

No. 615,946.

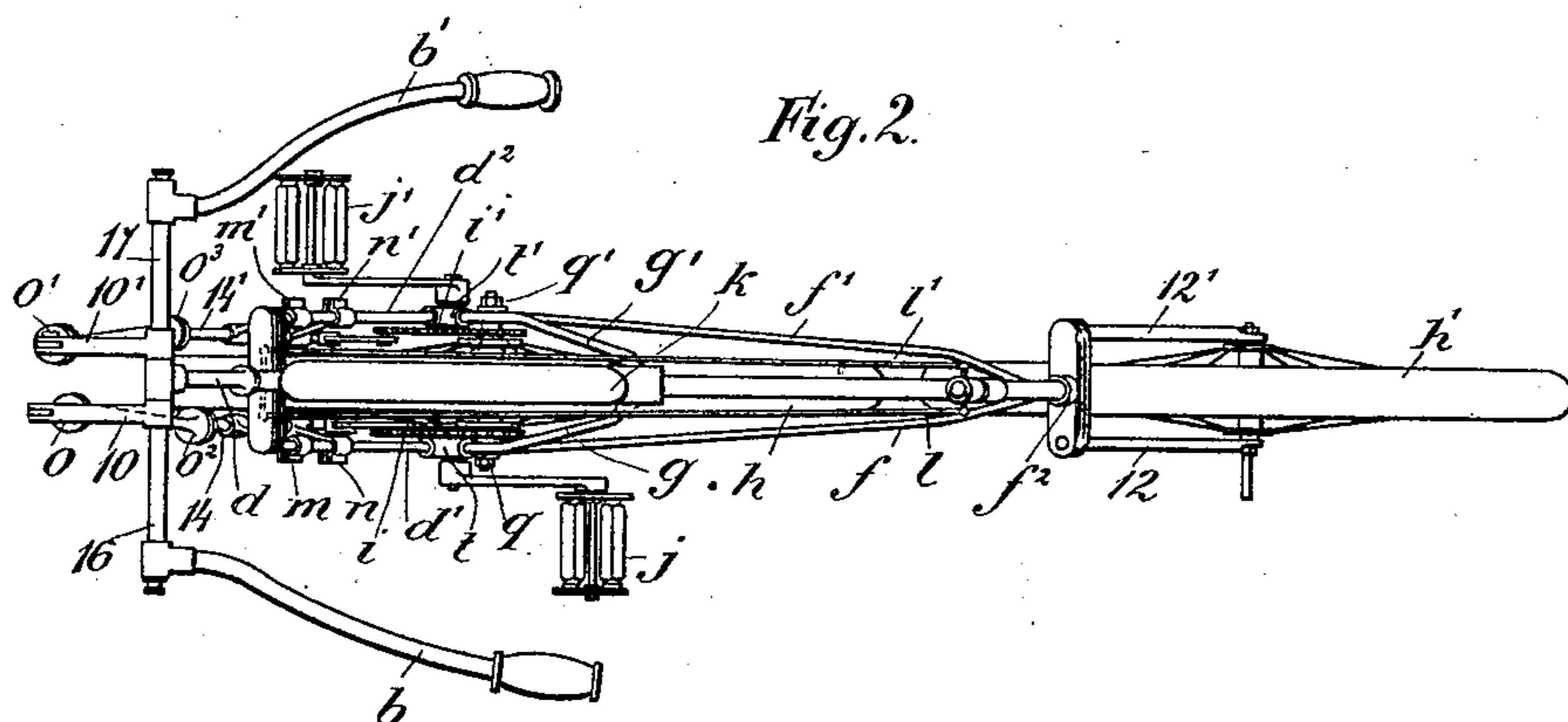
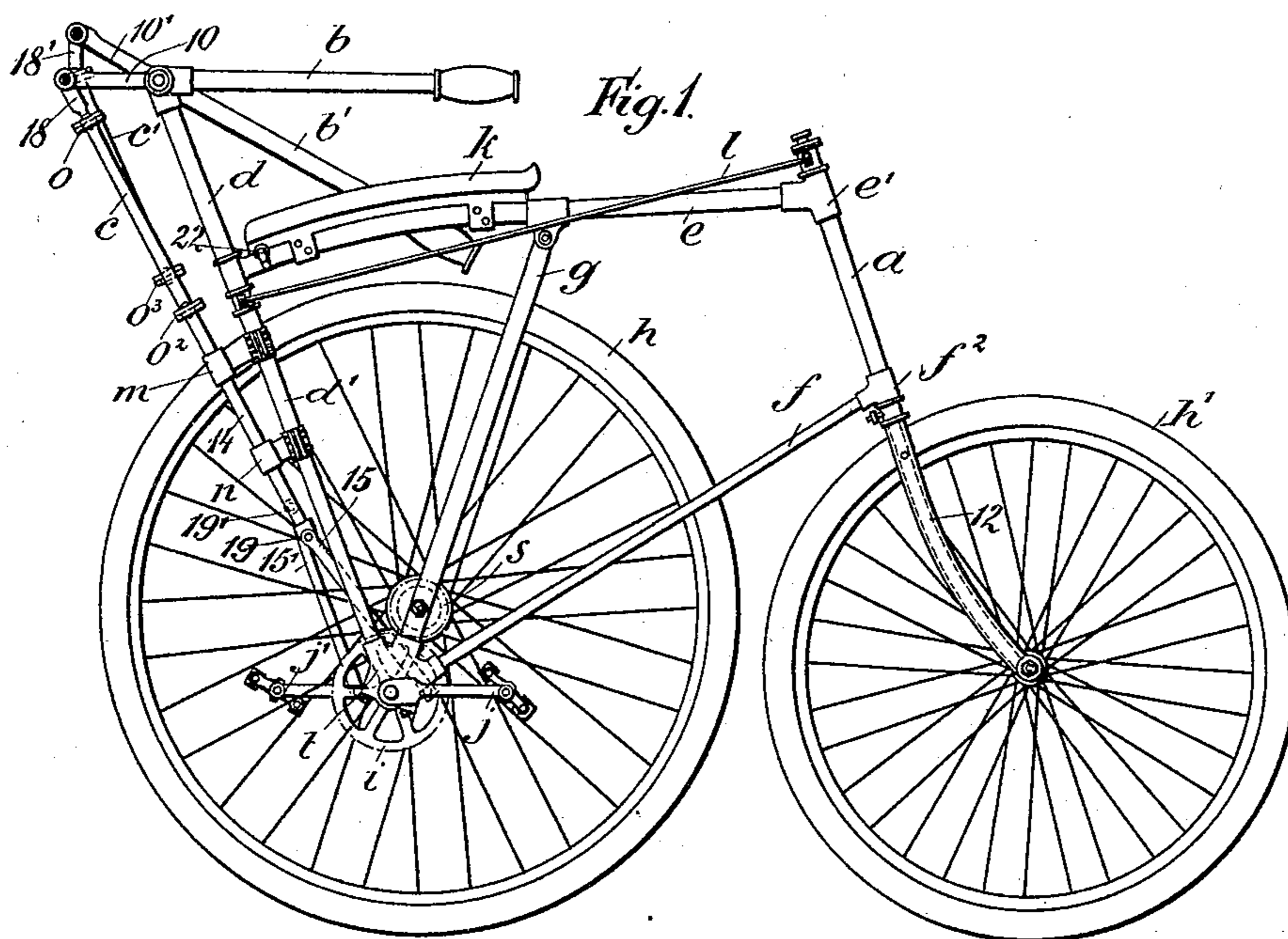
Patented Dec. 13, 1898.

