

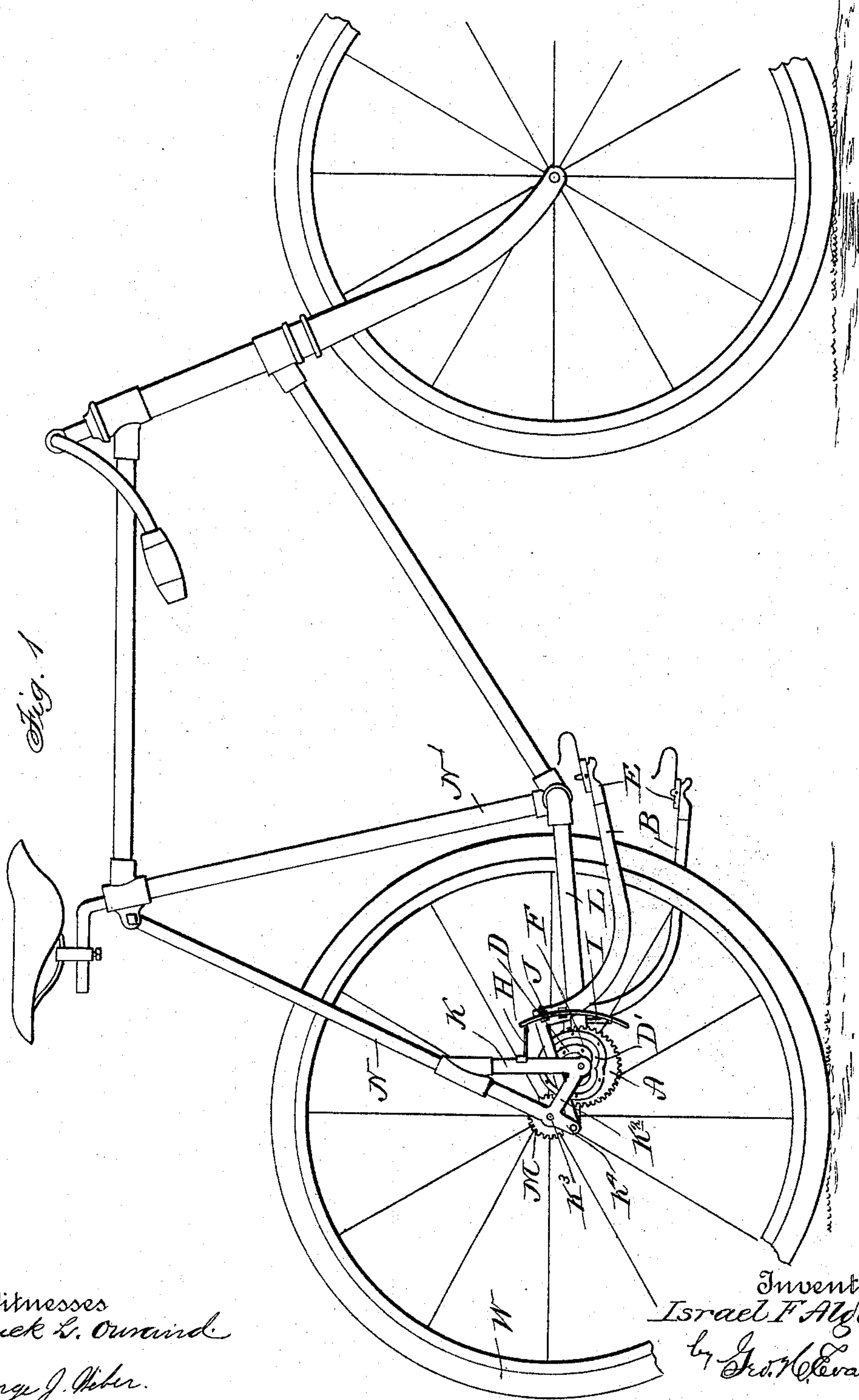
(No Model.)

2 Sheets—Sheet 1.

I. F. ALGER.
BICYCLE.

No. 589,920.

Patented Sept. 14, 1897.



