(No Model.) 2 Sheets—Sheet 1.

W. J. PINE.

BICYCLE.

No. 589,750. Patented Sept. 7, 1897.

Fig. 1.

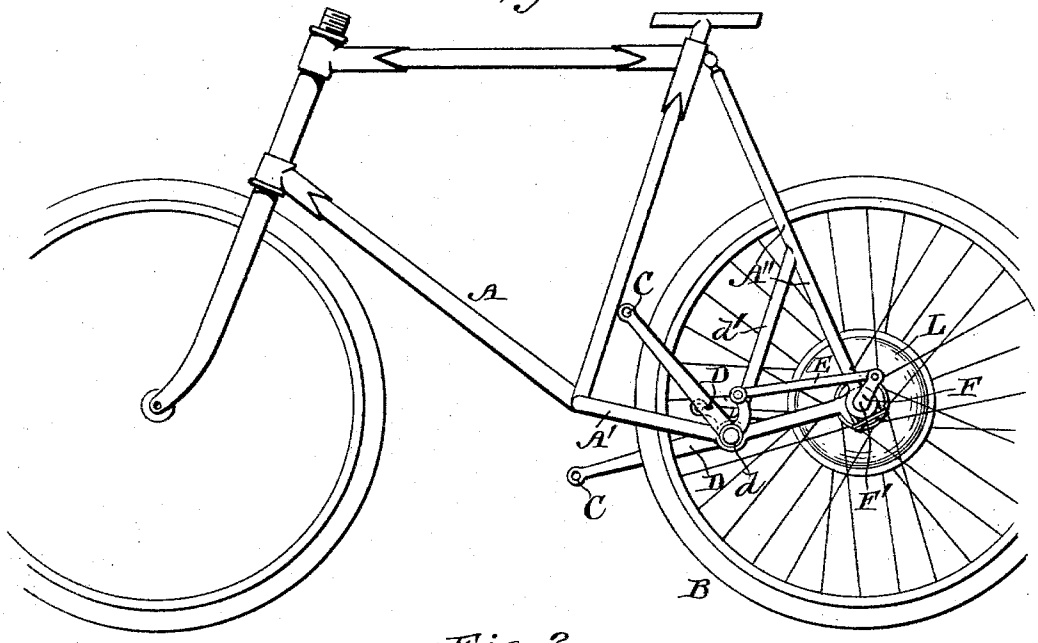
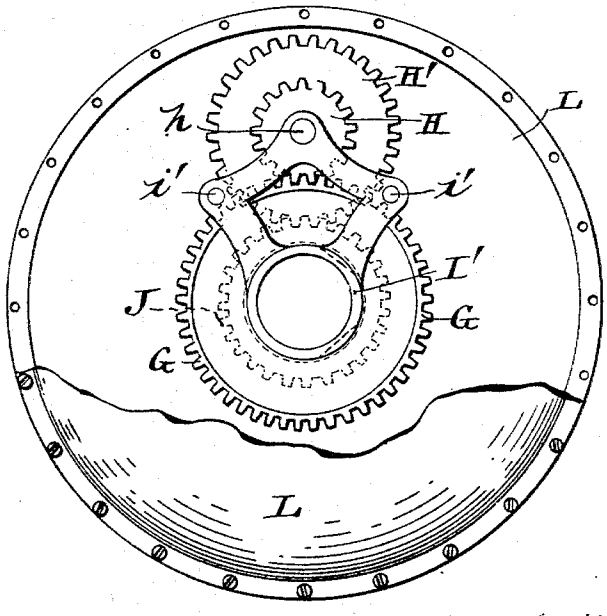


Fig. 2.



WITNESSES

Geo. Everance.

