No. 681,144. Patented Aug. 20. 1901.

# F. W. SPACKE.

## SPEED VARYING PULLEY.

(Application filed Oct. 19, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

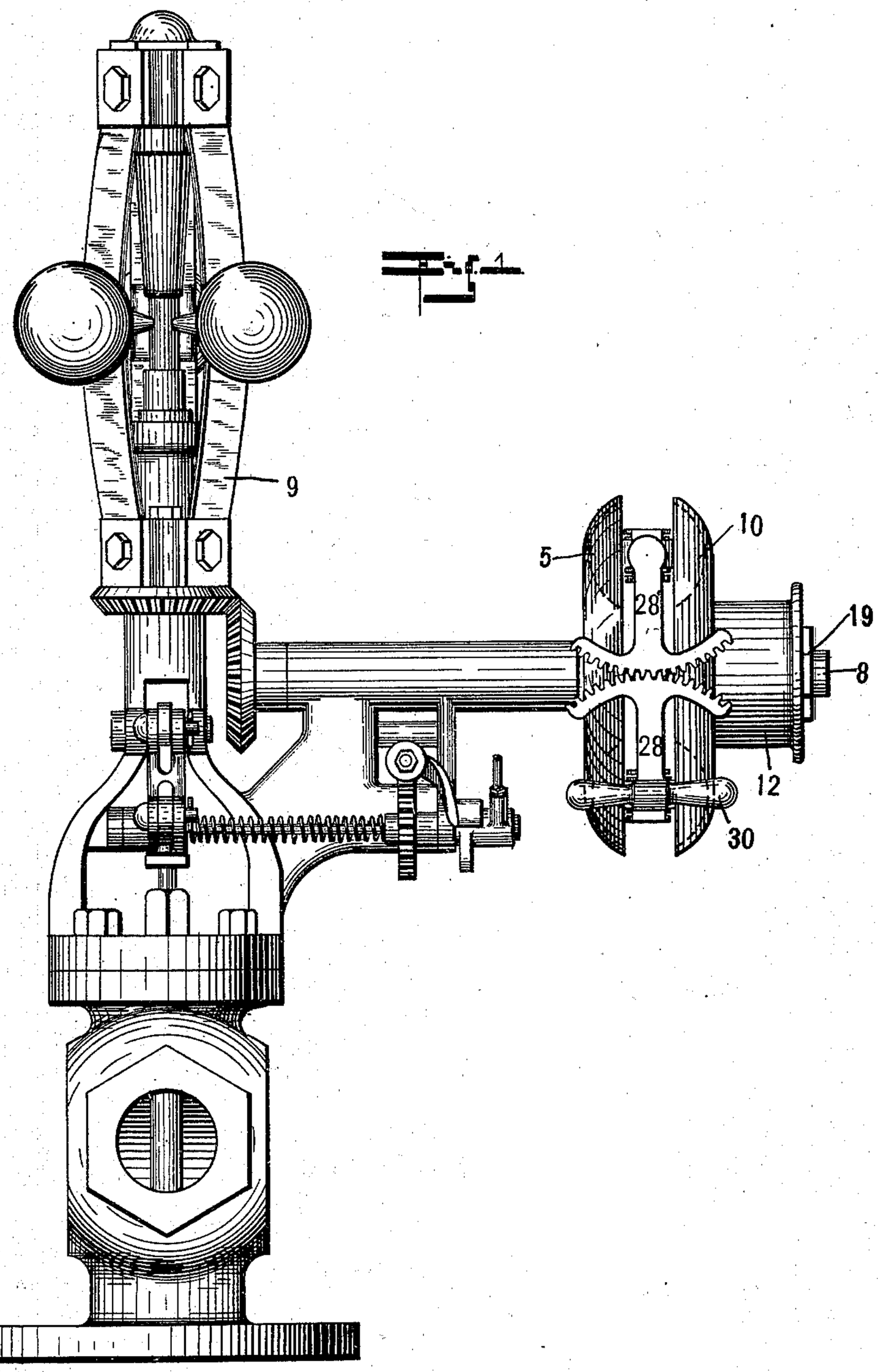


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Fig. 3.

