(No Model.)

3 Sheets—Sheet 1.

W. S. KELLEY.

BICYCLE.

No. 321,932.

Patented July 7, 1885.

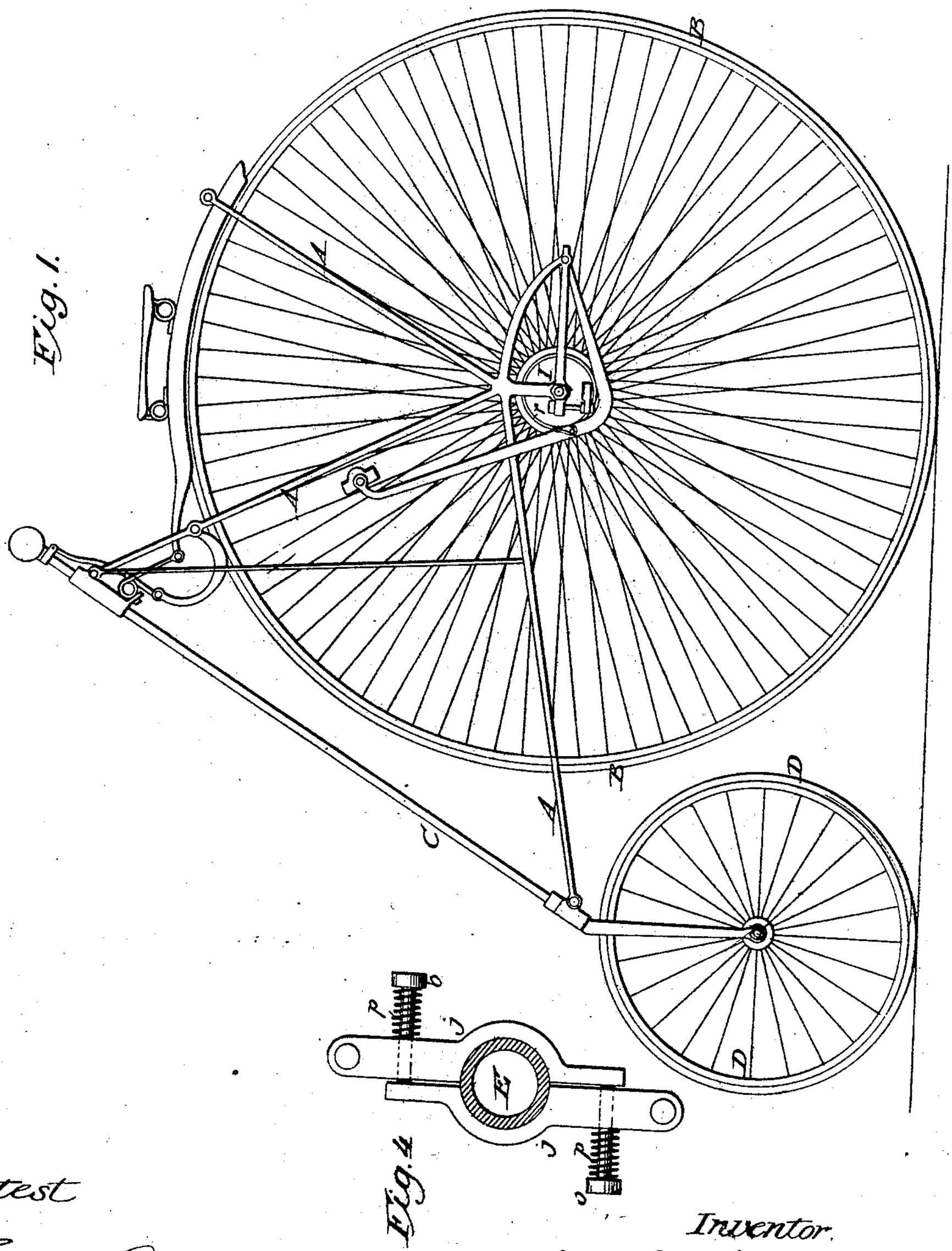

Fig. 1.

Fig. 4

Attest

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(No Model.)

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Fig. 2.

