

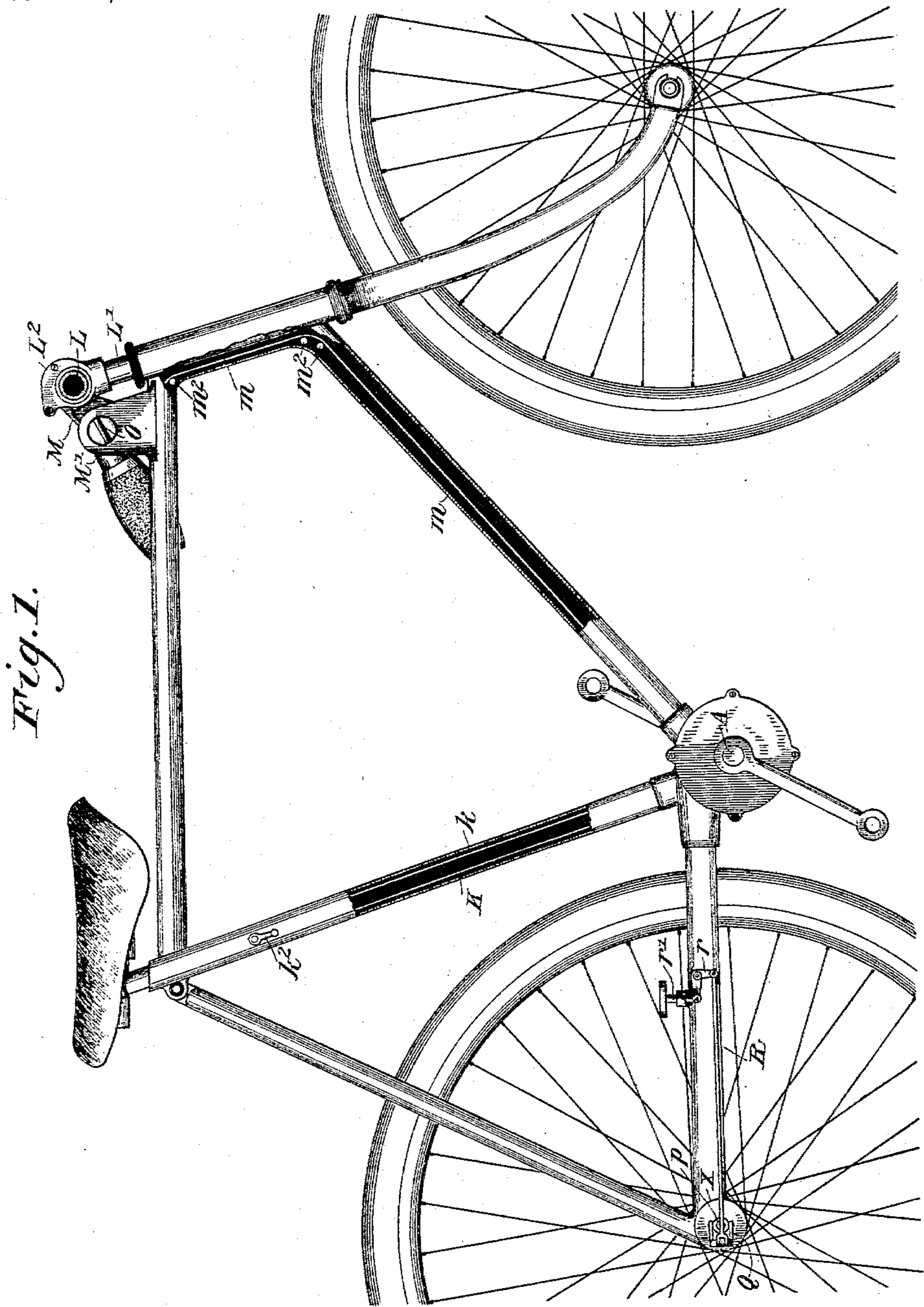
(No Model.)

5 Sheets—Sheet 1.

W. J. PUGH.
BICYCLE.

No. 598,058.

Patented Jan. 25, 1898.



