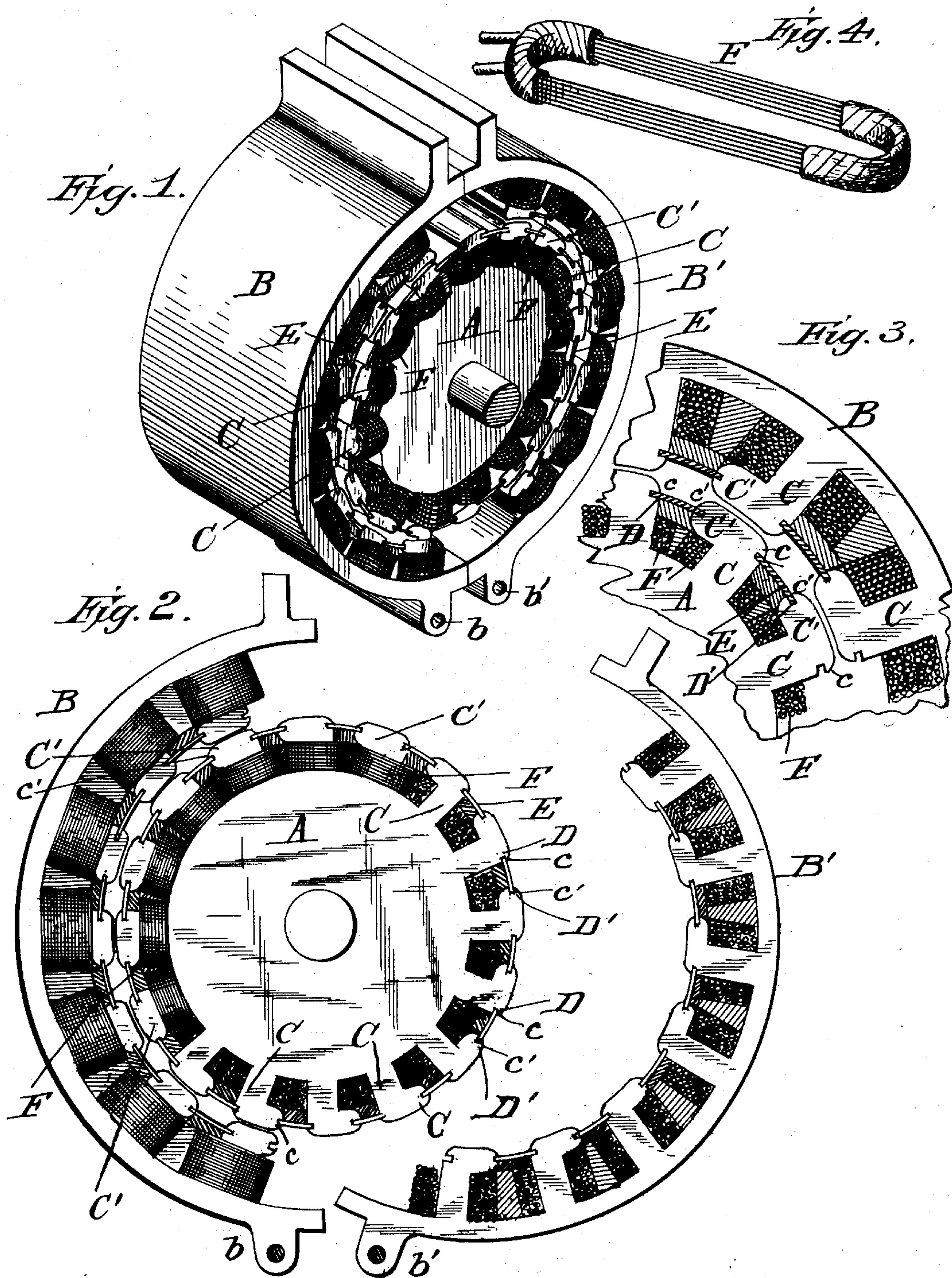


(No Model.)

R. ASHLEY.  
ELECTRIC MOTOR.

No. 505,783.

Patented Sept. 26, 1893.



WITNESSES:  
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# UNITED STATES PATENT OFFICE.

RALPH ASHLEY, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO CHARLES W. KENNEDY, OF SAME PLACE.

## ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 505,783, dated September 26, 1893.

Application filed May 20, 1893. Serial No. 474,870. (No model.)

*To all whom it may concern:*

Be it known that I, RALPH ASHLEY, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric Motors; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a perspective view showing the essential parts of an electric motor of my improved construction. Fig. 2 is an end view of the armature and the contiguous stationary pole-pieces appertaining to the "field" magnet; parts having been broken away the better to show the construction of the armature and pole-pieces. Fig. 3 is a sectional detail view of a portion of the armature, showing, on a larger scale, the peculiar L-shaped heads or polar-faces with their removable coils and slides; and Fig. 4 is a detail view of one of the removable coils, detached from the armature, with the greater portion of the covering or winding of insulating-tape removed.

Like letters of reference denote corresponding parts in all the figures.

This invention has relation to that type of electric motors in which the armature, or the field, or both the armature and field, are provided with "toothed" pole-pieces, or projecting pole-pieces with extended polar-face, around or upon which the wire-coils or bobbins are wound; and the object of my improvement is not only to increase the polar face, but to so construct these toothed pole-pieces, or wire-coil holders, that the coils of the armature, or of the pole-pieces appertaining to and forming part of the field-magnets, or of both the armature and the field-magnets, may be readily and easily removed, one coil or bobbin at a time, without disturbing or affecting the coils or bobbins appertaining to adjacent pole-pieces (whether of the armature or field).

With these objects in view, my improvement consists in the novel and peculiar construction of the teeth or coil-holders of the armature as well as of the pole-pieces of the field, and the combination with said peculiarly-constructed teeth of the coils or bobbins of insulated wire and a removable slide for holding the same (removably) in position upon their respective teeth or holders, as will be hereinafter more fully described and particularly pointed out in the claims.

Referring to the accompanying drawings, the letter A denotes the core or body of the armature, and B B' the two parts or sections of the field-magnet pole-pieces, which are made hinged to their supports, (not shown) respectively at *b* and *b'*, so that they may be swung open, as shown on the drawings, to permit ready access to the armature. The circular rim of the armature core is provided with equi-distant radially projecting L-shaped teeth, C C', each tooth comprising a shank or holder proper, C, in a radial line with the armature core, bent at right angles at its outer end to form an overhang or right-angled projection C', with a rounded elbow *c* at the point where the "L" joins the straight shank or body of the tooth. At this point, each tooth has also cut into it a slot, D, running longitudinally its entire length, from one side of the armature to the other, just opposite to a similar slot, D', on the contiguous side of the adjacent tooth; and into these opposite and registering slots is inserted a removable plate or slide, E, made (usually) of vulcanized fiber, or some other material that is a non-conductor of magnetism. In some cases, however, iron or other conductive material, possessing sufficient strength and stiffness, may be used for these slides.

The coils of insulated wire of the proper size, shown at F, are formed by winding a sufficient quantity of the wire upon an oblong mold or former to form an elongated coil, as shown in Fig. 4, which represents one of the armature-coils removed from the armature. After a sufficient number of these coils have been formed in this (or any other suitable) manner, they are placed upon the armature and field-poles by slipping them over the lateral heads of the L-shaped teeth, the corners of which are rounded off, as shown at *c'*, in the same manner as the notched or recessed



elbows *c*. The wire coils *F*, after being passed over the heads *C'* and elbows *c*, are forced, by pressure, down firmly around the necks *C* of the teeth, so as to entirely fill and occupy the spaces between the teeth; the long sides of the wire coils of adjacent teeth lying side by side, as clearly shown on the drawings. After each coil has been placed upon the neck of its appropriate tooth, the slide *E* is inserted endwise into the registering slots or guide-ways *D D'* of adjacent teeth, thereby forming in conjunction with the overhangs or extended polar-faces *C'* a continuous outer casing or cylindrical face for the armature-body, and absolutely preventing the coils from slipping off of their teeth or holders, or becoming dislodged or displaced through the centrifugal force when the armature revolves rapidly. By this construction and arrangement, I obtain all the advantages due to the use of T-shaped teeth, presenting an extended polar face, with the additional important advantage that burned-out, leaking, or otherwise injured wire-coils can readily be removed, simply by first withdrawing the slides on both sides of the tooth on which the damaged coil is located, and then lifting it off (*i. e.*, the damaged coil) and slipping it over the lateral overhang or projection *C'* of its appropriate tooth, after which a fresh or new coil is substituted, and the retaining slides *E* reinserted.