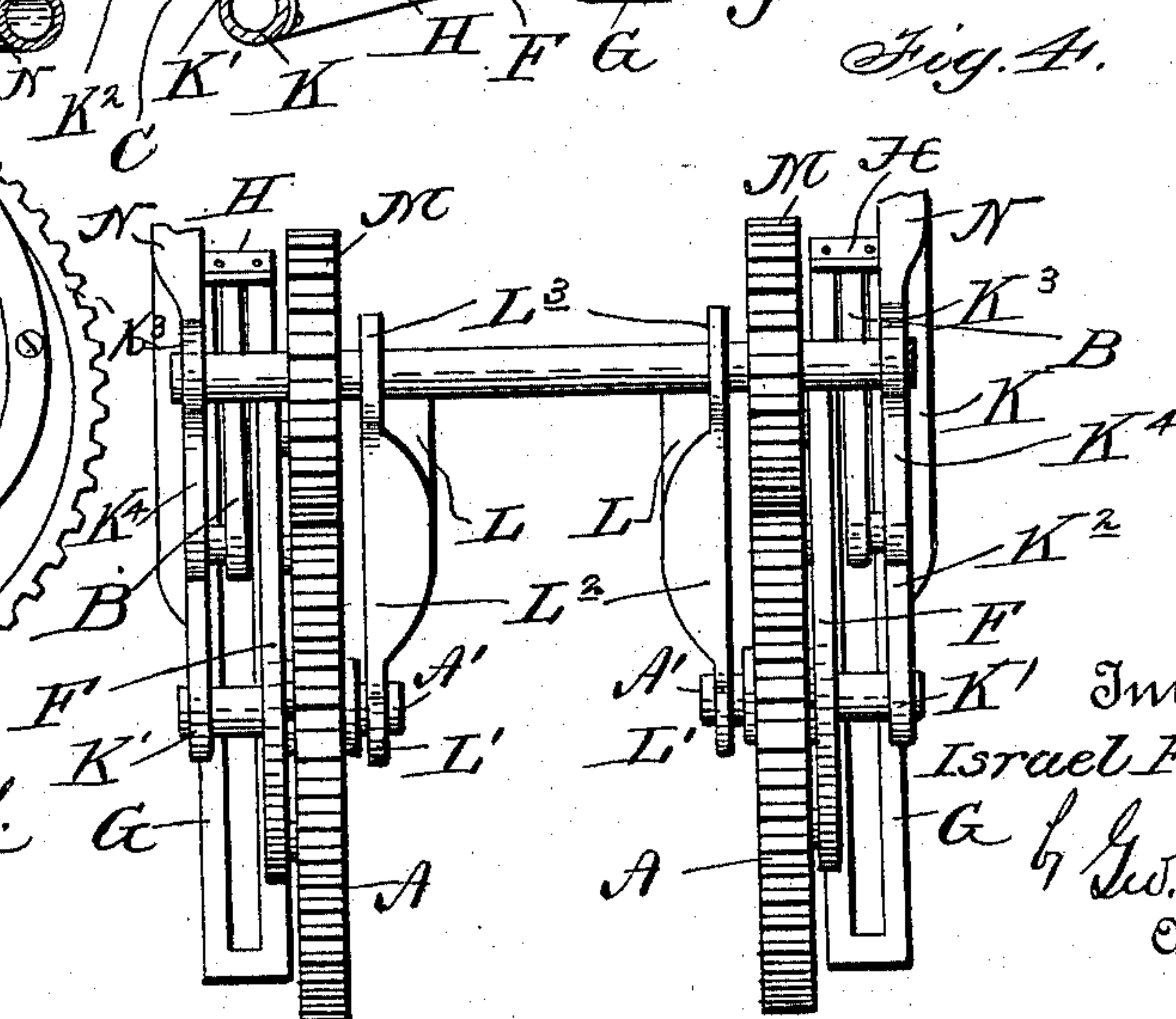
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UNITED STATES PATENT OFFICE.

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BICYCLE.

SPECIFICATION forming part of Letters Patent No. 589,920, dated September 14, 1897.

Application filed March 29, 1897. Serial No. 629,797. (No model.)

