(No Model.)

4 Sheets—Sheet 1.

J. W. PROSSER.

BICYCLE.

No. 507,081. Patented Oct. 17, 1893.

Fig. 1.

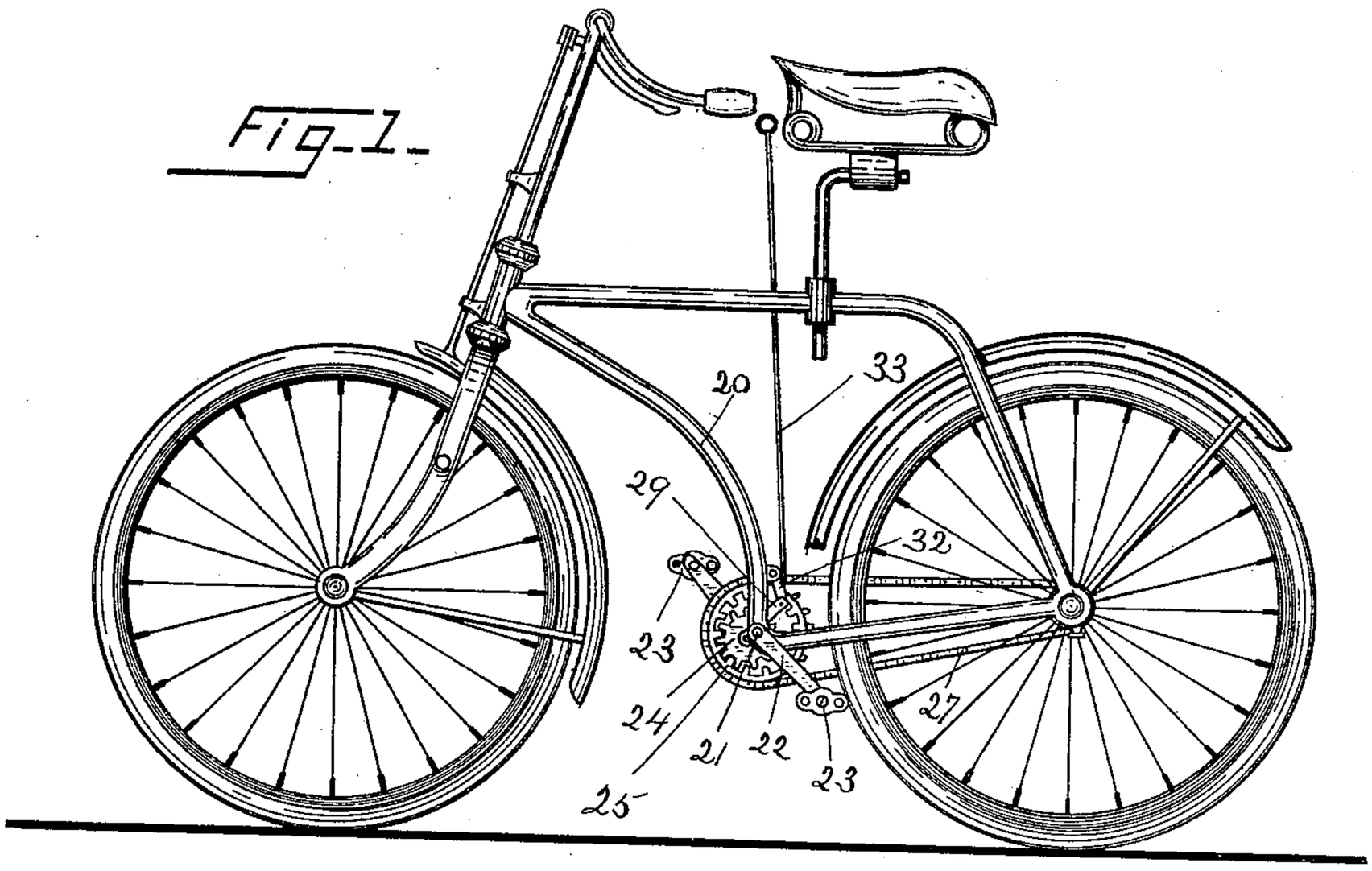


Fig. 9.

