

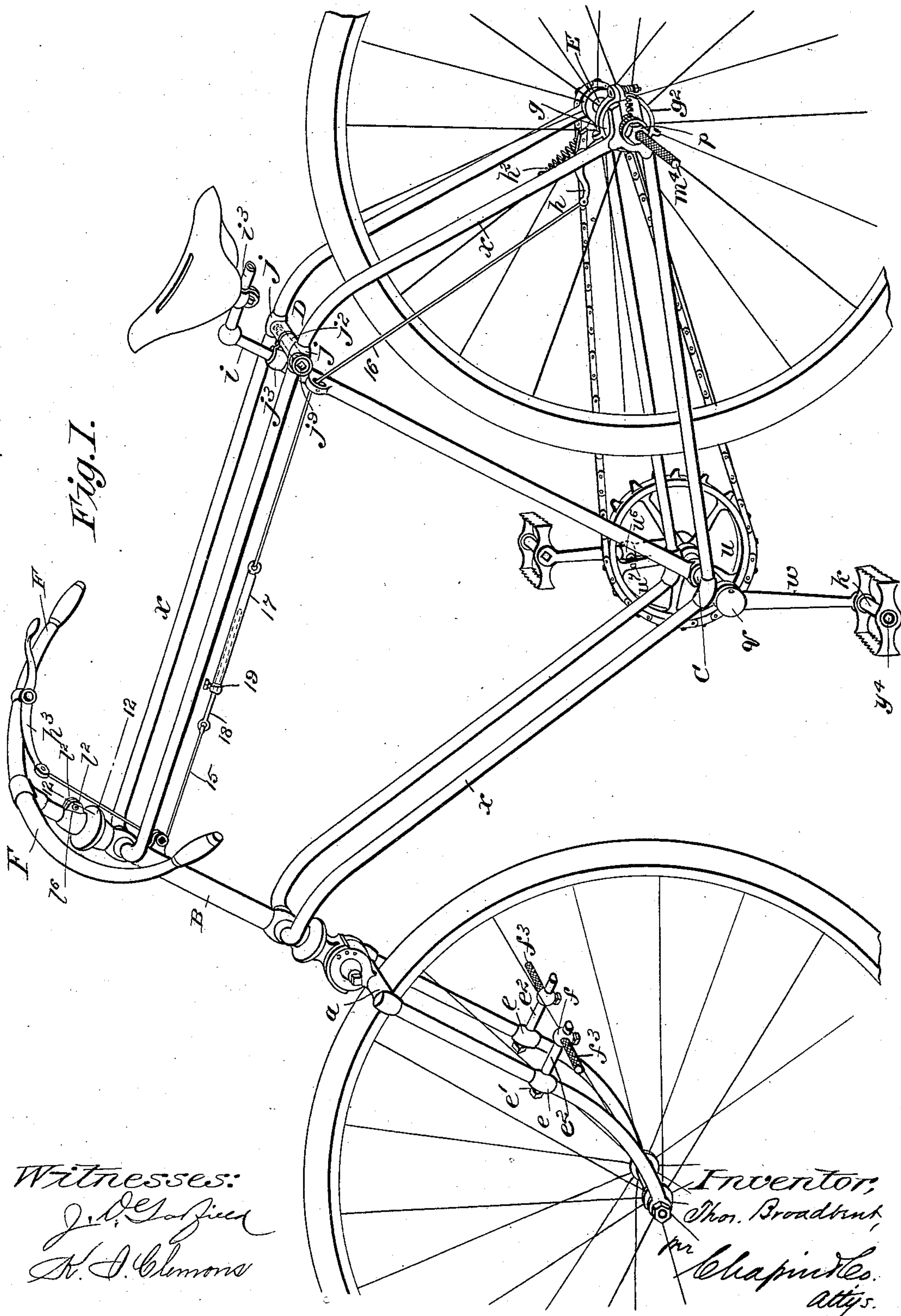
(No Model.)

3 Sheets—Sheet 1.

T. BROADBENT.
VELOCIPÈDE.

No. 507,412.

Patented Oct. 24, 1893.



(No Model.)

3 Sheets—Sheet 2.

T. BROADBENT.
VELOCIPEDE.

No. 507,412.

Patented Oct. 24, 1893.

Fig. 2.

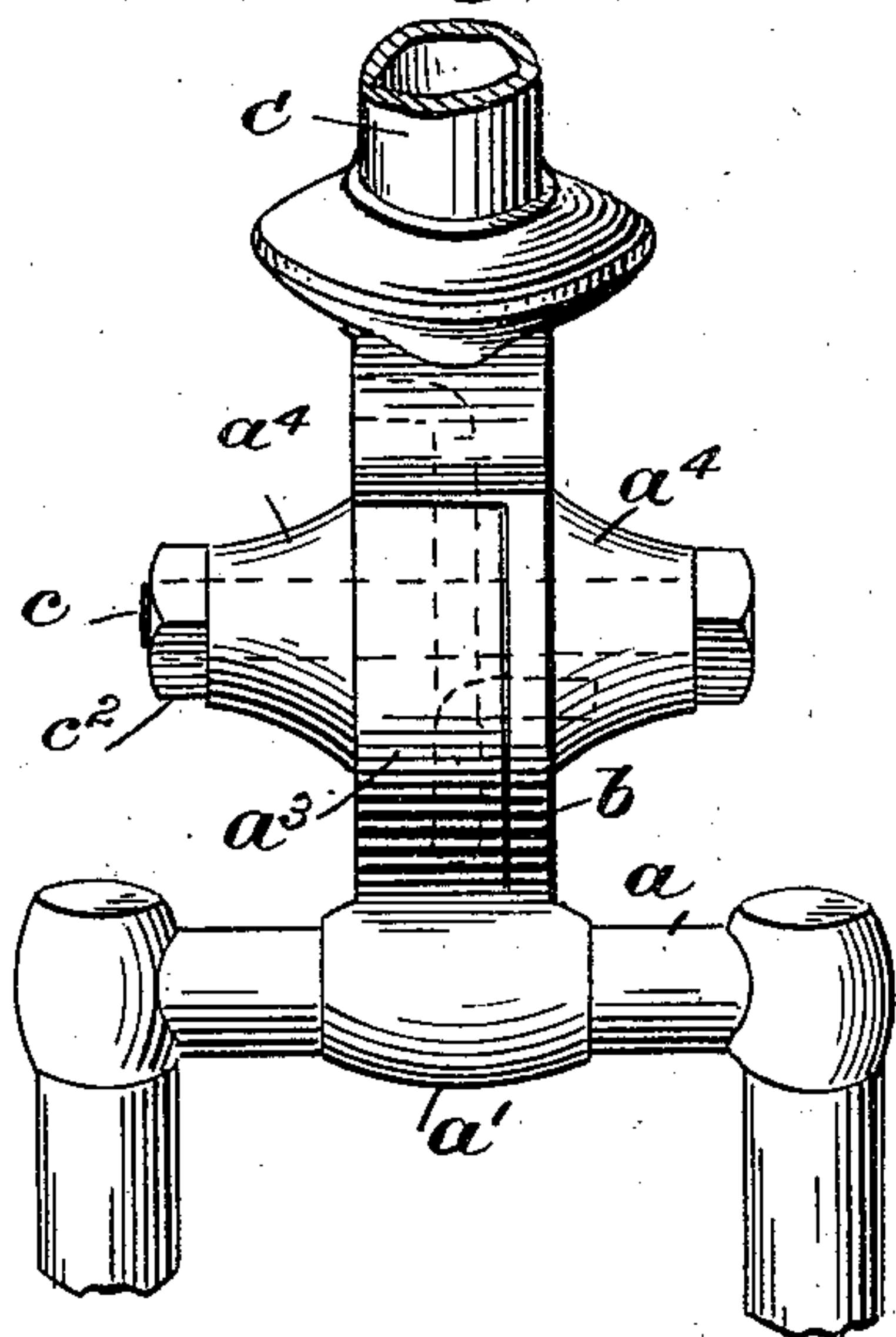


Fig. 3.

