No. 661,992. Patented Nov. 20, 1900.

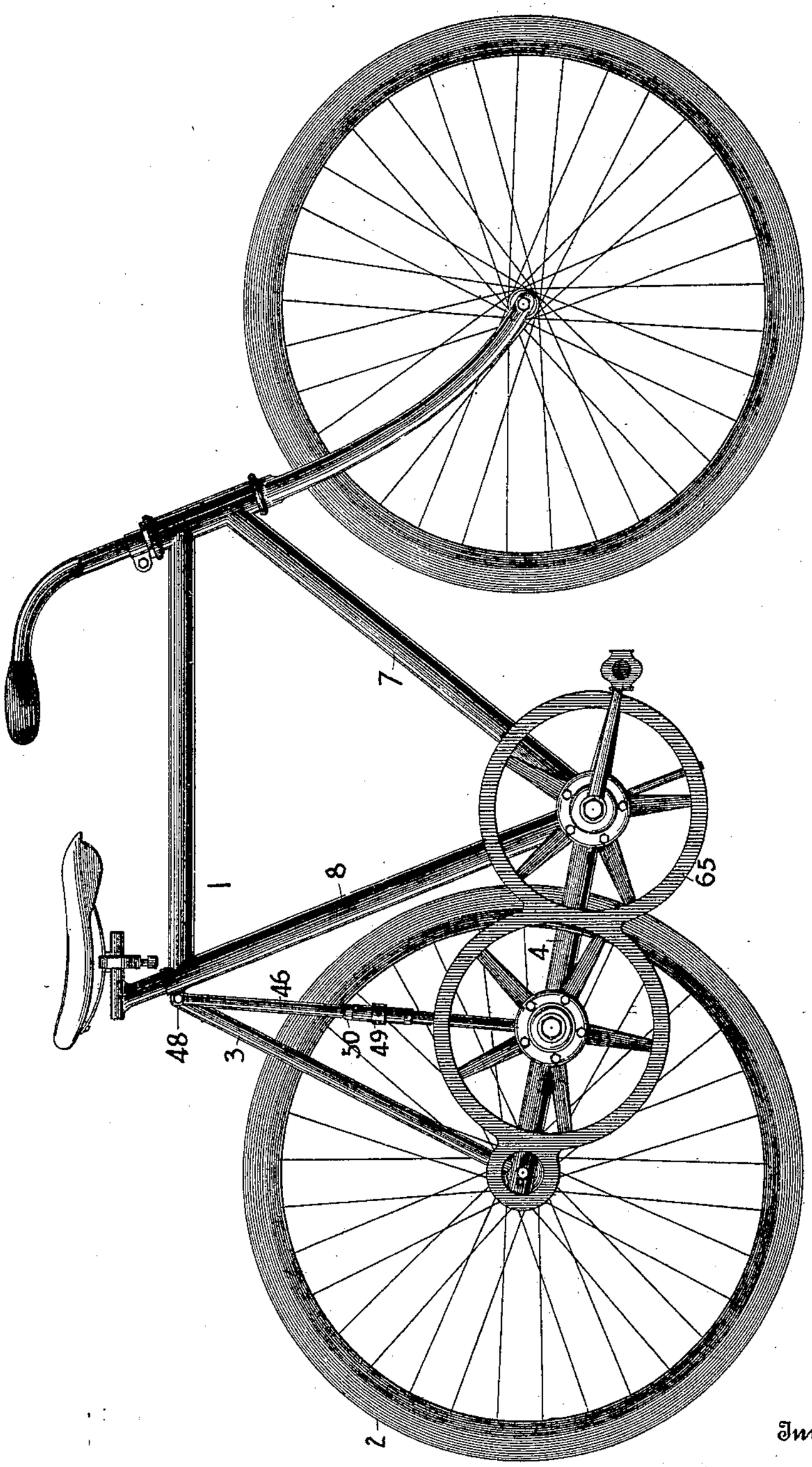
F. B. HUNT.

VELOCIPEDE.

(Application filed May 13, 1899.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.



