No. 685,834. Patented Nov. 5, 1901.

R. P. B. GREEN.

VARIABLE SPEED GEAR.

(Application filed Mar. 26, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2

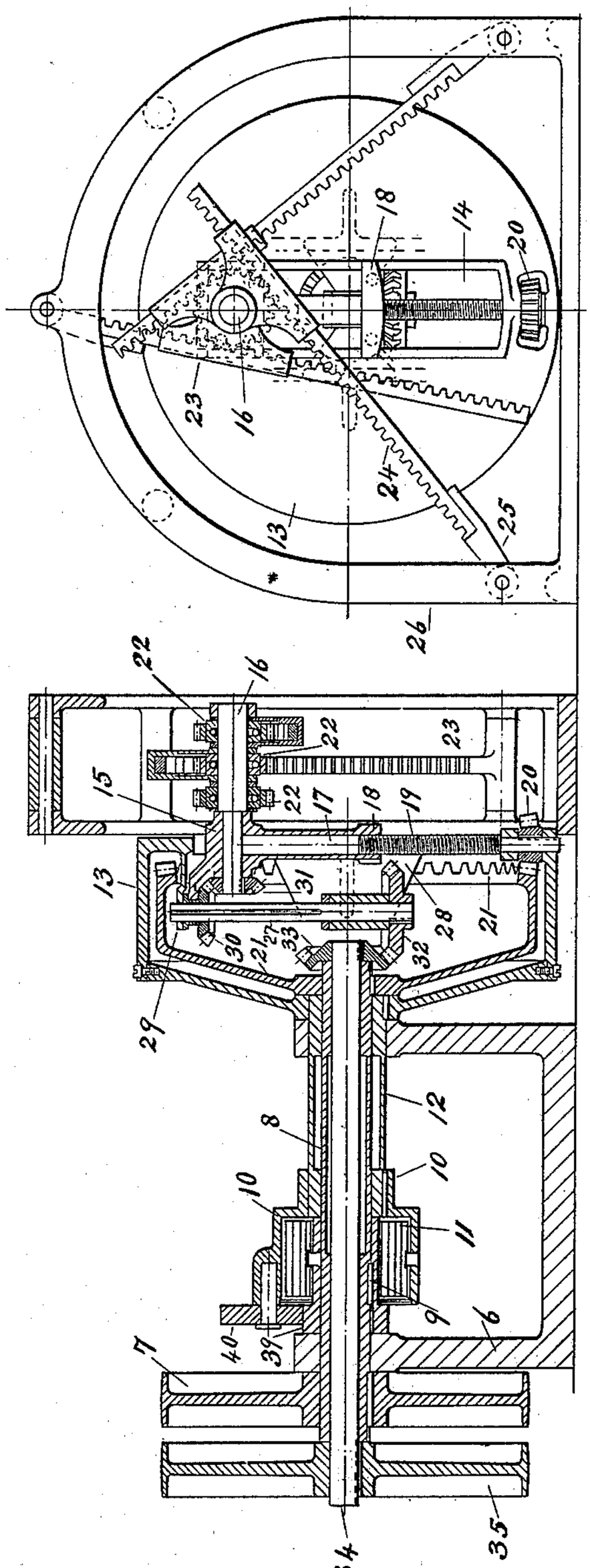

Fig. 1

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Fig. 3

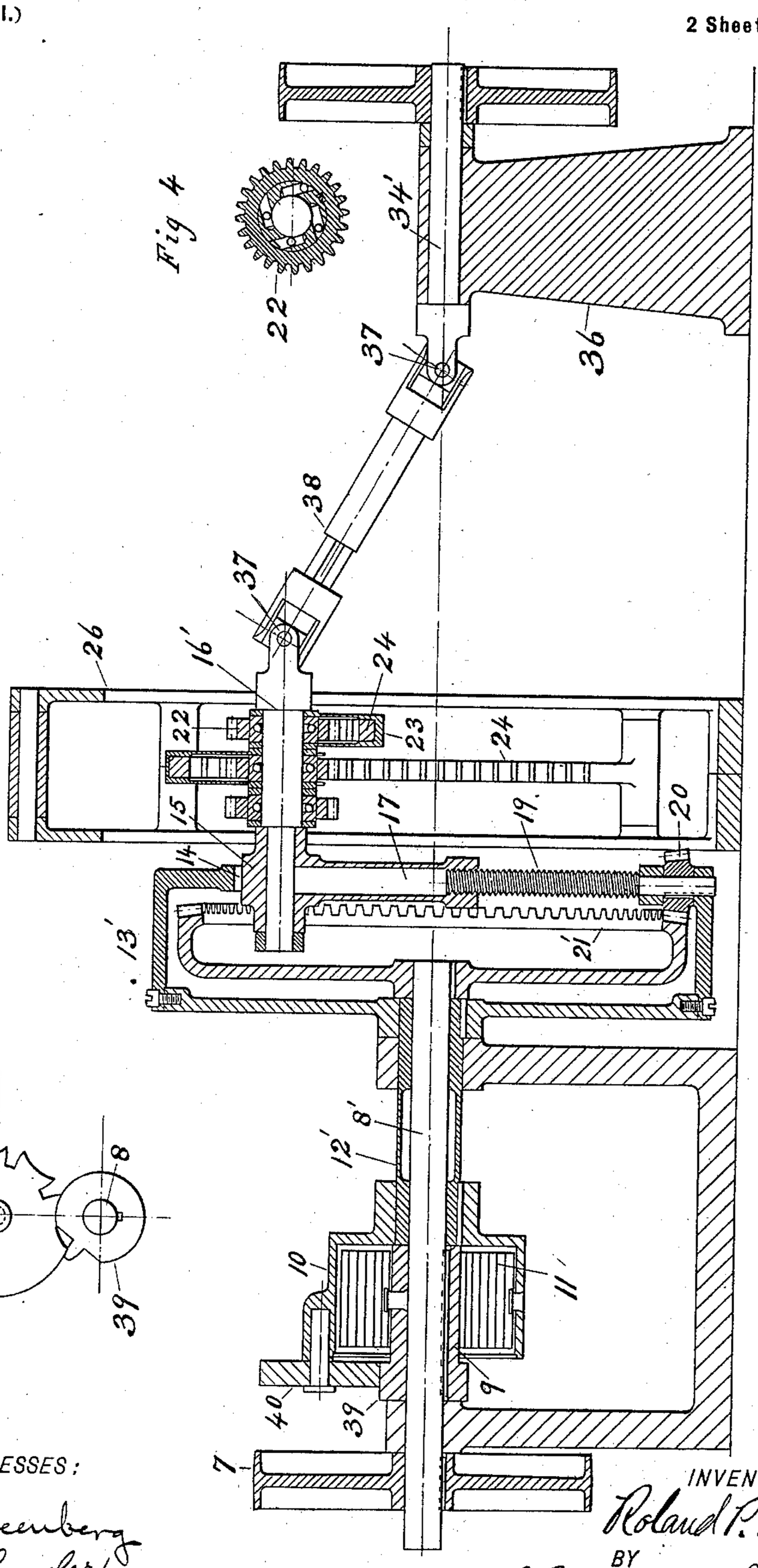

Fig. 4

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VARIABLE-SPEED GEAR.

SPECIFICATION forming part of Letters Patent No. 685,834, dated November 5, 1901.

Application filed March 26, 1901. Serial No. 52,948. (No model.)

To all whom it may concern:

Be it known that I, ROLAND P. B. GREEN, a subject of the King of England, 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 Gear, of which the following is a specification.

This invention relates to variable-speed gears, and particularly to an automatically-adjusting variable-speed gear.

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 automatically 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.

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 in vertical longitudinal section a variable-speed gear embodying my invention. Fig. 2 is an end elevation thereof. Fig. 3 is a vertical longitudinal section through a variable-speed gear involving the principal features of my invention, but showing the power taken therefrom in a different manner than that illustrated in Fig. 1. Fig. 4 is a transverse section through one of the ratchet-pinions forming part of my mechanism, and Fig. 5 is an end view of the winding stop seen in Figs. 1 and 3.

