No. 721,943. PATENTED MAR. 3, 1903.

O. DOCKSTADER.

POWER TRANSMITTING GEARING.

APPLICATION FILED DEC. 18, 1900.

NO MODEL. 2 SHEETS—SHEET 1.

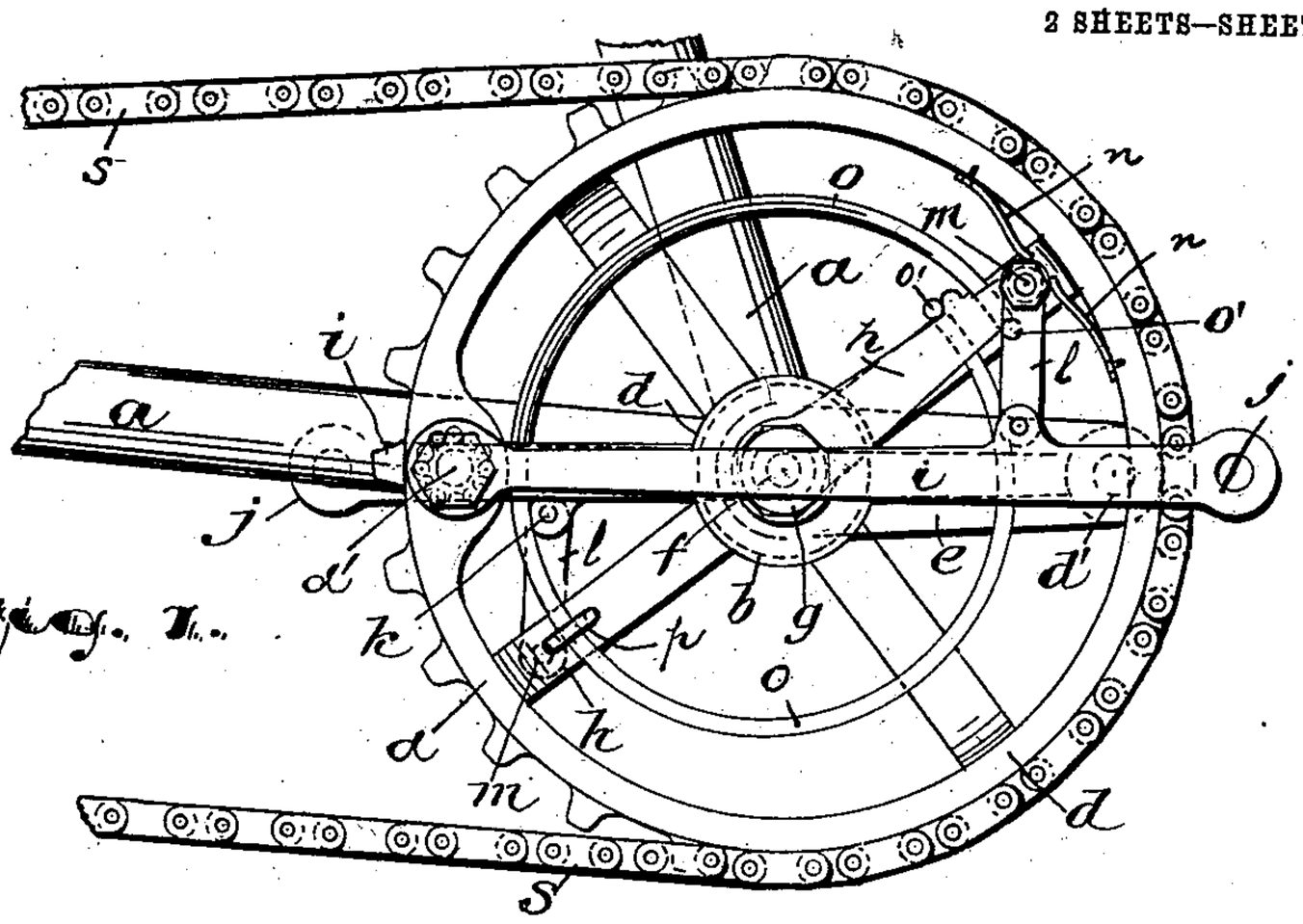

Fig. 1.

