

(No Model.)

3 Sheets—Sheet 1.

C. C. BURTON.
EQUALIZING GEAR.

No. 571,187.

Patented Nov. 10, 1896.

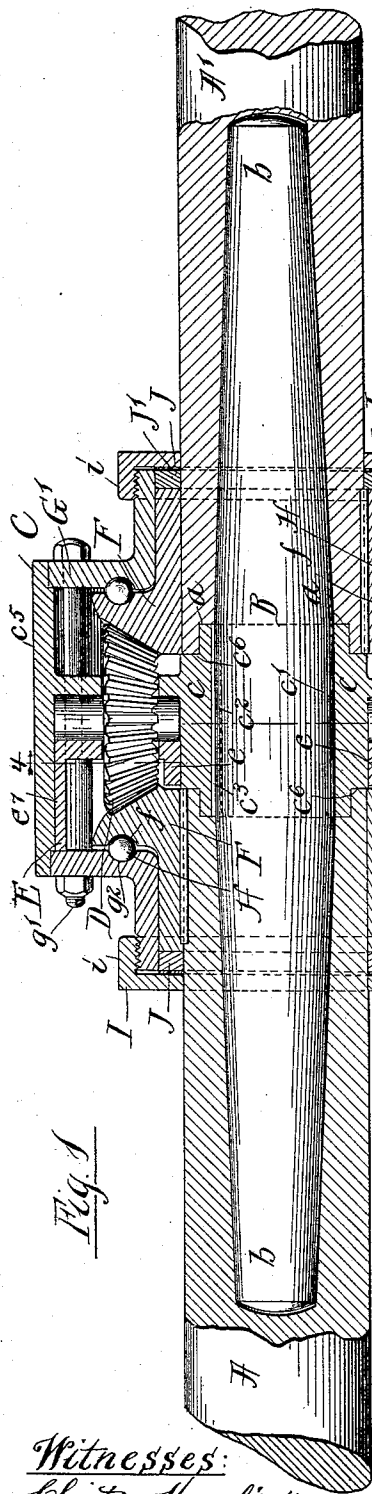


Fig. 1

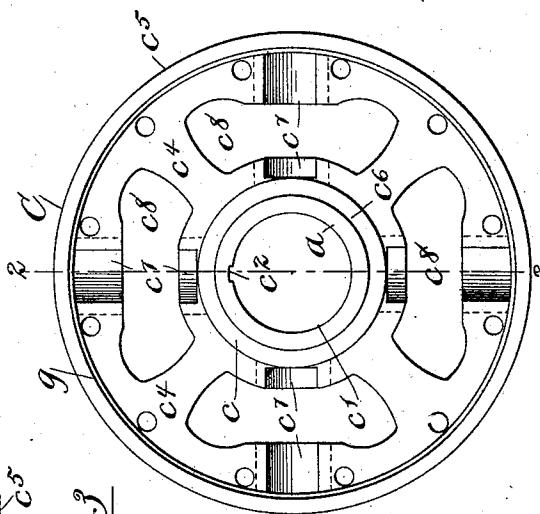


Fig. 3

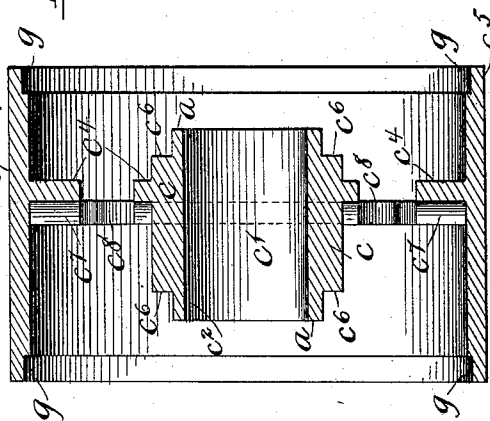


Fig. 2

Witnesses:
Clifton Hamlin.
John W. Adams.

Inventor:
Charles C. Burton.
by: Dayton, Pool & Brown
his Attorneys

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Fig. 4.

