No. 617,635. Patented Jan. 10, 1899.

K. BROOKS.

CHAINLESS BICYCLE GEAR.

(Application filed Nov. 20, 1897.)

(No Model.) 2 Sheets—Sheet 1.

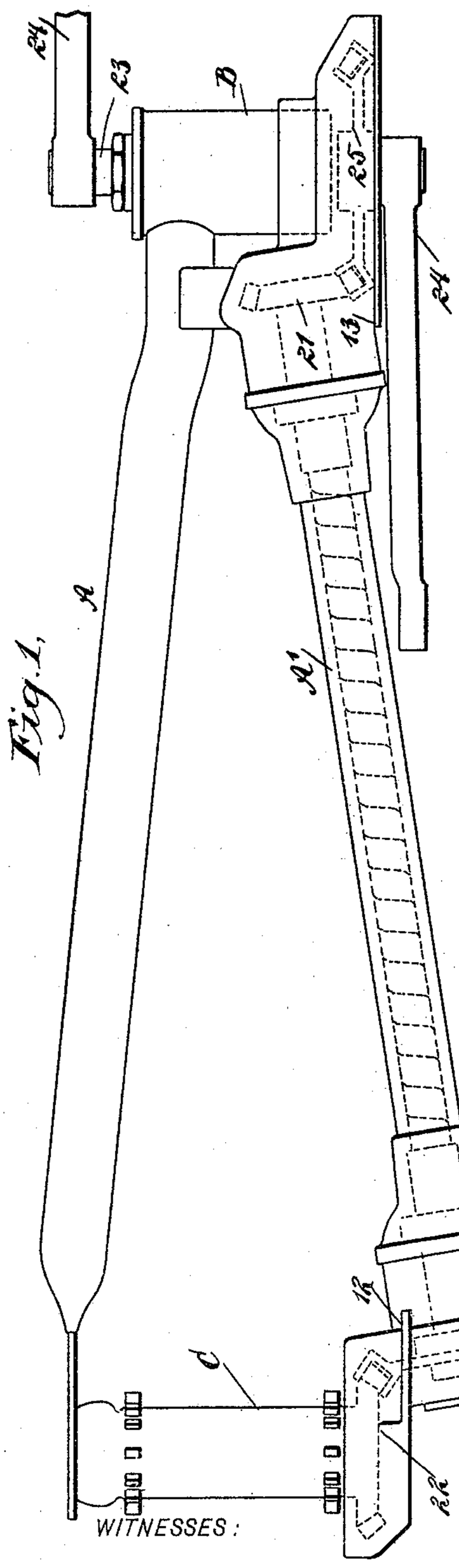

Fig. 1.

