(No Model.)

H. A. WAGNER & F. SCHWEDTMANN.

ELECTRIC MACHINE.

No. 474,787. Patented May 10, 1892.

Fig. 1.

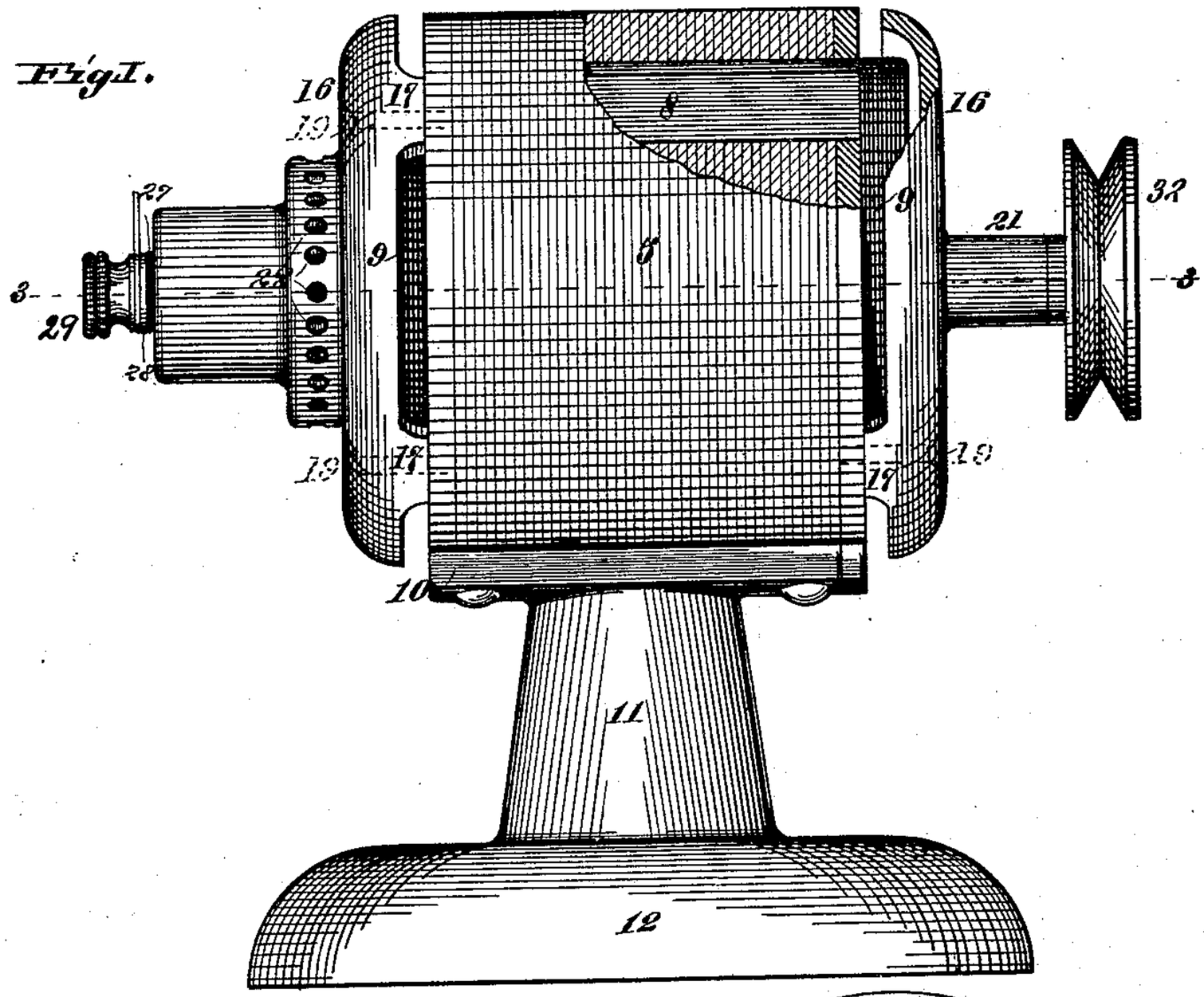


Fig. 2.