Witnesses

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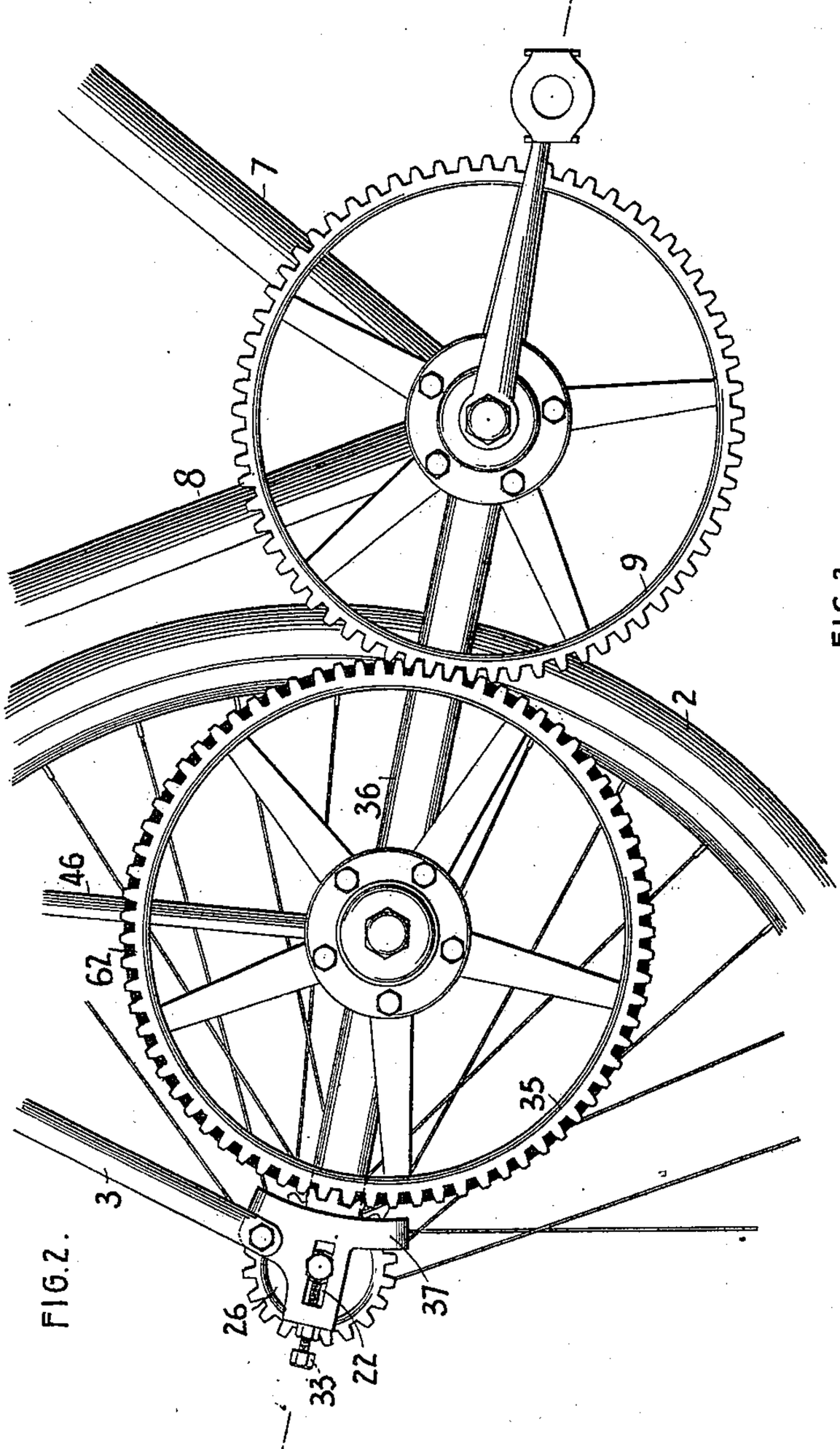

FIG. 2.