Witnesses

J. M. Withrow.
James R. Mansfield.

Inventor
W. J. Pugh,

By
Alexander T. Fowell Attorneys

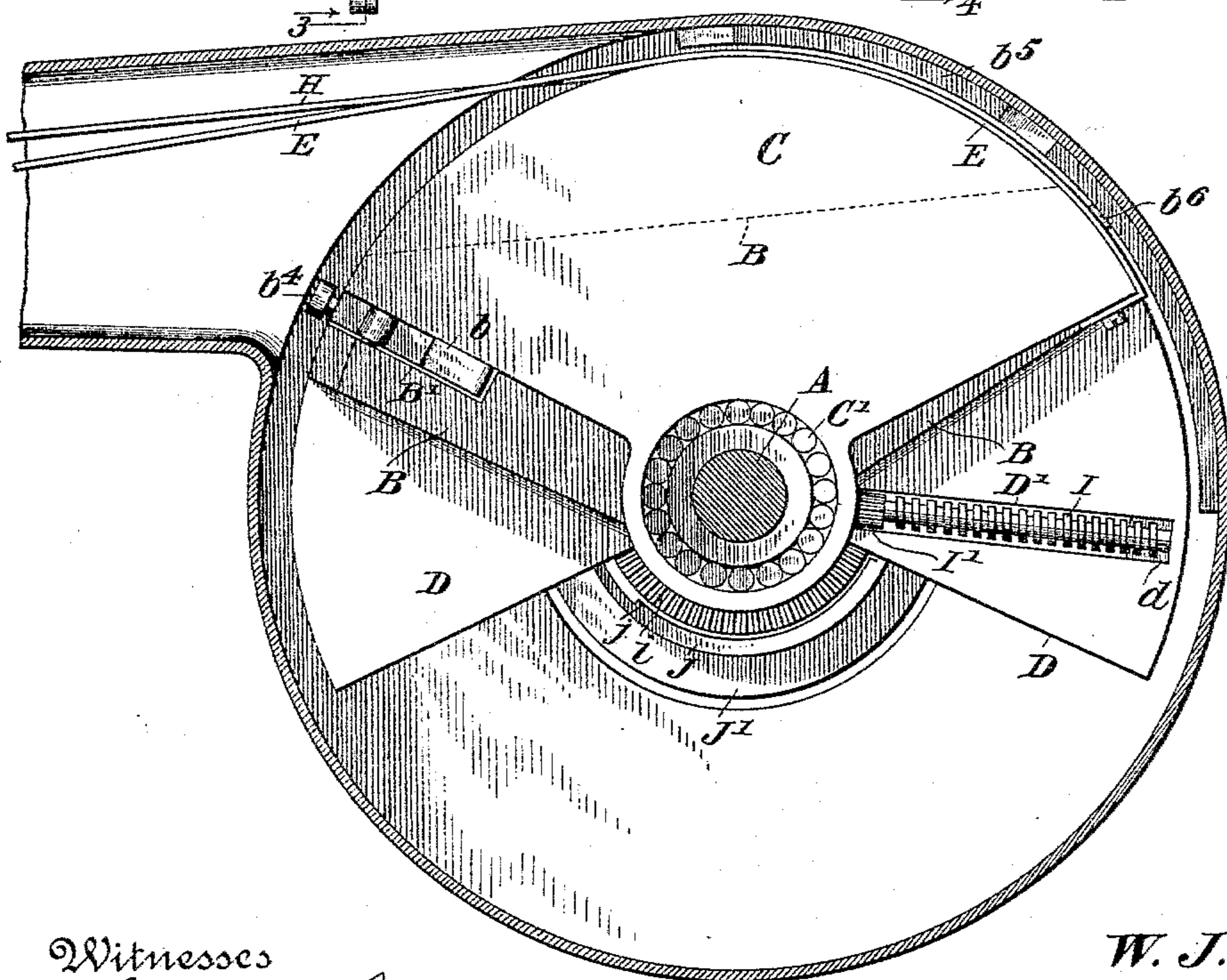
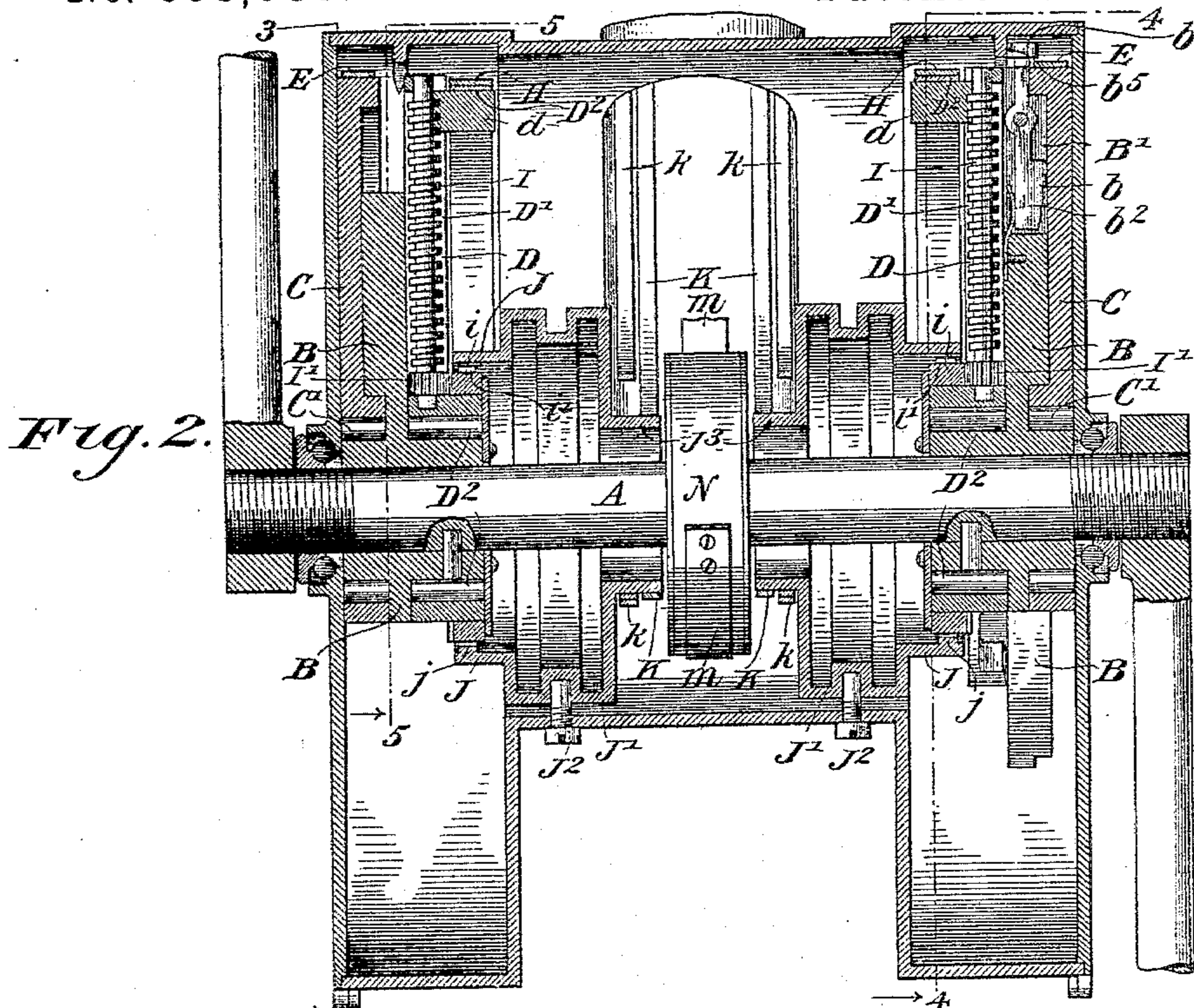
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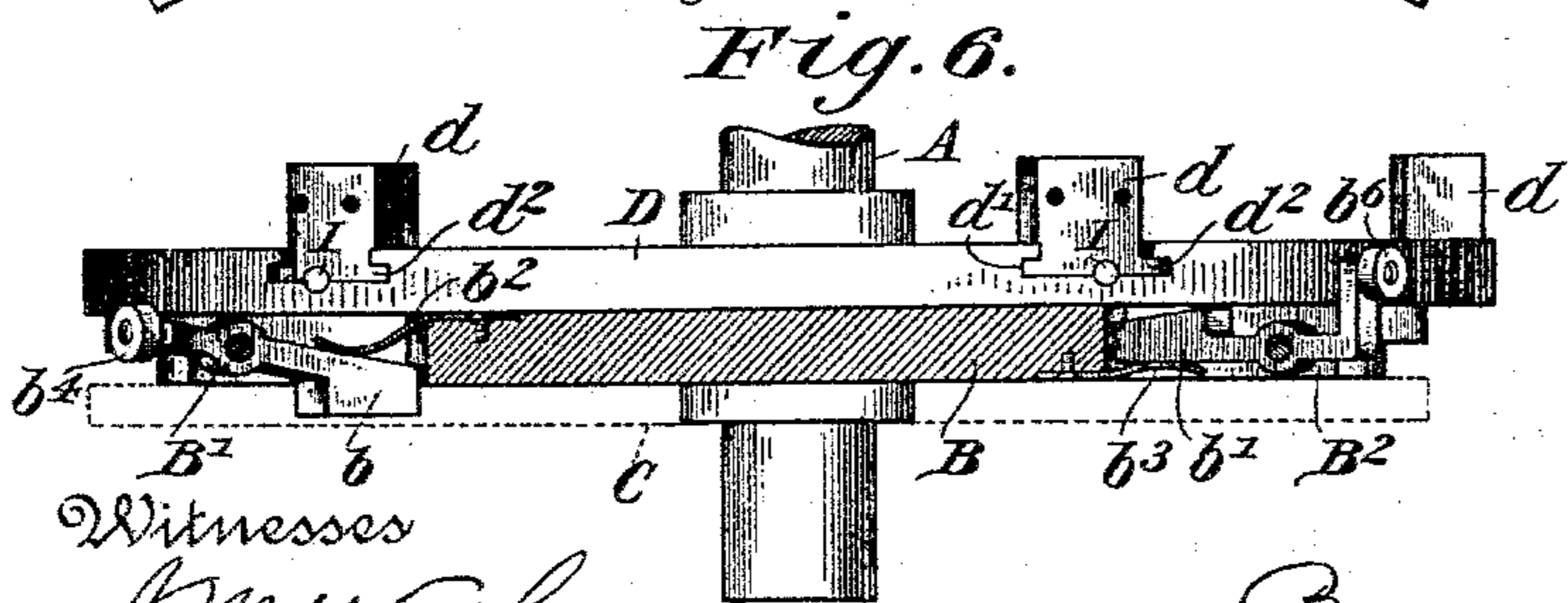
