No. 737,017. PATENTED AUG. 25, 1903.

A. F. PRICE.

BICYCLE.

APPLICATION FILED DEC. 7, 1896.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

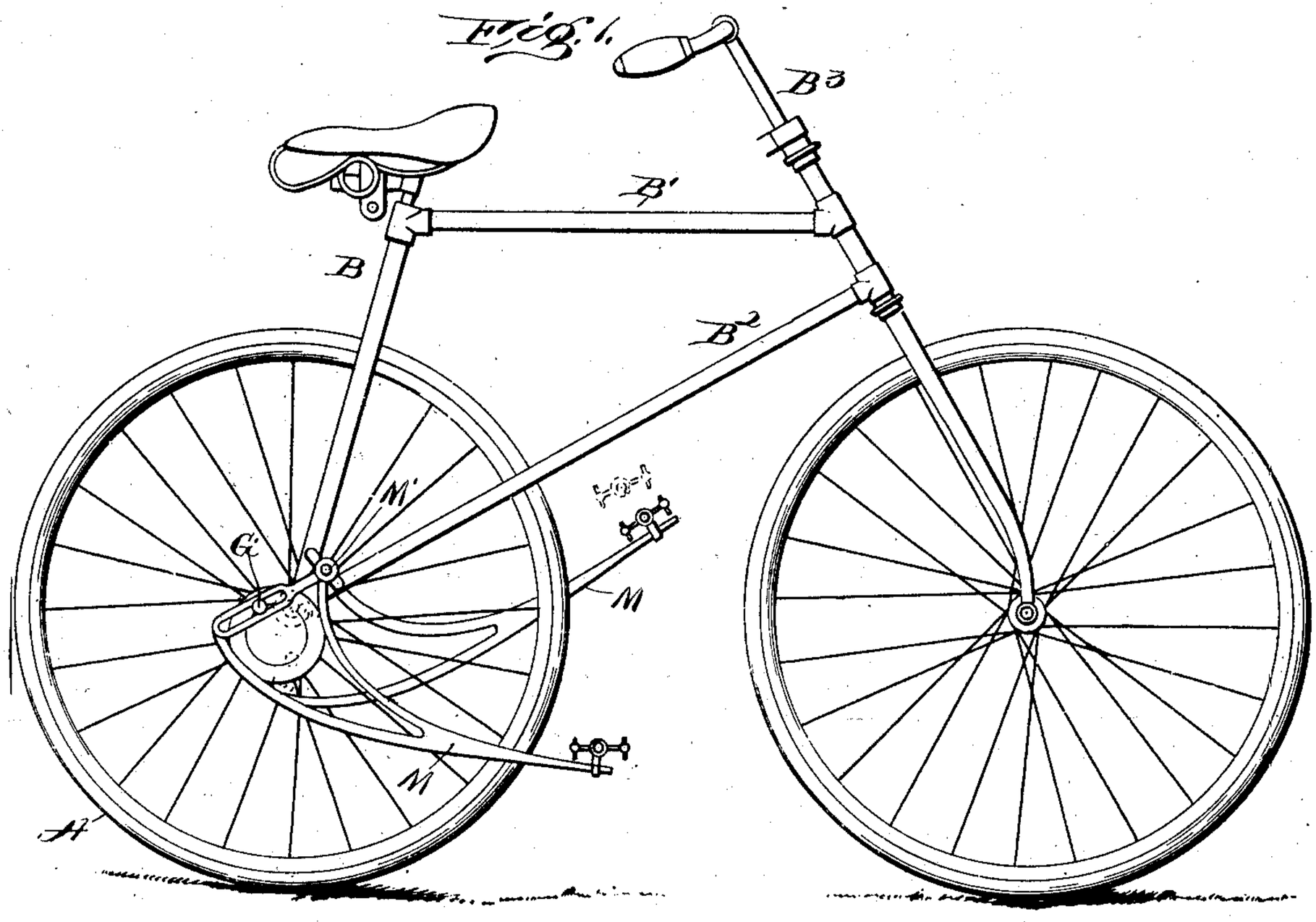


Fig. 5.