S. ZÜNGEL.  
VELOCIPEDE.

(Application filed Nov. 9, 1896.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses

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S. Zünger

by his Attorney

*[Signature]*

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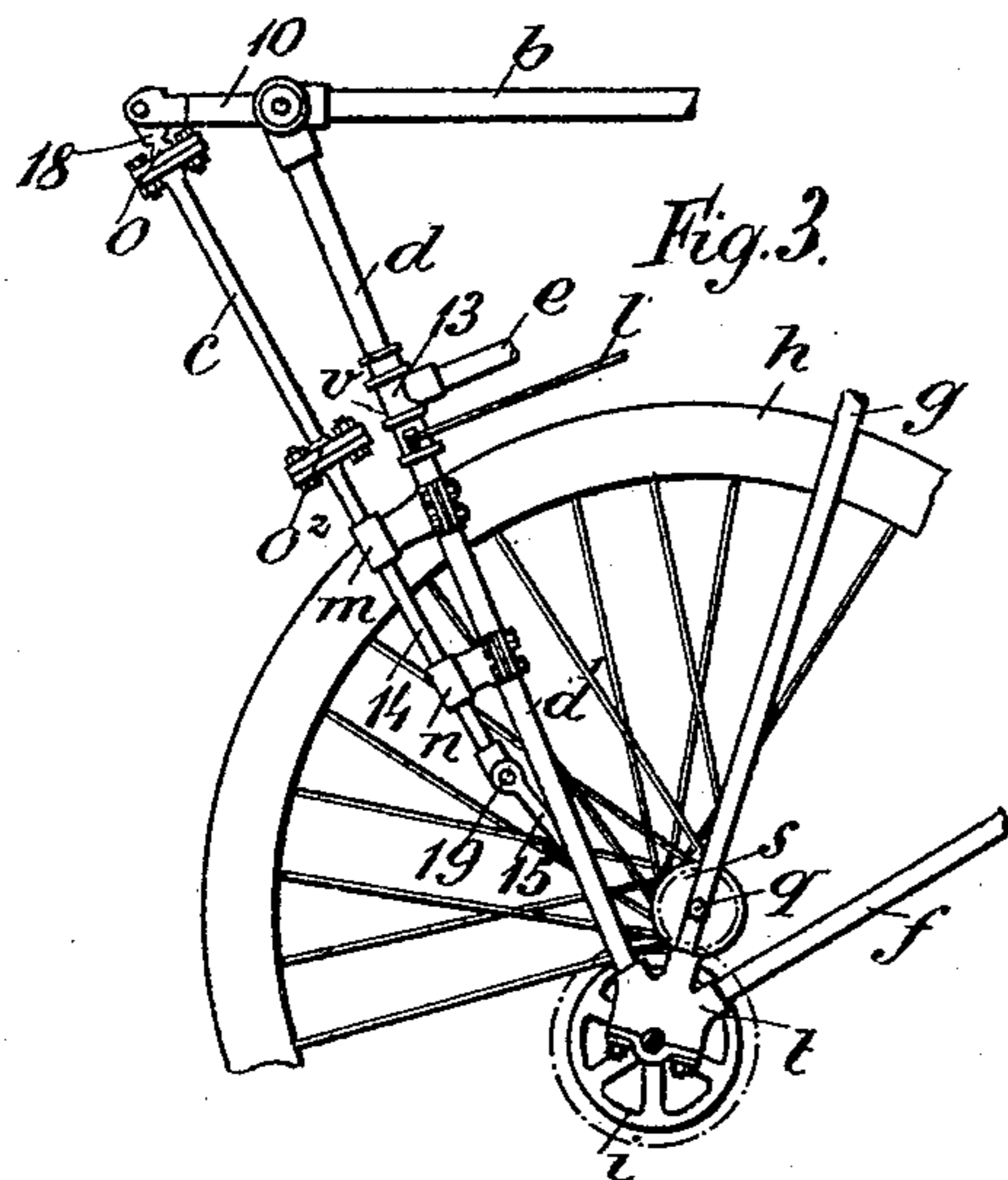


Fig. 3.

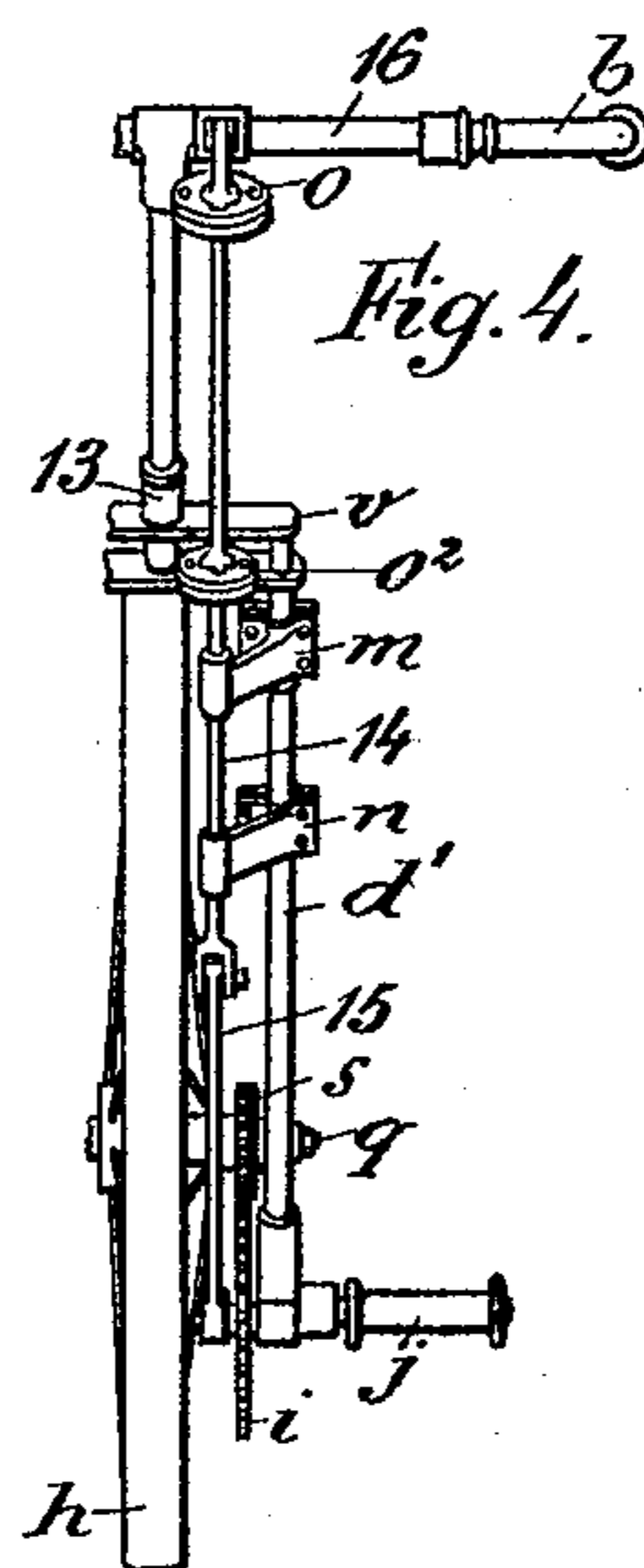


Fig. 4.