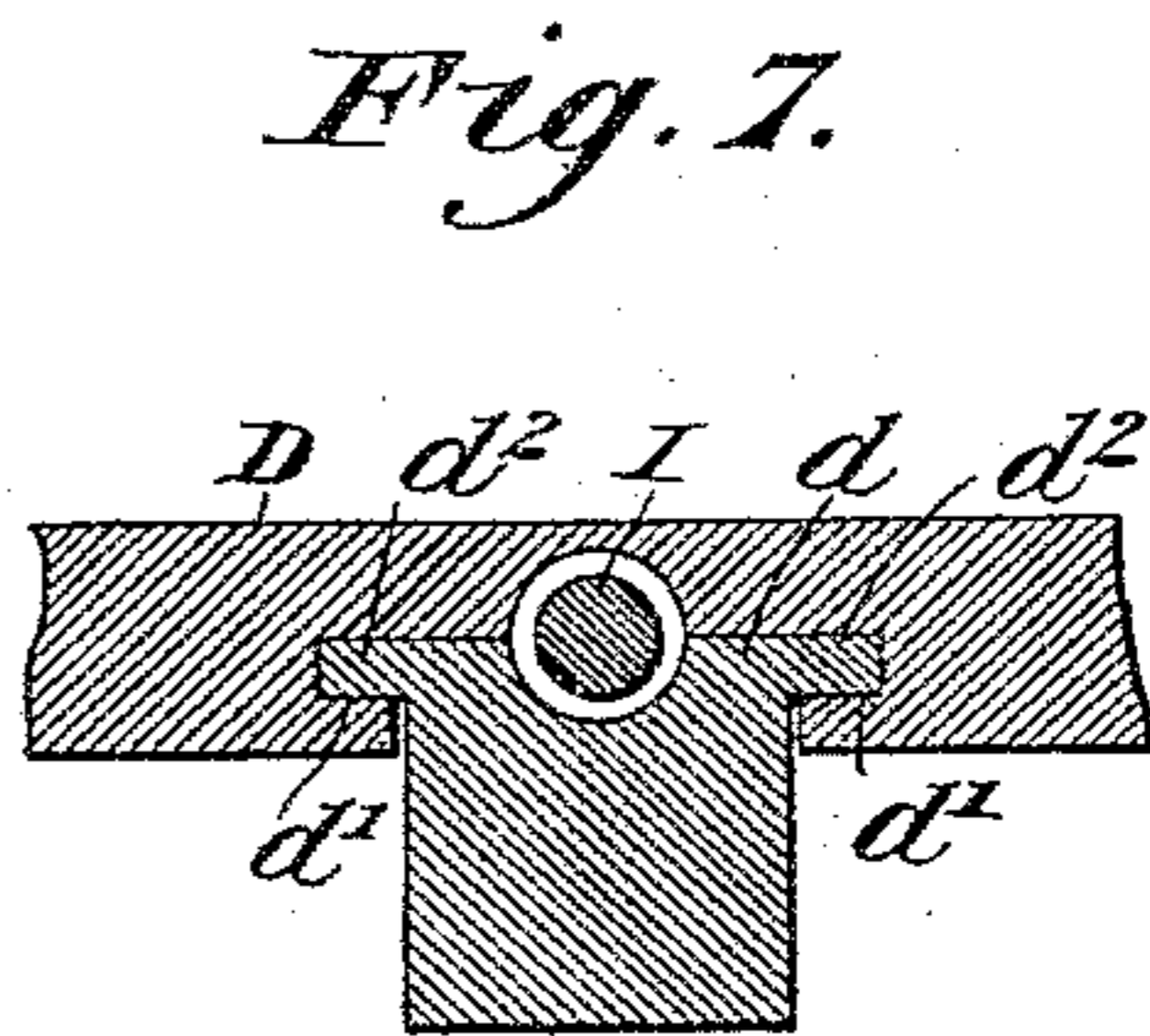
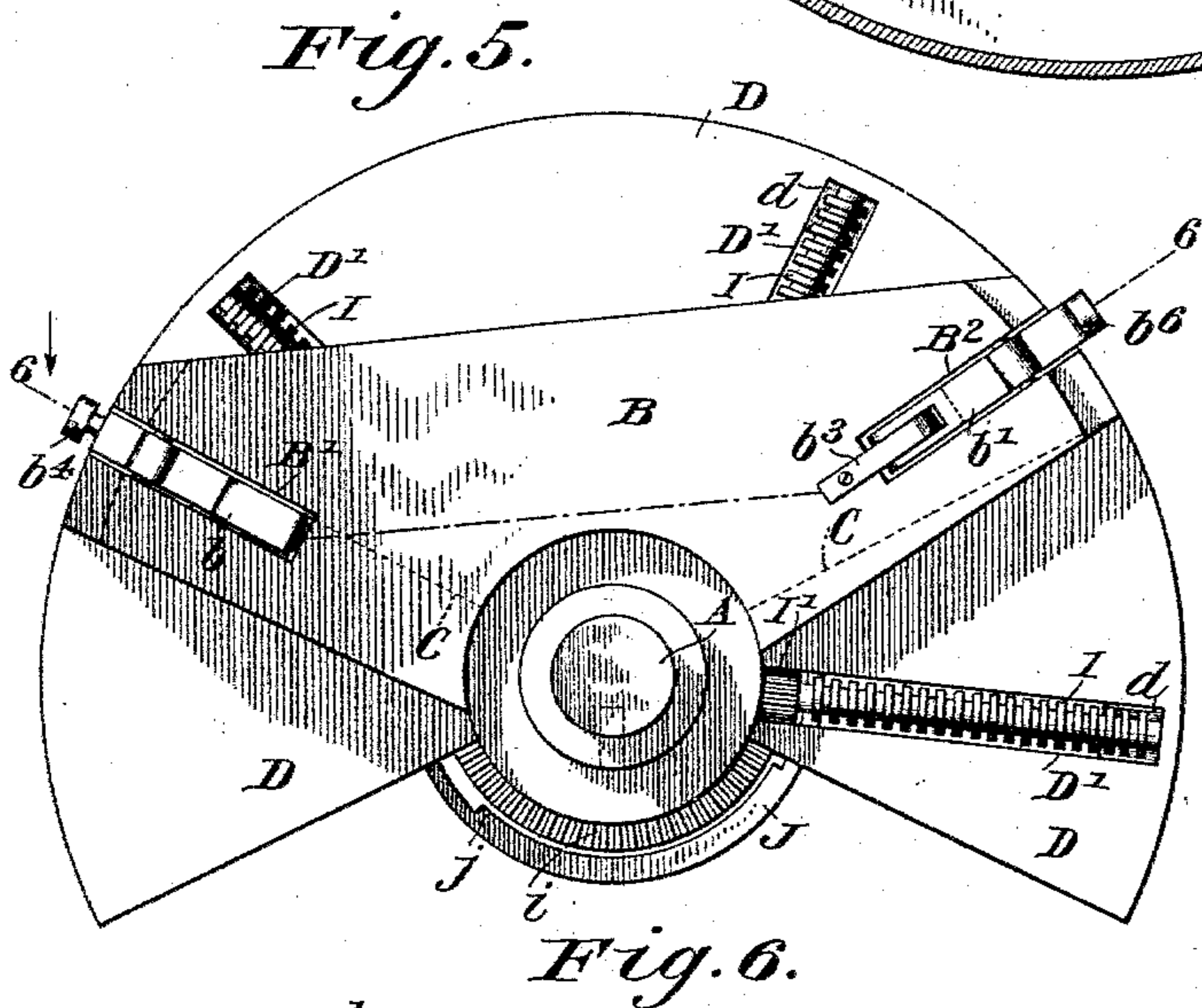
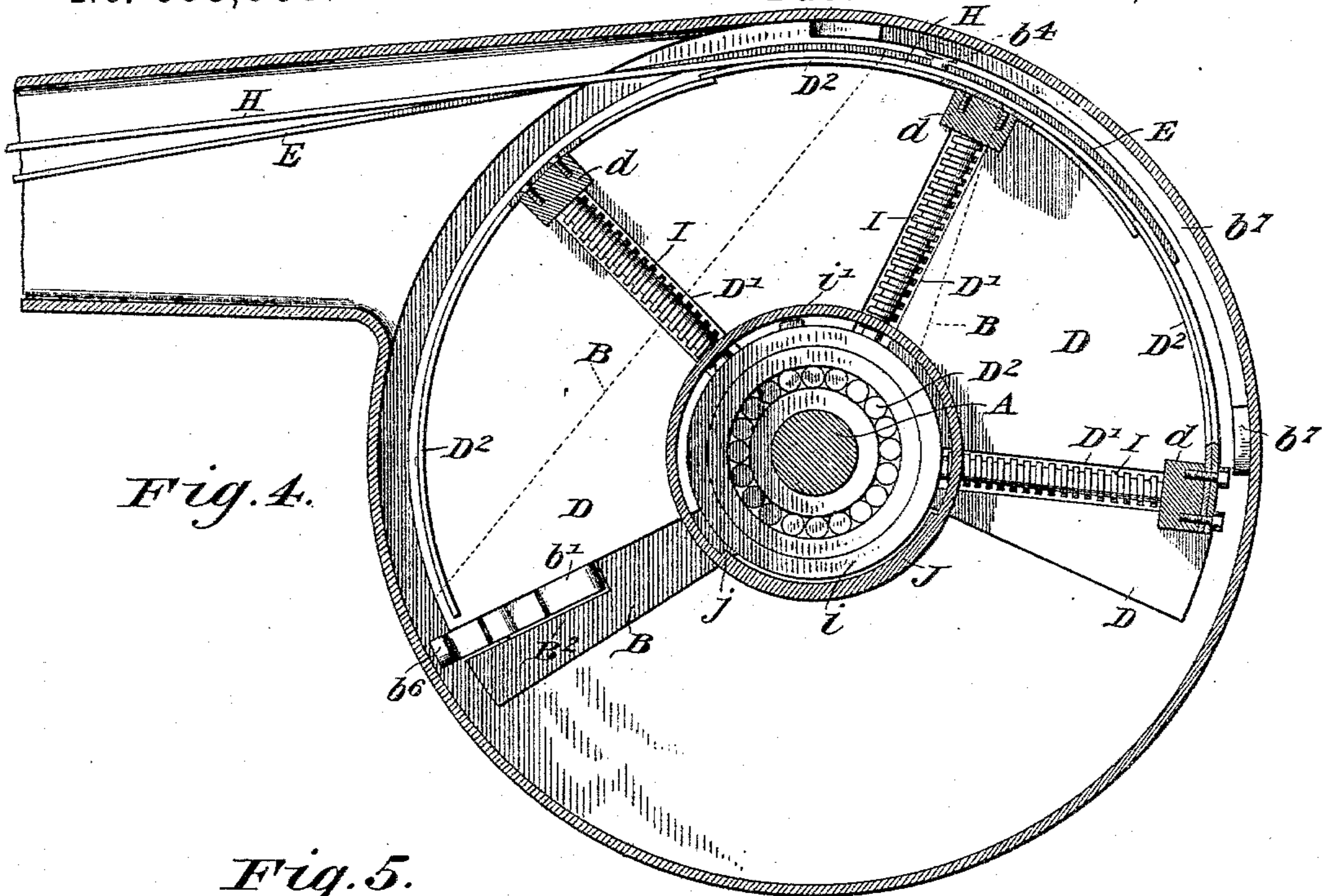
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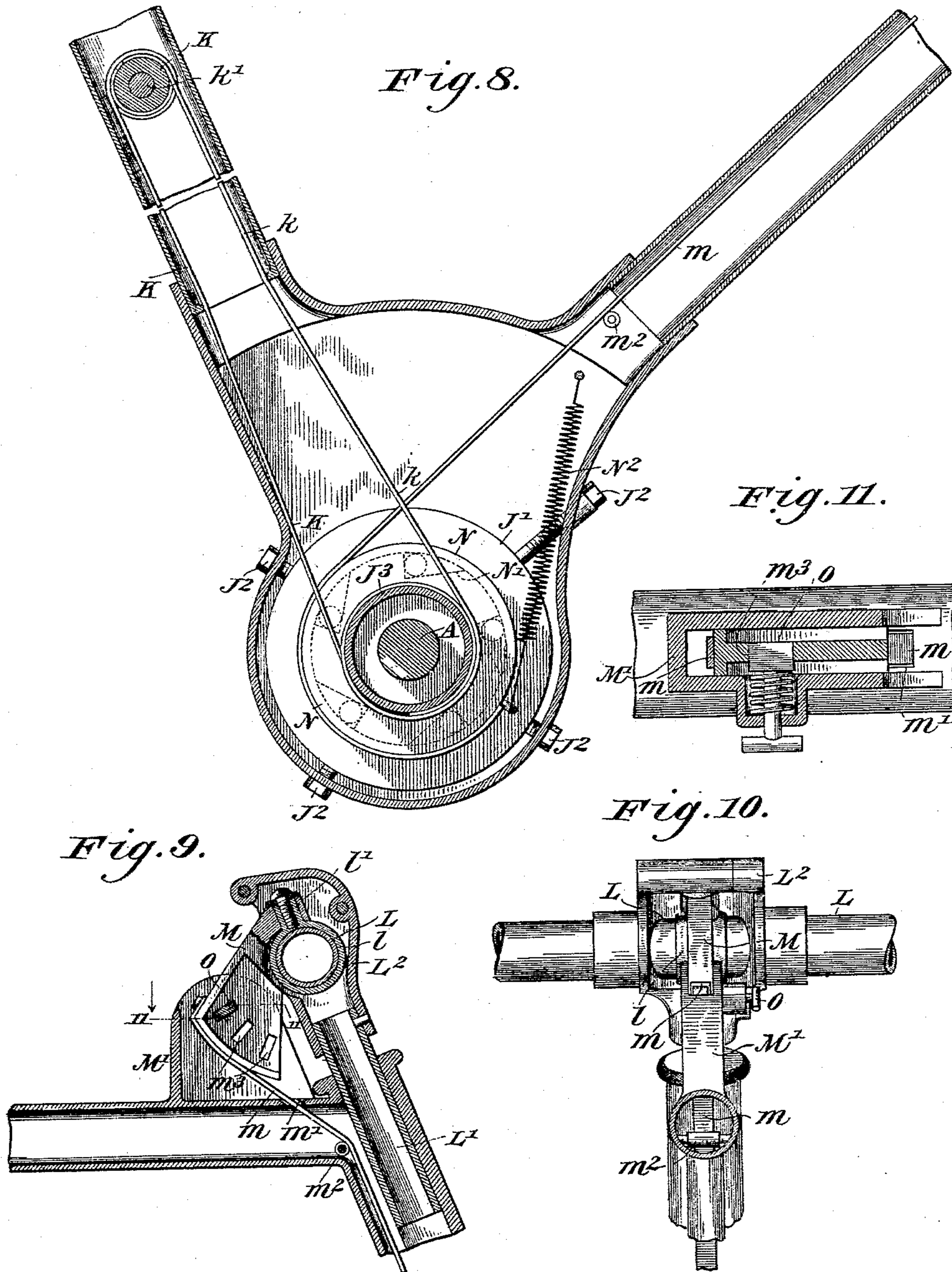
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(No Model.)