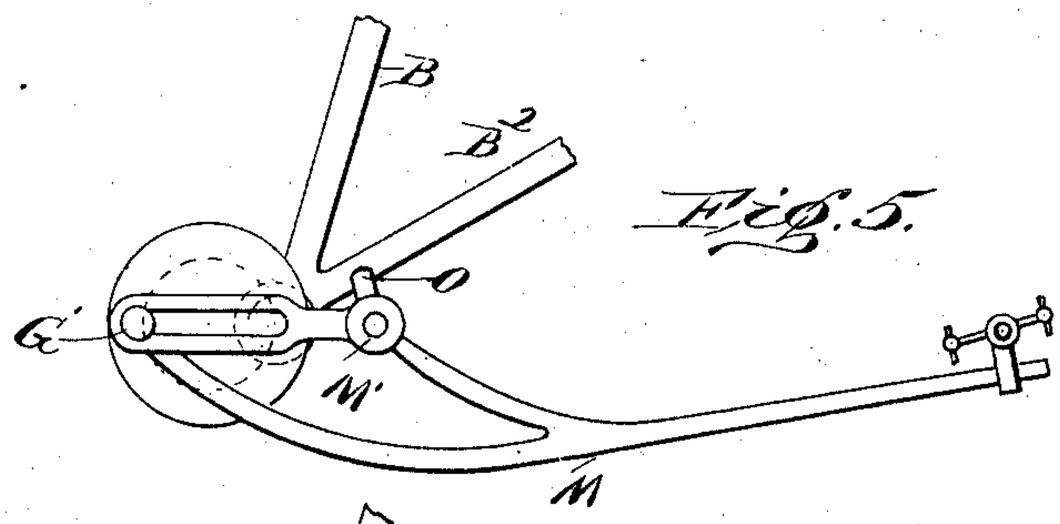
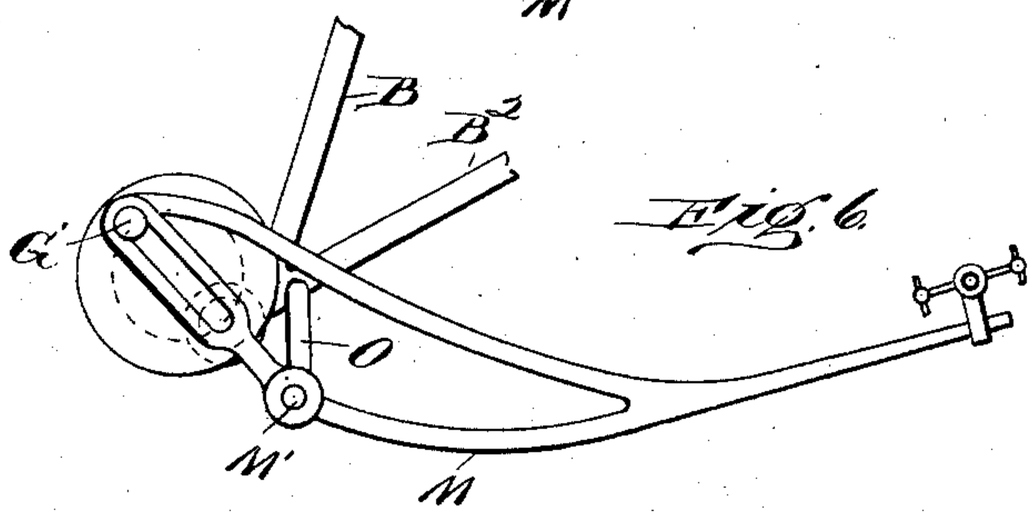


Fig. 6.



Witnesses:
J. M. Fowler Jr.
Thos. Durant

Inventor:
Abel F. Price,
by Church & Church
his Attys.

No. 737,017. PATENTED AUG. 25, 1903.

A. F. PRICE.

BICYCLE.

