No. 783,168. PATENTED FEB. 21, 1905.

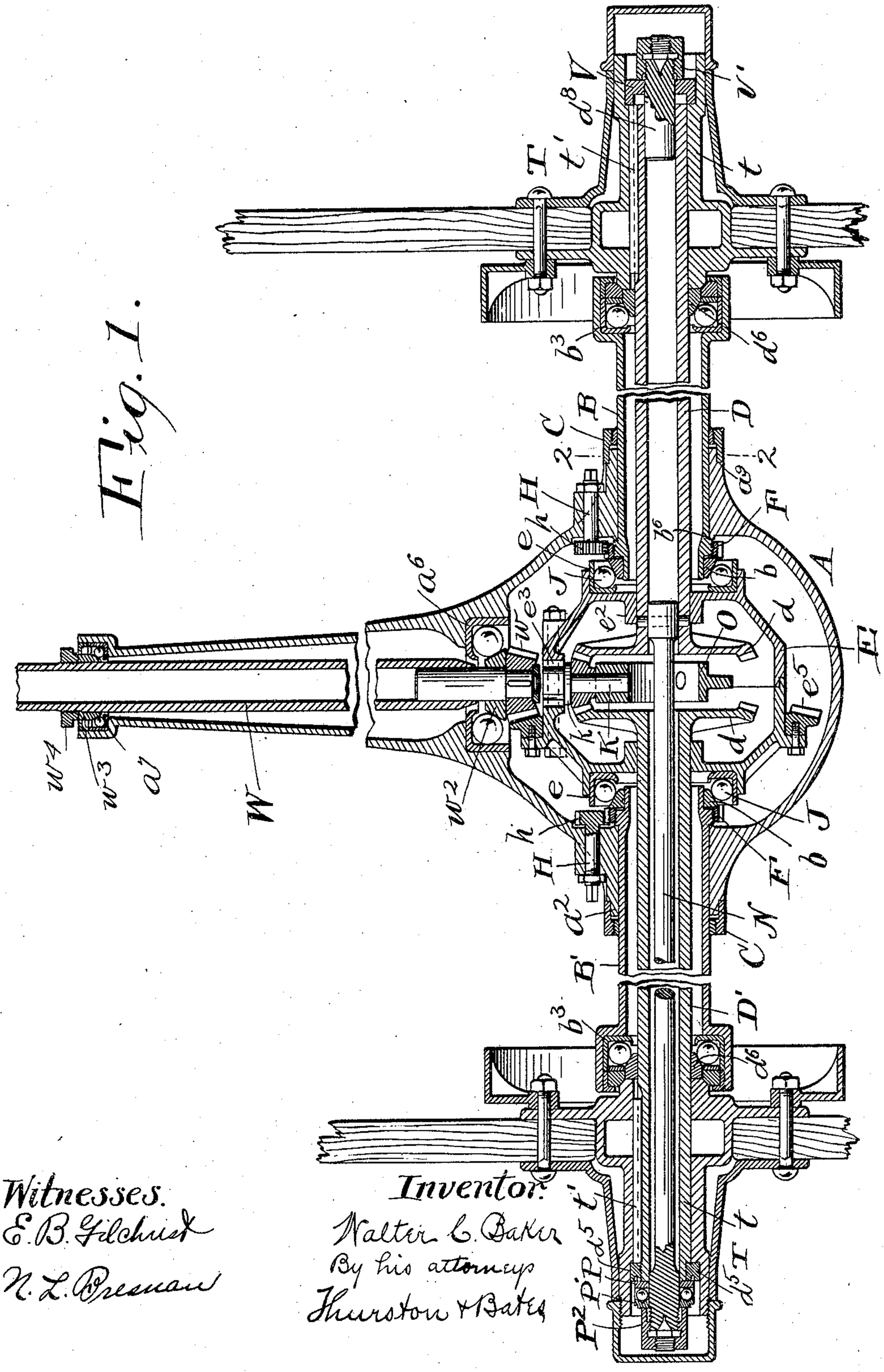
W. C. BAKER.

