No. 659,504. Patented Oct. 9, 1900.

C. A. BAYLOR.

DRIVING GEAR FOR VELOCIPEDES.

(Application filed Apr. 17, 1899.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.

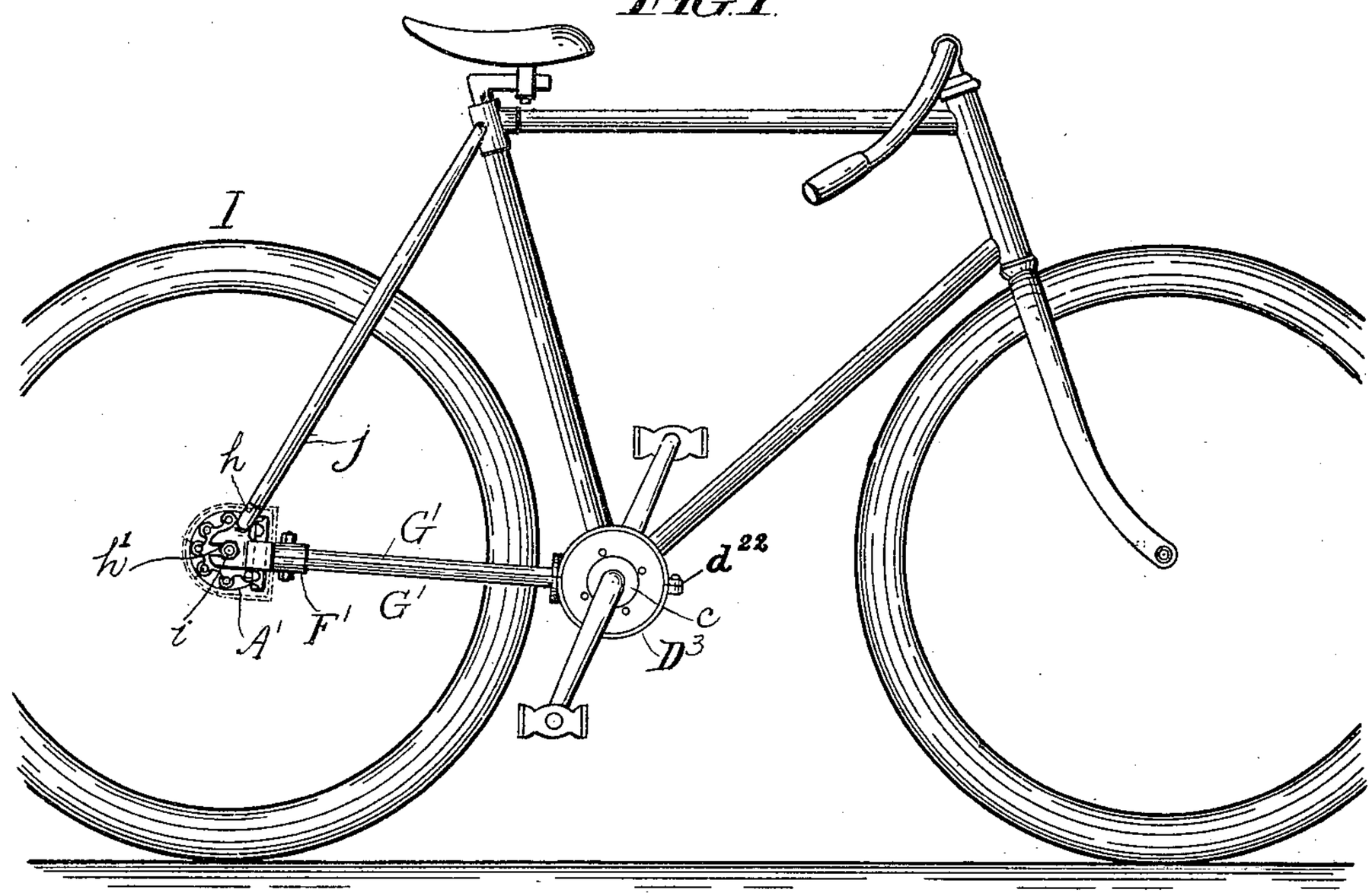

FIG. 2.

