

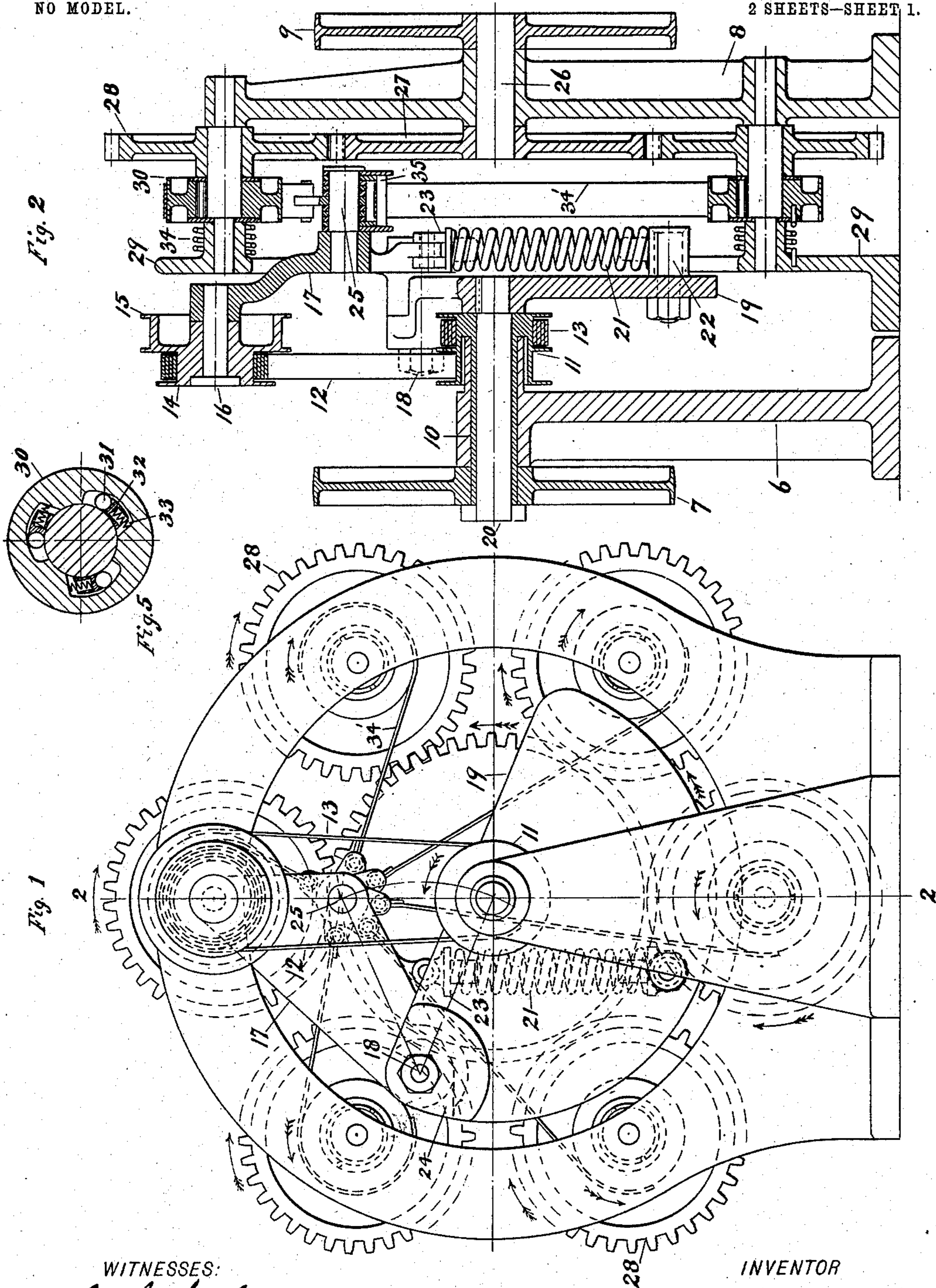
No. 741,904.

PATENTED OCT. 20, 1903.

R. P. B. GREEN.  
VARIABLE SPEED GEAR.  
APPLICATION FILED APR. 13, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES:

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INVENTOR

*Roland Percy Bartlett-Green.*

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2 SHEETS—SHEET 2.