The essential features of my invention are a driving-shaft in two parts resiliently joined, so that the speed of one part may vary with respect to the other; a crank-pin carried by one part of the driving-shaft; adjusting mechanism for varying the eccentricity of the crank-pin; a connection between the other part of the driving-shaft and said adjusting mechanism; means for rotating the crank-pin as it revolves, and means for taking power from the rotating revolving crank-pin.

In Figs. 1 and 2, 6 represents a bracket or frame or, in fact, any suitable means by which the shafts of the variable-speed gear may be supported or located. 7 indicates the pulley or wheel to which the driving power is applied. This obviously may be of any desired form or construction—a sprocket-wheel, band-wheel, or any other sort of gear-wheel or coupling.

The two-part driving-shaft above referred to is shown in Fig. 1 as consisting of the sleeve 8, to which is keyed the inner member 9 of a spring-barrel 10, the coiled spring being indicated in said barrel, as at 11. The outer member 10 of the spring-barrel is keyed to the other part of the driving-shaft, which is here represented as the sleeve 12, journaled upon the sleeve 8 and in frame 6. To the sleeve 12 is keyed a drum, as 13, in the head of which is a radial slot 14, wherein is guided the bearing 15 for the rotary crank-pin 16. From the bearing 15 there extends longitudinally of the slot 14 a tubular projection 17, which is guided at its lower end in the slot by the cross-head 18. This tubular projection is interiorly screw-threaded, and into it is fitted a screw, as 19, the lower end of which is journaled in the head 13 at the end of the slot 14, and upon the journaled end of said screw is keyed a pinion 20 between the journaled bearings of said screw, whereby it is held from longitudinal movement. Meshing with this pinion 20 is a bevel-gear 21, which is keyed to the end of part 8 of the driving-shaft. The crank-pin 16 as it revolves with the drum 13 may be given a rotary motion on its own axis in any suitable manner. This rotation may be effected by means of racks and pinions, and I have chosen such mechanism for the rotation thereof. Preferably three ratchet-pinions 22 are mounted upon the crank-pin. Each of these pinions has a suitable housing 23, journaled upon the crank-pin, and through each housing extends a rack 24, retained by the housing in mesh with its respective pinion and hinged at its outer end to a suitable fixed support. The racks are here shown as provided with a transverse head 25, journaled in bearings in the frame 26 at points one hundred and twenty degrees apart. The ratchets for the pinions 22 may be of any desired pattern, but are preferably of the ball sort, as indicated in detail in Fig. 4.

Power may be taken from the crank-pin 16 at either end thereof, as may be desired. By taking it from the inner end thereof, as illustrated in Figs. 1 and 2, a more compact mechanism is formed. This may be done by journaling within the drum 13, at the rear of the slot 14, a shaft, as 27, in suitable bearings formed upon the inner face of the head of said drum at the sides of the slot 14, as indicated at 28, and at the end of said slot, as indicated at 29. Feathered upon this shaft 27 is a miter-pinion 30, in mesh with miter-pinion 31, mounted on the inner end of the crank-pin. Upon the lower end of shaft 27 is mounted a miter-pinion 32, in mesh with a like pinion 33, keyed to the driven shaft 34, from which power may be taken in any suitable way, as by means of the pulley 35.

Power being applied to the pulley 7 of the mechanism just described, part 8 of the driving-shaft will be first started into rotation. This, through the bevel-gear 21 and pinion 20, will rotate the screw 19 and draw the crank-pin toward the center of the drum 13. Then as soon as sufficient tension has been applied to spring 11 to overcome resistance of shaft 34 the other part 12 of the driving-shaft will begin to rotate, thereby rotating drum 13 and carrying with it the crank-pin 16. As the crank-pin revolves about the center of the drum the ratchet-pinions 22 roll over racks 24, thereby giving rotary motion to the crank-pin, which is transmitted through gears 31 and 30 to shaft 27 and thence through miter-gears 32 and 33 and shaft 34 to the pulley 35. When the load or pulley 35 is under way or reduced, spring 11 will gradually uncoil, thereby reversing the rotation of screw 19 and setting the crank-pin at a greater distance from the center of the drum, where obviously it may receive greater speed of rotation from the engagement of the pinions thereon with racks 24. Then if the load on the driven shaft increases the spring 11 will be again wound up to a greater or less extent in proportion to the load, and the crank-pin accordingly advanced nearer to the center of the drum 13, in which position it will rotate more slowly, but with greater power.

