(No Model.) 2 Sheets—Sheet 1.

W. A. LORENZ.

BICYCLE.

No. 572,208. Patented Dec. 1, 1896.

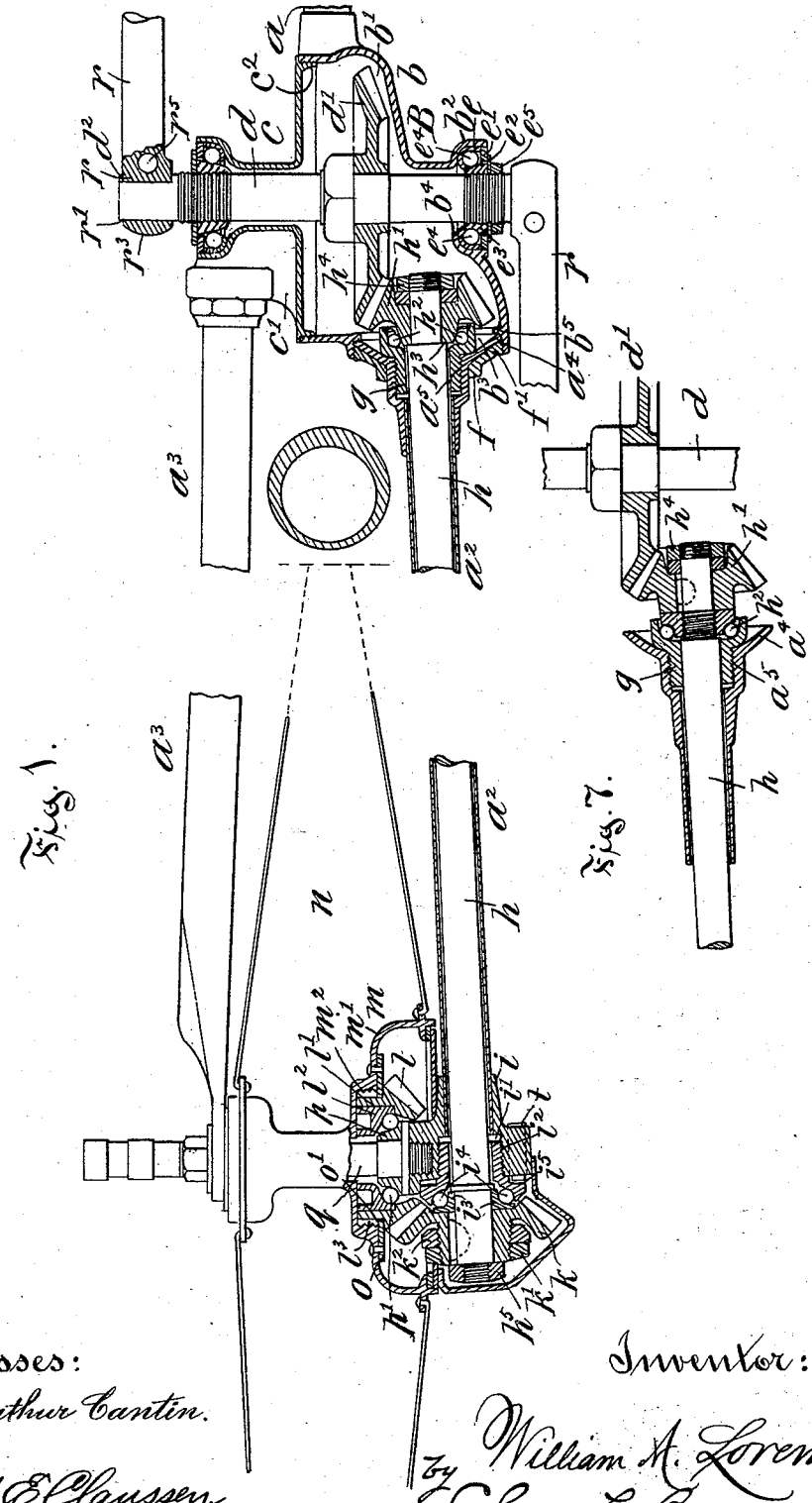

Fig. 1.

