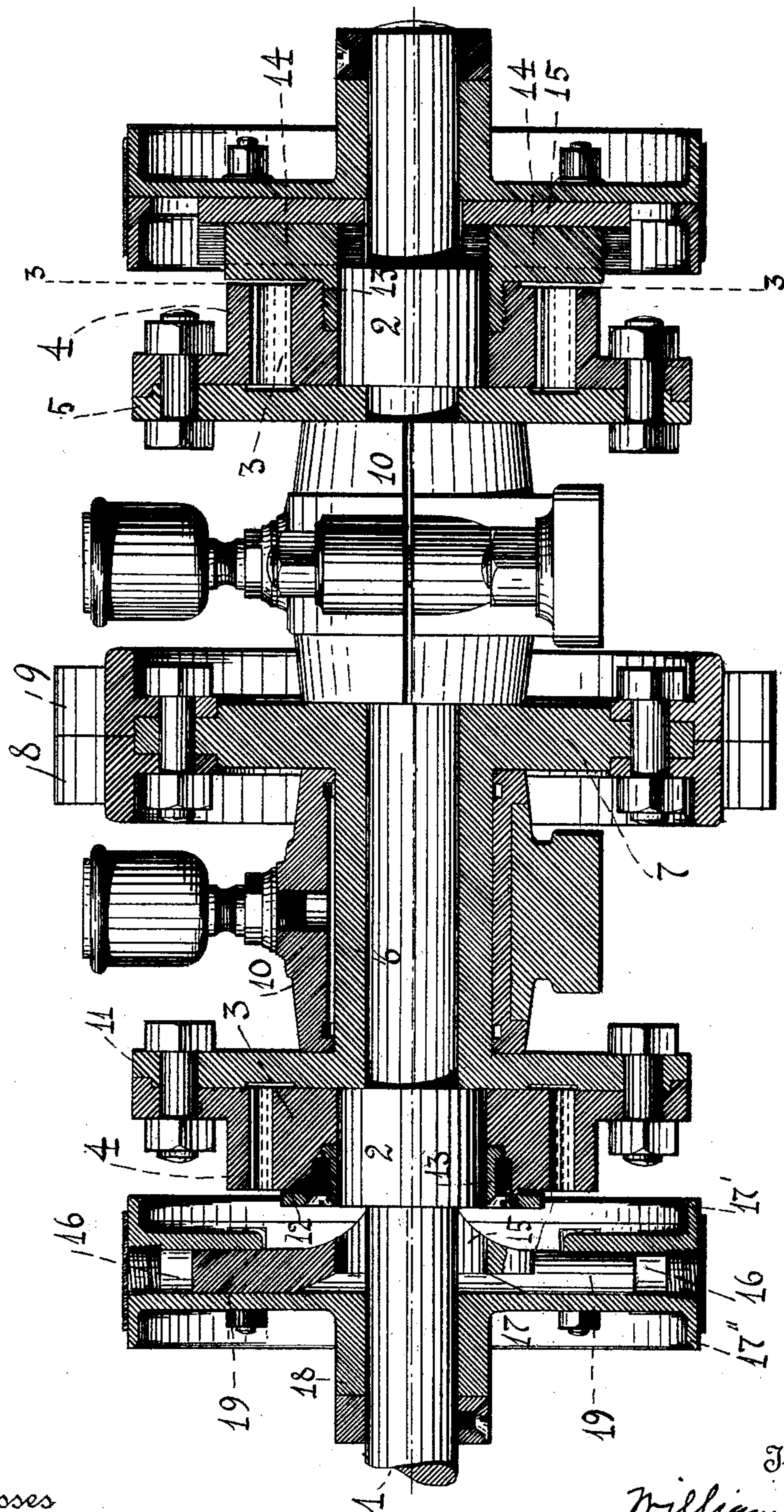


3 Sheets—Sheet 1.

No. 407,089.

Patented July 16, 1889.



