(No Model.)

2 Sheets—Sheet 1.

C. J. VAN DEPOELE.

DUPLEX ELECTROMOTOR.

No. 394,036. Patented Dec. 4, 1888.

Fig. 1.

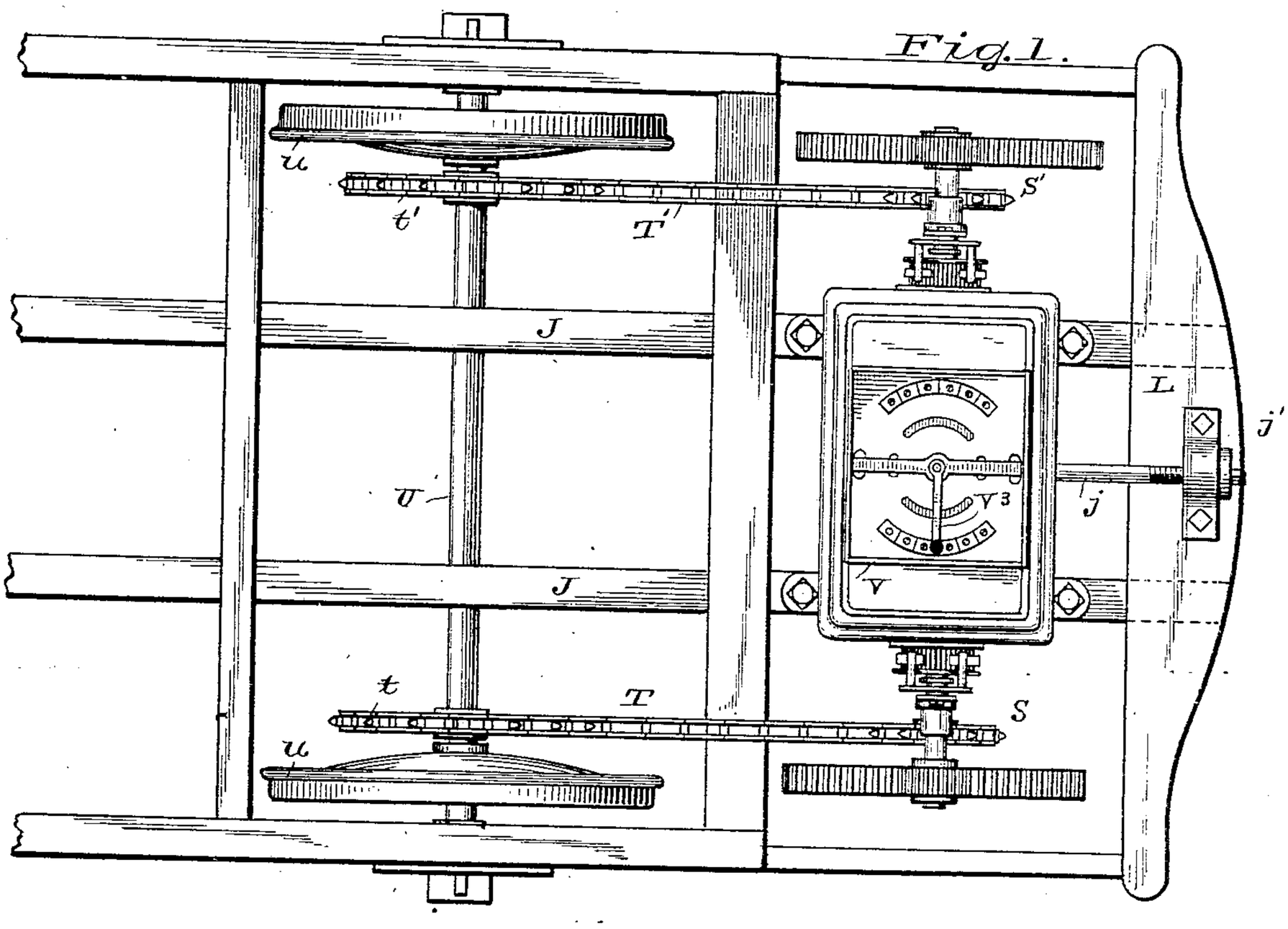
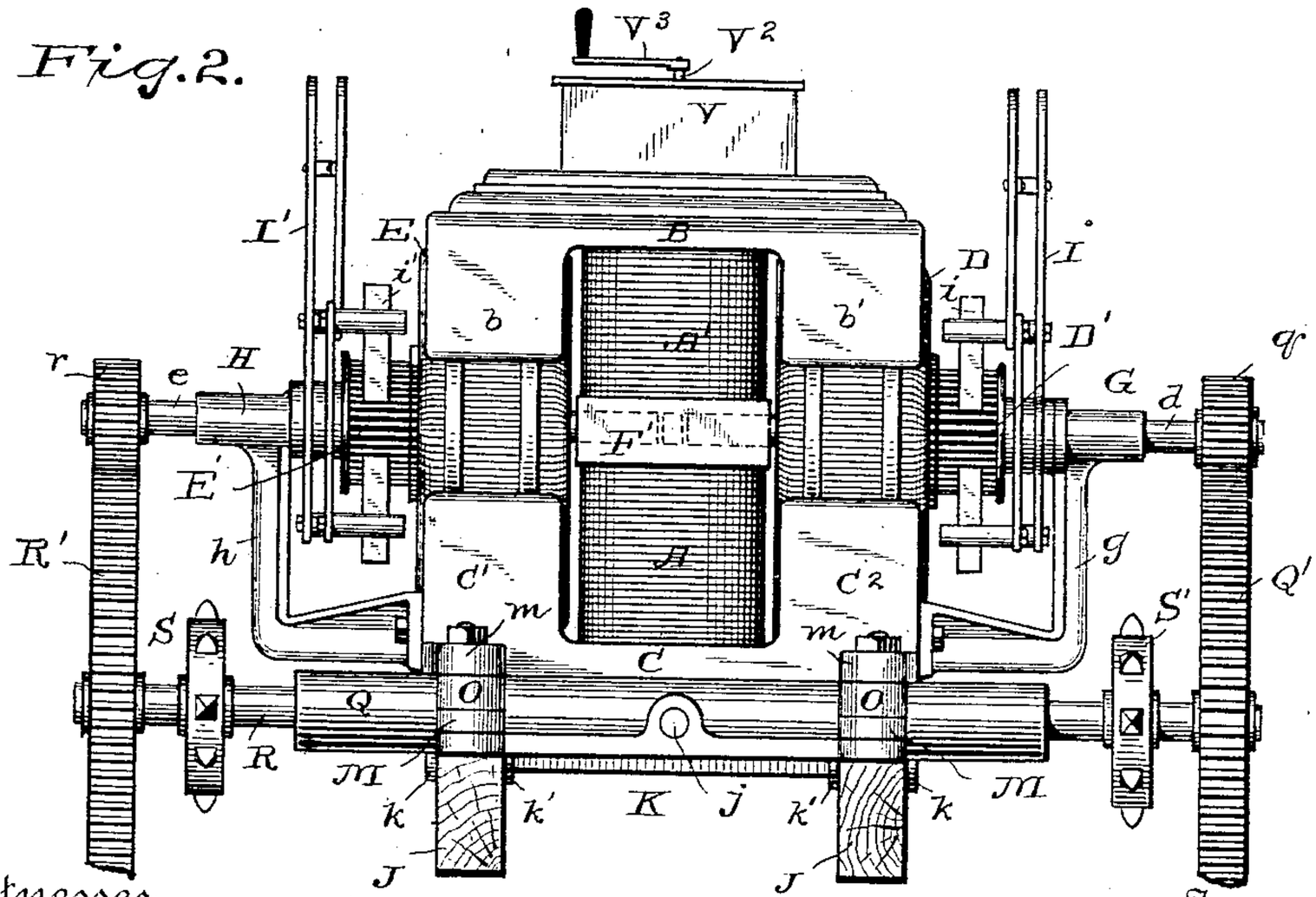


Fig. 2.



