(No Model.) 2 Sheets—Sheet 1.

T. J. ARMSTRONG.

BICYCLE PROPELLING MECHANISM.

No. 572,398. Patented Dec. 1, 1896.

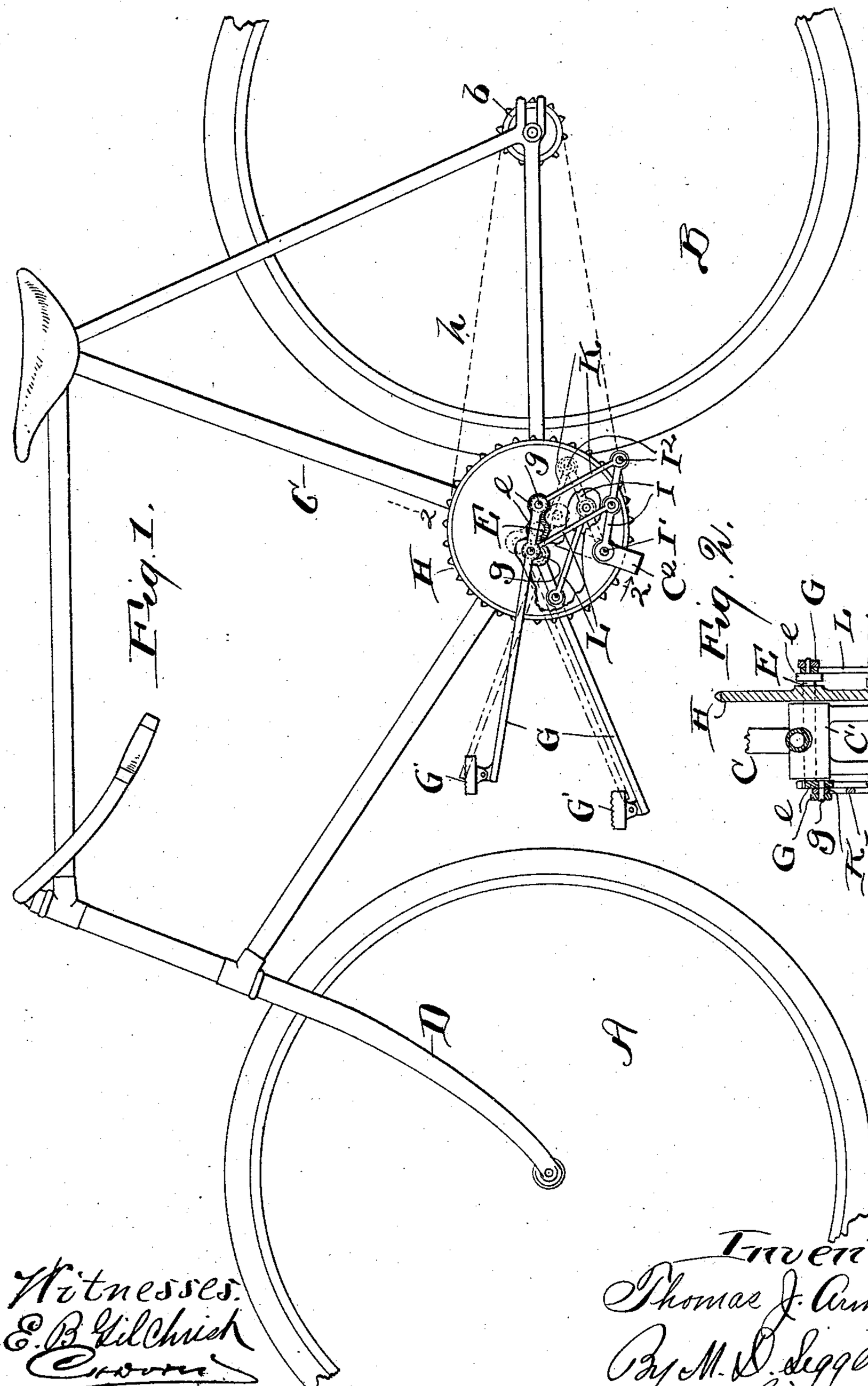

Fig. 1.