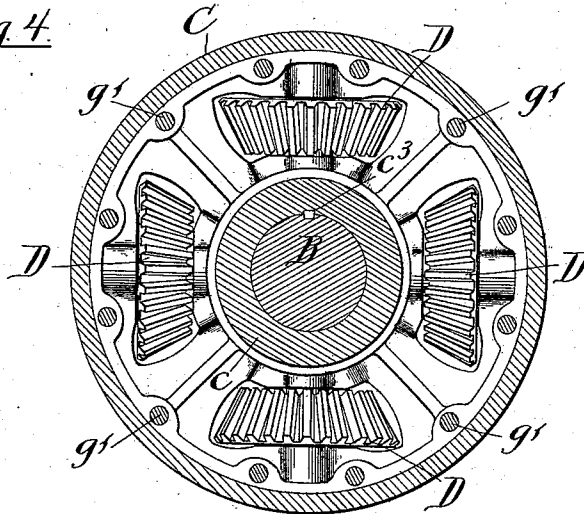


Fig. 5.

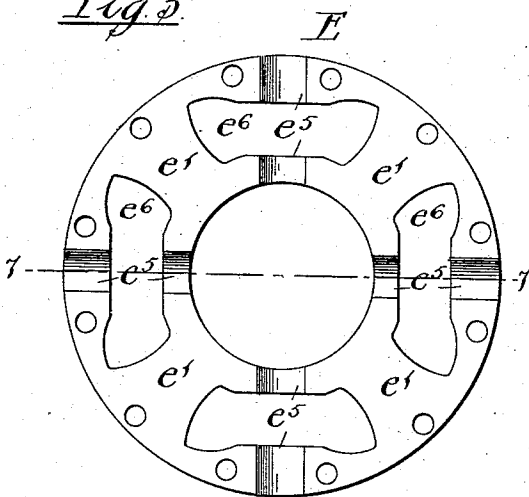


Fig. 6.

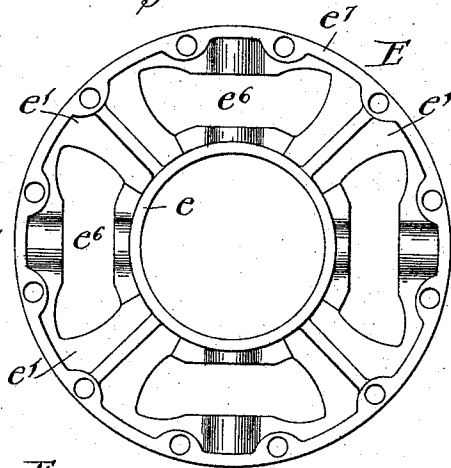
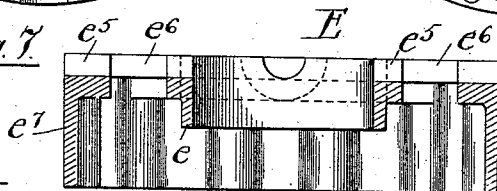


Fig. 7.



Inventor:
Charles C. Burton.

by: Dwight P. Brown
his Attorneys

Witnesses:
Wm L. Hall
John W. Adams.