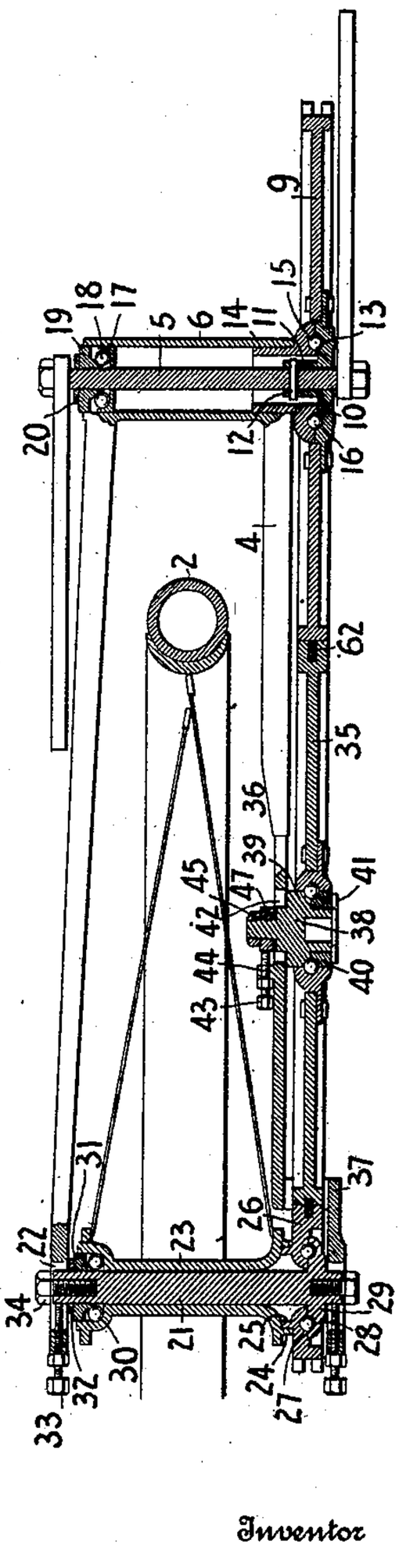

FIG. 3.

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FIG. 4.

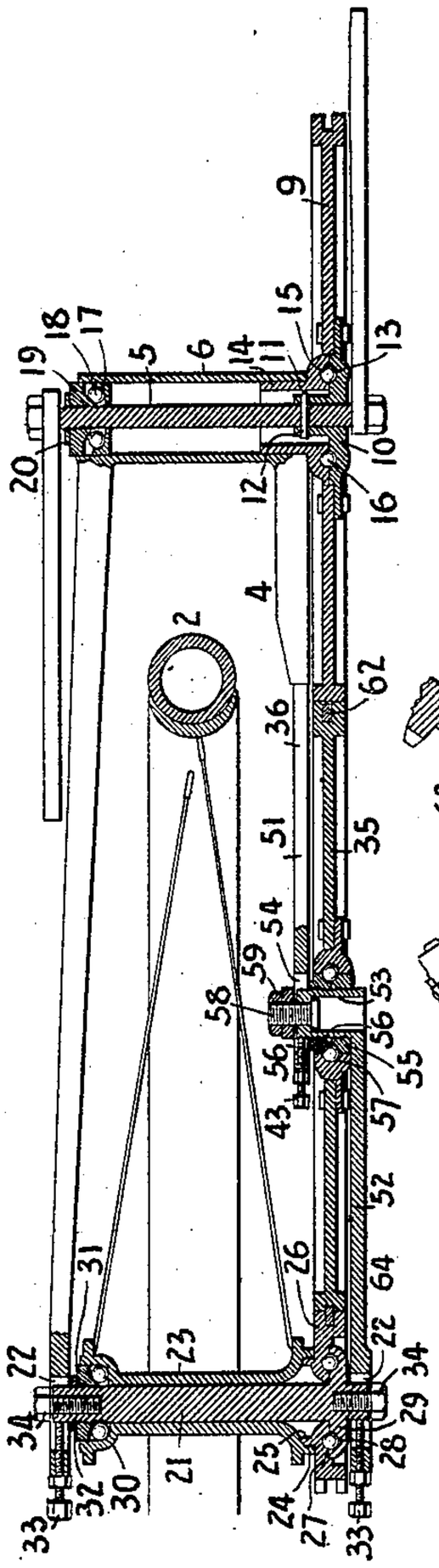


FIG. 5.