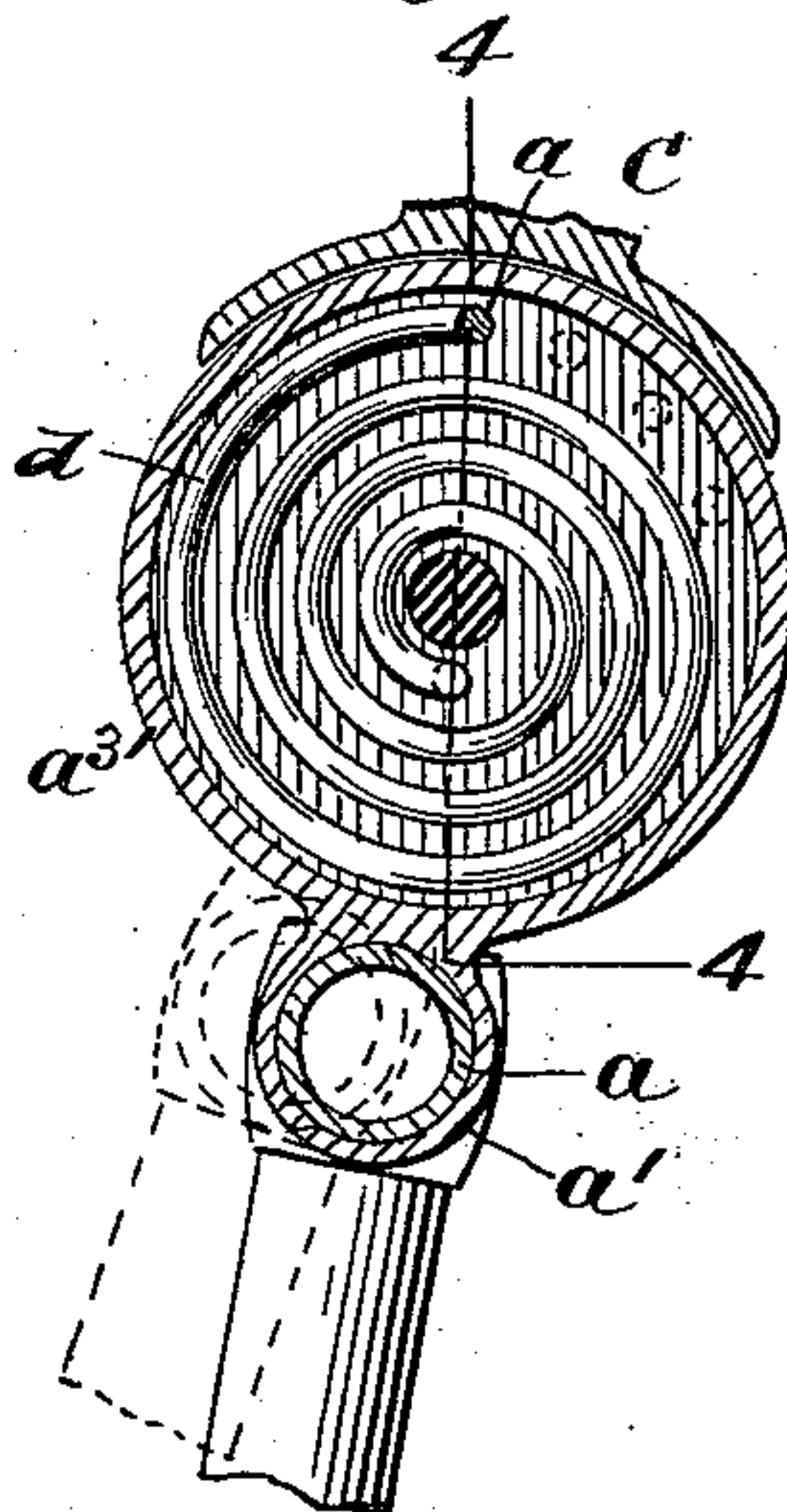


Fig. 4.

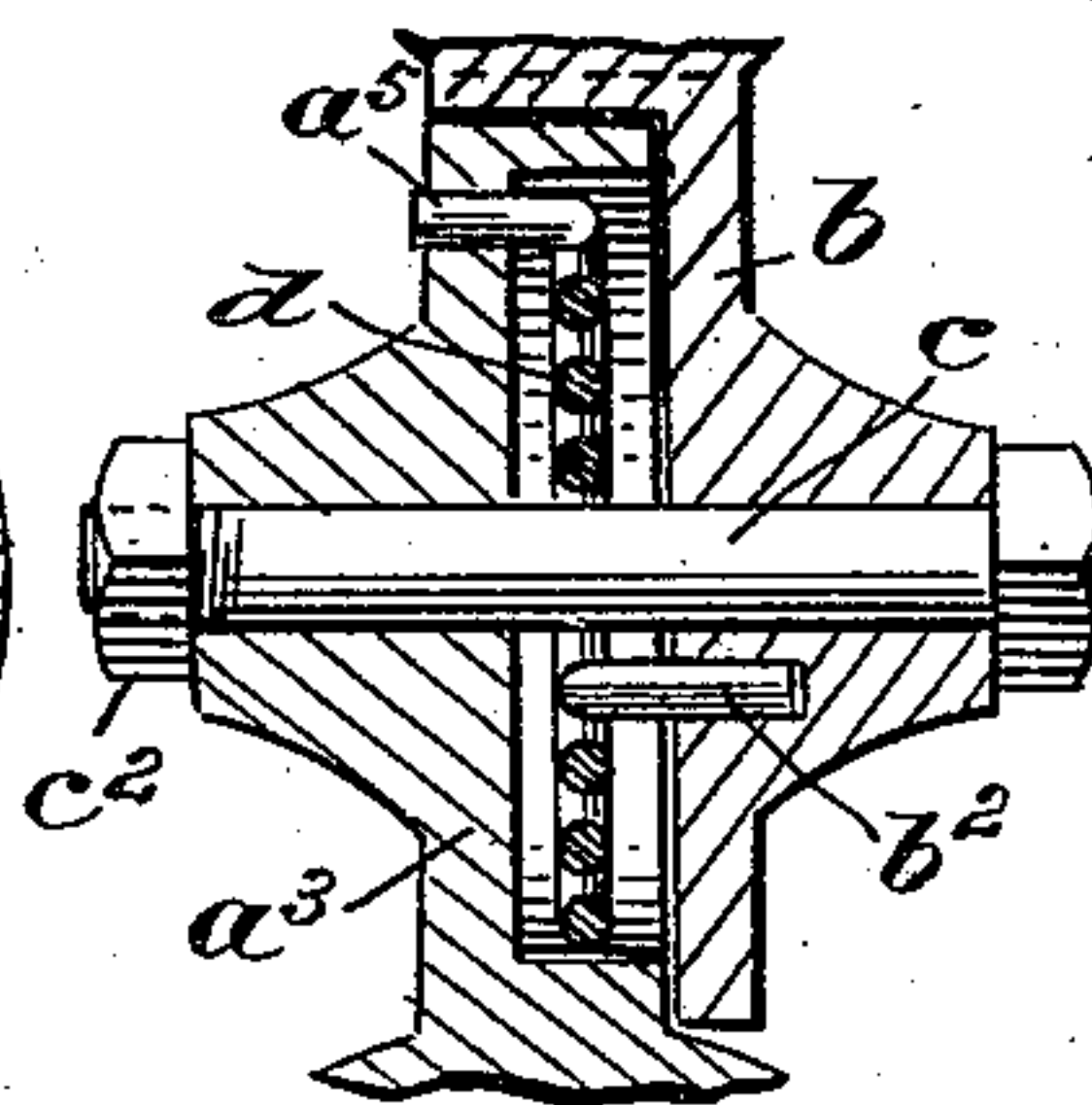


Fig. 5.