Fig. 7.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

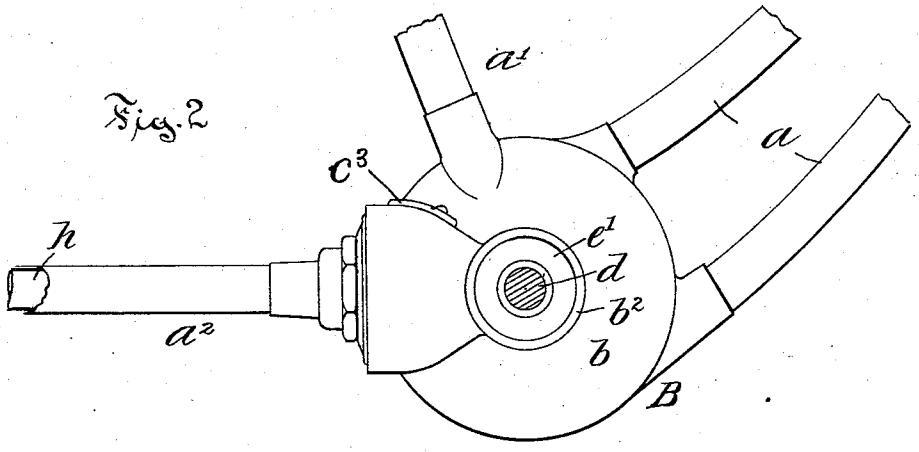


Fig. 3.

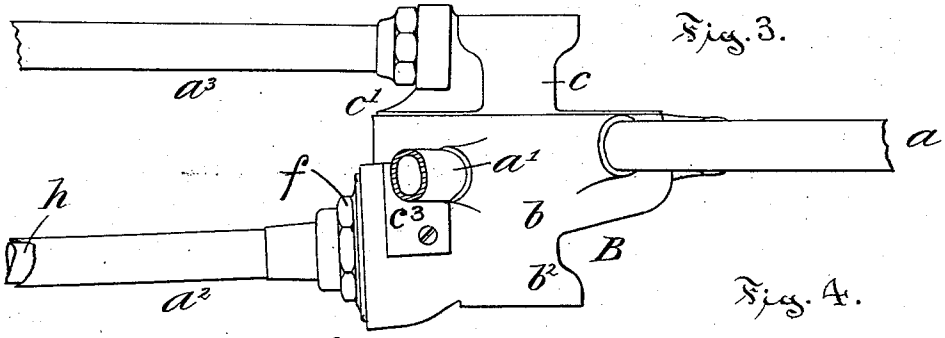


Fig. 4.

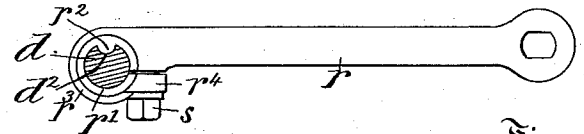


Fig. 6.

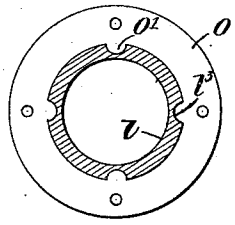
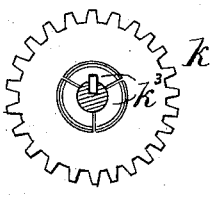


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM A. LORENZ, OF HARTFORD, CONNECTICUT, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE POPE MANUFACTURING COMPANY, OF SAME PLACE AND PORTLAND, MAINE.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 572,208, dated December 1, 1896.

Application filed April 25, 1894. Serial No. 508,954. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. LORENZ, of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Bicycles, of which the following is a full, clear, and exact description, whereby any one skilled in the art can make and use the same.

My invention relates to the class of vehicles in which the power is communicated from the driving or crank shaft to the driving mechanism by means of connecting shafts and gears, and more particularly to the class of bicycles known as "chainless safeties."

The object of my invention is to provide a vehicle of this class having a light and rigid frame, the different members of which shall be strongly and firmly united in such manner as to be quickly and easily taken apart or assembled; and a further object is to provide means for inclosing the running parts of the vehicle and for the adjustment of such parts relative to each other.

To this end my invention consists in the details of the several parts making up the vehicle as a whole, in the particular construction and arrangement of such parts, and in their combination, as hereinafter described, and pointed out in the claims.

Referring to the drawings, Figure 1 is a detail top or plan view, partly in horizontal section, of that part of a bicycle bearing the crank-shaft and rearward therefrom and on a line with the axis of the driving-wheel and crank-shaft. Fig. 2 is a detail side view of the crank-bracket and connected parts. Fig. 3 is a detail top or plan view of the same. Fig. 4 is a detail view of my improved form of crank. Fig. 5 is a detail end view of the bevel-gear on the rear end of the connecting-shaft. Fig. 6 is a detail view in cross-section of the hub of the driving-wheel gear, showing the plate-locking means. Fig. 7 is a detail view of the forward end of the connecting-shaft, showing the ball-race in section.

