No. 632,805. Patented Sept. 12, 1899.

W. R. C. CORSON.

AUTOMOBILE.

(Application filed July 3, 1899.)

(No Model.) 2 Sheets—Sheet 1.

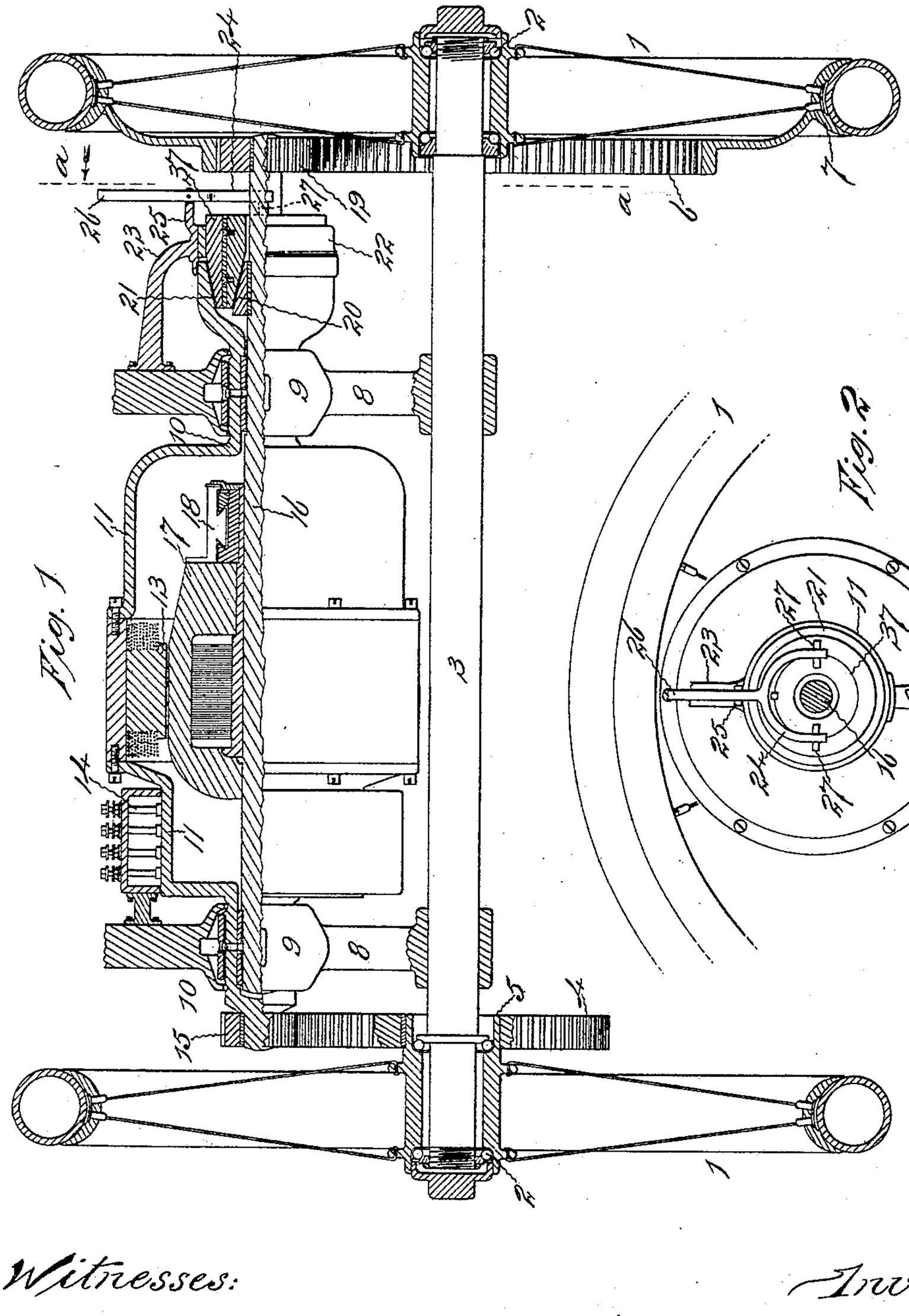

Fig. 1

Fig. 2

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Fig. 3

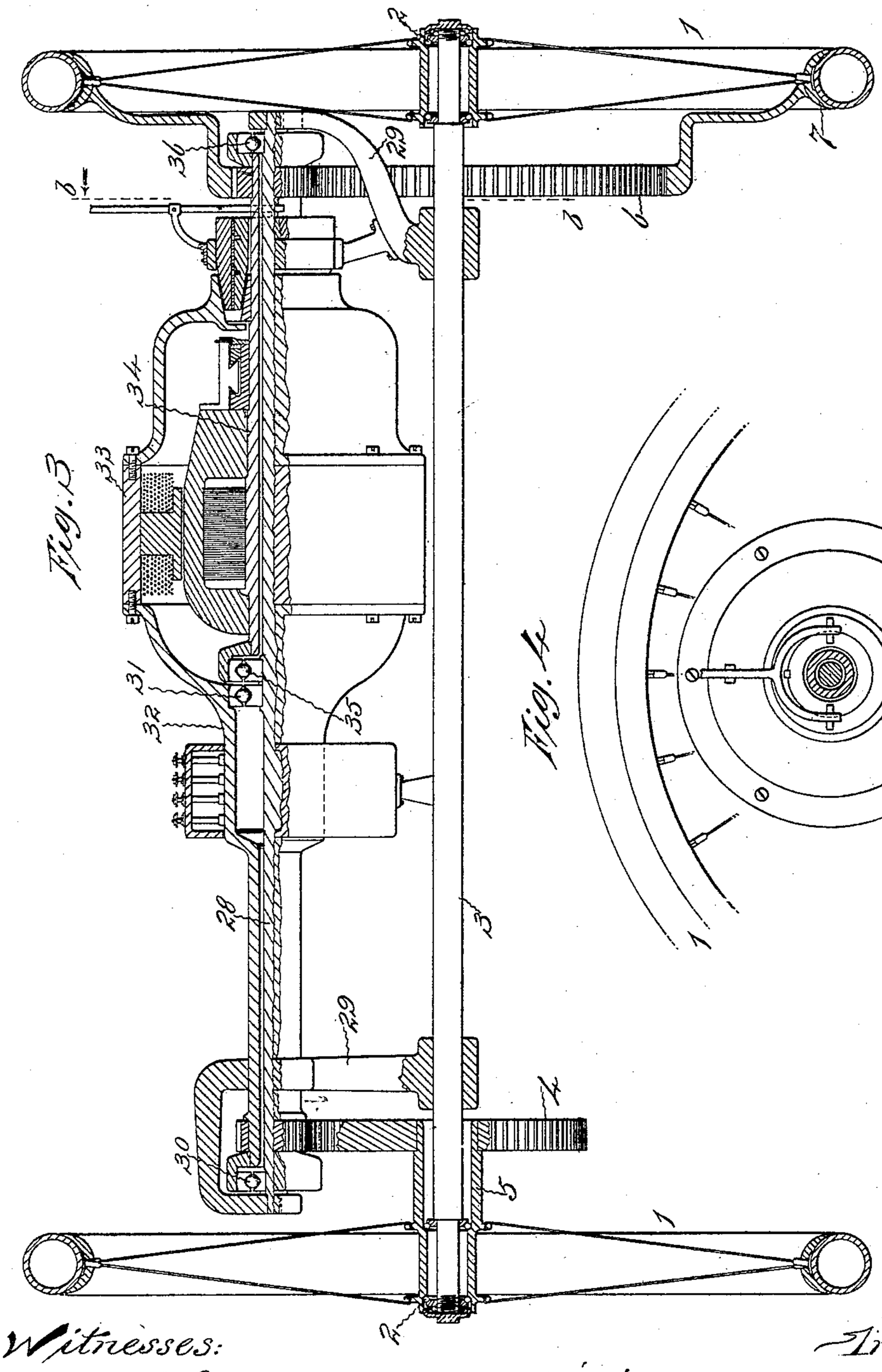

Fig. 4

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UNITED STATES PATENT OFFICE.

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AUTOMOBILE.

SPECIFICATION forming part of Letters Patent No. 632,805, dated September 12, 1899.

Application filed July 3, 1899. Serial No. 722,626. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM R. C. CORSON, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Automobiles, of which the following is a specification.

This invention relates to those automobiles that are driven by a single electric motor.

The principal objects of the invention are to so construct, arrange, and connect the motor and the wheels that the desired speed and necessary power may be obtained with a single motor that is very light in weight and that will accomplish electrically what previously has been brought about either by the aid of mechanical means or by the assistance of two motors and automatically rotate both driving-wheels at the rates of speed which they should naturally assume with relation to each other when the vehicle is traveling straight and also when turning around—that is, when the vehicle is traveling straight will drive the wheels with equal speed, but when the vehicle is being turned will drive the outer wheel proportionately faster than the inner; and the secondary objects are to arrange the parts so that the frictional wear upon the bearings will be reduced to a minimum and to provide a strong brake that may be applied without subjecting the body or wheels of the vehicle to any strain. These principal objects are attained by the employment, with the vehicle-body and wheels, of an electric motor so arranged that the field-frame rotates in one direction and is geared to the driving-wheel on one end of the axle and the armature rotates in the opposite direction and is geared to the driving-wheel on the other end of the axle, and the secondary objects result from the separation of the field-frame bearings and armature-bearings, so that those of the field-frame which rotate in one direction will run against a fixed part and those of the armature which rotate in the opposite direction will run against a fixed part, and from the arrangement of a brake, which will act between parts connected with the field-frame and with the armature-shaft, so that the strain of one rotating part is counteracted and resisted by the strain of the other rotating part when the brake is applied.

