

No. 626,875.

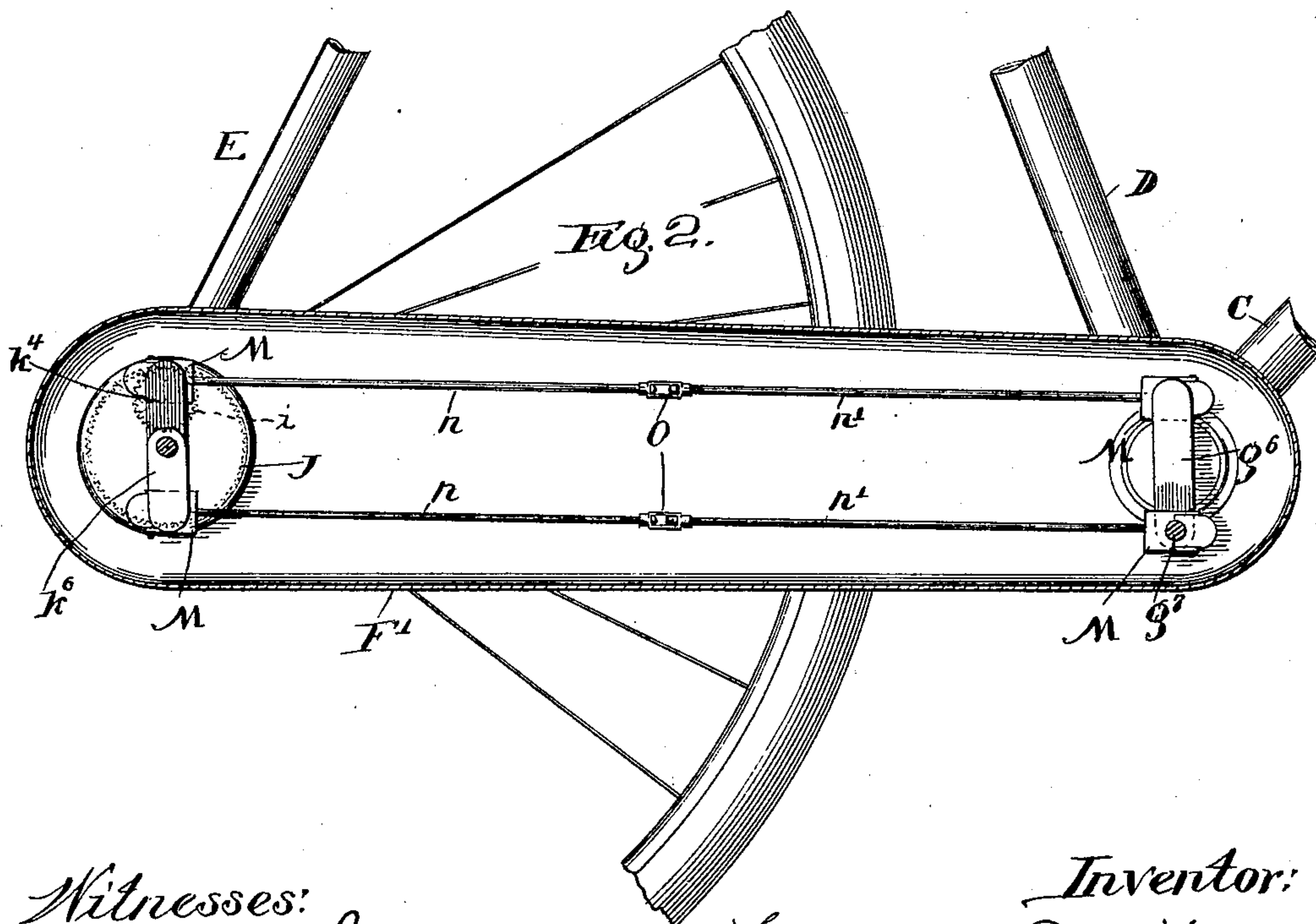