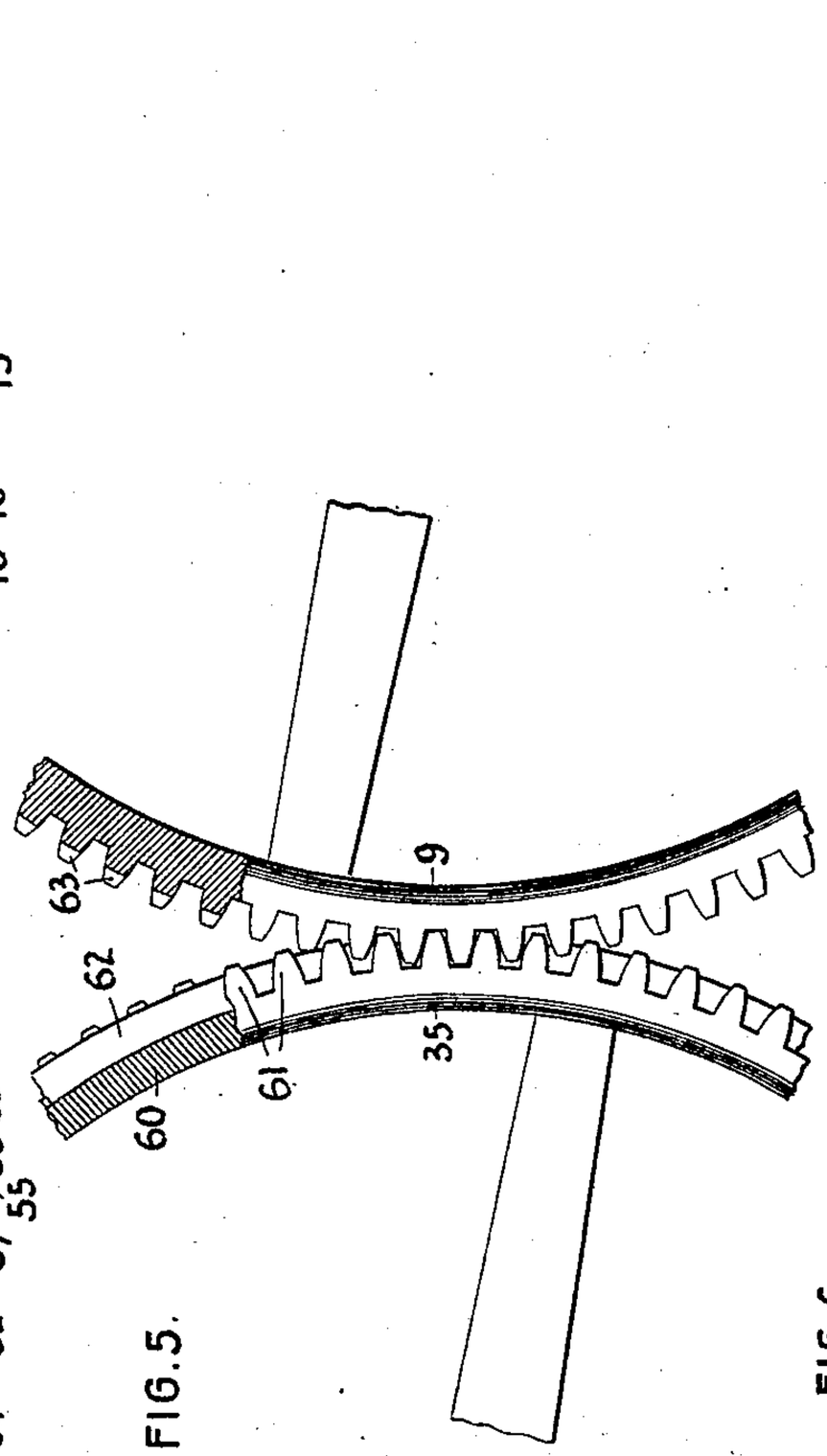
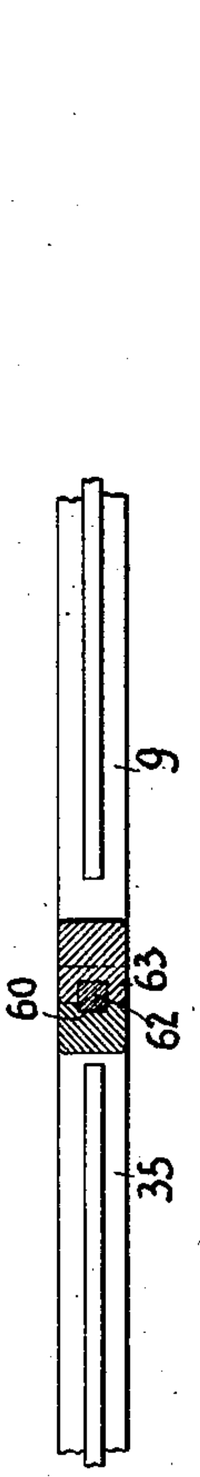