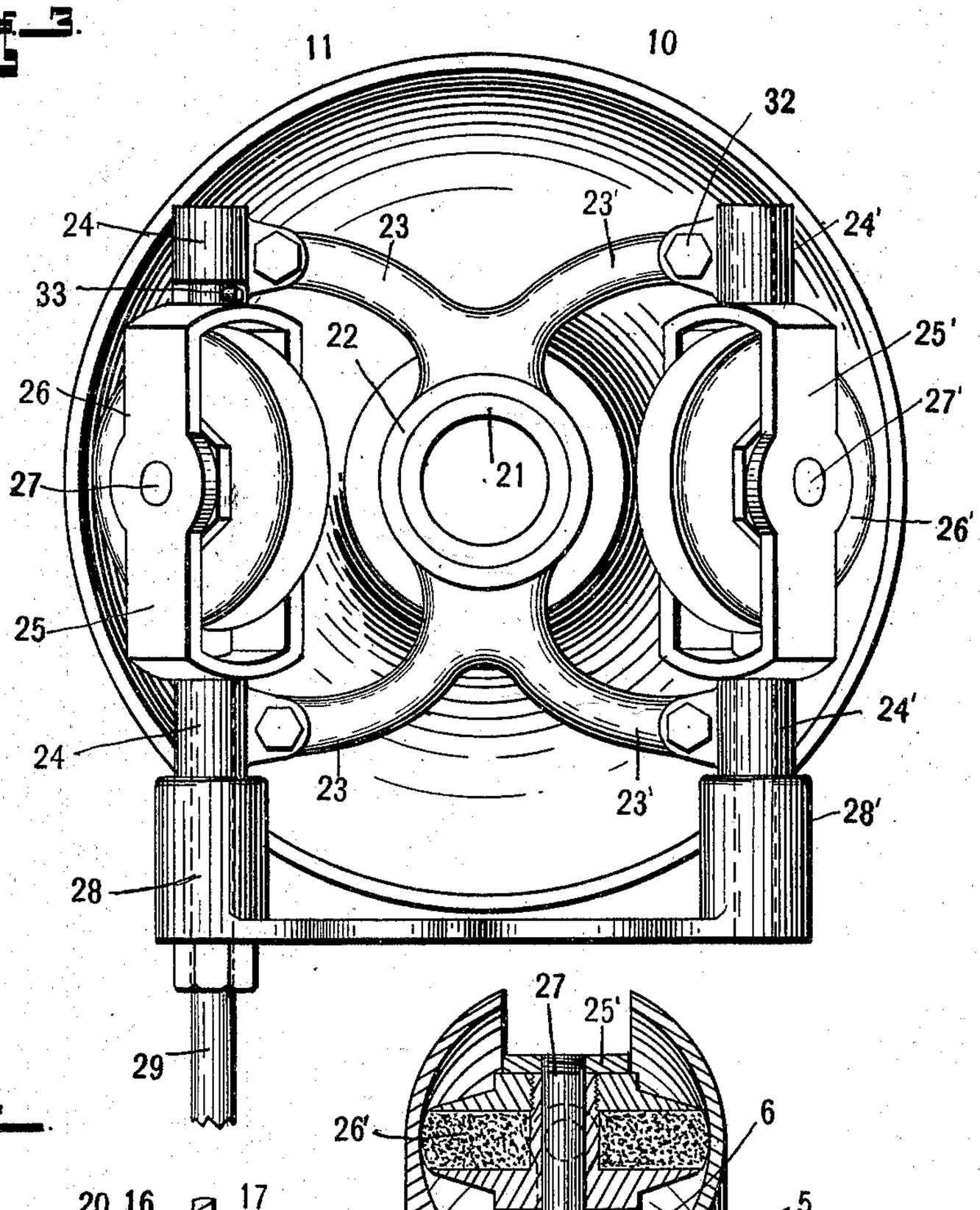


Fig. 2.

