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G. & G. J. LITTLE.

ELECTRIC MOTOR.

No. 437,835. Patented Oct. 7, 1890.

Fig. 5.

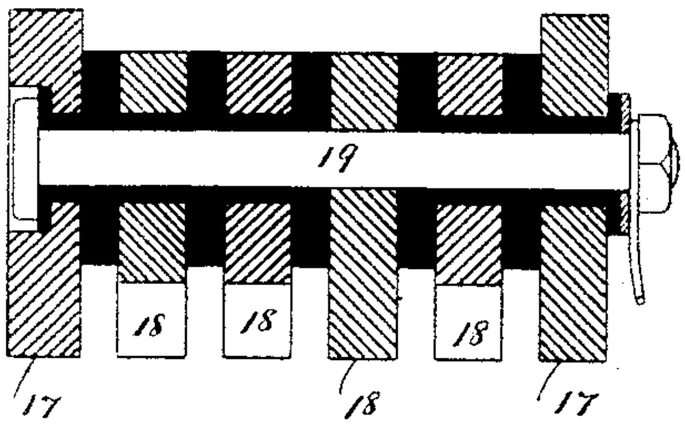

Fig. 4

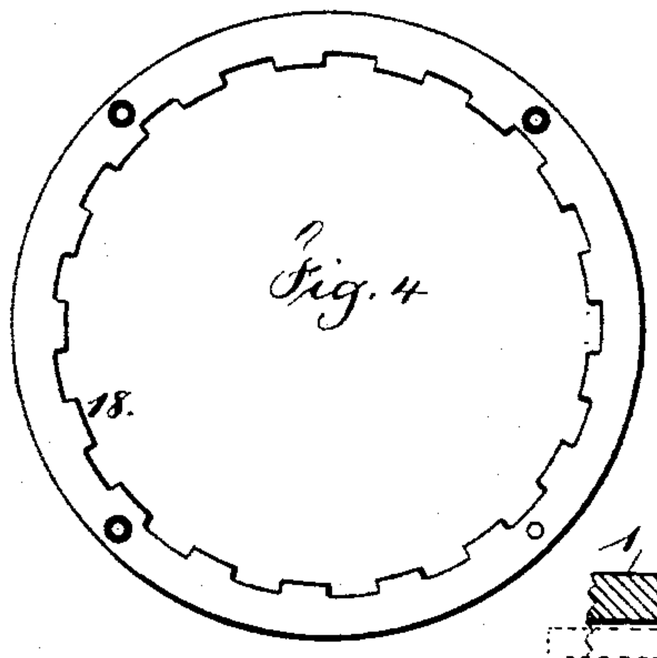

Fig. 1.