APPLICATION FILED DEC. 7, 1896.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

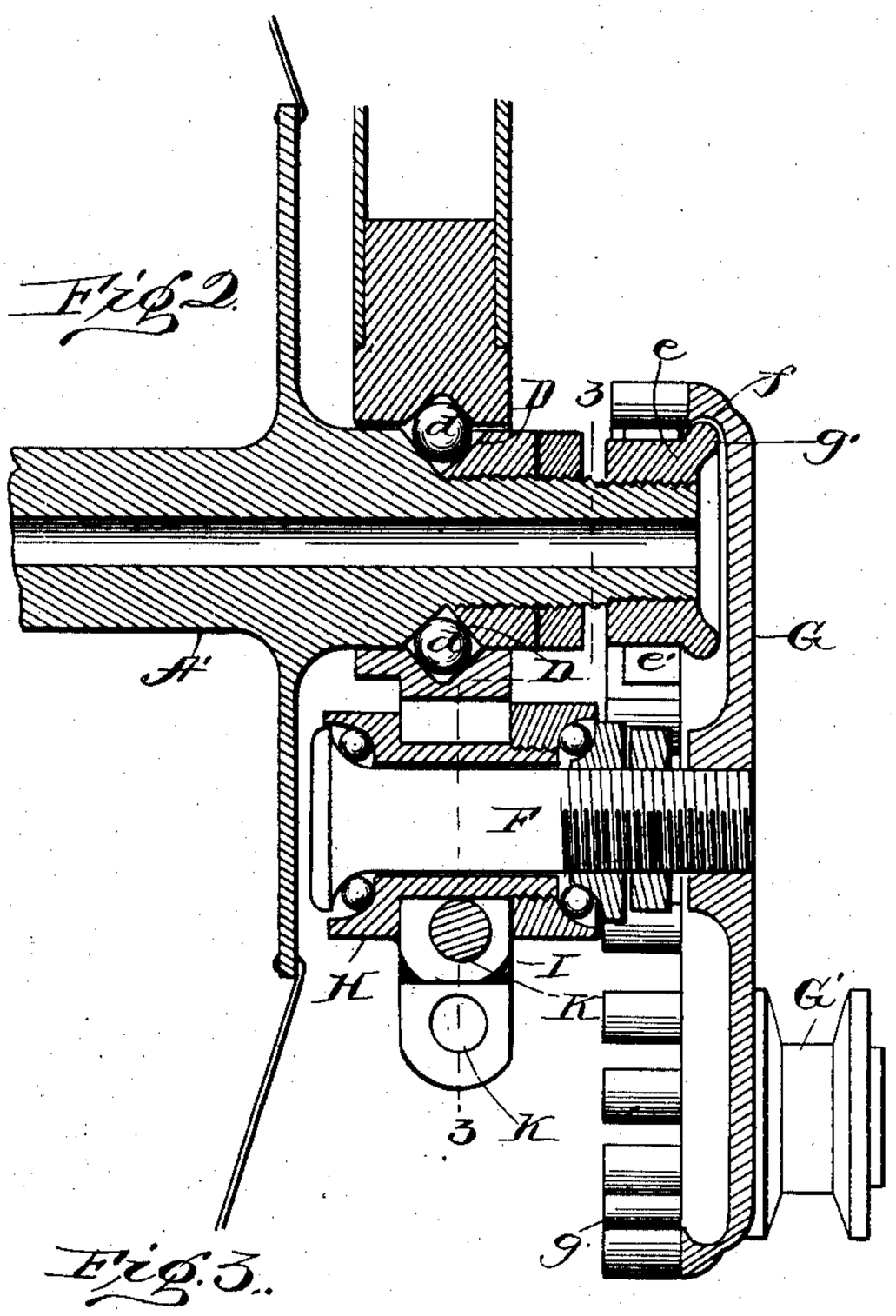


Fig. 3.

