No. 846,620. PATENTED MAR. 12, 1907.

P. RENAUX.

CHANGE SPEED AND REVERSING MECHANISM.

APPLICATION FILED DEC. 4, 1906.

2 SHEETS—SHEET 1.

FIG. 1

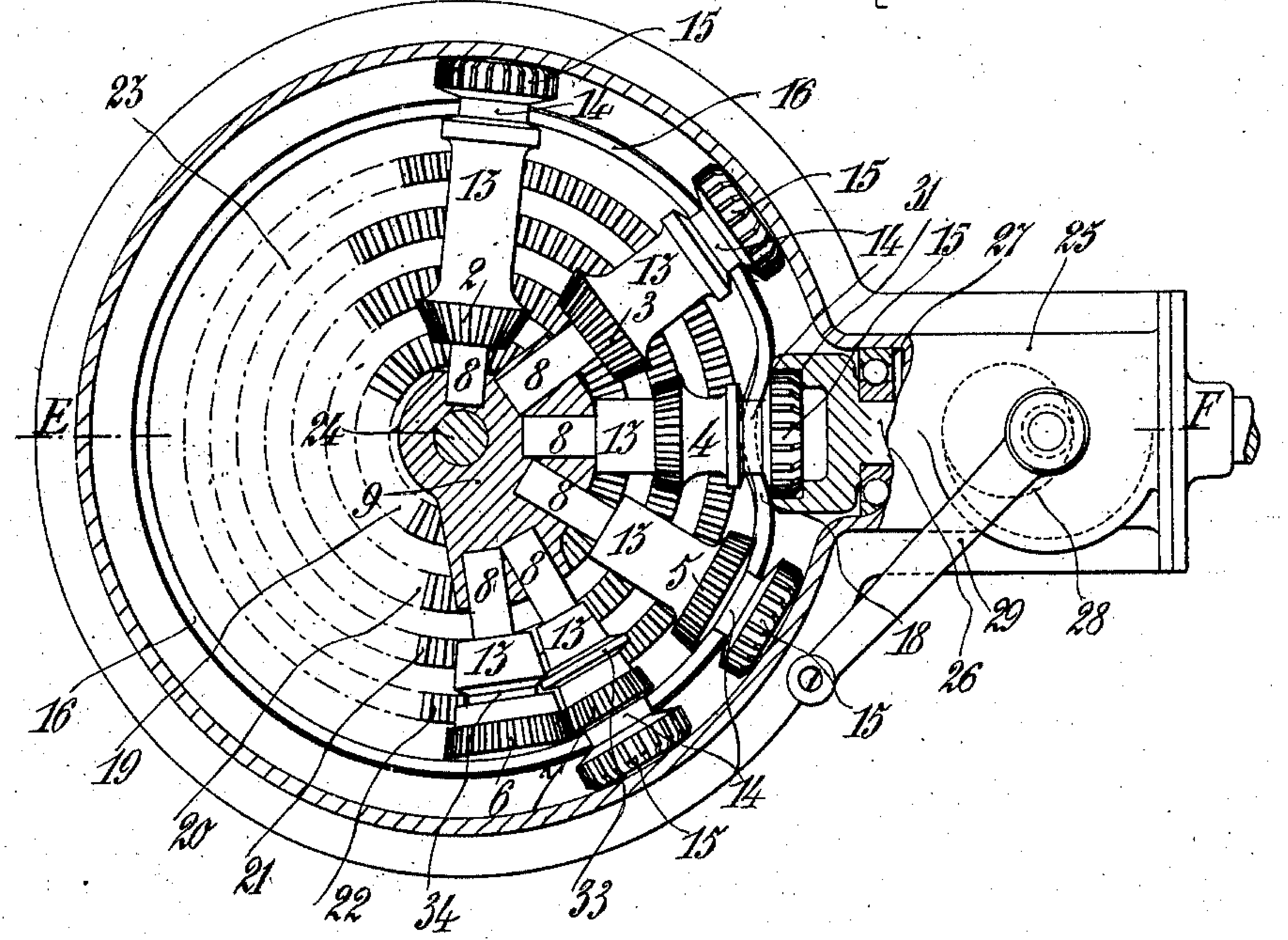
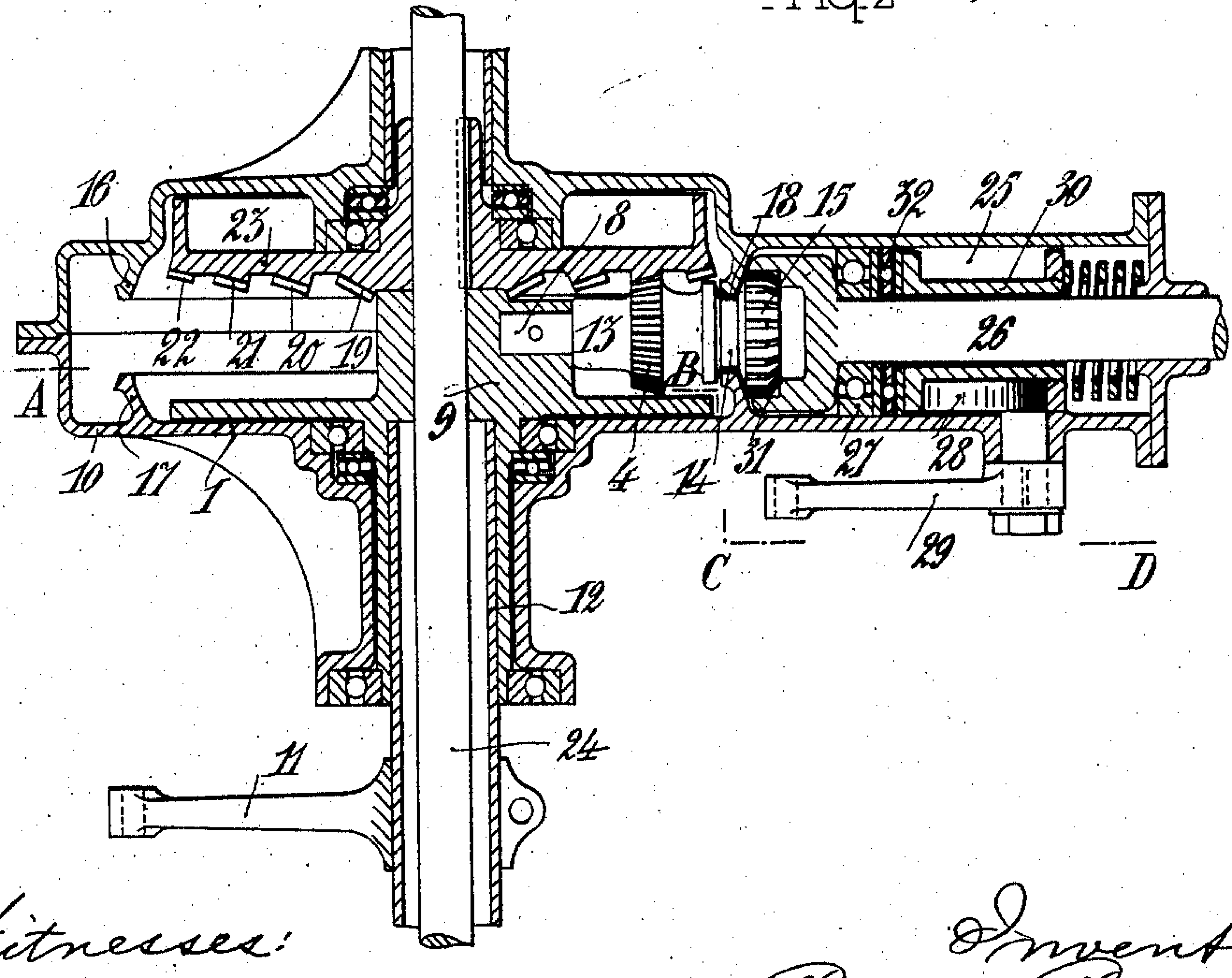