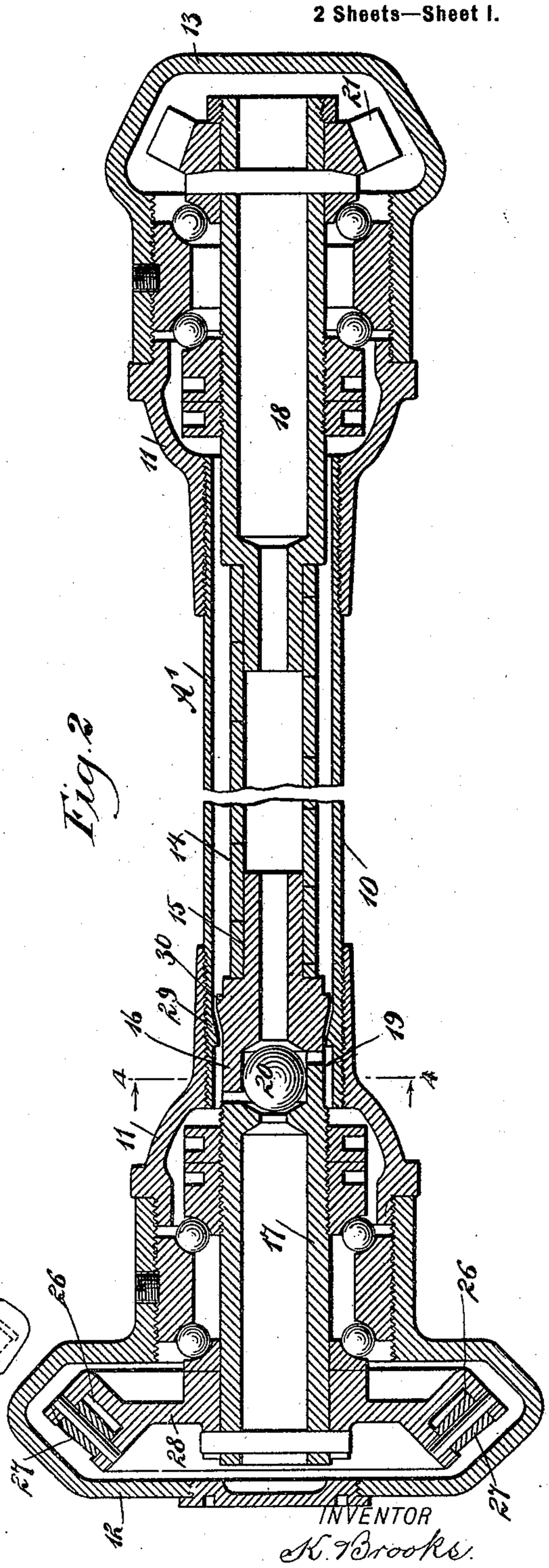

Fig. 2.

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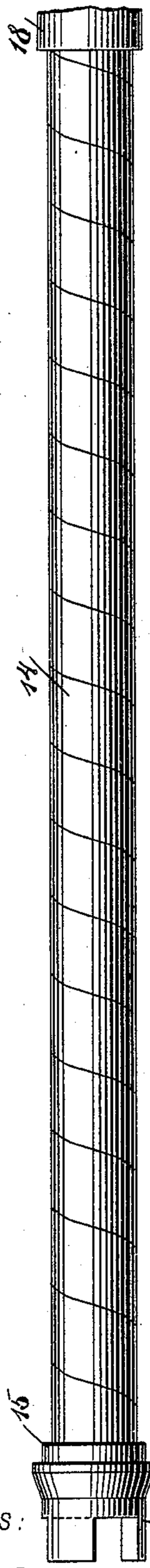

Fig. 3.

