

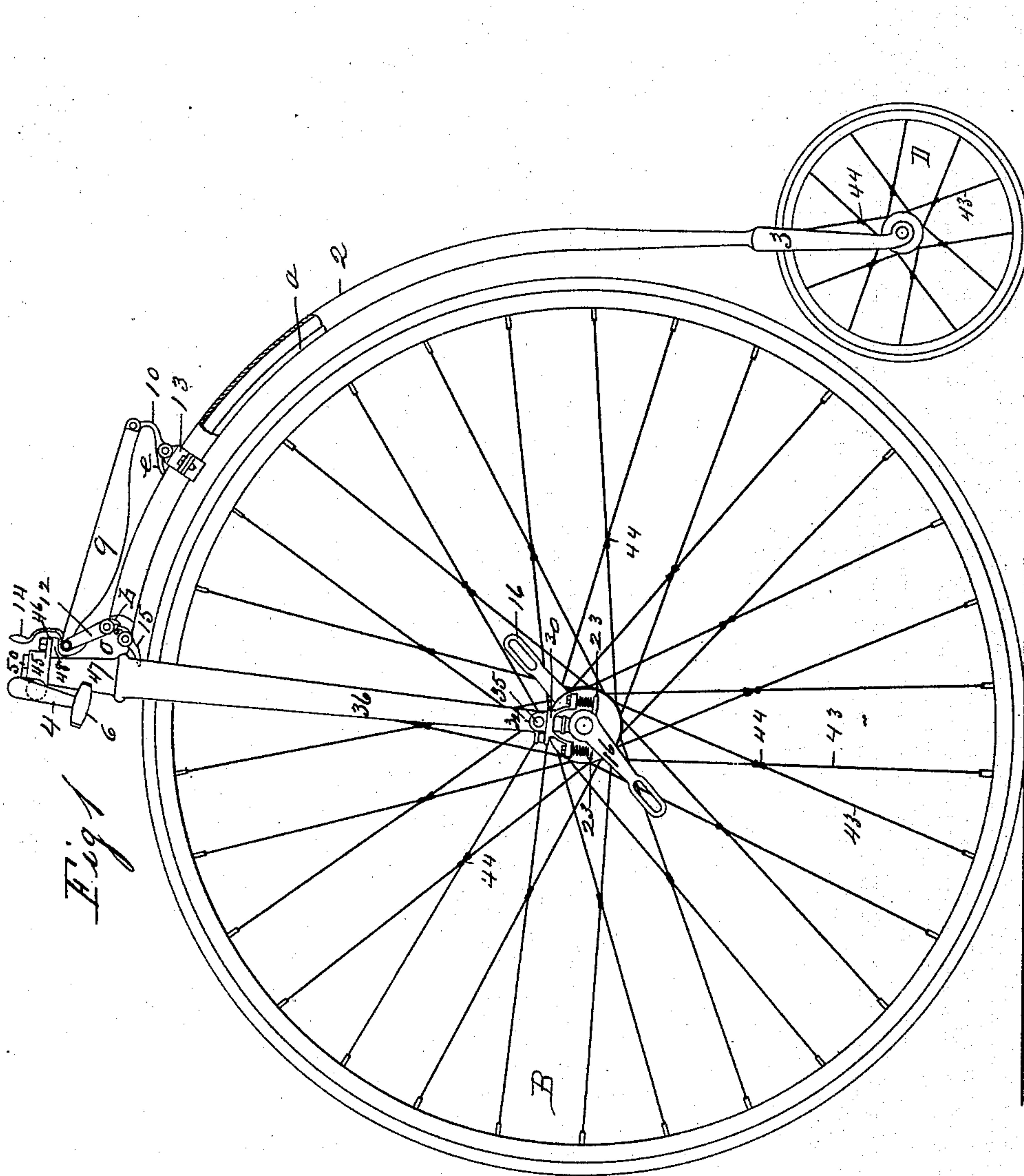
(No Model.)

G. T. WARWICK.
VELOCIPÈDE.

3 Sheets—Sheet 1.

No. 384,946.

Patented June 19, 1888.



Witnesses.
Wm. Chapin
G. M. Chamberlain.

Inventor.
George T. Warwick.