FIG. 6.



Witnesses

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UNITED STATES PATENT OFFICE.

FRANKLIN B. HUNT, OF WASHINGTON, DISTRICT OF COLUMBIA.

VELOCIPEDE.

SPECIFICATION forming part of Letters Patent No. 661,992, dated November 20, 1900.

Application filed May 13, 1899. Serial No. 716,682. (No model.)

To all whom it may concern:

Be it known that I, FRANKLIN B. HUNT, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Velocipedes; and I do 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 the figures of reference marked thereon, which form a part of this specification.

This invention relates to velocipedes and is directed particularly to improvements in the type of such vehicles which are commonly termed "chainless" or which, in other words, are provided with driving mechanism in the form of spur or beveled gearing interposed between the crank-shaft and driving-wheel in contradistinction to the sprocket-gear and chain type of connection.

The utilization of sprocket-gear and chain driving mechanism in connection with foot-propelled vehicles is attended with so many commonly-acknowledged disadvantages compared with the chainless class of machines as to make the latter type highly desirable, inasmuch as practically all of the defects present in the chain construction are in the chainless machines more or less overcome.

The chainless velocipede as at present constructed, and more particularly that type employing the beveled-gear principle of driving mechanism, while possessed of many advantages over chain-machines are nevertheless in many ways imperfect, the principal defect, perhaps, being the tendency to disorder under heavy strain, the quality of lightness of weight, which is necessarily present, precluding proper reinforcement of the parts to remedy this difficulty.

One object of my invention is the production of a chainless velocipede wherein the tendency to disorder under strain is minimized without the sacrifice of lightness and appearance and wherein perfect rigidity and freedom from vibration is obtained even under extraordinary usage.

Another object of my invention is the provision of velocipede driving mechanism of comparatively simple and durable construction which is operated with the minimum of friction and which is, practically speaking, noiseless.

A further object of my invention is the provisions of means, in connection with the driving mechanism, for insuring proper mesh between the gear-wheels thereof and for overcoming the backlash and lost motion usually present in this form of transmitting appliance.

A further object of my invention is the production of a velocipede which is capable of being "geared" to suit the work to be performed and which is attractive in appearance and inexpensive to manufacture.

The nature of my invention will be readily understood by reference to the following detailed description and to the accompanying drawings, in which—

Figure 1 is a side elevation of a bicycle embodying my invention. Fig. 2 is an enlarged elevation of the rear portion of the bicycle, the gear-casing being removed. Fig. 3 is an enlarged horizontal sectional view taken on line 3 3 of Fig. 2. Fig. 4 is a view similar to Fig. 3, showing a modification. Fig. 5 is a further enlarged detail view in elevation, partly in section, of portions of two engaging gear-wheels. Fig. 6 is a further enlarged horizontal sectional view of portions of said wheels.