FIG. 2



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2 SHEETS—SHEET 2.

FIG. 3.

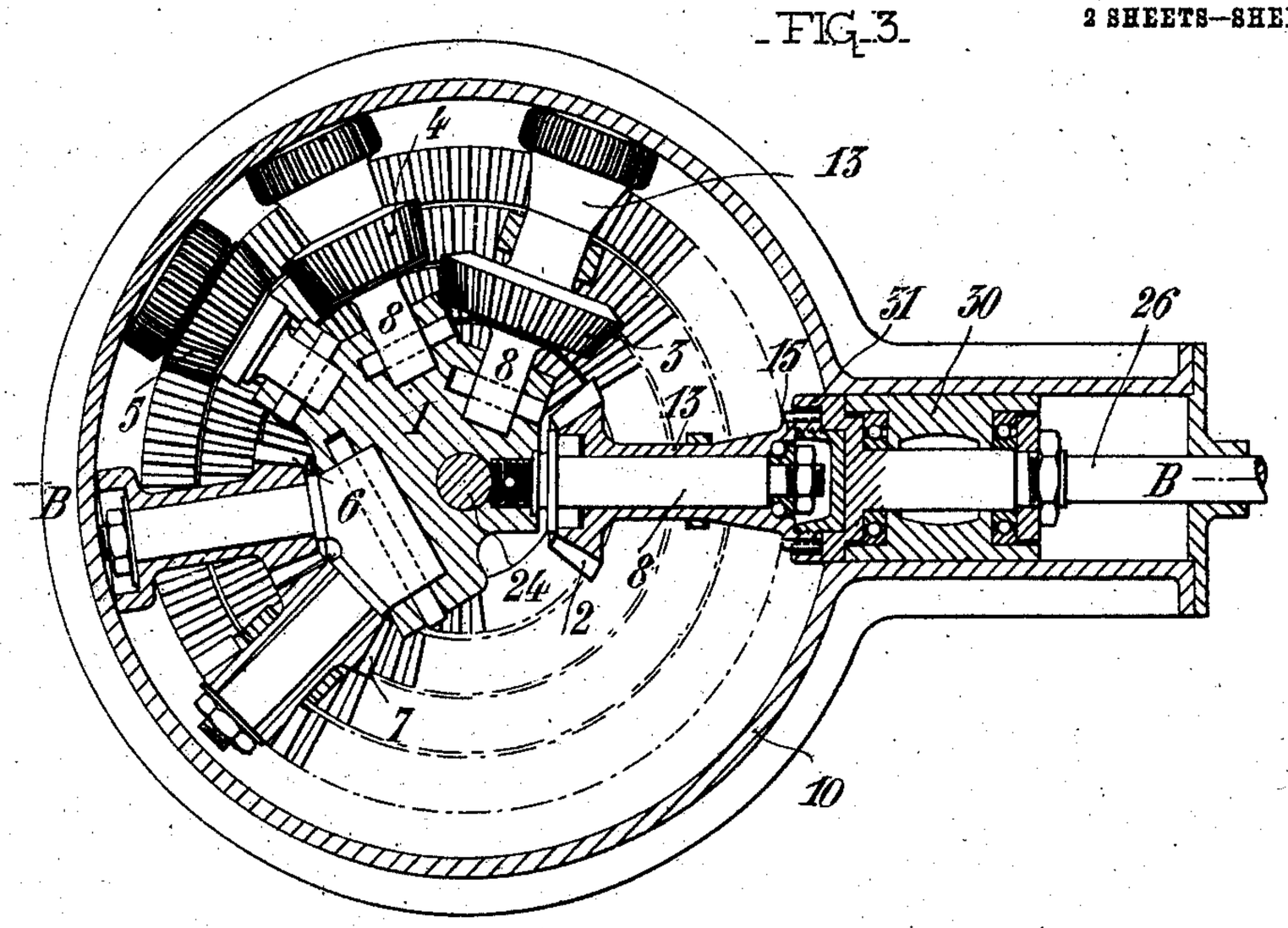
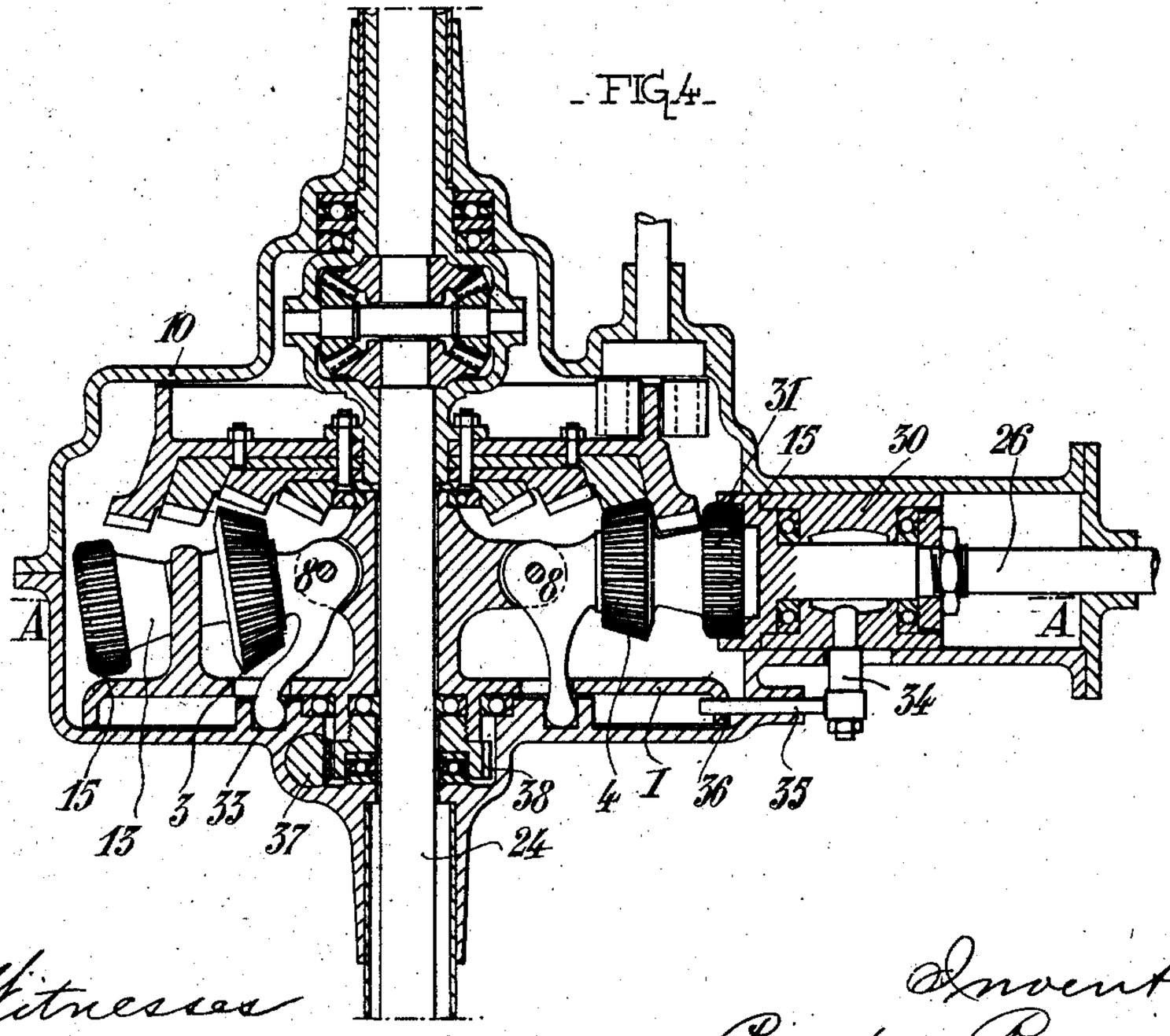