Fig. 2.

Witnesses:
E. B. Gilchrist
C. Dorsey

Inventor:
Thomas J. Armstrong
By M. D. Leggett & Co.
his Attorneys.

(No Model.) 2 Sheets—Sheet 2.

T. J. ARMSTRONG.

BICYCLE PROPELLING MECHANISM.

No. 572,398. Patented Dec. 1, 1896.

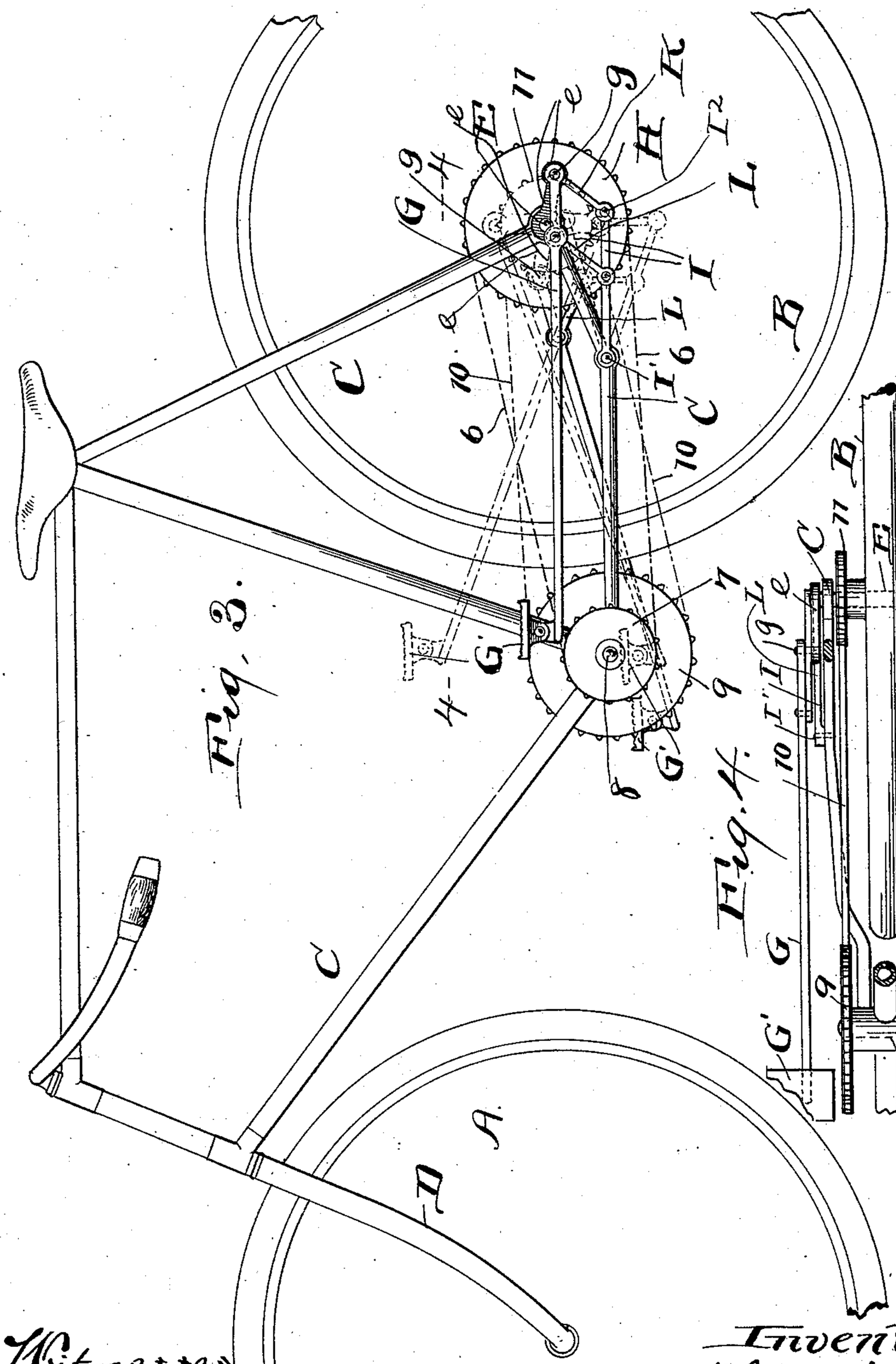

Fig. 3.