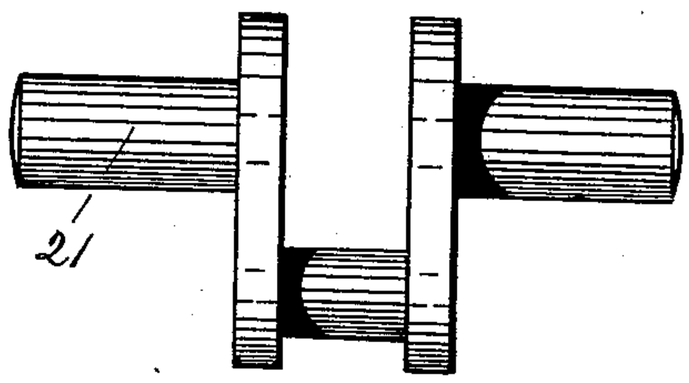
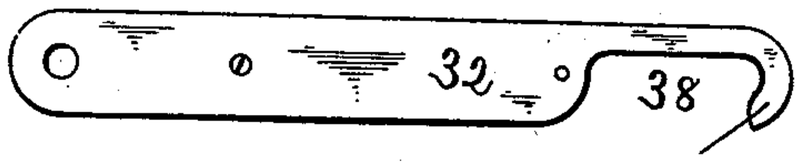


Fig. 13.



Witnesses
Alonzo M. Luther.
Allen Penny.

Inventor
Joseph W. Prosser,
By Attorney
Frank H. Allen.

(No Model.)

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J. W. PROSSER.

BICYCLE.

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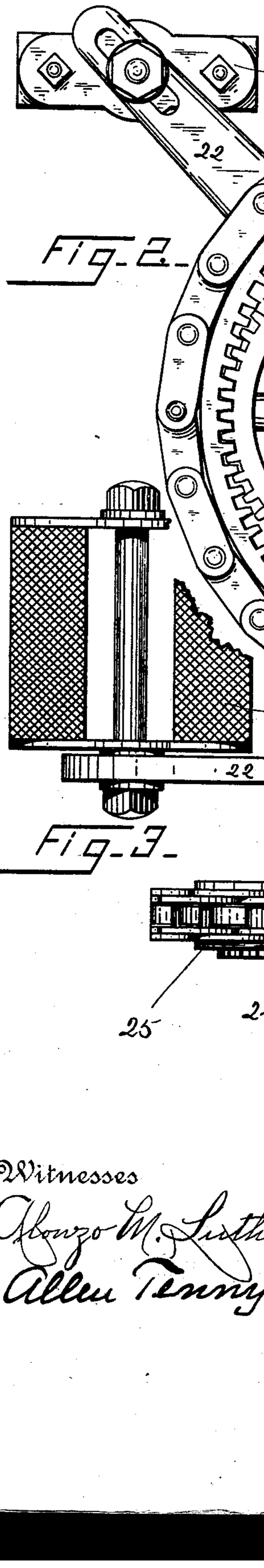


Fig. 2.

Fig. 3.

Witnesses

Alonzo M. Luther.

Allen Tenny.

Inventor

Joseph W. Prosser,

By Attorney

Frank H. Allen.

(No Model.)

4 Sheets—Sheet 3.

J. W. PROSSER.

BICYCLE.

No. 507,081. Patented Oct. 17, 1893.