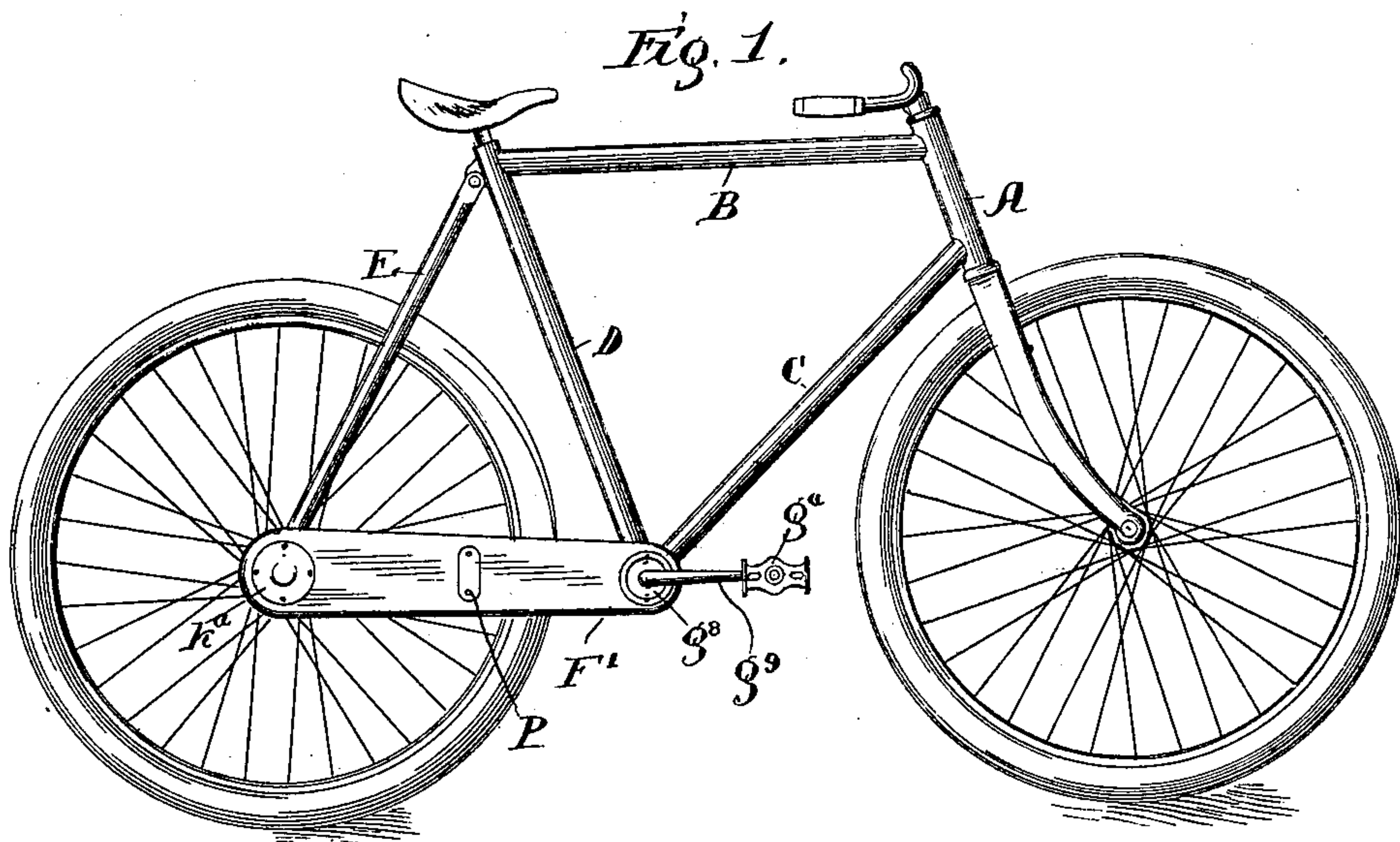
Patented June 13, 1899.