By his Attorney Chapin & Co.

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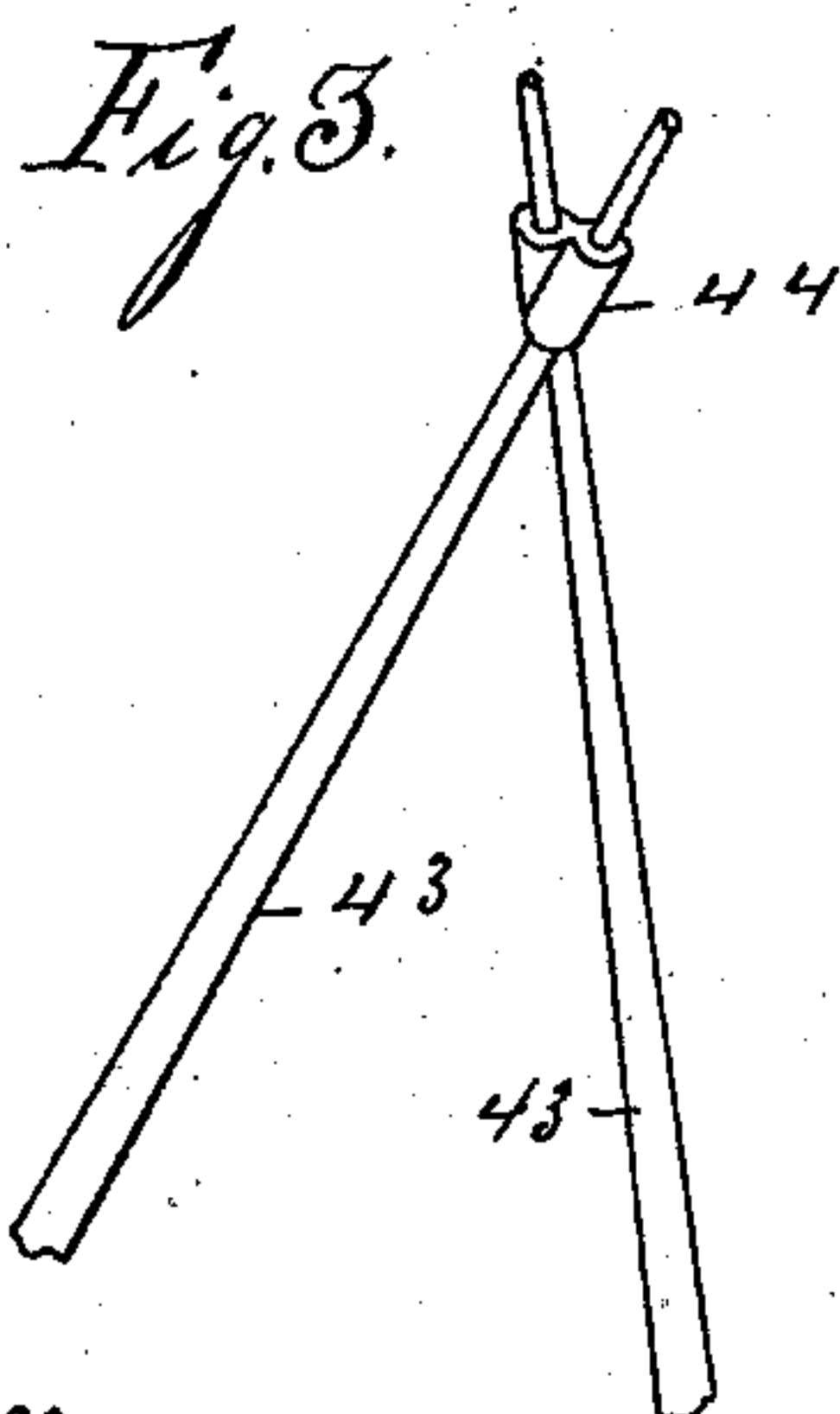
