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R. H. WHITE.

DRIVING AXLE MECHANISM.

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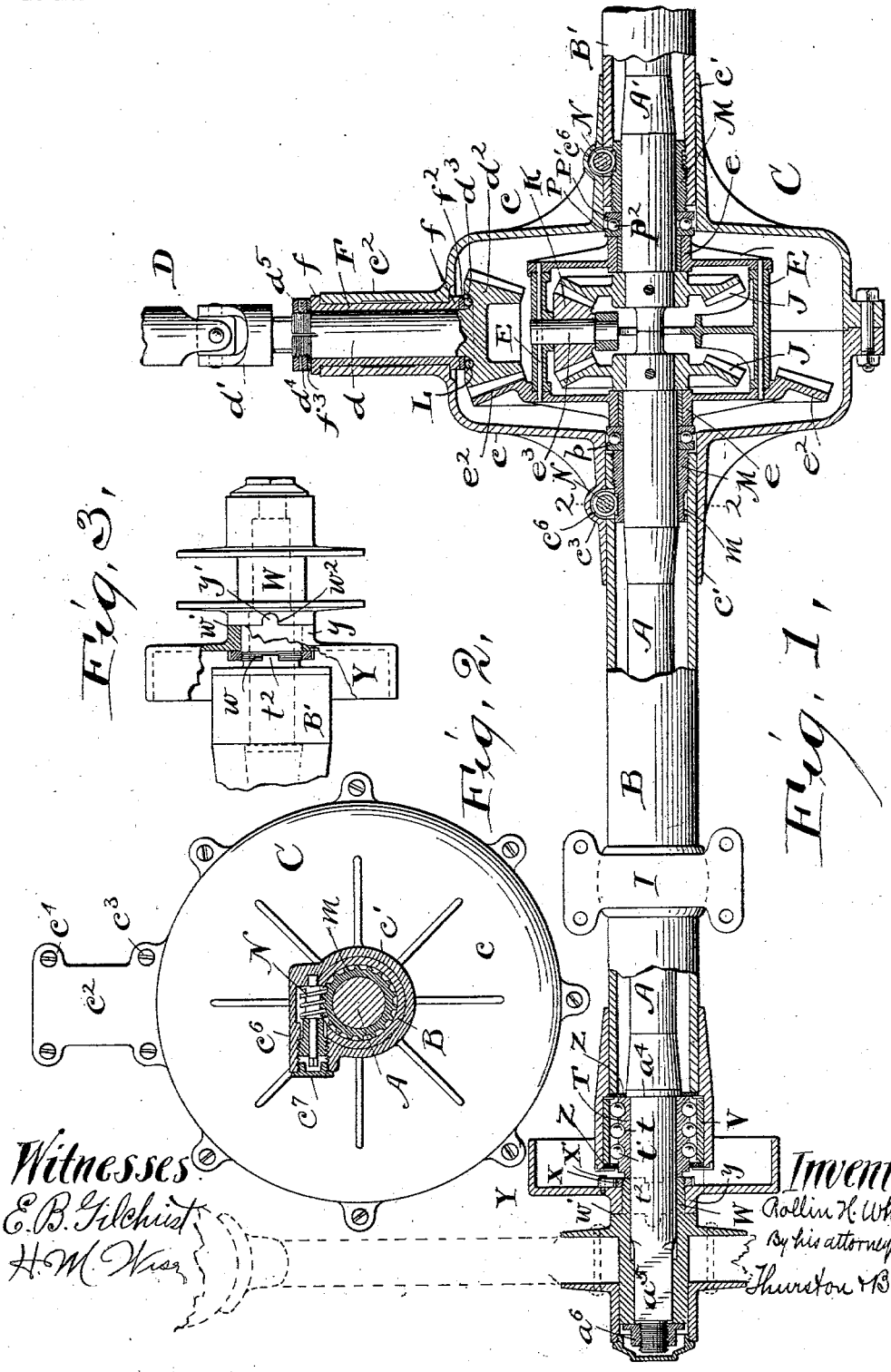
NO MODEL.