Fig 4

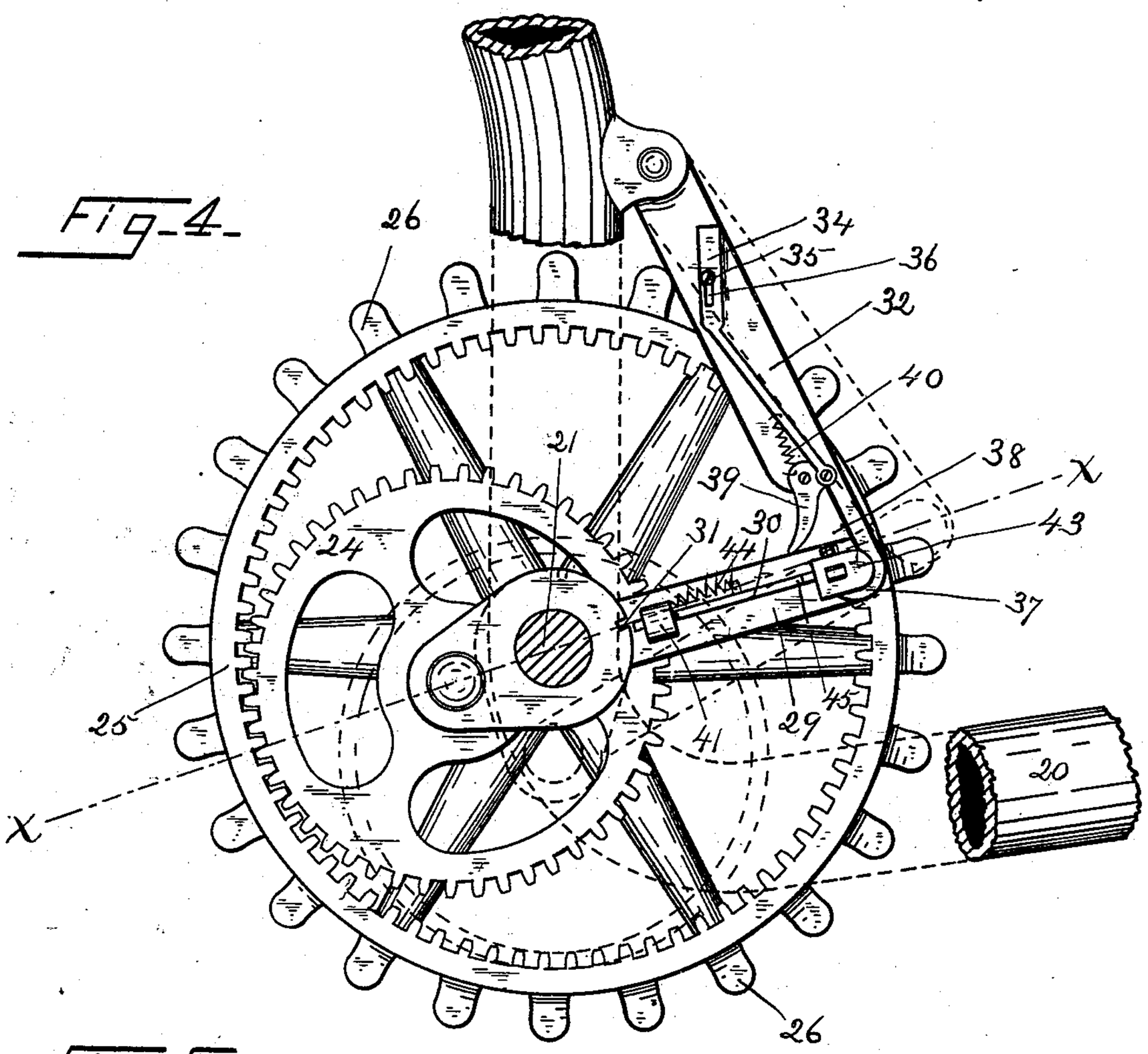
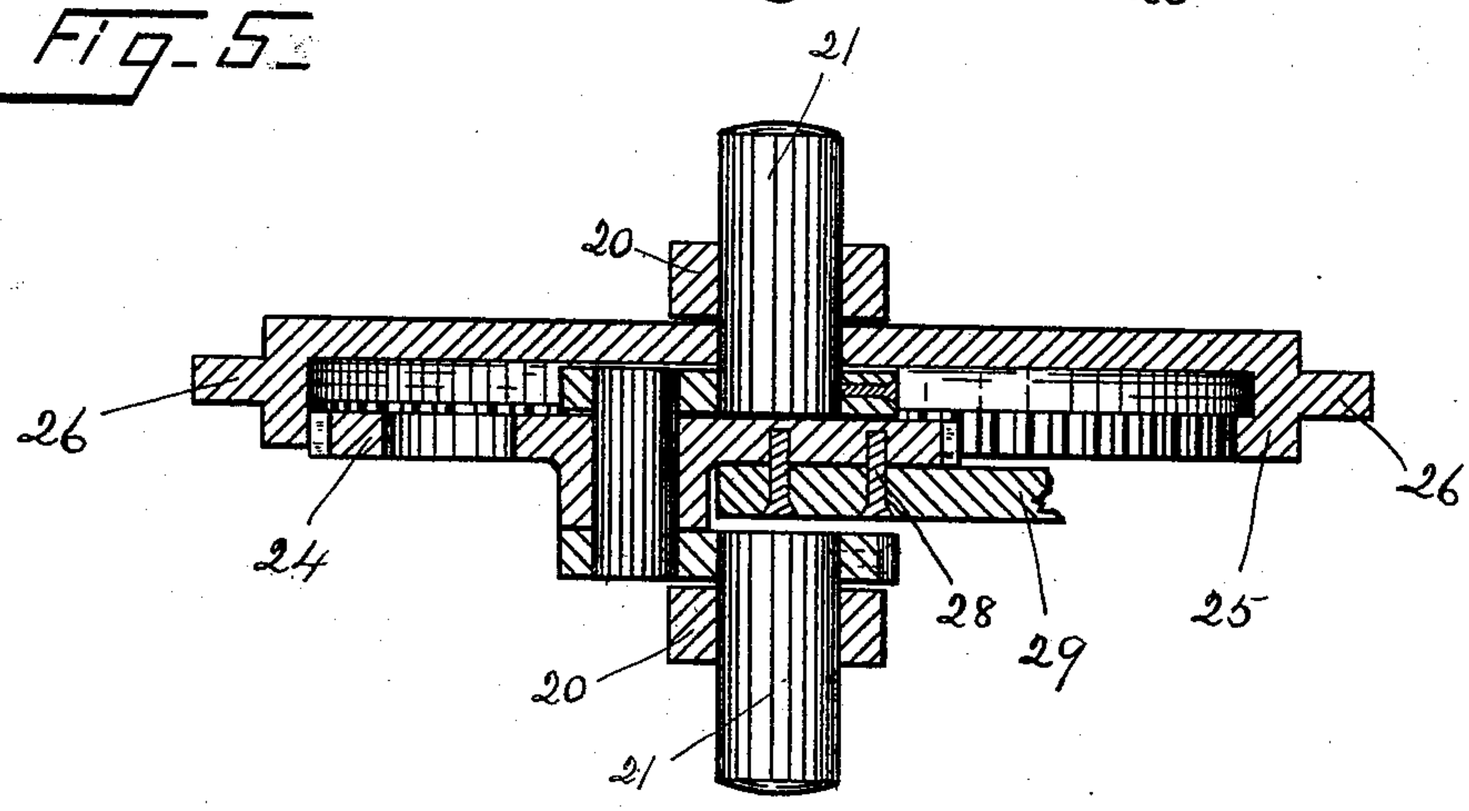