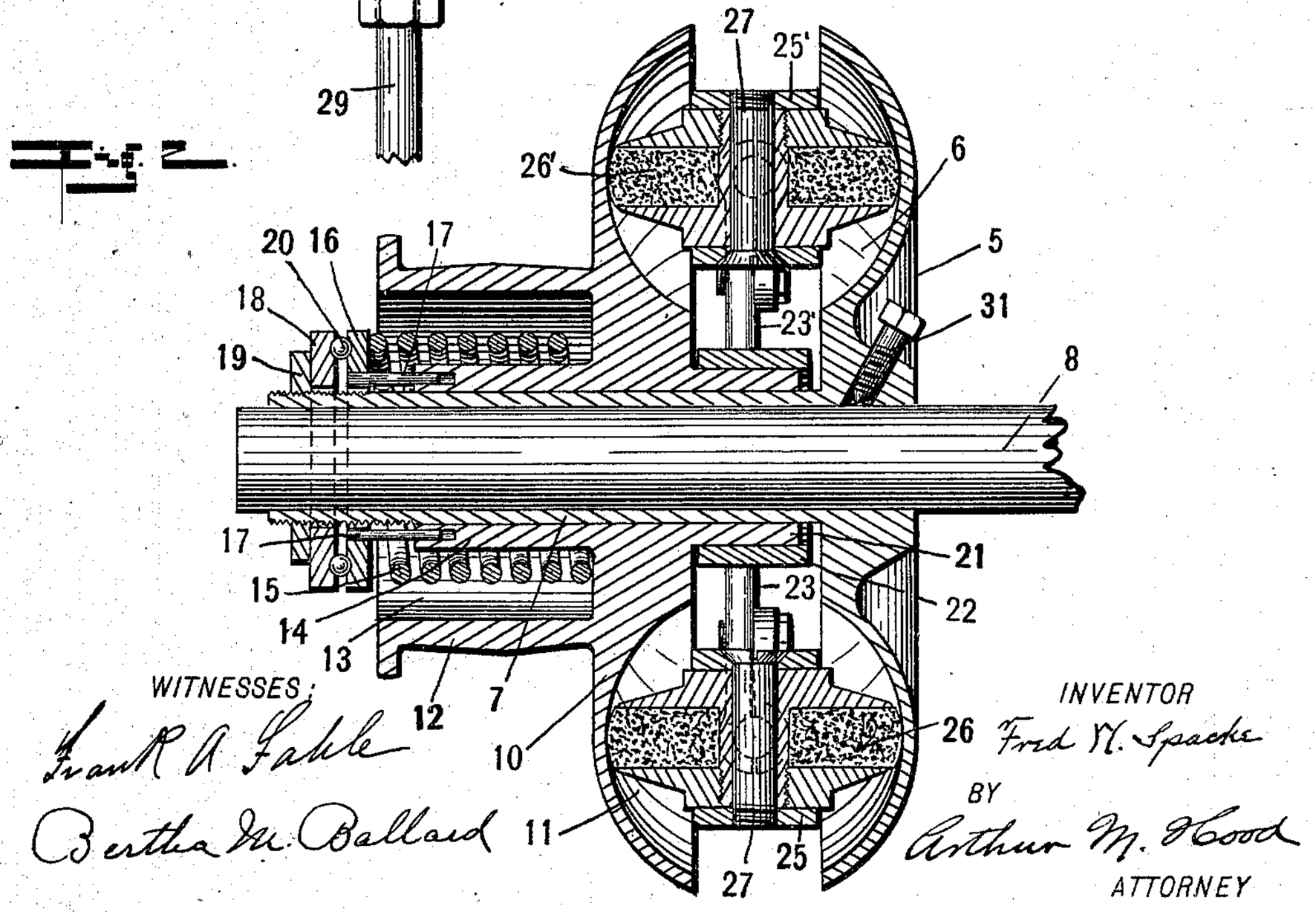


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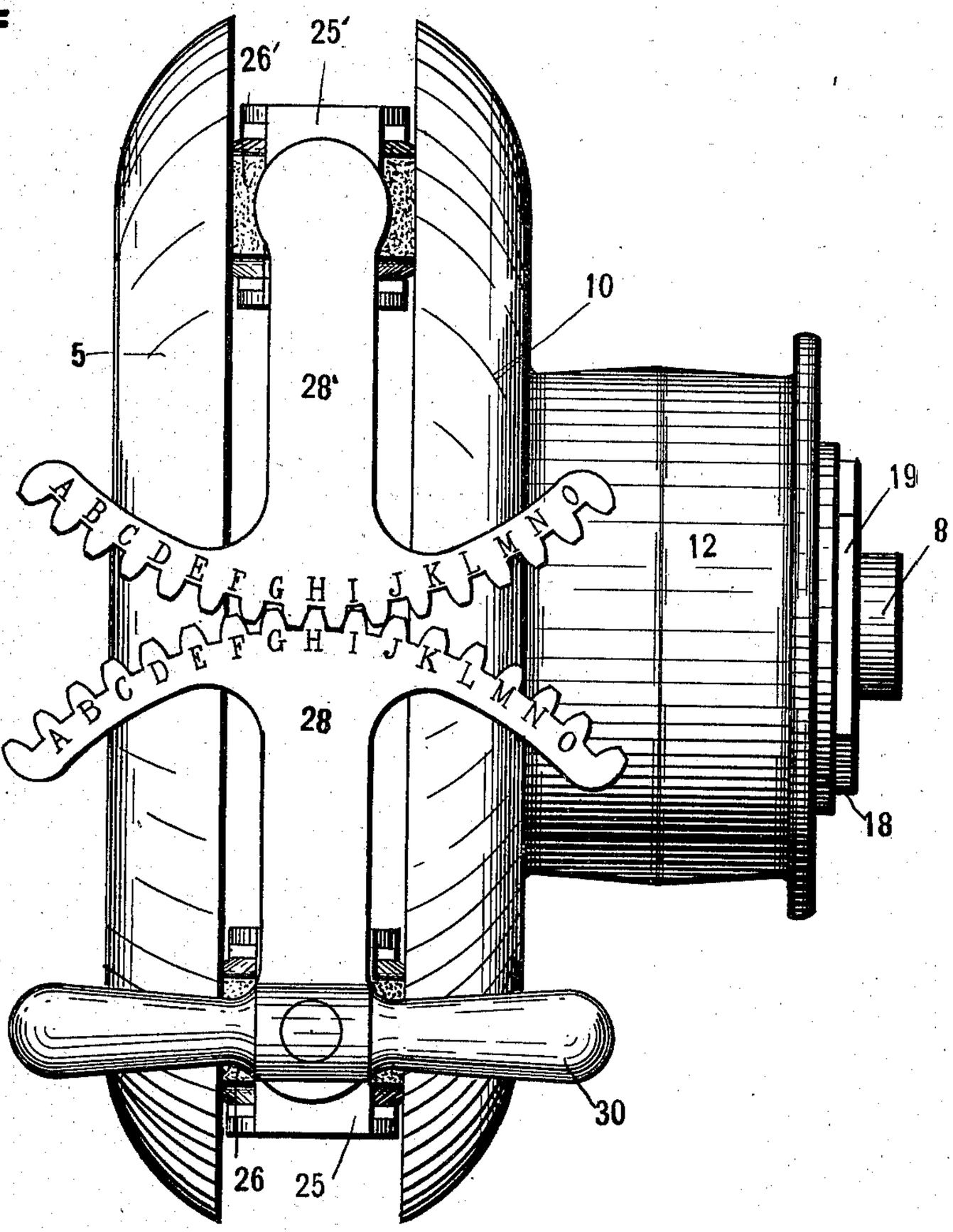
Fig. 4

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# UNITED STATES PATENT OFFICE.

FRED W. SPACKE, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO SPEED CHANGING PULLEY COMPANY, OF SAME PLACE.

## SPEED-VARYING PULLEY.

SPECIFICATION forming part of Letters Patent No. 681,144, dated August 20, 1901.

Application filed October 19, 1900. Serial No. 33,654. (No model.)

*To all whom it may concern:*

Be it known that I, FRED W. SPACKE, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented a new and useful Speed-Varying Pulley, of which the following is a specification.

My invention relates to an improvement in speed-varying mechanisms.

In the use of centrifugal governors, especially such as those for traction-engines and engines used for driving farm machinery, it is necessary to vary the normal speed of the engine, according to the particular class of work which is at the time being done. For instance, when a traction-engine is running on the road a higher speed can be used, and when used in driving threshing machinery the speed of the engine should be varied in accordance with the condition and character of the grain. It has been heretofore customary for the engineer to vary the strength of the tension-spring which is used on governors of this class to act upon the valve-stem. Governors provided with springs of this character are so proportioned that the best regulation of the valve is had when the tension-spring is in its normal medial condition. If this spring be too tight, the action of the governor-balls upon the valve is heavy and slow, while if the spring be too weak the action is jerky and uncertain. The unusual adjustment of the tension-spring results, therefore, in an impairment of the efficiency of the governor.