Two forms of the invention are illustrated by the accompanying drawings.

Figure 1 is a view with parts cut in central section, showing a form in which the motor-bearings are placed directly between parts connected with the field-frame and the armature-shaft. Fig. 2 is a transverse sectional view taken on the plane of the dotted line *a a* of Fig. 1, looking in the direction indicated by the arrow. Fig. 3 is a view with parts cut in section, showing a form in which the field-frame bearings are located between parts connected with the field-frame and a fixed axle and the armature-bearings are located between the fixed axle and the armature-shaft. Fig. 4 is a transverse sectional view taken on the plane indicated by the dotted line *b b* of Fig. 3.

Ordinary pneumatic-tire wire-spoke wheels 1 are shown in the drawings as supporting by common ball-bearings 2 the non-rotary axle 3, which may be connected in any desired manner with the body of a vehicle of any style. A spur-gear 4 is secured to the hub 5 of one of the wheels and an internal gear 6 is attached to the rim 7 of the other wheel.

In the form illustrated in Fig. 1 the motor is supported by arms 8. The lower ends of these arms are loosely mounted upon the axle, while the upper ends may be connected with the vehicle-frame by any suitable means. Bearing-boxes 9 are formed in the arms, and in these boxes bearings of common form are located. Extending through the boxes and loosely supported by the bearings therein are hubs 10, that are connected with the shells 11, attached to the field-frame 12. Suitably-wound poles 13 are secured to the field-frame, and the necessary collecting-brushes 14 are provided for taking current from the rotary field-magnet. A pinion 15, arranged to mesh with the spur-gear secured to the hub of one of the wheels, is mounted upon a projecting end of the field-frame hub, so that the rotation of the field-frame through this pinion and spur-gear will rotate the adjacent wheel. An armature-shaft 16 is supported by com-

mon bearings arranged between the shaft and the hubs of the field-frame in the box. Upon this shaft concentric with the field-poles is the armature 17, which is provided with the necessary commutator 18 and ordinary connections. One end of the armature-shaft extends beyond the field-frame hub on the side opposite the pinion 15, and secured to this end of the shaft is a pinion 19, arranged to mesh with the internal gear attached to the rim of one of the wheels, so that the rotation of the armature through this pinion and internal gear will rotate the adjacent wheel. When this motor is excited by the proper current from the source of electrical energy or power, the field-frame will rotate in one direction and through the pinion 15 and the spur-gear 4 will drive the wheel on that side in one direction. Simultaneously the armature will tend to run with equal speed and power in the opposite direction and through the pinion 19 and the internal gear 6 will drive the wheel on that side in the same direction as the wheel on the other side is driven by the field-frame and by the pinion and spur-gear. If the resistances to the rotations of the field-frame and the armature are equal, they will rotate at the same speed in opposite directions. Thus when the vehicle is being driven straight forward and both wheels are required to travel equally and offer the same resistance the field-frame and armature will rotate at the same speed in opposite directions. However, if the resistances to the rotations of the field-frame and armature are unequal they will rotate at different speeds—that is, should the armature be held stationary the field-frame will rotate at double speed or should the field-frame be held stationary the armature will rotate at double speed. Thus if the vehicle is being turned and the wheel connected with the armature is required to travel a different distance from the wheel connected with the field-frame the wheel which is on the outside of the turn and of necessity must travel the farther will be driven faster by the member to which it is connected than is the wheel which is on the inside of the turn and does not have to travel as far. In other words, the relative speeds between the field-frame and armature adjust themselves to the conditions that arise and will drive the wheels at the rates of speed which they would naturally assume at all times when traveling straight or making turns.

The weight of electric motors of the same output is substantially inversely proportional to the relative speeds between the field-frames and armatures. In the ordinary electric automobiles the speed of rotation of the armature is limited by the requirements of the gearing between that member and the wheels—that is, the ratio between the gears cannot be greater than a certain amount, and the rotation of the armature must be so limited that the wheels, with the ratio between the gears as large as practicable, will not be driven at too high speed. This consequently limits the speed at which the armature may be rotated and necessarily increases the weight of the motor for a given power. With the present invention the limitation of the speed of the armature lies in the requirements of the gearing between that member and its wheel, and the same limitation applies to the field-frame, but as both rotate it is evident that the actual speed at which the wheels will be driven will be one-half of the relative speed between the field and armature, which of course is the sum of the speeds of each. Consequently the weight of the motor will be that of the higher speed, and for this reason it will be very light, although capable of driving the wheels with the necessary power and at the desired speed.