F. W. SMITH.
BICYCLE.

(Application filed Apr. 25, 1898.)

3 Sheets—Sheet 1.

(No Model.)



Witnesses:
Chas. O. Phurvey.
A. H. Nelson

Inventor:
Frederic W. Smith,
by Nicholas M. Butler,
Attys.

No. 626,875.

Patented June 13, 1899.

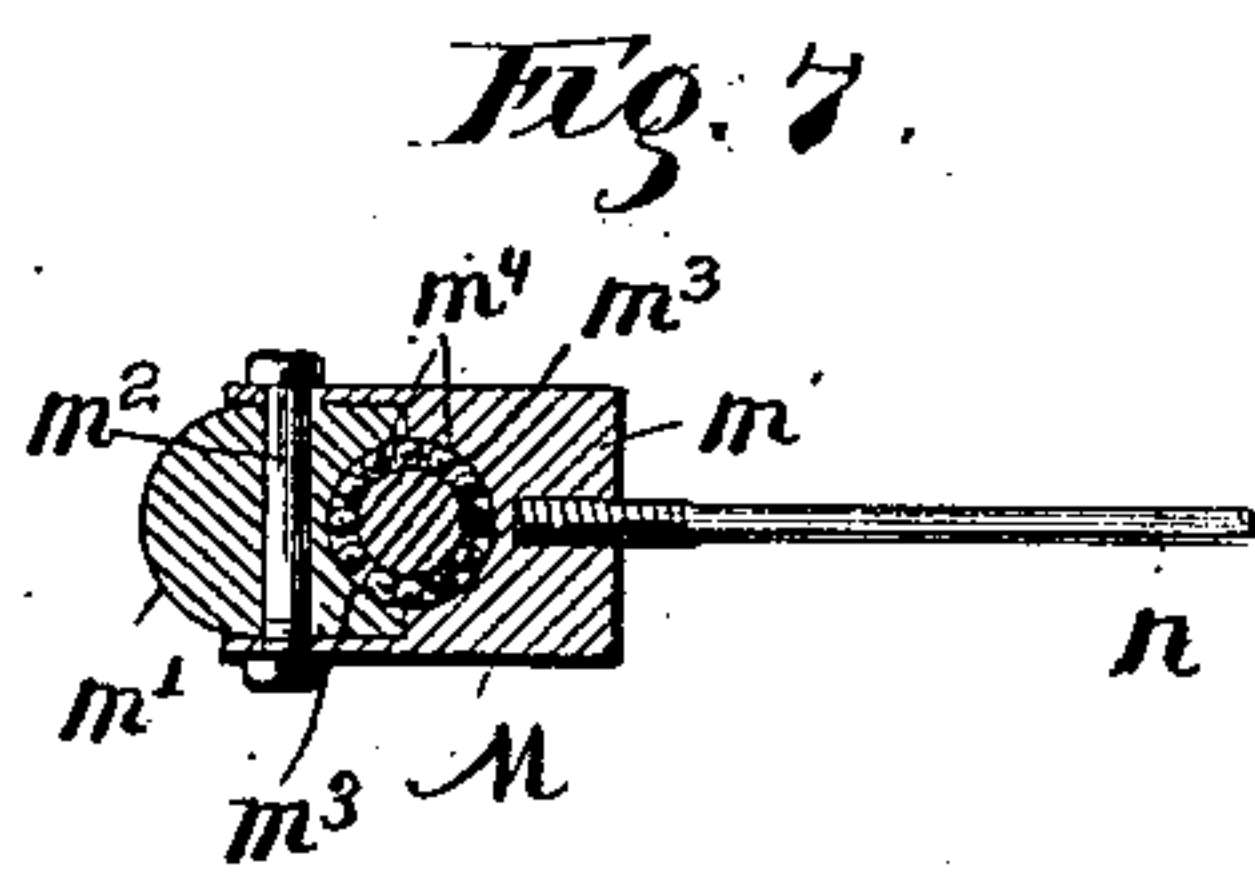
F. W. SMITH.

BICYCLE.

(Application filed Apr. 25, 1898.)

(No Model.)

3 Sheets—Sheet 2.



No. 626,875.

Patented June 13, 1899.