Fig 4

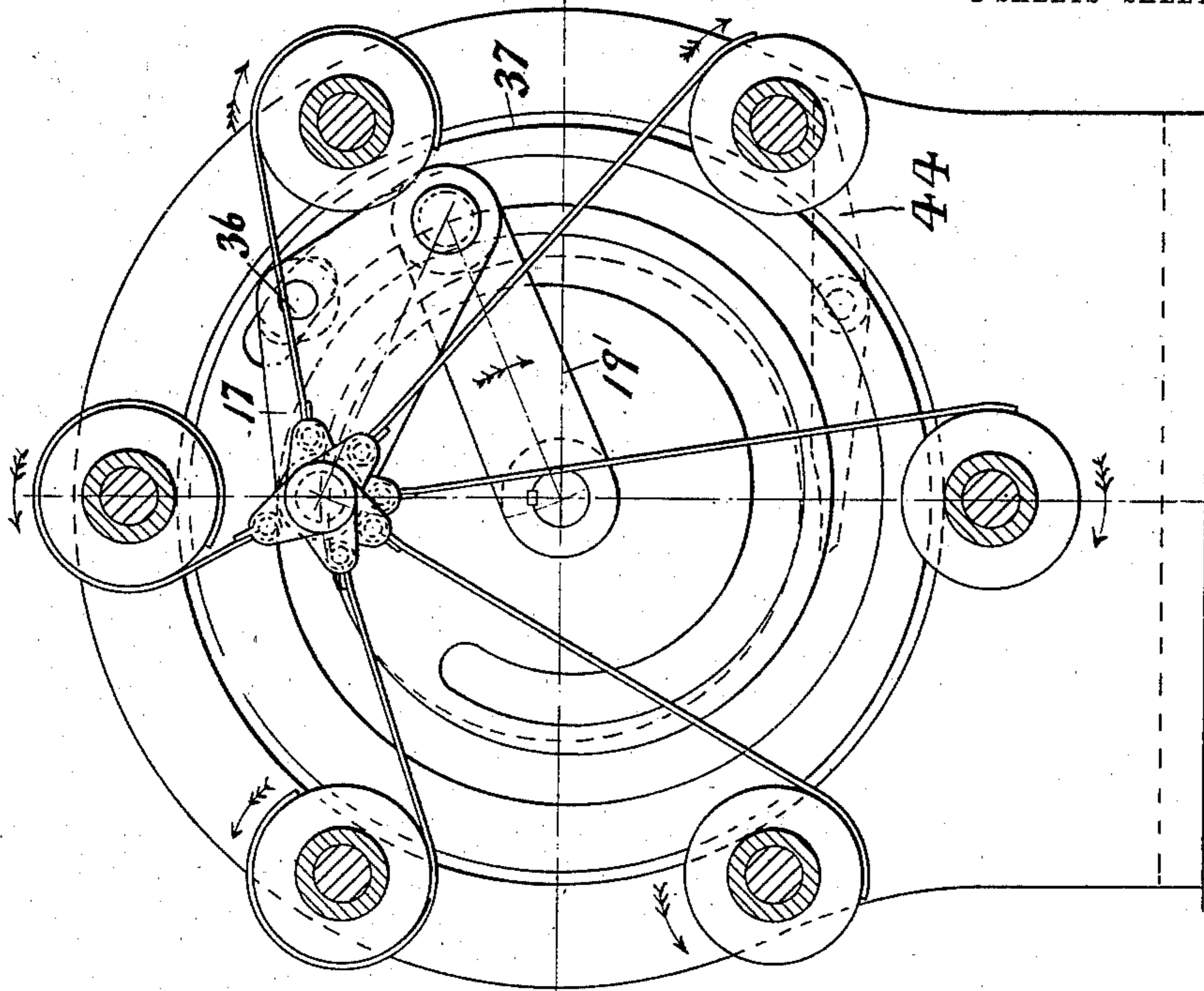
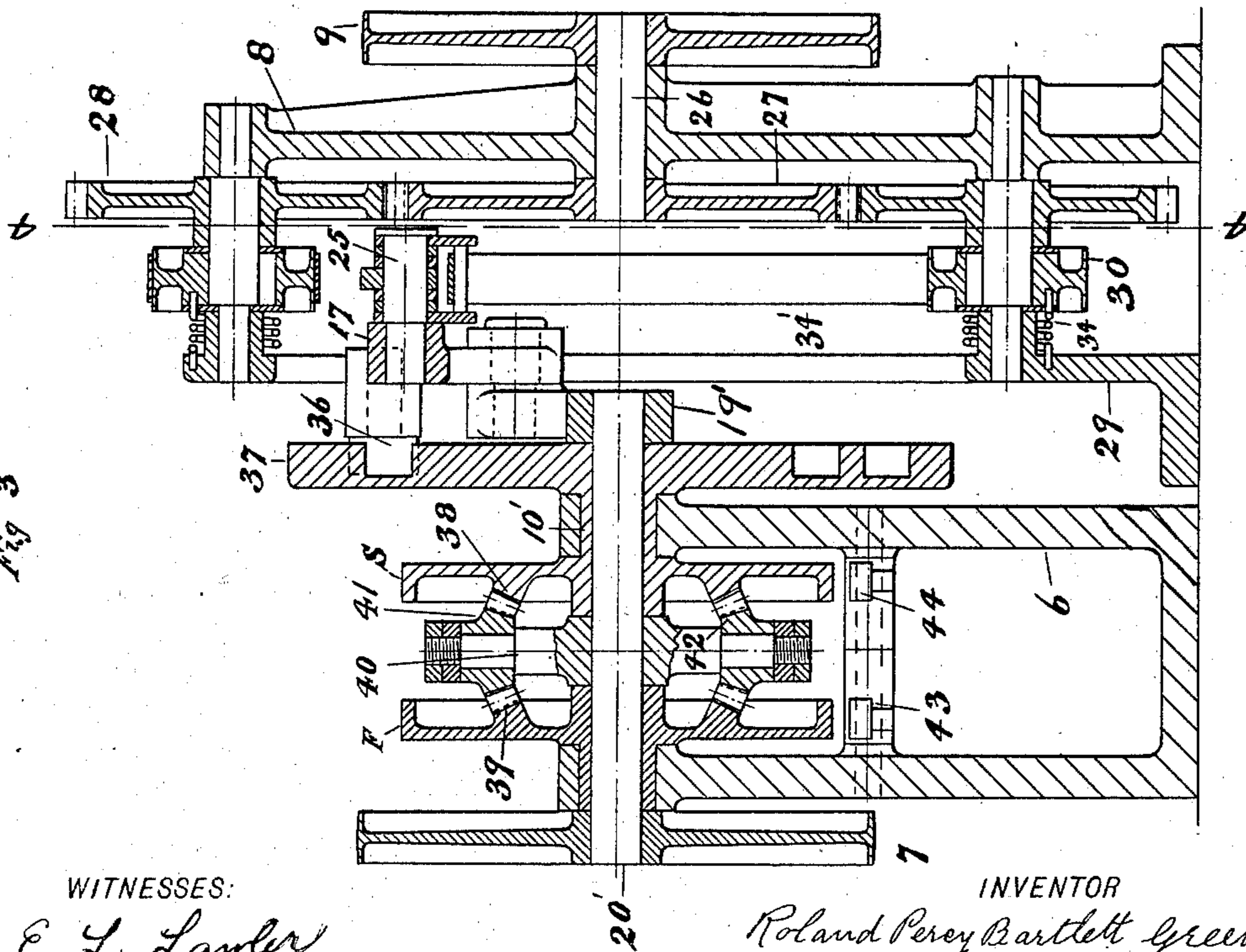


