No. 707,872. Patented Aug. 26, 1902.

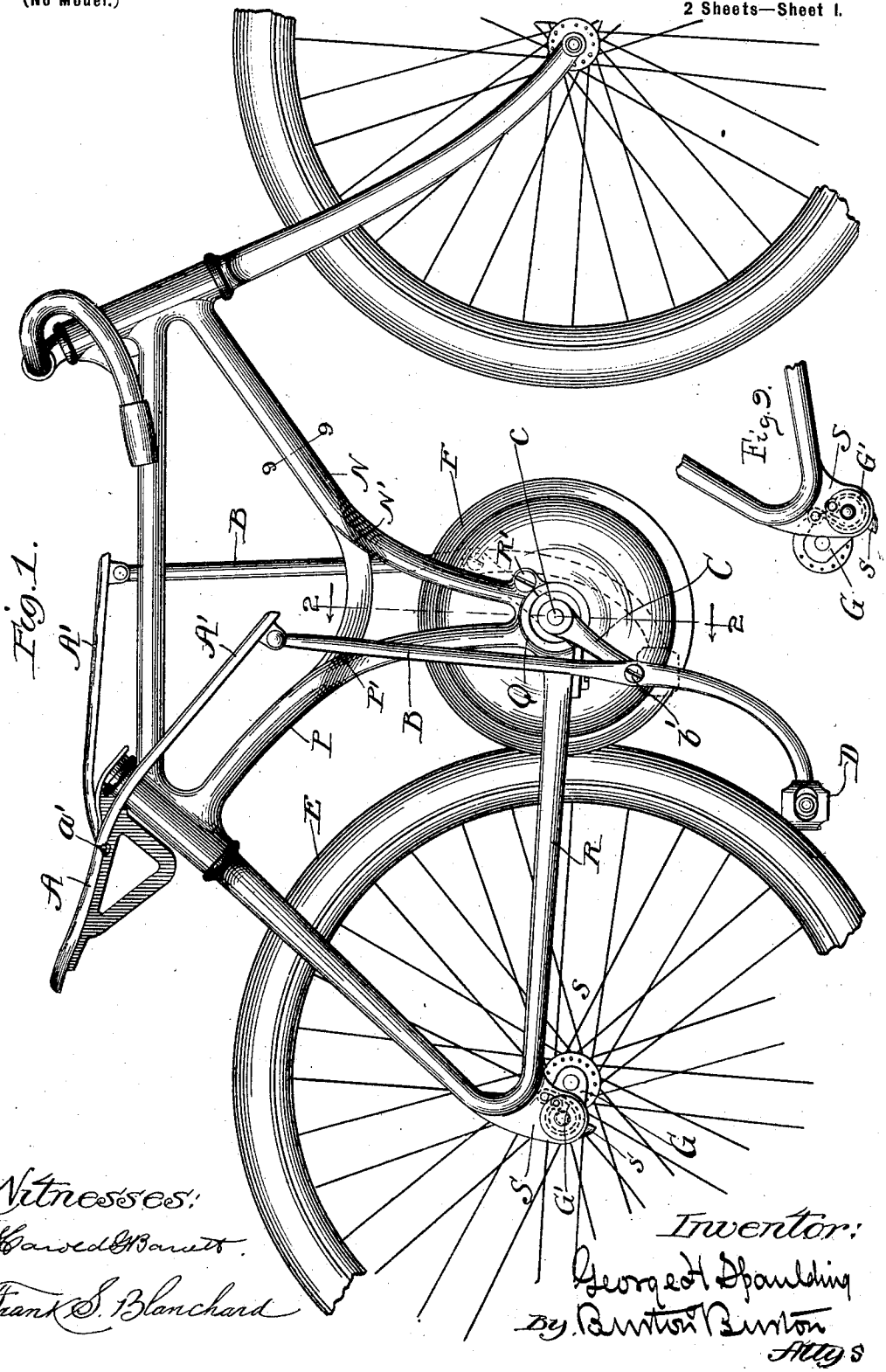
G. H. SPAULDING, Dec'd.

L. L. SPAULDING, Administratrix.

BICYCLE DRIVING MECHANISM.

(No Model.) (Application filed Mar. 30, 1900.)