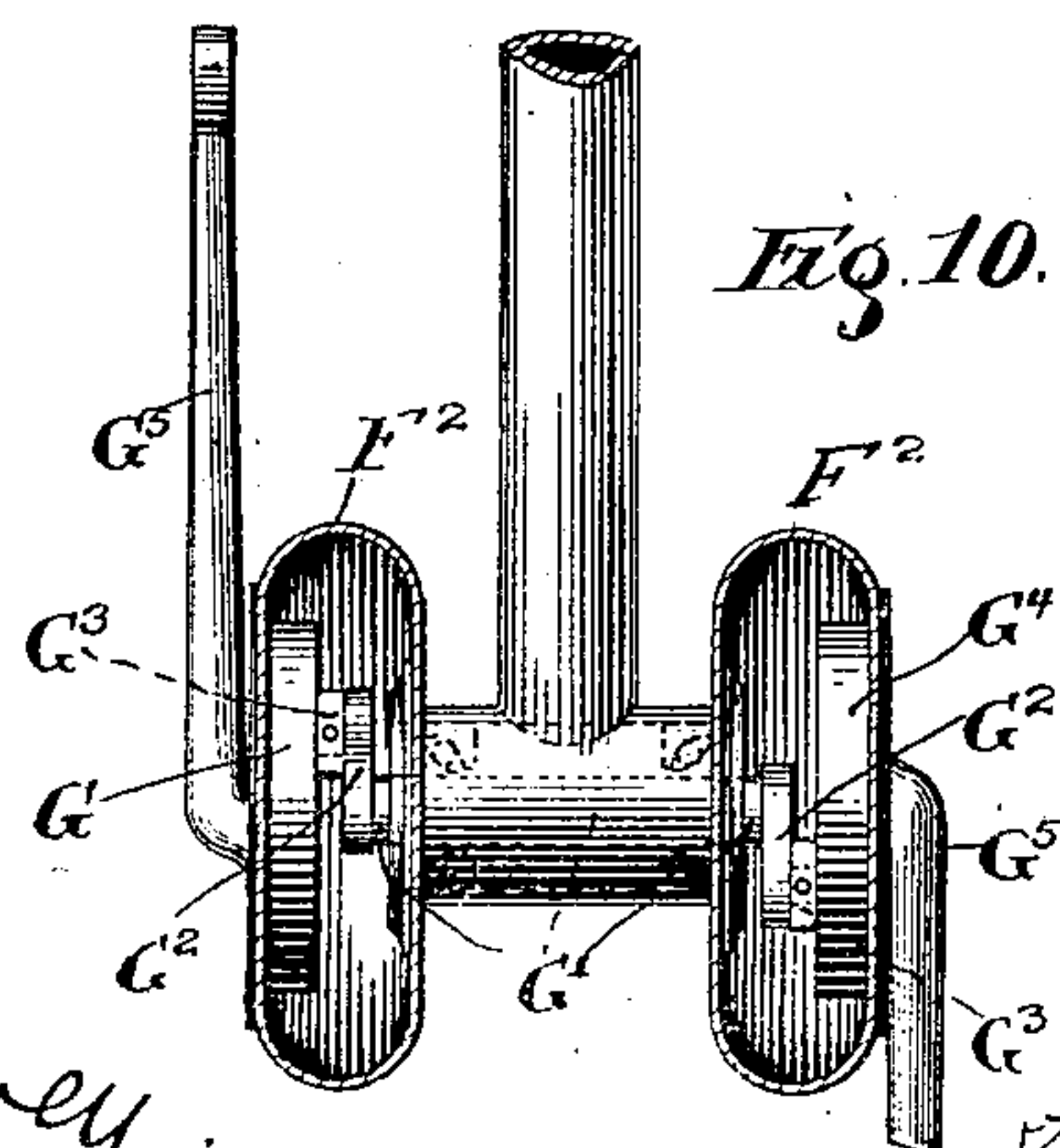
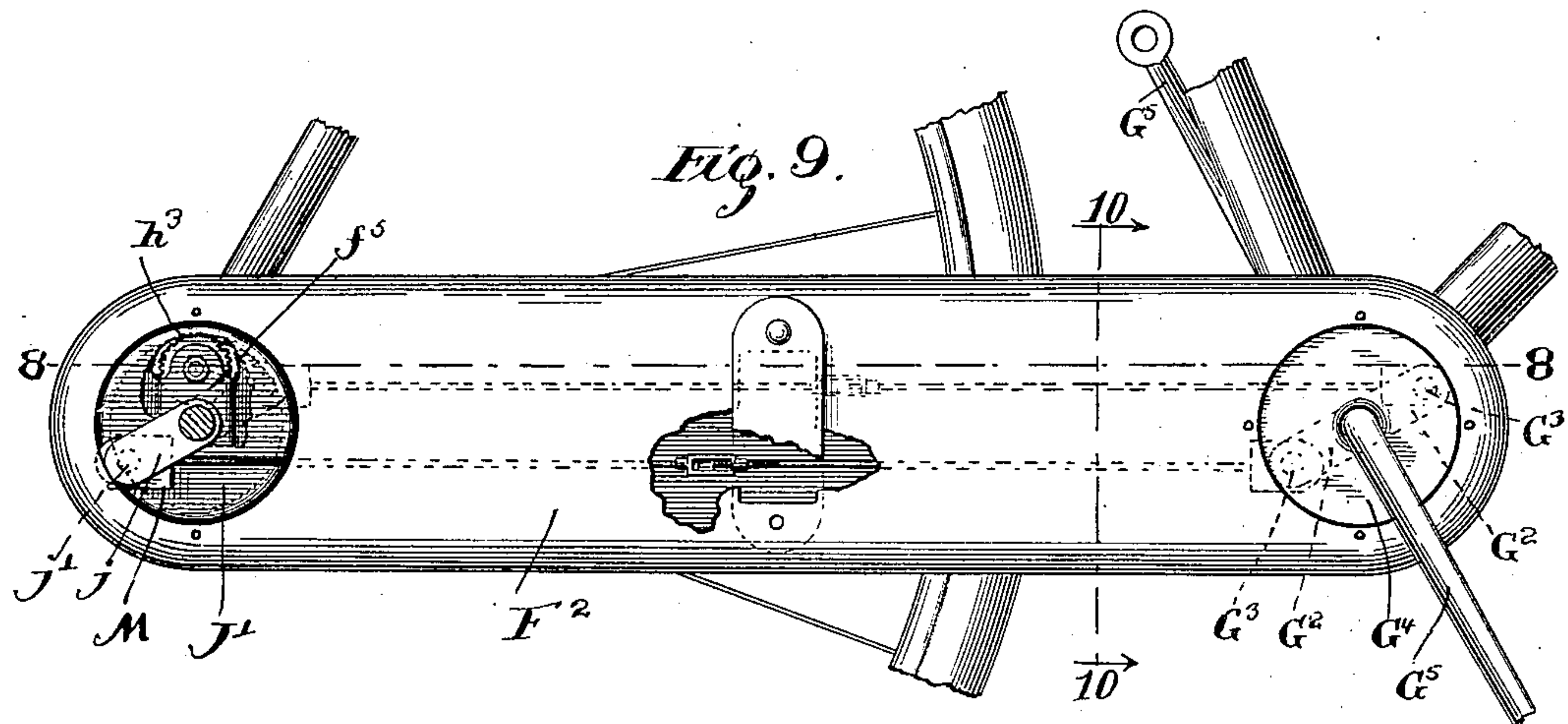