POWER TRANSMISSION MECHANISM FOR AUTOMOBILES.

APPLICATION FILED MAY 29, 1903.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

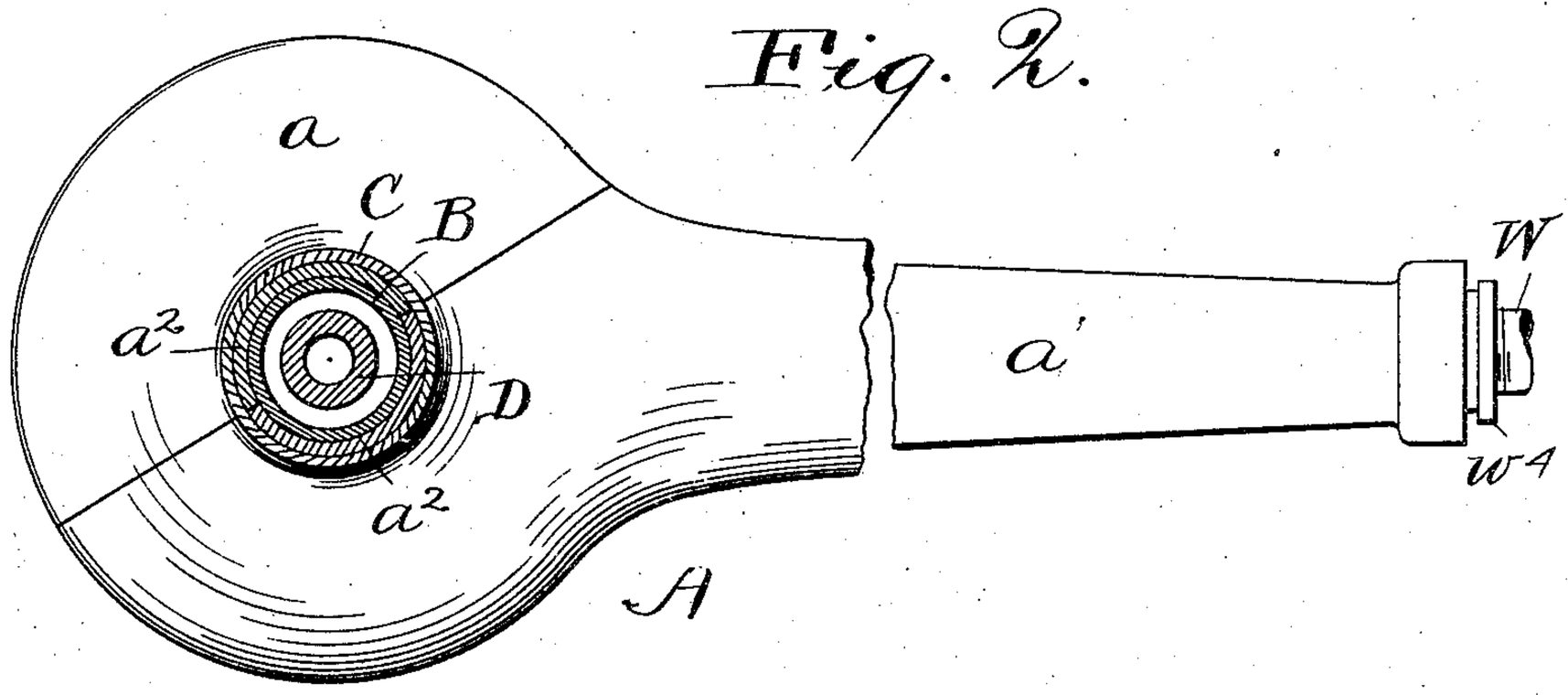


Fig. 3.