Witnesses.

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S. J. Jamms.

Inventor.

Charles J. VanDepoele,

By his Attorney

Frankland Jamms

(No Model.)

2 Sheets—Sheet 2.

C. J. VAN DEPOELE.

DUPLEX ELECTROMOTOR.

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Fig. 3.

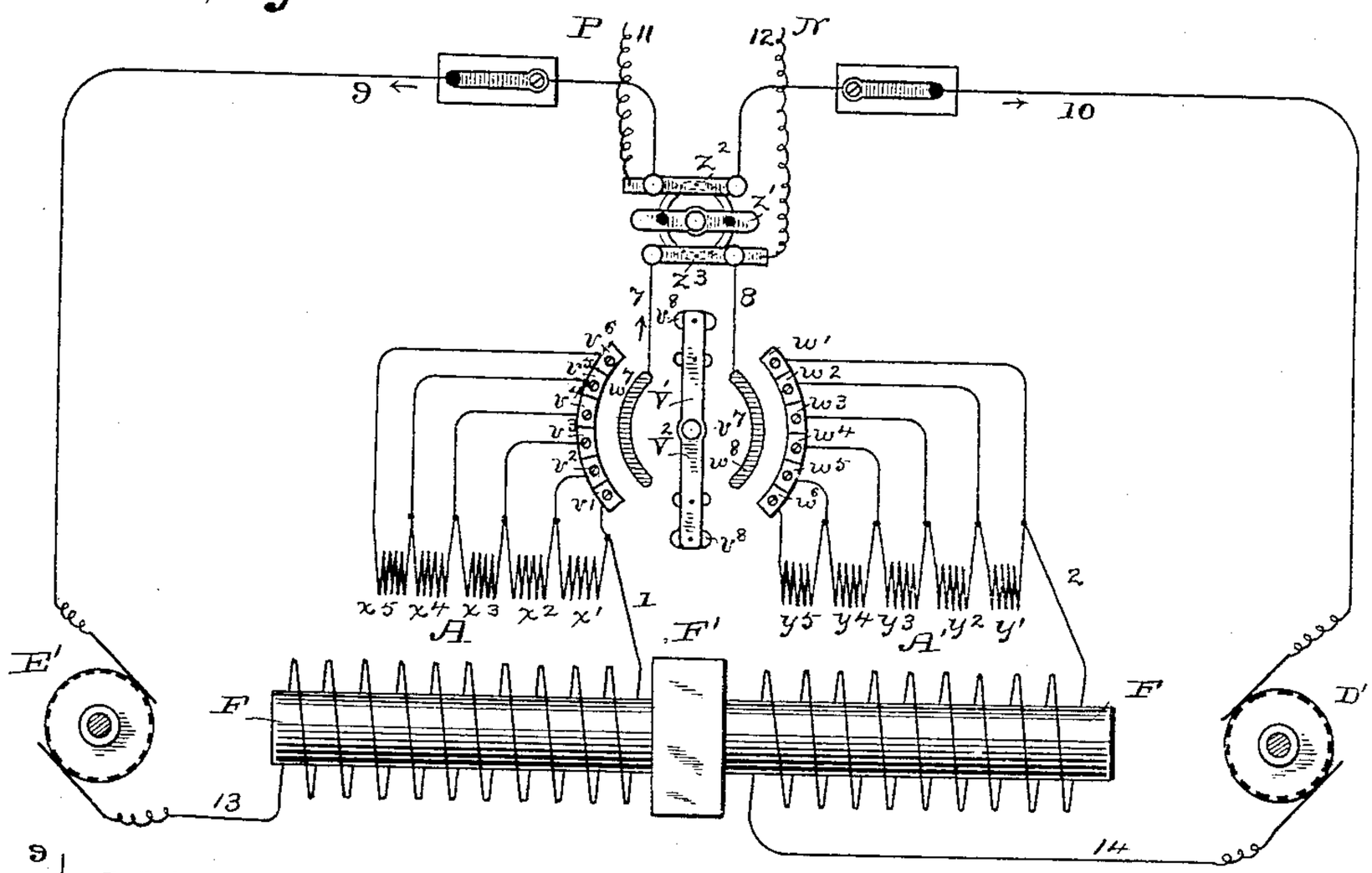


Fig. 5.