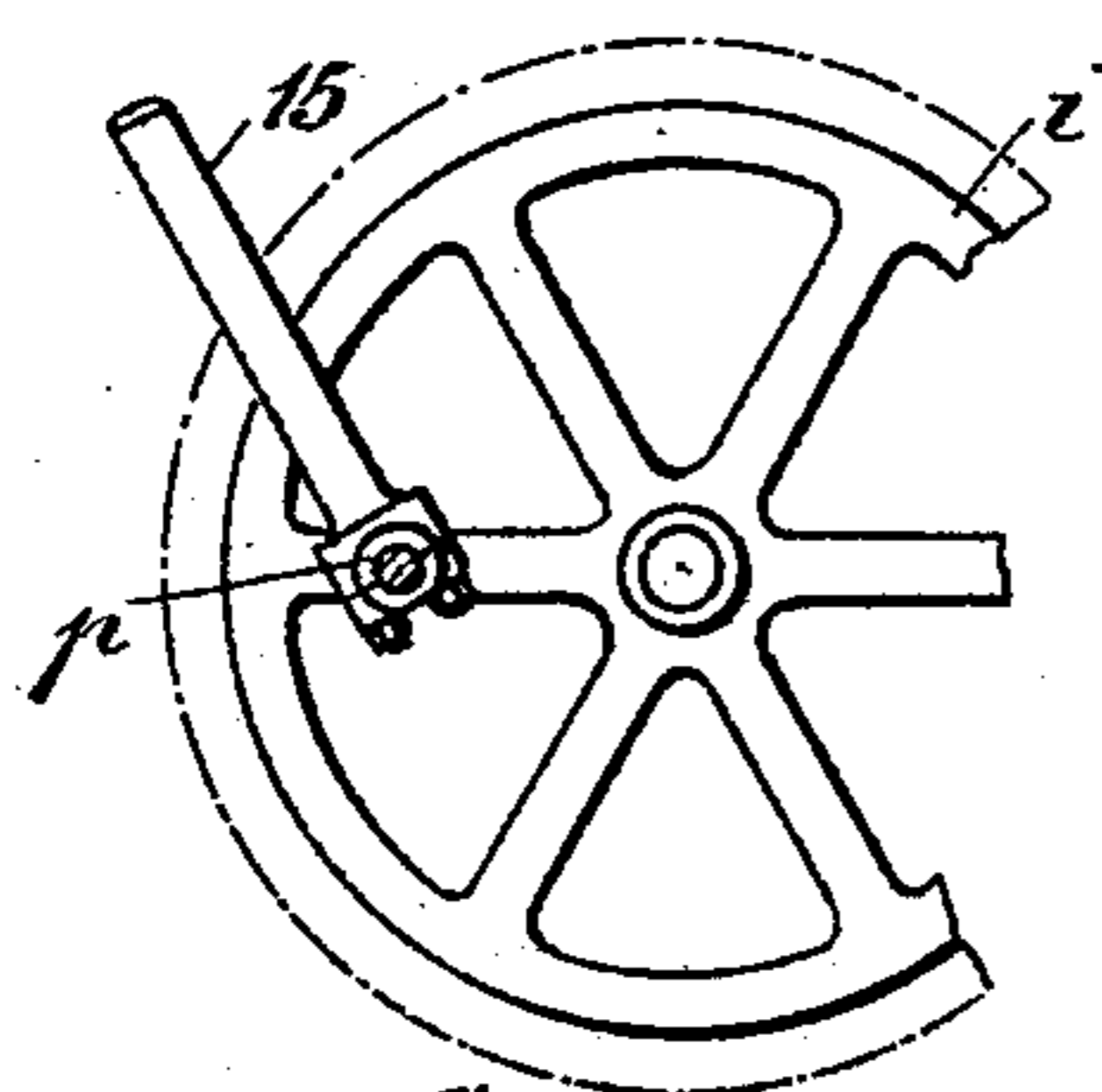


Fig. 6.

Fig. 5.

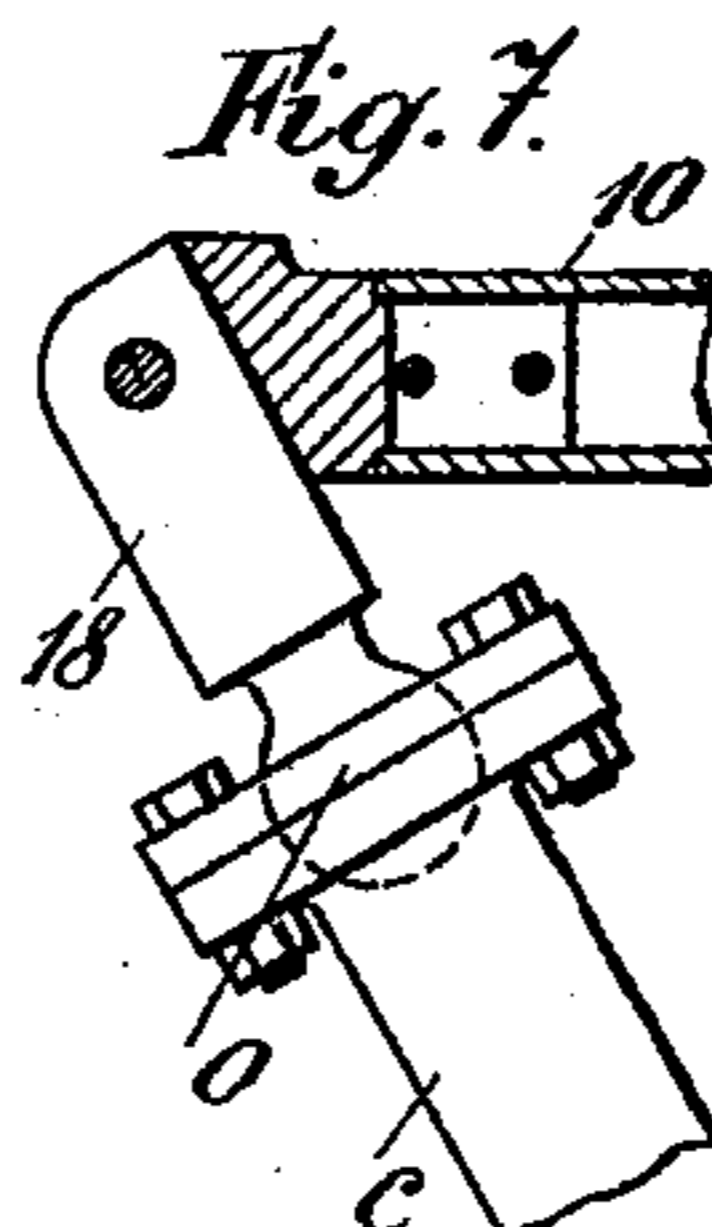


Fig. 7.