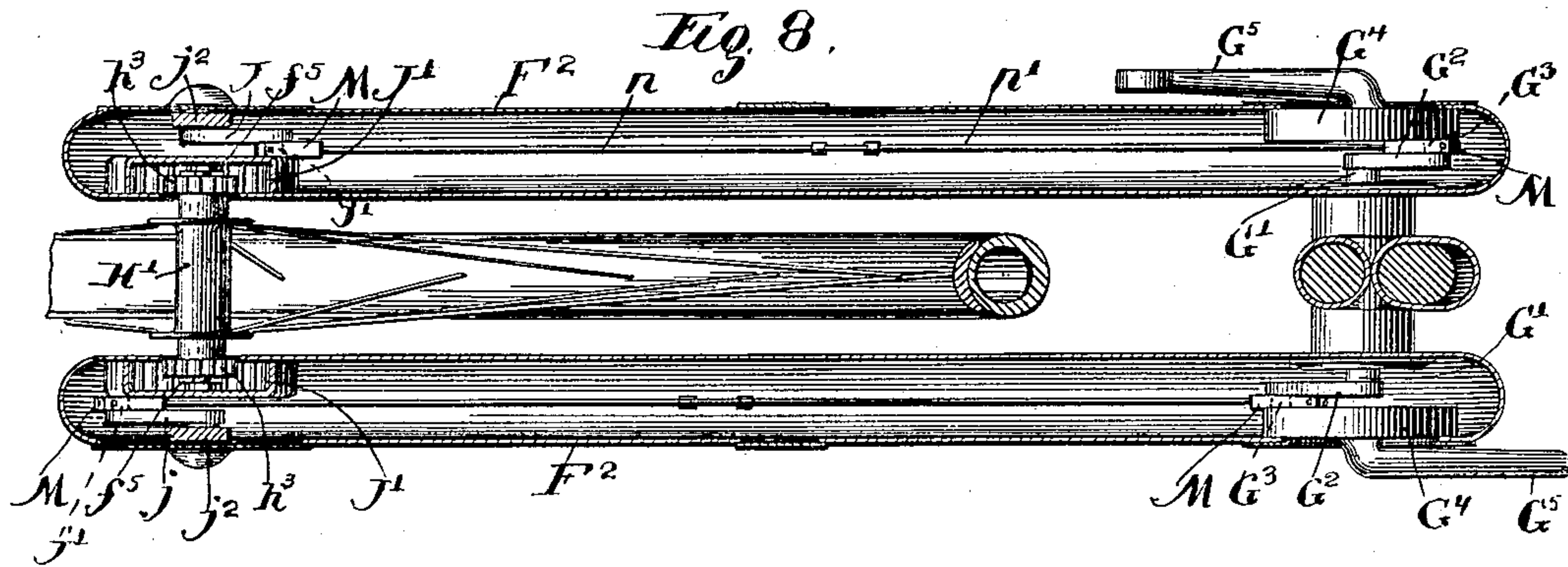
F. W. SMITH.