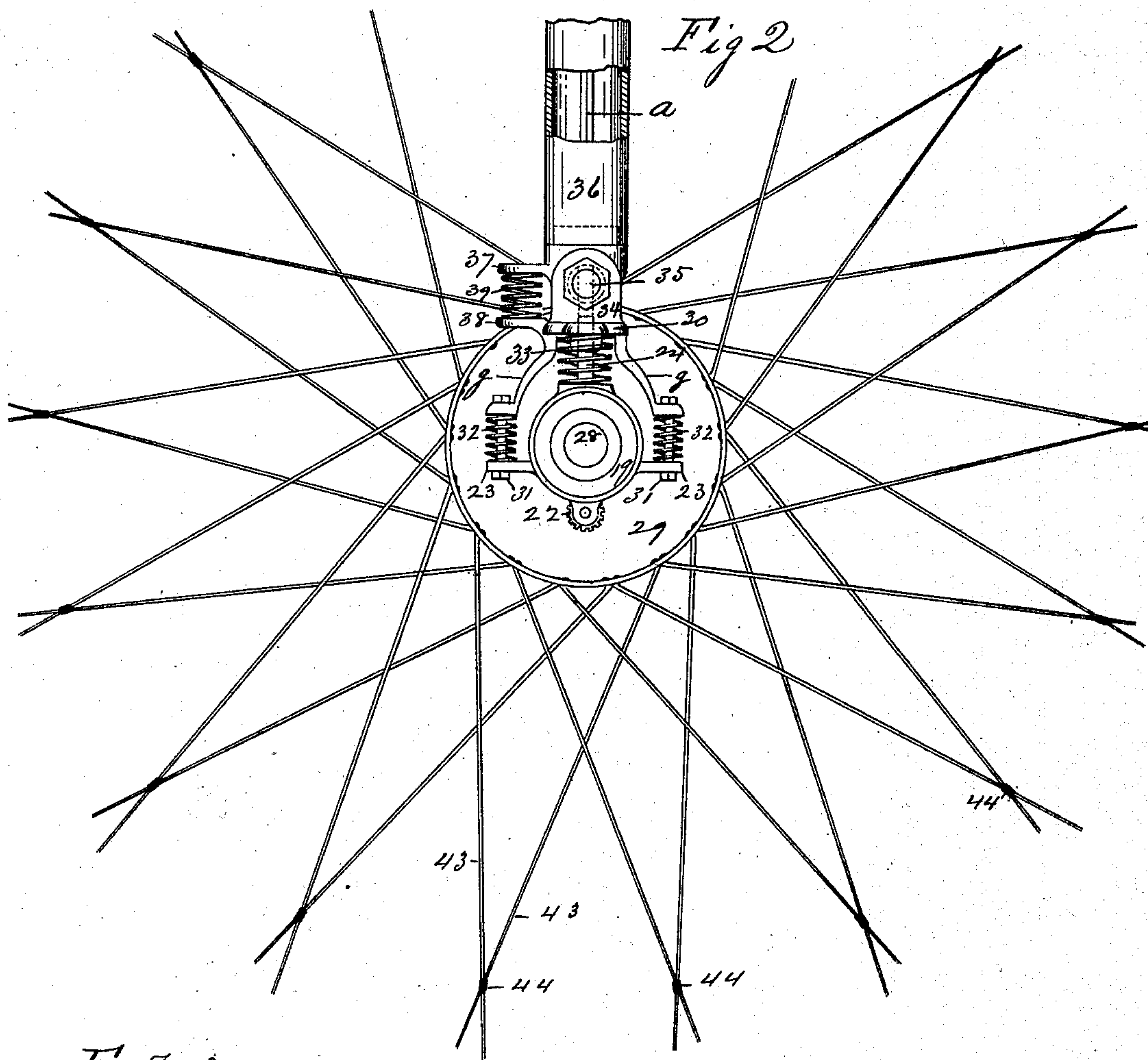
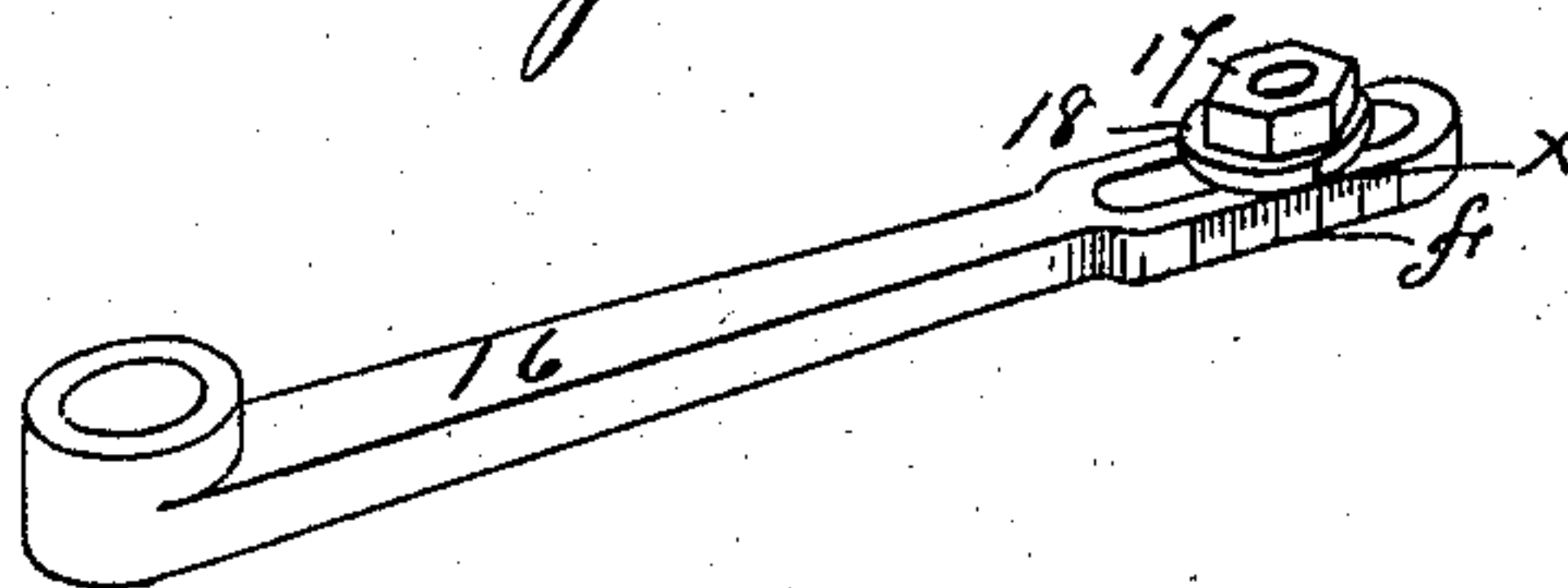