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Witnesses
J. J. Kennedy
T. H. Palmer

Inventor.
William Main

By *li* Attorney: *Philip Phelps & Henry*

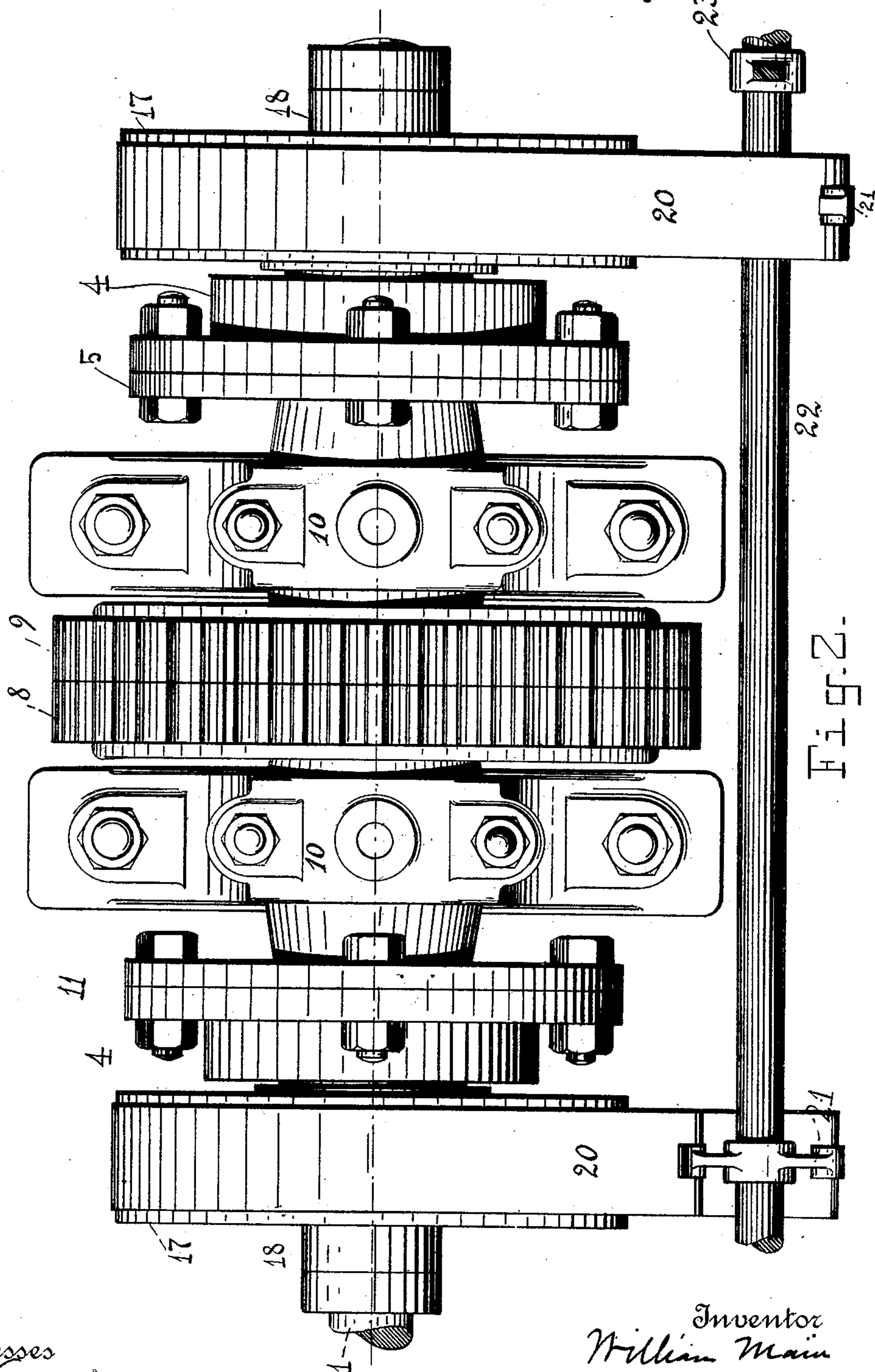
(No Model.)

3 Sheets—Sheet 2.

W. MAIN.
METHOD OF TRANSMITTING POWER.

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(No Model.)