To all whom it may concern:

Be it known that I, ISRAEL F. ALGER, a citizen of the United States of America, residing at Fitchburg, in the county of Worcester, in the State of Massachusetts, have invented certain new and useful Improvements in Bicycles, of which the following specification contains a full, clear, and exact description, reference being had to the accompanying drawings, forming part thereof.

My invention relates more especially to improvements in that class of bicycles which are driven by gear-wheels operated from cranks on the pedal-levers.

The objects of the invention are to dispense with the intermediate pinion of such gearing and the slots heretofore necessary in the pedal-levers, to have the pedal-operated gear mesh directly with the pinion on the ground-wheel axis or hub, to increase the driving power by a gain of leverage through the positioning of the pedal-levers and their gear-operating pins, to strengthen the frame at the point where the driving or pedal-operated gear is mounted, to guide the pedal-levers with as little friction as possible, and to accomplish these objects in a simple, efficient, and inexpensive manner.

The invention consists principally in a gear-wheel meshing directly with a pinion on the ground-wheel and provided at one side around its axis with a cam or eccentric engaged by a pin projecting from one side of the pedal-lever; and the invention further consists in the construction and combinations hereinafter described and claimed.

Referring to the drawings, Figure 1 is a side elevation of a modern safety-bicycle, showing my improvements applied. Fig. 1^a is a similar view, on an enlarged scale, of the rear portion of the bicycle. Fig. 2 is a sectional plan on the line *y y* of Fig. 1. Fig. 3 shows the driving-gear detached. Fig. 4 is rear view on the line *z z* of Fig. 1^a.

The bicycle-frame is constructed in the main substantially like the ordinary rigid diamond frames, but differs therefrom in having the bottom bars *L* bent down at an angle between the rear-wheel fork *N* and the seat-supporting bar, the bars *L* being flattened at their angles to form the bearing *L'*. Moreover,

vertically-extending hangers or bars *K* extend downwardly from the fork *N* as far as the bearings *L'*, where they are provided with bearings *K'*, from which they incline upwardly and rearwardly, as at *K*², parallel with the rear ends *L*² of the bars *L*. The rear ground-wheel *W* is mounted in the bearings *L*³ *K*³ in the upper ends of these extensions *L*² *K*² and is provided on its axle between said extensions with pinions *M M*, with which mesh the drive-gears *A A*, the axles or shafts *A'* of which are mounted in the bearings *K' L'* of the bars *K L*. These gears *A A* are provided with cams at their outer faces which are eccentric to their axes *A'*, and these cams are formed of inner and outer spaced heart-shaped plates *D F*, secured to the gears by means of screws 1 and spacing-sleeves 2, as shown in Figs. 1 and 2. Thus heart-shaped cam-grooves or guideways *D'* are formed on the gears *A*, in which work the crank-pins *C*, each provided with an antifriction wheel or roller *C'* and secured to the inner side of the forwardly-extending pedal-levers *B*. These levers *B* are pivoted at their rear ends to the lugs *K*⁴, depending from the bearings *K*³ to a point just in advance of the gears *A A*, when they are bent or offset downwardly and provided at their front ends with pedals *E*, which are just in advance of the frame-bar *N'*. It will be understood, of course, that the cams on the two drive-gears are oppositely arranged.

The levers *B B* are provided in their offset portions with transverse openings, in which are journaled the antifriction-wheels *J J*, which project beyond said openings and engage the forked guide *G*, which is curved concentric with the axes of the said levers. The rollers *J* are also placed in a curved line, as shown in Fig. 1. The upper ends of the guides *G* are supported by the arms *H*, projecting forwardly from the hangers *K K*, and the lower portions of the guides are supported by braces *I I*, secured at their upper slotted ends by set-screws *i i* to the frame-bars *L* and at their lower ends secured to the inner members of the said forks, so as not to cross the guides and interfere with the operation of the pedal-levers.

When the right-hand lever *B* is raised, the friction-wheel *C'* will lie at the apex of the

cam-plate D, so as to tend to roll down the forward edge thereof, and the left-hand lever will be depressed and its friction-wheel will lie in the cavity at the base of the cam engaged by it.