Witnesses
E. B. Gilchrist
H. M. Wise

Inventor
Rollin H. White
By his attorneys
Thurston & Bates

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UNITED STATES PATENT OFFICE.

ROLLIN H. WHITE, OF CLEVELAND, OHIO, ASSIGNOR TO THE WHITE SEWING MACHINE COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

DRIVING-AXLE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 753,022, dated February 23, 1904.

Application filed December 1, 1902. Serial No. 133,333. (No model.)

To all whom it may concern:

Be it known that I, ROLLIN H. WHITE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Driving-Axle Mechanism, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The invention relates to the driving-axle mechanism of an automobile, and particularly to the means for properly mounting and effectively driving the divided axle and to the means for connecting the wheels and brake-cylinder to said axles.

The invention, which is specifically set forth in the claims, may be here summarized as consisting in the construction and combination of parts shown in the drawings and hereinafter described.

In the drawings, Figure 1 is a plan view, partly in section, of a little more than half of the rear axle and associated mechanism. Fig. 2 is a sectional side elevation on line 2 2 of Fig. 1; and Fig. 3 is a plan view, partly broken away, of the parts at one end of the axle, showing the manner in which the wheel-hub, brake-cylinder, and axle are connected so that they must rotate in unison.

The rear axle is composed of two alined sections A A, which meet or may meet in the longitudinal center of the vehicle. These axle-sections except their projecting outer ends are inclosed in what may be termed a "housing." This housing consists of two alined tubes B B′, in which the axle-sections are rotatably mounted, and an interposed gear-case C. The gear-case is composed of two halves *c c*, each having the sleeves c' c', which embrace and are rigidly secured to the inner ends of the tubes B B′ by brazing or otherwise. Each half of the gear-case is provided with the forwardly-extended half c^2 of a sleeve, which when the casing-halves are bolted together by bolts c^3, going through the flanges c^4, embraces and holds a bearing-sleeve F. This sleeve has external flanges *f f* at its ends, between which the sleeve c^2 c^2 lies, whereby endwise movement of the sleeve relative to the gear-casing is prevented.

A longitudinal driving-shaft D is rotatively mounted in this sleeve F, or rather the rear section *d* of the driving-shaft is so mounted, because it is preferable that the shaft shall be made of sections flexibly secured together, as by universal joints d'.

On the inner end of the shaft-section *d* is a bevel-gear d^2, preferably formed integral with said shaft-section. In the back face of this gear is an annular groove d^3, which forms a raceway for the balls L, and between these balls and the end of the bearing-sleeve F a hardened-steel washer f^2 is placed, against which the balls bear. A hardened-steel collar d^4 is screwed upon the outer end of this shaft-section and bears against a steel washer f^3, interposed between it and the outer end of the bearing-sleeve F. When this screw-collar is adjusted properly, endwise movement of the shaft-section in the sleeve F is prevented, and the adjustment is maintained by a jam-nut d^5, which also screws onto the shaft-section *d*.

Within the gear-casing is a built-up hollow member E, having hubs *e e*, which are rotatively mounted upon the axle-sections A A′ within the gear-case. Rigidly secured to this member is a bevel-gear e^2, which meshes with the bevel-gear d^2. Within this hollow member are two bevel-gears J J, which are respectively pinned or otherwise rigidly secured to the ends of the axle-sections A A′. Between these gears and in mesh with them is a bevel-gear K, (or several bevel-gears,) mounted on radial shafts e^3, secured to and carried by this hollow member. The rotation of the shaft D through the described gears causes the rotation of both of the shaft-sections A A′ at the same or different speeds, as circumstances require.