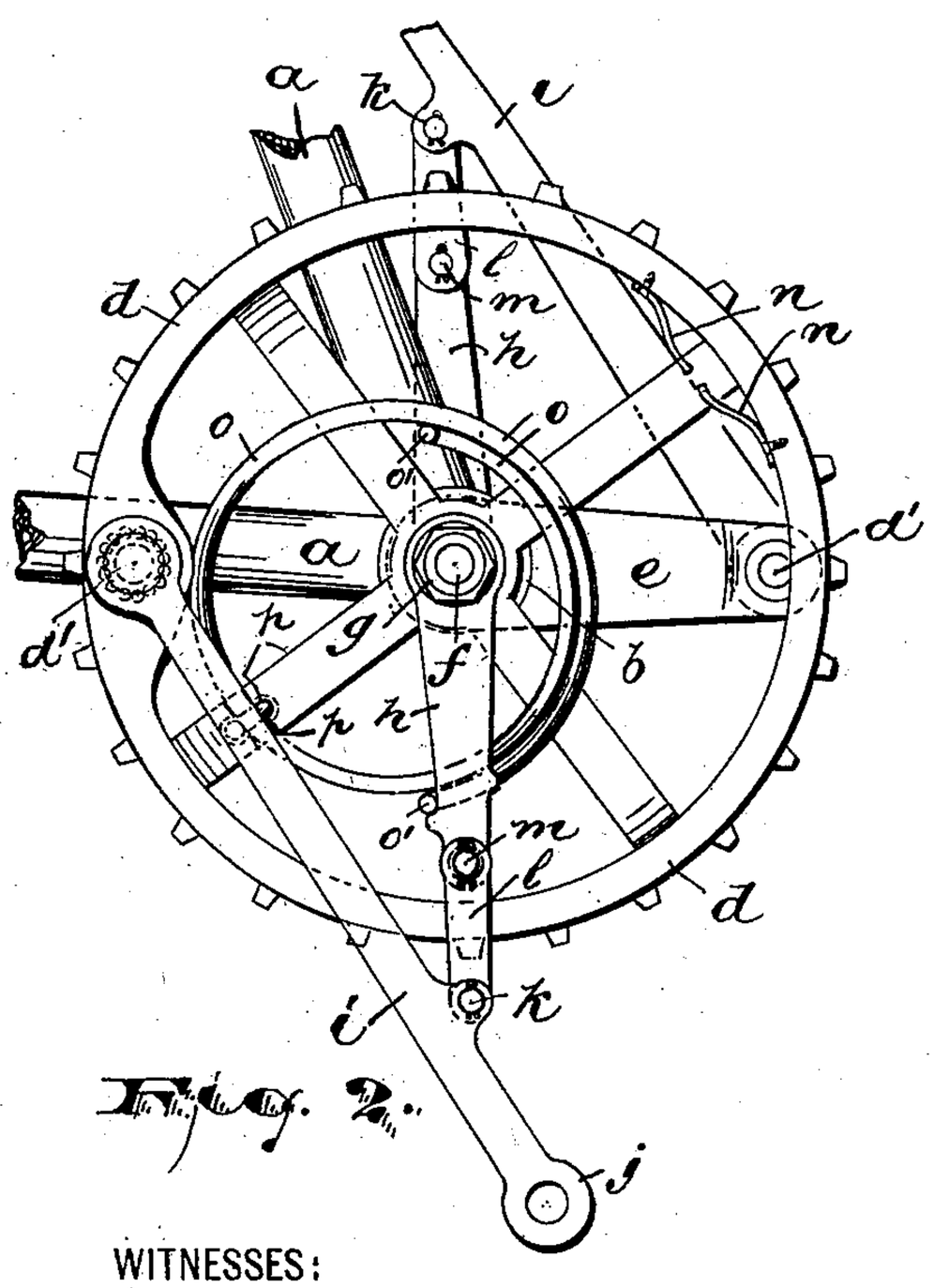

Fig. 2.