The object of my invention is, therefore, to produce a small and compact speed-varying mechanism which is self-contained and has the general form of a pulley, which mechanism may be substituted for the usual pulley used upon the driving-shaft of any ordinary centrifugal governor.

The accompanying drawings illustrate my invention.

Figure 1 is a side elevation showing my improved pulley attached to a governor. Fig. 2 is an axial section. Fig. 3 is a plan with one of the disks removed. Fig. 4 is a side elevation, about full size.

In the drawings, 5 indicates a disk provided on one surface with an annular groove 6, substantially semicircular in cross-section. Formed integral with disk 5 is a sleeve 7, threaded at its outer end and provided with an axial bore for the reception of the driven shaft 8, said shaft being in Fig. 1 the usual driving-shaft of the governor 9. Coöperating with disk 5 is a disk 10, which is provided on that face adjacent disk 5 with an annular groove 11, which is similar to and registers with groove 6. Formed integral with or secured to disk 10 is a driving-pulley 12, adapted to receive the belt ordinarily used for driving the governor. Disk 10 is provided with a central hub 14, which is bored to receive sleeve 7 of disk 5. The pulley 12 is hollow, so as to form with sleeve 7 an annular chamber 13 for the reception of spring 15, one end of which engages disk 10 and the other end of which is engaged by a collar 16, longitudinally movable upon sleeve 7 and provided with pins 17, adapted to engage hub 14, so as to prevent any relative rotating movement between said collar and hub. Coöperating with collar 16 is a collar 18, longitudinally adjustable upon sleeve 7 by means of a nut 19. The two collars 16 and 18 are provided upon their adjacent faces with ball-races adapted to receive balls 20, thus forming a thrust-bearing connection between the two disks.

Disk 10 is provided on its groove-face with a hollow projecting hub 21, upon which is loosely fitted the hub 22 of a spider consisting of two pairs of oppositely-extending arms 23 and 23′. Each of arms 23 is provided at its outer end with a bearing 24, the two bearings alining upon a line at right angles to shaft 8. Mounted between bearings 24 is a yoke 25, within which is mounted a friction-wheel 26, the axis 27 of which lies at right angles to the axis of the yoke. Arms 23′ are provided with bearings 24′, between which is mounted a yoke 25′, carrying a friction-wheel 26′, whose axis 27′ is at right angles to the axis of yoke 25′.

Secured to yoke 25 is a segmental gear 28, which meshes with a similar gear 28′, secured to yoke 25′. The axis of yoke 25 is extended by a stem 29, to the end of which is secured an operating-handle 30, the said handle being placed at any desired distance from the speed-

varying pulley and the arrangement being such that by turning the handle the position of friction-wheels 26 and 26′ may be shifted.

Disk 5, together with sleeve 7, is rigidly secured to driven shaft 8 by any suitable means, such as set-screw 31, and disk 10 is revoluble upon sleeve 7. The supporting-spider lies between the two disks and is nominally mounted upon the projecting hub 12. In operation the spider, together with the two friction-wheels, is practically suspended without engagement with the hub 12, the stress upon the two friction-wheels balancing the entire transmitting mechanism between the two disks and any movement of the spider being prevented by supporting the outer end of stem 29. Disk 10 is continually urged toward disk 5 and a proper engagement had between said disks and the friction-wheels by means of the spring 15, the force of which may be increased or diminished by an adjustment of nut 19.

It is to be noticed that the mechanism described is entirely self-contained. It may be removed bodily from the driven shaft or attached thereto without in any manner disturbing its adjustment and without manipulation of a number of parts, the tightening or loosening of set-screw 31 being sufficient to attach or detach the device from the driven shaft. By this means I have been enabled to produce a device especially applicable for attachment to throttling-governors.

The bearings 24 and 24′ are preferably of the removable-cap form, so that by adjusting their fastening-bolts 32 the trunnions of the yokes 25 and 25′ may be clamped with sufficient force to normally hold the friction-wheels in any position of angular adjustment in which they may be placed by swinging the segments 28 and 28′.