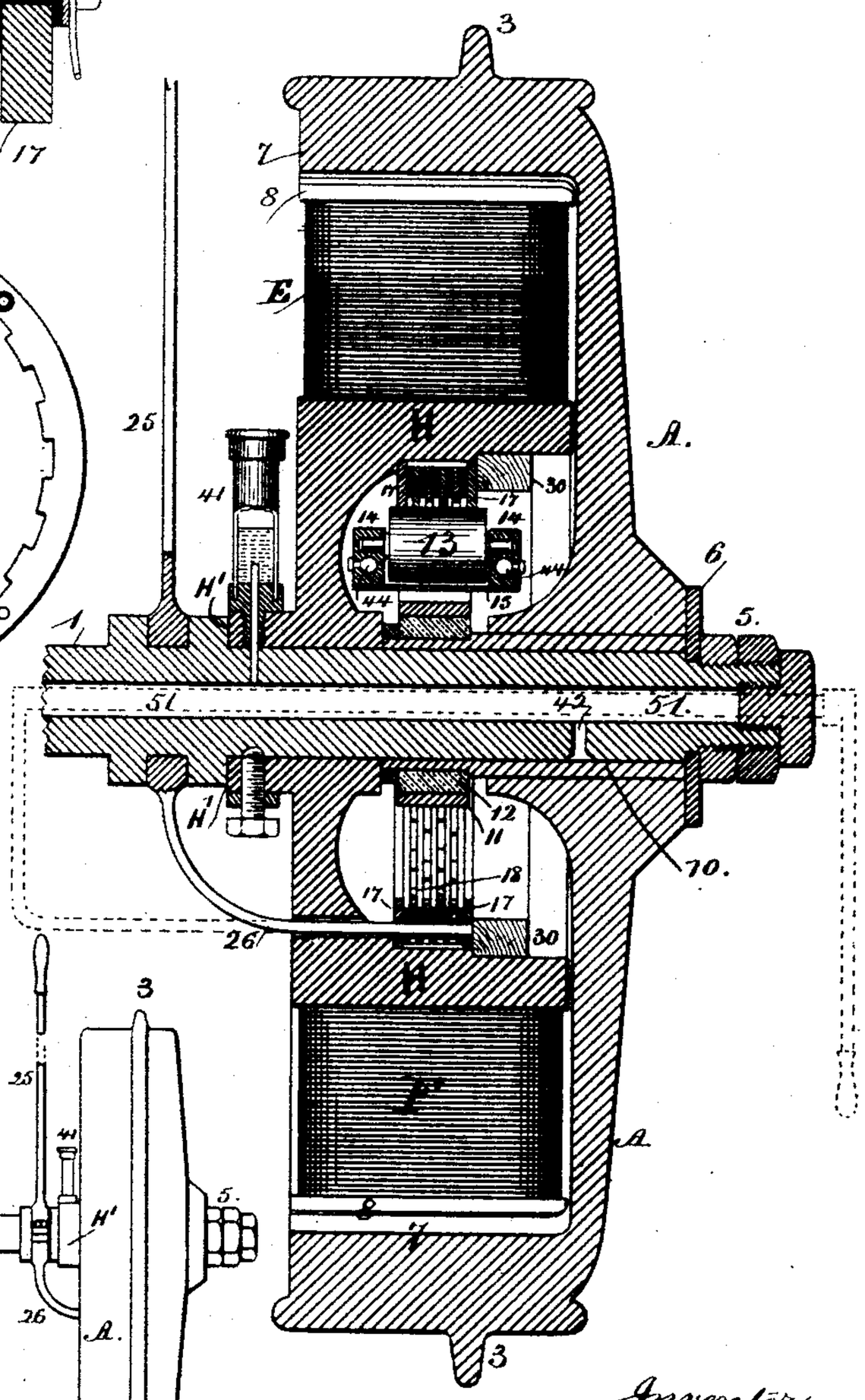

Fig. 2.