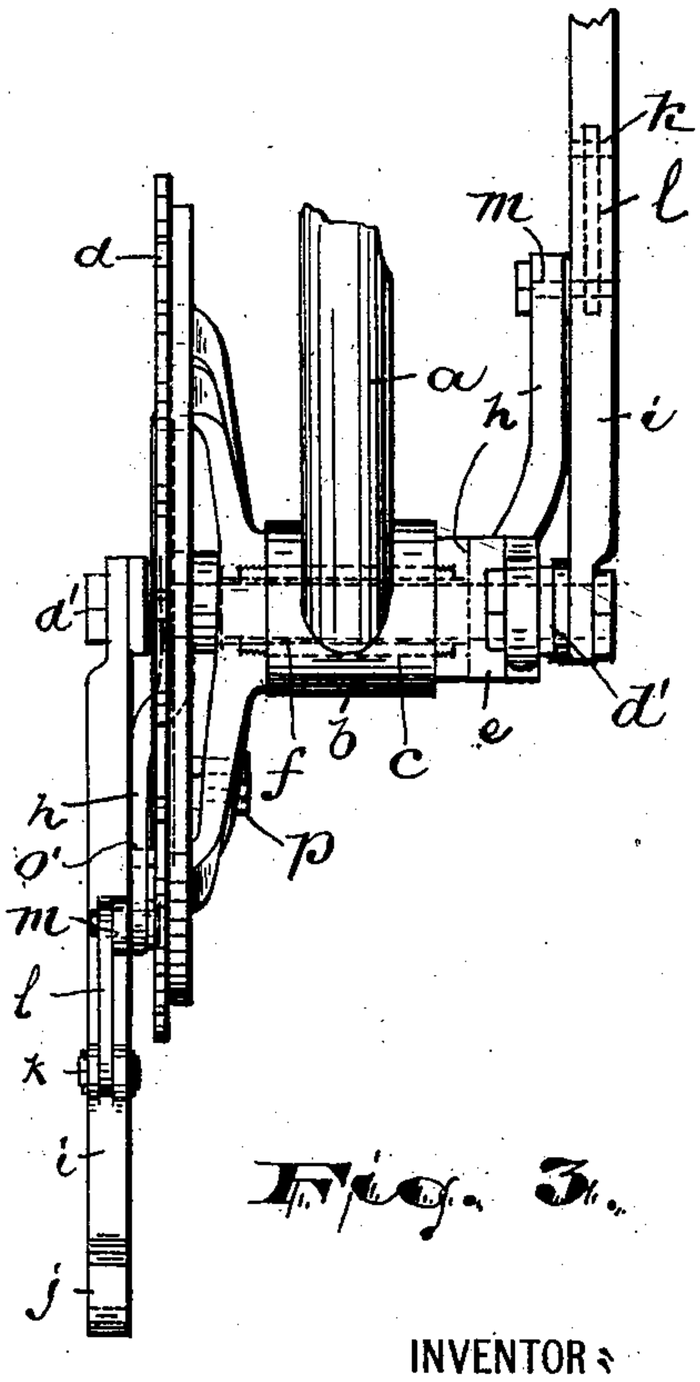

Fig. 3.

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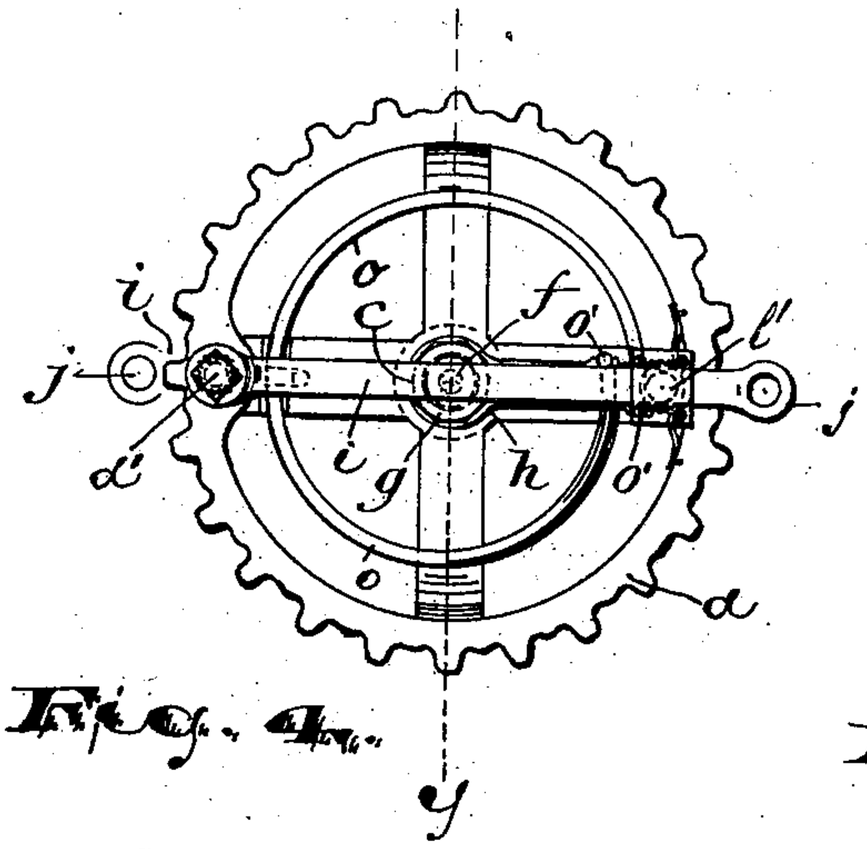