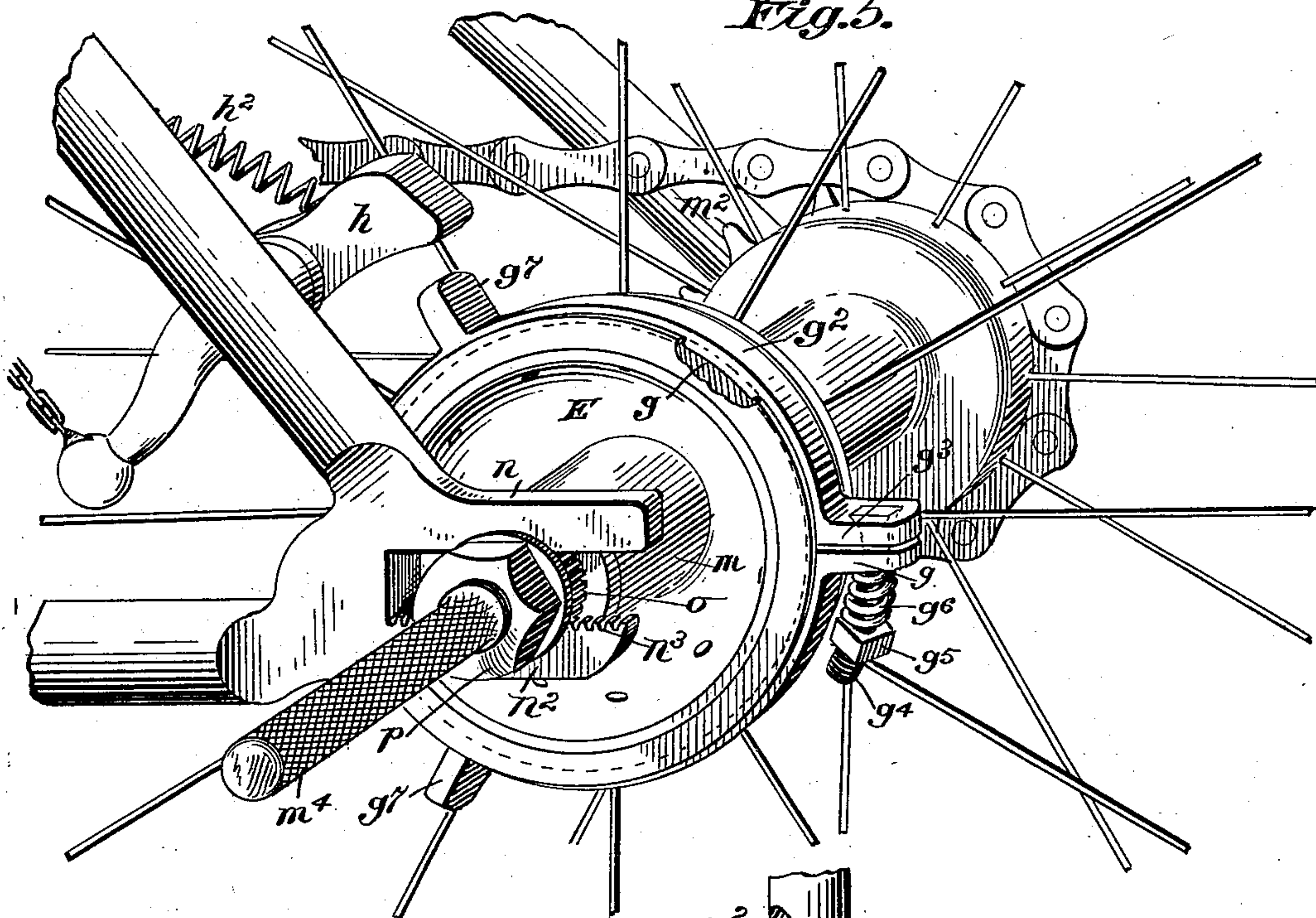
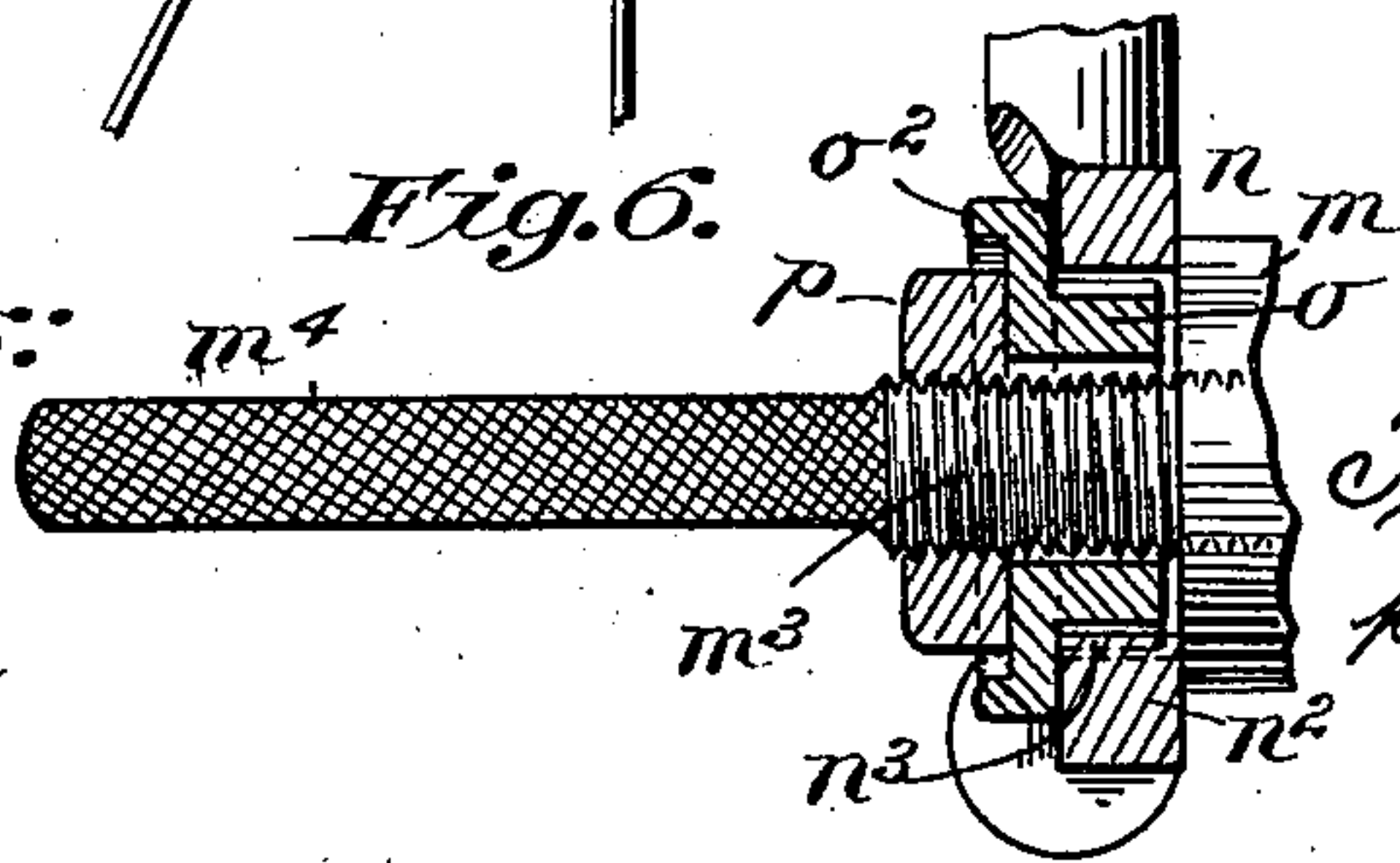


Fig. 6.