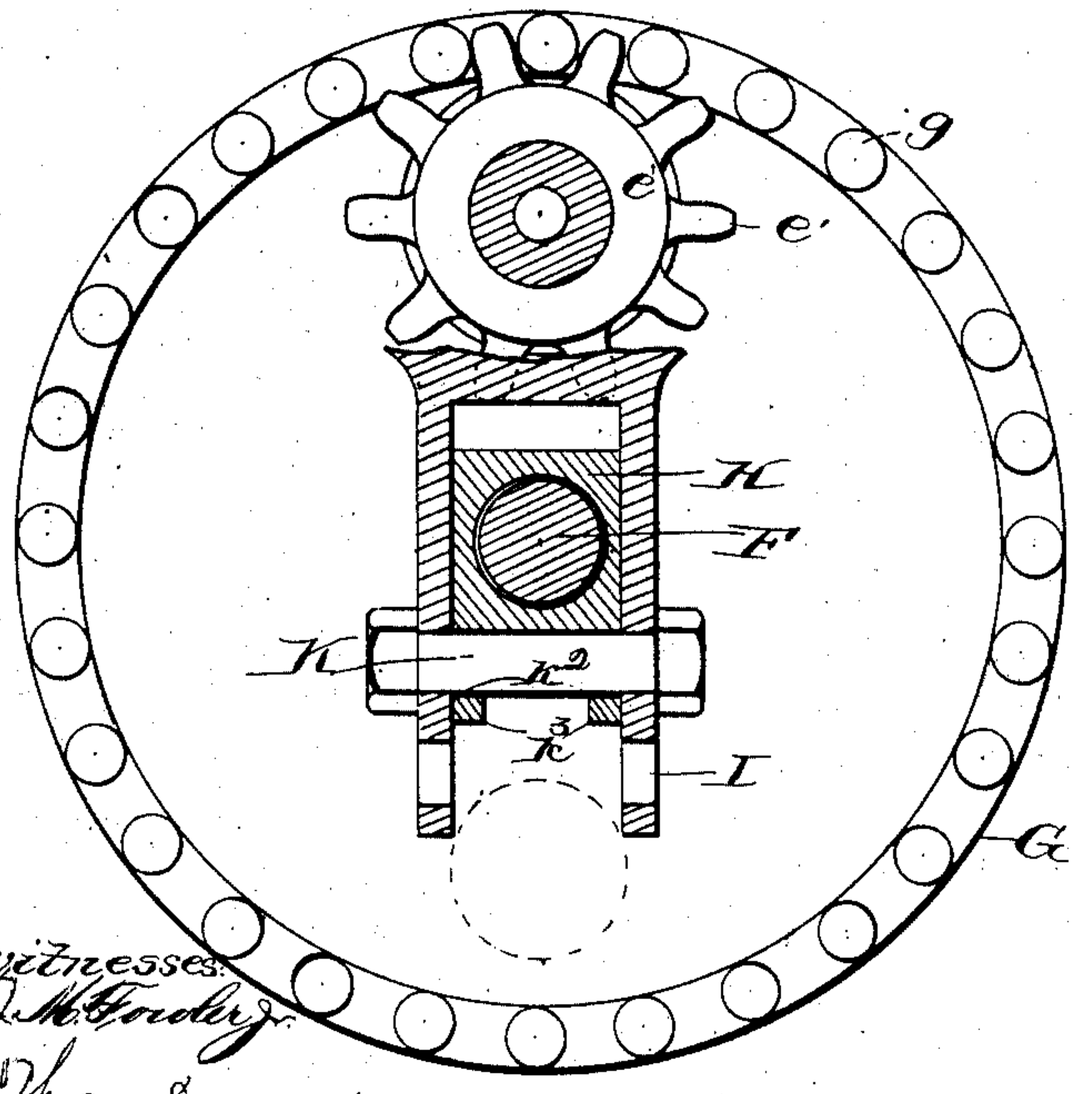
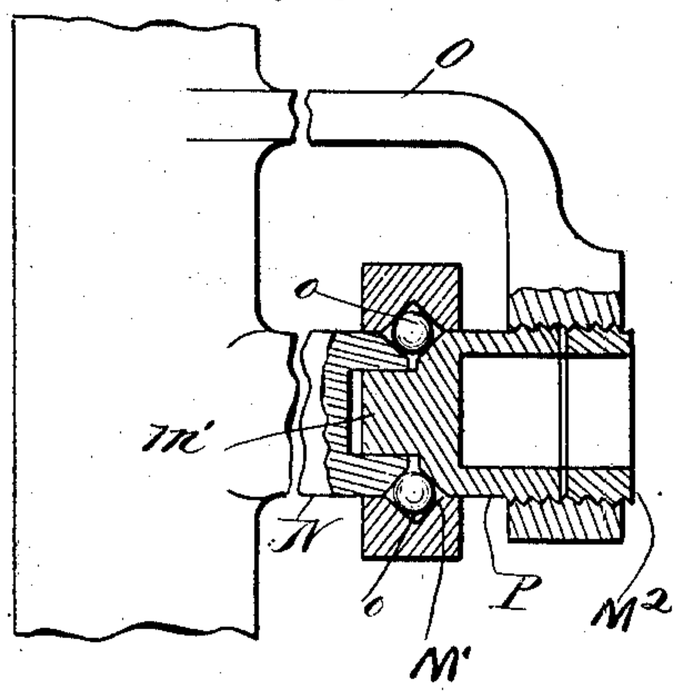


Fig. 4.



