No. 632,306. Patented Sept. 5, 1899.

E. S. BRYANT.

BICYCLE.

(Application filed Mar. 23, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

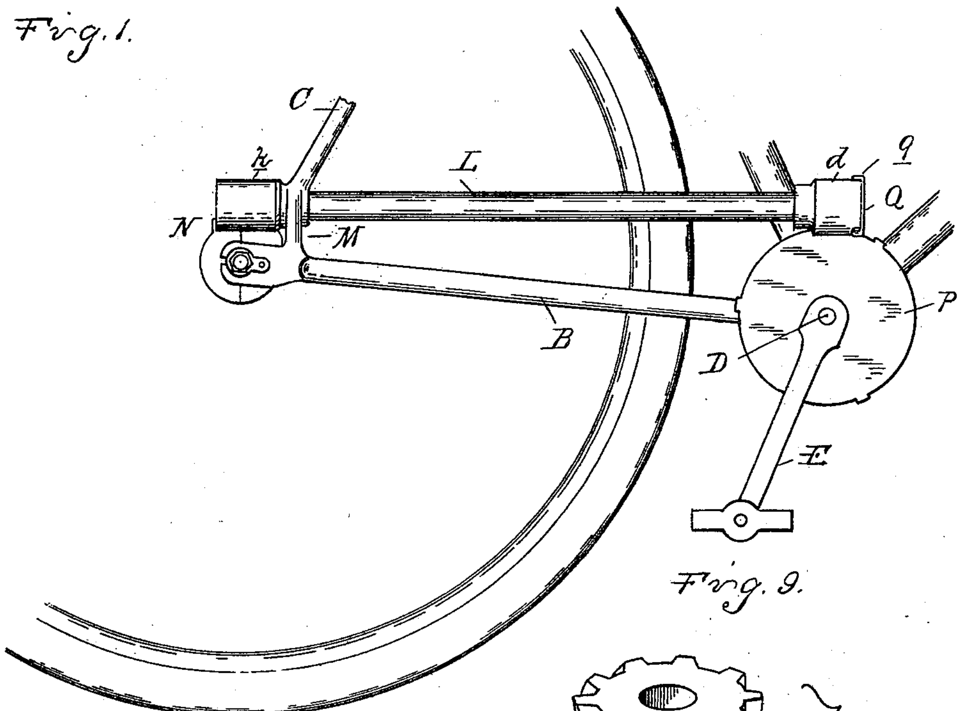


Fig. 9.

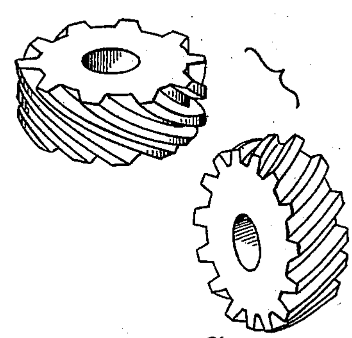
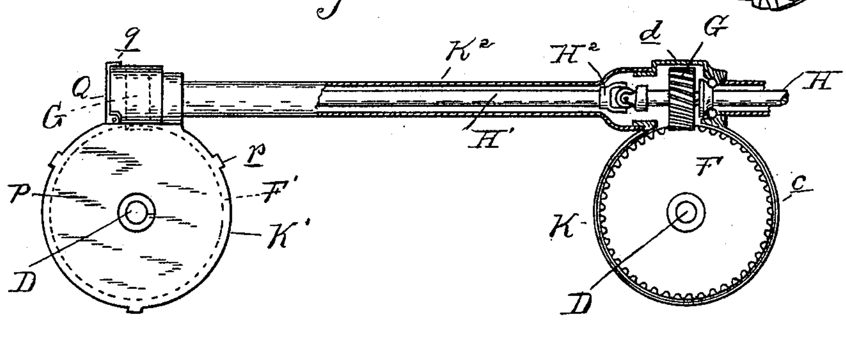


Fig. 10.