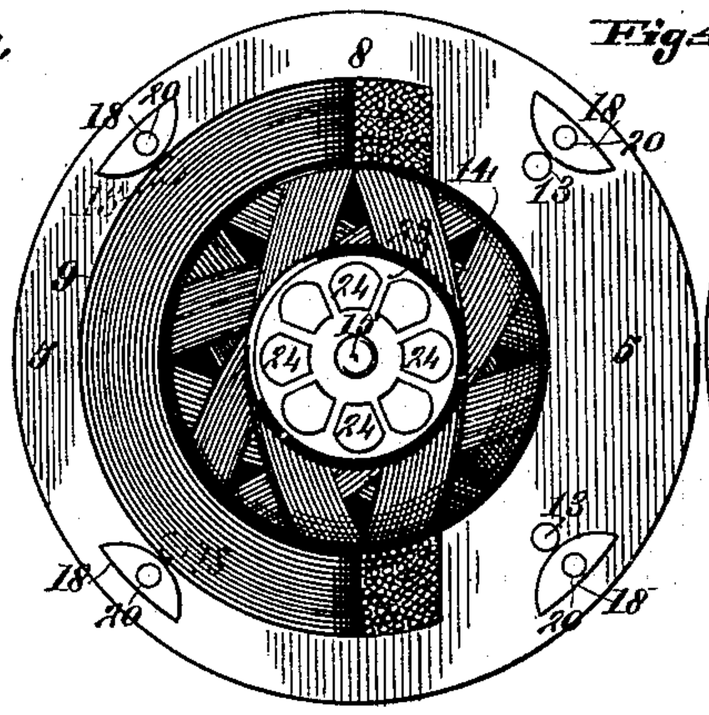


Fig. 4.