Fig. 4.

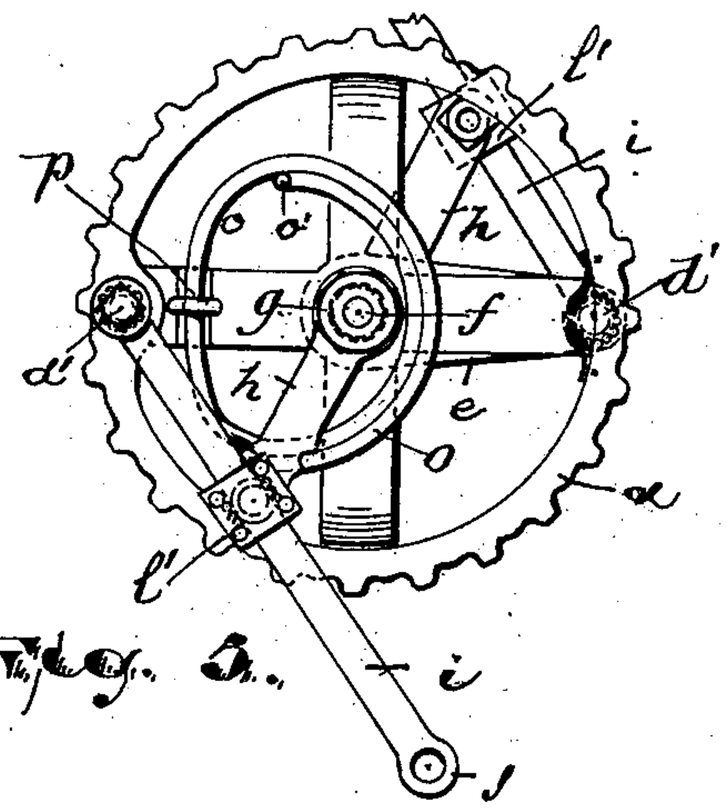

Fig. 5.

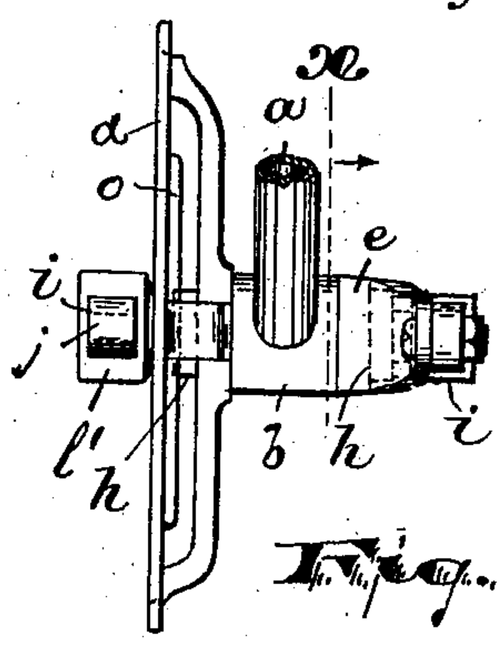

Fig. 6.