Fig 5



Witnesses
Thorgo W. Luther.
Allen Penny.

Inventor
Joseph W. Prosser,
By Attorney
Francis H. Allen.

(No Model.)

4 Sheets—Sheet 4.

J. W. PROSSER.

BICYCLE.

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Fig. 6.

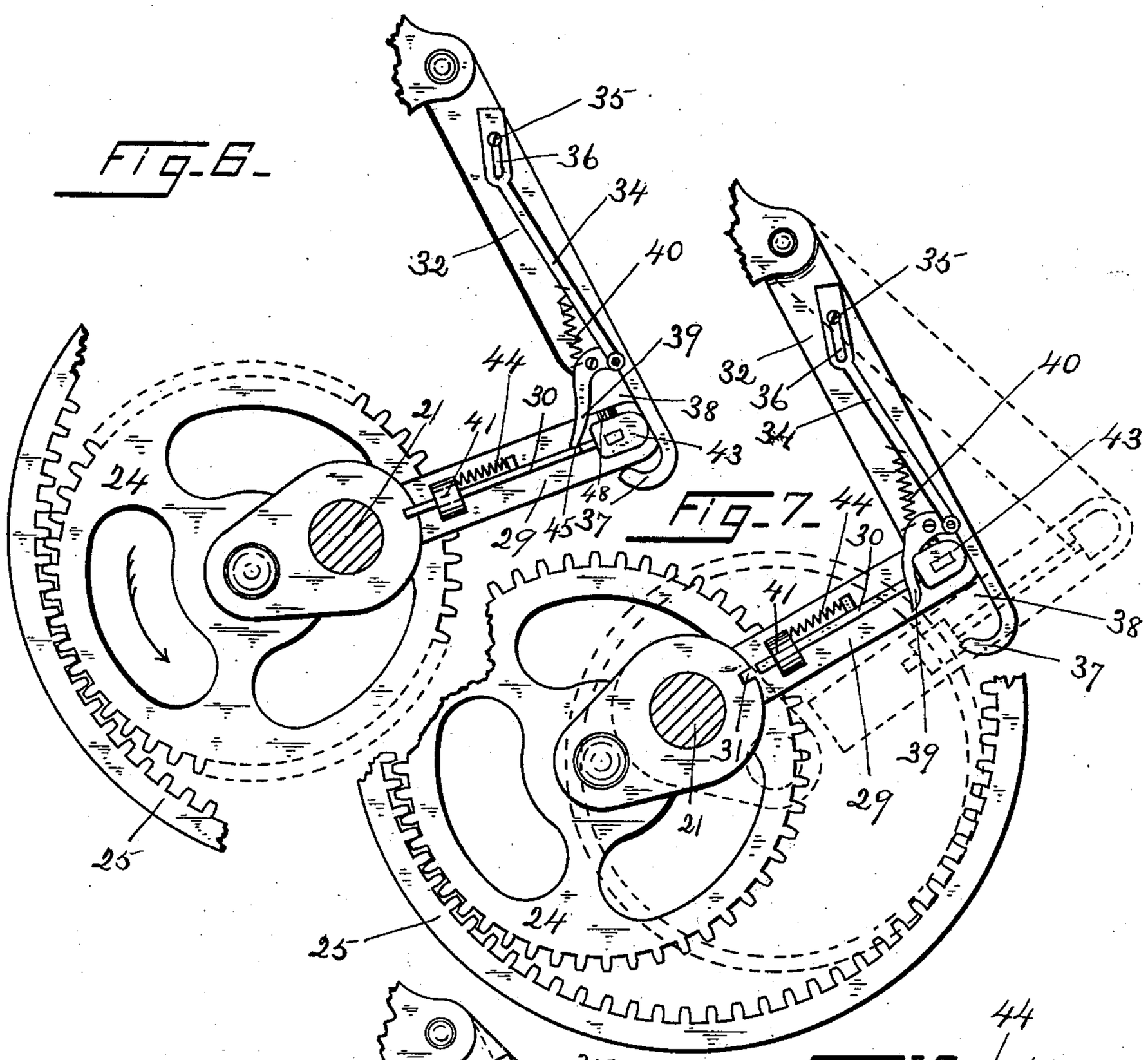


Fig. 7.