Referring to the said drawings by numerals, 1 denotes the frame of a bicycle, which type of velocipede is selected for the purpose of illustration. The driving-wheel 2 is mounted at the junction of the upper and lower fork members 3 4, and the crank-shaft 5 is journaled in bearings in the crank-hanger 6, which is located at the junction of the lower fork member 4, lower member 7, and truss 8. Fixedly secured to the crank-shaft, toward one end, is a spur gear-wheel 9, which for convenience will hereinafter be termed the "crank gear-wheel." This wheel is preferably constructed to have a separable hub portion 10, bolted to place, and at the aperture for the shaft said hub portion is provided with a reinforcement in the form of a sleeve 11, through which and the shaft is passed a key 12. Beyond the sleeve 11 the hub portion is provided with a ball-bearing race member 13, preferably in the form of the annular recess shown.

The companion race member consists of a sleeve 14, fitting tightly within the crank-hanger and provided with an annular recess 15, between which and the recess of the race member 13 are confined balls 16. Fitting tightly within the crank-hanger, toward its opposite end, is a ball-bearing race member 17, in the annular recess of which are balls 18. The companion race member is in the form of a ball-bearing apertured cone 19, screwed on the threaded end of the shaft 5. The periphery of the cone beyond the end of the crank-hanger is roughened or squared to permit of its being readily turned to properly adjust both bearings, the adjustment being maintained by the employment of any suitable device for locking the cone against movement, such as the jam-nut 20 shown. It will be understood from this description that the race members 14 and 17 are fixed, while the companion members 13 and 19 are carried by, and hence are rotatable with, the crank-shaft and gear-wheel 9.

The driving-wheel 2 is rotatably mounted on a fixed axle 21, the ends of the axle being reduced and squared and slidably fitted in slots 22, provided toward the ends of the arms of the lower fork member 4. The hub 23 of the driving-wheel is provided at one end beyond the spoke-rim with an internally-threaded flange 24, which is engaged by an externally-threaded sleeve 25, provided about the axle-opening of a spur gear-wheel 26. This wheel 26, which is of relatively small diameter, will hereinafter be termed the "driving gear-wheel." The wheel 26 is provided opposite the sleeve 25 with an annular recess 27, forming a ball-bearing race member, the companion member being a similar recess 28, formed in a collar 29, integral with or fixedly secured to the axle 21. Toward its opposite end the hub 23 is enlarged in diameter to provide a recess 30, forming a ball-bearing race member, the companion member being an apertured bearing-cone 31, screwed on the threaded end of the axle, and hence capable of adjustment in a manner and for a purpose similar to that described with reference to the cone 19. The cone 31 is locked in its adjusted position by any suitable device—as, for instance, a jam-nut 32. The driving gear-wheel 26 is capable of adjustment for a purpose presently to be explained, and to allow of the necessary range of movement the axle is, as before stated, mounted in the slots 22 in the lower fork ends. To obtain the adjustment, screws 33 are passed through the fork-arm ends and turned against the axle, and to maintain the adjusted position screws 34 are inserted into threaded apertures in the axle ends and tightened against the sides of the fork-arms.

Interposed between and meshing with the gear-wheels 9 and 26 is an idler spur gear-wheel 35, through which motion is transmitted from the crank-gear to the driving-gear to propel the machine, it being understood that by the use of this intermediate wheel the pedal-crank and driving-wheel are caused to rotate in the same direction. The idler-wheel 35 is mounted on a bearing preferably carried by one of the arms of the lower fork member 4. In the construction shown in Fig. 3 this arm, which is numbered 36, extends from the crank-hanger rearwardly of the gearing to a point adjacent to the plane of engagement of the wheels 26 and 35, where it is offset for connection with the end of axle 21. This offset is preferably in the form of a yoke 37. The arm 36 may be secured to the crank-hanger in a number of ways; but I prefer the sleeve connection shown, as by it existing velocipedes may be readily modified to embody my invention. The wheel 35 is mounted on a short axle 38, provided with an integral or fixedly-secured ball-bearing cone 39 and beyond the cone with a threaded portion to receive an adjustable ball-bearing cone 40, the cones forming a race member the companion of which is an annular recess provided around the wheel-aperture. The adjusted position of the cone 40 is maintained by a jam-nut 41. At the rear of the cone 39 the axle is reduced and squared to slidably fit a slot 42 in the arm 36. By this construction the wheel 35 is adjustable relative to the wheels 9 and 36, the adjustment being obtained by means of a screw 43, which is passed through a lug 44 on the arm 36 and is turned against the axle.