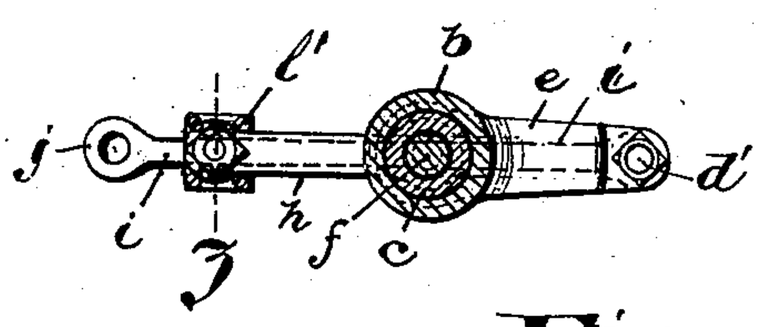

Fig. 7.

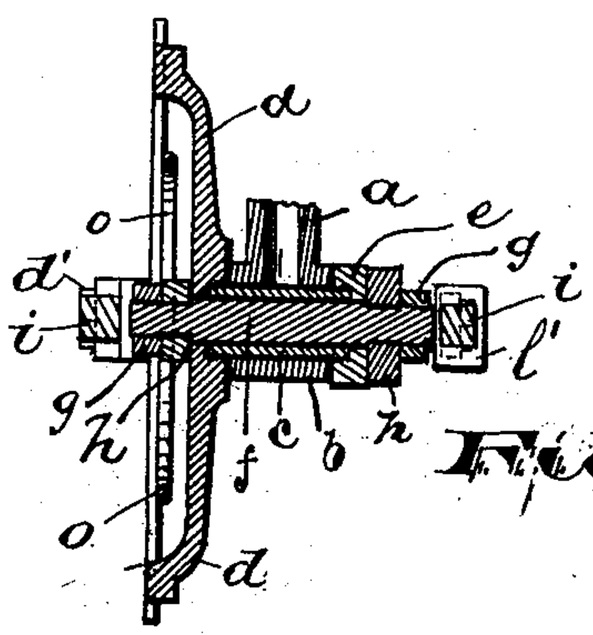

Fig. 8.

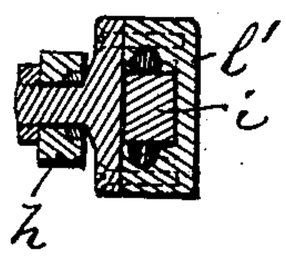

Fig. 9.

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UNITED STATES PATENT OFFICE.

OTIS DOCKSTADER, OF HORSEHEADS, NEW YORK.

POWER-TRANSMITTING GEARING.

SPECIFICATION forming part of Letters Patent No. 721,943, dated March 3, 1903.

Application filed December 18, 1900. Serial No. 40,248. (No model.)

To all whom it may concern:

Be it known that I, OTIS DOCKSTADER, a citizen of the United States, residing at Horseheads, in the county of Chemung and State of New York, have invented certain new and useful Improvements in Power-Transmitting Gearing or Devices; 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 appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The objects of this invention are more particularly to enable a bicycle-rider on mounting a steep incline to secure increased leverage upon the crank to which the pedal is attached, and thus obtain greater power at the expense of speed, to enable the crank-arm to be easily changed in position from a position of normal leverage for service in pedaling upon level or easily-inclined grades to the desired increased leverage, to enable such change to be effected automatically, and to enable the said crank to be returned from its position of increased leverage to its normal position automatically and with facility and ease, and to secure other advantages and results, some of which may be referred to hereinafter in connection with the description of the working parts.

The invention consists in the improved bicycle gearing apparatus or device and in the arrangements and combinations of parts of the same, all substantially as will be hereinafter set forth, and finally embraced in the clauses of the claim.

Referring to the accompanying drawings, in which like letters of reference indicate corresponding parts in each of the several figures, Figure 1 is a side elevation of my improved device, showing the crank-levers in normal relation to the coöperating parts for ordinary pedaling. Fig. 2 is a similar view showing the said crank-levers in abnormal position, whereby increased power is obtained. Fig. 3 is an edge view of said parts. Figs. 4 and 5 are side views showing modifications of construction, and Fig. 6 is an edge view showing the parts in the modified construction. Fig. 7 is a sectional detail taken at line *x*, Fig. 6. Fig. 8 is a vertical section taken at line *y*, Fig. 4; and Fig. 9 is a section at line *z*, Fig. 7, on an enlarged scale and showing the relation of certain sliding parts more clearly.