For the sake of convenience the disk 5 will be hereinafter called the "driven" disk and the disk 10 will be called the "driving-disk."

It will be readily apparent that my device may be used wherever a variation of speed between the driving and driven mechanism is required; but the device is primarily designed not for the transmission of large powers, but rather for the mere variation of speed. Special description of the operation therefore will be limited to a discussion of this use in connection with governors, although the device is not necessarily limited to such use.

In use with a throttling-governor the device is slipped upon the shaft 8 and disk 5 secured thereto, so as to rotate therewith, by means of the set-screw 31. The usual driving-belt is then placed upon pulley 12. Suppose now that the governor be arranged to normally limit the speed of the engine to two hundred revolutions per minute, pulley 12 for that purpose being driven from a pulley twice its diameter. Friction-wheels 6 would then be placed parallel to the shaft 8, and disk 5 would be driven at the same speed as the disk 10. Suppose now that it is desired to allow the engine to run at an increased speed. In order to obtain the best efficiency of the governor, the governor-balls should rotate at the normal speed, which in the present case is four hundred revolutions per minute. The operator will therefore grasp handle 30 and by turning it to the left, Figs. 1 and 4, the friction-wheels 26 and 26′ are turned bodily about their external axes at right angles to their own axes, so as to bring their peripheries closer to the center of disk 10 and farther away from the center of disk 5. By this means the disk 10 can be rotated at a greater speed, while disk 5 will be rotated at the original and most efficient speed. In case it is desired to run the engine slower than the normal speed of operation the friction-wheels are turned bodily to the right about their external axes, so as to bring their peripheries nearer the center of disk 5 and farther away from the center of the disk 10. By this means the governor will always be made to rotate at its normal and most efficient speed, so that it will give the most efficient operation of the throttling-valve.

For the sake of convenience of the operator the two segments 28 and 28′ should be marked at their meshing surfaces with corresponding marks, such as the letters shown in Fig. 4, to indicate to the operator the position for any desired speed of the engine. In order to prevent too great a movement of the segments, the cap of one of bearings 24 is shortened and a radial pin 33 secured to one trunnion of the yoke 25 in position to engage the other half of the bearing.

I claim as my invention—

1. In a speed-varying mechanism, a driven disk, a driving-disk, a friction-wheel mounted between and coöperating with said disks, means arranged about the axis of the disks for supporting said friction-wheel upon an external axis at an angle to its own axis and the axis of the disks, and means for swinging said friction-wheel upon its external axis.

2. In a speed-varying mechanism, a driven disk, a driving-disk, a pair of friction-wheels mounted between said disks upon opposite sides of the axis thereof, means arranged about the axis of said disks for supporting said friction-wheels each upon an external axis at an angle to its own axis and the axis of the disks, and intermediate connections between said friction-wheels for swinging them simultaneously in opposite directions upon their external axes.

3. In a speed-varying mechanism, a driven disk adapted to receive and be secured to a driven shaft, a driving-disk, intermediate connections between said disks allowing a relative rotation but normally preventing a separation, a friction-wheel mounted between and coöperating with said disks, means supported upon the connection between the disks for supporting said friction-wheel upon an external axis at an angle to its own axis

and the axis of the disks, and means for swinging said friction-wheel upon its external axis.

4. In a speed-varying mechanism, a driven disk adapted to receive and be secured to a driven shaft, a driving-disk, intermediate connections between said disks allowing a relative rotation but preventing a separation, a pair of friction-wheels mounted between said disks upon the opposite sides of the axis thereof, means supported upon the connection between said disks for supporting said friction-wheels each upon an external axis at an angle to its own axis and the axis of the disks, and intermediate connections between said friction-wheels for swinging them simultaneously in opposite directions upon their external axes.

5. In a speed-varying mechanism, a driven disk provided with an axial sleeve, a driving-disk revolubly mounted upon said sleeve, a friction-wheel mounted between and coöperating with said disks, means supported upon said sleeve for supporting said friction-wheel upon an external axis at an angle to its own axis and the axis of the disks, and means for swinging said friction-wheel upon its external axis.

6. In speed-varying mechanism, a driven disk provided with an axial sleeve, a driving-disk, revolubly mounted upon said sleeve, a supporting-spider pivotally mounted about said sleeve, a pair of friction-wheels supported upon said spider upon opposite sides of the axis of the disks and each upon an external axis at an angle to its own axis and to the axis of the disks, and intermediate connections between said friction-wheels for swinging them simultaneously in opposite directions upon their external axes.