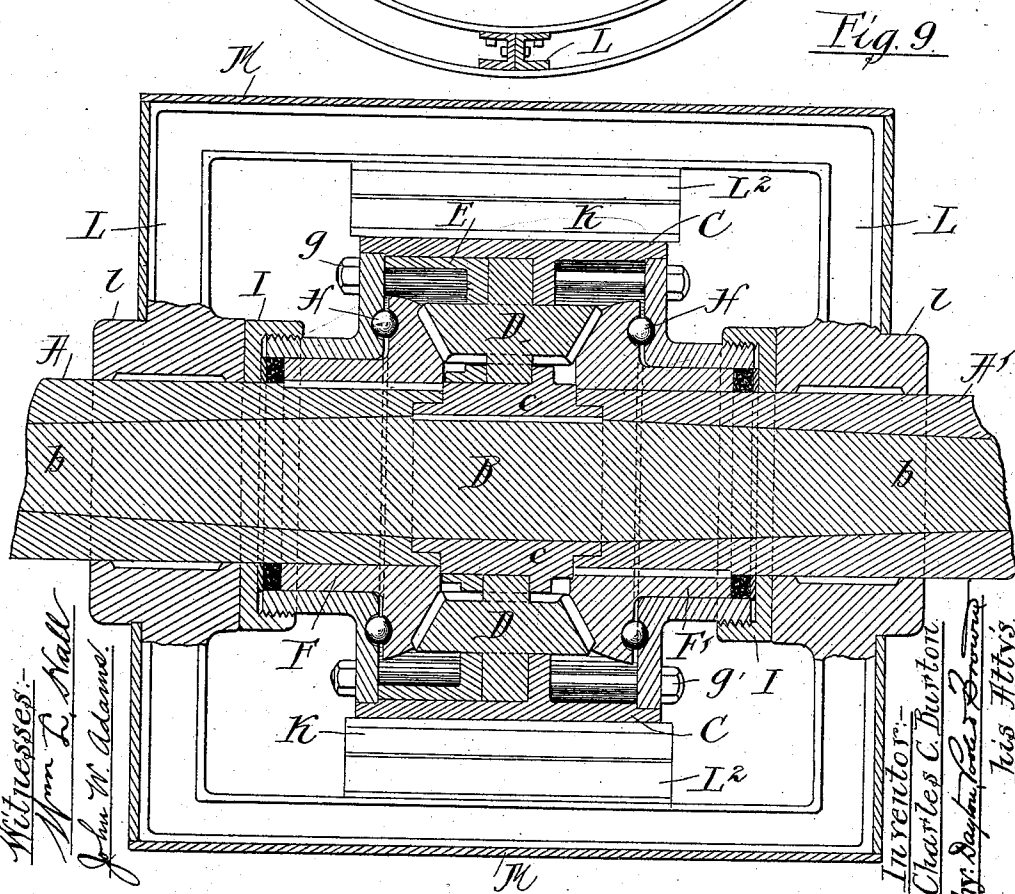
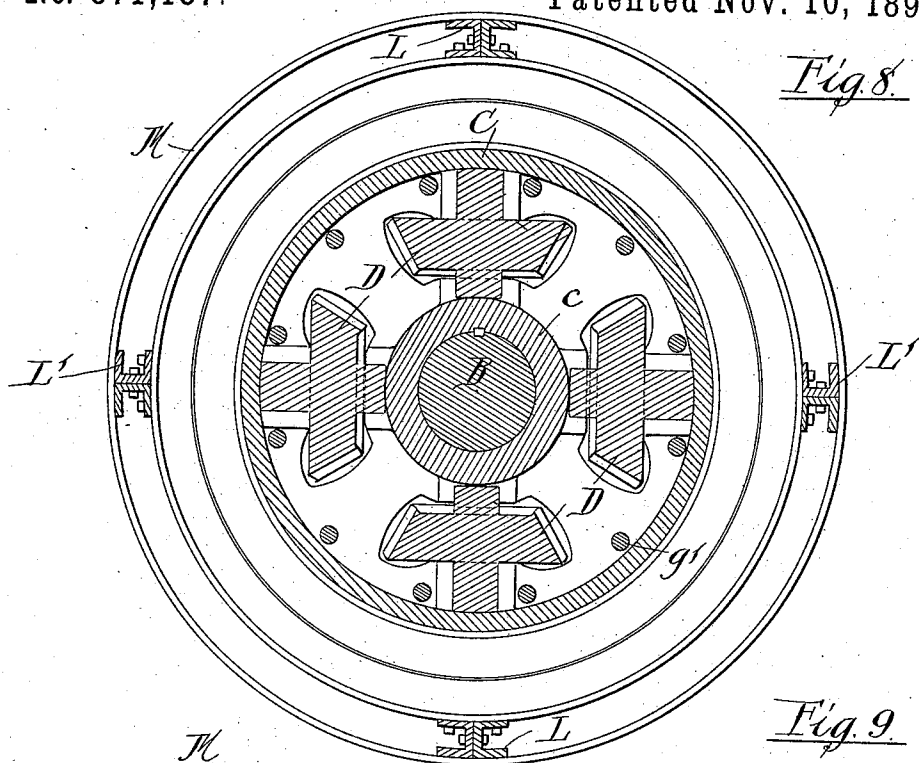
(No Model.)