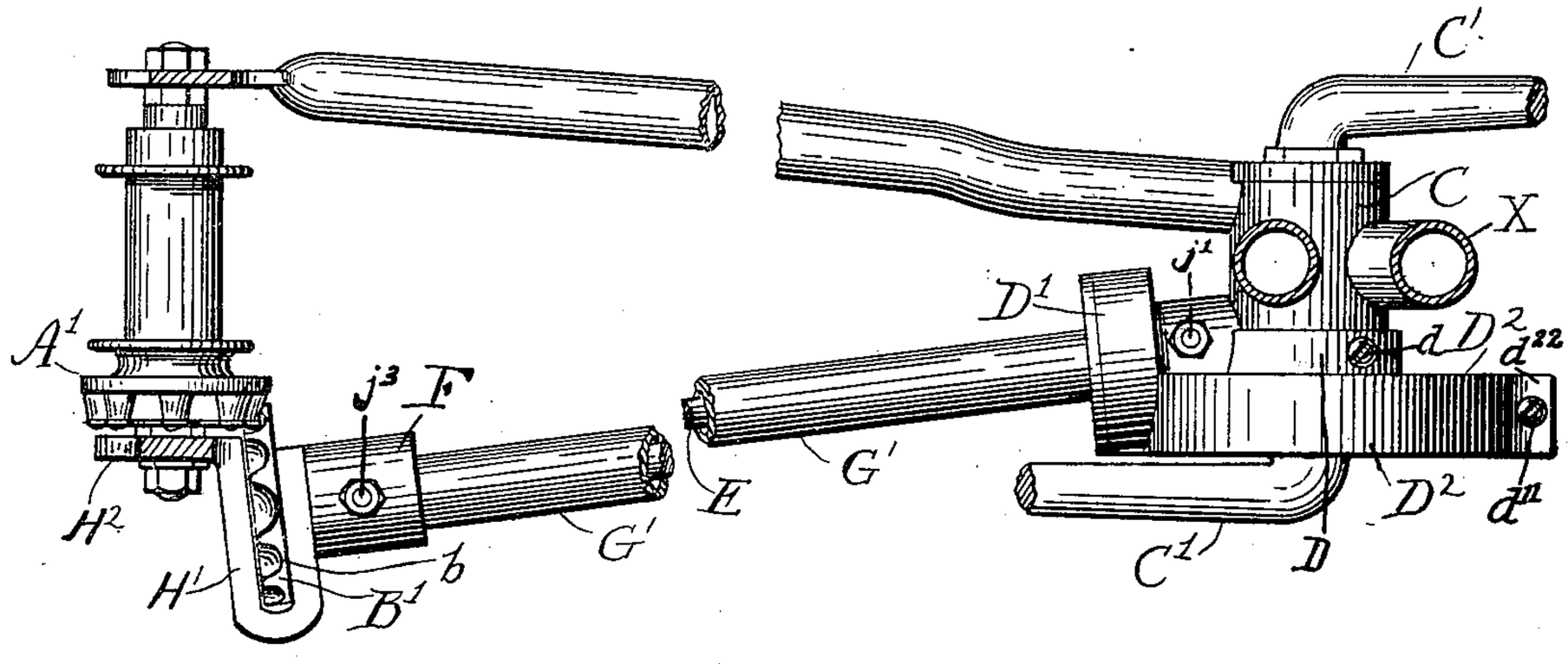

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Fig. 3.