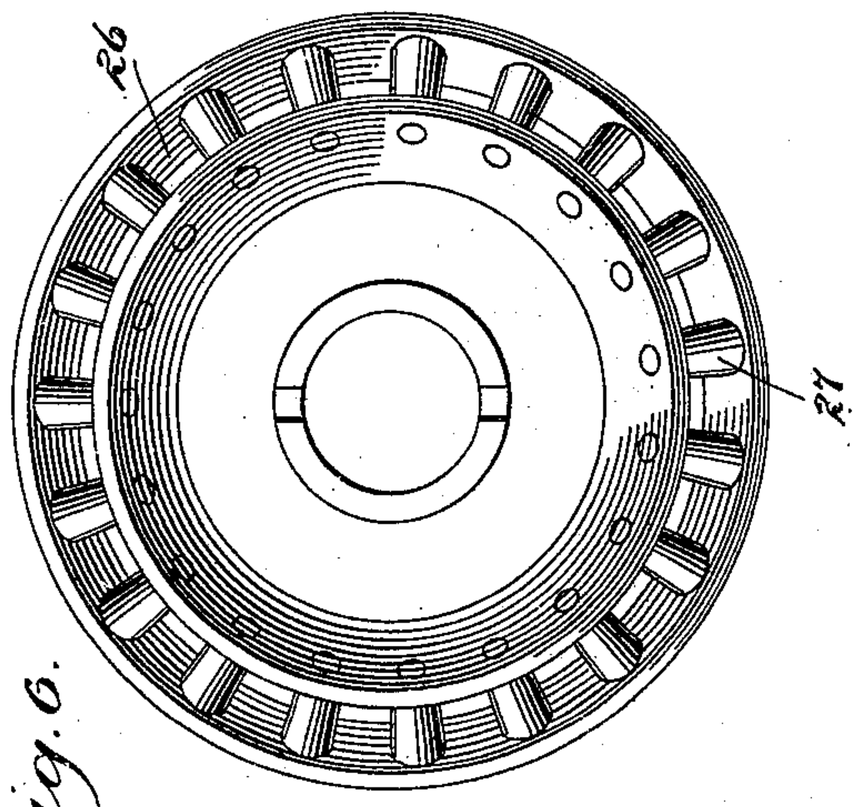

Fig. 6.

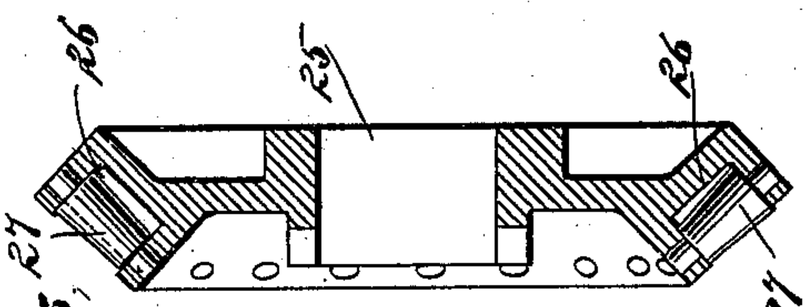

Fig. 5.

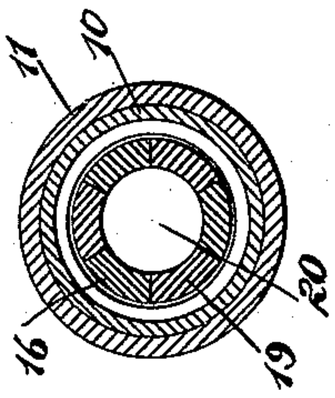

Fig. 4.

WITNESSES:

Edward Thorpe.

J. Fred Acker.

INVENTOR

K. Brooks.

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

KARMELL BROOKS, OF NEW YORK, N. Y., ASSIGNOR TO KATE BROOKS, OF SAME PLACE.

CHAINLESS BICYCLE-GEAR.

SPECIFICATION forming part of Letters Patent No. 617,635, dated January 10, 1899.

Application filed November 20, 1897. Serial No. 659,259. (No model.)

To all whom it may concern:

Be it known that I, KARMELL BROOKS, of New York city, in the county and State of New York, have invented a new and Improved Chainless Bicycle-Gear, of which the following is a full, clear, and exact description.

The object of the invention is to provide a simple, durable, and economic chainless driving device for bicycles and similar machines and to so construct the device that it will compensate for any deflection of the frame and under every condition of ordinary use will not disturb the proper relation between the driving-gears employed.

A further object of the invention is to provide an improved driving mechanism for bicycles and like machines which will be easier in operation and far more durable than other mechanisms of a similar character at present in use and with which there will be comparatively no lost motion.

A further object of the invention is to provide a spring or flexible shaft adapted to carry the gears and which will, as above stated, allow for any deflection of the frame, overcoming one of the principal objections to chainless driving-gears as now employed.

It is also an object of the invention to so construct the improved driving mechanism that a rider will experience great relief in the use thereof by reason of the spring-shaft acting as a cushion to take off "that great jar" so noticeable in pedaling over uneven surfaces machines having the ordinary driving mechanisms applied.

A further improvement consists in the brake, which is exceedingly simple, is thoroughly protected, and may be brought into instant action by back-pedaling, the brake being so constructed that the moment back-pedaling ceases the brake is taken out of action.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of the rear fork and crank-hanger of a bicycle-frame, together with the hub of the rear wheel, illustrating the application of the improved driving mechanism to the frame. Fig. 2 is a longitudinal section through the member of the back fork to which the improved driving mechanism is applied. Fig. 3 is a side elevation of the spring-shaft employed in the improved driving mechanism. Fig. 4 is a vertical transverse section taken practically on the line 4 4 of Fig. 2. Fig. 5 is a vertical section through one of the roller or conical gears employed, and Fig. 6 is a face view of the gear shown in Fig. 5.