Fig. 4.



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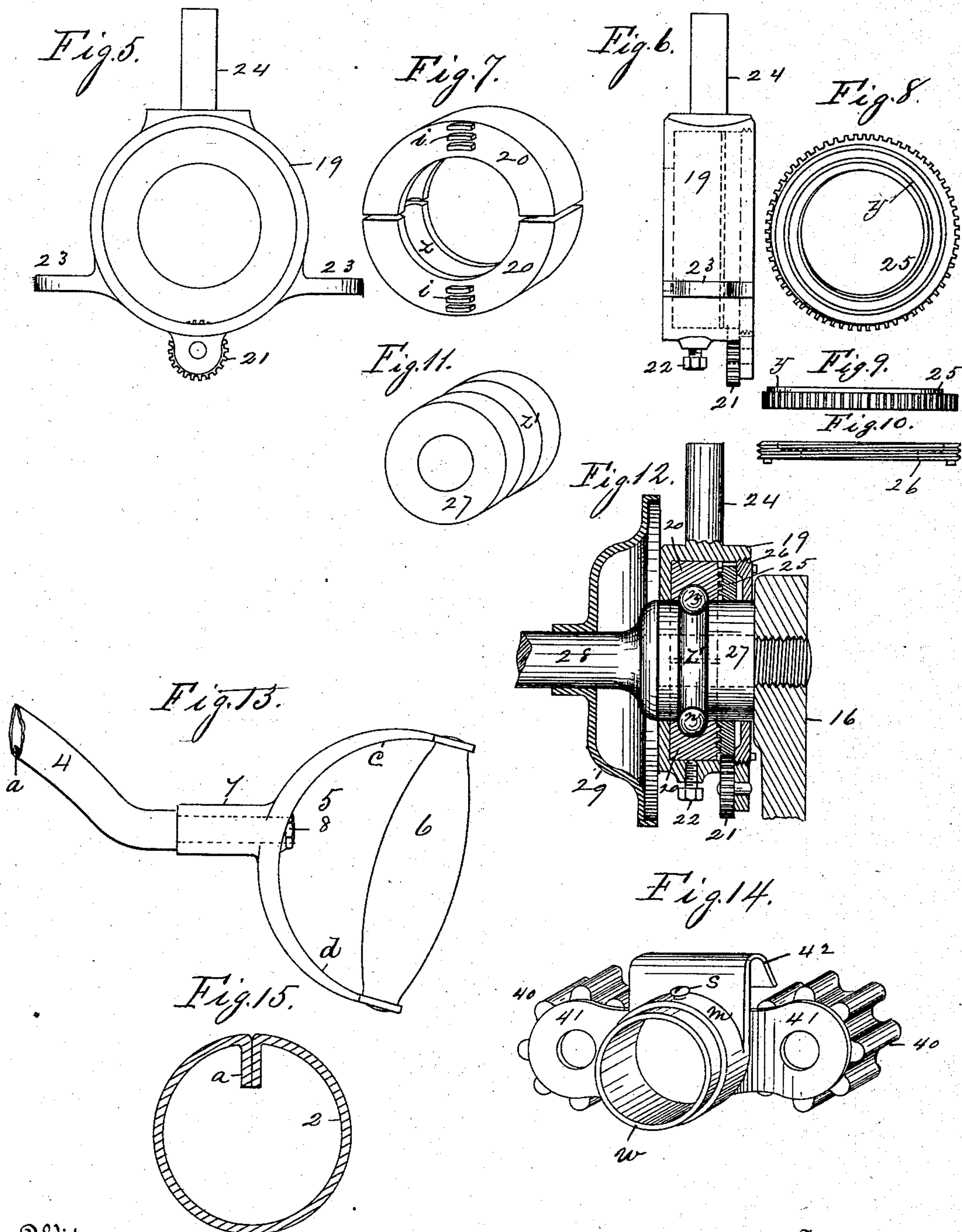
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UNITED STATES PATENT OFFICE.

GEORGE T. WARWICK, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO
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VELOCIPEDÉ.

SPECIFICATION forming part of Letters Patent No. 384,946, dated June 19, 1888.

Application filed December 1, 1887. Serial No. 236,584. (No model.)

To all whom it may concern:

Be it known that I, GEORGE T. WARWICK, a citizen of England, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Bicycles, of which the following is a specification.

This invention relates to bicycles, the object being to provide improved constructions for various parts of the machine, all as hereinafter fully described, and pointed out in the claims.

In the drawings forming part of this specification, Figure 1 is a side elevation of a bicycle embodying my improvements, the backbone being shown broken away at one point to disclose the interior thereof, and the pedals being omitted from the cranks. Fig. 2 is a side elevation of the central portion of the front wheel and of the lower end of one of the forks, illustrating on a larger scale than is shown in Fig. 1 the manner of attaching the fork to the end of the axle, or of supporting the end of the fork thereon, the side of said end of the fork being shown partly broken away. Fig. 3 is a side elevation of portions of two of the wheel spokes and of a connection applied at their intersection with each other. Fig. 4 is a perspective view of one of the cranks, showing the nut and washer thereon, by which the pedal is connected thereto. Fig. 5 is a front elevation of the ball-bearing case, the cover being removed, and Fig. 6 is an edge view of said case. Figs. 7, 8, 9, and 10 illustrate detail parts of the ball-bearing fixtures, hereinafter fully described. Fig. 11 is a perspective view of an axle-sleeve operating within the ball-bearing. Fig. 12 is a sectional view of one end of the wheel-hub of the ball-bearing case and internal parts, as hereinafter described, a longitudinal section of a portion of the crank, and a side elevation of one end of the axle and of said axle-sleeve, said figure showing two of the balls of the bearing in operative relation to said sleeve and the ball-case. Fig. 13 is a side elevation of one end of the handle-bars and the handle thereon. Fig. 14 is a perspective view of the end plate of a pedal and portions of the foot-

rollers thereof. Fig. 15 is a transverse section of the backbone of the bicycle.