In Fig. 3 the essential features above described are the same, though the mechanism as a whole becomes somewhat simplified by taking the power from the outer end of the crank-pin. In this modification the driving-shaft is of two parts, 8′ and 12′, respectively, which are joined by the coil-spring 11′, the bevel-gear 21′ being keyed to the part 12′. The bearing 15′ for the crank-pin 16′ is guided, as before, in the slot 14 in the head of the drum, and this bearing is provided with the tubular extension 17, in which the screw 19 operates, as before explained, and has a pinion 20 upon its journaled end in mesh with the bevel-gear 21. The ratchet-pinions and racks are identical with those in Figs. 1 and 2. The driven shaft 34′ is mounted concentrically with the driving-shaft 8′ in a suitable bearing 36, the motion being conveyed thereto through the gear consisting of the universal joints 37 and the telescoping shaft 38.

The operation of the mechanism just described is substantially the same as that shown in Figs. 1 and 2.

It is preferable to provide the spring connection between the two parts of the driving-shaft with a winding stop. This may be of any old and well-known form and is here shown as consisting of two members 39 and 40, connected, respectively, to the inner and outer members of the spring-barrel, the face view thereof being represented in Fig. 5. Obviously in place of this stop the limiting stops to the radial movement of the bearing 15 for the crank-pin might be employed, such as the upper and lower ends of the slot 14. It is preferable, however, to apply the stop as herein shown.

Other changes in form and arrangement of parts aside from those shown and described may be made without departing from the spirit of the invention.

I claim as my invention—

1. In a variable-speed gear, the combination of a driving-shaft, a driven shaft, a rotary revoluble crank-pin, and gearing for connecting said crank-pin to both of said shafts for transmitting rotary motion from one to the other.

2. In a variable-speed gear, the combination of a driving-shaft carrying a crank-pin, a driven shaft, gearing connecting the crank-pin to the driven shaft, and means for rotating said crank-pin as it is revolved by the driving-shaft.

3. In a variable-speed gear, the combination with the driving-shaft, of a crank-pin mounted thereon in a manner to be movable radially, the driven shaft connected to the crank-pin, mechanism located in the path of the crank-pin whereby the crank-pin is rotated as it revolves and means for automatically varying the eccentricity of the crank-pin.

4. In a variable-speed gear, the combination with the driving-shaft, of a crank-pin mounted thereon in a manner to be movable radially, the driven shaft connected to the crank-pin, a series of ratchet-pinions on the crank-pin and hinged racks meshing therewith to rotate the crank-pin as it is revolved by the driving-shaft.

5. In a variable-speed gear, the combination with the driving-shaft, of a crank-pin mounted thereon in a manner to be movable radially, the driven shaft connected to the crank-pin, rack-and-pinion gearing for rotating the crank-pin as it is revolved by the driving-shaft, and automatic adjusting mechanism for varying the eccentricity of the crank-pin.

6. A variable-speed gear consisting of a two-part driving-shaft, a resilient connection between said parts whereby the speed of one part may vary from the other, a radially-adjustable crank-pin carried by one of said parts,

means for rotating said crank-pin as it is revolved, gearing operated by the other part of the driving-shaft for adjusting the crank-pin, a driven shaft concentrically mounted with respect to the driving-shaft, and gearing connecting the driven shaft with the rotary crank-pin.

7. In a variable-speed gear, the combination with a revoluble rotary crank-pin of means for taking power therefrom, and a series of pinions and hinged racks for rotating said crank-pin.

8. The combination with a revolving crank-pin, of ratchet-pinions thereon, hinged racks meshing with said pinions to rotate the crank-pin as it revolves, means for varying the eccentricity of the crank-pin, and a driven shaft connected to the crank-pin.

Signed at the city of New York, in the county of Kings and State of New York, this 23d day of March, A. D. 1901.

ROLAND P. B. GREEN.

Witnesses:
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ETHEL L. LAWLER.