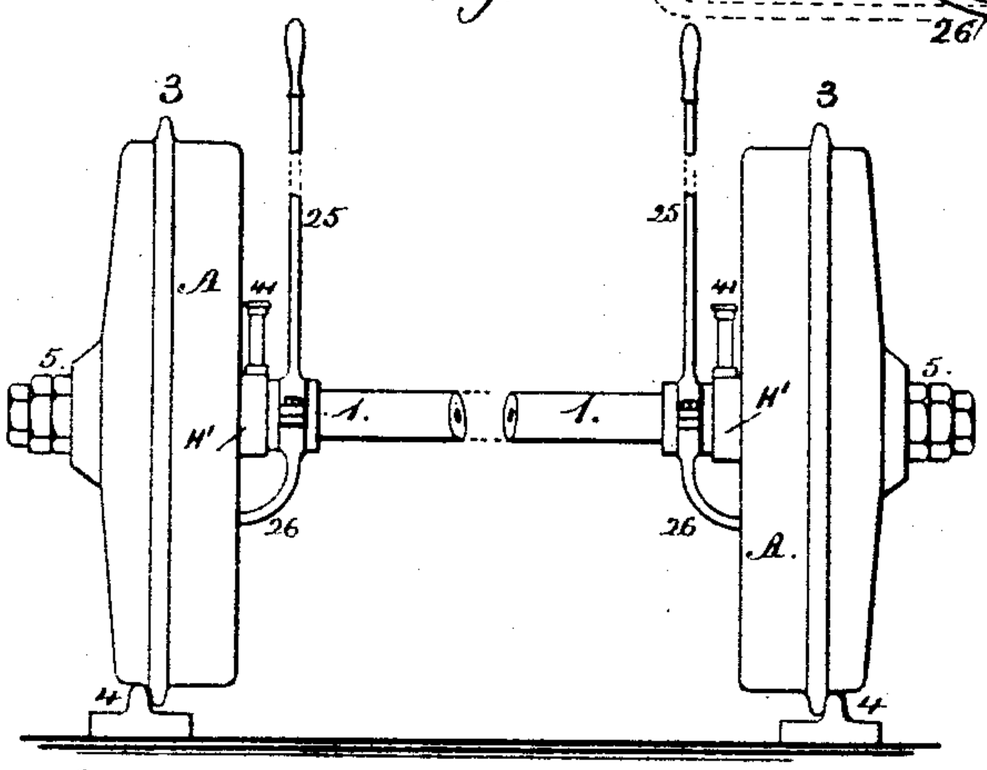

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Fig 3