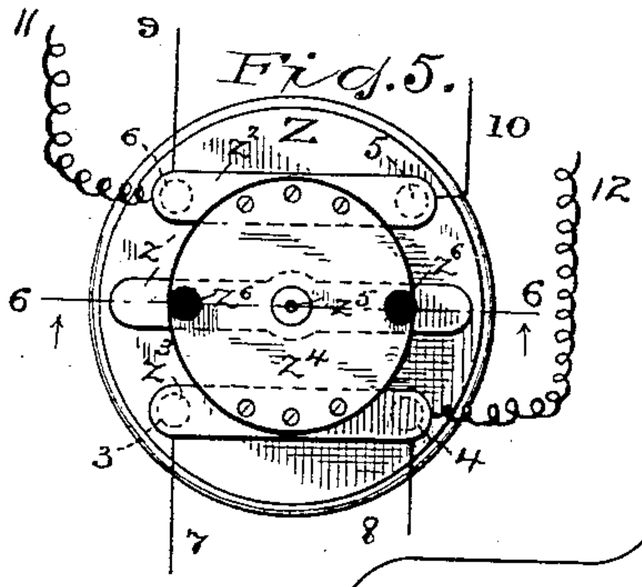


Fig. 7.

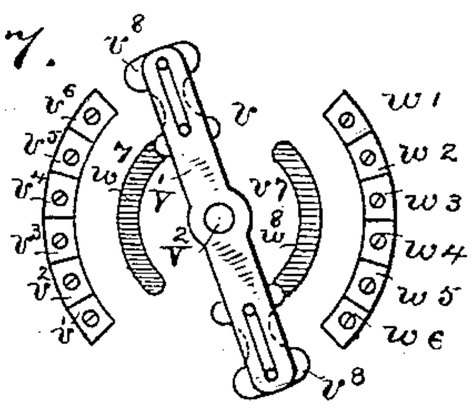
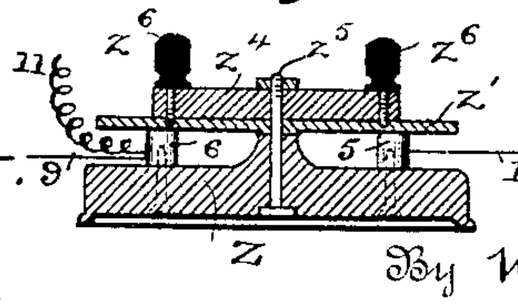


Fig. 4.

Fig. 6.



Witnesses,

H. A. Lamb.

S. J. Jamus.

Inventor,

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By his Attorney

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UNITED STATES PATENT OFFICE.

CHARLES J. VAN DEPOELE, OF CHICAGO, ILLINOIS.

DUPLEX ELECTROMOTOR.

SPECIFICATION forming part of Letters Patent No. 394,036, dated December 4, 1888.

Application filed June 6, 1888. Serial No. 276,262. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. VAN DEPOELE, a citizen of the United States, residing at Chicago, in the county of Cook, State of Illinois, have invented certain new and useful Improvements in Duplex Electro-Dynamic Motors, of which the following is a description.

My invention relates to improvements in electro-dynamic motors, and more particularly to that class of electromotors from which a great variety of service is required—as, for instance, the motors used to propel railway-cars and for other similar work.

A motor embodying my invention is provided with two separate armatures, each mounted upon an independent shaft, the inner ends of both shafts being for convenience mounted in the same bearing, and, as here shown, their extremities each provided with a mechanical connection extending to a counter-shaft to be connected in any suitable manner to the point or apparatus where power is to be delivered.