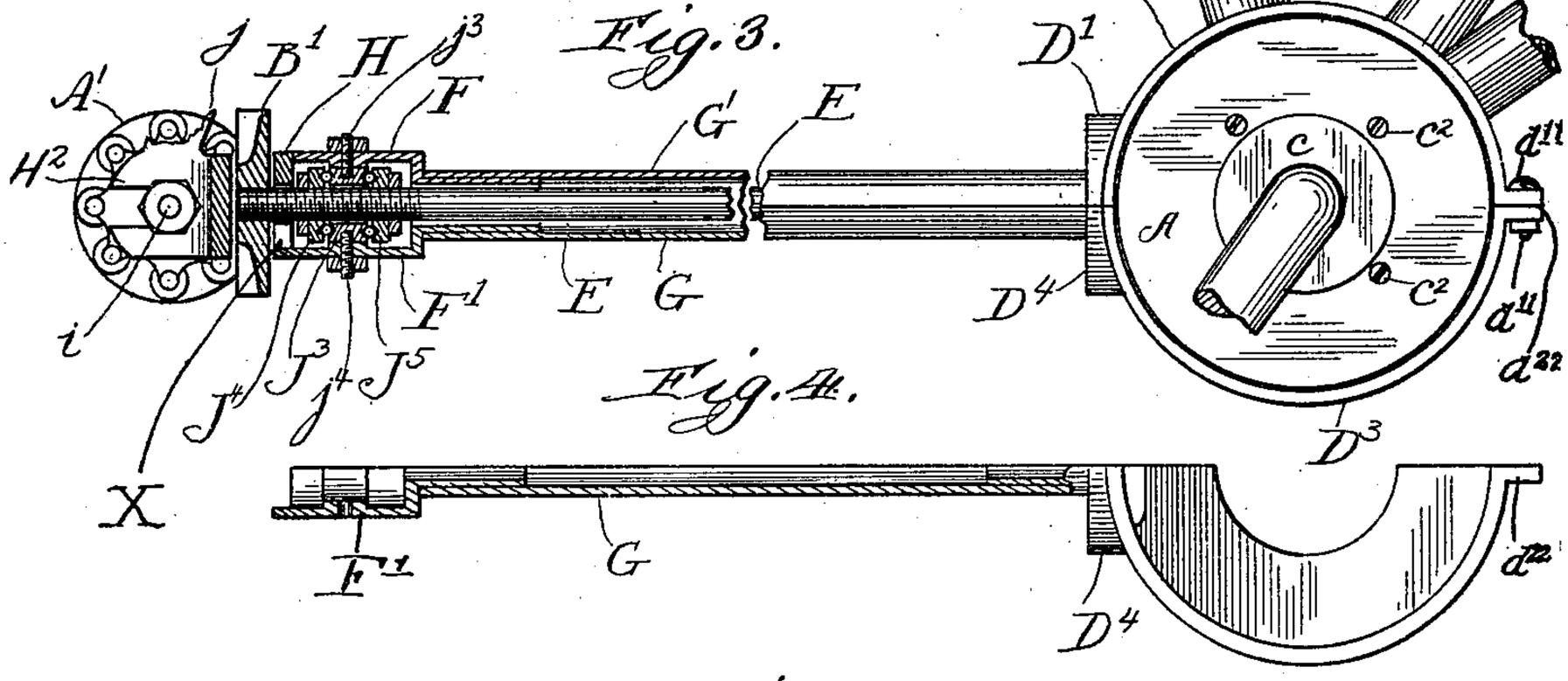

Fig. 4.

Fig. 5.

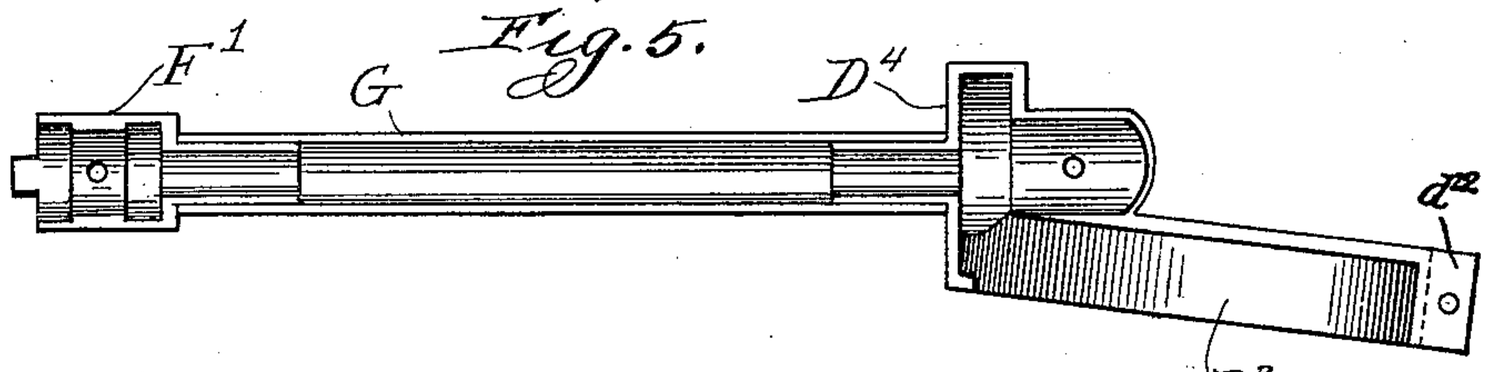

Fig. 6.