BICYCLE.

(Application filed Apr. 25, 1898.)

(No Model.)

3 Sheets—Sheet 3.



Witnesses:

Chas. O. O'Harvey.

A. H. Nelson

Inventor:

Fredric W. Smith

by Melusmar H. Bitner,
Atty.

UNITED STATES PATENT OFFICE.

FREDRIC W. SMITH, OF CHICAGO, ILLINOIS.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 626,875, dated June 13, 1899.

Application filed April 25, 1898. Serial No. 678,783. (No model.)

To all whom it may concern:

Be it known that I, FREDRIC W. SMITH, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Bicycles, of which the following is a specification.

My invention relates to certain improvements in bicycles, said improvements being directed especially to the gearing between the crank-shaft and the rear wheel with a view to supplying a connecting device which shall be free from the disadvantages encountered in the use of the ordinary chain.

To such end the invention consists in certain novel features both in the frame and the running-gear, which will be fully pointed out below and defined in the appended claims.

The drawings illustrate the preferred form of the invention by means of ten figures, of which—

Figure 1 is a side elevation of a complete bicycle. Fig. 2 is an enlarged longitudinal vertical section of a portion of said wheel, the plane of section being indicated by the line 2 2 of Fig. 3. Fig. 3 is a horizontal longitudinal section in the plane 3 3 of Fig. 4. Fig. 4 is a transverse section in the plane indicated by the line 4 4 of Fig. 5. Fig. 5 is a longitudinal section in the planes 5 5 of Fig. 4. Fig. 6 is a vertical section in the plane 6 6 of Fig. 3. Fig. 7 is a detail vertical section in plane 7 7 of Fig. 4. Fig. 8 is a horizontal section of a portion of a bicycle, showing a slight modification, the plane of section being taken at 8 8 in Fig. 9. Fig. 9 is a side elevation of the portion shown in Fig. 8, certain dust-caps being removed and a portion of the rear brace broken out to illustrate important parts which would otherwise be hidden from view; and Fig. 10 is a vertical cross-section taken in plane 10 10 of Fig. 9.

In the frame of the machine shown in Figs. 1 to 7, inclusive, the forward member A, containing the fork-stem, the horizontal brace B, the oblique brace C, the center post D, and the rear braces E are shown as of the ordinary construction, as is also the rear horizontal brace F upon one side of the machine. Upon the other side of the machine, however, a rear horizontal brace F' is provided in the frame in the form of a tube flattened verti-

cally, so as to give it sufficient vertical extent to contain within it the connecting-gear between the crank-shaft and the rear wheel. This connecting-brace F' may be secured to the frame by brazing in the ordinary way or by any convenient means.