3 Sheets—Sheet 3.

C. C. BURTON.
EQUALIZING GEAR.

No. 571,187.

Patented Nov. 10, 1896.



Witnesses:
Amos L. Hall
John W. Adams.

Inventor:
Charles C. Burton
By: Dayton Ford Brown
His Atty's

UNITED STATES PATENT OFFICE.

CHARLES C. BURTON, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR OF FOUR-FIFTHS TO JOHN C. DES GRANGES, OF SAME PLACE, LEWIS E. HOLDEN, OF BELOIT, WISCONSIN, GEORGE M. LUDLOW, OF CHICAGO, ILLINOIS, AND CURTIS G. HUSSEY, OF ALLEGHENY, PENNSYLVANIA.

EQUALIZING-GEAR.

SPECIFICATION forming part of Letters Patent No. 571,187, dated November 10, 1896.

Application filed March 11, 1895. Serial No. 541,229. (No model.)

To all whom it may concern:

Be it known that I, CHARLES C. BURTON, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Equalizing-Gears; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in equalizing-gears, and relates more particularly to an equalizing device for use in connection with a two-part shaft or axle which encounters a variable resistance at each of its ends, the equalizing device being interposed between said points of resistance and serving to equalize the resistance of the two sides. The device is adapted for use for relieving the torsional strain on a driven axle incident to the unequal rate of travel of the wheels fixed thereon in traversing curves, and also for equalizing the power transmitted from a motor or prime mover to any driving-shaft encountering a variable resistance at its opposite ends, as hereinbefore described.

The object of the invention is to provide an improved construction in devices of the character above referred to; and the invention consists in the matters hereinafter described and more particularly pointed out in the appended claims.

The invention may be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is an axial section of a shaft and equalizing-gear embodying my invention. Fig. 2 is a similar view of the annular gear-casing removed from the shaft. Fig. 3 is an end elevation of the same, looking at the left-hand end of Fig. 2. Fig. 4 is an end elevation of the gear-retaining plate in position within the annular gear-casing, taken on line 4 4 of Fig. 1 and looking in the direction of the arrows. Figs. 5 and 6 are inner and outer faced views, respectively, of the gear-plate removed from the gear-casing. Fig. 7

is a transverse section of the same, taken on line 7 7 of Fig. 6. Fig. 8 is a central transverse sectional view wherein the gear is shown as forming a core of an armature. Fig. 9 is an axial section of the same.

Referring to said drawings, A A' designate the two adjacent ends of a shaft or axle made in two independently-revoluble aligned sections.

C, Figs. 1 and 2, designates a casting mounted concentrically with the axis of the shaft and constituting principally a gear-support, within which are journaled one or more (in the present instance four) miter-gears D, having their axes disposed radially and at right angles to the axis of the shaft.

In the construction herein shown the gear-support C is revolvably mounted concentrically with the shaft by means of spindle projections *b b*, extending from opposite sides thereof and engaging axial recesses in the adjacent ends of the shaft-sections, said spindle projections being herein shown as provided in the form of a core or mandrel which extends through the gear-support, and the opposite ends of which are each tapered from the point of juncture with the gear-support to its outer end and fit accurately within the correspondingly-shaped recesses of the shaft-sections A and A'. By means of the above construction the shaft-sections are held rigidly in alinement, but are permitted to rotate independently of each other.