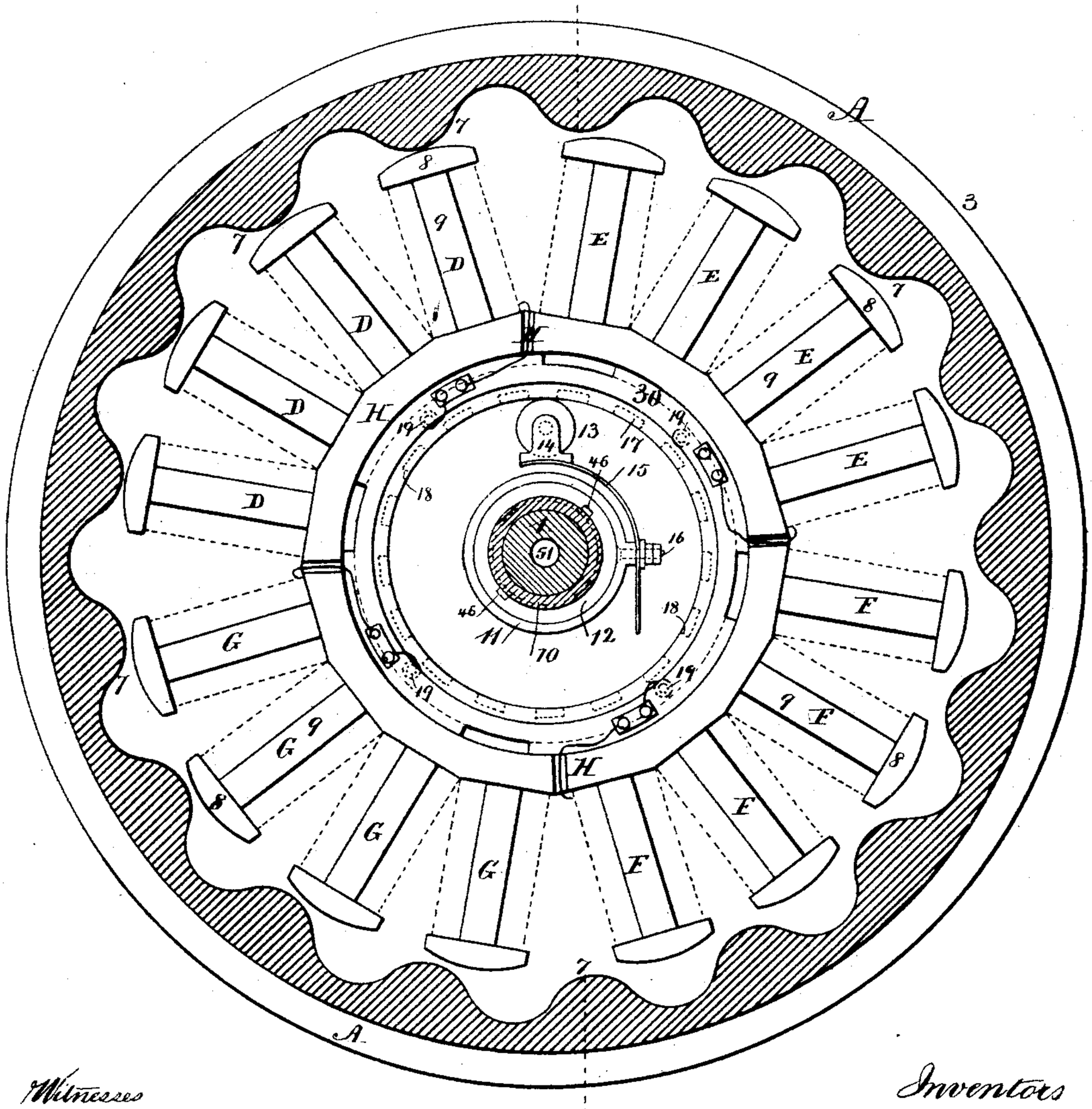

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Fig. 6

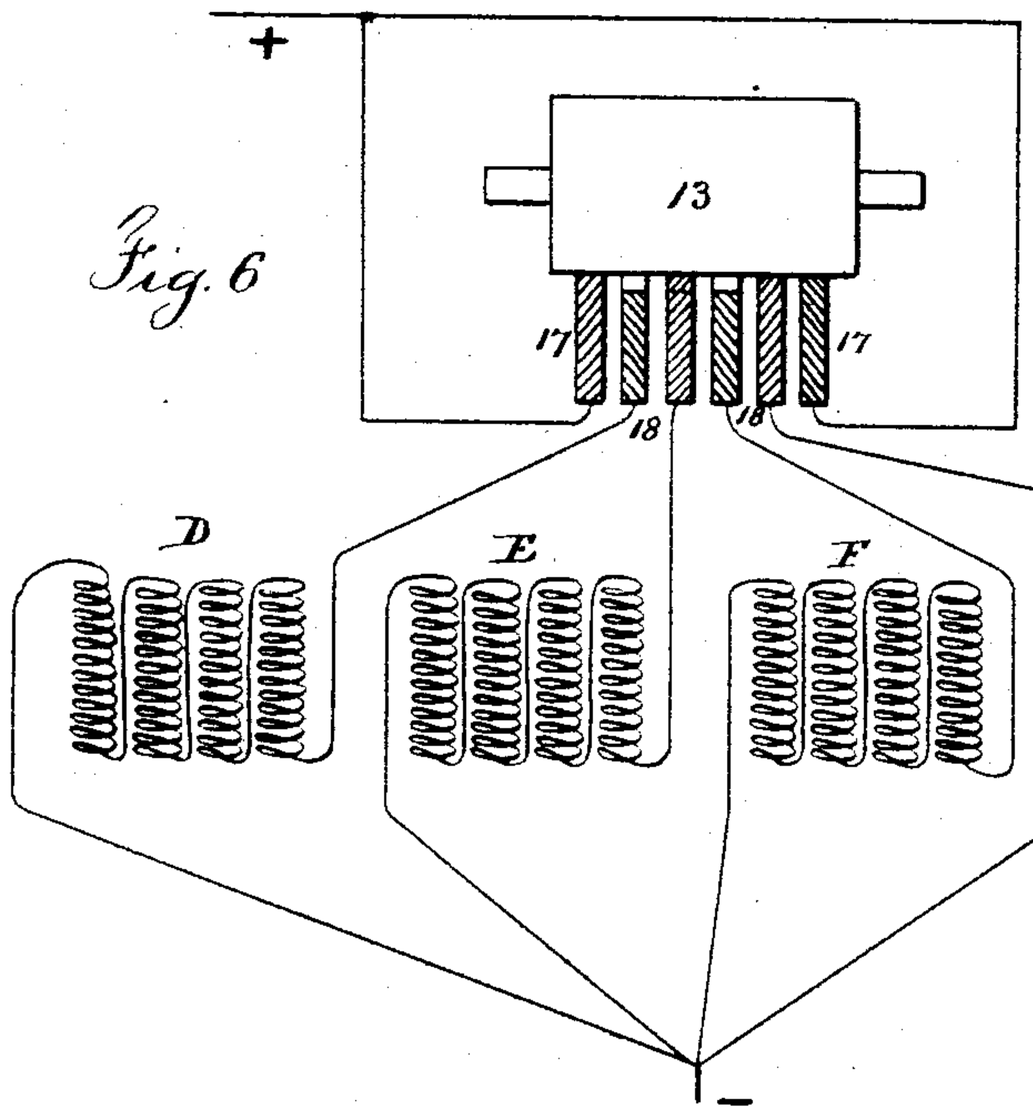