In said drawings, *a* indicates a portion of the frame of a bicycle or similar vehicle of any ordinary construction, said frame having at a suitable point therein a hub *b*, providing bearings to receive a hollow or tubular sprocket-wheel shaft *c*, on which the sprocket-wheel is seated or screwed. *d* indicates the sprocket-wheel, which is preferably threaded to be screwed upon one end of the correspondingly-threaded tubular shaft, the other end of said shaft being preferably threaded also and adapted to receive an arm *e*, which latter turns with the sprocket-wheel *d* and tubular shaft and lies on the opposite side of the frame *a* from said sprocket-wheel. The sprocket-wheel *d* and arm *e*, screwed upon said hollow shaft *c*, act as nuts to hold the tubular shaft *c* within the hub in proper operative position. The said sprocket-wheel *d* and arm *e* may be secured to said hollow shaft *c* in any other suitable manner. Within the said hollow shaft *c* is arranged what I may term a "secondary" shaft *f*, which projects at opposite ends out beyond the ends of said hollow shaft. At its opposite extremities said secondary shaft is threaded to receive locking-nuts *g*, and back or in from said threaded extremities the said secondary shaft provides bearings upon which supplemental cranks *h h* are rigidly secured, the said cranks *h h* being movable with the said secondary shaft *f*.

At or near the periphery of the sprocket-wheel *d*, as at *d'*, and at or near the extremities of the arm *e* are pivotally connected the pedal-carrying cranks *i*, which furnish, at or near their outer extremities, suitable bearings *j* for the pedals, (not shown,) such as are commonly employed in bicycles, and intermediate of said bearings *d'* and *j*, as at *k*, the cranks *i* are provided with pivotal bearings for connecting rods or links *l*, which latter are also pivotally connected, as at *m*, to the outer extremities of the supplemental cranks *h*. The extremity of the supplemental crank *h* nearest the sprocket-wheel provides bearings adapted to enter between and be held in nor-

mal position by springs *n n*, secured in suitable position upon the said sprocket-wheel at or near the periphery thereof, so that under ordinary circumstances when great power is not needed in propelling the vehicle the said crank *h* adjacent to the sprocket-wheel may be locked by said springs and held in fixed relation to said sprocket-wheel, so as to revolve therewith. The said springs *n n*, which serve as a lock or as catches for the supplemental crank, may be dispensed with and any other form of catch may be employed for the purpose; but I prefer the construction as shown in Figs. 1 and 2, in that it permits of an easy automatic locking or catching of the end of the crank *h* under normal exertion of power of the foot and an automatic releasing of said crank *h* when increased power is applied to the pedals preliminary to or in the act of mounting a hill or steep grade of the road-bed. When the sprocket-wheel *d* is locked with the supplemental crank by the springs *n*, as described and as shown in Fig. 1, it will be observed that the radial distance of the pedal-bearing *j* from the axis of the sprocket-wheel is at its minimum distance from said axis; but when released from said catching-springs *n* the crank *h*, crank *i*, and connection or link *l* assume the positions shown in Fig. 2 or intermediate positions between those of Figs. 1 and 2, so that the bearing *j* of the crank *i* is increased in radial distance from the axis of the sprocket-wheel and so that there will be a material increase in the leverage, and the exerted power of the foot will be materially increased at the expense of speed, and the vehicle may be forced up the inclined grade with greater ease. To hold the released parts *h l i* in proper operative relation to the sprocket-wheel, I have employed a spring or springs *o*, which is curved and disposed approximately concentric with the axis of the sprocket-wheel and is, intermediate of its length, fastened, as at *p*, to one of the spokes or other part of the said sprocket-wheel, the said spring *o* being preferably clamped to said spoke by any suitable clamping or fastening device. The free ends of the said spring are provided with pintles or lugs *o'* at their extremities, formed by turning the extremity of the spring at right angles to the body of said spring, and the said lugs are adapted to engage one or the other of the opposite edges of the arm *h* lying nearest the sprocket-wheel, and so when increased power is applied in one direction or the other such power is applied against the power of the said spring, so that the said parts are held in relative position without undue looseness of movement, the movements to and from the radial center of the sprocket-wheel being cushioned by the said spring. The power which is thus absorbed by the spring in cushioning the action of the crank *i h* is expended in securing effective movement in the sprocket-wheel. When the resistance of the spring *o* is overcome by the pressure of the foot on the pedal and the crank *i* is forced to the position of Fig. 2, the connecting rod or link *l* will be brought into alinement with the supplemental crank *h*, so that further relative movement is prevented and the spring *o* ceases to act as a power-transmitting means, as will be apparent. A relaxation of the pressure on the pedal causes the free end of the crank *i* to again approach the catching-springs *n*, when it may be locked for normal pedaling.