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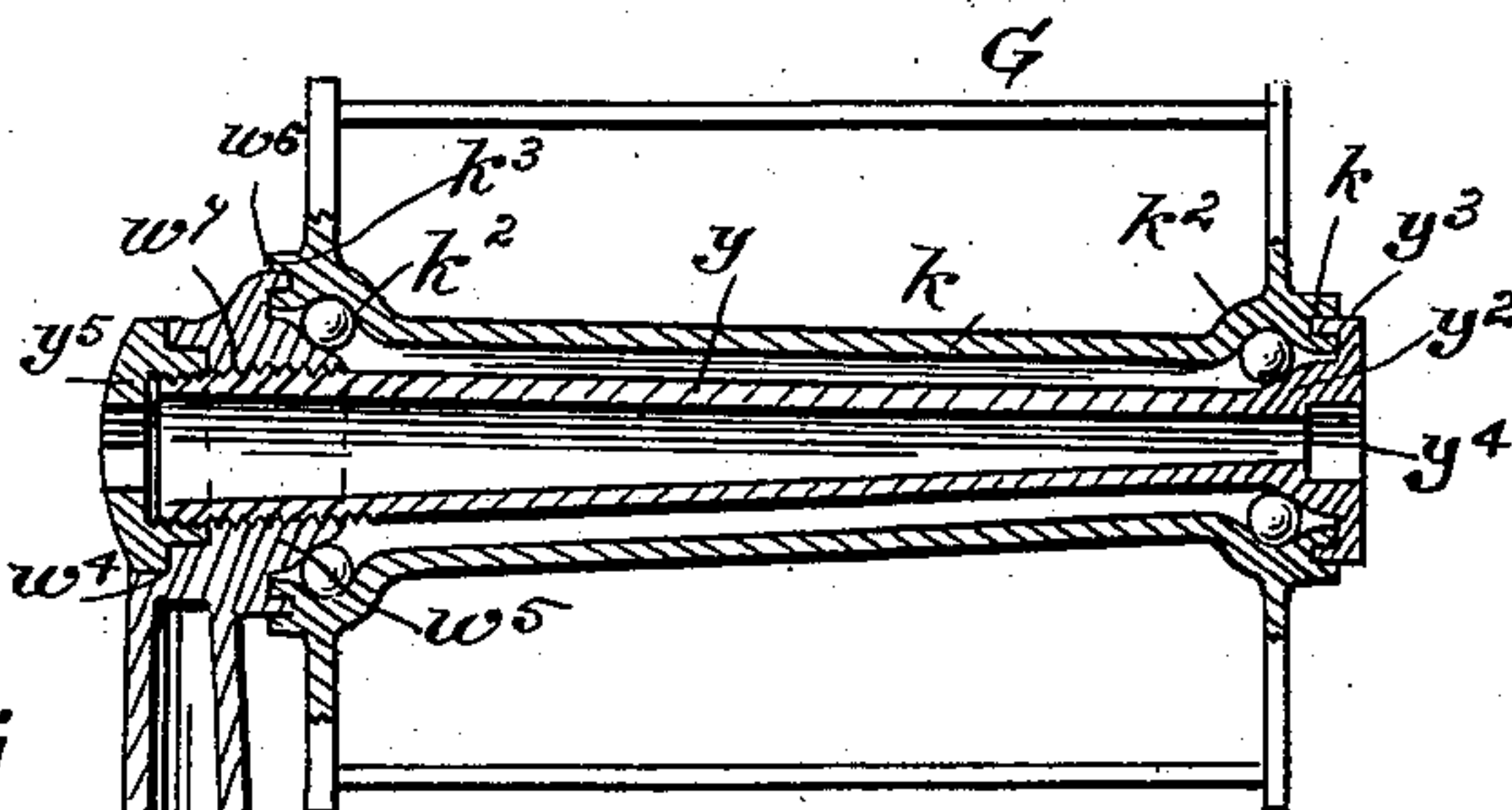
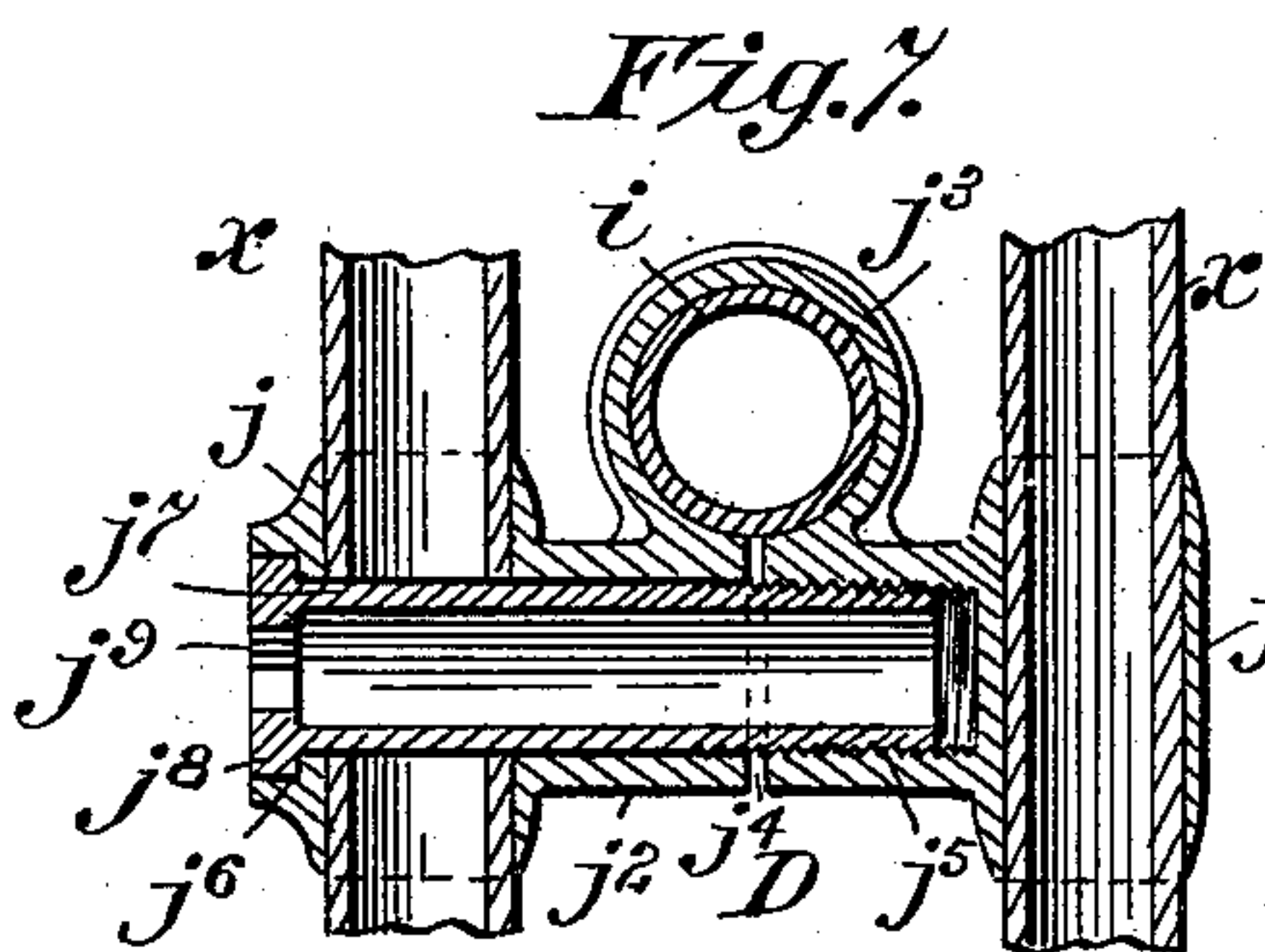


Fig. 8.

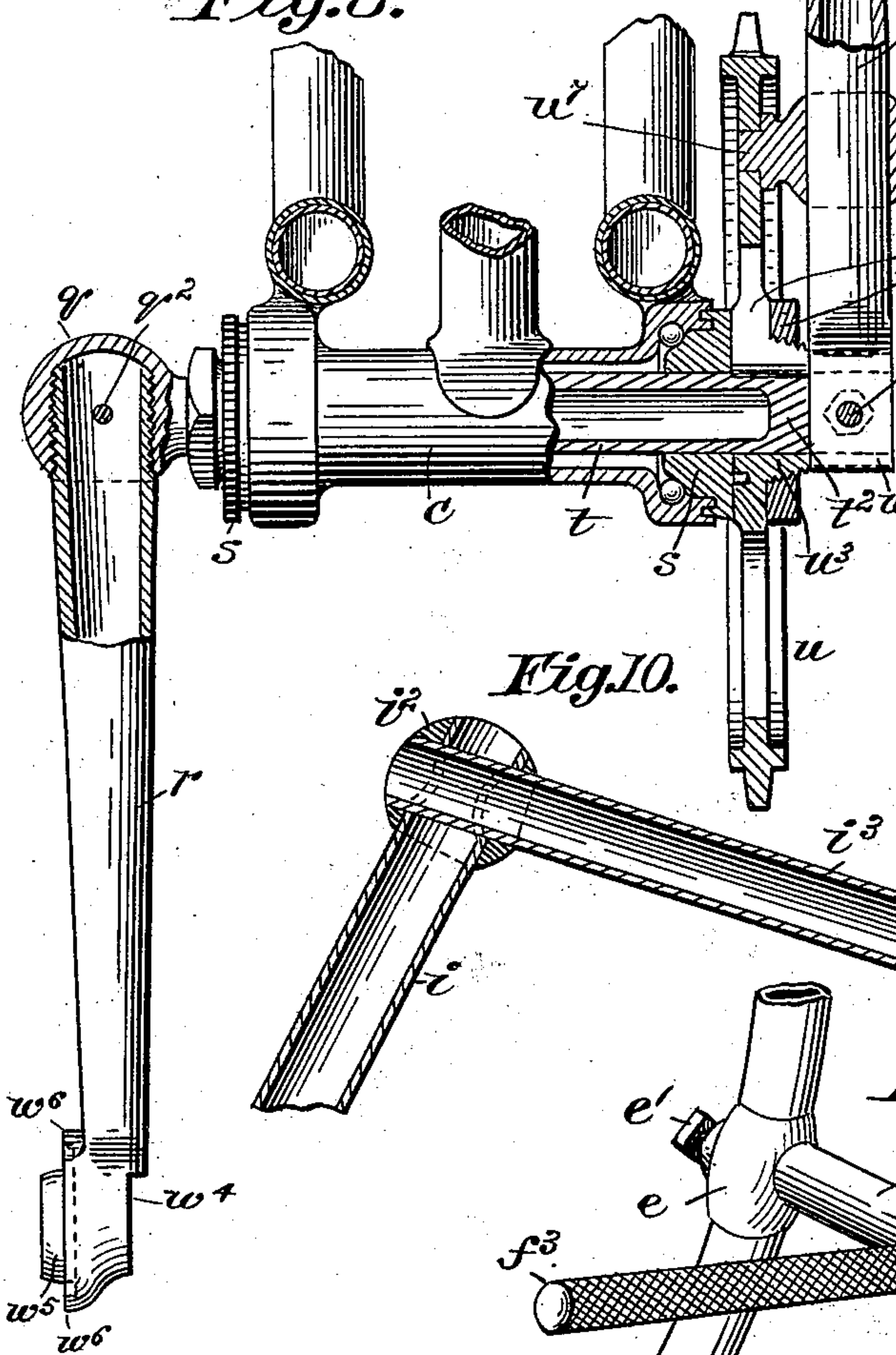


Fig. 10.