2 Sheets—Sheet 1.



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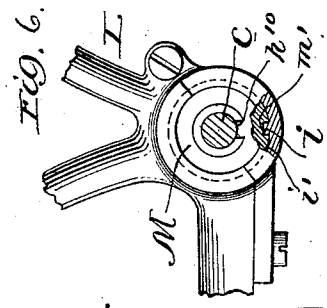
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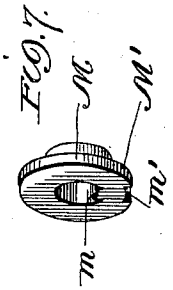
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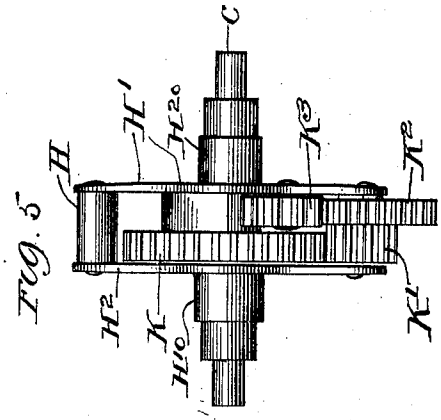
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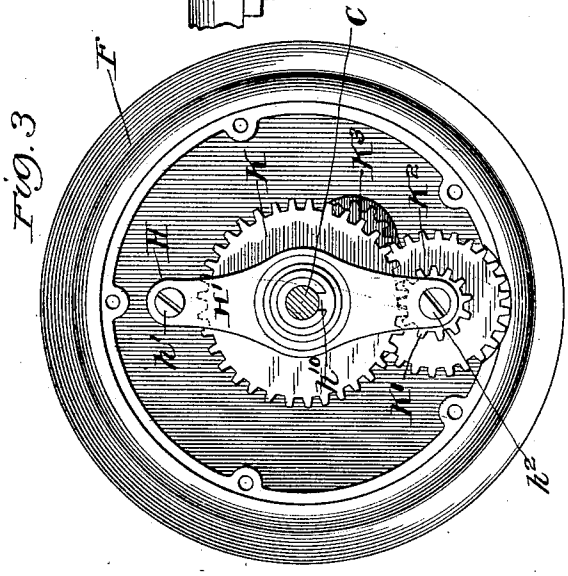
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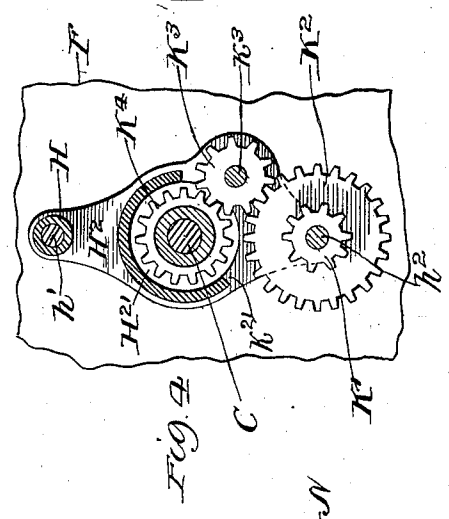
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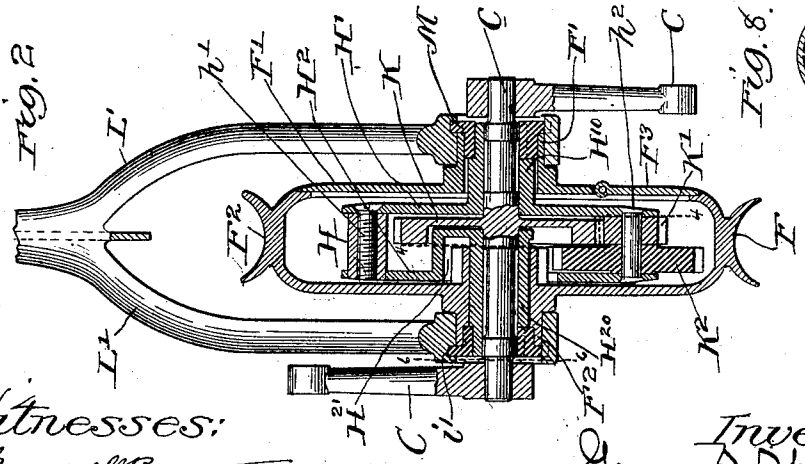


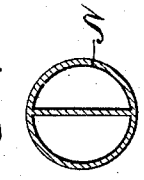












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UNITED STATES PATENT OFFICE.

GEORGE H. SPAULDING, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO GEORGE NIEDERMAIER, OF CHICAGO, ILLINOIS; LOIS L. SPAULDING ADMINISTRATRIX OF SAID GEORGE H. SPAULDING, DECEASED.

BICYCLE DRIVING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 707,872, dated August 26, 1902.