A and A′ represent the rear fork of a bicycle-frame, the members of the rear fork being connected in any suitable or approved manner with a crank-hanger B. The hub C of the rear wheel of the bicycle is journaled in any desired manner in the members of the said rear fork. The member A′ of the rear fork contains the major portion of the improved chainless driving device. The aforesaid member A′, as shown particularly in Fig. 2, comprises a tube 10, enlarged end members 11, screwed or otherwise secured to the tube, and hoods or casings 12 and 13, secured to the enlarged portions 11 of the said member, the hood or casing 12 at the rear of the member A′ of the frame being preferably larger than the hood at the front or that which is adjacent to the crank-hanger B. Both hoods 12 and 13 are usually of angular formation, the rear hood 12 receiving the end portion of the hub C of the rear wheel and a portion of the forward hood 13 receiving the pedal-shaft journaled in the crank-hanger B. A spring or flexible shaft 14 is held to turn in the body-tube 10 of the fork member A′ of the frame. This shaft is constructed of spring metal twisted upon itself to form a continuous spiral section, whereby when tension on said shaft is exerted in one direction the shaft will expand and when tension is exerted in an opposite direction the shaft will contract.

At the rear end of the flexible shaft 14, which is shown best in Fig. 3, a head 15 is securely fastened, and said head is provided with a series of segmental spurs 16, projected horizontally from its outer end. A coupling is provided for each end of the spiral or flexi-

ble shaft 14, the couplings being designated, respectively, as 17 and 18. The coupling 18, which is preferably that at the forward end of the flexible shaft, is securely fastened to the shaft, while the coupling 17, which is at the rear end of the shaft, is provided with segmental projections or spurs 19, arranged to interlock with the spurs 16 on the shaft-head 15, and the interlocking connection is such that while the coupling 17 must turn with the shaft the shaft can have end movement relative to the coupling 17 or may be contracted or expanded without disengaging from said coupling.

Both couplings 17 and 18 are provided with ball-bearings located within the hoods 12 and 13. One or more balls 20 are located within the head 15 of the flexible shaft and the coupling 17 where said points connect, as shown in Fig. 2. A conical gear 21 is securely fastened upon the forward end of the forward coupling 18, and a like gear 22 is secured to the hub of the rear wheel C. The crank-shaft 23 is provided with the usual pedal-arms 24, and on the said crank-shaft 23 a conical gear 25 is secured of peculiar construction, the gearing being adapted to engage with the forward gear 21, connected with the flexible shaft, the shaft-gear 21 being usually of less diameter than the gear 25. The gear 25, instead of being provided with fixed teeth, as is usual, has its beveled surface provided with a channel 26, as shown in Figs. 5 and 6, and in the said channel rollers 27 are mounted to turn, the said rollers being shaped and adapted to enter the spaces between the teeth of the smaller or shaft gear 21, and a gear 28, similar to the gear 25, just described, is secured upon the rear end of the rear coupling 17 of the flexible shaft, the rollers of this latter gear being arranged to enter the spaces between the fixed teeth of the smaller gear 22, attached to the hub C of the rear wheel. It will thus be observed that the entire driving device is within a casing and is therefore protected from dust and the weather.

The improved driving device is provided with a simple, readily-applied, durable, and efficient brake. The brake is also within the member A′ of the rear fork and is therefore protected from the weather and from dust. This brake, as particularly shown in Fig. 2, is constructed by forming an annular projection 29 upon the inner surface of the tube 10, the said projection being provided with an inclined inner surface, while upon the head 15 of the flexible shaft a corresponding annular projection 30 is formed, also inclined, but in a reverse direction to the inclination of the inner projection 29 of the said tube. Ordinarily the two projections 29 and 30 are out of engagement, as shown in Fig. 2, and the driving mechanism may be operated at such time to propel the machine; but the moment that the brake is needed the rider, through back-pedaling, will expand or lengthen the flexible shaft and will cause the two inclined or braking surfaces 29 and 30 to be brought almost instantly into contact with each other, preventing the flexible shaft and attached gears from rotating.