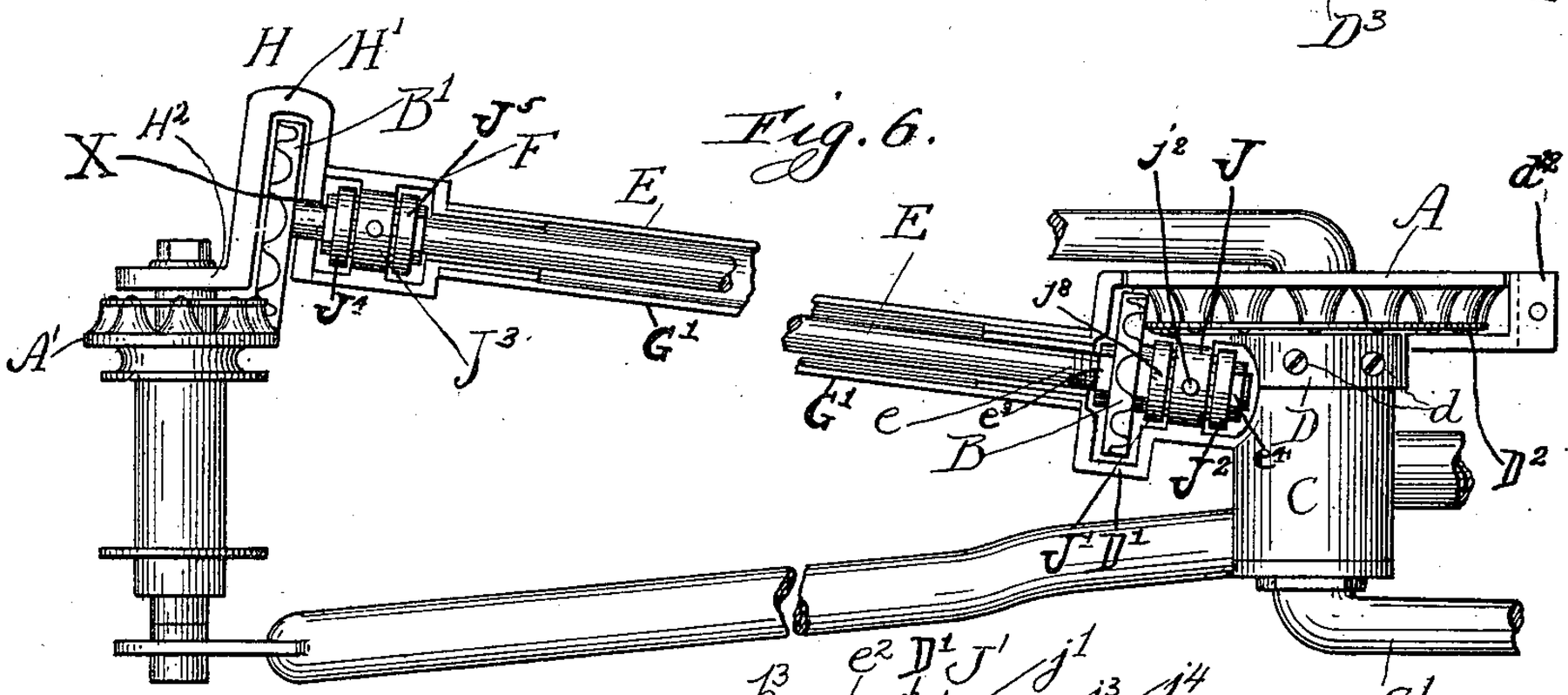

Fig. 7.