Fig. 8.

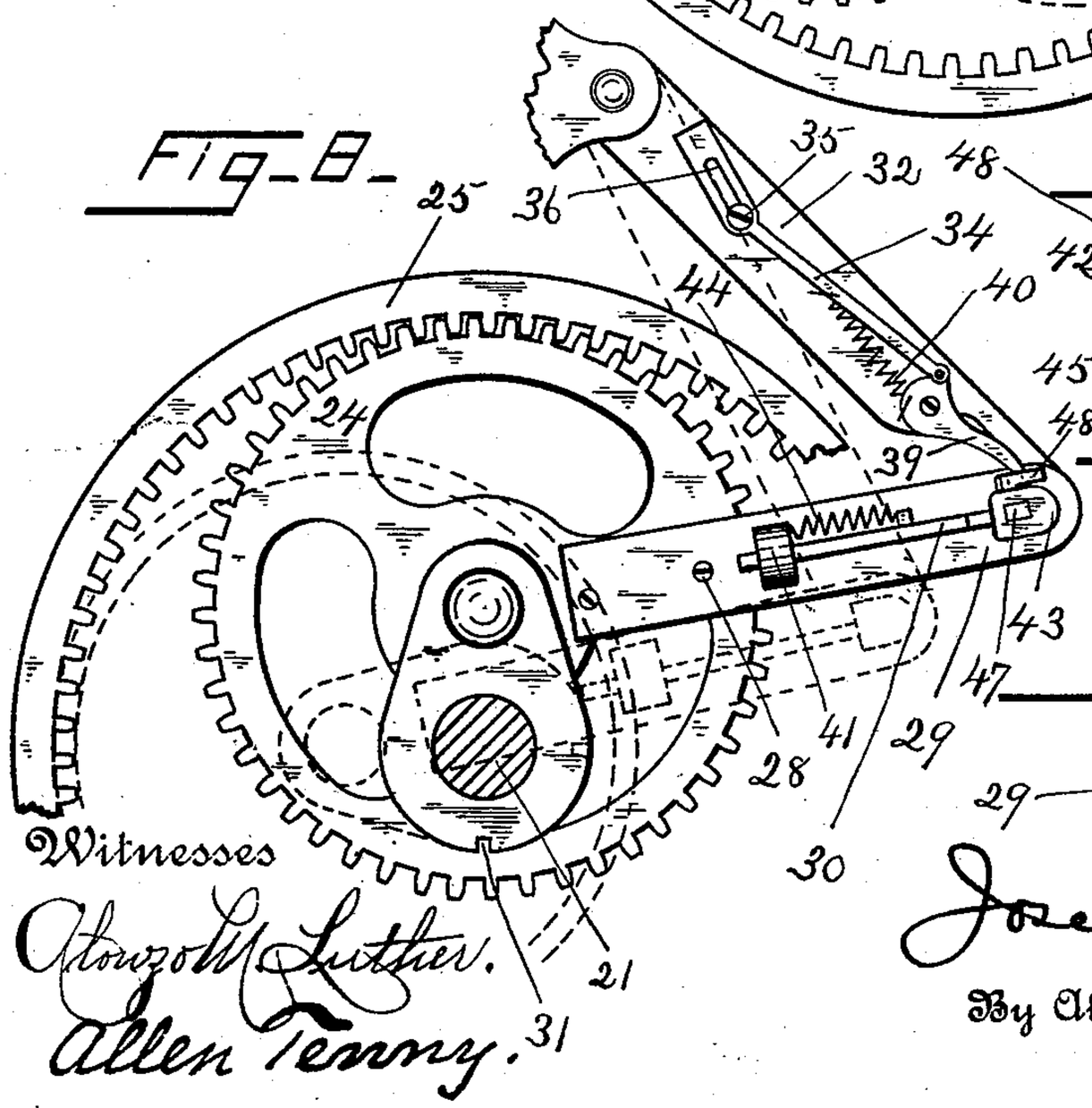


Fig. 10.