In the accompanying drawings, the letter *a* denotes two members of the frame with their lower ends secured to the crank-bracket B and shown as broken off a short distance therefrom. The upper ends of these parts of the frame are secured to the steering-head in any ordinary manner, (this part of the vehicle not being illustrated herein.) The letter *a'* denotes a brace also having its lower end secured to the crank-bracket and shown as broken off a short distance therefrom, the upper end of which brace is adapted to be secured to the frame of the vehicle adjacent to that part usually supporting the seat-post, the illustration of this part also being omitted.

The letters a^2 and a^3 denote the rear fork sides, their forward ends being preferably removably secured to the crank-bracket B and their rear ends to the frame in any suitable manner.

The crank-bracket B is composed of two sections, a socket-section *b* and a cover-section *c*. The socket-section *b* contains a gear-socket or recess *b'*, within which is located the bevel-gear *d'*, fast to the crank-shaft *d*, to the outer ends of which are secured the cranks *r*. A ball-case b^2 is located on the outer end of the socket-section *b*, within which is located the bearing for one end of the crank-shaft *d*. Within the ball-case b^2 is located a shell *e*, that bears at its inner end against a shoulder b^4 in the casing and is held in this position by means of the centrally-perforated disk *e'*, resting against the outer edges of the shell, and this disk may be held in place in the bearing-case b^2 by frictional contact with the walls thereof or by means of the retaining-cap e^2, that is held against rotation on and independently of the crank-shaft *d*, as by means of a lug on the former engaging a groove cut lengthwise in the latter. An adjustable cone e^3 is borne on a threaded portion of the crank-shaft, the balls e^4, forming the bearing, being supported between this cone e^3 and the shell *e*, the retaining-cap e^2 resting against the cone and being held in place by the lock-nut e^5, located on the screw-threaded portion of the shaft, this lock-nut holding the cap e^2 and consequently the cone e^3 in any desired position on the shaft.

A washer may be placed between the cap e^2 and the lock-nut e^5 if required to cause the cap to bear equally against the disk *e'* and the adjustable cone e^3.

A fork-socket b^3 is formed in the rear of

the socket-section b, this socket extending through the wall of the latter. The walls of this socket are screw-threaded and a flange-seat b^5 is formed therein. A flange a^4 is formed on the fork side a^2, against which a shoulder f' on the coupling-sleeve f abuts, the edges of the sleeve being screw-threaded to fit the thread in the fork-socket b^3 and serving as a means of holding the flange a^4 securely against its seat b^5.

Within the forward end of the fork side a^2 is formed a bearing-case socket a^5, threaded on its interior surface, and within this socket is secured a screw-threaded hub of the bearing-case g, between which and the hub of the bevel-pinion h' are supported the balls h^2, this bevel-pinion being secured to the reduced end of the connecting-shaft h, the hub of the pinion resting against a shoulder h^3 on the shaft and the nut h^4 holding the pinion in place. This arrangement of the case and pinion with regard to the shaft h affords a partial means for longitudinally adjusting the connecting-shaft h. The connecting-shaft h extends through the fork side a^2, that is secured to the angular bracket i, forming part of the frame. Within this angular bracket i is a socket i', the walls of which are screw-threaded to receive the screw-threaded hub of the bearing-case i^2, between which and the cone i^3 are located the balls i^4. This cone i^3 is supported on the reduced rear end of the connecting-shaft h, and against this bearing abuts the rear bevel-gear k. It is essential that the cone i^3 shall be hardened to withstand wear, and should the gear k be made of a material not capable of being hardened to the required degree, or it is not desired that the entire gear shall be hardened, the cone is made independent of the gear, but is secured to the shaft h to turn with said gear.

If desired, the cone may be formed on the hub of the gear, as described with regard to the bevel-pinion h', located on the forward end of the connecting-shaft h, or the cone last mentioned may be made separate, if desired.

The bevel-gear k is secured on the reduced end of the connecting-shaft h by means of the holding-nut h^5 and is secured against rotation preferably by means of a key. As an additional means of securing this gear to the shaft the hub of the former is beveled and slit lengthwise (see Fig. 5) and the clamping nut or nuts k' k^2 used to clamp the ears k^3 between the slits to the connecting-shaft.

The bevel-gear k is in mesh with the bevel-gear l, that is secured to the hub m of the driving-wheel n. This gear is located within the cup-shaped end m' of the hub and has a shouldered recess l', within which is located the bearing-case l^2. This bearing-case may be made in one piece for hardening purposes, as described, with reference to the bearing-case i^2, or, if desired, integral with the gear, this being useful when an adjustment at this end of the axle q is desired.