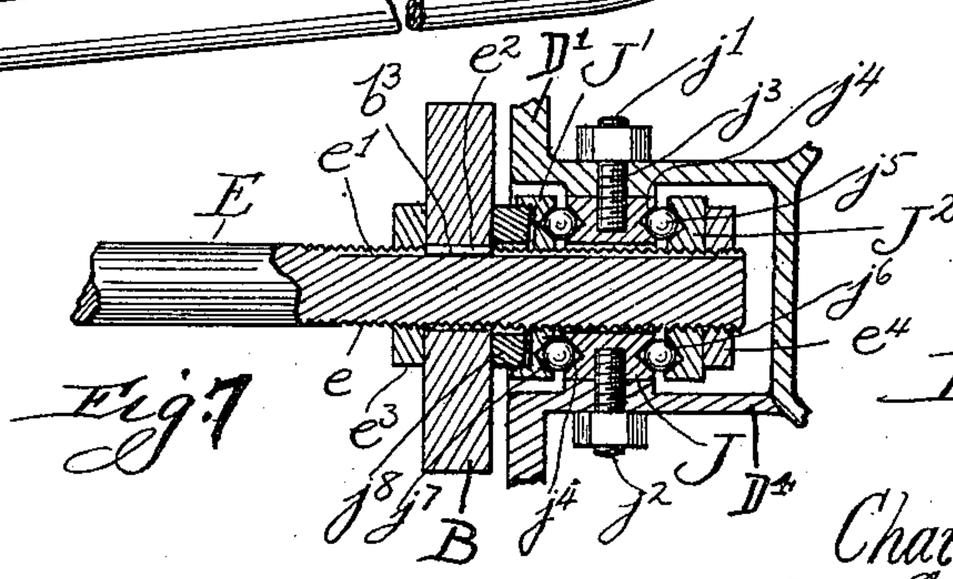

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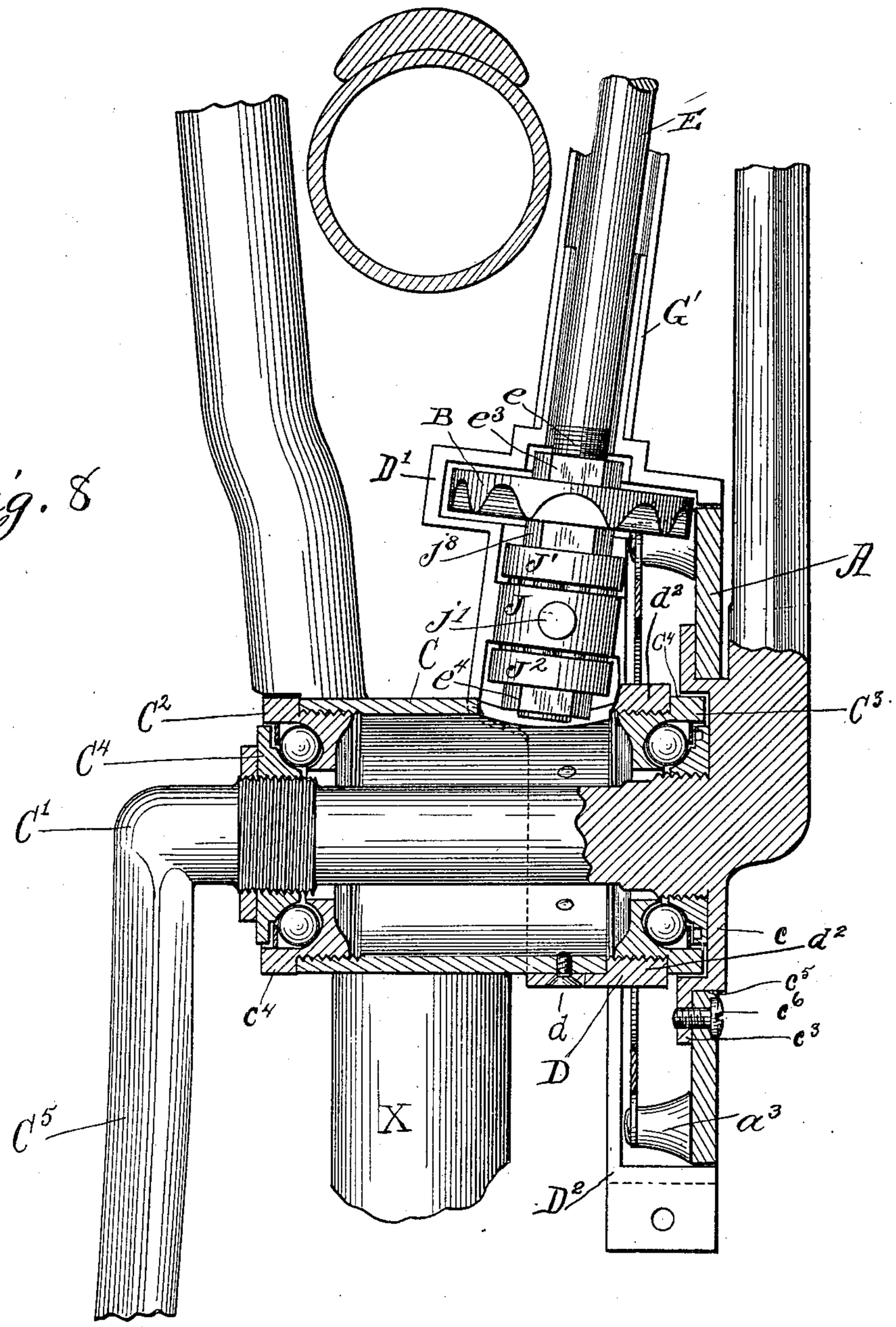
Fig. 8



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UNITED STATES PATENT OFFICE.

CHARLES A. BAYLOR, OF LA PORTE, INDIANA.

DRIVING-GEAR FOR VELOCIPEDES.

SPECIFICATION forming part of Letters Patent No. 659,504, dated October 9, 1900.

Application filed April 17, 1899. Serial No. 713,239. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. BAYLOR, of La Porte, in the county of La Porte and State of Indiana, have invented certain new and useful Improvements in Driving-Gear for Velocipedes, of which the following is a specification.

This invention relates to an improved driving-gear for velocipedes of that character in which the power is transmitted from the pedal-crank to the wheel through the medium of intermeshing gears and an intermediate shaft, the invention having special reference to the details of construction of the connections and bearings.

Among the objects of the invention are to so construct the several parts and their mountings that the mechanism may be applied with facility to wheels made in the usual manner for chain driving-gear, and particularly to a certain one-piece crank construction now in extensive use, without difficult or expensive structural changes; to provide antifriction-bearings so constructed and arranged as to take practically all of the separating thrust of the gear; to provide improvements in the details of construction whereby all parts, both of the gear mechanism and of the crank mechanism, are made readily accessible and readily adjustable to compensate for wear, and in general to provide a simple, strong, and efficient driving-gear inexpensive to build and less susceptible to serious derangement than driving-gears heretofore known.

The invention consists in the matters hereinafter described, and more particularly set forth in the appended claims, and may be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a bicycle equipped with my improved driving mechanism. Fig. 2 is a horizontal sectional view, parts being broken away to reduce the size of the view. Fig. 3 is a side elevation of the parts shown in Fig. 2, the rear end of the driving-shaft and bearings for the same, as well as the supporting-yoke, being shown in longitudinal vertical section. Fig. 4 is a side elevation of the lower half of the detachable casing. Fig. 5 is a plan view of the same. Fig. 6 is an inverted view of the parts shown in Fig. 2 with the lower detachable casing removed. Fig. 7 is a sectional detail of the bearings for the forward end of the driving-shaft. Fig. 8 is an axial sectional view of the crank, connected gear, and crank-hanger inverted, and taken in the same plane with the plane of separation of the front gear-casing.

Referring to the drawings by letters, A and A′ designate, respectively, the gears on the crank-shaft and the hub of the rear wheel, and B B′ designate, respectively, the forward and rear pinions, meshing with said gears A and A′ and carried by the drive-shaft E, as more fully hereinafter described.