Fig 3



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# UNITED STATES PATENT OFFICE.

ROLAND PERCY BARTLETT GREEN, OF BROOKLYN, NEW YORK.

## VARIABLE-SPEED GEAR.

SPECIFICATION forming part of Letters Patent No. 741,904, dated October 20, 1903.

Application filed April 13, 1903. Serial No. 152,350. (No model.)

*To all whom it may concern:*

Be it known that I, ROLAND PERCY BARTLETT GREEN, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Variable-Speed Gears, of which the following is a specification.

This invention relates to variable-speed gears, and particularly to an automatically-adjusting variable-speed gear in which a voluntary controlling device may be substituted, if desired.

The object of the invention is the production of a gear which may be interposed in any power train where it is desired to transmit rotary motion from a source of constant power to a machine or any form of power utilizer wherein the load is variable and to make said gear readily adjusting so that the speed of the thing driven through the gear will vary with the load, and therefore the power applied will be inversely as the speed or proportional to the load.

With these objects in view the invention consists in the construction, combination, and arrangement of parts hereinafter described and claimed.

In the accompanying drawings, which form a part of this specification, Figure 1 represents the embodiment of my invention in side elevation. Fig. 2 represents a vertical section thereof taken in the plane indicated by the line 2 2. Fig. 3 represents a longitudinal vertical section through the apparatus modified with respect to the speed-controlling part thereof. Fig. 4 represents a vertical section of the apparatus seen in Fig. 3, said section being taken in the plane indicated by the line 4 4. Fig. 5 is a detail, on an enlarged scale, of one of a number of ratchet-wheels.