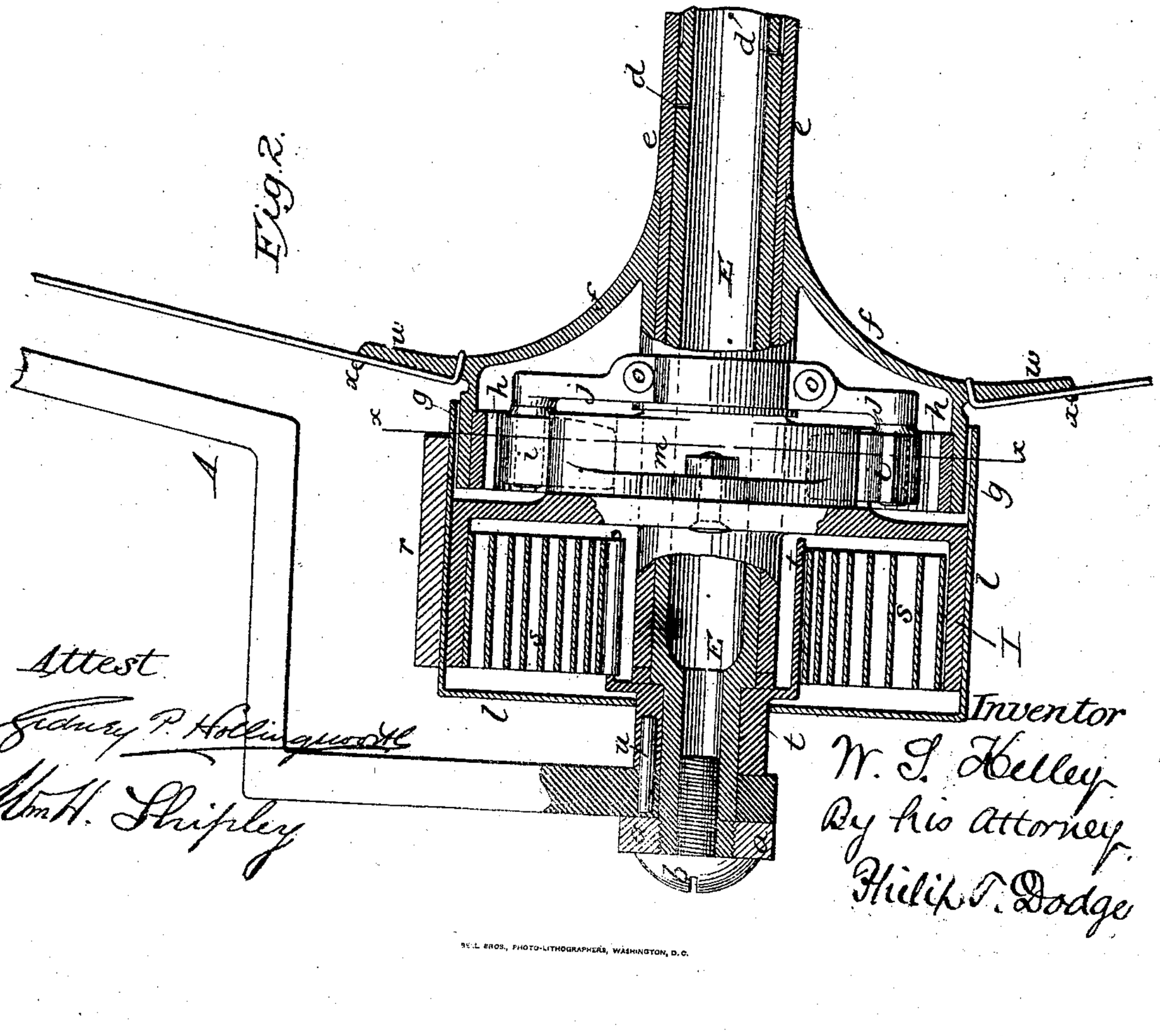