Describing now the particular adaptation of the gears to a velocipede driving mechanism and the peculiar construction and arrangement of parts whereby this mechanism is applied to a machine constructed in the same way as machines adapted for chain-and-sprocket driving-gear and equipped in the particular instance shown with what is known in the trade as a "Fauber single-piece crank-set," C designates as a whole the crank bracket or hanger, and C′ a crank mounted therein. The crank hanger or bracket is provided in each of its ends with bearing-cups C^2 C^3, respectively, removably threaded therein and provided with rims c^4, which protrude beyond the end of the hanger to afford access thereto for removing the cups. In order that the single-piece crank may be inserted or removed from the hanger, it is provided with a removable cone C^4, seated upon that end of the crank remote from the gear or sprocket thereon and capable of being unscrewed and slipped off over the crank-arm. After the said cone has been thus removed the bearing-cup C^2 may be removed in the same manner, whereupon the crank-shaft may be shifted through the hanger sufficiently to afford access for unscrewing the cup C^3, after which the crank as a whole may be removed from the bracket by passing its arm C^5 through the latter. The right-hand end of the crank-shaft is provided with a hub or enlargement *c*, formed integrally with the crank, having a radial flange c^3 extending around and projecting beyond the periphery of the hub, the angle formed at the intersection of the peripheral surface of the hub and the meeting surface of the flange forming a right-angled rabbet c^5, within which is mount-

ed the gear or sprocket A, as the case may be, the latter being provided with a central opening adapted to fit upon the hub and being secured thereto by means of a plurality of screws c^6, inserted through the gear and into the said flange c^3.

In the ordinary construction of the Fauber crank-set both of the bearing-cups C^2 C^3 are threaded directly into the ends of the barrel of the hanger C in the same manner as is the cup C^2 of the present construction and the hanger as a whole is disposed symmetrically with relation to the median vertical plane of the wheel-frame. In other words, the ends of the hanger are equidistant from a vertical plane extending centrally and longitudinally through the frame member X. In the present construction, however, in order to adapt the hanger-set to receive the driving-gear mechanism the left-hand end of the bracket, or that within which the cup C^2 is seated, is shortened somewhat and the opposite end of the hanger is correspondingly lengthened by means of an extension-piece D, so that the crank as a whole is located somewhat out of center with relation to the machine-frame. It is this shifting of the crank mechanism laterally which enables me to arrange the gear mechanism in such manner as not to interfere with other parts of the frame construction and at the same time produce an exceedingly central, strong, and convenient attachment which may be applied not only to a single-piece crank, but also to any other wheel in which the bearings of the crank and crank may be thus shifted over. It is to be noted in this connection that while the shifting of the crank mechanism laterally places the pedals slightly out of symmetrical relation to the wheel-frame, yet not sufficiently so to amount to a serious objection, and that the necessary room for the gear mechanism is thus provided without increasing the "tread width" at all.

The extension D, as preferably constructed and as shown herein, comprises a flat band or ring of somewhat greater diameter than the external diameter of the bracket and provided with an enlarged portion adapted to telescope over and fit upon the end of the bracket. The extension is rigidly but detachably secured to the bracket conveniently by means of a plurality of screw-bolts d, inserted through the telescoping parts, while the part d^2, which extends beyond the bracket, is internally threaded to receive the cup C^3. With this ring D is integrally formed the upper half D′ (see Fig. 2) of a combined supporting-sleeve and gear-casing, which is arranged to project therefrom at the proper angle to receive the forward end of the drive-shaft E, which transmits the motion from the front pair of gears to the rear pair connected with the rear wheel of the vehicle. The upper half D^2 of a casing for the gear A is also preferably formed integrally with the supporting-ring D, this casing being made open at its outer face side, as indicated most clearly in Fig. 6, and arranged to fit closely around the periphery of the said gear A, so as to form in conjunction with the latter a complete housing for the toothed side of the gear. The lower half D^3 of this gear-casing is similarly shaped and made integral with the lower half D^4 of the supporting-sleeve which receives the end of the driving-shaft, (see Fig. 5,) said parts being detachably connected with the fixed members, as hereinafter more fully described. The opposite end of the shaft E is supported in a two-part supporting-sleeve F F′, the upper half of which is formed integrally with or rigidly connected to and carried by a yoke-shaped bracket H, which serves the combined purposes of supporting-bracket and union-piece for the rear stay members of the wheel-frame and hub-clip. As shown herein, said bracket consists of the upper member F of the supporting-sleeve, a laterally-projecting U-shaped yoke H′, between the arms of which the gear B′ is located, and a slotted hub-clip H^2, with which the axle i of the rear wheel I of the vehicle is connected, this latter clip portion being provided with an upwardly-projecting lug h for engagement with the lower end of the upright fork-stay j. The lower half F′ of the supporting-sleeve is made detachable, (see Figs. 4 and 5,) this part being rigidly connected by brazing or otherwise with the lower half G of a tubular casing which extends between the two supporting-sleeves and similarly connected at its opposite end with the part D^4. The upper side of the driving-shaft is inclosed by a similar casing member G′, which is also rigidly connected with the supporting-sleeves at its respective ends, the line of separation between the parts G G′ being made coincident, so that the lower halves of the front gear-casings of the two supporting-sleeves, together with the connecting part G′, are removable in a single piece, as indicated more clearly in Figs. 4 and 5.