My present invention puts into more practical, simple, and compact form the essential features of the apparatus patented to me November 5, 1901, under No. 685,834. This new form of variable-speed gear while being adapted for automatic adjustment and preferably so used may be adjusted at will or hand-controlled, if desired, and in either form is especially well adapted for motor-vehicles. In Figs. 1 and 2 the apparatus is illustrated with the automatic controlling feature.

Therein 6 represents that portion of the frame on the side of the apparatus to which power is applied, 7 indicating the power-receiving pulley, which is in reality typical of any wheel or gear clutch or coupling to which the power transmitted through the variable-speed apparatus may be applied. 8 represents that portion of the frame on the opposite side of the apparatus, and 9 the pulley or wheel clutch or coupling of any form, from which power transmitted through the variable-speed gear may be taken. In the frame 6 is journaled a sleeve 10, and it is upon this sleeve that wheel 7 is mounted. On the inner end of this sleeve is a pulley 11, to which are attached belts 12 13. Said belts are fastened at one end to this pulley and at their opposite ends to cone-pulley 14 15, the portion 14 of said pulley being of less diameter than the portion 15. This cone-pulley is mounted upon a stud-shaft 16, carried in the upper end of the hinged arm 17, said arm being hinged by stud 18 to sector 19, which is keyed to the inner end of shaft 20, said shaft being journaled within the sleeve 10, as clearly seen in Fig. 2. A spring, as 21, is mounted upon a lug 22, carried by a stud located in the lower side of sector 19 and confined between this lug and the shoulder 23, which is hinged to the lower edge of arm 17. This spring 21 acts as a compression-spring and serves to force the arm 17 away from the pivotal center of the sector 19, the outward movement of said arm being prevented to a certain extent by the belts 12 13, and the extreme outward position of said arm being determined by the stop 24 upon the sector 19 and against which the end of the arm 17 engages when in its outermost position. It is upon this arm 17 that the crank-pin 25 is mounted and through the movements thereof that the position of the crank-pin with respect to the center of rotation is varied, as will be fully explained farther on. On the shaft 26, which carries pulley 9, is keyed a spur-gear 27, and in said frame 8 at equal intervals are journaled a number of smaller spur-gears, preferably six, as here represented, which are indicated at 28. These smaller pinions mesh with the gear 27. The shafts to which the pinions 28 are keyed while journaled at one end in the frame 8 are also journaled at their opposite ends in a

frame, as 29, and upon these shafts are mounted ratchet-wheels 30, one of which is shown in detail in Fig. 5, wherein the ratchets consist of rollers 31, backed up by blocks 32, which are held against said rollers by springs 33, said springs and blocks serving to immediately seat the ratchet-rollers upon the rotation of the wheels 30. Springs, as 34, serve to reverse the rotation of the ratchet-wheels 30 and are coiled at each operation of the ratchet. To each ratchet-wheel 30 is secured a flexible connection 34', which may be a belt or chain or any other suitable device, the opposite end of which belt is connected to a yoke 35, which is journaled upon the crank-pin 25.

The operation of the device thus constructed is as follows: Upon the application of power to the pulley 7 in a manner such as to rotate the pulley 11 in the direction indicated by the dart in Fig. 1 the belt 12 is wound upon the pulley 11, and as said belt unwinds from pulley 14 the belt 13 becomes wound upon the pulley 15, and as the diameter of pulley 15 is greater than that of pulley 14 the outer end of arm 17 is made to approach the center of rotation of sleeve 10, thereby moving the crank-pin 25 toward said center, and consequently shortening the power-arm of said crank-pin. When the crank-pin has approached the center of rotation to such an extent as to overcome the resistance of the load to be moved by pulley 9, said crank-pin will begin its revolution, being accompanied therein, of course, by the arm 17 and the sector 19. As the crank-pin revolves it unwinds successively from the ratchets 30, the belts 34' thereby giving rotation to the pinions 28 and they in turn to the gear 27 and that to the pulley 9, whereby the load is moved. Each of the belts 34' as the crank-pin passes on the side of the center of rotation opposite to the ratchet carrying said belt is rewound upon the drum of the ratchet by means of the coil-springs 34 and begins again to unwind as the crank-pin passes between said ratchet and the center of rotation. Through this operation of the belts upon the successive ratchets a continuous rotation is given to the pulley 9. When the load is gotten under way or when it requires less power to move it, then the spring 21 will force the arm 17 away from the sector 19, thereby carrying the crank-pin to a greater distance from the center of rotation, whereby its power-arm is lengthened, and, again, as the load increases the belts 12 and 13 will operate as before to shorten the power-arm of the crank-pin to thereby apply the power with greater force to the load. In this manner the mechanism automatically adjusts itself in the application of power to the load.