45 is a nut screwed on the threaded inner end by the axle to maintain the adjusted position of the wheel 35.

The arm 36 is ribbed to obtain proper rigidity, and to further strengthen the arm at its slotted portion I preferably employ a brace in the form of a rod 46, provided toward its ends with eyes, one of which, 47, engages the inner end of the axle 38 between the squared portion and the nut 45, while the other eye, 48, preferably engages the bolt which is employed to secure the arms of the upper rear fork to the truss. The rod 46 to be adjustable in length is made in two sections and connected by a turnbuckle 49, and jam-nuts 50 are employed to maintain the adjustment. The rod 45 may extend from the arm 36 to any portion of the frame other than the junction between the truss and upper rear fork. The employment of this arm insures absolute rigidity in the support for the wheel 35 and overcomes the tendency to vibration even under extraordinary strain.

In the construction illustrated in Fig. 4 the arm 36 is formed in two sections, one of which, 51, extends from the crank-hanger rearwardly of the gearing to a point beyond the center of the wheel 35, while the other section, 52, extends forwardly from the driving-wheel axle 21 at the outer side of the gearing a distance sufficient to overlap the end of section 51, the sections being parallel with each other and with the gear-wheels, as shown. The axle 53 for the wheel 35 is carried by the section 52

and is provided with a squared portion adjustably engaging a slot 54 in the end of the section 51. The bearing for the wheel 35 consists of a fixed cone 55 and an adjustable cone 56, carried by the axle, and an annular recess 57, provided in the wheel 35 around the aperture for the axle. The adjustment of the wheel 35 is effected by turning a screw 43 in the end of the section 51, and a bolt 58 and nut 59 are employed to secure the parts in adjusted position.

In both of the constructions exhibited in Figs. 3 and 4 it will be observed that the bearings for the three gear-wheels are in alinement and are disposed centrally with reference to the wheel sides, whereby direct pressure on the bearing-balls is obtained and all tendency to side motion of the wheels is practically overcome.

Referring now more particularly to Figs. 5 and 6, wherein is shown means for effecting in a practically noiseless manner the engagement free from backlash and lost motion between the teeth of the gear-wheels, 60 denotes an annular groove or channel formed through the teeth 61 of the idler gear-wheel 35 at a right angle to their working faces or sides and preferably midway between the sides of the wheel-rim. In this groove or channel is a circumferential band or ring 62 of yielding material—such as rubber, leather, rawhide, or their equivalent—the band or ring being preferably secured in a manner to permit of its being removed and replaced, if desired. The groove or channel preferably extends to a point slightly below the base of the teeth 61, and the band is of such dimensions as that it completely fills the groove transversely and extends to a point beyond the pitch-circle, which point or line is governed by the nature of the material of which the band is composed. Similar grooves or channels 63 64 are respectively formed through the teeth of the crank gear-wheel 9 and driving gear-wheel 26, the grooves or channels, however, terminating, preferably, above the base of the teeth, as shown. The depth of the grooves or channels of wheels 9 and 26 is with relation to the normal periphery of the band such that the latter is put under compression by its contact or engagement with the base of the grooves or channels 63 64, whereby not only is there obtained an effective frictional engagement between the wheels of the gearing, in addition to the interlocking of the teeth thereof, but under compression the band is forced outwardly at each side and by entering the spaces between the flanking teeth and wedging against the sides of the groove or channel it is thus held firmly against tendency to slip along the latter. The frictional engagement between the respective gears is due to the pressure exerted by the band against the base of the teeth in the outside wheels and also by the engagement of the sides of the band with the base and sides of said grooves, and under ordinary conditions this frictional engagement suffices to transmit the motion from one wheel to another, thereby materially relieving the teeth of work and consequently wear. Under extraordinary conditions the engaging teeth of the respective wheels are brought into coöperation with the band and engaging grooves, so that by the construction transmission is effected by the combined operations of spur and frictional gearing in a manner which entirely avoids backlash and lost motion and renders the machine practically noiseless. The band may be of any relative size in cross-section and may be employed in connection with teeth the form of which differs from that shown. Moreover, I do not confine this part of my invention to its use in connection with spur-gearing, and I may, if desired, employ more than one band to a wheel.