Referring more particularly to the construction of the gear-support C, the same comprises an inner hub portion *c*, having a bore *c'*, within which is located the mandrel B, a keyway *c''*, formed longitudinally with the bore for the reception of a key *c'''*, a flat or disk-shaped portion *c''''*, which forms with the hub the pinion-support proper, and an outer cylindrical portion *c'''''*, constituting in effect oppositely-extending annular flanges on the periphery of the disk part *c''''*. As herein shown the ends of the hub and the adjacent ends of the shaft-sections have interfitted parts provided with oppositely-arranged annular rabbets *c''''''* *a*, respectively, thereby

forming an overlapping joint having square abutting shoulders. In one face of the disk c^4 are formed radially-disposed semicylindric journal-recesses c^7 for the reception of the journals of the miter-pinions D, the said disk c^4 being also provided with an opening c^8 , extending across each journal-recess for the reception of the body of the gear, as shown more clearly in Fig. 3.

E is a second annular casting forming a gear-retaining plate adapted to fit within one end of the casting C. This latter casting comprises a hub e , which fits upon the exterior of the hub c , a radially-disposed web e' , adapted to fit against the face of the disk c^4 , provided in its proximate face with semicylindric journal-recesses e^5 and openings e^6 , which are similar to and register with those of the castings C, and an annular flange e' , which fits against the inner face of the part c^3 of the casting C.

F F' designate miter-gears keyed concentrically upon the ends of the shaft-sections A and A', respectively, in position to intermesh with the diametrically opposite sides of the miter-gears D D.

G G' designate bearing-rings rigidly supported upon the cylindric flanges of the gear-support C and arranged to overlap portions of the gears F F', thereby forming bearings which prevent said gears from endwise movement or separation from the miter-pinions D. The bearing-rings G G' are herein shown as secured in position by means of through-bolts g' , passed through suitable apertures in the margins of the rings and through corresponding apertures formed in the disk portions c^4 and e' . Obviously said bearing-rings G will sustain the principal part of the endwise thrust due to the tendency of the miter-gears to separate, and in order to reduce the friction between the bearing-rings and annular gears annular roller-bearing races g^2 and f are formed in the adjacent surfaces of said parts, within which are arranged antifriction-roller bearings H.

It will be obvious that the bearing-rings G G' need not necessarily extend inward or overlap the peripheries of the gears F F' more than sufficient to form suitable bearings between said parts, but in order to form a complete housing for the entire gear mechanism both the cylindric flanges c^5 of the gear-support C and the said bearing-rings are made imperforate, and the latter are extended inwardly and provided with out-turned hub portions g , which embrace and form tubular bearings for the hub portions of the gears F F'.

I I' designate annular glands closely fitted upon the respective ends of the shaft-sections A A' and each provided at its periphery with an internally-threaded flange i , adapted to fit upon the correspondingly-threaded tubular bearings g . Between the inner face of each gland and the end of the gear F or F' a packing-ring J is interposed, and preferably an antifriction-washer K' will also be inter-

posed between the inner face of the gland and the end of the casing G or G' and packing-ring J.

With the various parts constructed and arranged as above described it will be obvious that each end of the shaft may rotate with relation to the other and that whenever the resistance or friction on one end of the shaft exceeds that of the other that end will be retarded, the shafts will turn with relation to each other, and through the medium of the miter-gears the resistance will be distributed or equalized between the two ends of the shaft.

I am aware that equalizing-gears similar in principle to that herein described have before been applied both to power-shafts and to the axles of vehicles, but the general construction herein set forth is, so far as I am aware, novel and possesses important features of improvement.

The construction as a whole is extremely simple, compact, and easy of access for inspection or repairs. The use of the roller-bearings described is of special utility, since practically the entire spreading or endwise thrust on the miter-gears is received and carried directly upon said rollers, and the friction is thereby reduced to a minimum.