The outer surface of the hub of the bevel-gear l is screw-threaded and fits the screw-threaded socket m^2 within the cup-shaped end m' of the hub m. Locking-recesses l^3 are formed lengthwise of the hub of the gear l, into which project locking-lugs o' on the locking-plate o, that is located between a shoulder on the gear and the inner surface of the cup-shaped end m' of the hub m. This locking-plate is secured to the hub m, as by means of screws or rivets, after the hub of the gear has been turned to place within the socket m^2 in the hub m', this fastening means holding the gear l against rotation in the running of the vehicle and a consequent tightening or loosening of the bearing at this point, the gear being at all times, by loosening the rivets, capable of adjustment to or from the cone p, secured to the axle q, that in turn is secured to the frame in any suitable manner, the balls p' being located between the bearing-case l^2 and the cone p.

Any other means of securing the gear against rotation may be employed and come within the scope of my invention, or the adjustment of both bearings of the driving-wheel may be controlled from the opposite end of the hub thereof.

The cranks r have formed therein openings r', through which the ends of the crank-shaft extend, the lugs r^2 on each of the cranks engaging grooves d^2, formed in each end of the crank-shaft. The opening r' in each of the cranks is formed by a strap r^3, preferably formed integral with body of the crank, the lug being so located that in bending the strap to properly form the opening the lug will appear on the inside of the latter. The strap r^3 is bent around so that the end r^4 will lie along the body of the crank, and in this end is made a bolt-hole r^5, through which extends the bolt s, the end of the bolt being secured in the bolt-hole r^6 in the body of the crank. The joint between the end r^4 of the strap r^3 and the body of the crank is located, preferably, on the front side of the crank, and by "front" side I mean in that direction in which the crank is turned in driving the vehicle forward, and forward of a line through the axis of the crank-shaft and lengthwise of the crank. This construction of the parts causes the force exerted in driving the machine to always tend to close the joint between the strap and the body part of the crank.

A clamp-screw t is borne in the angular bracket, with the inner end of the former engaging sockets i^5, of which there may be any desired number, located in the bearing-case i^2. This forms a means of maintaining any desired adjustment of the bearing-case, or the same result may be obtained simply by allowing the end of the clamp-screw t to bear against the surface of the bearing-case i^2, or any other equivalent means of holding the case against rotation may be employed and yet come within the scope of my invention.

It is obvious that this same means may be

employed for maintaining the adjustment of the ball-case at the front end of the connecting-shaft.

The cover-section *c* of the crank-bracket is secured to the socket-section, as by means of interengaging screw-threaded parts, a projection *c'* being formed on the cover-section to which is preferably adjustably secured the fork side a^3. This cover-section *c* is provided with ball-cases, &c., for securing a proper bearing of the crank-shaft, as described with regard to the socket-section *b*. The fork side a^3 may be secured to this cover-section, or, if preferred, a projection may be made extending from the socket-section *b*, to which the fork side a^3 may be secured.

The gears and running parts at the rear end of the machine are provided with suitable covers and guards for preventing the entrance of dust to the running parts of the vehicle. The socket-section *b* is provided with a movable cap-piece c^3, to give access to the interior of the case.

I claim as my invention—

1. In combination with the frame of a bicycle or like vehicle, a crank-bracket including a hollow and sectional case composed of a socket-section containing gear-sockets and a crank-bearing, and a cover-section having a crank-bearing centrally therethrough and with its edges provided with a screw-thread fitting the screw-threaded interior surface of the socket-section, and projections or sockets for the attachment of the several members of the frame, all substantially as described.

2. In combination with the frame of a bicycle or like vehicle, a crank-bracket having integral projections for the attachment of the tubular members of the frame and composed of a socket-section and a cap-section entirely inclosing the crank-shaft and running parts connected therewith and adjacent thereto, the socket-section provided with gear-sockets and with bearings for one end of the crank-shaft, and a cap-section provided centrally thereof with a bearing for the opposite end of the crank-shaft and secured to the socket-section by means of interengaging screw-threaded parts, the crank-shaft located in said bearings, a driving-wheel, and means for imparting movement from the crank-shaft to the driving-wheel, all substantially as described.

3. In combination in a bicycle or like vehicle, a crank-bracket inclosing the crank-shaft and moving mechanism connected therewith, the crank-shaft, the connecting-shaft extending within the crank-bracket and in engagement with the crank-shaft, a bearing-case surrounding the connecting-shaft and adjustably secured in the fork side, a threaded socket in the frame, a flange on the fork side located in the socket, a threaded sleeve fitting the socket in the frame and engaging the flange on the fork side whereby the entrance of dust is prevented, and the driving-wheel in engagement with the connecting-shaft, all substantially as described.

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