5 Sheets—Sheet 5.

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Fig. 12.

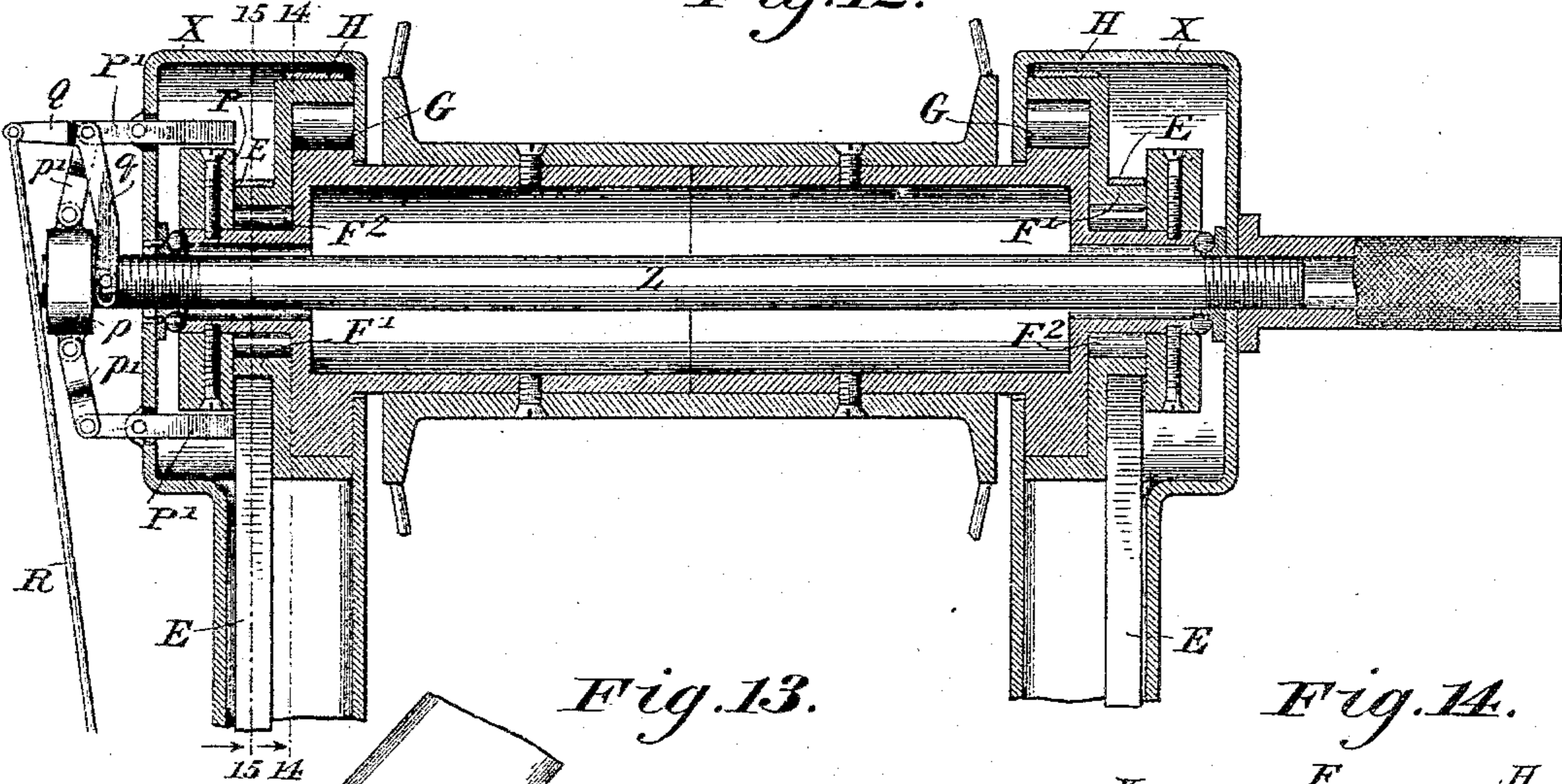


Fig. 13.