The means for adjusting the gear-wheels relative to each other are provided for the purpose of securing proper mesh between the teeth thereof and for regulating the degree of compression of the band and consequently the amount of friction necessary to produce the best results. Such adjustment is also desirable in case of wear, although by the employment of the band and engaging grooves wear of the parts, if any, is confined to the band, and this, as before stated, may be readily replaced.

The peripheries of the gear-wheels are covered and concealed by a casing 65, which is supported by the frame in any convenient manner.

I have for the purpose of illustration exhibited my invention as embodied in a bicycle, but I wish it understood that I do not confine myself to such an embodiment, nor do I limit myself to the details of construction shown and above described, as many changes may be made without departing from the spirit of my invention.

I claim as my invention—

1. In a velocipede, a crank-shaft, a spur gear-wheel on said shaft, a driving-wheel, a spur gear-wheel rotatable with the driving-wheel, a spur gear-wheel intermediate of and engaging the aforesaid gear-wheels said intermediate gear-wheel having a circumferential groove extending through the teeth at a right angle to the base thereof, a yielding band seated in the groove and having a depth sufficient to bring it beyond the pitch-line of the teeth and engage circumferential recesses in the crank and driving gear-wheels, which recesses extend approximately to the pitch-line of the teeth of said wheels whereby the band is compressed and expanded laterally between the teeth of the crank and driving gear-wheels, a support for the intermediate gear-wheel provided with an offset portion, and means for adjusting the intermediate gear-wheel and the driving-wheel and gear-wheel on said support.

2. In a velocipede, a power-shaft having means for its rotation, a gear-wheel on said

shaft, a driving-wheel, a relatively small gear-wheel rotatable with the driving-wheel, a gear-wheel intermediate of and engaging the aforesaid gear-wheels, an arm extending from the power-shaft support rearwardly and thence by an offset forwardly of the gear-wheels and having adjustable connection with the axle, an axle for the intermediate gear-wheel having a squared portion occupying a slot in the arm and a threaded stud beyond said squared portion, an adjustable brace-rod connected at one end to the stud and at its other end to a portion of the frame, an adjusting-screw to adjust the intermediate gear-wheel with relation to the crank gear-wheel, and a binding-nut on the stud to maintain the adjusted position of the parts.

3. In combination in a velocipede, a gear-wheel on the crank-shaft, a gear-wheel on the drive-wheel shaft and an intermediate engaging gear-wheel, a hub-bearing axle for the latter wheel having a square neck terminating in a screw-stem, an arm connecting the crank-hanger and the drive-wheel shaft, and having a slot engaging the square neck of the hub-bearing axle to prevent its rotation, said arm terminating in a loop-formed yoke, provided with a slot engaged by the square end of the drive-wheel shaft, a frame member having a slot engaged by the other end of the drive-wheel shaft, and a screw-bolt in the slotted yoke and in the end of the frame member engaging the ends of the drive-wheel shaft, a brace-rod having eyes engaging the screw-stem of the bearing hub-axle and the frame, a screw-bolt engaging a screw-lug on the arm and the eyed end of the brace-rod which engages said screw-stem, screw-bolts firmly clamping the said slotted parts to the shaft and a nut firmly clamping said slotted arm to the axle.

In testimony whereof I affix my signature in presence of two witnesses.

FRANKLIN B. HUNT.

Witnesses:
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W. T. NORTON.