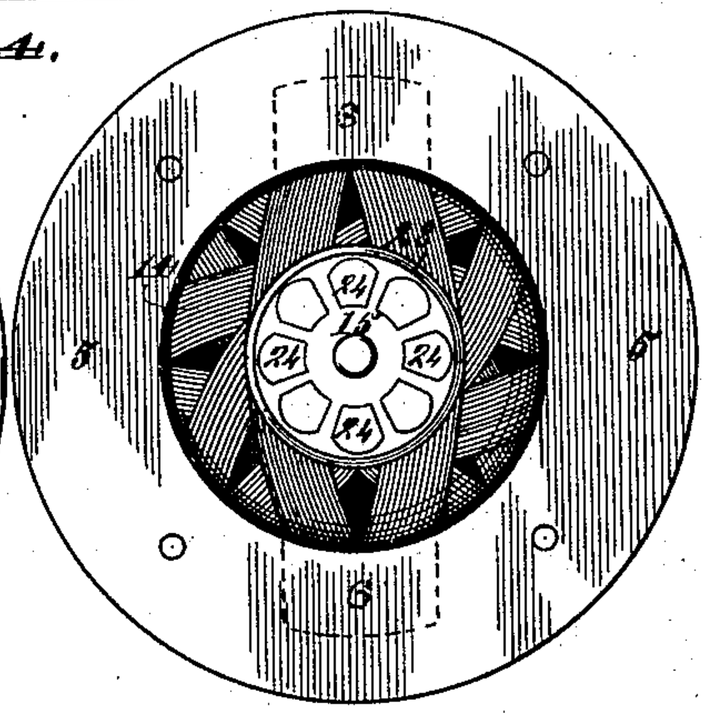
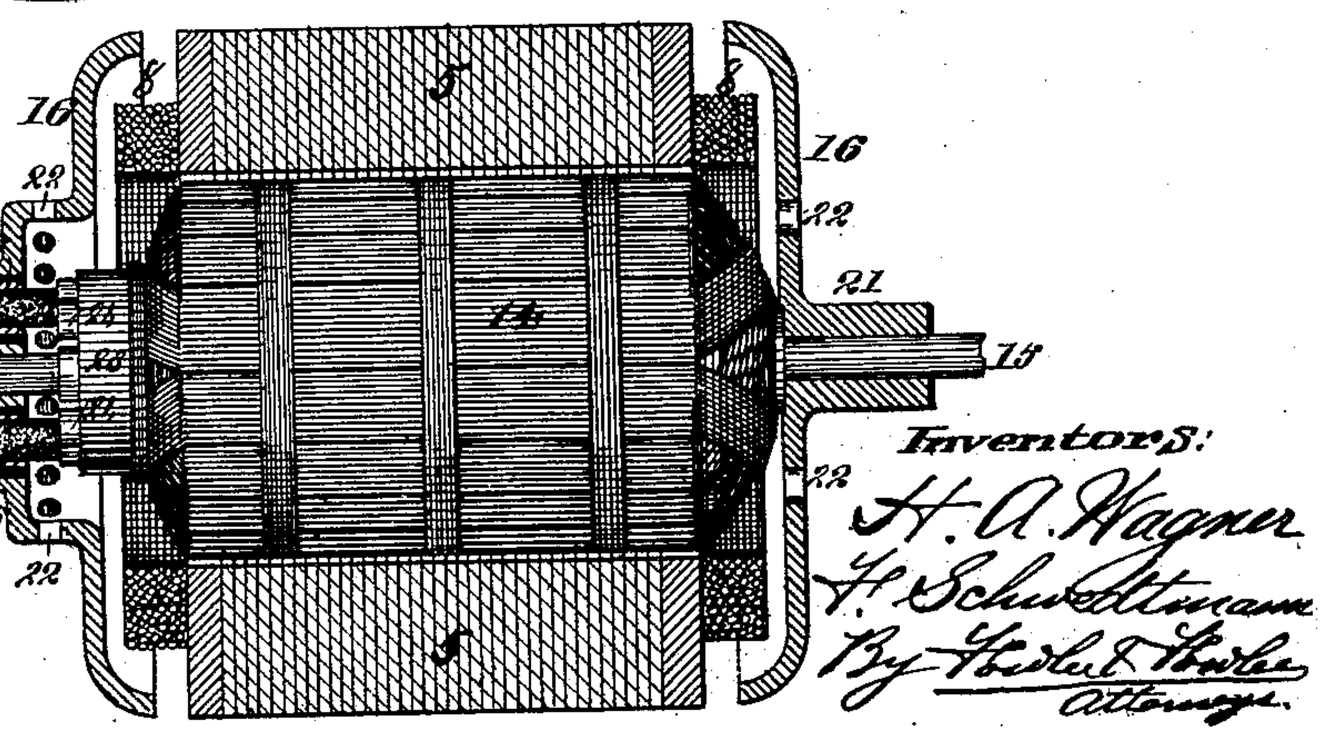


Fig. 3.



Witnesses:
J. F. Wharton
M. M. Brown

Inventors:
H. A. Wagner
F. Schwedtmann
By Hosford & Turlee
Attorneys.

UNITED STATES PATENT OFFICE.

HERBERT A. WAGNER AND FERDINAND SCHWEDTMANN, OF ST. LOUIS, MISSOURI, ASSIGNORS TO THE WAGNER ELECTRIC MANUFACTURING COMPANY, OF SAME PLACE.

ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 474,787, dated May 10, 1892.

Application filed May 15, 1891. Serial No. 392,831. (No model.)

To all whom it may concern:

Be it known that we, HERBERT A. WAGNER and FERDINAND SCHWEDTMANN, citizens of the United States, residing at St. Louis, in the State of Missouri, have invented a certain new and useful Magneto-Electric Machine, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

Our invention relates more particularly to improvements in alternating and pulsating current magneto-electric machines, and has more especial reference to electrical motors.

The invention consists in features and details of construction which will best be understood by referring to the accompanying drawings, in which—

Figure 1 is an elevation of an electric motor more particularly adapted for alternating and pulsating currents. Fig. 2 is an end elevation of the field-magnet and armature of the aforesaid motor. Fig. 3 is a longitudinal central section of the latter on the line 3 3 of Fig. 1; and Fig. 4 is a view corresponding to Fig. 2, showing a modification.

The same figures of reference indicate the same parts throughout the several views.