Fig. 7

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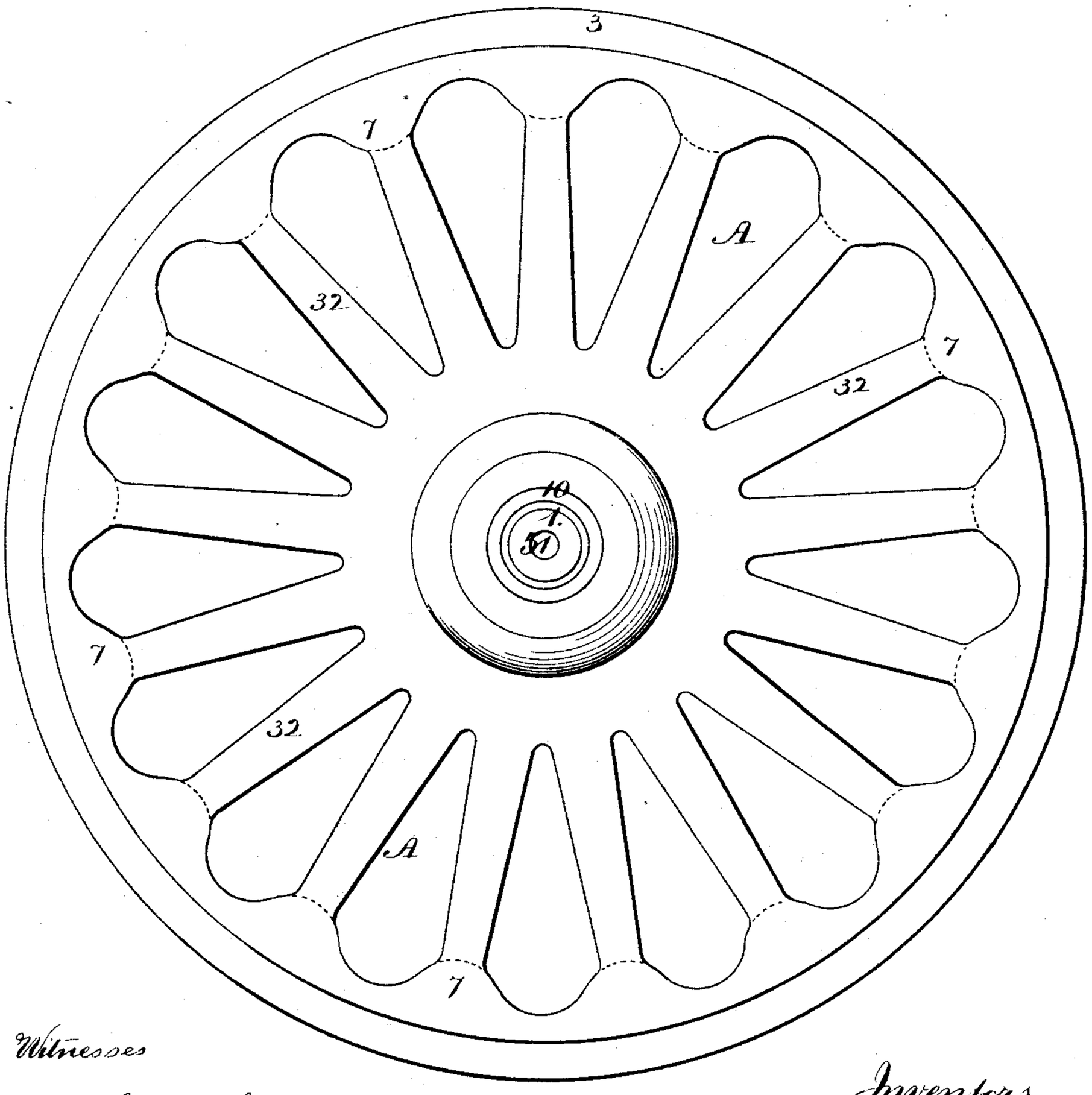
Fig. 8.