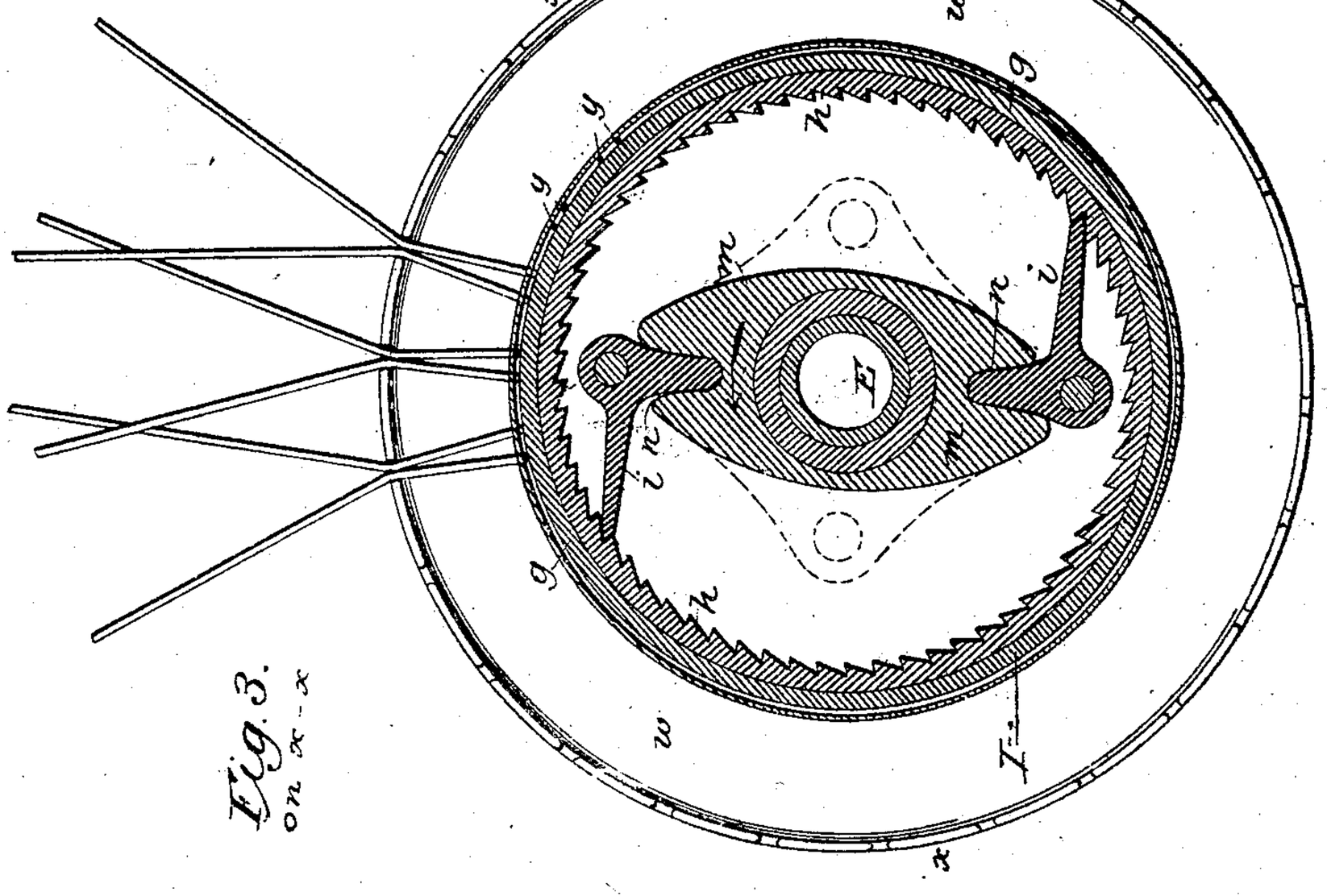