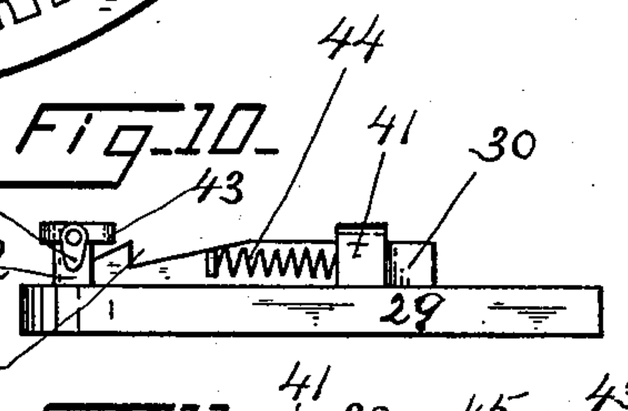


Fig. 11.

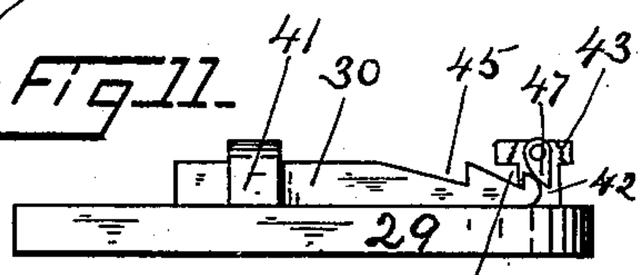
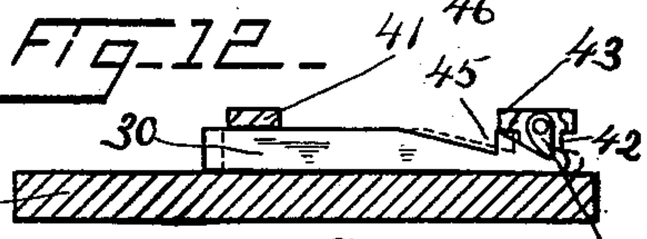


Fig. 12.



Witnesses

Alonzo M. Luther.

Allen Tenny.

Inventor

Joseph W. Prosser,

By Attorney

Frank H. Allen.

UNITED STATES PATENT OFFICE.

JOSEPH W. PROSSER, OF NEW LONDON, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO CHARLES WATROUS AND STANISLAS D. BEAUSHENE, OF LEDYARD, CONNECTICUT.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 507,081, dated October 17, 1893.

Application filed October 7, 1892. Serial No. 448,159. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. PROSSER, a citizen of the United States, residing in the city and county of New London and State of Connecticut, have invented certain new and useful Improvements in Bicycles, which improvements are fully set forth and described in the following specification, reference being had to the accompanying four sheets of drawings.

This invention relates particularly to the driving mechanism of cycles and has for its object the provision of simple differential gearing and clutch mechanism controlling the same, whereby either high power or great speed may be attained. For ordinary use upon level or descending ground great speed is desirable rather than high power and at such times a simple system of sprocket gearing is provided substantially like that now in common use, but when it is desired to climb steep grades, speed is sacrificed to power and a system of gearing is brought into use by means of which the rider is able to immediately bring to his aid powerful gearing, as hereinafter described.

In the drawings hereto annexed Figure 1 is a side elevation of a complete bicycle containing my newly invented driving mechanism. Figs. 2 and 3 are, respectively, side and plan views of the differential gearing and attachments containing the essential features of said driving mechanism, the same being about one half of full size. Fig. 4 is a side view of said differential gearing showing the locking bolt "30" withdrawn to permit the smaller gear "24" to rotate independently of the internal gear "25" with which it meshes. Fig. 5 is a sectional view on line *x*—*x* of Fig. 4. Figs. 6, 7 and 8 illustrate said gearing in different positions, each being duly explained hereinafter. Figs. 10 and 11 are views of the bolt and its supporting arm employed to lock the smaller gear against rotation upon its shaft and Fig. 12 is a longitudinal sectional view of said bolt arm. Fig. 9 is a detached view of the crank-shaft of the cycle and Fig. 13 is a detached view of the body of a certain hook employed to coact with the bolt "30" and its supporting arm.

Referring to the drawings, the figures "20" denote those portions of the frame of a so-called "safety" bicycle in which the crank shaft and sprocket wheel are ordinarily journaled and "21" denotes the said crank-shaft having secured to each end crank arms "22" with pedals "23" of any desired practical form. The middle portion of shaft "21" is formed as a double crank and upon the wrist-pin that connects the outer ends of the webs of said crank is loosely mounted a gear "24" that meshes with the teeth of an internal gear "25" loosely mounted upon shaft "21" between one of said webs and the adjacent frame "20" (see Fig. 5). The outer face or perimeter of said internal gear "25" is formed with sprocket teeth "26" adapted to receive and drive a chain "27" that passes rearward around a sprocket wheel connected with the rear wheel of the bicycle in such manner that when rotary motion is given to the internal gear "25" the chain "27" will cause the rear cycle wheel to be correspondingly rotated.