The crank-hanger of the bicycle, which is shown in vertical section in Fig. 6, is lettered G and carries, by means of bearings of ordinary construction g , a divided crank-shaft made up of two parts $g^1 g^2$, secured together by means of an ordinary lap-joint and a connecting-screw g^3 . The end of the part g^2 extends into the brace F' and bears within the interior of said brace a double crank made up of the arm g^4 , the wrist-pin g^5 , extending laterally from the end thereof, the cross-bar g^6 , connected to the wrist-pin and extending back past the crank center and bearing upon the opposite side thereof the wrist-pin g^7 . Upon the wrist-pin g^7 is secured a disk g^8 , concentric with the crank-axis and bearing a pedal-crank g^9 , which in turn carries one of the pedals g^a of the machine. The opposite end of the crank-shaft is of ordinary construction and bears a pedal corresponding to the pedal g^a . The forward end of the brace F' contains a circular opening f , (see Fig. 6,) through which the end g^2 of the crank-shaft and the parts connected therewith may be inserted, and about this opening an inwardly-extending plate f' is secured by means of screws f^2 to make a substantially dust-proof joint with the disk g^8 .

Upon the inner side of the rear end of the brace F' a portion f^3 (see Figs. 4 and 5) is bent inward and the upper portion cut away to form a crescent-shaped opening f^4 , the lower edge of which contains a downwardly-extending notch f^5 , in which is secured the adjacent end of the rear axle H by means of a nut h , which clamps the sides of this notch to one of the cones h' of the rear axle. The opposite end of the rear axle bears an ordinary cone h^2 , and the rear hub I is mounted upon said axle by means of suitable antifric-tion-balls. The end of said hub adjacent to the brace F' bears a pinion i , extending into the depression f^3 and the upper portion of which extends vertically through the crescent-shaped opening into the interior of said brace. Within said brace an internal gear J, in mesh with the

pinion i , is mounted upon a bearing formed by a screw K , supported in the depression f^3 , having a cone-shaped head k and a cone-shaped nut k' , forming a race for a series of
 5 antifriction-balls k^2 , running between this race and a corresponding race in the internal gear J . Said internal gear has secured to it a wrist-pin k^3 , a cross-bar k^4 extending from
 10 said wrist-pin across the center and bearing at its opposite end a wrist-pin k^5 , which in turn has secured to it an arm k^6 , extending back to the center and having there a bearing k^7 , similar to that of the internal gear J and secured in a bar k^8 , fastened to the brace
 15 F' by means of screws k^9 . Said brace has a circular opening at this end to permit of the insertion of the internal gear and the parts secured thereto, and said opening is covered by means of a cap k^a , preferably fastened by
 20 means of the same screws as those which secure the bar k^8 .

The wrist-pins g^5 g^7 k^3 k^5 carry bearing-blocks M , composed of two parts m m' , the former being forked at the end to engage the
 25 latter and secured thereto by means of a bolt m^2 and each of the two parts containing half of a circular opening m^3 , containing a wrist-pin and an interposed series of antifriction-balls m^4 . The blocks on the wrist-pins g^5 k^3
 30 are connected by means of two wires n n' , united by means of a turnbuckle O , (see Fig. 2,) which offers a means of adjusting the combined length of the wires and also gives one of them an opportunity to slide toward the
 35 other slightly to avoid buckling in case it should happen to be too long. A corresponding pair of wires connect the blocks on the wrist-pins k^5 g^7 , and whatever the direction of rotation of either the rear wheel or the crank-
 40 shaft may be one of these pairs of wires will be in proper position to transmit the motion by means of a pull from one to the other.

The middle portion of the brace F' is provided with an aperture covered with a plate
 45 P to provide access to the turnbuckles by means of which the wires are adjusted in length.