It is evident that the flexible shaft 14 will compensate for any deflection of the frame, and that under almost every condition met with in riding a bicycle mating gears will be constantly in mesh, enabling a rider at all times to have full control of the machine and to obtain a maximum amount of power. It is furthermore evident that by the use of the flexible shaft a rider will be far more comfortable than if a non-yielding driving-shaft were employed or an ordinary chain driving mechanism were used, since the spring-shaft acts to cushion and to take off that great jar so noticeable in pedaling machines having the usual driving mechanism over uneven surfaces. It is furthermore evident that the moment back-pedaling ceases the brake will be taken out of action.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a driving device for bicycles and similar machines, a driving-shaft capable of expansion and contraction, gearing for the same, and a brake operated by the expansion or contraction of the said driving-shaft, substantially as specified.

2. In a driving device for bicycles and similar machines, a casing, a driving-shaft capable of expanding and contracting longitudinally and mounted to turn in said casing, gearing for the said shaft, and contact-surfaces on the said shaft and casing adapted to engage with each other when the shaft is expanded or lengthened, substantially as set forth.

3. In a driving device for bicycles and similar machines, a casing, a flexible driving-shaft comprising a spiral coil within the casing, gearing for the shaft and a brake operated by the expansion or contraction of the shaft, as set forth.

4. In a driving mechanism for bicycles and similar machines, a casing, a flexible driving-shaft mounted to turn within the casing and capable of expansion and contraction longitudinally, a coupling secured to one end of said flexible shaft, a second coupling having interlocking connection with a head at the other end of the shaft to permit of movement of the said end of the shaft relative to the coupling, gears carried by the said couplings, and braking-surfaces brought into engagement by the said movement of the driving-shaft, substantially as shown and described.

5. In a driving-gear for bicycles a casing, a shaft constructed of spring material coiled upon itself to form a continuous spiral member, and mounted to turn within the casing, a coupling rigidly secured to one end of said shaft, a head secured to the other end and provided with a series of segmental spurs projected horizontally from the outer end, a sec-

ond coupling provided with segmental projections or spurs arranged to interlock with the spurs on the shaft-head whereby longitudinal expansion or contraction of the shaft is permitted, gears carried by the said couplings, roller-bearings for the couplings within the said casing, and one or more balls located within the head of the flexible shaft and the coupling having interlocking connection therewith at the point where said head and coupling connect, as and for the purpose specified.

6. In a driving-gear for bicycles, the combination, with a casing, a flexible shaft mounted to turn within the said casing, constructed of spring metal twisted to form a continuous spiral member, a coupling secured to one end of the said shaft, a second coupling having interlocking engagement with the opposite end of the said shaft, a projection formed upon the said shaft near its interlocking end, and a mating projection formed upon the inner surface of the casing, whereby a brake for the shaft is formed when the two inclined surfaces are brought in contact with each other, for the purpose set forth.

7. In a driving-gear for bicycles, the combination, with a casing, a flexible shaft capable of expansion and contraction mounted to turn within the casing, a coupling secured to one end of the shaft, a head attached to the opposite end of the shaft, and a second coupling having interlocking connection with the said head, of an inclined annular surface formed upon the exterior of the said head, and an oppositely-inclined surface formed upon the inner face of the casing, arranged when the shaft is expanded to engage with the inclined surface on the head of the said shaft, as specified.

8. In a driving-gear for bicycles, the combination with a casing, and a flexible shaft capable of end expansion and contraction and held to turn in the said casing, the said shaft being provided with a head having a surface arranged for breaking engagement with the inner surface of the casing, of a coupling secured to one end of the said shaft, a second coupling having interlocking engagement with the opposite end of the said shaft, and gears secured upon the said couplings, as and for the purpose specified.

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Witnesses:
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