The electrical construction of my duplex motor is such that I can at once increase or decrease its power within very wide limits; further, that I can reduce the internal resistance thereof by connecting all parts in multiple arc, or I can increase the resistance by connecting several portions thereof in series whether the motor as a whole is connected with the working-circuit in series or in multiple arc. I may use either armature of the motor separately, thus securing the widest possible range of regulation and adjustment without in any way impairing the efficiency of or altering the completed structure.

Various minor advantages also ensue from my improvements, as will be hereinafter pointed out, and referred to in the appended claims.

In the accompanying drawings, Figure 1 is a top plan view showing the front portion of a street-railway car fitted with a motor embodying my invention. Fig. 2 is a side elevation of the motor and working-connections. Fig. 3 is a diagrammatic view showing the electric construction and the arrangement of circuits in the motor when the two portions thereof are connected in multiple arc. Fig. 4 is a similar diagrammatic view showing the parts of the motor connected in series. Fig. 5 is a plan view of the switch by which the connections are arranged and changed as desired. Fig. 6 is a sectional elevation on the line 6 6 of Fig. 5. Fig. 7 is an enlarged detail view of the switching devices by which the internal circuits of the motor are controlled.

Similar letters denote like parts throughout.

In the drawings illustrating my invention, A A′ indicate the coils of a single field-magnet arranged vertically and provided at top and bottom with T-shaped pole-pieces B C. The pole-pieces are provided with polar extensions *b b′* C′ C², between which and parallel with their field-magnets are mounted separate armatures D E, provided with suitable commutators, D′ E′. The core F of the field-magnet is provided with a central extension, F′, which is at the same time the neutral point of said magnet. The extension F′ of the field-magnet is centrally apertured and provided with suitable bearings for the reception of the inner extremities of the shafts *d e* of the armatures D E. A suitable washer of Babbitt or other material is interposed between the inner ends thereof to prevent unnecessary friction. The outer extremities of the armature-shafts *d e* are mounted in bearings G H, carried upon rigid metallic arms *g h*, secured to and projecting into the desired position from any desirable portion of the frame of the motor, preferably the outer faces of the polar extensions.

I I′ indicate hand-levers suitably mounted upon the bearings G H. The hand-levers I I′ are connected to the commutator-brushes *i i′*, and serve to adjust them as required. Upon suitable longitudinal frame-pieces, J J, forming part of the bottom frame of the vehicle, is mounted a longitudinally-movable metallic base or frame, K. The base K is formed with longitudinal flanges *k k′*, extending over the edges of the frame-pieces J J, upon which said pieces may be moved longitudinally by an adjusting-screw, *j*, working through a suitable head or collar, *j′*, secured to the end piece, L, of the frame upon which the base K is supported. The base K is provided with feet M, arranged to correspond with similar feet, *m*, extending from the lower pole-piece of the motor. Blocks O, of diamagnetic metal, are placed upon and secured to the feet M of the base, and upon these blocks O the feet of the motor are di-

rectly supported and properly secured. The base K carries a bearing, Q, within which is mounted a counter-shaft, R. The bearing Q may obviously be separated into two or more portions, or be in the form of a single tube, as most convenient.

The removable base K, together with diamagnetic supporting-blocks and longitudinal adjusting devices, forms the subject of a separate application for Letters Patent filed contemporaneously herewith, and is therefore not herein claimed.

The extremities of the armature-shafts *d e* are provided with gear-pinions *q r* or other suitable devices for communicating the movement of the armature-shaft. Said pinions engage driving-wheels Q′ R′, mounted upon the extremities of the counter-shaft R. Sprocket-wheels S S′, or other well-known means for communicating motion, may be mounted upon the counter-shaft, and serve to convey power therefrom. As shown in Fig. 1, sprocket-wheels *t t′* are secured upon the axle U of the driving-wheels *u* of the vehicle carrying the motor.

