wire being directly above the preceding turns thereof. I may provide the spools *f* with suitable tension devices for keep the wire taut. I insulate all the iron wires by passing the same through the vapor of nitric acid or of hydrogen peroxide, whereby the surface of the wire is oxidized or reduced to ferric oxide. This insulates the wire perfectly. This may be done by means of any suitable apparatus. In Fig. 5 is shown a chamber *m*, containing the oxidizing agent, which may be admitted or withdrawn through valve *n*. The wires *g* before being wound in ring form are passed through the chamber, and their surfaces thus oxidized. After the bobbin A is filled with wire I remove from it one of the segments formed by two pieces *d* on each side, which leaves a space on each side of and beneath the ring of iron wire at which the copper circuit-wire may be wound. This is illustrated in Fig. 3, the segment at the top of the ring having been removed, whereby a space *h* is left for the winding. I first wrap the core at this space with insulating tape *i*, and then wind upon the tape at right angles to the iron wire the insulated copper wire *k*, which is to form the wire of the armature-circuit. After one space is wound I remove the remaining segments one after another, and wind each space so formed with the insulating-tape and with the copper wire in the same manner, suitably connecting the circuit-wires together into a continuous coil. The ring C of iron wire wound with copper wire is then forced upon a wooden hub D, having a shaft E, and slips of vulcanized fiber *l* are inserted in notches in the edge of the hub D to prevent the ring C from turning on the hub.

It will be seen that in making the iron core

each revolution of the wooden bobbin A covers the whole face thereof with wires laid parallel, this being continued until the bobbin is full, and each turn of one wire being wound directly over the preceding turns the resulting structure is analogous to three hundred separate plates, each of which is formed of wire, and the wire being insulated, as described, the Foucault currents are largely diminished. It also makes a more even armature, and the rapidity of winding and cheapness of the operation are evidently much greater than where a single wire is used. The copper wire wound on the iron wire at right angles to it effectually binds and secures it together.

What I claim is—

1. The method of making armature-cores, which consists in simultaneously winding several wires side by side into an annular coil, said wires being sufficient in number to constitute one layer of the core, whereby an entire layer is made by a single winding, and continuing the winding as many times as there are to be layers of wire in the core, substantially as described.

2. The method of making armature-cores, which consists in simultaneously winding several wires side by side into an annular coil, said wires being sufficient in number to constitute one layer of the core, whereby an entire layer is made by a single winding, and continuing the winding as many times as there are to be layers of wire in the core, and then winding said coil with the circuit-wire at right angles to the wires of the core, substantially as described.

3. The method of making an armature, which consists in winding a number of wires simultaneously upon a temporary bobbin into an annular coil, removing said bobbin, and winding said coil with the circuit-wire at right angles thereto, substantially as set forth.

4. The method of making an armature, which consists in winding wire into an annular coil upon a temporary bobbin made up of removable segments to form the core, removing said segments one at a time, and winding the space occupied by each segment with the circuit-wire at right angles to the wire of the core, substantially as set forth.

5. The method of making an armature, which consists in winding a number of wires simultaneously upon a bobbin made up of removable segments into an annular coil to form the core, removing said segments one at a time, and winding the spaces occupied by the segments with the circuit-wire at right angles to the wire of the core, substantially as set forth.

6. The method of making an armature, which consists in winding a number of wires simultaneously into an annular coil, winding the circuit-wire thereon at right angles to the wire of the core, and forcing the whole upon a hub, substantially as set forth.

7. The method of making an armature, which consists in winding wire upon a bobbin made up of removable segments to form the core, removing said segments one at a time and winding the circuit-wire in the spaces occupied by the segments at right angles to the wire of the core, and then forcing the whole upon a hub, substantially as set forth.

8. The method of making an armature-core, which consists in oxidizing iron wire by passing it through an oxidizing agent and winding it into an annular coil, substantially as set forth.

9. The method of making an armature-core, which consists in oxidizing a number of iron wires by passing them through an oxidizing agent and winding the same simultaneously into an annular coil, substantially as set forth.

This specification signed and witnessed this 31st day of August, 1888.

THOS. A. EDISON.

Witnesses.

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ALFRED W. KIDDLE.