Roger N. Tennick

INVENTOR

Walter J. Pine

by his Attys

Mason Fenwick & Lawrence

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

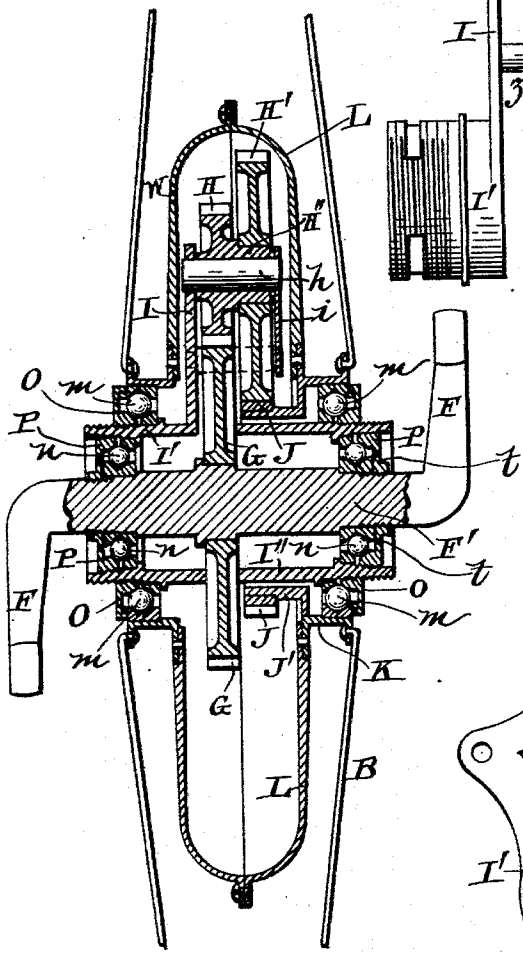


Fig. 7.

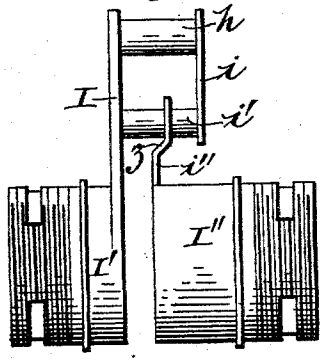


Fig. 6.

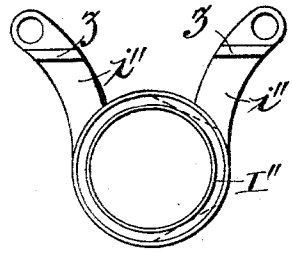


Fig. 4.

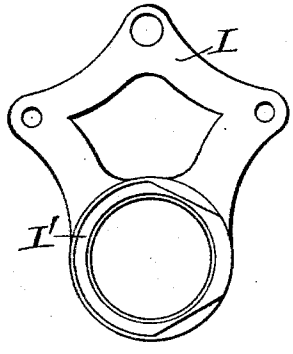
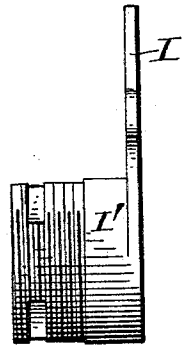


Fig. 5.



WITNESSES

Severance.

Roger A. Stenwick

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UNITED STATES PATENT OFFICE.

WILBER J. PINE, OF OSHKOSH, WISCONSIN, ASSIGNOR OF ONE-HALF TO E. B. HAYES, OF SAME PLACE, S. V. R. HAYES, OF MILWAUKEE, AND ARTHUR F. PINE, OF OMRO, WISCONSIN.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 589,750, dated September 7, 1897.

Application filed April 26, 1897. Serial No. 633,929. (No model.)

To all whom it may concern:

Be it known that I, WILBER J. PINE, a citizen of the United States, residing at Oshkosh, in the county of Winnebago and State of Wisconsin, have invented certain new and useful Improvements in Bicycles; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in bicycles; and it consists in certain novel constructions, combinations, and arrangements of parts, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side view of the bicycle. Fig. 2 is a side view of the gear-wheels, a portion being cut away; and Fig. 3 is a vertical section through the center of the driving-wheel. Fig. 4 is an end view, and Fig. 5 a side view, of the sleeve and arm which support the intermediate gears. Fig. 6 is an end view, and Fig. 7 is a side view, of the supporting-sleeve.

Similar letters refer to similar parts in each view.

A represents the frame, A′ the rear fork, and A″ the back-fork stays.