Fig. 3.
on x-x



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W. S. KELLEY.

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Fig. 5.

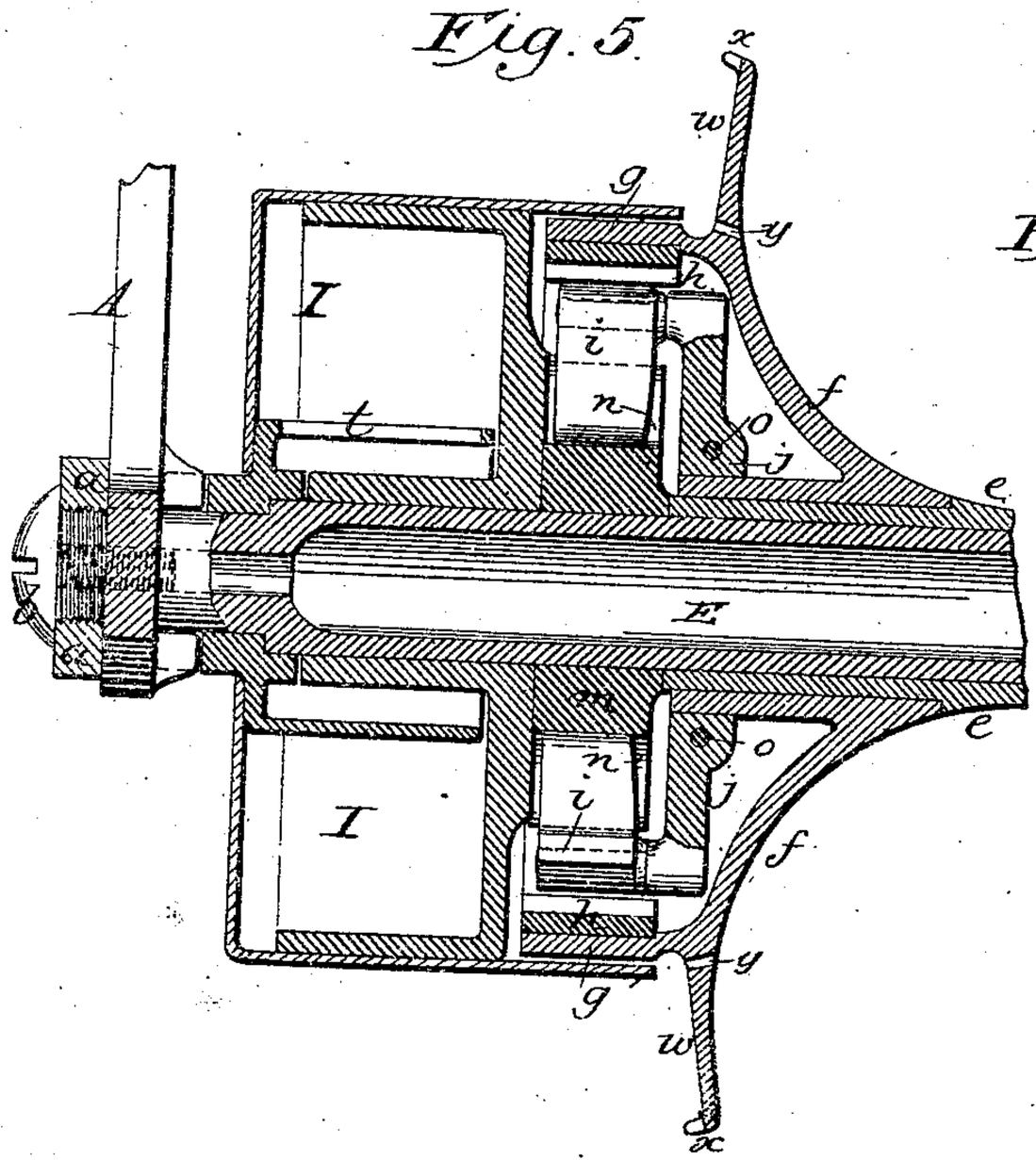
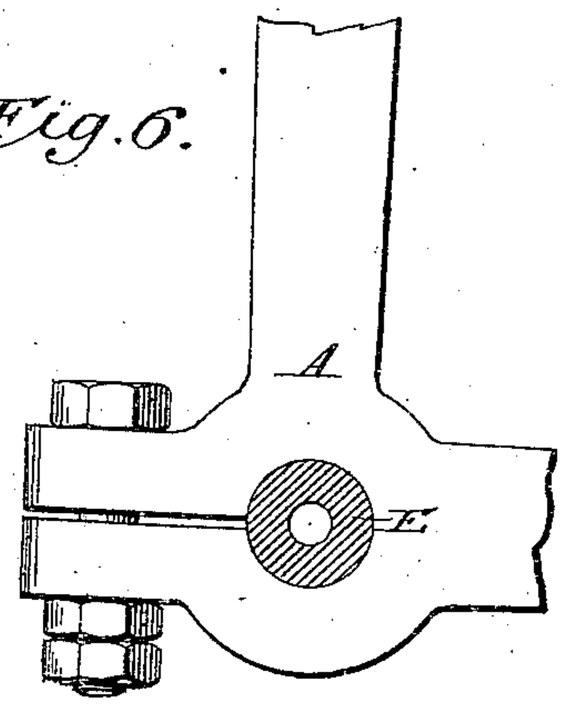