Application filed March 30, 1900. Serial No. 10,745. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. SPAULDING, a citizen of the United States, residing at Chicago, county of Cook, State of Illinois, have invented certain new and useful Improvements in a Bicycle Driving Mechanism, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

In the drawings, Figure 1 is a side elevation of my improved bicycle. Fig. 2 is a section at the line 2 2 on Fig. 1 through the axis of the crank-shaft. Fig. 3 is a side elevation of the speed-train and the case in which it is contained with the movable side detached. Fig. 4 is an enlarged detail section of the speed-gearing frame, showing a portion of the train therein as at the line 4 4 on Fig. 2. Fig. 5 is an edge elevation of the speed-gearing frame and train therein, including the prime-motor shaft or crank-shaft, which extends through the frame. Fig. 6 is a detail side elevation of the crank-shaft bearing, the crank-shaft itself being shown in section, the view being as at the line 6 6 on Fig. 2. Fig. 7 is a perspective of the coupling which connects the speed-gearing frame to the bicycle-frame. Fig. 8 is a detail section through the frame at the line 9 9 on Fig. 1. Fig. 9 is a detail side elevation of the central portion of the rear drive-wheel and connections, showing the modification in the manner of locating the links connecting the drive-wheel to the frame.

My invention relates to the speed-gear train and the construction by which the case of that train becomes the means of communicating power to the drive-wheel and specifically in the preferred form of construction illustrated becomes a friction-pulley operating upon the periphery of the drive-wheel to communicate power thereto.

It consists in the speed-gearing frame and a speed-train whose wheels are journaled in or on such frame, the prime-motor shaft or crank-shaft *c* being journaled in said frame and the prime wheel K of the motor-train being fixed on the crank-shaft between the bearings of the latter in the frame, a gearing-case F (which is the friction-pulley above mentioned) inclosing the speed-gear frame and train and apertured at the center, so that it may be journaled concentrically about the crank-shaft, which extends out through its said opening, and so that also through said opening connection may be made from the rear frame within the case to the bicycle-frame outside the gear-case, said frames being non-rotatably connected together and the last wheel of the speed-gear train being rigid and concentric with the gearing-case on the inner side thereof. In the specific construction which I have shown, which has certain advantages, as will be pointed out, this speed-gear train comprises two side plates H′ H², which are connected at points remote from the center by bolts *h′ h²*, said plates having at their centers trunnions H¹⁰ and H²⁰, respectively, which are hollow and afford journal-bearings for the crank-shaft *c*. The gearing-case F has also hollow trunnions F′ and F², through which the hollow trunnions H¹⁰ and H²⁰ of the gearing-frame extend, and said gear-frame trunnions are non-rotatably connected to the fork-arms L′ L′ of the crank-hanger fork of the frame L by means of couplings M M, which engage such fork-arms beyond the ends of the trunnions F′ F′ of the case and also extend within said trunnions and afford interior bearings for the same, said case-trunnions being exteriorly journaled also in the said fork-arms L′. In the specific construction shown it will be noticed also that all the wheels of the speed-gear train are between the plates H′ and H² of the speed-gear frame. This train comprises the prime wheel K, already mentioned, which meshes with the pinion K′, rigid with the gear K², and both journaled on the bolt *h²*, which connects the two side plates H′ H², the pinion K³, journaled on the stud-bolt *k³*, rooted in the plate H′ and meshing with the last pinion K⁴, which is rigid and concentric, as stated, with the gearing-case F on the inner wall thereof. The location of all the wheels of the train between the side walls or plates of the speed-gearing frame necessitates some provision for rooting the trunnion on the side of said frame at which the last pinion K⁴ is located and formed rigidly with the case in

the substance of the gearing-frame at a point inward beyond the point of said pinion, and for this purpose I form in the plate H^2 a pocket H^{21}, in which the pinion K^4 is located, the trunnion H^{20} at that side extending from the bottom of that pocket through the pinion K^4, said pocket being cut away at one side at the point h^{21} to permit the pinion K^3 to extend into said pocket and intermesh with and drive the case F to cause it to operate as a friction-pulley to actuate the drive-wheel, as above described. The coupling M, which I employ as the means of connecting the speed-gear frame non-rotatably with the bicycle-frame, has for this purpose an interior spline or feather m, which engages with a corresponding groove h^{10} in the outer surface of the outer portion of the trunnion, and at its outer periphery said coupling has a notch m', which engages a spline or tooth l, which projects into the groove l', in which the flange M′ of the coupling is seated and by which it is engaged with the fork-arm, so as to be longitudinally fixed, the engagement of the notch and tooth above described causing it to be non-rotatably fixed in the fork-arm.