Witnesses:
J. H. Fonda, Jr.
Thos. Durant

Inventor:
Abel F. Price
by Church & Church
Att'ys.

No. 737,017. Patented August 25, 1903.

UNITED STATES PATENT OFFICE.

ABEL F. PRICE, OF THE UNITED STATES NAVY.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 737,017, dated August 25, 1903.

Application filed December 7, 1896. Serial No. 614,805. (No model.)

To all whom it may concern:

Be it known that I, ABEL F. PRICE, a surgeon in the United States Navy, stationed at United States Navy Yard, New York city, New York, have invented certain new and useful Improvements in Bicycles; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention relates to improvements in bicycles, and particularly to the driving mechanism; and the invention consists in certain novel details of construction and combinations and arrangements of parts, all as will be now described, and pointed out particularly in the appended claims.

Referring to the accompanying drawings, Figure 1 is a side elevation of a bicycle embodying my present improvements. Fig. 2 is a vertical section taken transversely through the gearing at one side of the hub of the driver. Fig. 3 is a section on the line 3 3, Fig. 2, with a portion of the frame broken away. Fig. 4 is a detail sectional elevation showing the hanger and bearing for one of the levers. Figs. 5 and 6 are detail elevations of modifications of the foot-lever.

Like letters of reference in the several figures indicate the same parts.

The wheel A and framing of the bicycle may be of any ordinary type, although I prefer to employ a triangular frame—that is to say, one having a substantially vertical part B extending up from the drive-wheel and horizontal and diagonal braces B′ B^2 extending from opposite ends of the vertical portion to the steering-head B^3. The latter is preferably set at such an angle to the center of the steering-wheel and the forks are so curved as to give the wheel a tendency to stand in the plane of movement of the machine, or, in other words, the center of rotation of the steering-wheel is in rear of the axis of the steering-head, all as shown clearly in Fig. 1.

From Figs. 2 and 3 it will be seen that frame B is provided with a bearing or forging, one on each side, and in these forgings the cups or raceways D for the balls *d*, supporting the axle A′ of the drive-wheel, are formed. The axle extends through the ball-bearing and at each end is provided with a pinion E, preferably formed with a relatively smooth annular head or enlargement *e* and a series of teeth *e*′. (Shown clearly in Fig. 3.) A relatively large wheel or disk G is journaled in the frame in proximity to the bearing for the axle in a manner to be presently described. This disk has an annular raceway or groove *f*, in which the head *e* of the pinion travels, and along its edge I form a series of roller antifriction-teeth *g*, which mesh with the teeth of the pinion. When the wheel G is turned, obviously it will rotate the drive-wheel axle and drive-wheel, and in order to make provision for allowing of the use of a larger or smaller wheel, and thereby vary the speed of rotation of the ground-wheel, I mount the axle F, carrying the wheel, in ball-bearings in a box H. The box H is in turn held in an open bearing on the frame formed by arms I, projecting from the box or bearing in which the drive-wheel turns. It is preferably held against upward movement by a cross-bolt K, passing through suitable openings *k* in the arms I and through openings k^2 in arms k^3 on the box. The openings *k* may be located in proper position to hold gears of certain definite size, and thereby permit of the ready substitution of gears at any time. When the bolt is removed, the wheel may be raised sufficiently to disengage the head of the pinion from the pinion-teeth on the wheel, as will be readily understood.