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(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

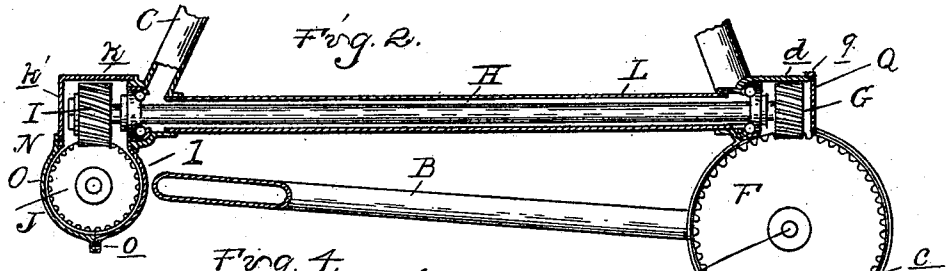


Fig. 3.

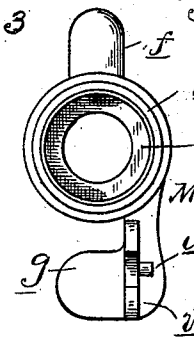


Fig. 4.

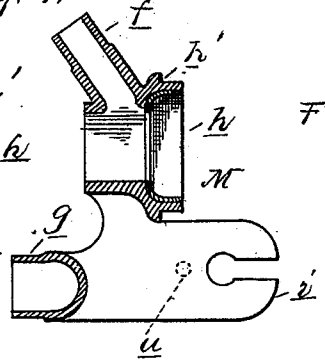


Fig. 11.

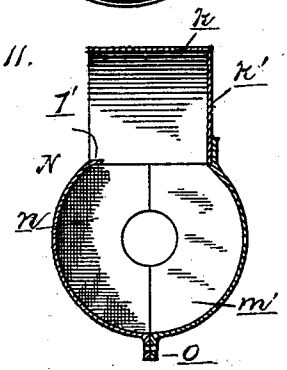


Fig. 5.

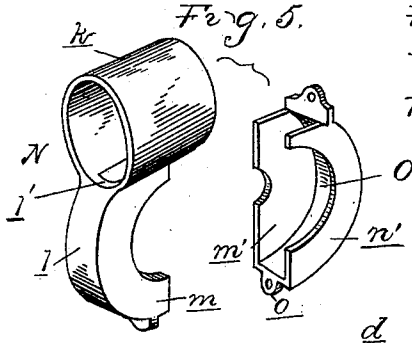


Fig. 8.

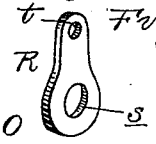


Fig. 7.

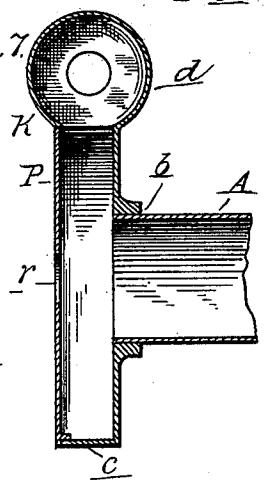
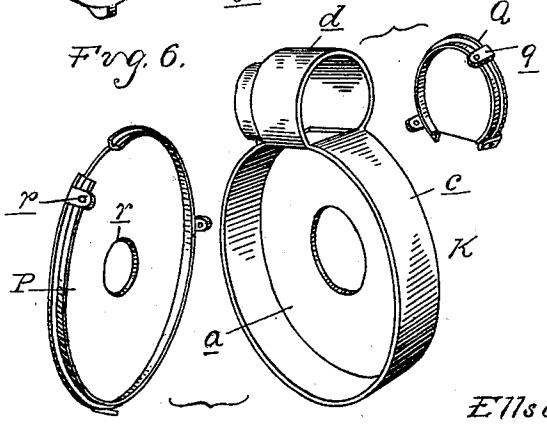


Fig. 6.



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UNITED STATES PATENT OFFICE.

ELLSWORTH S. BRYANT, OF DETROIT, MICHIGAN.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 632,306, dated September 5, 1899.

Application filed March 23, 1898. Serial No. 674,920. (No model.)

To all whom it may concern:

Be it known that I, ELLSWORTH S. BRYANT, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Bicycles, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to that class of bicycles commonly known as "chainless," and more particularly to the kind in which skew-gears are employed for transmitting motion from the crank-shaft to a longitudinal intermediate shaft and from the latter to the hub of the rear wheel.