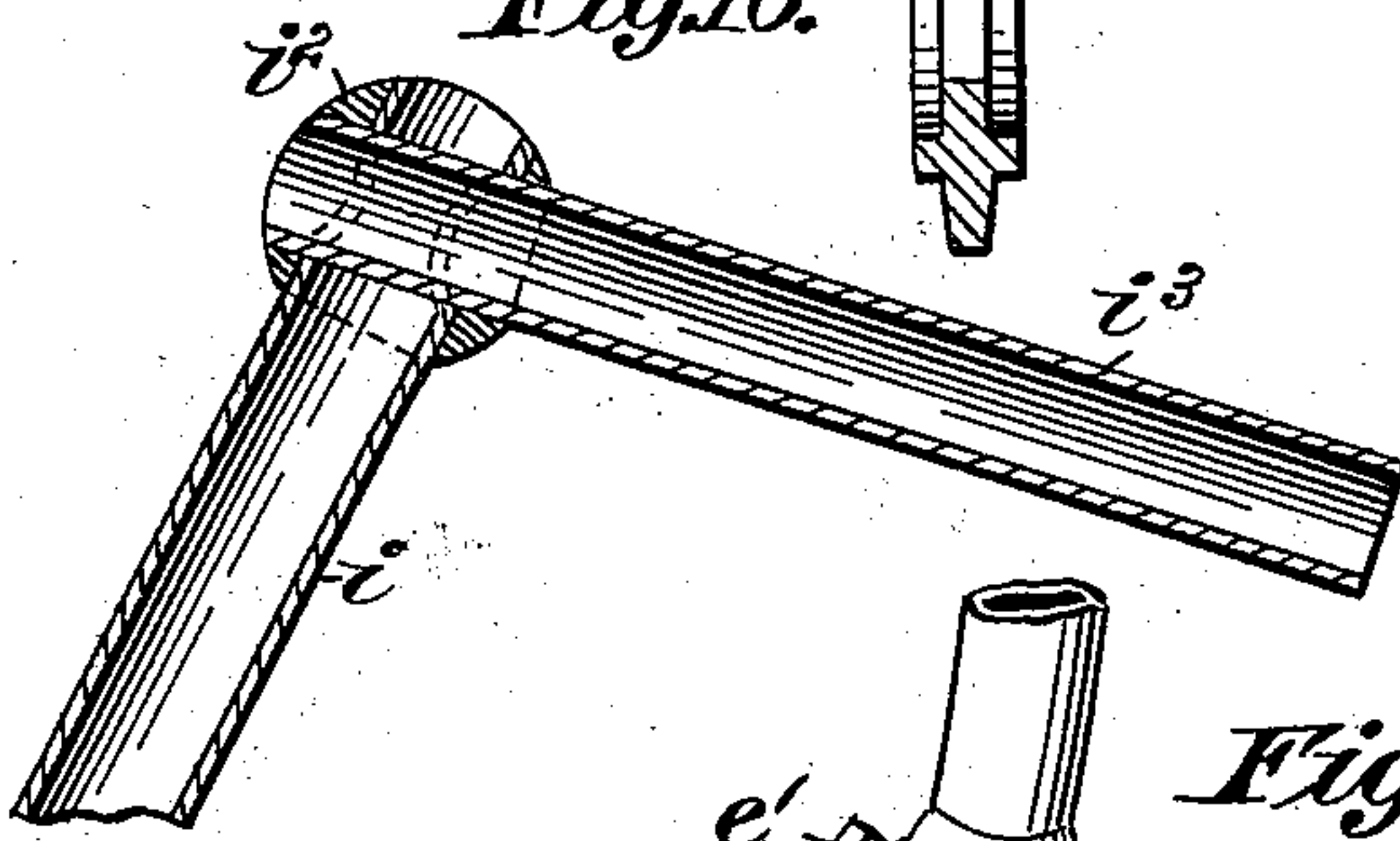


Fig. 11.

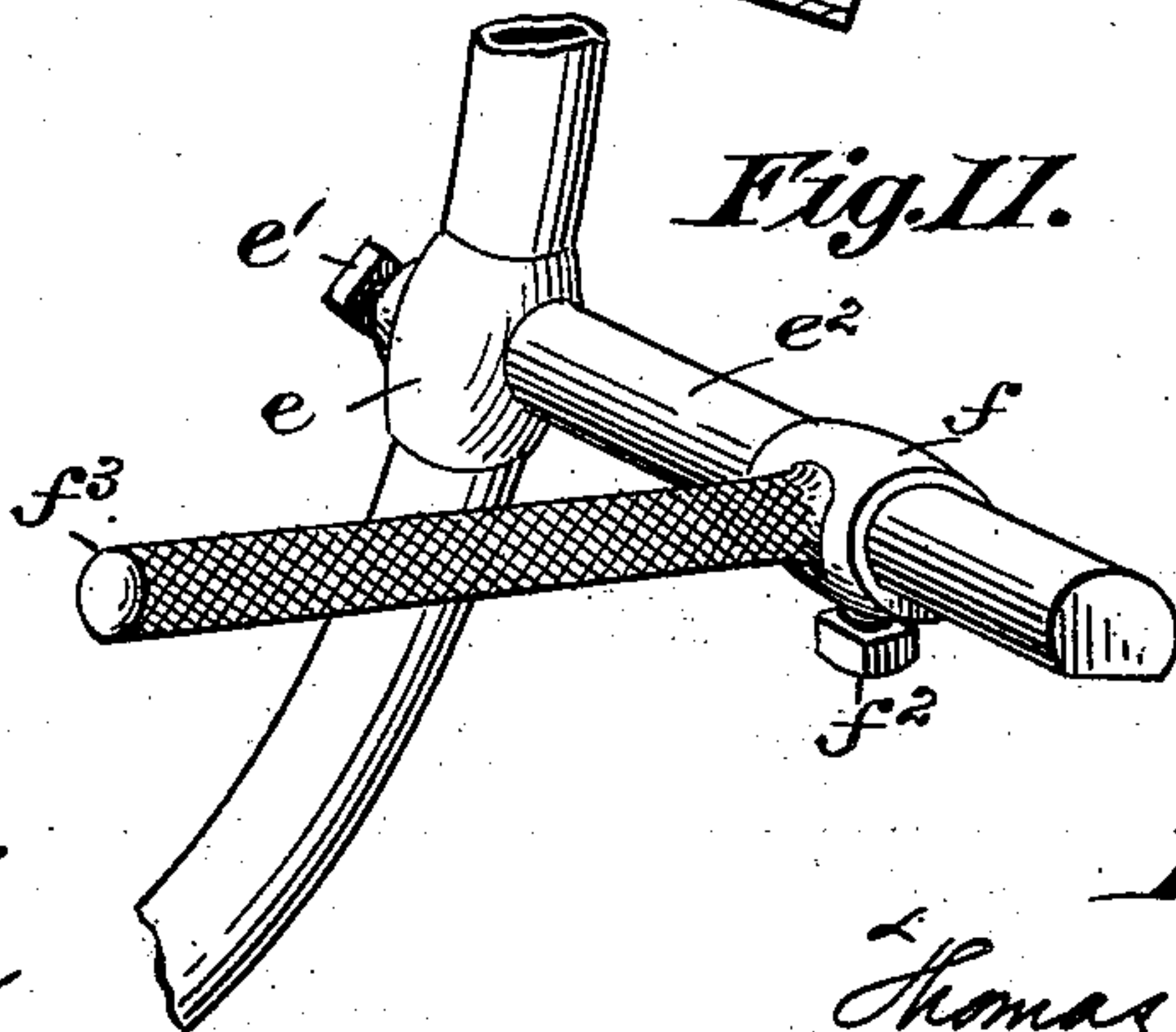
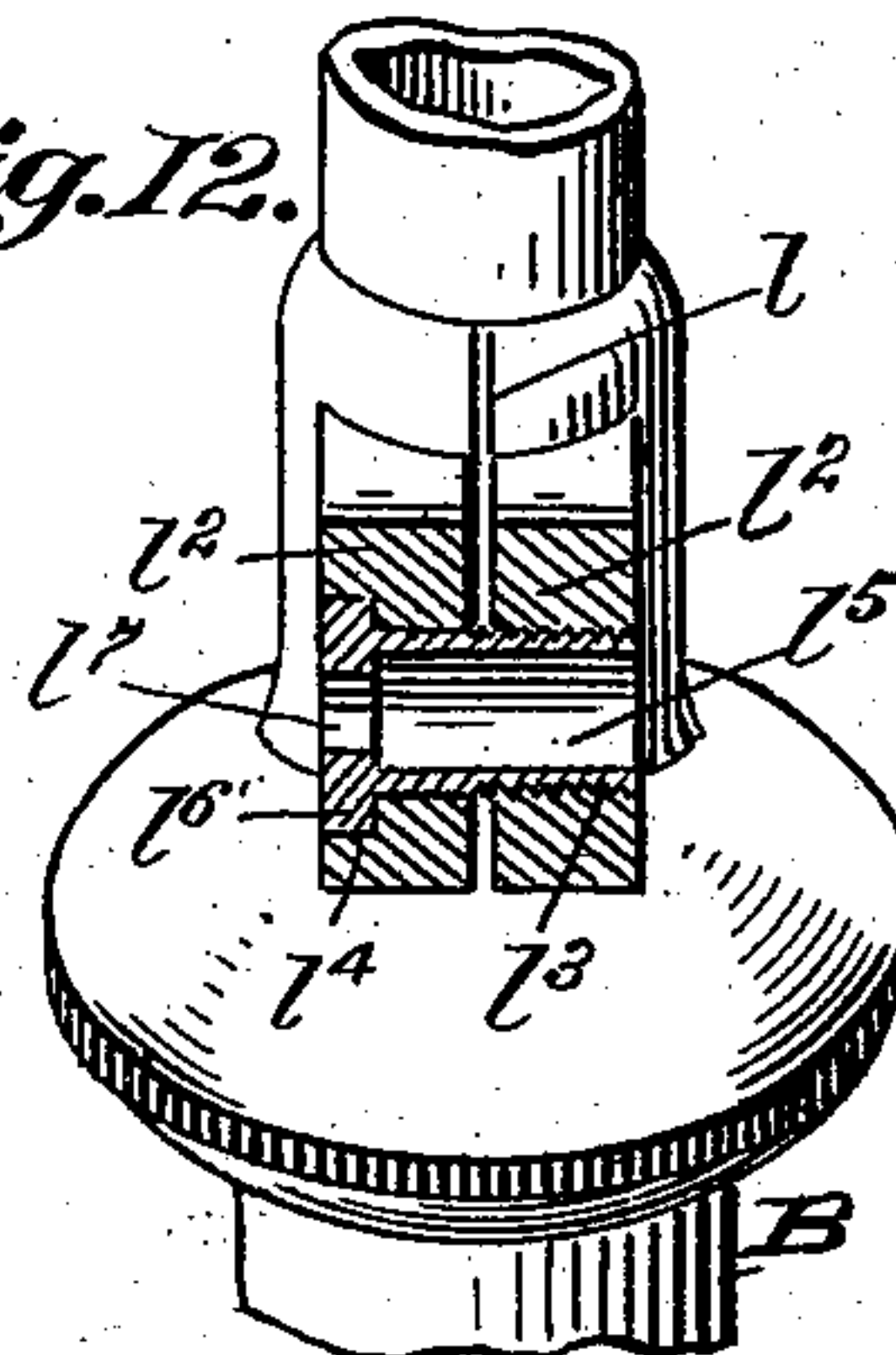