5 represents an annular or cylindrical field-magnet of suitably-laminated magnetic metal, the same having cut-away places 6 (see dotted lines, Fig. 4) therein at diametrically-opposite points for the reception of the field-coils 8. That part 9 of the field-coils which ordinarily passes over and around the end of the armature we bend to one side of the armature and adjacent to the annular field, so that it lies in a plane at right angles to the axis of the armature. This construction permits the armature to be withdrawn without disturbing the field-coils, as will be evident from an inspection of Fig. 2. The annular field-magnet is sustained by a plate 10, secured thereto, which is carried by a pedestal or standard 11, rising from a bed-plate 12, and the laminæ or annular plates of the field-magnet are bolted together by rods 13.

14 is an armature of any suitable type, and, as here shown, is a drum-armature of the Siemens type. This armature is carried by the shaft 15, which is sustained at each end by end plates or cap-pieces 16 of suitable non-magnetic metal. These caps 16 are cast in one piece with lugs 17, preferably four in number, extending therefrom. The said lugs 17 are adapted to rest upon lugs 18, which extend from the annular field-magnet. The lugs 17 and 18, engaging each other, hold the cap-pieces in place. The cap-pieces are secured to the annular field-magnet by screws 19, which pass into screw-holes 20 in the lugs 18, carried by the annular field-magnet. The cap-pieces are provided with suitable bearings 21 for each end of the armature-shaft and are furnished with perforations 22 for the purpose of ventilating the armature and keeping the same cool by allowing circulation of air to take place through the cylindrical field-magnet.

At one end of the armature and carried by the armature-shaft is a disk 23 of insulating material, into which take metal pegs 24, (constituting the commutator-segments,) with which the armature-coils are suitably connected. These pegs or bars 24 are placed a suitable distance apart and upon them bear, preferably, carbon rods 25, (forming the commutator-brushes,) carried by the cap-piece 16, adjacent to the insulating-disk 23. The carbon rods 25 are carried by conducting-tubes 26, which are insulated from the cap-piece 16 by insulating-tubes 27, inserted in sockets in said cap-piece. Upon the protruding end of each metallic tube 26, in which the carbon rods are, may be placed one or more metallic washers 28, and over the end of each of said tubes is placed a blind-nut 29, which grasps between it and the washers 28 the wires 30, leading to the external or working circuit.

Within each of the tubes 26 is a metallic helical spring 31, one end of which bears against the carbon rods 25 and the other end of which rests against the blind-nut, and thereby holds the rods up against the commutator-segments 24. By adjusting the blind-nuts 29 in or out the carbon rods 25, which constitute the commutator-brushes, may be made to bear with more or less force upon the commutator.

It will be noted that the blind-nuts 29 also serve as binding-posts. At the end of the armature-shaft remote from the commutator may be carried a pulley 32, by which the power of the motor may be transmitted to any apparatus that is to be driven thereby. The cap-piece 16, adjacent to the commutator, is adapted to cover the end of the armature-shaft. It is evident, however, that such shaft may protrude through the said latter-mentioned cap-piece if found desirable.