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UNITED STATES PATENT OFFICE.

GEORGE LITTLE AND GEORGE JUDGE LITTLE, OF PASSAIC, NEW JERSEY;
SAID GEORGE JUDGE LITTLE ASSIGNOR TO GEORGE LITTLE.

ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 437,835, dated October 7, 1890.

Application filed January 16, 1886. Renewed May 8, 1888. Again renewed April 19, 1890. Serial No. 348,596. (No model.)

To all whom it may concern:

Be it known that we, GEORGE LITTLE and GEORGE JUDGE LITTLE, of Passaic, in the county of Passaic and State of New Jersey, have invented an Improvement in Magnetic Motors for Railways, &c., of which the following is a specification.

The object of this invention is to revolve by the action of electro-magnets one or more wheels, and said wheels are especially adapted to the propulsion of cars on railways; but the same may be employed in revolving machinery of any character.

In our improvements the electro-magnets are arranged radially around a common base, and the armatures form inward projections or corrugations upon a ring. The electro-magnets may revolve and the ring remain stationary; but usually the electro-magnets will occupy a fixed position and the ring revolve around the same. We have described and shown the parts as arranged and acting in the manner last named. The interior of the ring is divided up into equidistant corrugations or projections, forming armatures, and the electro-magnets are in groups. There may be three or more such groups. We have represented four such groups. The electro-magnets in each group occupy radial positions to a corresponding number of armature-corrugations; but the sum of the electro-magnets composing the groups is different from the number of armature-corrugations, and the spaces between the groups are equal, but greater than the space between one electro-magnet and the next in the group, and the groups of electro-magnets are energized successively by a circuit-closing commutator, the magnetism being developed in each group in succession as the armature-corrugations approach the pole-pieces of that group and two or more groups are acting at the same time on the armatures, and the electric current is cut off from the group as the armature-corrugations nearly reach the centers of the pole-pieces. Thereby the rotation of the armature ring or wheel is maintained by the magnetism developed in the successive groups of electro-magnets, and by shifting the commutators in their relation to the circuit-closing devices the armature-ring can be revolved in either one direction or the other, or the armature-ring may be held stationary by the commutating devices being placed in such a manner as to develop the magnetism in the groups of cores at the time the armature corrugations or projections are central to the pole-pieces.

In the drawings, Figure 1 is a vertical section of the improved motor. Fig. 2 is an elevation illustrating two electric-motor wheels upon a railroad-track. Fig. 3 is an elevation of the electro-magnets and a section of the armature-wheel. Fig. 4 is an elevation of a portion of one of the commutator-rings. Fig. 5 is a section of the commutator and contact rings. Figs. 6 and 7 are diagrams of the circuit-connections, the helices of the electro-magnets being shown in Fig. 6 as wound in series, while in Fig. 7 they are shown in multiple arc; and Fig. 8 is an elevation of the outer face of the wheel.