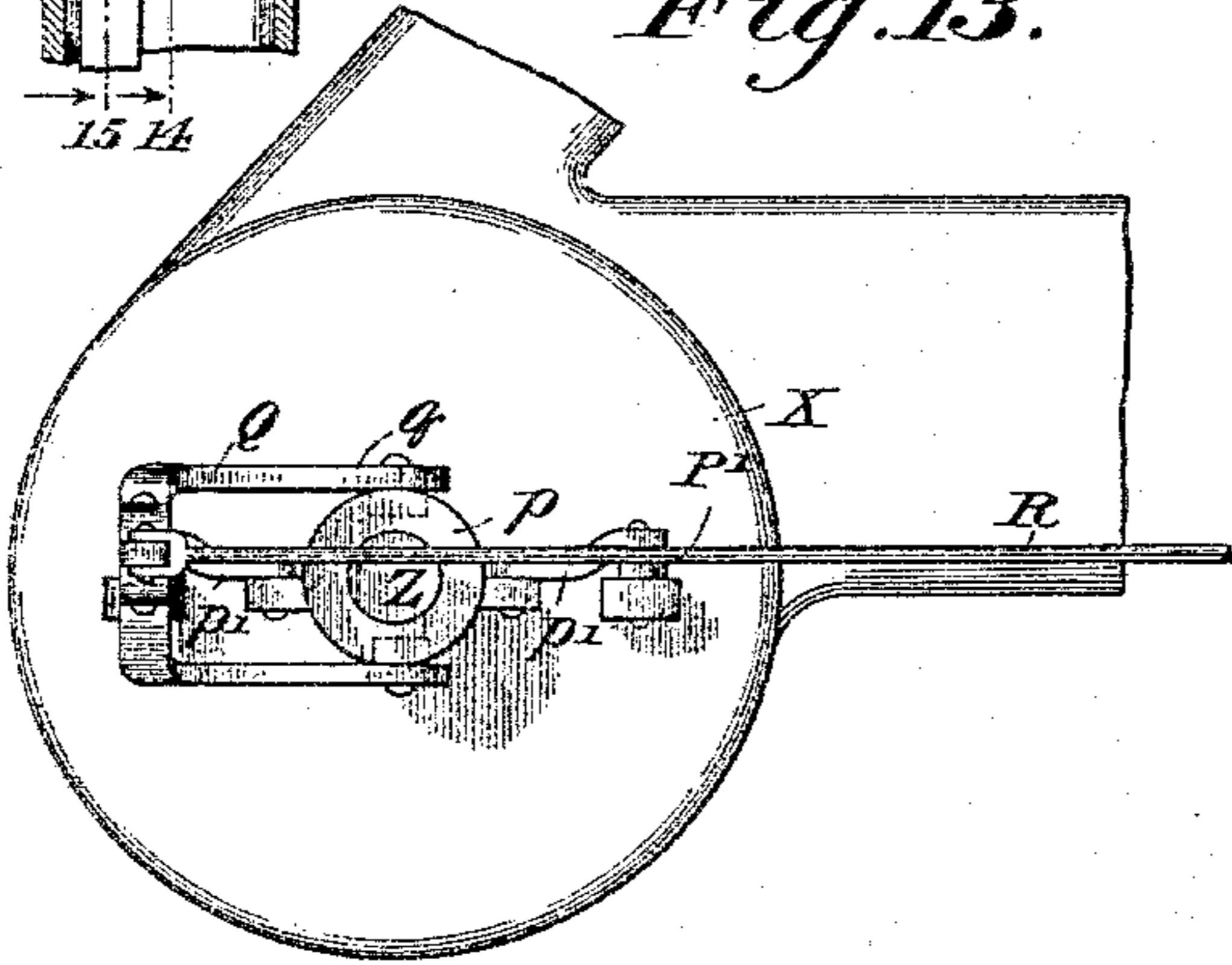


Fig. 14.

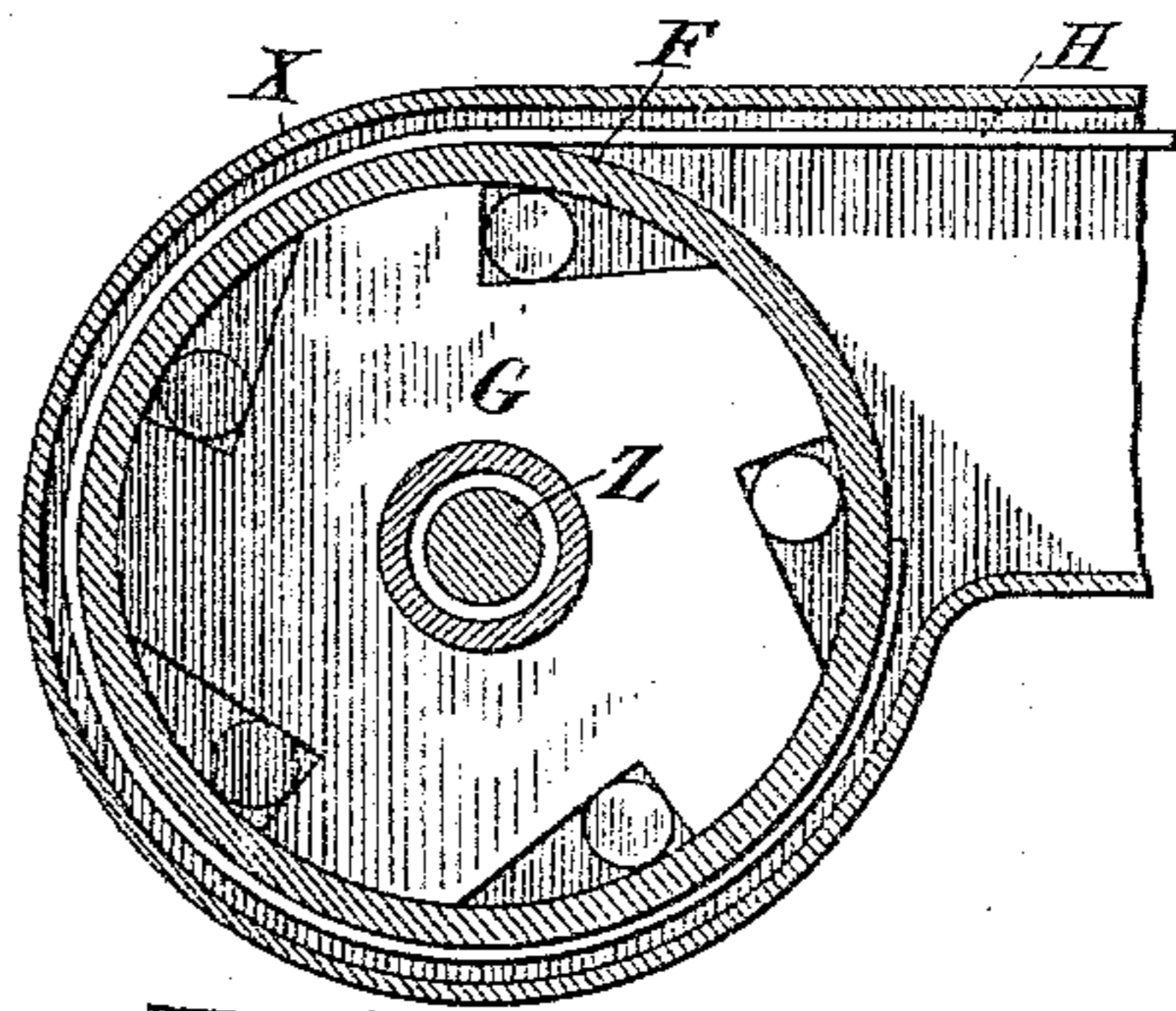


Fig. 15.