The L-shaped teeth of the pole-pieces *B* and *B'* of the field-magnets are constructed in precisely the same manner and fitted with removable coils, and (preferably) retaining slides. They do not, therefore, require further or separate description, as the description of the armature-teeth and coils is, in all respects applicable to them. The slides *E* may, however, be omitted if desired, as there is no centrifugal force at this point to disarrange or dislodge the wire coils, the pole-pieces of the field being stationary during the operation of the machine.

As the construction of the armature core, its mounting upon the shaft, and the arrangement of the commutator and electrical connections, form no part of my present invention, no description of these parts is called for. All that is necessary is to so arrange the connections with the removable wire-coils or bobbins that these may be readily severed or disconnected when a coil is to be removed, and re-connected after a fresh coil has been substituted. This comes within the province of ordinary mechanical skill, and may be done in various ways familiar to every practical electrician and motorman.

From the foregoing description, it will be apparent that my improvement is peculiarly adapted to multipolar motors or dynamos, although by no means restricted to that (or any other particular) form of motor or dynamo, being equally well adapted to bi-polar motors or dynamos. It will also be found particularly serviceable in street-car motors, as it admits of instant and effective repair of burned-

out or otherwise injured armature-coils or field-coils on the road by the motorman, without having to send the car to the shop for repairs. By simply carrying a small supply of ready-wound coils along with the car, to be held in reserve for emergencies, the motorman is enabled, in a few moments of time, to remove the damaged coils and substitute new and fresh ones. The importance and advantage of this are so obvious as to be self-evident; especially on suburban roads, or roads of considerable length, it is of the utmost importance to be able to repair a car on the road and at the place where the break-down occurs,—often many miles from the shop or power-house.

While, as above stated, the construction of the armature core forms no part of my present invention, I may state that I prefer to build it from disks of soft iron plates, preferably oxidized for better insulation, so as to form a "laminated" core, of which the L-shaped teeth form integral parts, by cutting out or stamping out the disks with these teeth from thin plates of soft iron. When these disks, after oxidation, are imposed or placed one upon another to form a columnar core of the proper length, with the circumferential L-shaped projections registering with one another and in perfect alignment with one another, the L-shaped teeth will form long shouldered ridges or projections extending from one end of the armature-core to the other, each with its one-sided overhang or projection *C'* for confining the removable wire-coils in place, in connection with the slides.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. An armature-core or body having a circumferential series of parallel equi-distant L-shaped ribs or teeth, notched or recessed on opposite sides of the lateral overhang forming the head of the tooth; substantially as set forth.

2. The combination with an armature-core having radially projecting equi-distant L-shaped teeth, of separate and separately removable coils of insulated wire fitting over the shank or radial body of the tooth and held in place by the lateral overhang of the same; substantially as set forth.

3. The combination, in an electric motor, of an armature-core having radially projecting equi-distant L-shaped notched teeth, the separate and separately removable coils of insulated wire placed upon said teeth below the lateral overhang, and the removable slides fitting into registering longitudinal notches or recesses in adjacent teeth; substantially as and for the purpose set forth.

4. In an electric motor, the combination with the extended polar-pieces or pole-faces formed by L-shaped parallel and equi-distant ribs, of the removable wire-coils *F* formed separately from said teeth and held in place



by the overhang thereof; substantially as and for the purpose set forth.

5 In an electric motor, the combination with the extended polar-pieces or pole-faces formed by L-shaped parallel and equi-distant notched teeth or ribs, of the removable wire-coils F and the removable slides E; substantially as and for the purpose set forth.

10 6. The combination, in an electric motor, with the armature provided with radial notched and equi-distant L-shaped ribs or teeth, separate and separately removable armature-wire coils, and the slides for retaining

said coils in place, of the field polar-pieces terminating in L-shaped ribs or teeth provided with separate and separately removable coils of field-wire; substantially as and for the purpose set forth. 15

In testimony that I claim the foregoing as my own I have hereunto affixed my signature 20 in presence of two witnesses.

RALPH ASHLEY.

Witnesses:

LOUIS BAGGER,  
AUGUST PETERSON.