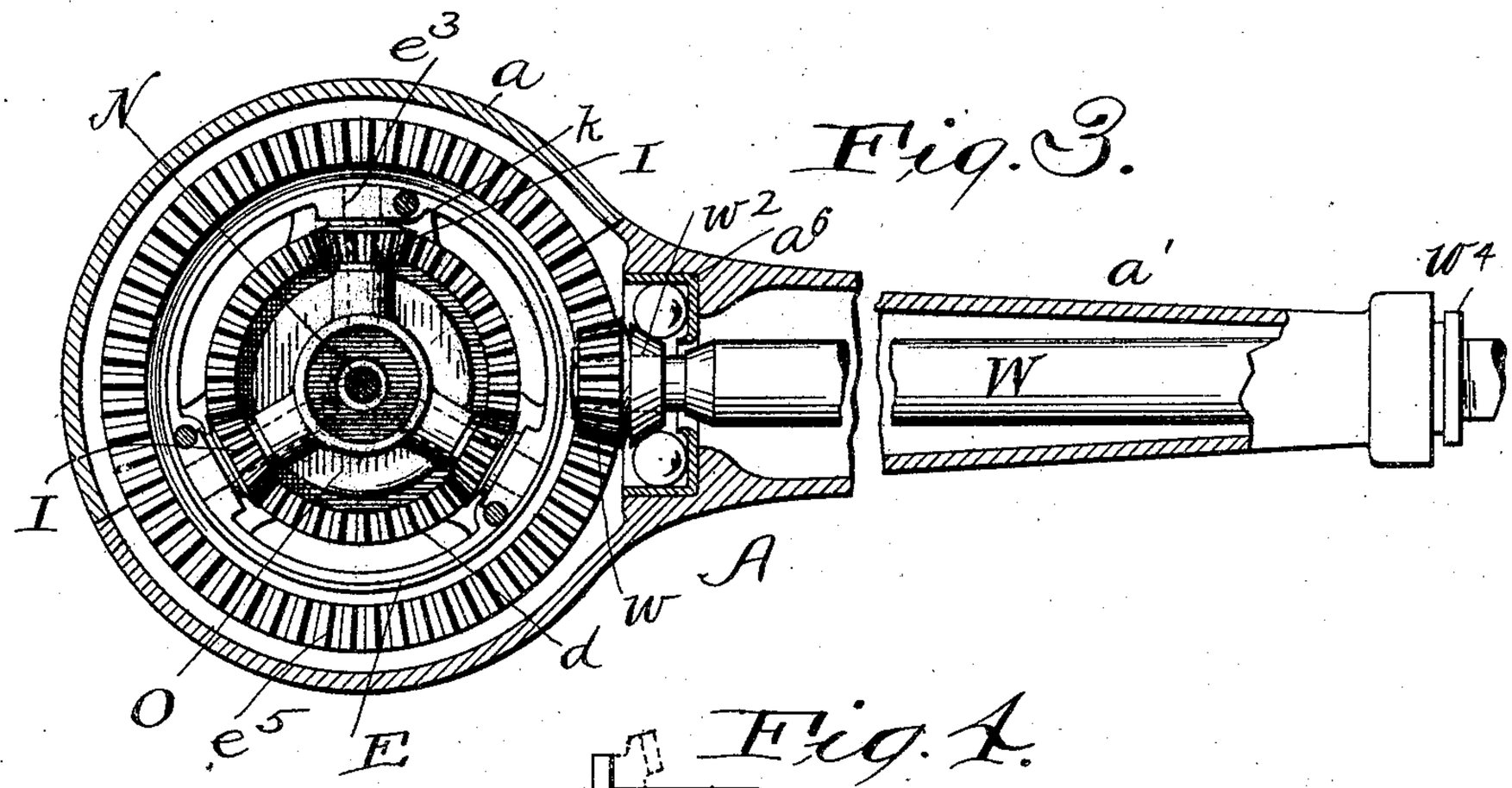
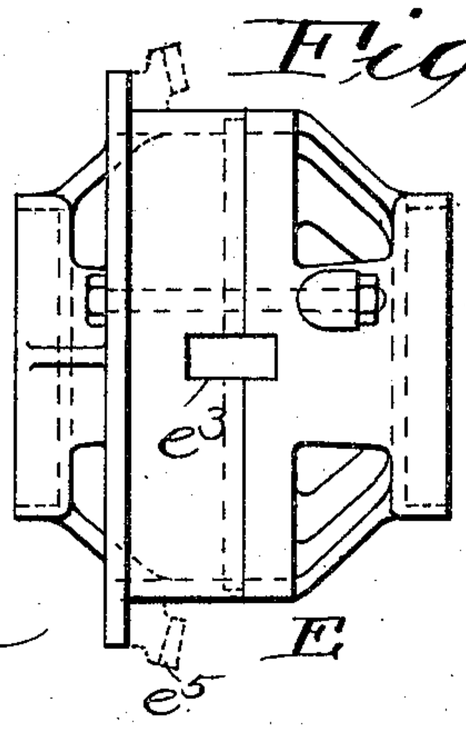