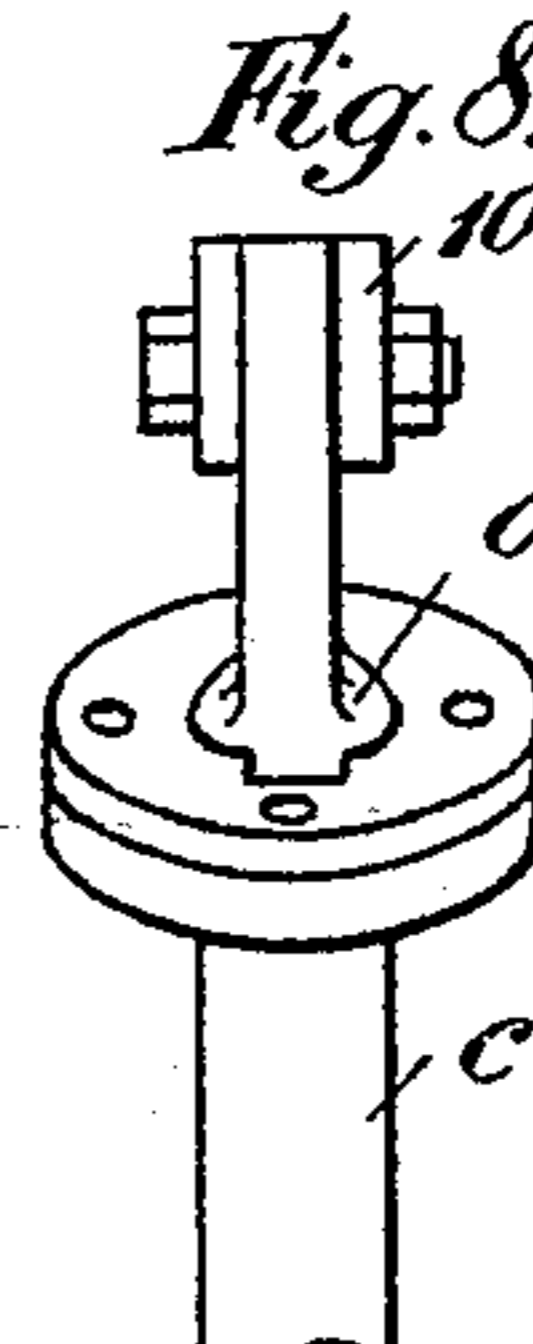


Fig. 8.

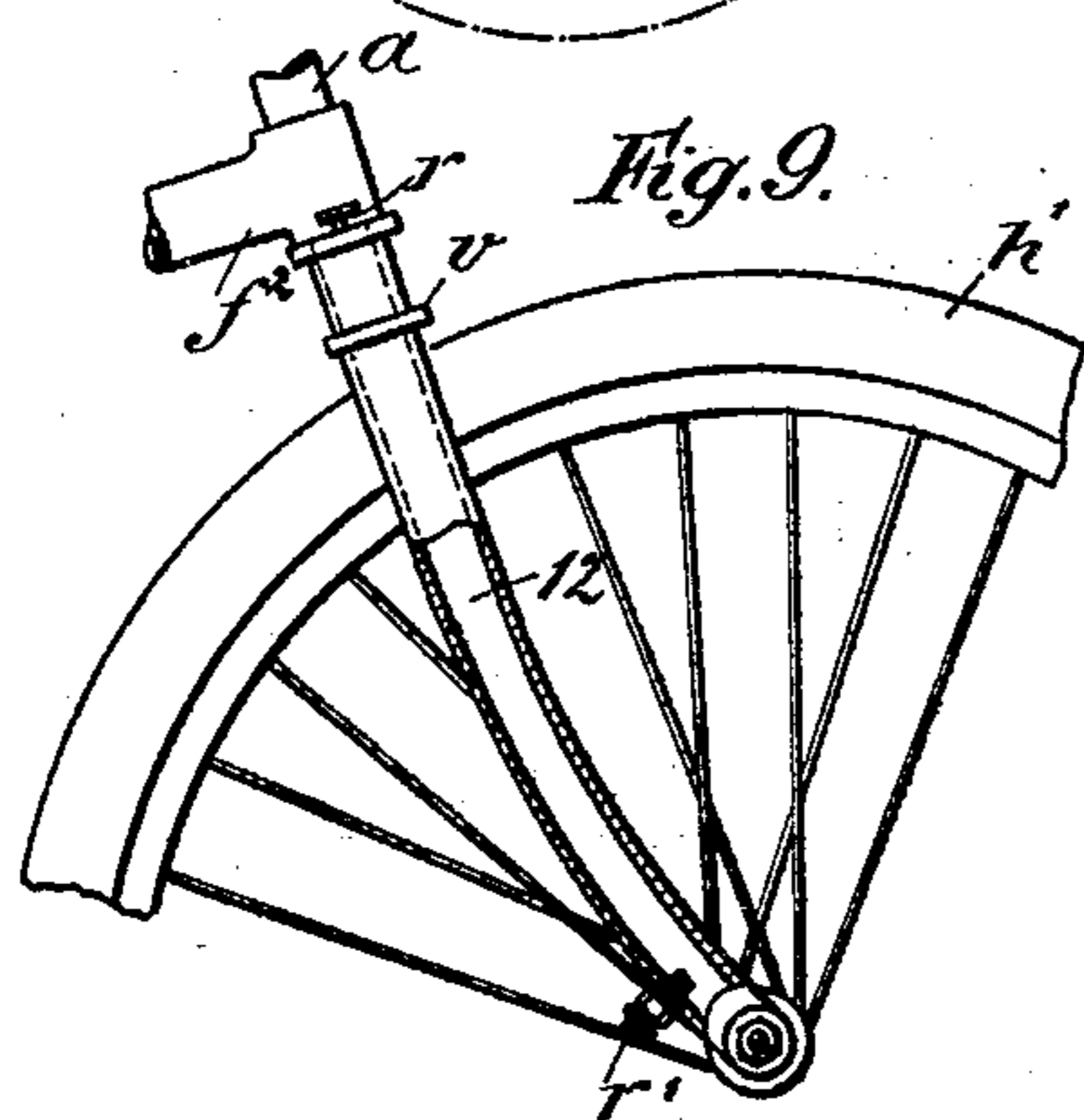


Fig. 9.

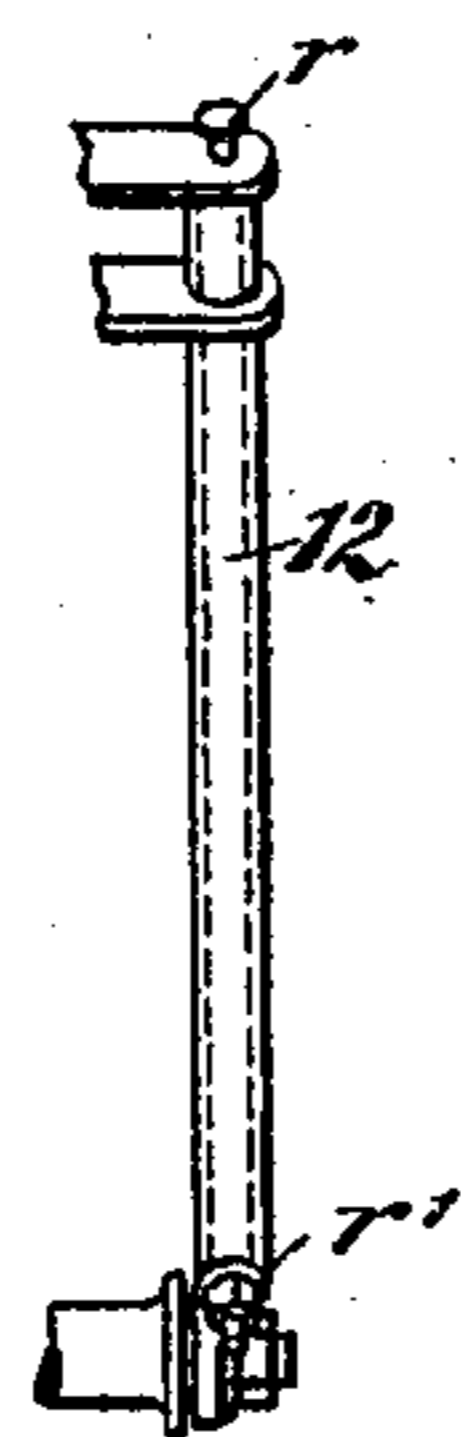


Fig. 10.

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No. 615,946.