The shaft 1 is presumed as occupying a fixed position and the wheel A as revolving thereupon, and in Fig. 2 the wheels A are represented as provided with flanges 3 and running upon tracks 4. In this case the shaft 1 is to be connected with the car-platform, and the wheels A become the motors for propelling the car. The lock-nuts 5 and washers 6 retain the wheel A upon the shaft 1.

The periphery of the wheel A is made in the form of a ring with internal corrugation 7 or projections similar to an internal gear-wheel, forming armatures. We have represented seventeen of these armature-corrugations and sixteen electro-magnets, there being four groups and four electro-magnets in each group. If there are thirteen armature-corrugations, there may be twelve electro-magnets divided up into three groups with four electro-magnets in each group, or four groups with three electro-magnets in each group, or the armature-corrugations may exceed the sum of the electro-magnet group by two or three, if desired.

The respective groups of magnets are marked D E F G. Each magnet is composed of a pole-piece 8 upon a core 9, that projects radially from a magnet-base H, that is in the form of a cylinder or ring, and it is connected by a disk or arms and a hub H′

firmly to the shaft 1, and around each core are the helices or coils, as usual.

The wheel A is preferably made with a cylindrical bush 10, surrounding the shaft 1 and revolving with the wheel, and to this bush 10 is connected a metal ring 11, there being insulating material at 12 between the bush 10 and said ring 11. There are projections 46 from the bush 10 and ring 11 into the insulating material 12 to insure the proper rotation of the parts.

The axis of the contact-roller 13 is supported in bearing-blocks 14, that are connected to the spring-segment 15, that is slotted for the passage of the bolt 16, projecting outwardly from the ring 11, and there are nuts upon the bolt 16 to clamp the spring-segment 15 after the same has been adjusted.

The contact-rings 17 and the commutator-rings 18 are connected to each other by bolts 19, as seen in Fig. 5, or in any similar manner; but these rings are insulated from each other and from the bolts by washers or tubes of hard rubber or similar material, so that the electric circuit may be passed from any conductor or source of electric energy to the contact-rings 17, and thence through the roller 13 to the commutator-rings 18, and from these to the respective groups of electro-magnets, as indicated in Figs. 6 and 7, and the return-circuit connections to the respective helices are bunched and connected to the negative conductor.

The contact-rings 17 have smooth inner surfaces; but each of the commutator-rings 18 is notched and has as many projections as there are armature corrugations or projections 7, and there is one ring 18 for each group of electro-magnets, and the commutator-rings 18 are placed so that the projections thereupon are in advance one of another by regular graduations of about half the width of the projections, so that the contact-roller 13 will close the circuit to one group of electro-magnets when the armature-corrugations occupy the positions represented in Fig. 3 in relation to the group of magnets F. They will continue to pass the current to such group until such armatures 7 are central to the cores 8, as indicated in connection to the group D. The circuit to the next group will have been previously closed, so that the electro-magnets of two groups will always be in action to rotate the armature-ring by acting upon the respective corrugations, thereby causing the magnetism to act to the best advantage in giving motion to the armature-ring.

It is to be understood that the helices are to be wound in such a manner that the pole-pieces 8 will be properly energized and the armature-corrugations will by induction assume the opposite polarity in passing the pole-pieces. If the pole-pieces are energized S. N. N. S. in the respective groups the residual magnetism will be lessened.

It is preferable to make the exterior of the contact-ring 17 correspond to the interior of the magnet-base H, so that the mass of contact and commutator rings can be turned around within the magnet-base to bring them into the proper position relatively to the groups of magnets, the armatures, and the contact-roller, and a convenient way of moving such rings is illustrated in Figs. 1 and 2, where the lever 25 has an eye surrounding the shaft 1 and an arm 26, passing off into an insulated hole in the contact-rings, thereby allowing the mass of contact-rings to be turned between two stops (more or less) and into the proper position by the action of said lever 25.