Secured to the smaller gear "24" by screws "28" is an arm "29" upon which is mounted to slide longitudinally a bolt "30" whose inner end, under certain conditions, may enter a slot "31" in one of the bosses of the described double crank and thus lock together the said crank and gear "24" of which arm "29" is a rigid part. The last named gear being then held against rotation serves to also lock the internal gear against rotation upon its axial shaft "21" and said internal gear becomes practically fixed on said shaft and rotates with it. When used under such conditions the internal gear serves to drive the cycle at the highest speed and is in effect the same as ordinary cycles of this class. When however it is desired to bring into use an increase of power to assist in climbing grades, the bolt "30" is withdrawn from the notch "31" and the smaller gear "24" may then be carried by the double crank around within the internal gear, the small gear being meanwhile restrained from rotating upon its own axis (the wrist pin) by means of peculiar mechanism which I will proceed to describe. This traverse movement of the smaller gear serves to impart to the internal gear "25" a

very much slower movement (proportionate to the relative diameters of the two gears) and increases correspondingly the propelling power produced by a given weight upon the pedals "23." I have already referred to a radial arm "29" which is secured fixedly to the small gear "24." When the end of bolt "30" is in notch "31" said arm swings (with said gear) around the shaft "21" which is then the common center around and with which both gears rotate but when it is desired to utilize the described "high power" mechanism, an arm "32" with hook shaped free end is lowered into the path of the outer end of arm "29" and said arm and its connected gear are stopped; the bolt "30" being at the same instant withdrawn from notch "31."

The arm "32" is hinged to the cycle frame "20" and is of such length that its free (hooked) end may swing upward and downward as indicated in dotted lines in Figs. 4, 7 and 8 to meet the varying positions assumed by the small gear "24" as the latter is carried around within the internal gear. The small gear is thus restrained from revolving upon its own axis but is free to be carried by the double crank around the common center, the shaft "21," and in consequence a slow movement is imparted to the internal gear "25" and to its chain "27." The direction of movement of the gears is shown by an arrow in Fig. 6. In Fig. 2 the parts are shown as arranged for producing the greatest speed, the arm "32" being raised out of the path described by the free end of arm "29" and the bolt "30" being entered in notch "31."

The arm "32" is controlled by a rod "33" that extends upward within easy reach of the rider, as seen in Fig. 1. This operating rod "33" is attached to a bar "34" secured to one side of arm "32" by a screw "35" passing through a slot "36" in said bar in such manner that the bar is movable lengthwise. The free end of arm "32" is formed as a hook "37," the arm being cut away as at "38" to provide an opening of considerable length adjacent to the hook, and at the opposite end of said opening is pivoted a crank-lever or finger whose longer arm "39" may be swung upward into said opening (see Fig. 2) or may be swung outward as in Figs. 4, 6 and 7. The shorter arm of the crank-lever is pivoted to the end of the described bar "34" and a spring "40" is provided that connects said bar with the crank lever in such manner as to throw the lever arm "39" outward (see Fig. 6). When the operating rod "33" is drawn upward by the rider of the cycle, the bar "34" is first moved lengthwise as far as its slot "36" will permit it to go (thus swinging the lever "39" into the opening "38" as in Fig. 8), and continued movement of said rod "33" will then result in lifting the arm "32" away from the end of the bolt-arm "29," as in Fig. 2.

The bolt "30" is supported on the arm "29" at one end by a slotted post "41" through which it passes and at the other (outer) end by a slotted stud "42" having a flange or head "43." A spring "44" connects post "41" with the said bolt and acts with a constant tendency to draw the latter forward into the notch "31."

The outer end of bolt "30" is provided with two notches "45"—"46" the latter of which, when the bolt is forced outward, may be engaged by a dog "47" pivoted in the slot of stud "42" (see Figs. 11 and 12), the said dog then acting as a latch to keep the bolt from entering notch "31." The same pivot that supports the dog "47" bears upon its outer end another dog or operating arm "48," best seen in Fig. 10 which shows the reverse side of the arm "29" and its connected parts.