The electrical and mechanical structure of the motor is, as will be readily perceived, entirely independent of the mechanical connections through which the rotary movement of the armature-shafts is conveyed to the point of use.

By my improved construction a single field-magnet of moderate size will suffice to operate both armatures, which are placed under control of the motor-man by means of the switches and connections hereinafter described.

The field-magnet coils A A′ may be divided into layers or sections bearing any desired proportionate relation to each other, as shown, described, and claimed in Letters Patent granted to me August 24, 1886, No. 347,903; but as herein shown the field-magnet helices are wound as single coils, one on each end of the field-magnet core, the terminals 1 2 of said field-magnet coils A A′ being connected to switch-points *v′ w′*.

Upon the upper pole-piece of each motor is located a suitable box or casing, V, within which are arranged two series of switch-points, v' v^2 v^3 v^4 v^5 v^6 and w' w^2 w^3 w^4 w^5 w^6, said series being arranged in segmental order with respect to a central point, v^7, at which is pivoted a switch-lever, V′. Segmental metallic conducting surfaces or strips w^7 w^8 are arranged between the series of switch-points and the central point, v^7. The switch-lever V′ is preferably constructed of insulating material, each extremity thereof being provided with a metallic rubbing-block, v^8, adapted to rest upon the switch-terminals and adjacent curved contact-piece simultaneously, and thereby to electrically connect the same, so that as the switch-lever is moved upon its pivot it may be made to connect any desired switch-point with the conducting-strips w^7 w^8, referred to. A shaft, V², extends upward from the central point of the switch-lever V′ through the top of the box V, where it is provided with a hand-lever, V³, by which it is turned as desired. Resistance-coils x' x^2 x^3 x^4 x^5 and y' y^2 y^3 y^4 y^5 are connected to and represented by the switch-points v^2 v^3 v^4 v^5 v^6 and w^2 w^3 w^4 w^5 w^6, and each set of resistances is connected with one terminal of the field-magnet coils, so that on rotating the switch-lever V′ the current can be made to pass through one or any desired number of the resistance-coils, as well as the coils of the field-magnets of the motor; or the resistance may be cut out altogether.

In order to render my motor available under the greatest variety of conditions, I provide a switching device whereby the field-magnet and armature-coils of the duplex motor may be arranged to coact in multiple arc, as shown in Fig. 3, or be placed in series, as seen in Fig. 4.

In Fig. 5 is shown a switch the essential features of which are four equidistant or symmetrically-arranged contact-points, 3 4 5 6, secured upon a suitable insulating-base, Z. Conductors 7 8 extend from the points 3 4 into permanent electric connection with the contact-strips w^7 w^8, while conductors 9 10, each extending from a commutator-brush of one of the armatures, are permanently attached to points 5 6. The conductors 11 12, by which the motor is connected with the source of electricity, are connected to points 4 and 6 of the switch, to which also are connected the conductors 8 and 9. Three metallic strips or bars, z' z^2 z^3, arranged in the same horizontal plane and united by being suitably secured to a disk or strip of insulating material, x^4, are centrally supported upon an insulated pivot, z^5. Suitable handles, z^6, are provided for turning the ring z^4 and contacts. As seen in Fig. 3, the positions of the strips z' z^2 z^3 are such that the two ends of the armature-conductors are joined and the current from line-conductor 11 flows into or out of them both in multiple arc, while at the same time the field-magnet connections 7 8 are united by the strip z^3, the current passing therethrough in multiple arc. With this arrangement the central strip, z', is inactive.