Fig. 4.



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No. 783,168. Patented February 21, 1905.

UNITED STATES PATENT OFFICE.

WALTER C. BAKER, OF CLEVELAND, OHIO.

POWER-TRANSMISSION MECHANISM FOR AUTOMOBILES.

SPECIFICATION forming part of Letters Patent No. 783,168, dated February 21, 1905.

Application filed May 29, 1903. Serial No. 159,266.

To all whom it may concern:

Be it known that I, WALTER C. BAKER, 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 Power-Transmission Mechanism for Automobiles, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The invention relates to mechanism whereby properly-differentiated motion may be transmitted from a longitudinal driving-shaft to the two driving-wheels of an automobile, and particularly to the casing for inclosing and protecting that mechanism, to the bearings for said mechanism, and to the means whereby some of said bearings may be adjusted without opening the casing.

The invention may be here summarized as consisting in the construction and combinations of parts shown in the drawings and hereinafter described, as pointed out definitely in the claims.

In the drawings, Figure 1 is a central sectional plan view. Fig. 2 is a sectional side elevation of the casing, the section being taken in the plane indicated by line 2 2 of Fig. 1. Fig. 3 is a central longitudinal section of the casing, and Fig. 4 is a plan view of the differential drum.

The following is a description in detail of the embodiment of the invention which is illustrated in the drawings, which is the best form of the invention now known to me.

Referring to the parts by letters, A represents a casing having a removable cap *a* and having also a forwardly-extended integral tube *a'*. There are also two laterally-extended tubes B B', which are clamped between the casing and its cap and when so clamped form in substance a part of said casing. The line of division between the casing and its cap is an oblique diametrical line, substantially as shown in Fig. 2. The cap and casing are provided with laterally-extended semicylindrical flanges or hubs a^2, which embrace the tubes B B', and said cap and casing are fastened together, so as to clamp the tubes B B', by means of sleeves C, which embrace these hubs and are held so embracing them by being screwed onto the tubes B. On each one of the tubes B B' is a shoulder b^6, which lies inside the casing, in contact with the inner wall thereof. The ends of the sleeves C engage against annular shoulders a^9 on said casing, wherefore when these collars are screwed up they not only hold the two parts of the casing together, but they also fix the positions of the tubes B B' relative to the casing. The cap is divided from the casing obliquely, as shown, so that the forwardly-extended tubular member *a'* remains intact; but the line of division between the cap and casing is made as near horizontal as possible under the circumstances, so that there is left in the casing what may be termed a "pocket" adapted for the reception of a suitable quantity of oil, in which some of the movable parts operate, and thereby splash and otherwise carry oil to the other relatively movable parts or bearings. The casing is to be secured to the automobile-body through the tubes B B', which are intended to be fastened thereto through suitable springs, which it has not been thought necessary to show.