7. A speed-varying pulley consisting of the following elements; a driven disk provided with an axial sleeve, a driving-disk revolubly mounted upon said sleeve, a pulley carried by said driving-disk, a support pivotally mounted about said sleeve between the disks, a friction-wheel mounted upon said support upon an external axis at an angle to its own axis and to the axis of the disks, and means for swinging said friction-wheel upon its external axis.

8. A speed-varying pulley consisting of the following parts, a driven disk provided with an axial sleeve, a driving-disk revolubly mounted upon said sleeve, a pulley carried by said driving-disk, a supporting-spider pivotally mounted about said sleeve, a pair of friction-wheels mounted upon said spider each upon an external axis at an angle to its own axis and the axis of the disks, and intermediate connections between said friction-wheels for swinging them simultaneously in opposite directions upon their external axes.

9. A speed-varying pulley consisting of the following parts; a driven disk provided with an axial sleeve, a driving-disk revolubly mounted on said sleeve, said sleeve projecting through the driving-disk, a thrust-bearing carried by the projecting end of said sleeve, a spring mounted between said bearing and the driving-disk so as to force the disks together, a spider mounted between said disks and pivoted about said sleeve, a pair of friction-wheels supported upon said spider each upon an external axis at an angle to its own axis and the axis of the disks, and intermediate connections between said friction-wheels for swinging them simultaneously in opposite directions upon their external axes.

10. A self-contained speed-varying pulley consisting of a driving element and a driven element, one supported upon the other and revoluble thereon, intermediate gearing supported upon and between said elements and forming a driving connection therebetween, and means for shifting said intermediate gearing with relation to the driving and driven elements.

11. A self-contained speed-varying pulley, consisting of a driving element and a driven element, one supported upon the other and revolubly mounted thereon and one of said elements being adapted to receive a shaft, an intermediate gearing supported upon and between said elements and forming a driving connection therebetween, and means for shifting said intermediate gearing with relation to the driving and driven elements.

12. The combination with a governor, of a driven disk adapted to receive and be secured to the driving-shaft of said governor, a driving-disk, connections between said disks allowing a relative rotation thereof but normally preventing a separation, a friction-wheel mounted between said disks upon an external axis at an angle to its own axis and the axis of the disks, and means for swinging said friction-wheel about its external axis.

13. The combination with a governor, of a driven disk provided with an external sleeve adapted to receive and be secured to the driving-shaft of said governor, a driving-disk revolubly mounted on said sleeve, a driving-pulley carried by said driving-disk, a spider mounted between said disks and pivoted about said sleeve, a pair of friction-wheels carried by said spider each upon an external axis at an angle to its own axis and the axis of the disks, and means for swinging said friction-wheels simultaneously in opposite directions about their external axes.

14. A speed-varying pulley consisting of the following parts; a driven disk provided with an axial sleeve, a driving-disk revolubly mounted thereon, a spider mounted between said disks and pivoted about said sleeve, two pairs of oppositely-extending arms forming part of said spider, a yoke pivotally mounted between each pair of arms, a friction-wheel carried by each of said yokes in position to coöperate with said disks, and intermediate

connections between said yokes for simultaneously swinging them in opposite directions about their axes.

15. A speed-varying pulley consisting of the following parts, a driven disk provided with an axial sleeve, a driving-disk revolubly mounted thereon, a spring for yieldingly urging said disks together, a spider mounted between said disks and pivoted about said sleeve, two pairs of oppositely-extending arms forming part of said spider, a yoke pivotally mounted between each pair of arms, a friction-wheel carried by each of said yokes in position to coöperate with said disks, and intermediate connections between said yokes for simultaneously swinging them in opposite directions about their axes.

16. The combination with a governor and the driving-shaft thereof, of a self-contained speed-varying pulley consisting of a driving element and a driven element one supported upon the other and revoluble thereon, means carried by the driven element for attachment to said driving-shaft, intermediate gearing supported upon and between said elements and forming a driving connection therebetween, and means for shifting said intermediate gearing with relation to the driving and driven elements.

FRED W. SPACKE.

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