Fig. 6.



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Inventor

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By his attorney

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UNITED STATES PATENT OFFICE.

WILLIAM S. KELLEY, OF SMITHVILLE, NEW JERSEY.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 321,932, dated July 7, 1885.

Application filed March 24, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. KELLEY, of Smithville, in the county of Burlington and State of New Jersey, have invented certain Improvements in Bicycles and Tricycles, of which the following is a specification.

This invention relates particularly to that class of machines in which the driving-wheel is actuated by a clutch or ratchet mechanism from a drum turned in a forward direction by a strap winding thereon and connecting with a foot-lever and turned in a backward direction when released by a spring, although certain of the features are also applicable to other machines, as will hereinafter more fully appear.

For purposes of illustration I have represented my improvements as embodied in a machine of the same general character as the well-known "Star" bicycle, having the large propelling-wheel at the rear and a small steering-wheel in front.

Referring to the accompanying drawings, Figure 1 is a side elevation of the machine. Fig. 2 is a vertical cross-section of the same through one side of the driving-wheel and frame, and the attendant parts. Fig. 3 is a vertical section on the line *x x*, looking toward the wheel. Fig. 4 is a side elevation of the pawl-carrier. Fig. 5 is an axial section through the clutch mechanism and the attendant parts in modified form. Fig. 6 is a side elevation of one of the main-frame bearings for the fixed axle.

In proceeding to construct the machine represented I first provide a main frame, A, which may be identical in all its leading features with that represented in my application for Letters Patent filed on the 7th day of February, 1884, No. 120,071, the frame being adapted to receive in its rear end the axle of the main driving-wheel B and at its forward end the inclined steering-shaft C, in the lower end of which the steering-wheel D is carried. The main wheel is constructed, as usual, with a hollow axle having flanges on its ends to receive the spokes, the whole being commonly designated as the hub of the wheel. This hub is mounted and arranged to revolve loosely on a central axle, E, which is extended through the same from side to side and secured at its ends firmly in the sides of the main frame. Heretofore it has been customary to construct the ends of this central axle of a rectangular form and to mount them in openings of like form in the frame. This construction involved considerable additional expense in order to insure the accurate fitting of the parts, and was objectionable for the reason, first, that the axle was liable to work loose, and, second, that it could not be conveniently turned in order to equalize the wear upon its different sides. To avoid these difficulties, I now construct the ends of the axle of round form, either cylindrical, as shown, or slightly tapered, and seat them in round holes in the sides of the main frame, which is divided adjacent to the axle and drawn together by a screw, in the manner represented in Fig. 10, so as to firmly grasp the axle. By loosening the compression-screw the axle may be released so as to be revolved in order to bring the main wear from time to time on different portions of its surface.

The present construction and arrangement of the central stationary axle differs from that described in my previous application above referred to, in that the ends of the axle are circular instead of angular, whereby a rotary adjustment of greater or less extent is permitted, to equalize the wear. The axle is confined endwise within the frame by means of nuts *a*, applied to its outer end, and these nuts are in turn confined in position by means of screws *b*, tapped into the ends of the axle, and having heads of sufficient size to overlap the outer faces of the nuts. The screws may have their threads cut in opposite directions from those of the nuts, or they may be constructed with threads of a pitch differing from those of the nuts, whereby they are adapted to prevent the nuts from working loose.