B is the driving-wheel, and C C the pedals. The pedals operate the bell-crank levers D D upon each side, which are pivoted to the frame at *d*, an additional brace *d′* being added to the frame extending upwardly and connecting with the rear fork A′. The opposite end of the bell-crank lever D is connected with the crank F on each side by means of the link E. The operation of the pedals on each side rotates the crank F, which is integral with or rigidly attached to the axle F′, Fig. 3. The straight-faced gear-wheel G is rigidly attached to the axle F′ and revolves therewith, and in its revolution engages and revolves the intermediate gear H, which revolves the inner gear H′, which is rigidly attached to the hub H″ of the wheel H and revolves therewith. The intermediate gear H revolves upon the pivot *h*, which is pivoted to the arm I and supported by the opposite yoke *i*, and in its revolution carries with it the gear H′, which is rigidly attached to its hub H″. The gear H′ engages and revolves the gear J, which is rigidly attached to the hub of the wheel J′. The arm I is integral with the inwardly-extending sleeve I′, which is rigidly connected with the frame. The opposite end of the pivot *h* is upheld by the connecting yoke or plate *i*, which is supported by the pins *i′ i′*. These pins also connect with the arm I and also support the opposite bifurcated plate *i″*, which is integral with the opposite inwardly-extending sleeve I″, rigidly attached to the frame of the wheel. Each arm of the plate *i″* is offset at *z* to avoid contact with the gear-wheels G and H′ in their revolution. The plate *i″* also slides laterally upon the pins *i′ i′*, so as not to antagonize the adjustment of the bearings, hereinafter more particularly described.

It will be observed that the arm I and the opposite supporting-plate *i″* are rigidly connected with the frame and do not revolve either with the wheel or with the axle and are for the purpose of supporting the intermediate gears. The intermediate gears, as described, serve to transmit the power from the driving-wheel G to the smaller gear J, which is rigidly attached to the hub of the rear wheel of the bicycle.

The hub of the wheel K supports the gear-case L, which may be integral therewith or rigidly attached thereto. The gear-case L surrounds the gears hereinbefore described and is constructed so as to be practically dust-proof. In the revolution of the wheel the hub K travels upon the ball-bearings *m m m*, &c., against the sleeves I′ and I″, which are rigidly attached to the frame, as heretofore described.

In lieu of cups I provide V-shaped depressions for the balls to travel in, thereby giving a four-point bearing of each ball against the depression on both sides. In order to provide a tight bearing, a lateral adjustment of the internal or stationary depression is necessary, and I provide a segmental construction for that purpose, so that in the adjustment of the bearings the supporting-arm I and the gear-case are relieved from any lateral pressure, thus enabling a light case to be used. The inner bearings *n n n n* are similarly constructed for the purpose of relieving the sleeve I′ and the arm I from lateral pressure. The bearings *m m m m* are

adjusted by means of the cones O O, and the bearings *n n n n* are adjusted by means of the cones P P. If necessary, packing can be inserted at *t t t t* to effectually prevent the escape of oil or the entrance of dust.

By means of my invention the whole interior of the casing L and all of the bearings and gears are completely oil and dust proof. Oil can be inserted into the casing through the opening W.

It will be observed that in the adjustment of the cones the inner cone of the outer bearing and the outer cone of the inner bearing are segmental and adjustable and do not antagonize each other in their adjustment.

This invention is an improvement on my application for Letters Patent filed January 2, 1897, and serially numbered 617,809; and the essential feature of my improvement is the elimination of the internal gear and the providing of an improved system of straight-faced gearing to communicate the crank motion to the driving-wheel of the bicycle. By reference to the drawings it will be observed that the revolution of the pedal-actuated crank F revolves the gear-wheel G, which is provided with a straight-faced gear along its periphery and is adapted to mesh into the corresponding gear in the wheel H, which revolves upon the pivot *h* and is provided with a laterally-extending hub H″, upon which the intermediate gear H′ is rigidly attached and revolves therewith. The gear H′ meshes into and revolves the wheel J, which is rigidly attached to and revolves the rear wheel of the bicycle. In this manner I have provided a simple, convenient, and cheap means of transmitting power from the pedal-crank F to the gear J of the driving-wheel. All of this is accomplished by a series of straight-faced gears reducing the power and increasing the speed.