Inasmuch as upon each reversal of the current transmitted to the motor the conditions in the motor—that is, the magnetism—is reversed, it will be evident that a continuous motion will result upon an alternating current being transmitted to the motor. This law, although of comparatively recent discovery, is now well known and needs no explanation. It is also a well-known fact that where magnetism is induced in a body by a current passed through a conductor in inductive proximity to such body that the body so magnetized does not respond at once to the current in the conductor, but that it lags behind the current passing in the conductor. Thus, for instance, where a body is magnetized by a current passing through a conductor in such a manner as to produce a north pole in that part of the body adjacent to the conductor and the current is thereupon reversed in the conductor and is in such direction as to produce a south polarity the north polarity in the body will continue to exist during the reversal of the current, so that the north polarity in the body and the north polarity in the conductor will, according to the well-known law of magnetism, repel each other and produce motion if one or both of such parts are movably mounted. By the time the current is again reversed or brought back to its first direction in the conductor a south polarity will be induced by the conductor in the body and the two south polarities will repel each other, thus tending to cause motion in the same direction as before. This magnetic lag is that which gives rise to the motion and is known as "hysteresis. In the modification of our invention we make use of this law, and have found by experiment that owing to such magnetic lag we can dispense with coils entirely on either the armature or field-magnet. In this modification we preferably do not cut away the field-magnet to make room for the field-coils, but build the field-magnet up from solid rings in the manner indicated by full lines in Fig. 4. Upon a reversal, therefore, of the current passing through the armature-coils in a direction to induce north polarity at one side of the field-magnet and south polarity at the other side of the field-magnet there will exist in the armature a north polarity adjacent to the north in the field-magnet and a south polarity adjacent to the south polarity in the field-magnet. These two polarities will repel each other and cause motion in a well-known manner. Upon the polarity being reversed the same result will follow, only the north and south polarities, respectively, will both be on opposite sides of the apparatus. Continuous motion will therefore follow upon reversals of the current. If there were no magnetic lag in the field-magnet, motion would, of course, not result, for the reason that a south in the field-magnet would occur at the same instant as a north in the armature and the two poles would attract, and hence prevent motion. It is obvious, of course, that our invention is also adapted for a pulsating current as well as an alternating one. It will be evident that the field-magnet may be provided with coils and the armature unprovided with coils and still accomplish the result attained by our invention.

In place of using solid imperforate caps 16 for sustaining the armature-shaft from the field spiders or arms may be employed. We prefer, however, to use solid cap-pieces 16, as herein shown, for the reason that the armature is entirely incased by such caps and the field, thereby making a very compact and completely-incased motor.

Having fully set forth our invention, what we desire to claim and secure by Letters Patent of the United States is—

1. The combination, in a magneto-electrical machine, of a cylindrical field-magnet, an armature surrounded thereby, and cap-pieces supporting said armature and its shaft from said cylindrical field-magnet and with said field-magnet completely incasing said armature, one of said cap-pieces being provided with sockets containing longitudinally-movable commutator rods or brushes, a commutator upon which said brushes bear in a plane at right angles to the axis of the armature, spiral springs carried by the latter-mentioned cap-pieces for holding said commutator-brushes against the segments of the commutator, and binding-screws, also carried by said cap-pieces, bearing against said spiral springs for adjusting the commutator-rods against the commutator-segments and forming the terminal connections of the armature-coils.

2. In a magneto-electric machine, the combination of an armature, a cylindrical field-magnet surrounding same, cap-pieces at the ends of said armature for supporting the armature-shaft from the field-magnet, socket-pieces formed in one of said caps, an insulating-tube in each of said sockets, a tube of conducting material incased by each of said insulating-tubes and extending at one end slightly beyond the same, a brush or rod of carbon or other conducting material free to move longitudinally in each of said conducting-tubes, spiral springs contained in said conducting-tubes, bearing at one end upon said carbon rod, blind-nuts carried by the extended end of said conducting-tubes and bearing upon the other end of the said spiral springs, forming thereby an adjustment for the tension of the aforementioned springs, whereby

the force of the brush against the commutator may be adjusted, and washers placed between said blind-nuts and said insulating-tubes and adapted to grasp between them and the said blind nuts the conducting-wires.

3. A magneto-electrical machine comprising a cylindrical field-magnet, longitudinal cut-away places therein for the field-coils, that part of the field-coils which ordinarily passes over the ends of the armature being bent to one side of the armature and lying in a plane at right angles to the armature-shaft, and cap-pieces forming bearings for said armature-shaft at each side thereof and secured to the cylindrical field-magnet and together therewith completely incasing the said armature, whereby upon removing one of the cap-pieces the armature may be withdrawn longitudinally from the cylindrical field-magnet without disturbing the field-coils.

In testimony whereof we have hereunto set our hands and affixed our seals, this 6th day of May, 1891, in the presence of the two subscribing witnesses.

HERBERT A. WAGNER. [L. S.]
FERDINAND SCHWEDTMANN. [L. S.]

Witnesses:
A. C. FOWLER,
M. M. BROWN.