When the machine is used upon level ground, and speed is desired rather than great power, the hooked arm "32" is raised out of reach of the bolt arm "29" as in Fig. 2. When however it is desired to climb a steep grade, and power is desired rather than speed, the rider grasps the end of rod "33" and forces it downward, resulting, first, in sliding bar "34" upon its pivot screw and swinging the lever arm "39" downward, away from the opening "38," and, second, in forcing the hooked arm "32" downward into the path of the free end of the bolt supporting arm "29." When said bolt-supporting arm is again brought around, the notch "45" of the bolt "30," is engaged by the cam-shaped inner edge of lever-arm "39" (see Figs. 6 and 7) and said bolt is withdrawn from notch "31," thus disengaging the small gear "24" from the shaft "21" and preventing said small gear from further rotation upon its own axis. When the bolt "30" is withdrawn from notch "31" the dog "47" drops into the notch "46" and then acts as a latch to prevent said bolt from locking with its notch until again needed. Continued rotation of the pedal shaft "21" will now simply carry the small gear around within the internal gear "25" and each complete movement of the small gear around the shaft "21" will serve to move said internal gear and its chain forward a distance equal to the difference in the number of teeth of the said gears. If, for example, the internal gear has seventy two teeth and the small gear forty eight teeth each complete circular movement of the latter will move the former forward one third of a revolution. So soon as the bolt "30" is disengaged from the notch "31" and the high power mechanism put to work, the resistance offered by the internal gear, chain, &c., tends to rotate the small gear rearward upon its own axis but at that instant the hooked end of arm "32" comes into play and catches and holds the stud "42" in the end of arm "29" (see Fig. 8) until such time as it is again desired to return to the use of the high speed mechanism. The rider then grasps rod "33" and, pulling it up forcibly, draws the lever arm "39" outward until it engages and rocks

the dog "48" (see Fig. 8). This serves to rock the connected dog "47" to release bolt "30," which is then left to the control of spring "44" which latter immediately draws the bolt inward. When the boss of the double crank again comes around it engages and pushes back said bolt until the notch comes into coincidence with the bolt end when the latter drops into said notch. The resistance due to the meshing contact of the two gears is immediately reversed and the stud "42" leaves the hook of arm "32" and it is carried forward underneath the lever-arm "39," the latter being then in the position illustrated in Fig. 8. The rider then draws rod "33" and the connected arm "32" upward, out of the path of the bolt supporting arm "29," and the high speed mechanism is ready for continued use.

My described differential gearing and the mechanism for controlling the same, are quite simple and in compact form and do not require material changes in the construction of bicycles to which they may be attached.

Having described my invention, I claim—

1. In combination with an interiorly geared sprocket wheel, a smaller gear wheel mounted on a crank and in mesh therewith, a radial arm secured to the smaller wheel and provided with mechanism for locking said smaller wheel against rotation upon its axis, and an arm pivotally secured to the cycle frame for engaging with said radial arm and releasing the locking mechanism, substantially as set forth.

2. In combination with an interiorly geared sprocket wheel, a smaller gear wheel mounted on a crank and in mesh therewith, a radial arm secured to the smaller wheel provided with mechanism for locking the smaller wheel against rotation upon its axis, an arm pivotally secured to the cycle frame for engaging with the end of the radial arm, a finger pivotally secured to said pivotal arm for releasing the locking mechanism and means for moving said pivoted arm and lever, substantially as set forth.

3. In combination with a sprocket-wheel having internal gear teeth a smaller gear in mesh therewith mounted upon a crank with notched boss as set forth, a radial arm "29" secured to said smaller gear, a bolt mounted to slide upon said arm and adapted to enter said notch, and mechanism, substantially as herein described, for locking and releasing said bolt.

4. In combination with an interiorly geared sprocket wheel, a smaller gear wheel mounted on a crank and in mesh therewith, a radial arm secured to the smaller wheel and provided with a locking bolt, the outer end of which bolt is provided with notches, a dog for engaging with the shoulder of one of the notches and provided with an operating arm, a lever pivotally secured to the frame of the cycle and provided with a finger for engaging with the operating arm of the dog, and means for operating the lever, substantially as set forth.

5. In combination with an interiorly geared sprocket wheel, a smaller gear wheel mounted on a crank and in mesh therewith, a radial arm secured to the smaller wheel and provided with means for locking said wheel against rotation upon its axis, a lever pivotally secured to the frame of the cycle, the free end of which is provided with a hook for engaging with the end of the radial arm, and a finger pivotally secured to the lever for engaging with the locking mechanism upon the radial arm, substantially as set forth.

6. In combination with an interiorly geared sprocket wheel, a smaller wheel mounted on a crank and in mesh therewith, a radial arm secured to the smaller wheel and provided with means for locking said wheel against rotation upon its axis, a lever arm pivotally secured to the cycle frame, for engaging with the end of the radial arm, a finger pivotally secured to the lever, a slotted bar upon the lever, one end of which engages with the finger, and means for moving said bar, substantially as set forth.

JOSEPH W. PROSSER. [L. S.]

Witnesses:
ALONZO M. LUTHER,
FRANK H. ALLEN.