I do not wish to confine my invention to the use of the bell-crank-lever connections shown in the drawings, as ordinary crank movement in connection with the pedals may be used by simply offsetting the arm of the crank sufficiently to permit the passage of the link within the line of movement, thus enabling the power to be transmitted by a single connection of the pedal-arm to the rear crank.

Having thus described my invention, what I claim to have invented, and desire to secure by Letters Patent, is—

1. In a bicycle, the combination with a suitable frame, of an axle carrying a master-gear, a smaller gear-wheel rigidly attached to the hub, sleeves secured to the frame of the bicycle on each side, interior of the hub, one of said sleeves having a projecting arm upon which intermediate gear-wheels are pivotally mounted so as to communicate motion from said master gear-wheel to the hub-gear, the opposite sleeve carrying a fork to engage and slide on the projecting arm and uphold the intermediate gears, substantially as shown.

2. In a bicycle, the combination with a suitable frame, of an axle carrying a master-gear, a smaller gear rigidly attached to the hub of the bicycle driving-wheel, sleeves secured to the frame of the bicycle upon each side, extending into the hub, one of said sleeves having a projecting arm with intermediate gear-wheels pivotally mounted thereon and so arranged as to communicate motion from the master-gear to the hub-gear, pins carried by said arm, and a bifurcated supporting-plate integral with the opposite sleeve, the legs of which support said pins, and a yoke on the pins to form a bearing for the intermediate-gear shaft, substantially as described.

3. In a bicycle, the combination with a suitable frame, of an axle carrying a straight-faced master-gear, a smaller gear-wheel rigidly attached to the hub, and sleeves interior of the hub and secured to the frame of the bicycle on each side, one of said sleeves having a projecting arm upon which intermediate gear-wheels are pivotally mounted so as to communicate motion from said master-gear to the hub-gear, a bifurcated plate integral with the opposite sleeve, the legs of which support pins attached to the opposite-sleeve arm, said bifurcated plate being movable laterally upon said pins, and a yoke mounted upon said pins to support the bearing for the intermediate-gear shaft, substantially as shown.

4. In a bicycle, the combination with a suitable frame, of an axle carrying a gear-wheel, a hub also provided with a gear-wheel, independent sleeves mounted in the said frame and extending within the hub, means for supporting the inner ends of said sleeves, the construction being such that the said sleeves are free to slide with relation to each other, and intermediate gears mounted on bearings carried by the sleeves for communicating movement from the said axle-gear to the hub-gear, substantially as described.

5. In a bicycle, the combination with a suitable frame, of an axle carrying a gear-wheel, a hub also provided with a gear-wheel, independent sleeves mounted in the said frame, and extending within the hub, means for supporting the inner ends of said sleeves so that they are free to slide with relation to each other, intermediate gears mounted on bearings carried by the sleeves for connecting the axle-gear and the hub-gear, and bearings interposed between the hub and the said sleeves and between the sleeves and the axle, the said bearings being so constructed with relation to the axle that all tendency of the sleeves to move laterally thereon is prevented, substantially as described.

6. In a bicycle, the combination with a suitable frame, of an axle carrying a gear-wheel, independent hubs upon each side of the wheel, one of said hubs being provided with a gear-wheel, independent sleeves mounted in the said frame and extending within the hub, means for supporting the inner ends of the

said sleeves so that they are free to slide with relation to each other, intermediate gears mounted on bearings carried by the sleeves for connecting the axle-gear and the hub-gear, a casing interposed between and mounted upon the independent hubs for inclosing the gearing, and bearings interposed between the hubs and the said sleeves and between the sleeves and the axle, the said bearings being so constructed with relation to the axle that all tendency of the sleeves to move laterally thereon is prevented and the casing is also free from all lateral strains, substantially as described.

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

WILBER J. PINE.

Witnesses:
F. J. McKENNEY,
GEORGE SIMPSON.