3 Sheets—Sheet 3.

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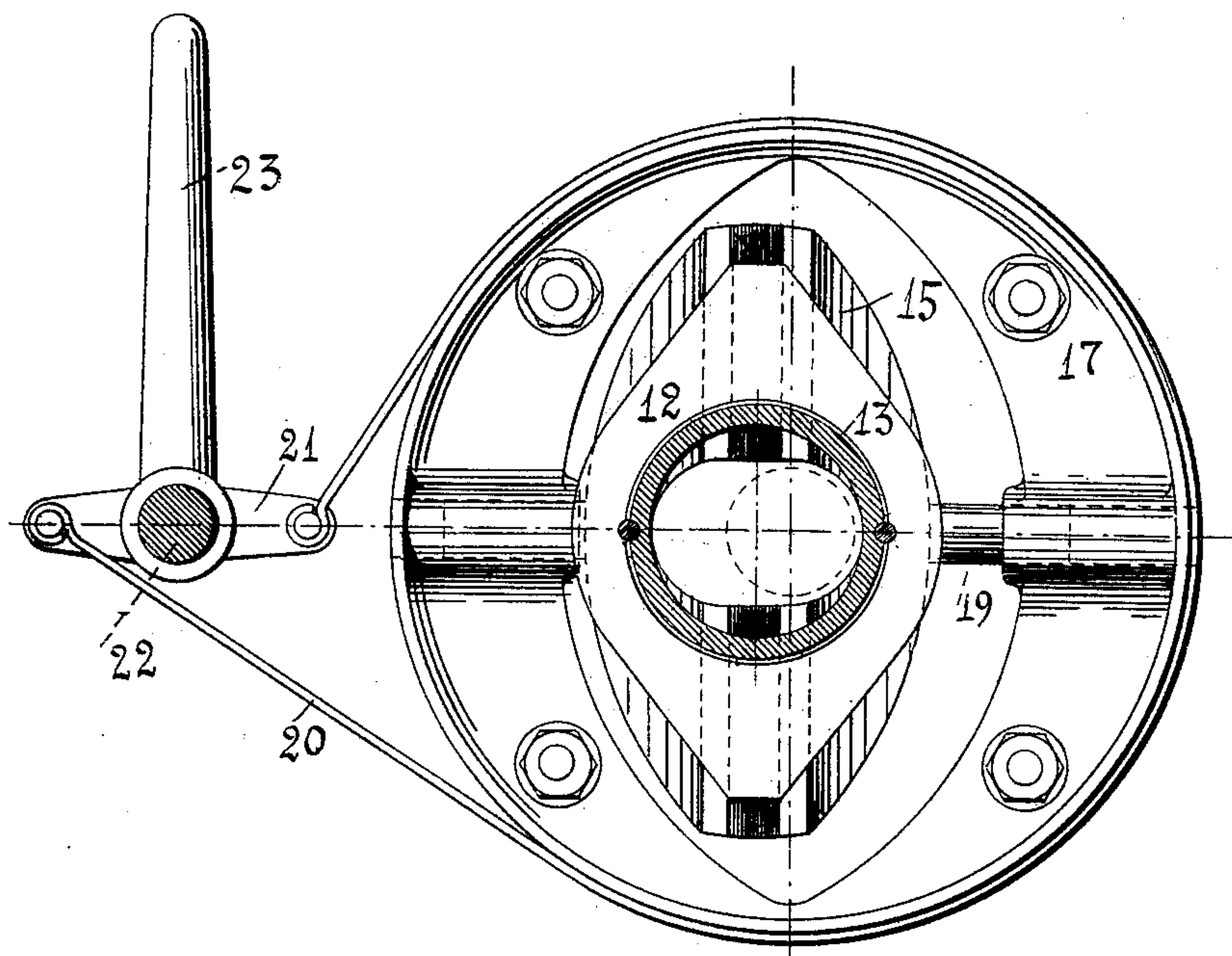


Fig. 3.