The axle is made of two alined sections D and D', which extend through the tubes B B'. To the inner end of each of these axle-sections within the casing the bevel-gears *d* are rigidly connected, or they may be formed or welded thereon, as shown in the drawings. The differential drum E is mounted axially with respect to these axle-sections on the ends of the tubes B B' which project into the casing. This drum is hollow, and the inner ends of the axle-sections, which are rotatably fitted in and supported by the hubs of said drum, project into the drum, and the gears *d* are entirely surrounded by it. This drum on each side is provided with a ball-bearing cup *e* for coöperation with a cone *b*, which is mounted upon the inner end of one of the tubes B B' and is movable lengthwise thereon for the purpose of adjustment. This adjustment is effected by means of a pinion-nut F, which is screwed onto the inner end of the tube B into contact with this cone. This nut has external gear-teeth with which a pinion *h* engages, this pinion being attached to the inner end of a shaft H, which is rotatably mounted in the casing and has an end projecting outside of said

casing, which end is squared for the application of a key-wrench, whereby the same may be turned. By turning this shaft the pinion-nut is caused to travel lengthwise of the tube B, thereby moving or permitting the movement of the cone *b*, and this adjusts the bearings for the balls J. This construction is to be found on both sides of the casing. This particular manner of mounting the differential drum and of adjusting its bearings is not a part of my invention or essential thereto. It is only necessary that said drum shall be mounted axially with respect to the axle-sections. These pinions are rotatively mounted on radial studs K, which are so connected with the differential drum E that they must share its rotary motion. In the construction shown the beveled pinions I, of which three are shown, are in mesh with both of the beveled gears *d*. The inner ends of the studs K are all secured in a ring O, located between the gears *d d* in axial alinement therewith. The outer ends of these studs K engage with the differential drum E, whereby they are carried by said drum as it rotates. The outer ends of these studs are squared and enter transverse slots e^3 in the differential drum. Therefore these studs, the pinions mounted thereon, and the ring O, in which the inner ends of the studs are secured, are all capable of moving a short distance in either direction lengthwise of the axles, although they are compelled, as before stated, to travel around with the differential drum. Flanges *k* on the studs K engage with the drum, and thereby the ring O is held in axial position relative to the axles D D′.

One of the axles, D′, is hollow of necessity, and the other one, D, is preferably hollow. A bar N, which is secured to the axle D, passes entirely through the axle D′, and its projecting outer end is threaded. Embracing the unthreaded portion of this projecting end is a bearing-ring P, which abuts the end of the axle D′, and another ring, P′, also embraces this unthreaded projecting portion of said rod, and in its inner face is an annular groove p^3. Antifriction-balls Q are placed in this groove between these two rings, thereby forming an antifriction thrust-bearing. A cap-nut P^2 screws upon the threaded end of this rod against the ring P′, and as it is screwed onto this rod it acts to push the axle D′ toward the center and through the rod N to draw the axle D toward the center, thus bringing the beveled gears *d* nearer together. Thus the position of these two axles may be adjusted so that they will most effectively engage with the pinions I, and this same movement also adjusts the bearings for the outer end of both axle-sections, as will presently appear. The outer ends of these axle-sections rotate in ball-bearings, the cups b^3 of which are secured upon the outer bell-shaped ends of the tubes B B′, while the cones d^6 are movable upon the axle. The hubs *t* of the wheels are secured upon the outer ends of the axles by means of tongues *t*′, which permit the hubs to move lengthwise on the axle-sections, but compel them to rotate together. One wheel-hub is prevented from moving outward on the axle-sections by a screw-collar d^5, while the like movement of the other hub is prevented by means to be presently described. The inner ends of these wheel-hubs abut against the cones d^6 last referred to.

A portion of the axle D—as, for example, a plug d^8 rigidly secured in its end—is screw-threaded. A flanged collar V is movably mounted upon this portion of this end of the axle, and a cap-nut *v*′ screws on the end of the axle against this flanged collar, and the inner end of the flanged collar engages with a shoulder on the wheel-hub *t*, which is feathered to said axle-section.

The bearings in the outer end of both of the tubes B B′ will be adjusted simultaneously by the operation of the nut *v*′, because when this nut is screwed on it moves the adjacent wheel-hub inward on the axle-section D and at the same time draws the said axle-section outward through said wheel-hub. This latter movement is transmitted to the axle-section D′ through the rod N, and this inward movement of the axle-section D′ causes a slight movement of the associated wheel-hub toward the ball-bearing in the outer end of the associated tube B′. The adjustment of these ball-bearings in the manner referred to causes, therefore, a bodily movement of both axle-sections toward one side of the vehicle.