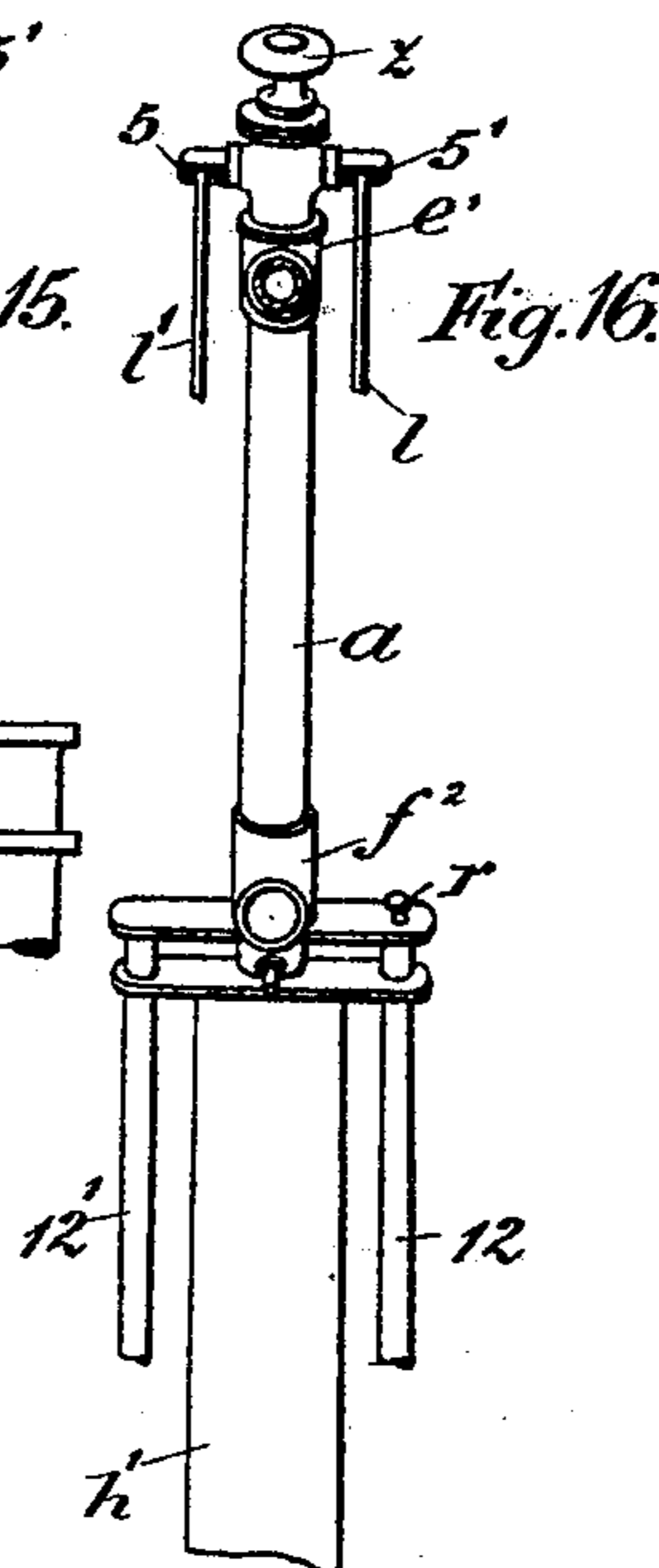
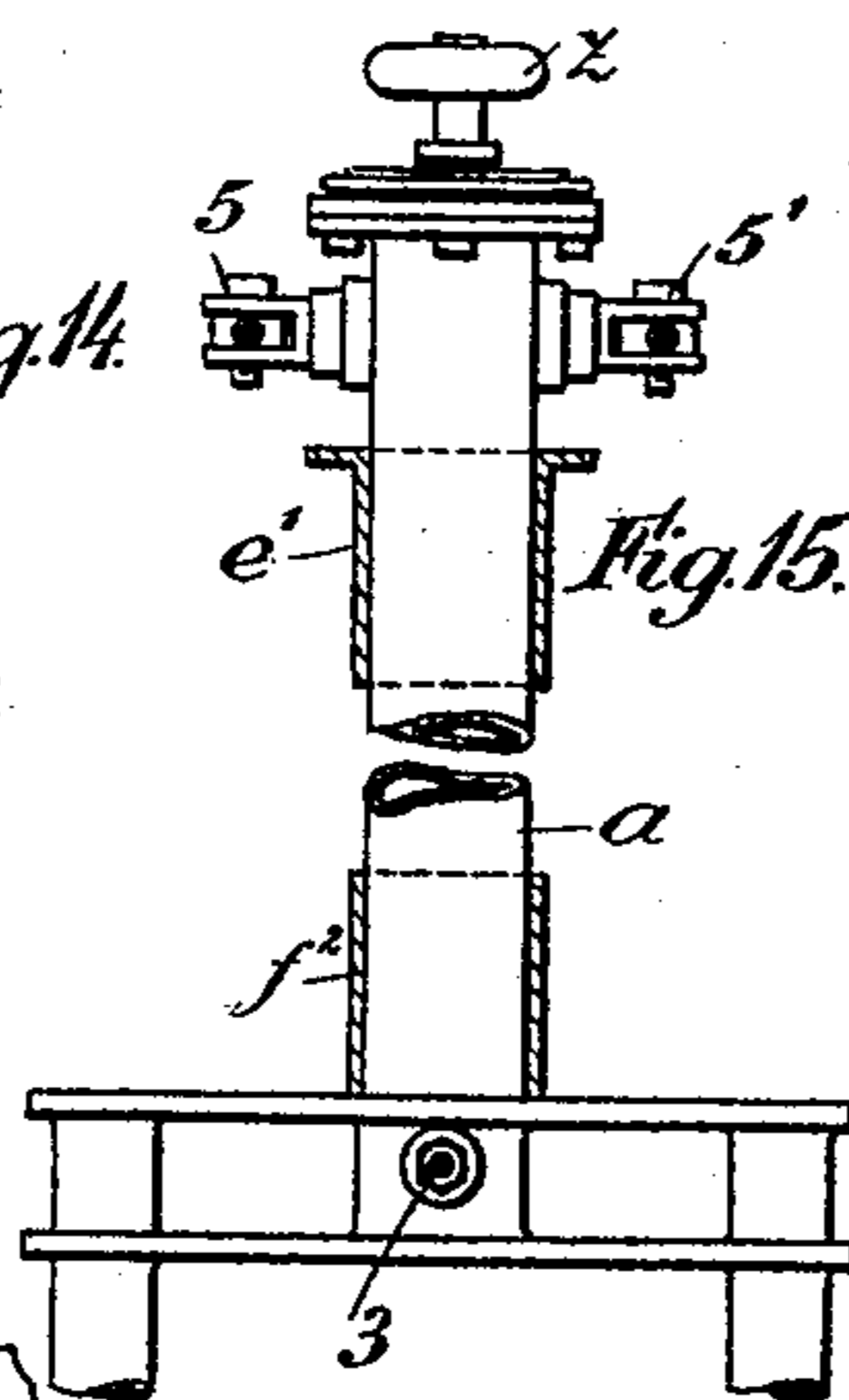
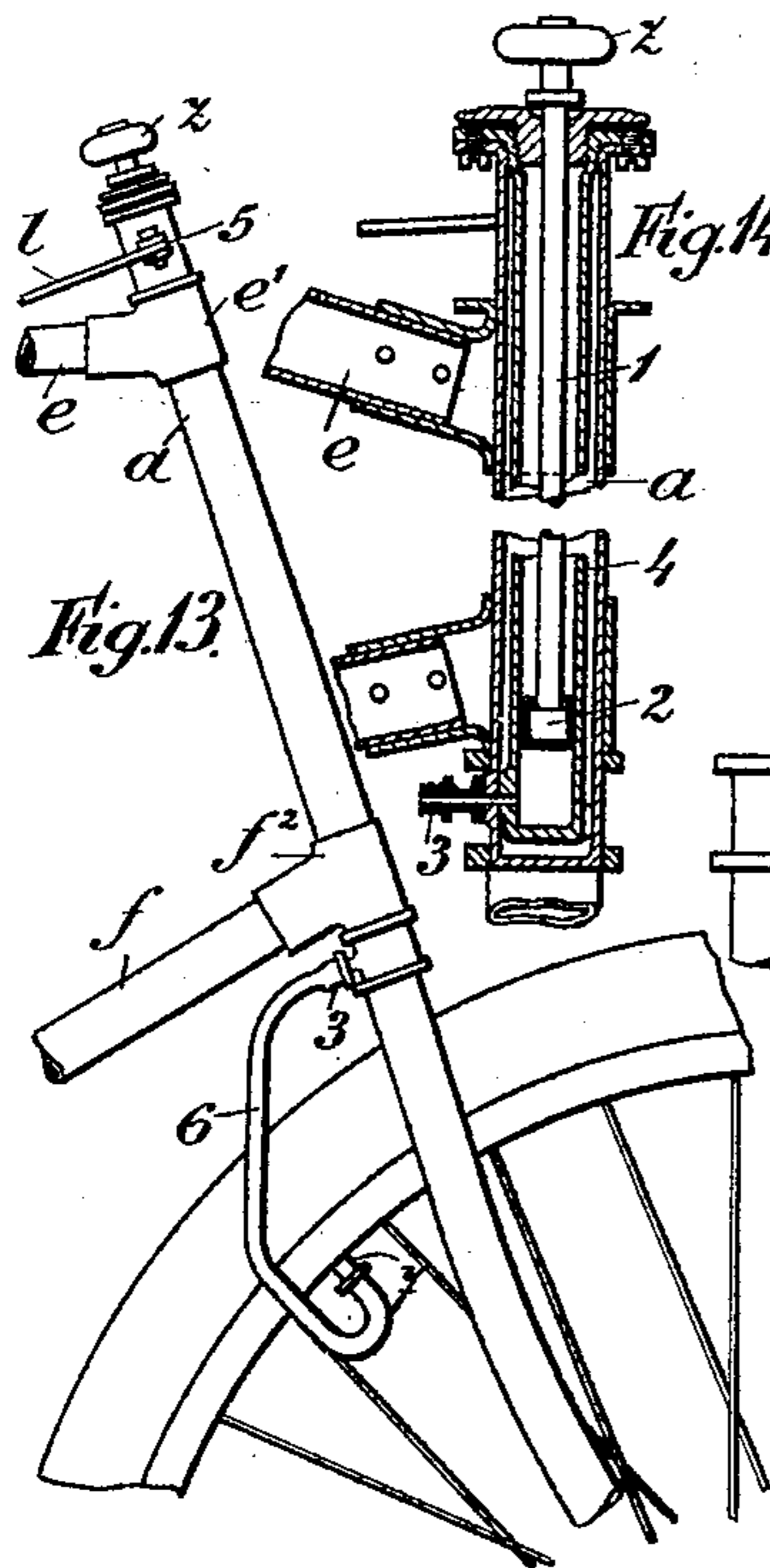
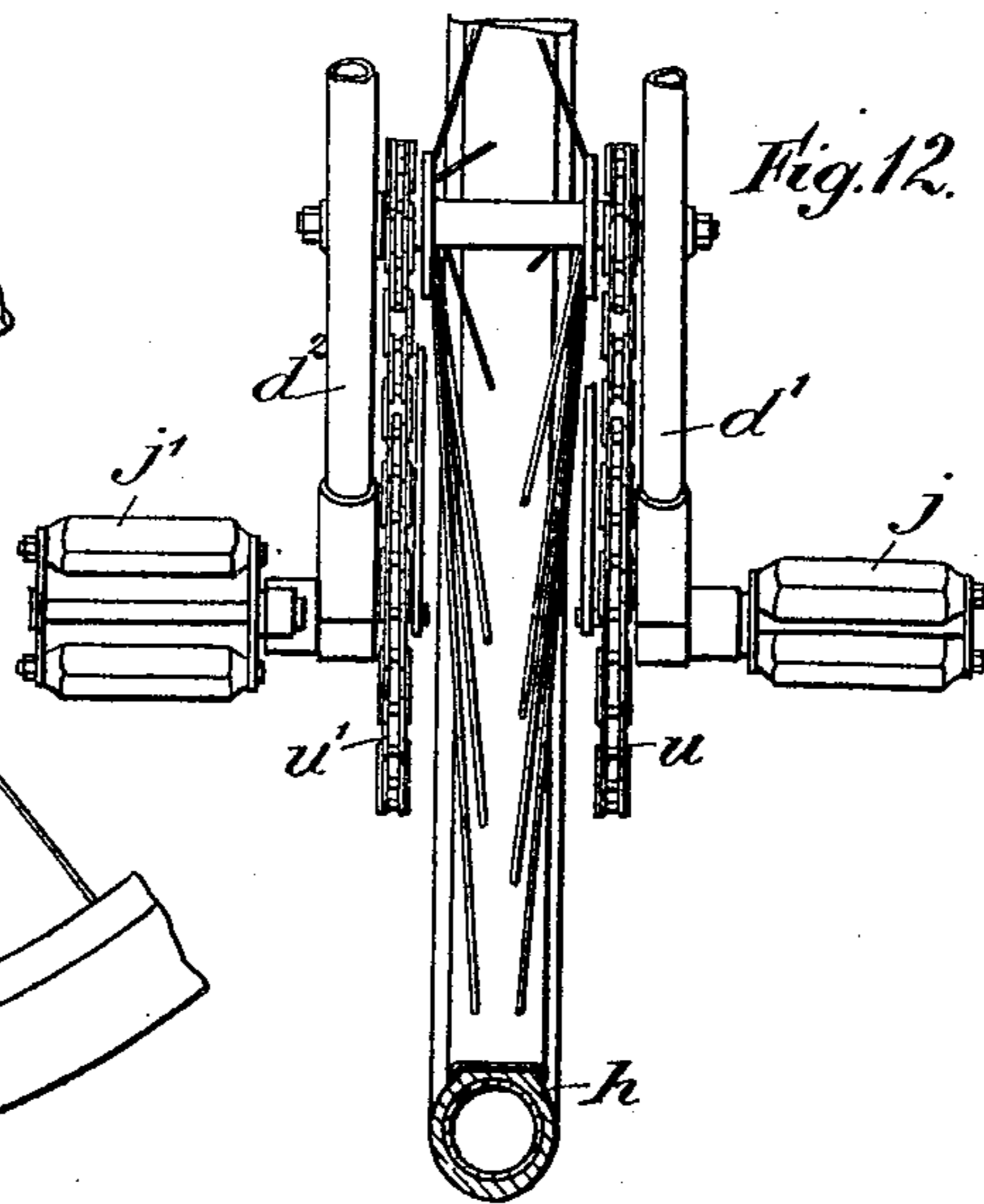