The tapered form of the spindle projection is also a feature of importance, especially when, as herein shown, used in conjunction with shaft-sections abutting against the relatively fixed hub of the spindle. With the parts thus constructed and arranged they are to a certain extent self-adjusting or compensating for wear, since as the ends of the shaft-sections are worn away by contact with the hub of the spindle the through-bolts may be tightened to bring said sections together. This will result in closing up the joints at all places of principal wear, to wit, between the shaft-sections and spindle, between the miter-gears, and between the ends of the shaft-sections and hub of the spindle.

The construction hereinbefore described and illustrated in Figs. 1 to 7, inclusive, is such a one as will be found suitable for application to any driven shaft, and the power may be transmitted to the device either by means of a driving-belt applied directly to the exterior of the casing by providing the latter with external gear-teeth with which a suitable driving-pinion meshes or otherwise.

In Figs. 8 and 9, however, I have illustrated a novel combination wherein the power for driving the axle or shaft is transmitted thereto through the equalizing-gear by means of electric motor elements mounted concentrically around the device and of which motor said gear and casing as a whole forms the movable part. It will be obvious that such a combination possesses many valuable features. The peculiarly compact arrangement of the parts of the device enables it to perform the function of an armature-core practically as well as though it were a solid mass of iron, while

the arrangement is such that the stationary elements of the motor may be built or mounted upon the device with great facility. As shown in said Figs. 8 and 9, which are to a certain extent diagrammatic, K designates the coil-sections of the rotary armature, which sections are secured directly upon the cylindric exterior ^c of the gear-casing. L L' designate two rectangular iron frames mounted at their longitudinal centers on the shaft or axle at each side of the gear-casing, and arranged to extend radially at right angles to the shaft and to each other. These rectangular frames L L' form four symmetrically-disposed field-magnet supports, each of which carries a mass of iron constituting one of the stationary elements of the motor. Obviously the field-magnet-carrying frames will be mounted upon the shaft-sections, so as to permit free rotation of the latter, being to this end provided with hubs ^{l l'}, forming journal-boxes, and will be held from rotation with the shaft by any suitable connections between said frames and the truck-frame of the car. Preferably a suitable housing or casing M will be arranged to inclose the entire device. A desirable form of construction for these supporting-arms will be that herein illustrated, wherein each arm comprises a pair of channel-irons placed back to back and bolted together, as indicated clearly in Fig. 8.

It will be understood, of course, that the windings and connections of the fixed and moving elements of the motor may be of any usual form, the drawings herein being intended merely to illustrate diagrammatically the general arrangement.

I claim as my invention—

1. An equalizing-gear comprising a two-part shaft, miter-gears secured upon each shaft-section, a gear-supporting disk mounted to turn concentrically with the shaft-sections, one or more miter-pinions mounted in said gear-supporting disk in position to intermesh with both of the gears on the shaft-sections, and means for holding the said gears from outward endwise movement, comprising bearing-rings rigidly connected with the said gear-support and overlapping the gears on the shaft-sections, substantially as set forth.

2. An equalizing-gear comprising a two-part shaft, miter-gears secured upon each shaft-section, a gear-supporting disk mounted to turn concentrically with the shaft-sections, one or more miter-pinions mounted in said gear-supporting disk in position to intermesh with both of the gears on the shaft-sections, and means for holding the said gears from outward endwise movement, comprising bearing-rings rigidly connected with the said gear-support and overlapping the gears on the shaft-sections, and roller-bearings interposed between said bearing-rings and the gears, substantially as set forth.

3. An equalizing-gear comprising a two-part shaft, miter-gears secured upon each shaft-section, a gear-supporting disk mounted

to turn concentrically with the shaft-sections, one or more miter-pinions mounted in said gear-supporting disk in position to intermesh with both of the gears on the shaft-sections, and means for holding said gears from outward endwise movement comprising cylindric flanges on the opposite sides of the gear-supporting disk, and bearing-rings rigidly connected with the said gear-support and overlapping the peripheries of the gears on the shaft-sections, substantially as set forth.