The manipulation of the nut P^2, which draws the two axle-sections together, likewise tightens these same bearings, unless one first loosens up the nut *v*′.

By employing one or both of the described means of adjusting these bearings one may not only properly adjust them, but may bring both gears *d* into the proper relationship to the gears I. It is not, however, necessary to make this latter adjustment with the same degree of precision if the studs K are automatically movable lengthwise of the axle, as they are in the precise construction shown.

W represents the rear section of the longitudinal driving-shaft, which passes through the forwardly-extended member *a*′ of the casing. It has a beveled gear *w* on its end within the casing, which meshes with a beveled gear e^5, secured to the differential drum. A ball-bearing on the inner end of this shaft is provided by means of a cone w^2 on the shaft and a cup a^6, secured to the casing. A similar cup a^7 is secured in the outer end of this forwardly-extended member of the casing, and a cone w^3, loose upon the shaft W, furnishes a ball-bearing for the outer end thereof, and both bearings are adjusted by a nut w^4, which screws upon the shaft against said cone w^3.

Having described my invention, I claim—

1. A casing for the power-transmitting mechanism of an automobile, consisting of a casing-body, a cap which is separable from the body in a diametrical plane, means for fastening said body and cap together, and two alined tubes clamped between said body and cap and extending laterally in opposite directions therefrom, substantially as specified.

2. A casing, for the power-transmitting mechanism of an automobile, consisting of a casing-body, and a cap which is separable from the casing-body in a diametrical plane, said casing-body and cap having external semicylindrical hubs, two laterally-extended tubes clamped between said hubs, sleeves embracing said hubs to hold the cap and casing together, and means for holding said sleeves in place, substantially as specified.

3. A casing for the power-transmitting mechanism of an automobile consisting of a casing-body, and a cap which is separable from said body in a diametrical plane, said casing and cap having external semicylindrical hubs, two laterally-extended tubes clamped between said hubs, and sleeves screwed upon said tubes and embracing said hubs, substantially as specified.

4. A casing for the power-transmitting mechanism of an automobile consisting of a casing-body, and a cap which is separable from said body in a diametrical plane, said casing and cap having external semicylindrical hubs, two laterally-extended tubes clamped between said hubs, each having a shoulder within said casing, and sleeves screwed upon said tubes and embracing said hubs and engaging with shoulders thereon, whereby said tubes are drawn and held in positions where the shoulders thereon engage the inner walls of said casing.

5. A casing for the power-transmitting mechanism of an automobile consisting of a casing-body having a forwardly-extended tube and a cap which is separable from the casing-body in an oblique diametrical plane, said casing-body and cap having external semicylindrical hubs, two laterally-extended tubes clamped between said hubs, sleeves embracing said hubs to hold the cap and casing together, and means for holding said sleeves in place, substantially as specified.

6. In an automobile, the combination of a casing consisting of a casing-body having a forwardly-extended tube, and a cap which is separable from said body in an oblique diametrical plane, said casing-body and cap have external semicylindrical hubs, two laterally-extending tubes clamped between said hubs, sleeves embracing said hubs to hold the cap and casing together, independently-rotatable axle-sections extending through the laterally-extending tubes, differential mechanism mounted in the casing for rotating said axle-sections, and a driving-shaft, which is extended through and mounted in the forwardly-extended tube, for rotating said differential mechanism, substantially as specified.

7. In an automobile, the combination of a casing having a removable cap and two laterally-extending tubes, a differential drum rotatably mounted on bearings rigid with and projecting into said casing, two axle-sections independently mounted in said tubes and in the differential drum, bevel-gears secured to the inner ends of said axle-sections, bevel-pinions mounted on said differential drum and lying between and engaging with the bevel-gears referred to, and means for rotating said differential drum, substantially as specified.