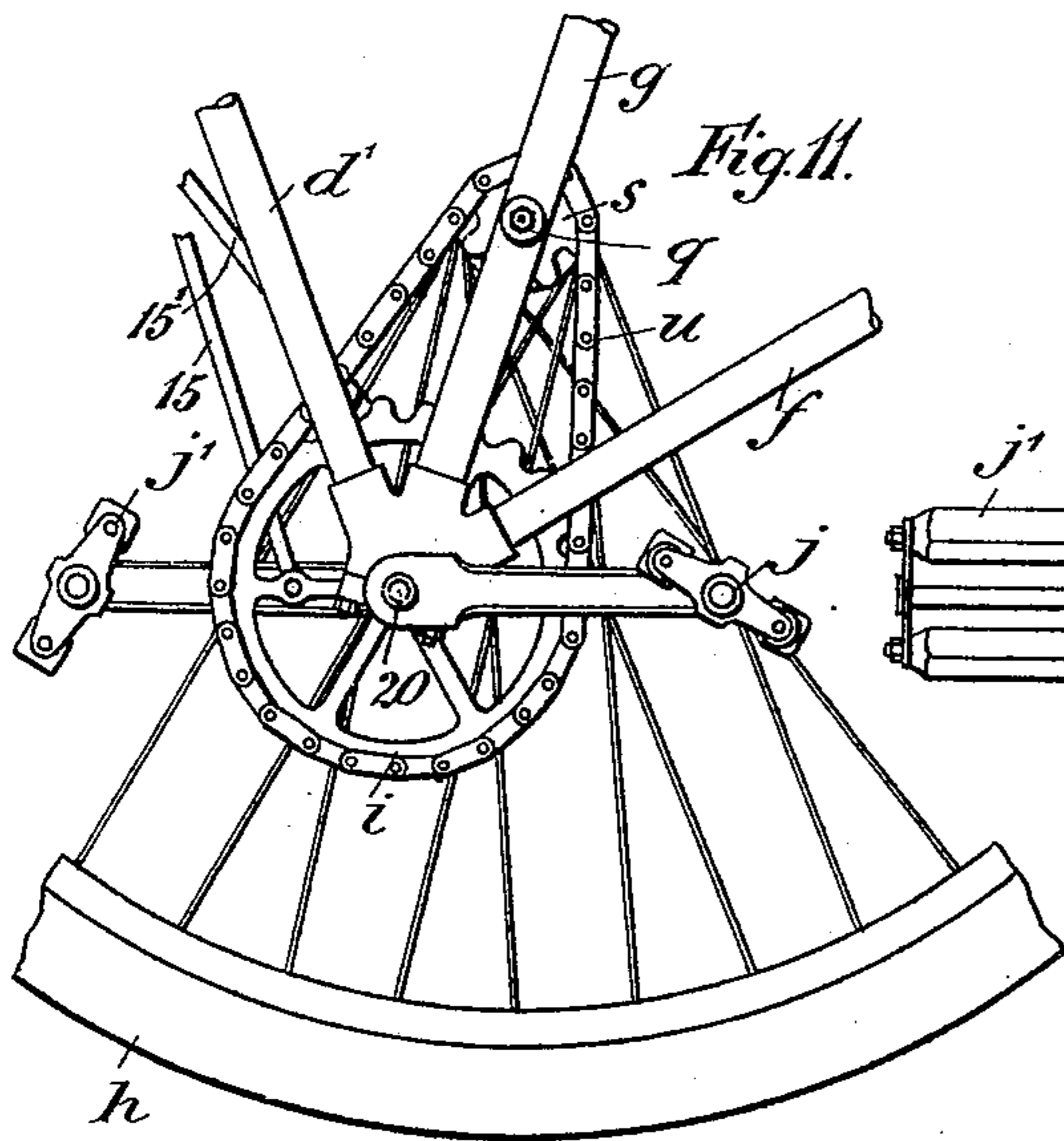
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(Application filed Nov. 9, 1896.)