The armature-shaft near the pinion 19 may be provided with an exterior cone 20 and the hub 10 on that side may be extended and provided with an interior cone 21. Between these conical surfaces an annular wedge 37 is located. This wedge is shown as formed of two rings, one inside of the other, which rings are keyed together, so that they will resist rotary strains as one part, but may be moved axially independently of each other. The wedge is supported by a band 22, fastened to a bracket 23, secured to one of the arms 8. A fork 24 is pivoted to a lug 25, projecting from the band. The shank 26 of the fork is adapted to be connected with any suitable means within the body of the vehicle, whereby the fork may be moved, and the ends of the fork are provided with loose blocks 27, arranged to bear against the ends of the wedge-sections and force them in when the fork is oscillated. When the wedge-sections are forced in, the outer ring binds against the internal conical surface on the field-frame part and the inner ring binds against the exterior conical surface on the armature-shaft, which surfaces rotate in opposite directions. This very effectively checks the rotation of the parts without putting any strain upon the wheels or upon the vehicle-body. Should the relative positions of the interior and exterior conical surfaces, by wear or otherwise, become changed, the parts of the wedge will readily adjust themselves to the conditions and effectively brake the vehicle. As the braking is accomplished between parts connected with the field-frame and the armature concentric with the armature-shaft, the torsional force exercised by each part is resisted by the other part and the strains so distributed that the mechanisms will not be wrenched.

In the form of the invention illustrated in Fig. 3 there is a non-rotary motor-axle 28, held at its ends by brackets 29, that are supported by the wheel-axle. In this case the field-frame bearings 30 and 31 are located between the motor-axle and the frame-shell 32, to which is fastened the field-frame 33. The armature-shaft 34 is tubular and is supported by bearings 35 and 36, located between the

motor-axle and the tubular shaft. With the bearings arranged in this manner while the relative speed between the field and armature is the sum of their individual speeds in opposite directions the bearings are only required to sustain wear incident to the speed of each member, which is supported upon bearings that run against a fixed part and not between members moving in opposite directions.

By means of this invention the employment of balance-gears is obviated and the use of a separate motor for each driving-wheel is rendered unnecessary. An automobile built according to the present invention will run straight or will turn, as occasion requires, and the motor will electrically act and cause the wheels to rotate together or one faster than the other, as circumstances demand. Not only are the rates of speed of the wheels cared for electrically, but the weight of the motor having the desired output can be for the reasons given materially reduced. The motor illustrated is simple to build and to apply to vehicles of any style, and the bearings can be arranged so that they are very durable and the braking effectively accomplished without wrenching the mechanisms, the vehicle, or persons in the vehicle.

I claim as my invention—

1. An automobile having supporting-wheels, an electric motor with rotary field-frame having a tubular shaft, and an armature arranged to rotate oppositely, bearing-boxes connected with the wheel-axle and vehicle-frame, bearings in the boxes supporting the tubular field-frame shaft, bearings in the tubular field-frame shaft supporting the armature-shaft, gearing between the field-shaft and a wheel on one side, and gearing between the armature-shaft and a wheel on the opposite side, substantially as specified.

2. An automobile having supporting-wheels, an electric motor with a rotary field-frame having a tubular shaft and an armature having a tubular shaft arranged to rotate oppositely, a motor-axle connected with the wheel-axle and extending through the field-frame shaft, bearings between the tubular field-frame shaft and the motor-axle, bearings between the tubular armature-shaft and the motor-axle, gearing between the field-frame shaft and a wheel on one side, and gearing between the armature-shaft and a wheel on the other side, substantially as specified.

3. An automobile having supporting-wheels, an electric motor with a field arranged to rotate about the armature and an armature arranged to rotate oppositely, gearing between the field-frame and a wheel on one side, gearing between the armature-shaft and a wheel on the opposite side, means for supporting the motor, and a brake arranged to act between a part connected with the field-frame and a part connected with the armature, substantially as specified.

4. An automobile having supporting-wheels, an electric motor with a field arranged to rotate about the armature and an armature arranged to rotate oppositely, gearing between the field-frame and a wheel on one side, gearing between the armature-shaft and a wheel on the opposite side, means for supporting the motor, an interior cone on the field-frame shaft, an exterior cone on the armature-shaft, and a wedge arranged to be forced between the conical surfaces that rotate with the field-frame shaft and with the armature-shaft, substantially as specified.

5. An automobile having supporting-wheels, an electric motor with a field arranged to rotate about the armature and an armature arranged to rotate oppositely, gearing between the field-frame and a wheel on one side, gearing between the armature-shaft and a wheel on the opposite side, means for supporting the motor, an interior cone on the field-frame shaft, an exterior cone on the armature-shaft, a wedge formed of two rings, one within the other, and a yoke with parts engaging the wedge-rings and adapted to force them against the conical surfaces that rotate with the field-frame shaft and with the armature-shaft, substantially as specified.

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