It is sometimes desirable to control the variable-speed gear at will, and for this purpose a controlling device—for instance, such as seen in Figs. 3 and 4—may be utilized. This voluntary controlling mechanism is simply substituted for the automatic controlling

mechanism, the other parts of the apparatus remaining the same. To this end the upper portion of arm 17, which carries the pulley 14 15, is preferably omitted and a pin or stud 36 is provided upon said arm. This stud engages and travels in a convolute channel formed in the face of a disk 37, which is mounted upon a sleeve 10', journaled in the frame 6', a shaft-arm 20', carrying the arm 19', (substituted for the sector 19,) being journaled within said sleeve 10'. This disk, with its convolute groove, is, in effect, a snail-cam, the rotation of which will move the stud 36, and therefore the crank-pin 25, to or from the center of rotation. Any suitable means may be employed for changing the radial position of the cam 37. Such a device may consist of a bevel-gear 38, mounted on the sleeve 10' with the snail-cam 37, and a similar bevel-gear 39 idle upon the shaft 20', and an arm 40, keyed to the shaft 20' and bearing at its outer ends pinions 41 and 42 in mesh with gears 38 and 39. There may be upon gears 38 39 brake-surfaces S and F, respectively, to which any suitable form of brake—such, for instance, as that illustrated at 43 44—may be applied when shaft 20' is revolving. By applying the brake to surface S the crank-pin may be made to approach the center of rotation, thereby reducing the speed of the load, and by applying the brake to the surface F said pin may be made to recede from the center of rotation, thereby increasing the speed of the load.

Many changes in the formation and combination of several features of my invention may be made without departing from the spirit thereof, and various forms of voluntary control may be adapted thereto and still be within the scope of my invention.

What I claim as my invention is—

1. In a variable-speed gear the combination with a revoluble crank-pin, of means for varying the eccentricity thereof, a load-shaft, a series of ratchets geared to said shaft and flexible connections from said ratchets to the crank-pin.

2. In a variable-speed gear, the combination with a driven revoluble crank-pin, of a spring for forcing it from the center of revolution, means for automatically forcing it toward said center and gearing for transmitting power from said pin.

3. In a variable-speed gear, the combination with a driving-shaft, of a pulley thereon, a support, such as sector 19, journaled at the axis of said pulley, an arm hinged to said support, a crank-pin carried by said arm, means for swinging said arm and thereby changing the eccentricity of the crank-pin, and gearing for transmitting power from said crank-pin.

4. In a variable-speed gear, the combination with a driving-shaft, of a pulley thereon, a support, such as sector 19, journaled at the axis of said pulley, an arm hinged to said support, a crank-pin carried by said arm, a spring

for forcing the arm away from said support, a cone-pulley mounted on said arm, flexible connectors between said pulleys, and means for taking power from said crank-pin.

5 5. In a variable-speed gear, the combination with a driving-shaft, of a pulley thereon, a support, such as sector 19, journaled at the axis of said pulley, an arm hinged to said support, a crank-pin carried by said arm, means  
10 for swinging said arm and thereby changing the eccentricity of the crank-pin, ratchet-wheels geared to the load-shaft, and flexible connectors between the crank-pin and the ratchet-wheels.

15 6. The combination of a load-shaft, a gear thereon, a series of spring-retained ratchets, intermediate devices transmitting power from said ratchets successively to said gear, a driven crank-pin and flexible connectors between  
20 the crank-pin and the several ratchets.

7. In a variable-speed gear, the combination with the driving-sleeve, of the stud-shaft within said sleeve, the sector on said shaft, the arm hinged to said sector, the differential  
25 gearing connecting the outer end of said arm to the driving-sleeve, the crank-pin carried

by said arm, and means for taking power from the crank-pin whatever the length of its power-arm.

8. The combination with the frames 8 and 30 29, of the series of spring-ratchets journaled therein, the load-pulley, gearing connecting said ratchets thereto, the driven crank-pin, means for changing the eccentricity thereof and driving connection between the crank-  
35 pin and said ratchets.

9. The combination with the frames 8 and 29, of a series of spring-ratchets journaled therein, the load-pulley, gearing connecting said ratchets thereto, the driven crank-pin, a  
40 spring for moving said pin away from the axis of the driving-shaft, and differential gearing connected to said pin for reacting against said spring as the load varies.

Signed at New York city, in the county of 45 New York and State of New York, this 28th day of March, A. D. 1903.

ROLAND PERCY BARTLETT GREEN.

Witnesses:

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C. T. TISCHNER, Jr.