(No Model.)

4 Sheets—Sheet 3.



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No. 615,946.

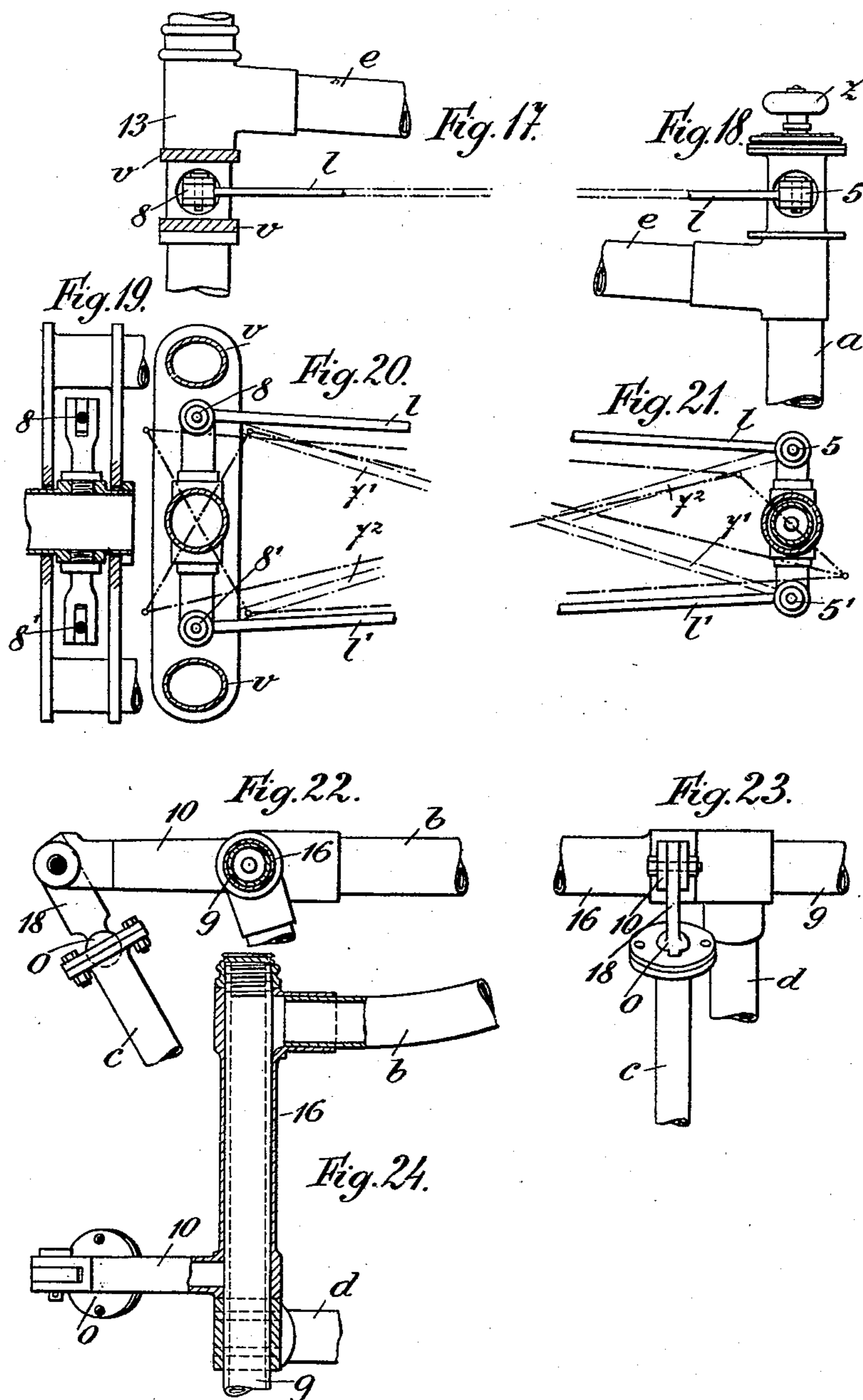
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(Application filed Nov. 9, 1896.)

(No Model.)

4 Sheets—Sheet 4.



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# UNITED STATES PATENT OFFICE.

STANISLAV ZÜNGEL, OF PRAGUE, AUSTRIA-HUNGARY.