It is obvious that the various pivotal bearings described, both of the hub *b* and at the centers of movements of the cranks *i* and connections, may be provided with balls, cones, rollers, or the like to reduce the friction; but these do not affect the essentials of my invention.

In lieu of the pivoted links or connecting-rods *l* I may employ rolling or sliding link connections *l'*, (shown in Figs. 4, 5, 6, 7, and 9,) in which case the slides *l'* are preferably box-shaped parts pivotally atached to the supplemental cranks *h*, fixed to the secondary shaft and through which the pedal-cranks *i* extend, the said boxes *l'* sliding on the crank *i* as the power or pressure of the foot is increased or diminished. The action of the box on the crank *i* is preferably facilitated by balls or rollers.

I am aware that other modifications involving my invention may be made, and I do not wish to be understood as limiting myself to the specific constructions herein described, as other modifications in addition to the one herein shown may be made without departing from the spirit or scope of my invention.

It is understood that the power from the sprocket-wheel *d* and its connections may be transmitted from said wheel by means of a chain *s* in any ordinary manner, and in lieu of said sprocket-wheel the power may be transmitted from any wheel *d* by any other power-transmitting means. In this case the arm *e* is the equivalent of a wheel *d*.

In operating the device in its preferred form the power of the spring *o* serves to throw one of the supplemental cranks into locked relation to the sprocket-wheel, and the bearing *j* of the pedal-crank is thus held at a minimum distance from the axial center of the wheel *d*. By increasing the pressure of the foot upon the pedal the supplemental crank is released from locking engagement with the springs *n n*, and the free end of the pedal-crank *i*, against the stress of the spring *o*, assumes a position more distant from the sprocket-wheel, the said crank turning pivotally on a center near the periphery of the wheel *d* and being free to vary the distance of the pedal-bearing from the axial center of the wheel *d* as the pressure of the foot varies in degree.

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

1. In a power-transmitting device for bicycles or like vehicles, the combination with a shaft *c*, having at one end a sprocket-wheel

d, and at the opposite end an arm *e*, of a secondary shaft *f*, supplemental cranks *h*, *h*, arranged upon said shaft *f*, pedal-cranks *i*, *i*, fulcrumed respectively on said wheel *d*, and arm *e*, means intermediate of the ends of said pedal-cranks connecting them to said supplemental cranks, and means controlling the angular movement of the pedal-cranks with respect to said arm *e*, and the radii of said sprocket-wheel, substantially as set forth.

2. In a power-transmitting device, the combination with two shafts concentrically arranged, one of which has a radial extension thereon and the other of which has a supplemental crank *h*, of a pedal-crank pivoted, at its end distant from the one adapted to receive the pedal, upon said radial extension, means intermediate of the ends of said pedal-crank connecting it to said supplemental crank *h*, and means controlling the angular movements of the pedal-crank with respect to said arm or wheel, substantially as set forth.

3. In a power-transmitting device, the combination with the wheel *d*, of a pedal-crank fulcrumed upon said wheel, eccentric to the axis thereof, and at its free end held by springs adapted to permit a movement of said free end to or from the said axis, and a pair of springs *n*, *n*, attached to the wheel to serve in catching and holding the crank in normal pedaling relation, substantially as set forth.

4. In a power-transmitting device, the combination with the wheel *d*, having a spring-catch thereon, of a pedal-crank fulcrumed upon said wheel at a distance from the center of movement of said wheel, and means connected to said crank near its free end and adapted to catch upon and be held by the said spring-catch, said spring-catch being adapted to thus hold the crank in normal operative relation to the wheel *d*, substantially as set forth.