In the drawings, B is the front, and D the rear, wheel of the bicycle. 2 is the backbone; 3, the rear-wheel fork. The front fork-legs (only one of which is shown in the drawings) are indicated by 36, and the fork-head by 47. The said backbone, the fork-legs 36, and the handle-bars 4 are made tubular, and each is constructed with a longitudinal rib, *a*, on its inner surface for the purpose of adding additional strength to said parts. The said backbone, fork-legs, and handle-bars are constructed from sheet metal folded and drawn to proper tubular shape, and having the edges thereof along the seam folded inward and brought side to side, as shown in Fig. 15, to form the longitudinal internal strengthening-rib *a*, (see also Fig. 2,) whereby a great degree of rigidity and strength is imparted to said parts. Said folded edges are secured together by brazing or other suitable means.

The handles on the ends of the handle-bars of a bicycle as ordinarily constructed extend substantially in a line with that part of the bar to which they are attached, and hence it becomes necessary for the rider to turn his hands to more or less of an unnatural position to grasp the handles, and such position is inconvenient and wearisome when maintained for a considerable time, especially when the handle-bar must be held with considerable rigidity, and to obviate the said inconveniences the improved handle and the means for attaching the same to the handle-bar (shown in Fig. 13) are provided. The handle-frame in said figure is made nearly in the form of that of a spade-handle, and consists of a longitudinally-perforated socket, 7, on the outer end of which the prongs *c* and *d* of the handle are so set as to maintain the handle proper, which is secured between the ends of said prongs at an incline to the axis of said socket. In other words, when the handle-bar 4 is fitted with said improved handles and they are turned to operative position thereon, the parts 6, which are grasped by the hand, stand at an outward incline relative to each other, and thereby said hand-gripped parts of the handle are brought

to a position which accommodates them to the natural position of the hands of the rider. The end of the handle-bar 4 passes through the said perforated socket 7 of the handle, and a nut, 8, screwed on the end of said bar, secures the handle thereto. The said socket is so fitted to the end of the handle-bar that the handle is free to turn thereon, so that the handle itself may automatically adjust itself to the position of the arms of the rider.

In order to guard against accidents caused by some obstruction on the road, against which the wheel B is suddenly driven, and to counteract the effect of such obstruction by throwing the rider backward on the machine, the saddle 9 is supported thereon as follows: A strap, 13, is secured on the backbone, and the lower end of the rear saddle-brace, 10, is pivoted to said strap, its upper end being pivotally connected to the rear end of the saddle. On the lower end of said brace is an arm, *e*, having a bearing on the backbone in front of said strap, whereby the brace is maintained in the position shown when the rider is on the saddle, but the brace is free to swing backward. The front end of the saddle is pivotally connected to the upper ends of two metallic straps, 12, (only one of which is shown in the drawings,) whose lower ends are pivoted to the neck *o* of the backbone. One of said straps has an upwardly-projecting hand-lever, 14, rigidly fixed thereon, and the other strap has a trigger-hook, *b*, on its lower end. A trigger, 15, is pivoted on said neck and has one arm extending between the fork-legs 36, near the periphery of the front wheel, B, and a second arm extending toward the end of and capable of engaging with said trigger-hook *b*, as shown in Fig. 1, and when so engaged the saddle is held in the position there shown; but when the wheel B strikes a stone or like obstacle on the road, whereby it is given an upward motion between the fork-legs, its periphery engages with one arm of said trigger and causes it to be disconnected from the said hook on the saddle-strap, letting the saddle drop backward on the backbone and causing the rider to be carried suddenly rearward, thus counteracting the tendency of said obstruction to throw the rider over the wheel. The saddle is again elevated to the position shown in Fig. 1 by grasping the end of the hand-lever 14 and throwing it toward the fork-head, and the hook *b* on the strap 12 becomes re-engaged with the trigger 15. The said lever 14 may be attached to either of said straps 12.

In order to enable a person to set the foot-pedals on the crank 16 (see Fig. 4) at such known distance from the axle 28 as may be required, the crank has formed on its edge opposite its slotted portion, through which the pedal-axle passes, an index-scale, *f*, on which figures may be applied to indicate the throw of the pedal. The washer 18, usually placed under the nut 17, by which the pedal is secured to the crank, has an index-mark, *x*,

thereon to aid in setting the pedal, in connection with said scale.