Fig. 4.

Witnesses:
E. B. Gilchrist
C. Dorsey

Inventor:
Thomas J. Armstrong
By M. D. Leggett & Co
his attorneys.

UNITED STATES PATENT OFFICE.

THOMAS J. ARMSTRONG, OF CLEVELAND, OHIO.

BICYCLE-PROPELLING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 572,398, dated December 1, 1896.

Application filed November 8, 1895. Serial No. 568,268. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. ARMSTRONG, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Bicycle-Propelling Mechanism; and I do hereby 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 pertains to make and use the same.

My invention relates to improvements in bicycle-propelling mechanism, the objects being to avoid dead-centers in the actuation of the driving crank-shaft, to propel the machine by an up-and-down movement of the pedals without revolving the latter around the crank-shaft, to reduce the sweep of the pedals to a minimum, to attain great leverage upon the pedal-actuated cranks, and to accommodate the employment of a large driving sprocket or chain wheel.

Another object of my invention is to attain the results indicated in the preceding paragraph without materially increasing the weight of the machine.

With these objects in view my invention consists in certain features of construction and combinations of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a bicycle provided with my improved propelling mechanism, and portions are broken away to more clearly show the construction and to reduce the size of the figure. Fig. 2 is an elevation, partly in section, on line 2 2, Fig. 1.

Referring to the drawings, A designates the forward main wheel of the machine; B, the rear main wheel; C, the stationary seat-bearing frame, and D the steering-fork.

E represents the crank-shaft, that is horizontally arranged and suitably supported from frame C between wheels A and B. Shaft E is preferably located as close to the rear wheel B as practicable. Shaft E is provided with two cranks *e e*, located at opposite ends, respectively, of the shaft and at opposite sides, respectively, of the machine. Cranks *e e* are preferably arranged exactly diametrically opposite each other. To the outer end of each crank *e* is horizontally pivoted at *g* a lever G. The two levers G extend forwardly from their connection to the crank-shaft, and each of said levers at its forward end bears a pedal G'. A sprocket-wheel H is operatively mounted upon shaft E at the inner side of one of the cranks, and said sprocket-wheel is operatively connected, by means of a chain *h*, with a sprocket-wheel *b*, operatively connected with the rear main wheel B of the machine. The crank-shaft-supporting barrel or member C', that is rigid with frame C, is provided with two depending arms or brackets C^2 C^2, rigid with opposite ends, respectively, of said member C'.

Two vertically-swinging sway-bars I, extending forwardly and rearwardly and arranged a suitable distance below the rear portions of the pedal-bearing levers, have their forward ends horizontally pivoted at I' to the different members C^2, respectively, of the machine's frame. Said sway-bars preferably extend rearward of the crank-shaft, and each of said bars at its rear end is horizontally pivoted at I^2 to the rear and lower end of a forwardly and upwardly inclined link K, whose forward and upper end is horizontally pivoted to the adjacent pedal-lever-bearing-crank of the crank-shaft, preferably by the same pivot *g* that secures said lever to the crank-shaft. Each bar I at any suitable point between its fixed end and the connected link K, preferably at a centrally-located point, has horizontally pivoted thereto one end of another link, L, arranged parallel with said link K and having its opposite end horizontally pivoted to the aforesaid adjacent pedal-bearing lever. Each sway-bar I is preferably arranged parallel with the connected pedal-bearing lever.