The lower members D^4 D^3 of the combined supporting-sleeve and gear-casings are rigidly attached to the corresponding upper members by means of a stud j^2, hereinafter described, which is made of sufficient length to project through a suitable aperture in the part D^4 and is provided with a nut, in conjunction with a screw-bolt d^{11}, inserted through ears d^{22} d^{22} upon the parts D^2 D^3. The supporting-sleeve section F′ is similarly attached to a stud j^4. The rear pair of gears will be cased in any preferred or suitable manner, such casing being omitted in order to more clearly show the working parts and connections, but indicated in dotted lines.

Describing now the arrangement of the parts whereby the driving-shaft E is rotatably supported in roller-bearings and the gear B is adjustably mounted thereon, the shaft E is screw-threaded from its forward end backwardly some distance, as indicated at e, and provided with a spline-groove e', extending throughout the length of the threaded

portion. The gear B is arranged to fit upon the shaft snugly, but without threads, and is also provided with a spline-groove b^3 for the reception of a key or feather e^2. The gear is held from movement backwardly along the shaft by a check-nut e^3.

J designates a journal-box or bearing-sleeve which is rigidly mounted in the supporting-sleeve D' D^4 conveniently, and as shown herein, by means of screw-studs $j' j^2$, threaded into the opposite sides of said bearing-ring and arranged to extend radially out through apertures j^3, formed in the upper and lower sections of the supporting-sleeve. The end faces of said bearing-ring are provided with double-cone annular ball-races j^4, adapted to receive sets of roller-balls j^5.

J' J^2 designate bearing-cups threaded upon the shaft at each end of the said bearing-sleeve and provided in their proximate faces with ball-races j^6, adapted to coöperate with the ball-races of the bearing-sleeve to confine the balls, the arrangement of these races being such as to support the balls and bearing-sleeve engaged therewith free from contact with the shaft. At the extreme end of the shaft is mounted a check-nut e^4, which is adapted to act against the cup J^2. In order that the gear B may be adjusted relatively to the bearing-sleeve, and therefore relatively to the gear A, the cup J' is made in two parts j^7 j^8, one of which is arranged to telescope partly within the other, said interfitting parts being screw-threaded together. The part j^8 is internally unprovided with screw-threads, so as to permit it to move along the shaft independently of the part j^7, and suitably shaped externally for engagement of a spanner. Obviously by adjusting it in one direction or the other the gear may be correspondingly adjusted.

With the parts constructed as thus described it will also be obvious that the shaft E may be adjusted endwise through the bearing-ring and locked in any desired position by means of the opposing check-nuts, the cups being at the same time locked in adjusted position to afford the required freedom of movement between them and the said bearing-sleeve.

The supporting-sleeve sections F F', which receive the rear end of the driving-shaft, are also provided with a journal-box or bearing-sleeve J^3, mounted therein in the same manner as hereinbefore described in connection with the sleeve J, the construction of this sleeve, as well as that of the coöperating cups J^4 J^5, being also like the sleeve J and cup J^2 hereinbefore described. The gear B', which is carried by this end of the shaft, is, however, rigidly mounted upon the extreme end thereof in position to operate between the arms of the yoke H' and to intermesh with the gear A', which is mounted on the hub of the wheel I, as indicated most clearly in Fig. 2.

The axle *i* of the rear wheel is rigidly and adjustably locked in the slot *h'* of the bracket H in the usual manner, and inasmuch as the gear B' is held fixed against movement longitudinally of its axis of rotation within said bracket said slotted connection obviously forms a convenient means of adjusting the said gear B' relatively to the gear A' if it be desired to make this adjustment without disturbing the adjustment of the other parts. Inasmuch, however, as the driving-shaft is capable of endwise adjustment, the position of the gear B' may obviously also be adjusted by movement of the shaft.

It will be seen from the foregoing that a driving mechanism embodying my invention possesses important advantages.

The peculiar construction of the casing which permits the entire half of the larger front gear-casing to be removed, the line of separation being diametrically of the same, is of importance when used in connection with a gear applied to the crank in the manner shown herein, since it permits the gear to be removed from the crank without removing the rest of the casing or disturbing the other parts. In case also a single-piece crank be used of a type permitting its removal from the bracket by withdrawing one of the arms through the latter, as is the case with some of the well-known cranks and with that shown herein, it may be removed with the gear still in place thereon without disturbing other parts of the casing than the said removable lower half and connected parts. It is to be noted also that by reason of the peculiar construction of the parts the entire shaft E and gears mounted thereon may be disconnected from the machine and lifted bodily out of its mountings without disturbing either the crank mechanism or the rear wheel or the gears carried by either by simply removing the connected casing members D^3, D^4, F', and G and then disconnecting the bearing-sleeves J and J^4 from their respective upper supporting-sleeve sections, the arm of yoke H being slotted at X to permit of the shaft being detached from the yoke without removing gear B'. This is a feature of importance not only for its convenience, but also because such separation of the parts either for cleaning or otherwise involves no change or loss of adjustment in any of the operating parts.

While I have herein shown what I deem to be the preferred embodiment of my invention, yet it will be understood that the details thereof may be modified to some extent without departure from the generic features. I do not therefore wish to be limited to the precise details shown, except as made the subject of specific claims.