Heretofore it has been customary to construct the central axle of solid metal. I now propose to construct the same of a hollow or tubular form, as represented in the drawings, whereby it is reduced in weight, and also made to serve as a reservoir to contain a lubricant and deliver the same to the working parts.

As a convenient means of introducing the lubricant into the axle, I provide the same at one end with an opening which may be closed

by one of the screws *b*, as represented in the drawings.

At suitable points in its length the axle may be provided with small openings *d* to permit the escape of the oil to its outer surface and to the inner surface of the wheel-hub revolving thereon. Openings may also be made from the axle outward into the clutch mechanism, if desired. If the delivery openings be made of small size, they may be left open or uncovered, but if of large size they should be filled with wicking or other absorbent material adapted to deliver the oil gradually and prevent waste.

Referring, now, to the construction of the wheel, it will be perceived that it consists of the hollow axle *c* and the two flanges *f*, secured rigidly upon its ends, as before alluded to. It has commonly been the practice to construct the shaft *c* and flanges *f* in one piece, either casting them complete or working them from the "solid." I find in practice that there is great advantage in constructing the flanges in separate pieces and shrinking, forcing, or otherwise applying them immovably in position upon the ends of their shaft. On the outer side the flanges are provided, as in my previous machine, with annular overhanging rims *g*, the inner surfaces of which are provided with ratchet-teeth *h* formed thereon, or on a ring secured therein, these teeth being designed to engage with the driving-pawls *i*. In my previous machines these pawls were mounted upon a revolving hub or drum. I now construct them of an angular form and mount them midway of their length upon horizontal pivots or journals formed on or attached to a friction-collar, *j*, which is mounted either upon the fixed axle, as shown in the drawings, or, if preferred, on a sleeve projecting from the hub of the wheel, so that the pawl-carrier and pawls may revolve independently of the driving drum or pulley. It will be noted that this organization differs from that shown in my former application, in that the pawls are pivoted to an independent frictionally-held carrier instead of being pivoted directly and firmly to the drum or pulley. The only essential requirement is that the pawl-carrier *j* shall engage the axle with a sufficient degree of friction to be carried thereby, while at the same time it is free to turn independently on the axle whenever a moderate force is applied. Loosely on the outer end of the axle there is mounted a revolving drum or pulley, I, having on its outer side a hub, *m*, the outer edges of which are notched, as shown at *n*, Fig. 3, to engage with the inner or heel ends of the pawls, which have their outer ends arranged, it will be remembered, to engage in the ratchet-teeth. The action of the parts thus arranged is as follows: When the pulley I is turned in a forward direction, its hub *m* urges the heels of the pawls forward in the direction indicated by the arrow in Fig. 3. The pivots of the pawls being held meanwhile in position by their support in frictional engagement with the axle, the outer ends of the pawls are thrown into engagement with the ratchet-teeth. The instant that this engagement occurs the pawls are carried bodily forward, imparting a rotary motion to the wheel, the friction-collar *j* being at the same time revolved with the other parts about the fixed axle. When the reverse motion of the pulley and hub occurs, the latter, acting on the pawls, causes their ends to be thrown inward out of engagement with the wheel, so that they may revolve in a backward direction without noise. The openings in the hub are of such form and size as to permit but a limited play in relation to the pawls, in consequence of which the pawls and pawl-carrier are caused to rotate backward with the hub as soon as the ends are out of engagement with the teeth.

It will be observed that the pawl-carrier resists moderately the movement of the pawls in a forward as well as in a backward direction, and that it is in consequence of this resistance, or, in other words, in consequence of the fact that the pivots of the pawls are held in a fixed position, that the hub has the effect of throwing the pawls inward and outward.

The collar *j* may be constructed in any suitable form in one or more pieces, provided it is adapted for frictional engagement with the axle or other fixed support; but it is recommended that it be constructed, as represented in Figs. 2 and 4, of two parts adapted to embrace opposite sides of the axle and united by means of screws *o* bearing spiral springs *p*. This construction permits the tension of the springs to be varied in order to modify the friction between the collar and the axle. It also permits the holder to yield to a limited extent, so that the two pawls on opposite sides of the center may seat themselves firmly against the teeth in the event of the latter being cut in an irregular or unequal manner.