A bearing-sleeve or bushing M is screwed into the inner end of each of the tubes B and serves as a bearing for the inner end of the axle-section, which passes through it. Between the bearing-sleeve M in each one of these tubes and the adjacent hub of the hollow mem-

ber E two steel disks P P′ are placed, and in their proximate faces annular grooves p are formed, which serve as raceways for the balls P^2. These two ball-bearings serve as thrust-bearings for the member E and the axle-sections as well, preventing any movement which will disturb the proper relationship of the described gears. These two bearing-sleeves M are adjustable in the tubes B. Worm-teeth m are formed on each sleeve M, which teeth are engaged by a worm N, mounted in a suitable bearing-socket c^6, which may be formed either in the hub c' of the associated gear-case or partly in it and partly in the tube B′, which is securely fastened in said hub. In either event the worm extends through said tube B into engagement with the worm-teeth of the bearing-sleeve. The outer end of the worm-shaft is squared for a key, whereby it may be turned. The end of the socket is closed by a screw-plug c^7 or by some other means.

The outer end of each shaft-section has a ball-bearing in the tube B. It consists of a sleeve T, fitted upon said axle-section and abutting against an annular shoulder a^4 thereon. In the periphery of this sleeve are one or more annular grooves t for the balls t', and in the end of the tube B is driven a steel sleeve V, which serves as the outer part of the ball-raceway. The annularly-grooved sleeve T is not directly fastened to the axle; but its outer end is provided with tongues t^2, which fit into corresponding grooves w in the inner end of the wheel-hub W. The inner end of the wheel-hub is of reduced external diameter, forming thereby the annular shoulder w'. Upon this reduced portion of the wheel-hub the hub y of the brake-cylinder Y is fitted, and this last-named hub is provided with tongues y', which enter recesses or grooves w^2 in the hub of the wheel. The brake-cylinder hub is held so that its tongues will engage with the grooves in the hub of the wheel by means of a nut X, which screws upon the wheel-hub. This nut has a notched edge, and when the nut has been screwed up so that the parts are in the proper relative position it is locked in place by a screw x', which screws into the brake-cylinder, so that the head of the screw enters one of the notches in the periphery of the nut. The outer end a^5 of the axle is made square or of some other angular form, and this part of the axle fits a correspondingly-shaped hole in the outer part of the wheel-hub. When the parts have been assembled as described, they are held in place by a nut a^6, which screws upon the threaded end of the axle. The axle of necessity rotates the wheel, and because of the tongue-and-groove connections described the rotation of the wheel is necessarily accompanied by a corresponding rotation of the brake-cylinder and ball-bearing sleeve T. Felt washers Z Z are held so as to close the annular space between the cylinder V and sleeve T.

Having described my invention, I claim—

1. The combination of a gear-casing composed of two connected parts, and two alined tubes respectively connected with said two parts, with two axle-sections rotatively mounted in said tubes and extended into the casing, wheels secured to the outer ends of said axle-sections, a hollow member within the casing rotatively mounted upon the ends of said axle-sections, two bevel-gears secured respectively to said axle-sections within said hollow member, a bevel-gear meshing with both of the bevel-gears last named and rotatively mounted on a radial shaft secured to and carried by said hollow member, a bevel-gear secured externally to said hollow member, a forwardly-extended bearing-sleeve secured to the gear-casing, a driving-shaft section rotatively mounted in the last-named bearing-sleeve, a bevel-gear secured to said shaft within the gear-casing in mesh with the bevel-gear secured externally to the hollow member, thrust-bearings at both ends of the hollow member, means for adjusting said thrust-bearings, and thrust-bearings for the driving-shaft at both ends of the sleeve in which it is mounted, and means for adjusting said thrust-bearings, substantially as specified.