Thus when the right-hand lever is depressed to the middle position of Fig. 1 the cam D will have been forced rearwardly, thus turning the gear-wheel A to the rear and turning gear M and ground-wheel W forwardly. A further downward movement brings the lever to its lowest point, and the cam D will have become inverted with the antifriction-wheel C' in the cam depression, as also shown in Fig. 1. The left pedal-lever will now be operated in the manner just described, when the right-hand lever will be lifted to its uppermost position, and so indefinitely.

It will be noticed that by back-pedaling the machine will be effectually braked owing to the antifriction-wheels on the levers working in the cam grooves or ways D'.

It is obvious that the cams might be formed integral with the drive-gears A, if desired.

It will be understood that the machine may be run backward by beginning the initial downstroke of the pedal-lever when its crank-pin C stands to the left or in rear of the apex of the cam. It will also be perceived that by reason of this cam mechanism the stroke of the pedal-levers will be shortened in comparison with the ordinary crank-pedals, since the rise and fall of my pedal-lever is not over seven inches. Moreover, the cam will work equally well on large or small gears.

What I claim is—

1. The combination with the frame and the ground-wheel provided at opposite sides with pinions, of driving-gears, meshing with said pinions, and having their axes parallel to that of the ground-wheel, oppositely-arranged eccentrics or cams on the faces of the drive-gears parallel therewith or within the vertical plane thereof, and vertically-rocking treadle-levers each provided with a pin or roller engaging the periphery of the adjacent cam; whereby as the levers are alternately depressed their pins or rollers will bear against the highest points of the eccentrics and thus impart a full rotary movement to the drive-gears, substantially as described.

2. The combination with the frame and the ground-wheel provided at opposite sides with pinions, of driving-gears meshing with said pinions; said driving-gears having their axes parallel to that of the ground-wheel and provided in their outer faces around their axes with oppositely-arranged heart-shaped cam-grooves, and vertically-rocking treadle-levers provided on one side with laterally-projecting pins or projections entering said cam-grooves and adapted to impart a full rotary movement to the drive-shaft by being alternately forced by the levers against the highest

points of the cams or eccentrics, substantially as described.

3. The combination with the frame and the rear ground-wheel having pinions at its opposite sides, of drive-gears having their axes below, in front of and parallel with, the axis of the ground-wheel, cam-grooves in the outer faces of the drive-gears, eccentric to their axes, treadle-levers journaled at their rear ends to the frame in rear of the drive-gears, extending forwardly across the upper portions of the grooved faces of the drive-gears and there provided with laterally-projecting pins or rollers entering said grooves to engage the highest points of the cams or eccentrics when the levers are raised; whereby when the levers are depressed the pins or rollers will be forced down on the cams from the highest to the lowest point and cause them to rotate the drive-shaft, substantially as described.

4. The combination with the bicycle-frame, the bottom bars L of which are inclined downwardly to the bearings L' and thence upwardly to the rear bearings L³, the hangers K depending from the rear-wheel fork N and provided with bearings K' opposed to the bearings L and having rear extensions K² terminating in bearings K³, and the rear ground-wheel journaled in the bearings K³ L³ and provided with pinions M, M, of the drive-gears A, A, having their axes or shafts parallel to that of the rear ground-wheel journaled in the bearings K', L' said drive gears meshing with the pinions A and provided on their outer sides with heart-shaped cams eccentric to their axes, and the pedal-levers pivoted to the frame in rear of the drive-gears and provided with lateral pins engaging said cams to rotate them and their gear-wheels rearwardly, substantially as described.

5. The combination with the frame and the rear ground-wheel having pinions at its opposite sides, of drive-gears meshing with said pinions and having their axes parallel with, and in front of and below the axis of the rear ground-wheel, said drive-gears being provided in their outer faces eccentric to their axes with heart-shaped cam-grooves, the vertically-rocking treadle-levers pivoted at their rear ends to the frame in rear of and above the axes of the drive-gears and extending forwardly across the grooved faces of said gears above their axes and there provided with lateral rollers entering said grooves said levers being offset downwardly in front of the drive-gears and then extended forwardly, and depending curved guides on the frame and between which the offset portions of the levers work, substantially as described.

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