## VELOCIPEDÉ.

SPECIFICATION forming part of Letters Patent No. 615,946, dated December 13, 1898.

Application filed November 9, 1896. Serial No. 611,552. (No model.)

*To all whom it may concern:*

Be it known that I, STANISLAV ZÜNGEL, a subject of the Austrian Emperor, and a resident of Prague, in the Kingdom of Bohemia, Austria-Hungary, have invented certain new and useful Improvements in Velocipedes, of which the following is a specification.

My invention relates to a velocipede which can be driven by the hands as well as by the feet of the rider. In consequence of the peculiar construction of the frame and of the connection of the crank and pedal with a suitable connecting or guide rod the machine can be much more readily and conveniently driven up hill than heretofore.

In the accompanying drawings, Figure 1 is a side view, and Fig. 2 a plan, of a bicycle constructed according to my invention. Figs. 3 and 4 are a side and an end view, respectively, of the gear for driving the machine by hand, together with the connecting or guide rod. Figs. 5 and 6 are an end and a side view, respectively, of the driving rod and wheel. Figs. 7 and 8 are a side and an end view, respectively, of the guide-rod joint. Figs. 9 and 10 are a side and an end view, respectively, of the rear fork and wheel. Figs. 11 and 12 are a side and an end view, respectively, of the driving-gear. Fig. 13 is another side view of the rear fork and wheel. Fig. 14 is a longitudinal section of the air-pump. Figs. 15 and 16 show the rear wheel and fork in front view. Figs. 17 and 18 show in side view the connection of the rear wheel and fork with the guide-rod. Fig. 19 is a longitudinal section of this guide-rod. Figs. 20 and 21 show a plan of the guide-rod. Figs. 22, 23, and 24 are respectively a side and a front view and a plan of the said guide-rod.

The bicycle-frame consists of the guide-rod  $d$ , the rear-wheel-fork pillar  $a$ , the saddle-bar  $e$ , and the connecting-rods  $f f'$  and  $g g'$ . The rods  $g g'$  are fixed to the saddle-bar and are provided below with the bearings  $t t'$ . In the bearings  $t t'$  are mounted the gear-wheels  $i i'$ . The rods  $g g'$  are also fixed to these bearings and are furnished above the hub with the openings  $q q'$ , wherein rests the axle of the front wheel. The rear wheel is supported by the fork 12 of the rod, which is firmly fixed to the pillar  $a$ , the latter being free to turn within the sleeves  $e' f^2$ . The guide-rod  $d$

is movably held in the head  $v$  of the fork of the front wheel  $h$  and in the sleeve 13, secured to the saddle-bar  $e$ . This guide-rod is furnished with transverse arms  $8 8'$ , Figs. 19 and 20, which are connected by the tie-rods  $l l'$  with the upper arms  $5 5'$  of the pillar  $a$ . The tie-rods  $l l'$  may be connected parallelly or crosswise. The rod  $d$  is furnished above with a cross-tube 9, upon which can turn the sleeves 16 and 17, Fig. 2. The hand-levers  $b b'$  are rigidly connected to the sleeves 16 and 17, which are provided with the short arms 10 and 10'. The supports 18, which are furnished with ball-and-socket joints at their extremities, are riveted to the arms 10 10'. The joint is secured to the ball carried by the upper end of the rod  $c$ . The tie-rods  $c$  and  $c'$  are connected at their lower extremities to the rods 14 and 14' by the joints  $o^2$  and  $o^3$ , these joints enabling the rod  $c$  to be turned in every direction, which is absolutely indispensable in driving the machine. The guide-rods 14 and 14' are supported by the bearings  $m m'$ , fixed to the rods  $d' d^2$ , and are directly connected by means of the cross-heads 19 and 19' with the cross-head rods 15 and 15', which are carried by the tubular projections  $p p'$  of the gear-wheels  $i i'$ . The gear-wheels  $i i'$  are furnished with the pedals  $j j'$  and are coupled by means of teeth or of chains with the wheels  $s s'$ , mounted on the axle of the wheel  $h$ .

The rod  $a$ , which is the pillar of the rear fork and is free to turn within the sleeves  $e' f^2$ , contains an air-pump 4, with a piston 2 and a piston-rod 1, provided at the top with a knob or handle  $z$ . Below is a small tube 3, to be connected to the usual air-valve 7 by the aid of a small india-rubber pipe 6, so that the inflation may be carried on in the ordinary manner by the aid of the air-pump 4.

One of the forks 12 and 12' is provided with the valves  $r r'$  and its cavity can be filled with oil. The saddle  $k$ , carried by the bar  $e$ , is longer than usual and may be inflated with air. The wheels  $i i'$  are rotated by pedaling, being connected, by the cranks 15 15', the guide-rods 14 14', and the tie-rods  $c c'$ , with the levers  $b b'$ , acting also as guides, so as to be able to rotate the gear-wheels  $i i'$  when driving by hand as well as by the feet. As shown, the guide-rod is directly connected with the rear wheel  $h'$ , and hence the direc-

tion of the wheel can be regulated by the same.

With this construction of bicycle the pedal-crank shaft is revolved by the rider in a direction opposite to that which is usual in bicycles. In this bicycle the steering is performed by the swiveling of the back wheel through the levers 8 8' and 5 5', which bare a proportion to one another of two to one or four to one and act on each other by the direct or crossed rods *l l'*. The driving is performed partly by hand-lever gear *b 16 10* and *b' 17 10'* and draw-rods *c 14 15* and *c' 14' 15'*, acting on driving-wheels *i i'*, symmetrically placed on both sides of the wheel-axle *s*, and on the axles of which are also the pedal-cranks *j j'*, so that hand and foot driving may both be used for driving the wheel *h* by direct gear or through a chain and the center of gravity of the system may always be brought into a vertical line with the driving-wheels *i i'* through the elongation of the saddle *K*, permitting of the backward or forward displacement of the rider, thus permitting easy ascent of inclines, more perfect braking, and turning in smaller curves than is usual.

I claim as my invention—

In a cycle, a frame comprising fixed forks converging on the axis of the pedal-cranks whereof the leading fork *g* is raked forwardly of said axis, the said frame having at the common termination of said fixed forks bearings for two crank-shafts respectively and above the latter, an axle for the leading-wheel, at its rear a steering-socket and a frame-tube *e* extending from the head of the steering-socket to the head of the fixed fork *g* the for-

ward portion of which frame-tube *e* is downwardly curved, in combination with a steering-fork 12 with pillar adapted to be rotarily movable in said steering-socket, a leading-wheel *h* journaled to revolve on the aforesaid axle in said frame, a rotary guiding-pillar *d* in said frame at its forward end in extension of said fork *g*, a cross-head 9 to said pillar *d*, arms on said pillars *a* and *d*, rods *l* connecting said arms, hand-levers *b, b'*, pivoted on said cross-head 9 and extending rearwardly, forward extensions 10, 10' to said levers *b b'*, wheels *i i'* adapted to gear with pinions on said leading-wheel *h* pedal-cranks on the axles of wheels *i i'* rotary pedals on said cranks, eccentrically-placed wrist-pins on the wheels *i i'*, universally-jointed rods connecting said extensions 10, 10' to said wrist-pins and adapted to permit of a lateral oscillatory movement of levers *b b'* for purpose of steering, and vertical reciprocating movement thereof for assistance in the rotation of the wheels *i i'*, and a saddle of equal breadth throughout and curved in lateral elevation and extended in the plane of the frame above the curved part of frame-tube *c* to enable the cyclist to assume positions in which his center of gravity bears the same relation to the driving center, under different inclinations of road, the whole substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

STANISLAV ZÜNGEL.

Witnesses:

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