FIG. 4.



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UNITED STATES PATENT OFFICE.

PROSPER RENAUX, OF PARIS, FRANCE.

CHANGE-SPEED AND REVERSING MECHANISM.

No 846,620. Specification of Letters Patent. Patented March 12, 1907.

Application filed December 4, 1906. Serial No. 346,314.

To all whom it may concern:

Be it known that I, PROSPER RENAUX, a citizen of the Republic of France, residing at 3 Rue du Repos, Paris, France, have invented certain new and useful Improvements in or Relating to Change-Speed and Reversing Mechanism, of which the following is a specification.

This invention relates to a revolving mechanism for changing the speed and reversing adapted for general application, but intended more particularly for use in motor-cars.

In mechanism according to the present invention the movement of the driving-shaft is transmitted to the driven shaft by means of pinions which can be separately brought into direct engagement with the driving-shaft and mesh with one of the corresponding toothed gears of different diameters mounted on the shaft to be driven, so that the revolving mechanism, according to this invention, enables the movement to be transmitted by direct engagement at any speed.

In the accompanying drawings, given by way of example, Figure 1 is an elevation of a revolving gear in vertical section on the line A B C D of Fig. 2, which latter is a horizontal section on the line E F of Fig. 1. Figs. 3 and 4 illustrate a modified construction of the device shown in Figs. 1 and 2, Fig. 3 being an elevation and vertical section on the line A A of Fig. 4, which itself is a horizontal section on the line B B of Fig. 3.