It will be observed that when, during the operation of the machine, one of the pedals is at the starting extremity of its downward stroke, the other pedal has not yet completed its downward stroke, as shown in dotted lines in Fig. 1, and that when the last-mentioned pedal has completed its downward stroke, the other pedal is in its downward sweep or stroke, as shown in solid lines in said figure. Hence while power is being applied to the lower pedal in the last portion of the downward stroke of said pedal power is also applied to the upper and downwardly-moving pedal, so that power in the operation

of the machine is continuously applied and dead-centers are avoided. The pedal-bearing levers are preferably as long as the proximity of the crank-shaft to the axis of the main rear wheel will accommodate. The sweep or stroke of the pedal-bearing levers is comparatively short and considerably less than the length of the levers. A short sweep or stroke of the pedals, it is obvious, is desirable to enable the operator to keep his feet in contact with the pedals during the operation of the machine.

The great leverage involved in and the facility of operating my improved propelling mechanism also accommodates the employment of a driving sprocket-wheel much larger in diameter than the driving sprocket-wheels heretofore employed, and it follows that great speed can be obtained by my improved propelling mechanism with remarkable facility.

It will be observed, therefore, that my improved bicycle-propelling mechanism possesses the following important advantages or meritorious features, namely: avoiding dead-centers in the operation of the cranks, great leverage, short pedal stroke or sweep, simplicity and durability in construction, accommodation of diametrically large driving sprocket-wheel, and the ability of the rider or operator not only to propel the machine with great facility and rapidity, but to assume a natural, erect, and comfortable attitude during the operation of the machine.

As shown in Fig. 2, one of the depending arms or brackets C^2 is bent or extends around and transversely of the periphery of the driving sprocket-wheel to accommodate the location of said wheel.

Referring again to the advantages of my improved propelling mechanism, it will be observed that said mechanism's vertically-swinging sway-bars are pivoted to the machine's frame at one end, and are shown extending rearward of the connected pedal-bearing lever, and thereby accommodate the movement of their free ends during the operation of the propelling mechanism into comparatively close proximity to and rearward of the crank-shaft, and thereby overcome the dead-center considerably. The operator's leg being bent at the top of the downward pedal-stroke is, of course, incapable of exerting nearly as much power as it is capable of exerting at the lower extremity of said stroke, when it is approximately straight.

By my improved construction it is obvious that the greater leverage is had during the commencement of the pedal's downward stroke, and hence the leverage is the greatest when the power of the operator's leg is the weakest. This advantage is due to the location of the vertically-swinging sway-bars below the crank-shaft and facilitates riding uphill; also, the operator is not dependent upon momentum to carry the crank over the dead-center, but the lower pedal has enough power applied to it to carry the upper pedal over said center considerably, because, as already indicated, the one pedal has commenced its downward stroke before the other pedal has reached the lower extremity of its downward stroke, so that the operator applies power with both feet for a short time.

What I claim is—

1. In a machine of the character indicated, the combination of the relatively stationary frame, and driving crank-shaft provided with two cranks at opposite sides, respectively: of the two forwardly-extending pedal-bearing levers operatively connected, at their rear ends, with the different cranks, respectively; two vertically-swinging sway-bars pivoted at one end to the aforesaid frame adjacent to the different pedal-bearing levers, respectively; a link operatively connecting the other end of each sway-bar with the rear end of the adjacent pedal-bearing lever, and another link connecting together each of the pedal-bearing levers, and connected sway-bar a suitable distance from the first-mentioned connection between said bar and lever, substantially as and for the purpose set forth.

2. In a machine of the character indicated, the combination with the suitably-supported driving crank-shaft provided with two cranks located at opposite sides, respectively, of the shaft; the relatively stationary frame extending below said shaft, the two forwardly-extending pedal-bearing levers operatively connected with the different cranks, respectively; the two vertically-swinging sway-bars pivoted, at their forward ends, to the aforesaid frame and arranged below the different levers, respectively, and extending rearwardly of the shaft; links operatively connecting the rear ends of the different sway-bars, respectively, with the rear ends of the different pedal-bearing levers, respectively, and another connecting-link between each pedal-bearing lever and the connected sway-bar a suitable distance forward of the first-mentioned connection between said bar and lever, substantially as shown, for the purpose specified.

In testimony whereof I sign this specification, in the presence of two witnesses, this 5th day of November, 1895.

THOMAS J. ARMSTRONG.

Witnesses:

C. H. DORER,

ELLA E. TILDEN.