Fig. 12.



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UNITED STATES PATENT OFFICE.

THOMAS BROADBENT, OF WORCESTER, MASSACHUSETTS.

VELOCIPEDE.

SPECIFICATION forming part of Letters Patent No. 507,412, dated October 24, 1893.

Application filed December 27, 1892. Serial No. 456,449. (No model.)

To all whom it may concern:

Be it known that I, THOMAS BROADBENT, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented new and useful Improvements in Velocipedes, of which the following is a specification.

This invention relates to improvements in velocipedes, more especially safety bicycles.

10 The invention relates: to improved, adjustable steps or foot supports for the front fork; to spring connections between the frame and front-fork whereby a yielding movement of the head relative to the frame may be had 15 strictly fore and aft, the parts being absolutely stiff so far as any sidewise deflection is concerned; to a cross-brace for the double frame at top, which is also an adjustable confining device for the saddle-post; to an improved brake mechanism applicable at the 20 hub of one of the wheels; which is very easy, quick and effectual in operation; to the construction of and means for securing the crank-shaft, crank, and sprocket-wheel, the one to 25 another, and all together; to the construction of the pedal-shaft and the means for securing it to the crank, and for adjusting it relative to the bearings for the pedal; to the construction of the saddle-post, and to other minor 30 devices, and all substantially as will be hereinafter rendered more apparent.

A leading object of several of the constructions is to insure great strength and durability and at the same time a remarkable degree 35 of lightness, and also the avoidance of many projecting members, bolts, nuts or lugs which, in addition to being unsightly, and which detract from the plain and simple aspect of the bicycle, constitute points of inconvenience and annoyance, not to say, also, of increased 40 danger, or liability of causing injury to the rider, or another person with whom collision may be had, as, for instance, in a road or track race.

45 The invention consists in various combinations and arrangements of parts, and the construction of certain of the parts, all as will hereinafter more fully appear and be set forth in, and covered by, the claims.

50 In the accompanying drawings, Figure 1 is a perspective view of a safety bicycle having

several of the improvements of this invention applied thereon. Fig. 2 is a view taken at the back of the head, looking forwardly, and on a larger scale, showing portions of the tubular head and of the front-fork which are pivotally united and normally spring sustained, the one relative to the other. Fig. 3 is a section taken centrally through the parts seen in Fig. 2, on a plane at right angles to the connecting pivot, and Fig. 4 is a section taken on line 4—4, Fig. 3. Fig. 5 is a perspective view illustrating the improved brake in its application on the hub of the rear wheel and also showing the adjustable take-up for the sprocket-chain, and Fig. 6 is a vertical cross-sectional view of the latter device. Fig. 7 is a horizontal sectional view of the cross-brace for the top of the double frame and the confining device for the saddle-post. Fig. 8 is in part a plan, and in part a horizontal sectional view, of the crank-axle and its bearing support, the sprocket-wheel, cranks, and one of the pedals,—while Fig. 9 is a side view of the crank-shaft, crank, and sprocket-wheel. Fig. 10 is a central vertical sectional view of the saddle-post and saddle-post-arm. Fig. 11 is an enlarged perspective view of a part of one of the front forks showing the adjustable step. Fig. 12 is a view of the rear upper part of the head, as seen looking forwardly.

Similar characters of reference indicate corresponding parts in all of the views.

In the drawings the frame of the machine, as shown, is of the type now quite commonly known as the double frame, double diamond, or double Humber, the same comprising two sidewise arranged frames of an approximate diamond form, forwardly united by the tubular head, B,—at the lower middle portion united by the crank-axle bearing support, C, and at the upper middle portion by the cross-brace, D, which latter will be hereinafter particularly described; while at its rear, this frame is adjustably connected to the axle of the rear wheel. The front fork-legs are preferably formed of tubes united by the crown or transverse uniting bar, *a*, and the front-fork and head are so pivoted as to be capable of a swinging or yielding motion, fore and aft, against a spring reaction by means which will be now described, reference being had to

Figs. 1, 2, 3 and 4. The fork-crown, a , is encircled by a sleeve, a' , which is brazed or otherwise suitably secured thereto and a circular chambered lug, a^3 , is rigidly secured to and upwardly extended above this sleeve, and the tubular head, B , has at its lower portion the depending circular lug, b , which may lie against and close the chambered part, a^3 . Both of these lugs, a^3 , b , are provided with the axially and sidewise extended bosses, a^4 , for increased length of bearing of the uniting pin, c , which is here shown as in the form of a headed bolt with confining nut, c^2 .

d represents a volute spring arranged within the aforesaid chamber to encircle the pivot-bolt, and one end of the spring is laterally turned, as seen at b^2 , and entered within a socket therefor in the lug, b , while the other end of the spring is turned laterally in the opposite direction, as seen at a^5 , and entered within the socket therefor in the lug, a^3 . The spring is understood as being, while in these relations, under a considerable degree of tension; and this simple, neat, and inexpensive connection between the front fork and head will insure the avoidance of considerable jolting occasioned by riding over rough or uneven roads, and it will, furthermore, be perceived that the connection is sufficiently rigid against any sidewise or twisting forces.

Each fork-leg is encircled by a sleeve, e , (see Figs. 1 and 11) which has a set screw, e' , for confining it in any vertical adjustment and each sleeve has, as an integral rearward extension thereof, a bar, e^2 , on which is a sliding sleeve-like part, f , with a set-screw, f^2 , for confining it in adjustment; and each of these sleeves, f , has the outwardly extended bar, f^3 , as a fixed part thereof to constitute the step or foot-rest. The rear support bars for the foot-rests may be of a **D** cross-section and the sleeves, f , have correspondingly formed holes therethrough whereby liability of the foot-rests to turn on their support-bars is prevented. Of course the sleeves, f , might have a squared fit upon the bars, e^2 , as equivalent for the indicated purpose.

Upon the hub E of the rear-wheel there is a suitably formed disk, g , to receive, for frictional engagement therewith, a brake-strap, g^2 . The brake-strap is shown as provided with the adjacent pair of ear-lugs, g^3 , g^3 , which are suitably extended angularly at the end portions of the strap, and one of these has the arm or spindle, g^4 , secured thereto, the same being extended through and beyond an aperture therefor in the other ear-lug, and receives at its outer threaded end the nut, g^5 , between which and the nearest ear-lug is placed, under reaction, the spring, g^6 , for normally holding the brake-strap in constriction about the brake-hub or disk of the rear wheel so that the strap will rotate as one with the wheel. The brake-strap is provided with a lug, one or more, which may be one of the aforesaid ear-lugs, g^3 , or one or more other lugs, as seen at g^7 , g^7 , which is, perhaps, pref-

erable, while upon a suitable supporting part of the frame is pivotally mounted a lever, h , which may be thrown into or across the circular path of the lug or lugs to arrest the rotation of the strap, whereupon, by the frictional engagement which it has upon the brake-disk of the running wheel the effective brake action will be accomplished. The spring, h^2 , normally holds the brake-lever out of its position for the impediment of the free running of the brake-strap with the brake-disk and this lever is moved into the position for such impediment by suitable operating connections a form of which is clearly indicated in Fig. 1 and consists of a cord, or other suitable flexible connection suitably supported and guided by the frame or fixtures thereof and extended from the brake-lever, h , to the operating hand-lever, h^3 , which is pivotally mounted on and movable with the handle-bar, F . The flexible connection is formed in two sections, 15 and 16, to one of which a tube, 17, of small diameter is secured, while to the other section, 15, a small rod, 18, is connected which has a telescoping engagement with the tube, being held by the set screw, 19, or otherwise.