2. The combination of a housing comprising agear-case and two alined tubes respectively connected with said gear-case, with two axle-sections rotatively mounted in said tubes and extended into the casing, wheels secured to the outer ends of said axle-sections, a hollow member within the casing rotatively mounted upon the ends of said axle-sections, two bevel-gears secured respectively to said axle-sections within said hollow member, a bevel-gear meshing with both of the bevel-gears last named and rotatively mounted on a radial shaft secured to and carried by said hollow member, a bevel-gear secured externally to said hollow member, a forwardly-extended bearing-sleeve secured to the gear-casing, a driving-shaft section mounted therein, and a bevel-gear secured to said shaft-section within the gear-casing and in mesh with the bevel-gear secured externally to the hollow member, a bearing-sleeve secured in each tube close to the gear-casing, ball-bearings interposed between said bearing-sleeves and the hubs of said hollow member, one of said bearing-sleeves being screwed into its tube and having external worm-teeth, and a worm mounted in said housing and engaging with said worm-teeth, substantially as specified.

3. The combination of a housing comprising a gear-case and two alined tubes fixed thereto, bearing-sleeves screwed into the inner ends of said tubes, one of said sleeves having external worm-teeth, and a worm mounted in said housing in mesh with said teeth, with a driving-shaft section projecting into the gear-case and having a bevel-gear on its inner end, axle-sections extending through said tubes and

mounted near their inner ends in said sleeves, and compensating gearing within the casing rotatable about the axis of said axle-sections and operatively connected with the bevel-gear on the driving-shaft, and thrust-bearings interposed between the said sleeve and the external member of said compensating gearing, substantially as described.

4. The combination of a gear-casing composed of two separable halves each having a forwardly-projecting half-tube, a bearing-sleeve in said half-tube and having external flanges at its ends, two tubes secured to said casing-sections in alinement and at right angles to the bearing-sleeve, two bearing-sleeves screwed respectively into the inner ends of said tubes, a driving-shaft mounted in the bearing-sleeve first mentioned and having a bevel-gear on its inner end within said casing, two axle-sections rotatively mounted in said tubes, and, specifically, at their inner ends in the bearing-sleeves in said tubes, a hollow member rotatively mounted upon the inner ends of said axle-sections within said casing, an external bevel-gear attached to said hollow member in mesh with the bevel-gear on the driving-shaft, ball-bearings interposed between the inner ends of the two bearing-sleeves in the tubes and the hubs of said hollow cylinder, bevel-gears secured to the axle-sections within the hollow member, a bevel-gear within said hollow cylinder mounted on a radial axis carried thereby, which gear is in mesh with the two gears on the axle-sections, means preventing endwise movement of the driving-shaft within its bearing-sleeve, and wheels secured to the outer end of said axle-section, substantially as described.

5. The combination of a gear-casing, and two tubes secured thereto in axial alinement, axle-sections rotatively mounted within said tubes, mechanism within the gear-case for rotating said axle-sections; each axle-section having near its outer end a squared portion, and, inside of said portion, an annular shoulder, an annularly-grooved sleeve embracing each axle-section and abutting the said shoulder thereon, a wheel-hub fitted to the squared part of said axle-section, which hub has a tongue-and-groove interlocking engagement with said annularly-grooved sleeve, a bearing-cylinder secured in each tube around the last-named sleeve, and balls interposed between it and said cylinder, substantially as described.

6. The combination of an axle-section having a squared outer end and some little distance from the same an external annular shoulder, an annularly-grooved sleeve embracing the axle and abutting said shoulder, a bearing-cylinder surrounding said annularly-grooved sleeve, and balls interposed between said sleeve and cylinder, a wheel-hub having a squared portion which fits upon the squared portion of the axle and having a tongue-and-groove interlocking connection with the annularly-grooved sleeve, said hub having also a reduced inner end, a brake-drum whose hub embraces the reduced portion of the axle-hub and has a tongue-and-groove interlocking connection with said hub, and a lock-nut screwed upon the end of said hub against said brake-cylinder hub, substantially as specified.

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

ROLLIN H. WHITE.

Witnesses:
E. B. GILCHRIST,
N. L. BRESNAN.