5. In a power-transmitting device, the combination with a wheel arranged upon a tubular shaft and a secondary shaft within said tubular shaft, of a pedal-crank fulcrumed on said wheel and having a loose connection with said secondary shaft, permitting said pedal-crank to move on its fulcrum toward and from the axis of the wheel, and means for controlling the movements of the pedal-crank, substantially as set forth.

6. In a power-transmitting device, the combination with a hollow axial shaft, a wheel *d*, and an arm *e*, arranged on the opposite ends of said shaft, and a secondary shaft projecting through and out from the opposite ends of said axial shaft, of supplemental cranks *h*, rigid upon said secondary shaft, pedal-cranks eccentrically fulcrumed on said wheel *d*, and arm *e*, respectively, and loosely connected to said supplemental cranks, and a spring cushioning the movement of the pedal-cranks with respect to said wheel and arm, substantially as set forth.

7. In a power-transmitting device the combination with a wheel *d*, having a tubular axial shaft and a secondary shaft arranged in said tubular shaft, of a supplemental crank *h*, rigid upon said secondary shaft, a pedal-crank eccentrically fulcrumed on said wheel and loosely connected to said supplemental crank, and a catch arranged upon said wheel at a distance from the fulcrum of the pedal-crank and adapted to engage said supplemental crank and hold the parts in normal relation and permit a release of said supplemental crank therefrom, substantially as set forth.

8. In a power-transmitting device, the combination with a wheel having an axial shaft and a secondary shaft, of a supplemental crank rigid upon said secondary shaft, a pedal-crank eccentrically fulcrumed on said wheel, a link loosely connecting said supplemental crank and pedal-crank, and a spring secured to said wheel and at opposite ends adapted to engage the supplemental crank and limit the movement thereof, substantially as set forth.

9. In a power-transmitting device, the combination with the tubular shaft and secondary shaft arranged in said tubular shaft and extending out therefrom, of a wheel arranged upon said tubular shaft, a pedal-crank fulcrumed upon the wheel at one end and free at its pedal-receiving end to be moved to increase the radial distance between said pedal-receiving end and the axis of the wheel, upon receiving an application of power greater than the power normally applied thereto, means for connecting said pedal-crank to the said secondary shaft, and means for holding said pedal-crank in normal pedaling relation to said wheel and a spring attached to the wheel and bearing upon the said means for connecting the crank and secondary shaft, substantially as set forth.

10. In a power-transmitting device, the combination with the tubular shaft and secondary shaft, the latter extending out from the former and having thereon a supplemental crank-wheel *d*, held upon said tubular shaft, a pedal-crank fulcrumed upon said wheel *d*, a link connecting said pedal-crank and supplemental crank, said link having its connection with the pedal-crank at a point between the fulcrum of said pedal-crank and the free pedal-receiving end, a spring fixed to said wheel and at its free ends having lugs or pintles which provide bearings for the supplemental crank, said spring serving to cushion the movements of said supplemental cranks and the parts linked thereto and a catch arranged on said wheel and serving to normally hold the supplemental and pedal cranks in normal relation, substantially as set forth.

11. The combination with the frame *a*, of a vehicle having a bearing *b*, for a shaft, of a tubular shaft *c*, having a wheel *d*, and arm *e*, at opposite ends, a secondary shaft extending through said tubular shaft, supplemental cranks *h*, *h*, fast on the opposite ends of said

secondary shaft and extending radially therefrom in opposite directions and at their outer extremities providing link connections, catching-springs secured to the said wheel *d*, near its periphery and adapted to normally hold said supplemental cranks in radial position, a pedal-crank fulcrumed upon the said wheel near the periphery of said wheel, a cushioning-spring tending to hold the free end of the crank at its minimum distance from the axis of the wheel, a secondary pedal-crank fulcrumed on the arm *e*, and links connecting said pedal-cranks intermediate of their ends to the ends of said supplemental cranks, respectively.

In testimony that I claim the foregoing I have hereunto set my hand this 6th day of December, 1900.

OTIS DOCKSTADER.

Witnesses:

CHARLES H. PELL,

C. B. PITNEY.