Inasmuch as the handle-bar is vertically adjustable and the brake-handle lever is carried by the handle-bar, it becomes, of course, necessary to have an extensible connection between the handle-lever, h^3 , and the brake-operating lever, h , and this may be satisfactorily provided for by the means last above described.

A device which constitutes a cross-brace between the opposite side members at the top of the frame, and a clamp for holding in a suitable adjustable confinement the saddle-post, i , will be now described, reference being had more especially to Figs. 1 and 7. The sleeves, j , j , encircle opposite side portions of the frame and a tube, j^2 , is transversely connected as one to said encircling sleeves, this tube having intermediately thereof the sleeve-like projection, j^3 , the axis of which is more or less nearly, though not usually strictly, vertical to accord with the fore and aft rake of the saddle-post. The said transverse tube, j^2 , is transversely cleft or split, as seen at j^4 , the said cleft extending to sever the contiguous part of the sleeve projection, j^3 ; one of the so divided portions of the transverse tube is internally screw-threaded, as seen at j^5 ; and one of the aforesaid sleeves, j , as also one of the tubular side members, x , of the double frame, is transversely bored in axial alignment with the tube, j^2 , the outer opening of the said bore in the sleeve, j , being countersunk, as seen at j^6 .

j^7 represents a tubular section having its one extremity screw-threaded for engagement with the said screw-threaded tubular part, j^5 , this tubular section otherwise passing loosely through the transverse bore of the sleeve, j , frame member, x , and adjacent portion of the transverse tube, j^2 . The outer end of this

screwed tube has the external flange, j^8 , and it is also provided within its end with a squared hole, or equivalent formation, to permit its rotation by means of a squared or
 5 other appropriate instrument. The flange, j^8 , being seated in the counterbore of the sleeve, j , forms a rest or stop for the tubular screw so that the rotation of the latter will draw the one section of the tube, j^2 , longitudinally thereof toward the other, causing
 10 the construction of the clamp tube, j^3 , about the saddle-post. It will be perceived that this constriction, though very light, may be strong, and that it presents a very neat appearance
 15 and is devoid of sharp and angularly protruding parts,—desirable characteristics, especially recognizable by wheelmen.

For the production of a saddle-post with an angularly extended arm which is very strong,
 20 light, and practicable of construction, the saddle-post, i , is preferably constructed of tube, at the upper end of which an axially bored sphere, i^2 , is secured by brazing, and the post extremity and encircling sphere are
 25 both transversely bored and the tubular saddle-post-arm, i^3 , has its end fitted within this bore and brazed or otherwise firmly secured thereto.

The devices for increasing or diminishing
 30 the distance between the crank-and-sprocket-wheel-shaft and the axle of the rear wheel for the adjustment of the sprocket-chain is indicated in Figs. 1, 5, and 6, and will be now described.

m represents the rear-wheel-axle which is understood as being rigidly united to the frame, being, however, bodily adjustable relative thereto by the means now under consideration, and the hub of the rear-wheel with
 40 the sprocket-teeth, m^2 , thereon, freely rotate upon this axle. The axle has, at each of its ends, an axial extension of smaller diameter which, as seen at m^3 , is screw-threaded. And this extension is, as shown, continued in the
 45 bar, m^4 , of suitable length to constitute the rear step. The rear portion of the frame has the upper and lower separated portion, n , n^2 , one of which is rack-toothed, as seen at n^3 .

o indicates a centrally apertured pinion to
 50 loosely encircle the screw-threaded axle-extension, m^3 , the pinion at its outer side having the flange, o^2 , to overlie the outer surfaces of the aforesaid separated members, n and n^2 . The distance between the inner face
 55 of the flange, o^2 , and the inner face of the pinion is less than the thickness of the said parts, n , n^2 , against the inner face of which the suitably enlarged adjacent portion of the axle, m , has an overlapping bearing, as particularly seen in Fig. 6.

p indicates a lock or jam-nut screwing on the axle-extension, m^3 , to be brought to a crowding bearing against the pinion to so force the latter as to firmly clamp and hold
 65 as one the frame members, n , n^2 , against the end face of the axle, forward or rearward slip-

ping of the parts being effectually prevented by the gear-tooth engagement.

Of course to adjust the parts in any degree it is only necessary to unloosen the nut, p , and
 70 turn the pinion, the flange thereof being preferably provided with a milled or knurled rim to facilitate this action. It is understood that this device is applied in duplicate, as necessary at each side of the rear-wheel-hub. 75

Attention will now be directed to the constructions and means for confinement of the parts comprised in the crank-mechanism: And t represents the crank-axle extended through the tubular bearing support, C, there-
 80 for the same having, as usual, the ball-bearings indicated at s , s . This crank-axle is preferably tubular except at its end portions,—and at one end portion, as seen at q , the axle has formed thereon, or secured there-
 85 to, a hollow knob which is apertured and screw-threaded, and the crank, r , at this end of the crank-axle is shown as tubular with its extremity externally screw-threaded and fitted by screw-engagement within the socketed
 90 spherical end of the crank-axle. The confining pin, q^2 , which is understood as passing through the hollow knob and transversely through the inclosed extremity of the crank insures the effectual locking of the so-connected parts. 95
 The crank-axle, at its other end, is left solid (or rendered solid by a filling-in piece), as indicated at t^2 , and receives the sprocket-wheel, u . The sprocket-wheel has the outwardly extended hub, the inner portion of which hub
 100 as indicated at u^3 , is of tapered or conical formation and screw-threaded, while the outer portion thereof, u^4 , may be cylindrical. The sprocket-wheel from its central opening which fits about the axle is radially kerfed, as indi-
 105 cated at u' , and the conical screw-threaded hub portion of the sprocket-wheel receives the nut, v , which, on being screwed thereupon insures the constriction of the sprocket-hub about the axle, and in addition to this means
 110 of confinement a key or pin may be provided. The portion, t^4 , of the axle, which is extended outwardly beyond the tapered hub portion, u^3 , and within the cylindrical hub portion, u^4 , is, together with said hub portion, u^4 , trans-
 115 versely,—here diametrically,—slotted, as indicated at t^5 . The tubular crank, w , has the walls thereof at its butt end closed the one upon the other, as seen at w' , and this so formed part is fitted in the slotted axle and
 120 sprocket-wheel hub, and the pin, or screw-bolt, w^2 , is passed transversely through these so engaged parts, all substantially as is clearly indicated in Figs. 8 and 9. w^6 represents a
 125 hollow hub or sleeve-like part which intermediately encircles the crank, and has a rigid engagement with the sprocket-wheel, u , at a suitable point radially beyond its hub. This rigid engagement of the crank-encircling part, w^6 , is shown as constituted by the stud, w^7 ,
 130 thereof, which is fitted and secured in a socket therefor in the web, or in a spoke, of the

sprocket-wheel. The cranks have at the backs of their outer extremities the step-like depressions, w^4 , and each crank has at its opposite side the angularly extended conical ball-bearing part, w^5 , with the concentric surrounding flange, w^6 . This so-formed extremity of the crank is bored at right angles to the length of the crank and screw-threaded, as seen at w^7 , and this bore which extends to the step-formed back is countersunk, as seen in Fig. 8.

y represents the pedal-shaft, which is formed tubular; the inner end of this shaft is screw-threaded and engaged with the screw-threads shown at w^7 of the crank, the extremity of the shaft being disposed within the aforesaid countersink at the back.

The outer end of the pedal-shaft, y , is formed with the inwardly tapered conical, or otherwise suitably inclined bearing portion, y^2 , with the outwardly extended and then inwardly turned annular flange, as seen at y^3 , the whole preferably being worked by forging or swaging out of the homogeneous stock from which the pedal-shaft is formed. A squared hole, or equivalent formation, for turning the pedal-shaft is seen at the outer end thereof at y^4 .

y^5 represents a hollow lock-nut having the internally threaded tubular shank entered within the countersunk opening at the back of the crank and screw-engaging the therein-disposed extremity of the pedal-shaft. The flanged head of the said hollow nut lies in the base of the step-like depression, w^4 .

The pedal, G, has the tubular body, k , with the outwardly curved or flaring mouths, as seen at k^2 , k^2 , which constitute the other bearing portions between which and the parts, w^5 and y^2 , the hardened balls are confined. The flanges, w^6 and y^3 , enter annular grooves, k^3 , in the ends of the pedal and serve as dust-guards.

The take-up for wear in the pedal-bearings is insured by loosening the lock-nut, y^5 , and turning the pedal-shaft, y , then again setting up the nut.