A ball-bearing for the front or rear wheel of a bicycle is constructed as shown in Figs. 5 to 12, inclusive, and embodies the following elements: A ball-bearing case, 19, of cylindrical form, is provided, having its rear side perforated to receive the axle 28, and having spring-steps 23 and a post, 24, thereon, for a purpose hereinafter described. A pinion, 21, is hung on a pending lip under said case, whose geared periphery extends through the side of the case, as shown. A screw-thread is cut around the interior of said case, extending only a short distance from its open side. Into the case 19 are fitted the two segments 20 of a ball-holding ring, having the internal annular groove, *z*, and on their outer borders the projecting teeth *i*. A ball-sleeve, 27, having an annular groove, *z'*, is placed between the said ball-holding ring, and bearing-balls *n* are placed between said sleeve and ring in the said grooves *z* and *z'* in the positions shown in Fig. 12, which figure shows also the end of the axle 28, adjoining the rear side of the case 19, and a portion of the wheel-hub 29 in like position, the reduced end of the axle, to which is screwed the crank 16, passing through said sleeve 27. A washer, 25, (see Figs. 8 and 9,) having a geared periphery and a spiral rib, *y*, on one face thereof, is fitted into the case 19, adjoining the outer side of said segments 20, and said spiral rib *y* is thereby brought into engagement with said projecting teeth *i* on said segments, and its geared periphery is brought into engagement with the said pinion 21, hung on the under side of the case 19. A locking-washer, 26, (see Fig. 10,) having a screw-threaded periphery, is adapted to be screwed into the case 19 against the side of said washer 25 and hold it in position when once adjusted. The said pinion 21 is capable of being turned to impart a rotary motion to said washer 25, whereby the segments 20 are adjusted toward and from the sleeve 27 to take up for any wear between the sleeve and said segments which may be occasioned by the movement of the balls *n* in the grooves between said parts. After said segments 20 have been adjusted, as aforesaid, the set-screw 22 in the lower side of the case 19 is screwed against one of said segments to prevent any circular movement of the segments 20 when the sleeve 27 is rotated between them. The crank 16 is screwed against the outer end of the sleeve 27, as shown in Fig. 12.

An improved spring-connection between the lower end of the front fork and the axle is provided, and is constructed as follows: Two posts, 31, (see Fig. 2,) are rigidly connected to the said spring-steps 23, and on said posts are placed the spiral springs 32, said steps 23 being, as above described, parts of or rigidly connected to the ball-bearing case 19. A spiral spring, 33, is also placed on the said post 24 on the top of said case 19. A yoke, 30,

having the legs *g*, whose lower ends are perforated, is placed on said springs 32 and on said posts 31, said legs having a free movement vertically on the latter and being connected therewith by suitable nuts on the top thereof. The upper portion of said yoke 30 bears upon the top of said spring 33, and is perforated to receive the end of the post 24. Two cheek-pieces, 34, (one only of which is shown in the drawings,) project upwardly on said yoke, between which the lower end of the fork-leg 36 is pivoted by a bolt, 35, which passes through said cheeks and leg. A spring-step, 38, projects laterally from the upper part of said yoke 30, and a like step, 37, is rigidly fixed on the front side of the fork-leg 36, opposite said step 38, and between said two steps is placed the spiral spring 39. The above-described yoke-and-spring construction, in connection with the lower end of the fork-leg, provides for an easy vertical motion of the front wheel and the axle when the machine is running on a road having a surface more or less uneven, and it permits the wheel when encountering a stone or similar thing on the road to have the above-referred to vertical motion in the fork, whereby the wheel is carried against the trigger 15, having an indirect connection with the saddle-supports. The spring 39, above described, also contributes to the increased ease of action of the wheel and fork under the conditions above described.