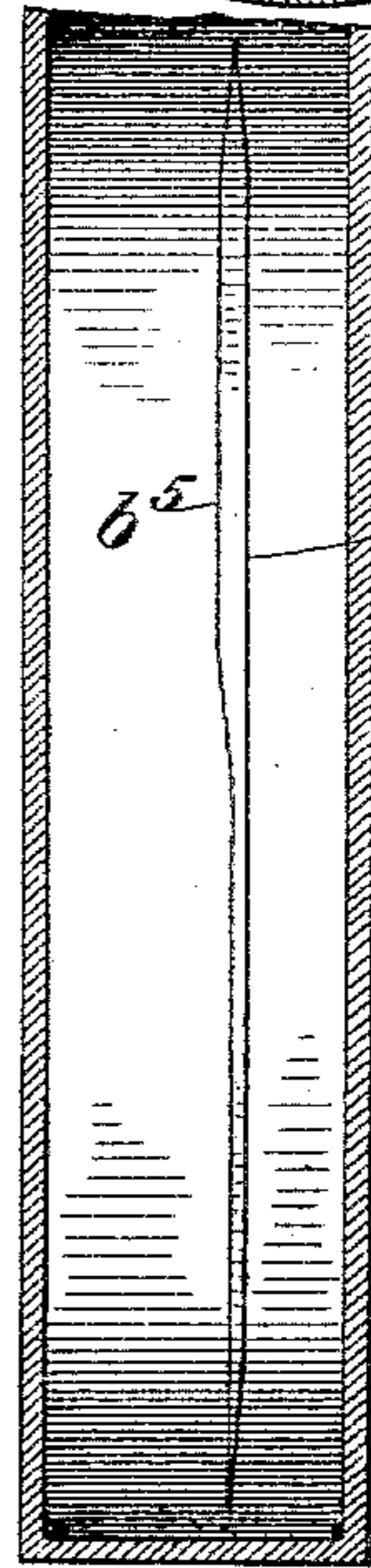
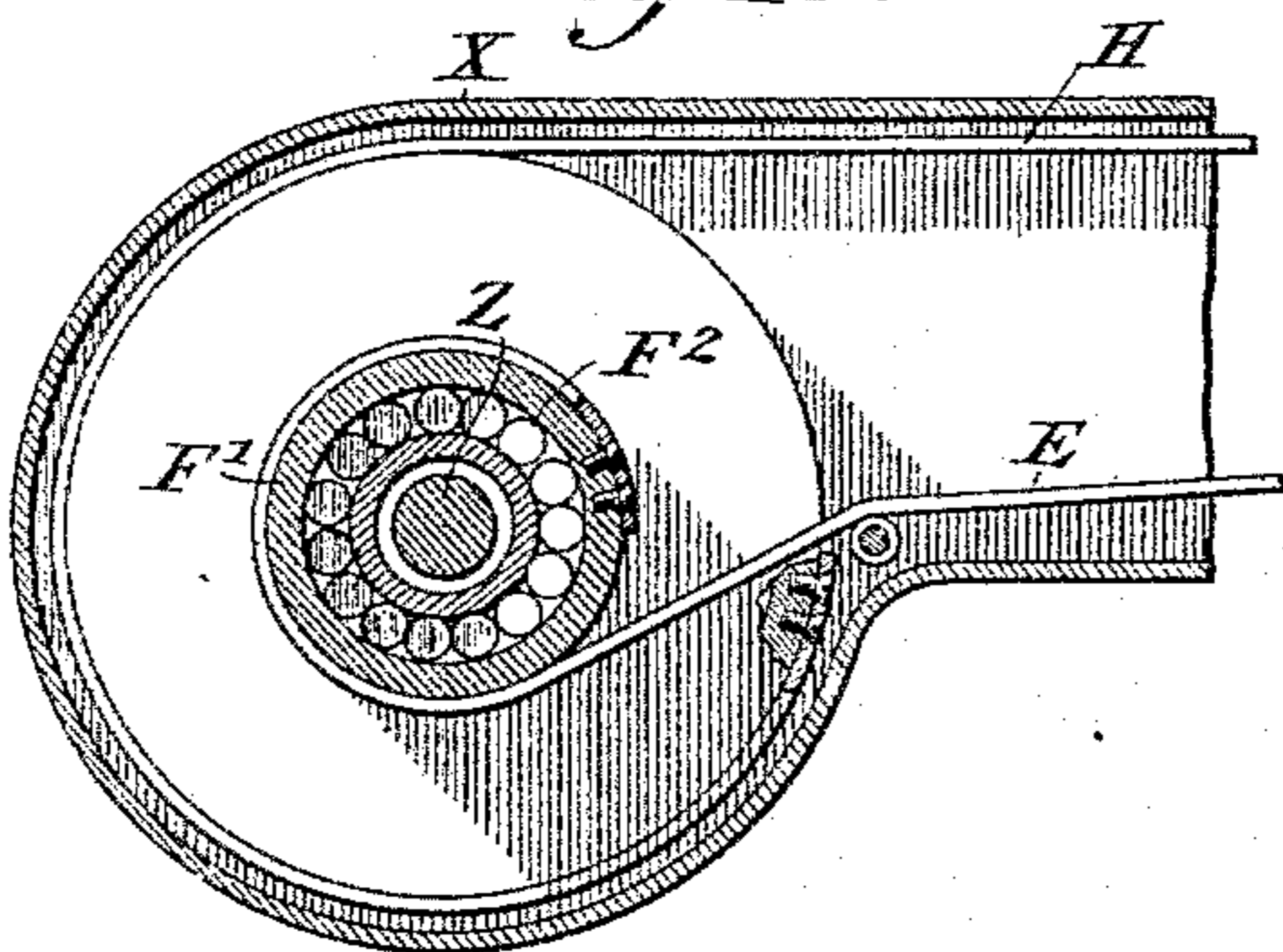


Fig. 16.

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UNITED STATES PATENT OFFICE.

WILLIAM JESSEE PUGH, OF MUSCATINE, IOWA, ASSIGNOR OF TWO-THIRDS
TO WILLIAM N. WALLACE, J. H. VAIL, AND WALTER L. JOHNSON, OF
SAME PLACE.

BICYCLE.

SPECIFICATION forming part of Letters Patent No. 598,058, dated January 25, 1898.

Application filed January 8, 1897. Serial No. 618,492. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM JESSEE PUGH, of Muscatine, in the county of Muscatine and State of Iowa, have invented certain new and
5 useful Improvements in Bicycles; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon,
10 which form part of this specification.

This invention is an improvement in safety-bicycles; and its objects are, first, to do away with sprocket-gearing or train-gearing of any description and to substitute therefor a novel
15 propelling mechanism which can be entirely housed and concealed from view without making an awkward-looking frame; second, to provide a variable-speed propelling mechanism by which the relative speeds of rota-
20 tion of the rear wheel and pedal-shaft can be varied within certain limits at the will of the rider, so that he can either increase speed or power for a given speed of the pedal-shaft; third, to enable the rider to utilize both foot
25 and hand power in propelling the machine, if he so desires, so that he can climb hills with greater ease and will not be altogether helpless should his pedals break, and, finally, to provide a simple but effective brake.

30 With these objects in view the invention consists in the novel combinations of parts and in the novel constructions of parts set forth in the appended claims, and the accompanying drawings illustrate a bicycle embodying the best form of my invention now
35 known to me, and the following is a description thereof.

Referring to said drawings, Figure 1 is a side view, partly broken, of a complete bicy-
40 cle. Fig. 2 is an enlarged vertical section through the pedal-shaft housings and the interior parts. Fig. 3 is a vertical section on the line 3 3, Fig. 2. Fig. 4 is a similar section on line 4 4 of Fig. 2. Fig. 5 is a section on
45 line 5 5 of Fig. 2. Fig. 6 is a section on line 6 6 of Fig. 5. Fig. 7 is a detail section on line 7 7, Fig. 4. Fig. 8 is a section on line 8 8, Fig. 2. Fig. 9 is a detail section of part of the connections between the handle-bar and
50 pedal-shaft. Fig. 10 is a rear view of Fig. 9. Fig. 11 is a detail enlarged section on line

11 11, Fig. 9. Fig. 12 is a horizontal section through the rear-wheel hub, showing the clutch and brake mechanisms. Fig. 13 is a side view of the brake on rear of frame. Fig. 55
14 is a vertical section on line 14 14 of Fig. 12. Fig. 15 is a vertical section on line 15 15 of Fig. 12. Fig. 16 is a developed view of the cams or guides.

For convenience I shall describe the vari- 60
ous parts of my invention in the order above named.

The propelling mechanism, (see Figs. 1 to 7.)—On the pedal-shaft A, near its opposite end, are keyed segments B, whose ends are
65 about sixty degrees apart. On the outer end of the hub of sector B is loosely journaled segment C, which is about one-third of a circle in area, and roller-bearings C' are provided therefor, as shown, to lessen friction. 70
At the inner side of sector B and loosely journaled on the hub thereof is another segment D about two-thirds of a circle in area, and roller-bearings D' are provided therefor, as shown. 75

To the periphery of segment C is attached a steel tape E, which extends back through the hollow lower side bar of the frame and is attached to the hub F' of a clutch-pulley F, journaled on the shaft of the rear wheel (see 80
Figs. 12 and 13) over a clutch G, made fast to the hub of the rear wheel, as shown, and of such construction that when pulley F is rotated forwardly the clutch engages and rotates the wheel forwardly; but when the 85
clutch-pulley F stops or rotates backward the clutch is released. To insure easy action, the clutch-pulleys are mounted on roller-bearings F², as shown. To the front edge of the periphery of segment D is attached one end of 90
a steel tape or other suitable connection, which extends backward through the hollow side bar of the frame and is fastened to the periphery of pulley F, as shown. Tape E being attached to the under side of hub F' and 95
tape H to the upper side of pulley F it is obvious that when one is unwinding the other will be wound up. Consequently the segments C and D will oscillate in opposite directions on the pedal-shaft. 100