The invention consists in the peculiar construction, arrangement, and combination of parts, and particularly in the means employed for housing the gears for supporting the bearings of the intermediate shaft for said gears, all without departing from standard lines in bicycle construction, the improvements being, in fact, adapted to be applied to bicycles already constructed and necessitating very little change therein, as will be more fully hereinafter described.

In the drawings, Figure 1 is an elevation of a portion of a bicycle, including the crank-hanger, the rear fork, and the connecting reach member, to which my improvements are applied. Fig. 2 is a longitudinal section therethrough. Figs. 3 and 4 are respectively an end elevation and a longitudinal section of the connecting member for the rear fork, reach-bar, and intermediate shaft-housing. Fig. 5 is a perspective view of the two members forming the rear gear-housing detached. Fig. 6 is a perspective view of the parts of the forward gear-housing detached. Fig. 7 is a cross-section through said housing. Fig. 8 is a perspective view of one of the connecting-links for securing the rear wheel in the forks. Fig. 9 is a perspective view of a pair of intermeshing skew-gear wheels detached. Fig. 10 is a longitudinal sectional elevation of the drive-gearing applied to a tandem bicycle. Fig. 11 is a longitudinal section through the rear housing.

A is the crank-hanger, B one of the reach-bars, and C the rear fork, of a bicycle-frame of ordinary construction, except as hereinafter specified.

D is the crank-shaft; E, the crank; F and G, intermeshing skew-gears connecting said crank-axle with the longitudinal intermediate shaft H, and I and J are intermeshing skew-gears connecting the rear end of said shaft and the hub of the rear wheel.

K is a housing for the forward gears F and G, which consists of a circular plate or disk *a*, provided with a central apertured hub or flange *b*, adapted to be secured to the crank-hanger in any suitable way, such as by brazing or a screw-threaded engagement. This disk has integrally formed therewith the outwardly-extending annular flange *c*, and intersecting with the upper side thereof is the cylindrical casing *d*, the axis of the latter being substantially at right angles to the axis of the crank-hanger. Between the lines of intersection the casing *d* and the flange *c* are cut away, forming an aperture of sufficient size to permit the gears F and G to intermesh, and at the rear end of the cylindrical casing *d* is formed a seat, in which a ball-race is secured, forming the forward bearing for the shaft H. L is a tubular housing for this shaft, which at its forward end is secured to the casing *d*.

M is a connecting member for uniting the reach-bar and rear fork of the frame and the tube L. This comprises the nipples *f* and *g* at opposite ends of the member, adapted to fit into the rear fork and reach-tubes, respectively, and between said nipples, the ring or annular portion *h*, and the rearwardly-extending and lateral offset portion *i*, the latter being preferably slotted to receive the axle of the rear wheel. The member M is connected in the frame by brazing or in any other suitable way and may be applied to any frame of standard type, thus adapting it to receive my improved gearing, the offset arm *i* giving ample clearance for the gears.

In assembling the parts thus far described the housing K and members M are first placed in position and the tube L then slipped through the ring *h* and engaged with the casing *d*, being brazed or otherwise secured to said casing and ring. In the ring *h* is formed

a seat adapted to receive a ball-race for the rear bearing of the shaft H.

N is the housing for the rear gears I and J, which comprises the cylindrical portion *k*, having the closed end *k'*, and the intersecting semicylindrical portion *l*, having its axis arranged at right angles to that of the cylinder *k* and provided with the flanges *m* and *n*. *l'* is an aperture formed by cutting away the casings *k* and *l* between the lines of intersection. O is a semicylindrical casing forming the counterpart of the portion *l* of the casing N and adapted to be detachably secured thereto, preferably by screws passing through the apertured lugs *o* and engaging with screw-threaded apertures in the casing N. The flanges *m* and *n*, together with the corresponding flanges *m'* and *n'* on the member O, form the sides of the housing for the gear J and are centrally apertured to fit, respectively, around the axle and hub of the rear wheel on opposite sides of said gear. The cylinder *k* of the housing N is adapted to fit around an annular seat *h'* on the ring *h*.