In the construction shown in Figs. 1 and 2, the mechanism comprises a disk 1, on one of the faces of which are arranged a desired number of pinions 2 3 4 5 6 7, capable of longitudinally sliding on corresponding pins or spindles 8, secured radially in a central boss 9, with which the said disk 1 is provided. The disk 1 is mounted in a fixed gear-case 10, so that it can be rotated freely therein by means of any suitable mechanism acting from the outside—for instance, by means of a lever 11, secured to a tube 12, forming an outside extension of the central boss 9 of the disk 1. Each pinion is cut on a sleeve 13, which is, moreover, provided with a groove 14 and with straight teeth 15 or with clutching members cut in the said sleeve. The groove 14 is intended to coöperate with two circular ribs or rails 16 17, secured to corresponding portions of the gear-box 10. Each of the ribs 16 17 is provided with a curved reëntering portion 18, arranged in accordance with a similar curved portion 18 of the other rib and forming a sort of cam, which forces the pinions to move toward the center when, owing to the rotation given to the disk 1, the said pinions pass in front of the said reëntering portions. In the movement which is thus given to it each pinion 2, 3, 4, 5, or 6 comes into engagement with the corresponding teeth of a series of bevel-gears of different diameters 19 20 21 22, secured to or cut in a disk 23, keyed to the driven shaft 24, which at the same time constitutes the axis of rotation for the disk 1. The curved portions 18 of the two ribs 16 17 are arranged opposite a recess 25, formed by two corresponding parts of the gear-case 10, in which recess rotates one of the ends of the driving-shaft 26. The ball-bearing 27, which carries the said driving-shaft, is arranged so that it can slide under the action of a cam or of an eccentric 28, the pin of which is supported in the corresponding wall of the recess 25 and which can be actuated from the outside by means of a lever 29 operated in any desired manner. The end of the driving-shaft 26, arranged in position to correspond to the curved portions 18 of the ribs 16 17, is provided with a socket, in the end of which are cut teeth 31 or clutching members intended to coöperate with the teeth 15 on the end of the sleeve 13 of each pinion. A ball bearing or stop 32 is arranged between a sleeve 30 and a bearing 27 for the purpose of taking up end thrust of the spindle 26 during the transmission of movement. The lever 29 of the eccentric 28 and the lever 11 of the disk 1 can be operated by the same mechanism, so as to act simultaneously for effecting the different movements for changing speed or reversing. In this construction the reversing is effected by the combination of the two pinions 6 and 7 of different diameters engaging with each other and guided one by the other in their radial movements by means of a collar 33 on one of them engaging with a groove 34 of the other. The pinion 7 of small diameter does not engage with the corresponding teeth 22 when the other pinion 6 is acted upon by the driving-shaft 26.

The working is as follows: In order to pass from one speed to another, the controlling parts are arranged in such manner as to act first on the sleeve 30 in order to enable the spindle 26 to slide back and the clutching members 31 to be disengaged from the clutching members 15 of the pinion with which it was in engagement and then to act on the

disk 1 in such manner as to turn it through a desired angle to bring the pinion of the desired speed opposite the driving-shaft 26. The latter is then moved back so as to place it in direct engagement with the said pinion.

The clutching members 31 instead of being arranged direct on the spindle 26 may be secured to the sleeve 30 itself, which would then be mounted so as to participate in the rotation of the said driving-shaft while still being able to slide longitudinally, while the driving-shaft would be arranged so as to rotate without any longitudinal movement. It is, however, preferable to adopt the arrangement shown for the purpose of being able to combine the longitudinal movement of the shaft 26 with the clutch-cone of the engine.

It is not absolutely indispensable to arrange the bevel-pinions 2, 3, 4, 5, 6, and 7 on the same side of the disk 23 as shown in the drawings, for they could also be arranged on the two opposite faces of the said disk. The driving movement at one of the two series of pinions or even at both would then be obtained by means of straight teeth arranged outside the driving-shaft and coming into engagement with corresponding straight teeth of the pinion to be driven.

This revolving change-speed gear may be applied either direct to a differential driving-axle or to an intermediate differential spindle or at some intermediate point of the transmission of movement to the wheels of a self-propelled vehicle.