Recurring back to the sector B it will be rotated continuously in one direction if the

pedals are properly worked and thus will rotate between the segments C and D, and I cause it to alternately engage the segments and turn them the proper distance forward, as follows: Near the opposite ends of sector B are radial slots $B' B^2$, in which are respectively pivoted dogs $b b'$, which are normally pressed outward so as to project beyond the face of the sector by springs $b^2 b^3$, as shown. Dog b when projected will during the rotation of the sector catch under the rear edge of segment C (see Fig. 3) and will turn said segment forward with the sector for a third of a revolution, when the dog b will be tripped by reason of the friction-roller b^4 on the outer end thereof striking a cam b^5 on the inner face of the casing inclosing the parts, (see Figs. 2, 3, and 4,) whereupon the segment C is left free to be returned to original position, while the sector continues its rotation. Now by reason of the connection of segment C by tape E with pulley F that pulley is rotated backward, so as to disengage the clutch G during the forward movement of the segment C, and by reason of the connection of pulley F by tape H with segment D the latter segment D is turned back upon the pedal-shaft contrary to the motion of segment C, as will be clear from the drawings. Further, as the hub F' is smaller than pulley F a one-third forward movement of segment C is sufficient to rotate segment D backward two-thirds of a revolution. At the moment, therefore, when dog b is disengaged from segment C dog b' comes into engagement with the rear edge of segment D and the latter is rotated forwardly with sector B, and through tape H rotates pulley F forward for about two-thirds of a revolution, and pulley F engaging clutch G thus imparts motion to the rear wheel in a forward direction only. This forward rotation of pulley F draws tape E back, and through it pulls segment C back to its original position, and when it reaches that position dog b' is disengaged from segment D by reason of the friction-roller b^6 on the end of said dog engaging a cam b^7 on the casing, (see Figs. 3 and 4,) and dog b thereupon engages segment C and the operation is repeated.

From the foregoing description it will be understood that the segments C and D oscillate upon the hub of sector B, moving simultaneously in opposite directions, and that sector B imparts a positive forward motion alternately to said segments by means of the dogs $b b'$, and that when one sector is moved forward it pulls the other segment backward by reason and means of the tapes E H and pulley F. It will also be understood from the drawings that the above-described parts are duplicated on each side of the machine. Consequently a continuous forward rotation is imparted to the rear wheel while the pedal-shaft is being rotated forwardly, the sets of propelling devices being arranged to act alternately and thus impart a uniform and constant motion to the rear wheel.

The variable-speed mechanism.—It will be readily understood that if the size of segment D be increased or diminished the amount of rotation imparted therefrom to pulley F will be accordingly increased or diminished, and for the same reason the power required to maintain a given speed of shaft A increased or diminished.

I have provided for increasing the peripheral area of segment D as follows: Referring to Figs. 2 to 7 it will be observed that in the inner face of segment D are radial grooves D', within which are disposed radial screw-threaded rods I, having small gears I' on their lower ends and retained in position in any suitable manner. The upper ends of grooves D' are widened and provided with channels d' on their sides to receive and guide the flanges d^2 of half-nuts d , which are fitted in the grooves and to the screw-threads of the rods, as shown in Fig. 7, so that said half-nuts d will be moved radially in or out, according to the rotation of the rods I. To the several half-nuts d are attached sections D² of flat steel bands which cover the periphery of segment D and slightly overlap, as shown in Figs. 3 and 4, and also lie under the tape H. When the half-nuts are moved outward, the sections D² increase the peripheral extent of segment D and at same time afford a continuous bearing for the tape H, and when the half-nuts are moved inward the peripheral extent of the segment D is diminished accordingly.

The rods I are rotated so as to simultaneously adjust the nuts d as follows: On the hub of segment D is a toothed annulus i , the teeth thereof engaging with the gears I', said annulus oscillating with the segment. Inclosing said annulus is a ring J, which is supported by an annularly-grooved circular boxing J' within the casing of the pedal-shaft, said boxing being centered in the casing by means of bolts J² engaging its annular groove, but can be partially rotated in the casing, as hereinafter described.

On the inner surface of ring J is a projection j , and on the outer surface of annulus i is a lug i' . Normally the ring J is held in such position that the lug i' will not strike the projection j . Consequently the rods I remain unaffected during the oscillations of segment D; but if it is desired to increase the peripheral extent of segment D the boxing J' is partially rotated, so that projection j is shifted into position to be engaged by the lug i' . Consequently at the next forward oscillating movement of the segment D the lug i' , striking the projection j , is stopped, while the segment D continues to move, and therefore the gears I', meshing with the momentarily stationary toothed annulus i , rotate rods I, so as to run the half-nuts outward, and thus expand or enlarge the periphery of the segment D, as is obvious. When the segment D starts back, the annulus i will move with it and will continue to oscillate with it as before with-

out being further affected by projection j so long as boxing J' remains undisturbed, and of course the segment D remains expanded.

To reduce the size of the segment, boxing J is turned in the opposite direction so that at the next backward oscillation of segment D the annulus i is arrested and the rods I rotated so as to draw in the half-nuts, and the parts then remain in their new positions until the boxing is again shifted.

Of course this variable gearing mechanism is duplicated on both sides of the machine.

In order to allow the rider to vary the effective size of segments D without dismounting, if he desires, I form small rings J^3 on the inner ends of the boxings, (see Fig. 2,) and attach tapes K thereto and lead these tapes up through the center truss of the frame, as shown in Fig. 1, and connect them reversely to a small disk K' on a stub-shaft k within the truss, shaft k having a small crank k^2 on its outer end by which it can be readily adjusted, and suitable indicating-marks (not shown) may be provided to enable the rider to know which way to shift the crank to raise or lower the gearing.

The hand-power propelling mechanism, (see Figs. 1 and 8 to 11.)—The handle-bar L instead of being rigidly fastened to the handle-bar post L' is mounted thereon in such manner that the handle-bar can be oscillated or turned up and down like an "adjustable" handle-bar, the post L' having a cap-casting L^2 on its upper end in which the handle-bar is journaled, as shown.

On the handle-bar, within the cap-casting L^2 , is fastened a ring l , having a top lug l' , on which is swiveled a casting M , which hangs down on rear of the handle-bar and post and between a pair of lugs or a slotted casting M' on the top bar of the frame, Figs. 1 and 9. The casting L and ring l are so fitted to each other that the casting M can always remain in line with the top bar of the frame without interfering with the lateral movements of the handle-bar necessary in steering the machine.

The lower edge of casting M is rounded, and a steel tape m is fastened to the rear edge of casting, passing down thereunder and through an opening m' in the frame, down through the steering-post thereof, and back through the lower front member of the frame to a clutch-pulley N , fitted over a clutch N' , keyed centrally upon the pedal-shaft A . (See Figs. 2 and 8.) The clutch is of ordinary construction, like clutches G on the rear-wheel hub. Now, obviously, if the handle-bars are lifted, so as to rock casting M upward, tape m will rotate pulley N , and it will engage clutch N' and impart a forward motion to the pedal-shaft independently of or in addition to the power applied on the pedals. When the handle-bars are lowered, a spring N^2 within the casing pulls pulley N back to original position, disengaging the clutch. (See Fig. 8.)

Obviously, therefore, the rider can supplement the work of the pedals by vibrating the handle-bar.

The advantages of having this handle-bar power in addition to the pedals will be obvious, especially in hill-climbing or in case of breakage of the pedals.

To lessen friction, small rollers m^2 may be placed at the joints or bends of the frame where the tape m has to turn.

As this hand-power is not intended to be used continuously, the rider can lock the casting M , so that the handle-bar cannot be vibrated on the post L' , by means of a spring-pressed pin O , Figs. 1, 10, and 11; which is located in one of the lugs M' and can be engaged with either of a series of openings M^3 in the lower part of casting M . By this means also the rider can adjust the height and position of the handle-bars to a considerable extent without disturbing the post L' , and this device considered merely as a means for adjusting the handle-bar is of value.

The brake, (see Figs. 1, 12, and 13.)—It will doubtless be already observed that this machine will require a brake, as there can be no back-pedaling. On the contrary, the rider can stop pedaling and rest his feet on the pedals without stopping the machine, so no coasters are necessary.

I have provided a simple and effective brake which can be operated by foot or hand. I have shown only the foot mechanism in the drawings, however.

On one end of the hub of the rear wheel is fixed a disk P , which may be faced with some frictional substance and is inclosed within a casing X , attached to the main frame. Pivoted on said casing at opposite sides of the wheel are brake-levers P' , whose inner ends are adapted to clamp the disk P when the brake is to be applied. On the adjoining end of the rear-wheel axle Z , which extends through casing X , is a sliding collar p , which is connected by links p' with the outer ends of levers P' . The collar can be shifted on axle Z to and from casing by means of a bell-crank lever Q , which is pivoted on the rear lever P' and has one arm q bifurcated and pivoted to collar p , while the other arm extends outward and is connected by a rod R to one arm of a bell-crank lever r , pivoted on the side of the frame in rear of the pedal-shaft and out of the way of the pedals, and the other arm of lever r is loosely connected to the stem of a foot-key r' , suitably guided in a small bracket attached to the frame, as shown in Fig. 1. Now by depressing key r' lever r is rocked, and through rod R lever Q is rocked, forcing collar p toward casing X , and consequently links p' force the outer ends of levers P' farther apart, thereby causing their inner ends to clamp disk P and arrest the rotation of the rear wheel, as is evident.