It will be seen that the construction above described requires or renders desirable a bifurcated crank-hanger having a deep crotch between its fork-arms to allow room for the friction-pulley and gear-case F. In order that a fork of suitable length of arm to accommodate this large pulley and case may, notwithstanding its depth or length, be suitably rigid with the reaches of the frame extending to the steering-head and seat-post, I bifurcate each of said reaches N and P, the former at N′ and the latter at P′, and unite the fork-arms of said reaches at each side of the case F in the hub or boss Q, in which also the lower fork-arm R, which extends to the rear-wheel-axle support, terminates. In these hubs the trunnions of the speed-gearing frame and case are secured by the hinged clasp R′, which interiorly forms each one-half of the bearing of the case and one-half the seat of the coupling M. The case F is arranged to be opened at one side, being made of two parts, so that the gearing frame and train may be introduced into it. As illustrated, one part of the case comprises the entire friction periphery or rim F^2, while the other part is a plate F^3, which forms only one side and comprises the hub or trunnion at the center. In order to facilitate oiling the gearing-train, I prefer to make the plate F^3 with a part hinged to the remainder and arranged to be secured in closed position and to be opened for the introduction of oil or for other attention to the speed-gearing train.

In the drawings, particularly in Fig. 1, I have shown my improved bicycle with the gear-case and friction-pulley F located in the position in which I have actually and preferably employed it—that is, with the axis substantially at the level of the axle of the rear drive-wheel. In this position, which for many reasons is preferable to the ordinary position of the crank-shaft, it would be manifestly impracticable to mount the pedals directly on the crank-wrist, since this would be very much too high and would compel the elevation of the seat and handle-bars to an extent which would make an unmarketable because highly-inconvenient machine. I am obliged, therefore, to employ swinging links B B, pivoted on the crank-wrists b', pivoted at their upper ends to controlling-links A′ and having the pedals B at their lower ends. In this construction I utilize the controlling-links A′ as levers, by means of which the rider may be able to drive the machine independently of the feet resting on the pedals, this being made possible by hinging said levers A′ at their rear ends to the seat. This feature of construction, which is incidental to, although it grows directly out of, the employment of the speed-gear case above described, is not claimed in this application, being regarded as independent invention.

I claim—

1. In a bicycle, the combination with the frame, the speed-gearing frame, the crank-shaft or prime-motor shaft having journal-bearings in the speed-gearing frame, said gearing-frame being made rigid at the ends of said journal-bearings with the bicycle-frame; a gearing-case having journals encompassing said journal-bearings of said shaft and encompassed at its ends by the terminals of the bicycle-frame; the speed-train having its first wheel fixed on the crank-shaft and its last wheel concentric with said shaft and fixed to said case, said gearing-case being exteriorly constructed to operate as a wheel communicating power to the drive-wheel.

2. In a bicycle, in combination with the main frame, a speed-gear frame; a two-part gearing-case which may be parted to admit the speed gear and train, the case having hollow trunnions and being journaled thereby in the main frame; the speed-gearing frame also having hollow trunnions, said trunnions extending through the hollow trunnions of the case, and coupling-sleeves extending between the respective trunnions of the case and the speed-gear frame, such coupling-sleeves having flanges at the outer ends extending past the ends of the hollow trunnions of the case to connect the speed-gearing frame non-rotatably with the main frame-bearings in which the gearing-case trunnions are journaled; a main shaft extending out through the bushings, and the prime wheel of the gear-train rigid with such shaft within the gearing-case.

3. In a bicycle, in combination with the main frame having a bifurcated crank-hanger, a speed-gear frame, a two-part gearing-case which may be parted to admit the speed-gear frame and train, the case having hollow trunnions by which it is journaled in the arms of the crank-hanger, and the speed-gearing frame having also hollow trunnions extend-

ing through the hollow trunnions of the case, and coupling-sleeves extending between the respective trunnions of the case and the speed-gear frame, such coupling-sleeves having flanges at the outer ends extending past the ends of the hollow trunnions of the case to connect the speed-gearing frame non-rotatably with the fork-arms of the crank-hanger.

4. In combination with a bicycle-frame, a speed-gear case having hollow trunnions, which are journaled in the bicycle-frame; a speed-gear frame within the case; the prime-motor shaft journaled in the speed-gear frame and extending out through the hollow trunnions of the case, a speed-gear train having its prime wheel fixed on the shaft between the bearings of the latter in the speed-gear frame, and the last wheel rigid and concentric with the case; and couplings which connect the bicycle-frame, outside the case-bearings non-rotatably with the speed-gear frame.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 27th day of March, A. D. 1900.

GEORGE H. SPAULDING.

In presence of—
CHAS. S. BURTON,
ADNA H. BOWEN, Jr.