In the construction shown in Figs. 3 and 4 the sleeves 13, on which are mounted or to which are secured the pinions 2, 3, 4, 5, 6, and 7, rotate without any longitudinal movement on spindles or pins 8, hinged at one of their ends to a central nut constituting the hub of the rotary disk 1, mounted loose on the spindle 24 to be driven. The oscillation of the spindles 8 for disengaging the pinions from their corresponding teeth is effected by means of a grooved cam 33, arranged at the back of the disk 1 on the wall of the gear-case, with which groove engages the end of a right-angle arm with which each spindle 8 is respectively provided and which travels freely in the grooves in the disk 1. The grooved arrangement of the cam 33 enables the spindles 8 to be oscillated in both directions without it being necessary to have recourse to return-springs; but it is obvious that other cam devices acting in the direction of the engagement of the pinions in combination with return-springs for disengaging the said pinions might be used. In this construction the disk 1 is rendered fixed at different positions of engagement of the pinions by means of a locking device working in combination with the bearing-sleeve 30, in which the driving-shaft 26 is supported. This device consists of a finger 34, secured to the sleeve 30 and passing through a groove of the tubular boss of the gear-case 10 and carrying another pin 35, sliding in a socket of the said gear-case, terminating at the back of the disk 1, which is provided with a circular flange 36, with notches or holes with which the finger 35 engages to secure the said disk in the position of engagement of the clutching members 15 and 31. In this construction of the mechanism the rotation of the disk 1 is effected from the outside by means of a tooth-rack 37, acting on a pinion 38, secured to the central back portion of the said disk 1.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a speed-gear of the kind described and in combination, a driven shaft, a rotatable member loose on said shaft, a series of circular toothed gears fixed to said shaft, a corresponding series of pinions normally out of mesh with said gears and carried on the said rotatable member on the shaft, a clutch member connected to each pinion, a driving-shaft, a clutch member on one end of said shaft, means to place any desired pinion in mesh with its corresponding circular gear and at the same time opposite to the driving-shaft clutch member, and means to place said clutch member in and out of engagement with the clutch member of the pinion so placed.

2. In a speed-gear of the kind described and in combination, a driven shaft, a disk fixed on said shaft and provided on one face with a series of concentric bevel-toothed rings, a rotatable member loose on said shaft, means to rotate said member independent of said shaft, a series of radial spindles secured in said rotatable member, a sleeve rotatable and longitudinally movable on each spindle, said sleeve having a bevel-wheel on one end a clutch member on the other end and being provided with a groove, a stationary cam-ring, engaging each of said spindle-grooves, adapted to maintain each bevel-pinion out of mesh with its corresponding circular gear, and having a depression at one point adapted to move the sleeve on the spindle and bring any one desired pinion in mesh with one of said gear, a driving-shaft, a clutch member on the end of said shaft, said member being arranged opposite the depression in said cam-ring, and means to bring said clutch member in and out of connection with the clutch member of a bevel-pinion when said bevel-pinion is in mesh with its ring-gear.

3. In a speed-gear of the kind described and in combination, a driven shaft, a disk fixed on said shaft, and provided on one face with a series of concentric bevel-toothed rings, a rotatable member loose on said shaft, means to rotate said member independent of said shaft, a series of spindles radially secured in said rotatable member, a sleeve rotatable and longitudinal y movable on each spindle, said sleeve having a bevel-wheel on

one end a clutch member on the other end and being provided with a groove, a radial spindle also carried in said rotatable member and having a sleeve rotatable and longitudinally movable thereon, a bevel-wheel on said sleeve and a groove on said sleeve, a second spindle adjacent to the last-mentioned spindle, a sleeve rotatable and longitudinally movable thereon, a collar on said sleeve adapted to engage with the groove in the adjacent sleeve, a small pinion on said sleeve in mesh with the pinion on said adjacent sleeve, a clutch member on the outer end of said sleeve and a guiding-groove on said sleeve, a stationary cam-ring engaging each of said spindle-grooves adapted to maintain each bevel-pinion out of mesh with its corresponding circular gear and having a depression at one point adapted to move the sleeve on the spindle and bring any one desired pinion in mesh with one of said bevel-toothed ring, a driving-shaft a clutch member on the end of said shaft, said member being arranged opposite the depression in said cam-ring, and means to bring said clutch member in and out of connection with the clutch member corresponding to a bevel-pinion when said bevel-pinion is in mesh with its ring-gear.

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

PROSPER RENAUX.

Witnesses:

HANSON C. COXE,

GEORGE BONNEIUL.