The operation of the various parts of the

invention has been sufficiently explained heretofore, and a repetition of the same here is unnecessary.

It is obvious that various modifications may be made in the mechanical construction of parts, especially of the propelling mechanism, without departing from the main features of my invention, and therefore I do not consider my invention restricted to the precise construction of parts herein shown and described, except as specifically claimed.

Having thus described my invention, what I therefore claim as new, and desire to secure by Letters Patent thereon, is—

1. In a bicycle, the combination of the friction-disk on the rear wheel, the clamping-levers pivoted beside the disk; the sliding collar, the links connecting said collar with the outer ends of said clamping-levers; the bell-crank lever for sliding said collar, and connections, substantially as described, for operating said bell-crank lever, all substantially as and for the purpose described.

2. In a bicycle, the combination of the vibratory handle-bar, the casting swiveled thereto so as not to interfere with the steering movements thereof, and the lugs on the main frame between which said casting is guided, with means for locking said casting to the lugs; for the purpose and substantially as described.

3. In a bicycle, the combination with a vibratory handle-bar, a casting swiveled thereon, so as not to be affected by the lateral oscillations of the handles in steering; with means for locking said casting so as to hold the handles in any position to which they are adjusted vertically, substantially as and for the purpose described.

4. In a bicycle, the combination with the vibratory handle-bar, the casting swiveled thereon, the guide-lugs on the frame, and the spring-pressed pin in said lugs adapted to engage with holes in the casting for the purpose and substantially as described.

5. In a bicycle the combination of the segment or disk having a series of radially-movable nuts attached thereto, and radially-disposed threaded rods for operating said nuts, provided with gears; with the toothed annulus engaging the gears of the rods and moving with the segment; and means, substantially as described, for shifting said annulus independently of the segment so as to cause it to rotate said rods and thereby cause said nuts to move in or outward and enlarge or contract the periphery of the segment or disk, for the purpose and substantially as described.

6. In a bicycle the combination of the oscillating segment, the radially-movable nuts thereon, radially-disposed threaded rods for supporting and operating said nuts; and the gears on said rods; with the toothed annulus engaging said gears and movable with the segment; and means substantially as described for shifting said annulus independ-

ently of the segment so as to rotate the rods and shift the nuts substantially as and for the purpose described.

7. In a bicycle the combination of the oscillating segment, the radially-movable nuts thereon, and radially-disposed threaded rods for supporting and operating said nuts; and the gears on said rods; with the toothed annulus engaging said gears and movable with the segment; and the stationary ring, substantially as described, having a projection adapted to engage a lug on the annulus and momentarily arrest the movement thereof, so as to cause the rods to rotate and thus shift the nuts so as to expand or contract the periphery of the segment, substantially as and for the purpose described.

8. In a bicycle the combination of the oscillating segment, the radially-movable nuts thereon, and radially-disposed threaded rods for supporting and operating said nuts; and the gears on said rods; with the toothed annulus engaging said gears and movable with the segment; and the stationary ring, substantially as described, having a projection adapted to engage a lug on the annulus and momentarily arrest the movement thereof, so as to cause the rods to rotate and thus shift the nuts so as to expand or contract the periphery of the segment; the boxing supporting said ring; and the tapes, disk, stub-shaft and crank for shifting the boxing at the will of the rider, for the purpose and substantially as described.

9. In a gearless and chainless bicycle, the combination of the rear wheel, the clutches on its hub, and the clutch-pulleys on the rear-wheel axle; with the rotary pedal-shaft, the oscillatory segments thereon, the flexible connections between the segments and clutch-pulleys, and means substantially as described whereby the segments are given an intermittent forward rotation by and from the crank-shaft while the latter is continuously rotated forwardly, for the purpose and substantially as described.

10. In a gearless and chainless bicycle, the combination of clutches and pulleys for imparting forward motion to the rear wheel; the pedal-shaft adapted to be rotated forward continuously and oscillatory segments on and connections between the segments and pulleys for alternately operating the pulleys so as to propel the machine forward, for the purpose and substantially as described.

11. In a bicycle the combination of the pedal-shaft, the oscillatory segments thereon, and flexible connections between said segments and clutch-pulleys on the rear-wheel hub; with catches on the crank-shaft adapted to intermittently engage the segments and propel the same forward for part of a revolution and means for returning the clutch-pulleys and segments to initial position when disengaged from the catches, substantially as described.

12. In a bicycle the combination of the rear

wheel and a clutch-pulley for imparting forward motion thereto; the pedal-shaft, a pulling-segment mounted thereon and connected by a flexible connection to the pulley, a second segment mounted thereon also connected by a flexible connection to said pulley in such manner that when one segment is moved forward the other is moved backward; with catches mounted on the pedal-shaft and arranged to alternately engage said segments and propel them forward for parts of the revolution of the shaft, all substantially as and for the purpose described.

13. In a bicycle the combination of the pedal-shaft, the pair of oscillatory segments mounted thereon, the rear wheel, the clutch thereon, and the clutch-pulley, a steel tape connecting the large segment with the larger part of said pulley, a steel tape connecting the smaller segment with the smaller part of the pulley so that when one segment is moved forward the other will be drawn backward; and a pair of catches mounted on and rotating with the pedal-shaft adapted to alternately and respectively engage said segments for the purpose and substantially as described.

14. The combination with the pedal-shaft, the oscillatory segments mounted thereon, the catches mounted on and rotating with the shaft adapted to alternately engage and propel the said segments for a part revolution, and means for tripping said catches; with a clutch on the rear wheel; a clutch-pulley, and separate flexible connections between said pulley and each of said segments, all substantially as and for the purpose described.

15. The combination of the pedal-shaft, the sector mounted thereon, the oscillatory segments on opposite sides of the sector, and the latches mounted on the sector adapted to alternately engage and propel the said segments forward and means substantially as described whereby as one segment is pulled forward it draws the other backward, for the purpose and substantially as described.

16. The combination of the pedal-shaft, the sector mounted thereon, the oscillatory segments on opposite sides of the sector, and latches mounted on the sector adapted to alternately engage and propel the said segments forward; with a clutch on the rear-wheel hub; the clutch-pulley, the steel band connecting the larger segment to the pulley, whereby it is rotated so as to propel the wheel; and the flexible connection between the smaller segment and the hub of said pulley, all substantially as and for the purpose set forth.

17. The combination of the pedal-shaft, the segment B provided with oppositely-disposed

catches b, b' ; the inner oscillating segment D adapted to be engaged by catch b' and the outer oscillating segment C adapted to be engaged by catch b , and the cams for disengaging said catches at the proper moment in the rotation of the sector, for the purpose and substantially as described.

18. The combination of the pedal-shaft, the segment B provided with oppositely-disposed catches b, b' ; the inner oscillating segment D adapted to be engaged by catch b' and the outer oscillating segment C adapted to be engaged by catch b , and the cams for disengaging said catches at the proper moment in the rotation of the sector; with the clutch on the rear-wheel hub, the clutch-pulley engaging said clutch; the steel tape connecting said pulley with segment D, and the steel tape connecting segment C with the hub of the pulley, all substantially as and for the purpose set forth.

19. In a bicycle the combination of the pedal-shaft, and the clutch and pulley thereon; with a vibratory handle-bar having a ring l and lug l' , a casting M swiveled on said lug l' and fitted to ring l substantially as described and lugs on the top bar of the frame between which casting M vibrates, so that it remains in line with the top bar of the frame of the machine while the handle-bar can be oscillated in steering, and a flexible connection between said casting and said friction-pulley, substantially as and for the purpose described.

20. In a bicycle the combination of the frame, the cap-casting L^2 on the upper end of the steering-post sleeve, the pedal-shaft, and means for transmitting motion therefrom to the rear wheel; a clutch on said shaft; a clutch-pulley, and a spring for disengaging the pulley and clutch; with a vertically-vibratable handle-bar journaled in casting L^2 , the ring l having lug l' , a vibratory casting M swiveled on lug l' and fitted to ring l so as not to interfere with the steering movements of the handle-bar; and lugs on the top bar of the machine between which casting M is guided, and a flexible connection m between said casting and the pulley extending through the hollow frame of the machine whereby motion may be imparted from the handle-bars to said pedal-shaft, all substantially as and for the purpose described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

WILLIAM JESSEE PUGH.

Witnesses:

BEN NELSON,
GEO. T. NIETZEL.