The tubular head has a portion thereof cleft, as seen at l , and provided at each side of the cleft with the integral lugs, l^2 , l^2 , both of which are transversely and one thereof is internally screw-threaded, as at l^3 , and the other is countersunk, as at l^4 ; and the tube, l^5 , has one end thereof screw-threaded and is loosely passed through one of the said ear-lugs, and with a screw engagement into the other; and the end of this tube opposite from its threaded end has the external flange, l^6 , seated in the aforesaid countersunk lug, and the tube has a squared hole, l^7 , or equivalent means, for turning it.

The pending spindle, F, carrying the handle-bars may be adjusted vertically in the tubular head by loosening the tubular threaded connection between the ear-lugs, which as indicated are rounded, with the constricting tube, l^5 , so applied therein as to leave no pro-

truding part which might accidentally gouge the hand of the rider.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a bicycle, the combination with a suitable part of the frame, as a fork-leg, of a vertically adjustable support and a foot-rest or step forwardly and rearwardly adjustable on the support, substantially as described.

2. In a bicycle, the combination with a front fork-leg having a rearwardly extended bar secured thereon, of a step consisting of a bar connected to and extended laterally from the support bar, and adjustable longitudinally thereof, substantially as described.

3. In a bicycle, the combination with a tubular fork-leg, of a sleeve encircling it, with a set screw therefor, and having a rearwardly extended bar, another sleeve having a forward and rearward sliding engagement with the said bar and a confining screw therefor, and a bar secured to and extended laterally from said sleeve, to constitute a step, substantially as described.

4. In a bicycle, the combination with a front fork and forward portion or head of the frame, the one pivotally connected to the other for a swinging movement fore and aft, and a volute spring encircling the pivot and having one end connected to the fork and the other to the head of the frame, and adjacent parts of said frame-head and fork, which are constructed to constitute a chamber within which the spring is inclosed and concealed, substantially as described.

5. In a velocipede, the combination with a driving or driven wheel having a hub or brake-disk with a friction or brake-strap encircling and normally in tension upon the disk, and a device movable to impede or arrest the brake-strap.

6. In a velocipede, the combination with a wheel of the machine having a hub or brake disk, with a friction or brake-strap encircling the disk and having ear-lugs, and a spring applied thereto for constricting the brake-strap, and a lever adapted to be swung to engage and impede the rotation of the strap with the hub, substantially as described.

7. In a velocipede, the combination with the rear-wheel having the hub or brake-disk, and a brake-strap encircling the disk, and having the extended ear-lug, an arm connected to one of said lugs and extended loosely through and beyond the other, and screw-threaded, the spring and nut arranged as described, and a device for engaging the brake-strap to impede its rotation, substantially as described.

8. In a velocipede, the combination with the rear wheel having a hub or brake-disk encircled by a brake-strap which has a constant tension thereon and which is provided with a lug, a lever pivoted adjacent the brake-

strap and adapted to have an arm thereof swung into the path of the brake-strap-lug and a spring for withdrawing the lever from its position of engagement, substantially as and for the purpose set forth.

9. In a bicycle, the combination with a frame having the upper portion thereof constituted by separated members extending sidewise, and a tube which is arranged transversely between and connected to said side-wise members and which has, at one side thereof a sleeve-like projection, and said tube having the transverse cleft which intermediately divides it and severs the proximate portion of the sleeve, the saddle-post extended within the sleeve, and means for drawing the one portion of the uniting tube longitudinally toward the other to constrict the sleeve about the saddle-post, substantially as described.

10. In a bicycle, the combination with a frame having the upper portion thereof constituted by separated side members, sleeves encircling them and a tube which is connected to said sleeves and which has at one side thereof, and as one therewith, a sleeve-like projection, and said tube having the cleft which transversely divides it and severs the proximate portion of the sleeve, the saddle-post extended within the said sleeve-like projection, and means for drawing one portion of the uniting tube longitudinally toward the other, substantially as and for the purpose described.

11. In a velocipede, in combination, the upper separated side-members of the frame, and a tube which is arranged transversely between and connected to said side-members and which has at one side thereof a sleeve-like projection, and said tube having the transverse cleft which intermediately divides it and severs the proximate portion of the sleeve, a tubular screw extended within the transverse tube and held against endwise movement, and having its extremity in screw-engagement with the internal portion of one of the cleft-divided portions of said transverse tube, substantially as and for the purpose set forth.

12. In a velocipede, the combination with the upper separated side members of the frame, and the sleeves encircling opposite portions thereof, and one of said sleeves and the encircled frame-member being transversely bored, and the sleeve at the orifice of said bore countersunk and the transversely arranged tube, which is connected to and extended between said encircling sleeves and which has the sleeve-like projection, j^3 , at one side and said tube having the transverse cleft which intermediately divides it and severs the contiguous portion of the sleeve, and one of the so divided portions of the transverse tube being internally screw-threaded, and the tube which has its inner portion externally screw-threaded and its outer end provided with the outwardly extended flange with the polygonal hole, and a saddle post all combined and ar-

ranged for conjoint operation, substantially as described.

13. In a bicycle in combination, a frame having the upper portion thereof constituted by separated side-members, and having at a lower portion thereof a support for the saddle-post upright, a tube which is transversely arranged between and connected to the upper side frame-members which has at one side thereof a sleeve-like projection, said tube and contiguous portion of the sleeve projection having the transverse cleft, the saddle-post-supporting-upright sustained on the aforesaid support therefor and having a connection with said sleeve projection, the saddle-post encircled by said sleeve projection and a means for drawing one portion of the uniting tube longitudinally thereof toward the other, all substantially as and for the purposes set forth.

14. In a velocipede, the combination with a tubular saddle-post and a bored sphere encircling and united to the extremity thereof and the post extremity and sphere transversely bored and the tubular saddle-post-arm having its extremity therein and united, substantially as described.

15. In a velocipede, the combination with a crank-axle and sprocket-wheel thereon, the latter having a hub which, together with the axle, have a transverse slot or groove and a crank having its end portion flattened and fitted within the slotted axle and sprocket-wheel-hub, and a confining pin, extended transversely through the hub-axle and crank at right angles to the slot, substantially as set forth.

16. In a velocipede, the combination with a crank-axle and sprocket-wheel fixed thereon, the latter having a hub which together with the axle is transversely slotted, and a crank having its end portion fitted within the slotted axle and sprocket-wheel-hub, a confining pin passed transversely through the hub, axle and crank, and a part which encircles an intermediate portion of the crank and has a rigid connection with the sprocket-wheel at a point radially beyond its hub, substantially as described.

17. In a velocipede, the combination with the crank-axle having in its end portion a diametrical slot, and the sprocket-wheel, of a crank constituted by a tube which has the walls thereof at the extremity closed the one against the other and fitted in the axle-slot, the transverse confining pin, and a part which encircles an intermediate portion of the crank and has a rigid connection with the sprocket-wheel radially beyond its hub.

18. In a velocipede, the crank-axle formed tubular throughout its intermediate portion and one extremity being, however, substantially solid, but provided with the transverse slot and the other end having a hollow knob, the one tubular axle having the walls at its extremity closed together to form the flattened portion to fit in the axle-slot and hav-

ing the transverse confining screw or pin, and the other crank being formed with a screw-threaded extremity to screw engage the hollow axle knob and the lock-pin passed transversely through the knob and portion of the crank therein, substantially as described.

19. In a velocipede the combination with the crank, of a pedal-axle connected thereto and extended at right angles therefrom and formed by a tube which has its outer end outwardly swaged or wrought with the returned flange, and formed to constitute the one bearing member, and dust-guard for the adjacent ball-bearing.

20. In a velocipede, the combination with a crank having its outer extremity formed with the laterally extended conical ball-bearing portion which is centrally apertured and screw-threaded, and the pedal-shaft of tubular form extended through the threaded extremity of the crank and receiving thereon the lock-nut, and said axle having at its outer end the inclined or conical bearing portion, and the pedal having the longitudinal central body of tubular form with internal peripheral ball-bearing surfaces at its ends, substantially as described.

21. In a velocipede, the combination with the crank having at the back of its extremity the step-like depression, w^4 , and the angularly extended conical ball-bearing portion which is centrally apertured and screw-threaded and countersunk at the back, the tubular pedal-

shaft having one end externally screw-threaded and passed in screw engagement through said conical crank-extremity with its extremity lying within the countersunk opening at the back, and said pedal-shaft having at its outer end the squared or equivalent-formed opening and the hollow lock-nut having the internally threaded tubular shank to enter said countersunk opening and screw engage the pedal-shaft, and having its head disposed in the step-like depression of the crank, and provided with the squared hole, substantially as described.

22. In a velocipede, the combination with the crank having the conical bearing portion and the surrounding annular flange, said portion being apertured and screw-threaded, and the pedal-shaft screw-engaged therewith and extended therefrom, the same being formed tubular and provided, near its outer end with the external conical-formed ball-bearing surface with the concentric, surrounding, inverted flange, and the pedal having the tubular body with enlarged openings at its end, and having the concentric end-grooves receiving the aforesaid flanges, respectively, of the crank and pedal-shaft for dust-guards, substantially as described.

THOMAS BROADBENT.

Witnesses:

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H. A. CHAPIN.