For the purpose of increasing the strength of a wheel, either front or rear, by holding the spokes 43 in line, the double sleeve 44 is provided, constructed of suitable metal, the longitudinal perforations in which correspond to the directions in which the spokes extend at their points of intersection as they run from the hub to the wheel-rim, and said perforations are tapered to correspond to the taper of those portions of the two spokes on which the sleeve is fitted at the point of intersection of said spokes. By reference to Fig. 2 it will be seen that when once said sleeve is brought to its proper position on the spokes, and the latter are secured to the hub and the rim of the wheel, the sleeve must retain its position thereon and unfailingly hold the spokes side by side at that point, which, as will be seen by reference to Fig. 1, is about central between the hub and the rim.

In order to enable the rider to retain his foot on the pedal in a position about midway between the ends thereof, a foot-guide, 42, (see Fig. 14,) is arranged near each end of the pedal between the foot-rolls 40. The said foot-guide is made, preferably, of sheet metal and more or less elastic, and is provided with a sleeve, *m*, having therein a set-screw, *s*. Said sleeve, together with the guide 42, is secured on the hollow hub *w* of the end plate, 41, of the pedal, and may be moved longitudinally on said hub. In practice one of said guides is attached to each end of the pedal, in the manner above described, and the guides may be adjusted on

the hub *w* to such spread as may be required by the width of the sole of the boot. The downturned end of the guide 42, between the rollers 40, is not intended to hook onto the edge of the sole of the shoe, but simply to bear against said edge.

The handle-bar 4 has a bearing in the front side of the head 45, which fits onto the upper end of the fork-head 47. Said head 45 is secured to the fork-head in such a way that it is conveniently removable for convenience in packing the machine for transportation, as follows: A lip, 48, extends rearwardly on said fork-head, and a similar lip, 46, on the rear side of the head 45, extends over said lip 48, and a bolt passing through said two lips rigidly secures one to the other and prevents the head 45 from swinging on the fork-head while the machine is being guided. As a further means for rigidly securing the head 45 to the fork-head, a nut, 50, is screwed on the upper end of the fork-head, which projects above said head 45. The said socket part 7, or prong-support of the handle, which is attached to the handle bar, may, if preferred, be made solid and to enter the end of said bar and to swivel therein, instead of having said bar enter the socket.

What I claim as my invention is—

1. In combination, the fork-head 47, having the lip 48, the handle-bar head fitting on said fork-head having a lip, 46, and a suitable bolt passing through said lips, substantially as set forth.

2. A bicycle-handle consisting of the prong-support 7, having prongs thereon holding the hand-grip part 6 at an incline to the axis of said support, substantially as set forth.

3. In combination, the handle-bar 4, the handle consisting of the longitudinally-perforated prong-support 7, receiving the end of said bar and having prongs thereon holding the hand grip part 6 at an incline to the axis of said support, said handle being capable of turning on said bar, substantially as set forth.

4. In combination, the saddle 9, the rear brace, 10, thereof having the arm *e* engaging with the backbone, the front straps, 12, one having thereon the hook *b* and one having the lever 14 thereon, the trigger 15, engaging with said hook, and the front wheel, B, substantially as set forth.

5. A ball-bearing consisting of the outer case, 19, having a partially screw-threaded interior, the two internally-grooved segments 20, each having the teeth *i* thereon, the grooved sleeve 27, a series of balls, *n*, fitting the grooves in said segments and sleeve, the washer 25, having a spiral rib engaging with said teeth *i* and having a geared periphery, the locking-washer 26, screwing into said case, and the pinion 21, engaging with said washer 25, combined and operating substantially as set forth.

6. In combination with the ball-bearing case 19, having the spring-steps 23 and the post 24 thereon, the posts 31, fixed on said steps, the springs 32, the yoke 30, having legs

bearing on the latter-named springs and engaging with the posts 31, the spring 33, interposed between said case and said yoke, and the fork-leg pivotally connected to said yoke, substantially as set forth.

7. The yoke 30, having the projecting step 38, the fork-leg pivoted to said yoke and having the step 37, extending over said step on the yoke, combined with the spring 39, interposed between said two steps, substantially as set forth.

8. In combination with the spokes of a bicycle-wheel, the double longitudinally-per-

forated sleeve 44, fixed on said spokes at their point of intersection, substantially as set forth.

9. As means for adjusting and holding the grooved segments 20 of the ball-bearing, said segments each having the teeth *i* thereon, combined with the washer having a spiral rib thereon engaging with said teeth, substantially as set forth.

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