I claim as my invention—

1. In a bicycle, the combination with the usual main frame provided with a built-in shaft-hanger, of a crank-shaft extending therethrough and carrying at one end a gear, a side shaft carrying a gear meshing with the

aforesaid gear, means for connecting said side shaft to the traction-wheel of the bicycle, a detachable extension mounted upon the end of the shaft-hanger adjacent the gear on the crank-shaft, bearings for the crank-shaft, one supported in said extension and the other at the opposite end of the shaft-hanger, this latter end of the shaft-hanger being made shorter than the opposite end, as measured from the median line of the bicycle-frame, an amount substantially equal to the extent the shaft-hanger is lengthened by the extension, and housings for said gears, comprising a semicylindrical casing D^2 attached to said extension and inclosing the upper half of the gear carried by the crank-shaft, a semicylindrical casing D' also carried by the extension and inclosing the upper half of the gear on the side shaft and a portion of the side shaft, and a detachable semicylindrical casing D^3 for the gear on the crank-shaft, this casing carrying a semicylindrical casing D^4 for the adjacent end of the drive-shaft and the gear thereon, substantially as and for the purposes set forth.

2. In a power-transmission mechanism, a shaft having a threaded portion, a journal-sleeve through which the threaded portion of the shaft extends, a cup threaded on the shaft adjacent to each end of said sleeve, balls interposed between the ends of the sleeve and the cups, one of said cups being of two-part construction, one of these parts being mounted adjustably upon the other, a check-nut at one end of the bearing thus formed, a gear mounted upon the shaft at the other end of the bearing, and a stop upon the shaft beyond said gear, said gear being locked between said stop and the movable part of the adjacent cup.

3. In a power-transmission mechanism, a gear-shaft having a threaded portion, a fixed journal-sleeve through which the threaded portion of the shaft extends loosely, a roller-race in each end of said journal-sleeve, a cup threaded upon the shaft adjacent to each end of said journal-sleeve, balls interposed between the ends of the sleeve and each of said cups, one of said cups being of two-part construction, one member being constructed to telescope partly within the other and having screw-threaded connection therewith, a check-nut at each end of the bearing thus formed, and a gear mounted upon the shaft and locked between one of said check-nuts and the adjacent cup.

4. In a driving mechanism for velocipedes, having front and rear intermeshing pairs of gears and an intermediate shaft, a support for the rear end of said shaft and connected parts, consisting of a yoke provided at one end with a clip adapted for engagement with the rear vehicle-wheel and at its other end with one part of a longitudinally-divided shaft-inclosing sleeve, the gear on the rear end of said shaft lying within said yoke, a removable companion part to said part of the shaft-inclosing sleeve carried by the yoke, a fixed journal-sleeve fitting within said divided sleeve and provided with a pair of radial studs, one passing through an opening in each section of said sleeve, nuts on the projecting ends of these studs, whereby the sleeve-sections are clamped together and the journal-sleeve is held fixedly in place, and suitable bearing cups and balls within the divided sleeve and abutting against said journal-sleeve, substantially as set forth.

5. In combination, a driving mechanism of a velocipede, comprising a crank-shaft mounted in a bearing-bracket, a gear upon said shaft, a drive-shaft upon which a second gear is mounted, means for supporting the drive-shaft and for housing both gears, comprising a supporting-ring D mounted upon the bearing-bracket and projecting therefrom and carrying a semicylindric casing D^2 for the gear on the crank-shaft and also a semicylindric casing D' for the adjacent end of the shaft and the gear thereon, and a detachable semicylindric casing D^3 for the gear on the crank-shaft, this casing carrying a semicylindric casing D^4 for the adjacent end of the drive-shaft and the gear thereon, the line of separation of said casings being in alinement with the axes of the shafts, and devices for attaching the respective parts of the semicylindric casings together to completely house the end of the driving-shaft and the two gears, substantially as and for the purpose set forth.

6. In combination, a velocipede-frame and driving mechanism, the latter comprising a drive-shaft provided with a drive-gear, an intermediate drive-shaft carrying a gear meshing with said drive-gear and another gear meshing with a gear on the traction-wheel, a longitudinally-divided casing inclosing said drive-shaft and having one of its sections rigidly secured at its ends to the frame of the velocipede and the other section removable, means for attaching the two sections of said casing together, comprising a pair of journal-sleeves J and J^3 fitting within the casing encircling the shaft at different points in its length, each of said sleeves being provided with radial, threaded studs passing through holes in the respective parts of the casing and provided on their projecting ends with clamp-nuts, whereby the journal-sleeves are fixedly inclosed and the two parts of the casing secured rigidly together, inclosed bearing-cups adjustably supported on the shaft adjacent the journal-sleeves, and balls between the cups and the sleeves, for the purposes set forth.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two subscribing witnesses, this 10th day of April, A. D. 1899.

CHARLES A. BAYLOR.

Witnesses:
E. J. LONN,
CHAS. LONN.