8. In an automobile, the combination of a casing having a removable cap and two laterally-extended tubes which are provided with ball-bearings in their outer ends, a differential drum rotatably mounted on the ends of said tubes within said casing, two axle-sections passing through said tubes and rotatably mounted at their inner ends in the ends of said drum, cones adjustable upon said axle-sections and balls interposed between said cones and the cups in the ends of said tubes, differential mechanism intermediate of said drum and axle-sections, and means for rotating said drum, substantially as specified.

9. In an automobile, the combination of two alined separated bearing-cups and means for holding them in fixed relationship to each other, two alined axle-sections, one of which is tubular and which passes through said bearing-cups respectively, cones movably mounted upon said axle-sections near their outer ends for coöperation with said cups, wheels splined respectively to said axle-sections and engaging with said cones, means for imparting properly-differentiated rotative motion to said axle-sections, a rod extending entirely through the tubular axle-section and attached to the other axle-section, bearings for the adjacent ends of said axle-sections, a ball-bearing ring embracing said rod and bearing against the end of the tubular axle-section, another ball-bearing ring embracing said rod, a set of balls between said rings, and a nut screwing onto said rod against the outer bearing-ring.

10. In an automobile, the combination of a casing having two laterally-extended tubes, a differential drum rotatively mounted in said casing, two axle-sections one of which is tubular, extending through the said tubes, respectively, and independently rotatable in ball-bearings in the outer ends of said tube concentric with the bearings of the drum, and rotatably mounted at their inner ends in said drum, a rod extending entirely through the tubular axle-section and attached to the other axle-section, a ball-bearing ring on said rod in contact with the end of the tubular axle-section, another ball-bearing ring on said rod, a set of balls between said rings, and a nut screwing onto said rod against the outside ring, bevel-gears attached to the inner end of

the axle-sections, bevel-gears mounted on the drum between and in mesh with the bevel-gears on the axle-sections, and means for rotating said drum, substantially as specified.

11. In an automobile, a casing having two laterally-extended tubes, an axle composed of two independent sections rotatably mounted in said tubes respectively, one of said axle-sections being tubular, a rod secured to the other axle-section and extending entirely through the tubular section, means mounted on the outer end of this rod for moving said rod and tubular section relative to each other, a thrust-bearing interposed between said tubular section and rod, bevel-gears secured to the inner ends of said axle-section, a differential drum axially mounted with respect to said axle-sections, and bevel-gears mounted on the drum and lying between and in mesh with the bevel-gears on the axle-sections, substantially as specified.

12. In an automobile, the combination of a casing having two laterally-extended tubes, two axle-sections rotatably mounted in said tubes on ball-bearings, connections between said axle-sections which permit their relative rotation but prevent them from moving apart, a wheel-hub secured upon one axle-section by a tongue-and-groove connection, a ball-bearing cone movable upon said axle-section and against which said wheel-hub abuts, and means for relatively moving said wheel-hub inward and the axle-sections in the opposite direction, substantially as specified.

13. In an automobile, the combination of a casing having two laterally-extended tubes provided with ball-cups in their outer ends, two independently-rotatable axle-sections, connections between them which permits their independent rotation but prevents their separation, a cone on one axle-section for coöperation with the adjacent cup, a cone movable on the other axle-section for coöperation with the adjacent cup, a wheel-hub on said axle-section having a tongue-and-groove connection therewith, a collar on said axle-section abutting said wheel-hub, and a nut screwed onto said section against said collar, substantially as specified.

14. In combination, a casing comprising a body having a forwardly-extended tube and two laterally-extended tubes and a cap which is separable from the body in an oblique downwardly and rearwardly extended diametrical plane, a driving-shaft extending into the casing through said forwardly-extended tube, two axle-sections extending into the casing respectively through the laterally-extended tubes, and differential-power-transmission mechanism in said casing and adapted to transmit properly-differentiated movement from the driving-shaft to the axle-sections, substantially as specified.

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

WALTER C. BAKER.

Witnesses:
N. S. WRIGHT,
E. L. THURSTON.