The wheels G may be rotated by any suitable power mechanism; but I prefer to employ foot-levers M, one on each side of the machine and pivoted at the rear ends to the frame just above and forward of the drive-wheel axle. To support the levers, the frame is provided with a projection N, having a recessed end and a cone bearing on the extremity. Above the projection or stud N is a second or brace projection or projections O, extending out over the projection N and having a threaded aperture in line with the latter. Passing through this threaded aperture is the adjustable cone P, forming with the projection N an adjustable raceway for the balls *o* of the bearing M′ on the foot-lever. The adjustable cone is provided with a projection *m*′, fitting in the recess in the end of the projection N to steady the cone, and it is held

rigidly in its adjusted position by an annular jam-nut M^2, screwing against the adjustable cone. Both the jam-nut and adjustable cone are preferably cut away centrally for the application of an internal wrench, as shown clearly in Fig. 4. In supporting these foot-levers in their bearings it has been one of my principal objects to secure what might be termed a "balanced" lever—that is to say, a lever which if left free would exert an equal weight on each side of its pivotal support when at an intermediate point half-way between the extremes of its motion. In the preferred construction (shown in Fig. 1) the levers are pivoted at a point above and slightly forward of the bearings for the drive-wheel, and if left free would hang pendulously, with their forward ends or pedals at a point half-way between the extremes of its movements, and for engagement with the foot-levers I preferably provide crank projections G′, having antifriction-rollers thereon, on the wheel G and form slot-bearings in the rear arms of the foot-levers, in which the antifriction-rollers play, as will be readily understood from an inspection of Figs. 1, 2, 5, and 6. The particular location for the pivot for the foot-levers is not essential, however, as they may be pivoted directly forward of the drive-wheel axle, as shown in Fig. 5, or forward and below the same, as shown in Fig. 6; but in order to secure the best results the pivotal center of the foot-levers, the center of the drive-wheel axle, and the center of the gear-wheel should always be in alinement. Thus the bearing on the foot-lever works across the center of the axle, and by pivoting the foot-levers at a point relatively close to the gearing the advantages of an increased leverage and a long effective stroke are secured. With such an arrangement it will be seen that on the downward movement the pedal exerts a rotating influence on the crank projection throughout a greater extent of its movement than a half-rotation, and when one pedal has descended to its lowermost position, as shown in Fig. 1, the other pedal has already begun its descent, as illustrated by the full lines, thereby eliminating the dead-center and enabling the rider to apply effective power at practically every point in the rotation of the crank. The dotted pedal in this figure indicates the upper extreme movement of the lever.

While I prefer to employ the annular groove *f* in the large gear-wheel and the bead *e* on the pinion, it is obvious that inasmuch as the large gear-wheel is held rigidly in place these features may be omitted.

The invention may be applied to other vehicles adapted to be propelled by foot-power, and hence in using the term "bicycle" it will be understood that it is simply for convenience in designating the class of foot-propelled vehicles.

Having thus described my invention, what I claim as new is—

1. In a bicycle, the combination with the drive-wheel its shaft having a pinion thereon, of the frame, the bearing in said frame in which the shaft is journaled, the arms on the frame forming an open bearing, the relatively large driving-gear meshing with the pinion, the box supporting said gear held in said open bearing and having enlargements on opposite ends to prevent tilting and the transverse bolt passing through the arms of the bearing and through the box whereby the gear is held in its adjusted position; substantially as described.

2. In a bicycle, the combination with the drive-wheel and its shaft having the pinion thereon, of the frame the bearing in said frame in which the shaft is journaled, the arms on the frame projecting below the shaft-bearing, forming an open bearing and having a series of transverse bolt-openings therein, the relatively large driving-gear meshing with the pinion, the journal-box carrying the said gear mounted in said open bearing and having enlargements to prevent tilting and the transverse bolt for holding the gear in its adjusted position passing through one of said transverse openings and through said box; substantially as described.

3. In a bicycle, the combination with the drive-wheel, the frame and the foot-lever rotating the drive-wheel, of the bracket or projection on the frame having its end recessed and carrying the fixed cone, the brace-bracket on the frame having the aperture in line with the axis of the fixed cone, the adjustable cone passing through said aperture and having the projection entering the recess in the first-mentioned bracket, the lock for holding the adjustable cone and the bearing on the foot-lever held by the said cones, substantially as described.

ABEL F. PRICE.

Witnesses:
JOHN D. MCCAFFREY,
JAMES J. GILL.