As shown in Fig. 4, the disk z^4 has been turned until the central strip rests upon and bridges the armature-conductor 10 and the field-magnet conductor 7, leaving the line-conductors 11 12 in connection with the armature-conductor 9 and the other field-magnet conductor, 8, both the strips z^2 z^3 being in this case inactive. With this arrangement the current enters the motor through armature-conductor 9, and issuing from the armature, is conveyed by conductor 13 to coils A of field-magnet; thence by conductor 1 and switch-point v', or one or more of the resistances x' x^2 x^3 x^4 x^5, and switch-point representing same, to strip w^7; thence by conductor 7 to bridge-strip z' and to conductor 10; thence to the other armature and by con-

ductor 14 to coil A′ of the field-magnet, and from there by conductor 2 to the switch-points w', &c., contact-strip w^8, conductor 8, to negative line-wire 12.

The rubbing-blocks v^8 on the switch V′ serve to complete the circuit of the field-magnet terminals or any one or other of the terminals of the resistance-coils through the conducting-strips w^7 w^8, so as to complete the circuits of the two portions of the motor and include the resistance-coils or not, as desired.

It will be obvious that, so far as the arrangement and the variation of the magnetizing power of the field-magnet coils, as herein shown and described, is concerned, it is immaterial whether one or two armatures are employed, since the same arrangement may be equally well adapted to that form of my motor employing only one armature.

It will be entirely obvious that instead of winding the coils A A′ of the field-magnets in two separate portions for convenience of manufacture or dividing the field-magnet winding into two separate portions, A A′, the said coils may be wound or connected as a single coil. When so arranged, the resistance may also be arranged to constitute a single series instead of a double one, as shown, the difference being that when the parts of the motor were to be placed in series, as might be desirable with the particular current at the time available, the entire field-magnet and the resistance could be placed in one single series instead of being connected alternately with the armatures, as shown in Fig. 4. Such an arrangement would render it more convenient to cut out one of the armatures when so desired.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An electro-dynamic motor having a central field-magnet, duplex polar extensions, a pair of armatures arranged between the respective polar extensions, suitable bearings secured to the frame of the motor and sustaining the outer portions of the armature-shafts, and bearings at the neutral portion of the field-magnet for the inner extremities of the armature-shafts, substantially as set forth.

2. In an electro-dynamic motor, the combination of a central field-magnet having T-shaped pole-pieces at each end, armatures mounted between the polar extensions of each pole-piece and carrying driving-pinions at the outer extremities of their shafts, a suitable base upon which said motor is mounted, a counter-shaft journaled in said base and carrying driving-wheels at or near its extremities, said driving-wheels engaging the driving-pinions on the armature-shafts, substantially as described.

3. The combination, with a pair of armatures, of a field-magnet common to both and provided with coils divisible into two independent or separate portions, a series of resistances for each portion of the field-magnet coils, and a switch-lever adapted to connect more or fewer of the resistances in series with the separate or divided portions of the field-magnet, substantially as described.

4. The combination of a plurality of armatures, a field-magnet common to both armatures, a series of resistance-coils, and a switch-lever arranged to connect more or fewer of the resistances in series with the coils of the field-magnet, substantially as described.

5. The combination of a plurality of armatures, a field-magnet wound in two portions, a series of resistance-coils for each portion of the field-magnet, a duplex switch, and a switch-lever arranged to connect more or fewer of the resistance-coils in series with the field-magnet coils, substantially as described.

6. In an electric motor, the combination of the armature, a field-magnet comprising coils divided into two portions, a series of resistance-coils and switch-terminals arranged adjacent to each portion, the outer one of each series of coils being connected with one terminal of a portion of the field-magnet, and a switch-lever arranged to connect the terminals of the field-magnets with the source of electricity and to combine one or more of the resistance-coils therewith, substantially as described.

7. The combination, with a duplex electric motor, of a switch provided with three or more parallel conducting-strips, four contact-points equidistant from each other, and connections extending from two of the commutator-brushes to two of said contacts and from the terminals of the field-magnet coils to the other two of said contacts, whereby when the positions of the conducting-strips are reversed with respect to the contacts the several parts of the motor will be connected in multiple arc or in series, substantially as described.

In testimony whereof I hereto affix my signature in presence of two witnesses.

CHARLES J. VAN DEPOELE.

Witnesses:
W. A. STILES,
EVERETT D. STILES.