The essence of the present arrangement consists in having the pawls supported by a frictional carrier and acted upon by the revolving pulley or hub, and it is manifest that the form and detail of the parts may be modified to any extent required provided the general mode of action is retained. The pulley *l* has attached to its exterior one end of a strap, *r*, which is wound thereon and connected to the foot-lever as usual for the purpose of imparting a rotary motion to the drum. The drum is recessed in the outer side to receive a spring, *s*, the outer end of which is attached thereto, while the inner end is attached to a fixed non-rotating collet encircling the axle, as shown. This collet, which is of essentially the same construction as that represented in my previous machine, instead of being secured to the axle, as in the former case, is now connected to the frame, in order that the axle may be revolved therein, and also in order that there may be no danger of its wearing loose and being turned out of position by the strain of the frames. This connection of the collet to the

frame instead of the axle, or, in other words, the fastening of the same independently of the axle, is of great importance, since it not only avoids the danger of its accidental rotation in the event of the axle becoming loose, but also in that it permits the axle to be given a rotary adjustment in order to equalize the wear thereon, as elsewhere detailed. Its connection with the main frame may be of any suitable character, a simple mode of connection being the application of a pin or key, *u*, one end of which is seated in the frame while the opposite end is seated in a slot or recess in the collet, as shown in Fig. 2, or a stud or projection on the frame extended into a notch in the end of the collet, as in Fig. 9. The connection of the collet to the frame instead of to the axle is found in practice to be a feature of importance.

Having thus described my invention, what I claim is—

1. In a bicycle of the general character herein described, the combination of the wheel having the double hub or axle, the main frame, and the central non-rotating axle having its ends made of round form in cross-section and confined firmly but adjustably in the frame, as described, whereby the rotary adjustment of the axle is permitted to equalize the wear thereon.

2. The combination of the main wheel having a tubular hub, the non-rotating axle having round ends, and the main frame divided and drawn together upon the ends of the axle by contracting-screws, substantially as described and shown.

3. In a bicycle or similar vehicle, the combination of the wheel having a tubular hub, the fixed tubular shaft, and the main frame having the two ends of the shaft secured thereon.

4. In a bicycle, a main frame, a wheel mounted centrally therein and provided with a tubular hub, and a tubular axle extended through the hub and fixed at its two ends in the frame, said axle being provided with oil-inlets passing to the outside of the frame and with oil-outlets opening to the exterior of the hub.

5. In combination with the frame, the axle, and the drum or pulley and the spring, the collet encircling the axle and secured to the frame.

6. The spring-retaining collet secured to the main frame independently of the axle.

7. In combination with the main wheel having the driving rim or flange, the non-rotating axle, the pawls, the pawl-carrier having a frictional connection with the axle, and the driving-pulley having the hub to engage the pawls, whereby the pawls are rendered noiseless and positive in their action.

8. In a bicycle or tricycle, a pawl-supporting device having a frictional connection with a non-rotating part, a driving-wheel with which the forward ends of the pawls engage, and a driving-drum arranged to turn independently and connected with the inner or heel ends of the pawls, substantially as described, whereby a forward motion of the drum is caused to throw the parts into engagement with the wheel, and vice versa.

9. In a clutch-machine, substantially as described, the combination of a shaft or support, a rotary pawl-carrier divided and provided with means whereby it may be contracted for frictional engagement with its shaft, and pawls pivoted on and carried by said support.

10. In a bicycle or tricycle, a driving drum or pulley, a rotating frictionally-retained pawl-carrier wholly independent of the drum, pawls mounted on said carrier and connected with the drum, and a wheel driven by the active ends of the pawls, substantially as described and shown.

11. The combination of the main frame, the wheel having a tubular hub, the fixed hollow axle, and the screw located at the outside of the frame and affording access to the interior of the axle.

12. In combination with the wheel and the main frame, the fixed axle seated at its end in the frame, the nut applied on the end of the axle, and the screw applied to the axle to secure the nut, as shown.

WILLIAM S. KELLEY.

Witnesses:
EDWARD F. BURNS,
CHAS. H. CHICKERING.