The housing K is provided with the detachable caps P and Q, the former for the side of the main portion of the housing and the latter for closing the end of the cylindrical portion *d*. These caps are formed to fit closely, so as to make a dust-proof casing, and are preferably provided with the apertured ears *p* and *q* for the securing-screws, the cap P being provided with a central aperture *r*, through which the crank-shaft passes.

R are links for securing the rear-wheel axle in the slotted bearings of the frame, which have the apertures *s* for receiving said shaft and the apertures *t*, adapted to engage with pins *u* on the slotted bearing-arm of the frame.

The gear-wheels F and G and I and J are what are commonly known as "skew-gears" and are adapted to mesh with each other when their axes are arranged either at right angles or at any lesser angle to each other. They are thus especially adapted for bicycle-gearing, both for the reason that they may be more conveniently arranged in relation to the standard type of frame and because they are less sensitive to any change of alinement than beveled gears. Another reason why they are especially suitable for bicycle-gearing is that the relative speed of intermeshing gears may be varied in gears of the same diameter by altering the angle or lateral pitch of the teeth. This is for the reason that the number of teeth which may be arranged around the periphery of a wheel of a given diameter decreases as the angle of said teeth to the axis of the wheel increases, or inversely the number of teeth increase as they approach parallelism to the axis of the wheel. Thus where a change of gear is desired it may be obtained by using gears of precisely the same size, but of different pitch, and where, as in the construction above described, the gears are housed the change may be made without any alteration in the housing.

My improvements are also especially adapted to be applied to tandems. In Fig. 10 of the drawings I have shown a construction of gearing for tandem bicycles in which F' and F are skew-gear wheels secured to the front and rear crank-shafts, respectively, and G' and G are their intermeshing skew-gear wheels. K is the housing for the gear-wheels F and G, and H is the shaft on which the gear-wheel G is mounted, which is arranged as in the construction previously described, but projects beyond the gear-wheel G. H' is another shaft forming an extension of the shaft H and connected thereto by a universal coupling H^2. This shaft is journaled at its forward end in the housing K', which is similar in construction to the housing K and incloses the gears F' and G', the latter being secured to the shaft H'. K^2 is a tubular housing for the shaft H'. This construction of gearing may be readily applied to the standard construction of tandem bicycle without any changes thereon except as before mentioned.

What I claim as my invention is—

1. In a bicycle-frame a connecting member for the reach and rear fork, comprising nipples at its upper and lower ends for connecting respectively with the fork and reach tubes, an intermediate annular bearing or ring and an offset rearwardly-extending wheel-securing member for the purpose described.

2. A housing for the crank-axle gear-wheel of a bicycle and its intermeshing gear-wheel, comprising intersecting cylindrical casings, having their axes arranged in planes, substantially at right angles to each other and having no common plane, the side of one casing having an apertured hub or flange adapted to be secured to the crank-hanger, and a detachable plate forming the opposite side, and the other casing having a ball-race formed at one end and a detachable cover forming the opposite end.

3. In a bicycle, the combination with the frame having a ring formed in the connecting member of the rear fork and reach-tubes, a longitudinal shaft having a bearing in said ring and intermeshing skew-gear wheels connecting said shaft with the rear-wheel hub, of a housing for said gear-wheels comprising a cylindrical section closed at one end adapted to fit at its opposite end on an annular seat on said ring, a semicylindrical casing intersecting with said cylindrical casing with its axis at right angles thereto and a detachable complementary section for the latter casing.

4. In a bicycle a frame having a ring interposed between the rear fork and reach member, said ring having on its rear side an annular shaft-bearing surface and a surrounding supporting-bearing for a gear-housing, a shaft passing through said ring having a coun-

ter-bearing and a gear thereon, and a gear-housing detachably secured to said supporting-bearing.

5. In a bicycle a frame having an offset rear-wheel-supporting member and a ring connected therewith interposed between the rear forks and reach member, said ring having on its rear side an annular shaft-bearing surface and a surrounding supporting-bearing, a shaft passing through said ring having a counter-bearing thereon, intermeshing gears connecting said shaft and rear wheel, and a housing for said gears detachably secured upon said supporting-bearing.

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

ELLSWORTH S. BRYANT.

Witnesses:

M. B. O'DOGHERTY,

OTTO F. BARTHEL.