The connections passing from the notched commutator-rings 18 to the group of magnet-helices may be of any desired character. It is, however, convenient to make use of as many bolts 19 as there are groups of electro-magnets, and all the holes but one in each commutator-ring are large enough to admit an insulating-tube, and that one hole in the ring fits the bolt tightly. This is shown in Fig. 5. By this construction each bolt is in electric contact with its proper ring and insulated from all the others, and the electric connections can be made directly from the end of the bolt to the group of helices, or the ends of the bolts may press against insulated plates in a stationary ring 30, of insulating material, the electric wires being connected to such plates. This allows the rings 17 and 18 to be moved as a whole around a few degrees within the magnet-base H, the motion being limited by stops, so that the armature-wheel can be rotated in either one direction or the other, or the magnetism maintained in the pole-pieces that are in line with the armature-corrugations, and hence tending to hold the motor-wheel quiescent and prevent its turning in either direction.

It is usually preferable to make an armature-wheel with spokes 32, as shown, the same being continuations of the armatures, so that the magnet-poles can attract the spokes as well as the armatures.

By making the axis or shaft 1 hollow at 51 and supplying oil to the same from the oil-cup 41 the moving parts can be lubricated by oil passing through the lateral hole or holes 42, and the bearings 14 should have oil-cavities at 44 for lubricants of the journals of the contact-roller 13.

It will be understood that the magnets act upon the armature projections that are on the inner surface of the main wheel. Hence the magnetic attraction is operative to the best advantage because there is but little leverage against the electro-magnets.

The commutator-rings are easily kept cool because there is a free circulation of air between them; but we do not limit ourselves to this particular form of commutator-ring, and the wheel is free to revolve with great rapidity, as there are not any helices or other parts thereon that are likely to become loose by centrifugal action. This magnetic motor may be

connected to gearing that reduces the speed and enhances the power that is exerted.

The rod or bar 26, by which the commutator-rings are adjusted, may be a single straight rod, or it may be acted upon by a crank-arm from a shaft within the tubular axle 1, there being a handle at the end outside the axle, as seen by dotted lines in Fig. 1.

We claim as our invention—

1. The combination, with a wheel having a circular exterior surface and inward corrugations or angles forming armatures, of electro-magnets in groups, the sum of the groups being one less than the number of the armature-corrugations, and contacts and commutator-plates, substantially as set forth.

2. The combination, with an armature-wheel, of groups of electro-magnets, with pole-pieces and cores occupying radial positions within the armature-ring, a circular magnet-base and contact and commutator rings within the magnet-base, and a roller connected with the armature-wheel and acting to close the electric circuit in succession to the respective groups of electro-magnets, substantially as set forth.

3. The combination, in an electro-magnetic machine, of an armature-wheel, groups of electro-magnets, and commutator-rings connected together and adjustable around the axis of rotation to vary the order of the circuit-connections and cause the motor to revolve in one direction or the other, substantially as set forth.

4. The commutator-rings and the contact-rings electrically insulated but connected to each other, in combination with the circular magnet-base, within which they are received, the lever for moving the same, the contact-roller, and the spring-segment for carrying the same, substantially as set forth.

5. The combination, with the circular range of electro-magnets, of an armature-wheel in the form of a ring, having a circular exterior surface and corrugated internally to form the armatures, and spokes or arms corresponding to the corrugations, substantially as set forth.

6. In an electro-magnetic machine, commutator-rings insulated from each other, connecting-bolts passing through the commutator-rings and connecting the same together, insulating material except at the points of contact of the respective bolts and rings, and electric-circuit connections to the ends of the respective bolts, substantially as set forth.

7. The combination, with a circular range of electro-magnets, of a wheel surrounding such magnets and having a flange upon its exterior surface, so as to be adapted to run upon a rail, and internal projections forming armatures that vary in number from the cores of the electro-magnets, substantially as specified.

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