In the modification shown in Figs. 8, 9, and
 10 the means for connecting the crank-shaft with the rear wheel are arranged upon either
 50 side of the latter, and both of the rear braces F^2 are shown as flattened tubes adapted to contain said connecting parts. In this modified form the crank-shaft G' is journaled in
 55 the crank-hanger in the ordinary way and bears upon each end a crank G^2 , which has near its end a wrist-pin G^3 , connecting it with a disk G^4 , concentric with the crank-shaft and formed with a pedal-bearing crank G^5 .
 60 The axle H' of the rear wheel is supported in brackets f^5 , stamped inward from the inner walls of the braces F^2 , and upon both ends of the wheel-hub are secured pinions h^3 , meshing with internal gears J' , journaled upon the
 65 brackets f^5 . Each of the internal gears J' is connected to a crank j by a wrist-pin j' , the

free end of said cranks being journaled in bars j^2 , secured to the braces F^2 . Upon the wrist-pins G^3 j' are journaled blocks M , similar to the blocks above referred to, and these
 70 blocks are connected by suitable connecting rods or wires n n' , having turnbuckles interposed between them for adjusting the length of the same.

I recognize the possibility of great variation in the form and arrangement of the various parts above described, and therefore do not limit myself to the specific construction of the same.

I claim as new and desire to secure by Letters Patent—

1. The combination with the frame, crank-shaft and rear wheel of a bicycle, of a hollow brace of sufficient extent to contain within it the connecting-gear between the crank-shaft
 85 and the rear wheel, suitable connecting-gear between said crank-shaft and said rear wheel located within said brace, the rear portion of the inner side of said brace being depressed to receive the portion of the hub of the rear
 90 wheel in engagement with said connecting device and the wall of said depression being cut away upon one side to allow said connecting device to reach and engage with the rear hub whereby said depression furnishes for
 95 the rear axle of the frame a support within the brace and beyond the end of the rear hub adjacent thereto; substantially as described.

2. The combination with the frame, crank-shaft and rear wheel of a bicycle, of a brace
 100 extending from the crank-hanger to the lower extremity of one member of the rear fork and having adjacent to said rear fork a portion of the brace pressed inward toward the interior thereof and a portion of the wall of said
 105 depression cut away, an axle for the rear hub supported at one end in said inward depression, a pinion upon the adjacent end of the rear hub extending through the opening in the walls of said depression, an internal gear
 110 mounted upon a bearing secured to said inward depression and in mesh with the portion of said pinion extending through the walls thereof and suitable connecting devices within the brace between said internal gear
 115 and the crank-shaft; substantially as described.

3. The combination with the frame, crank-shaft, and the rear wheel of a bicycle, of a hollow brace extending from the crank-
 120 hanger to the lower extremity of one of the members of the rear fork and having upon its inner side adjacent to said rear fork, a depression having the wall thereof upon one side cut away to form an opening into the interior,
 125 an internal gear within the brace journaled upon a bearing secured to said depression, a notch in the side of the opening therein next to the bearing of the internal gear, a rear wheel having a pinion on the end adjacent to
 130 said internal gear in mesh with the latter and journaled upon an axle resting in said notch

and a suitable connecting device between the internal gear and the crank-shaft located within the brace; substantially as described.

4. In a bicycle a brace connecting the crank-hanger and the lower extremity of one member of the rear fork of the frame consisting of a laterally-flattened tube, a crank-shaft extending at one end through said tube and having within the same a double crank bearing two wrist-pins upon opposite sides of the axis of the shaft, a depression upon the inner side of the rear end of the brace having its wall cut away upon the upper side to leave an opening into the interior and a notch in the lower side of said opening, a rear wheel having a hub extending into the depression and bearing within the same a pinion extending through said opening, said hub being journaled upon an axle secured at one end to said depression and resting in said notch, an internal gear within said brace in mesh with said pinion and journaled upon a bearing within the brace, said internal gear being provided with a double crank containing two

wrist-pins upon opposite sides of the axis of the gear corresponding to the two wrist-pins upon the crank-shaft, bearing-blocks upon the respective wrist-pins, and a pair of wires connecting the corresponding bearing-blocks of the crank-shaft and internal gear, respectively, each of said wires being composed of two parts connected by a turnbuckle by means of which they may be adjusted, one of said parts being adapted to slide longitudinally in said turnbuckle in case of any accidental push thereon, said brace being provided with suitable covered openings upon the outer side adjacent to said turnbuckles and to said internal gear; substantially as described.

In witness whereof I have hereunto set my hand, at Chicago, in the county of Cook and State of Illinois, this 11th day of April, A. D. 1898.

FREDRIC W. SMITH.

Witnesses:

CHAS. O. SHERVEY,
A. I. H. NELSON.