4. An equalizing-gear comprising a two-part shaft, miter-gears secured upon each shaft-section, a gear-supporting disk mounted concentrically with the shaft, spindle projections extending from opposite sides of said gear-supporting disk and engaging recesses in the adjacent ends of the shaft-sections, one or more miter-pinions having its or their axis disposed radially with relation to the shaft and each arranged to intermesh with the gears on the shaft-sections, and means for holding said gears from outward endwise movement comprising bearing-rings rigidly connected with the said gear-supporting disk and overlapping the gears on the shaft-sections, and roller-bearings interposed between said bearing-rings and adjacent parts of the gears, substantially as set forth.

5. An equalizing-gear comprising a shaft or axle formed in two alined sections each provided with an axial recess in its adjacent end, a spindle extending between said shaft-sections the ends of which engage said axial recesses, an annular gear-casing mounted rigidly upon said spindle, comprising a hub portion keyed to the spindle, a disk portion extending outward from the hub portion and provided with a plurality of radially-disposed journal-recesses therein, annular imperforate cylindric flanges extending from opposite sides of the periphery of the disk, a circular disk or plate adapted to fit within one of said cylindric flanges and against the disk portion, provided in its face with journal-recesses adapted to register with those of said disk, miter-gears mounted between said disks, an annular miter-gear rigidly mounted upon the end of each shaft-section in position to intermesh with opposite sides of the radially-disposed miter-gears, and imperforate end-closing plates secured to the margins of the cylindric flanges and forming in conjunction therewith a complete housing for the gears, substantially as set forth.

6. An equalizing-gear comprising a shaft or axle formed in two alined sections each provided with an axial recess in its adjacent end, a spindle extending between said shaft-sections the ends of which engage said axial recesses, an annular gear-casing mounted rigidly upon said spindle, comprising a hub portion keyed to the spindle, a disk portion extending outward from the hub portion and provided with a plurality of radially-disposed journal-recesses therein, annular imperforate cylindric flanges extending from opposite

sides of the periphery of the disk, a circular disk or plate adapted to fit within one of said cylindric flanges and against the disk portion, provided in its face with journal-recesses
 5 adapted to register with those of said disk, miter-gears mounted between said disks, an annular miter-gear rigidly mounted upon the end of each shaft-section in position to inter-
 10 mesh with the opposite sides of the radially-disposed miter-gears, imperforate end-closing plates secured to the margins of the cylindric flanges, said plates having central cylindric hub portions forming tubular bearings which embrace the hubs of the annular gears, and
 15 glands centrally apertured for the shaft-sections and threaded upon the cylindrical hub portions of the end-closing plates, substantially as set forth.

7. The combination with a two-part shaft
 20 or axle and an equalizing-gear connecting the shaft-sections, of moving electrical motor elements mounted concentrically with and upon said equalizing-gear, and stationary electrical motor elements supported adjacent to the said
 25 moving elements, substantially as set forth.

8. The combination with a two-part shaft or axle and an equalizing-gear connecting said shaft-sections, of a series of moving elec-

trical motor elements mounted upon the exterior of the equalizing-gear, a frame mounted
 30 upon the shaft provided with parts extending at opposite sides of the equalizing-gear, and immovable electrical motor elements supported upon said frame in proximity to said
 35 movable elements, substantially as set forth.

9. The combination with a two-part shaft or axle and an equalizing-gear connecting said shaft-sections, comprising a plurality of miter-gears inclosed within a cylindrical-shaped housing of moving electrical motor
 40 elements mounted directly upon said gear-housing, whereby said housing and inclosed gears constitute the moving part of the motor, a rectangular frame mounted upon the shaft, opposite sides of which extend parallel with
 45 the shaft and at opposite sides of said gear-housing and stationary electrical motor elements mounted upon said frame, substantially as set forth.

In testimony that I claim the foregoing as
 50 my invention I affix my signature in presence of two witnesses.

CHARLES C. BURTON.

Witnesses:

E. H. SCHOALES,
 FRED. G. HALLETT.