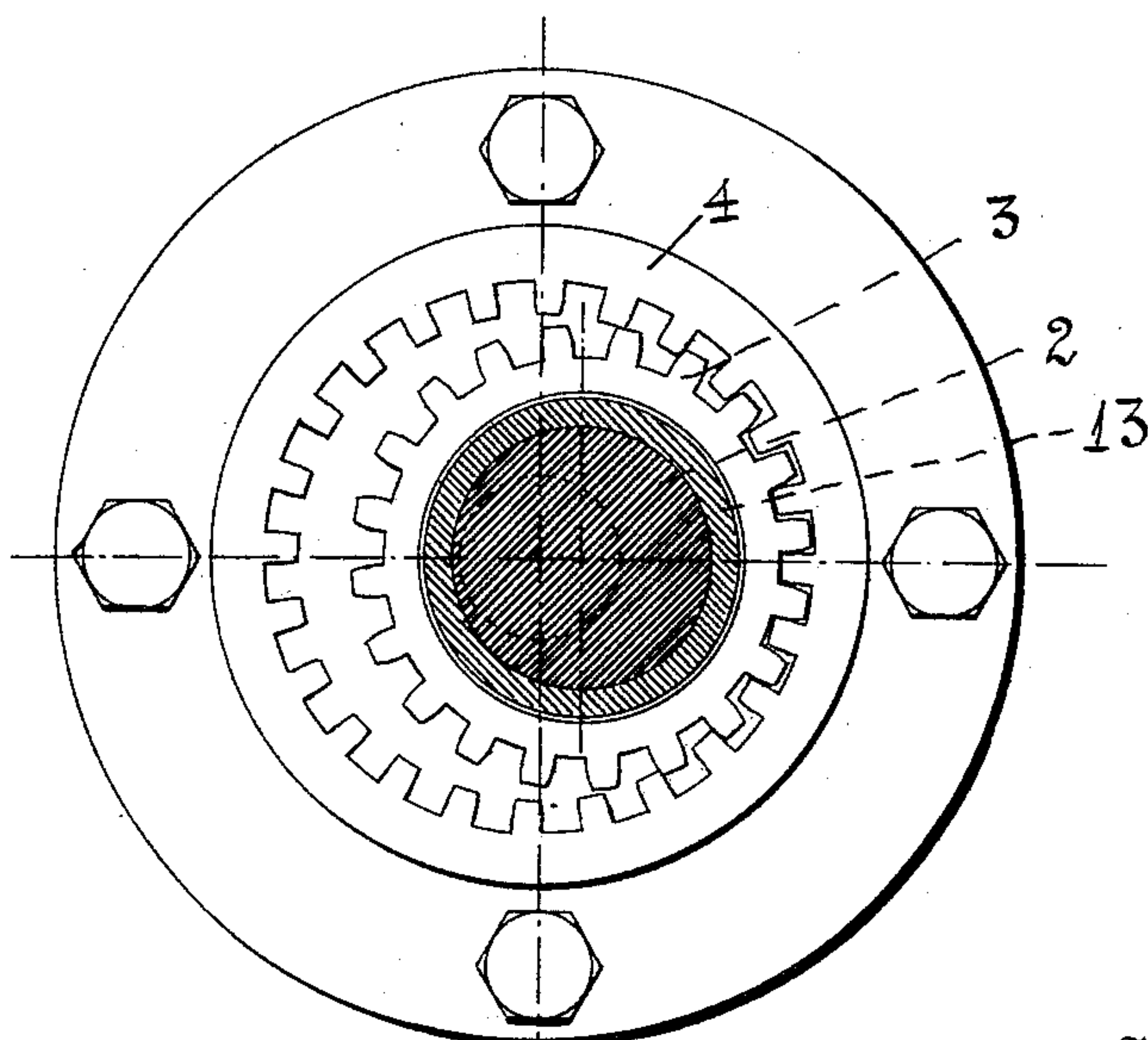


Fig. 4.

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UNITED STATES PATENT OFFICE.

WILLIAM MAIN, OF BROOKLYN, NEW YORK.

METHOD OF TRANSMITTING POWER.

SPECIFICATION forming part of Letters Patent No. 407,089, dated July 16, 1889.

Application filed June 13, 1888. Serial No. 276,984. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MAIN, a citizen of the United States, residing at Brooklyn, county of Kings, and State of New York, have
5 invented certain new and useful Improvements in Methods of Transmitting Power, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

10 The object of my invention is to provide a method for utilizing the device known generically as the "Watt sun-and-planet gear" for the practical and uniform transmission of power by restraining the rotation of the oscillating member of said sun-and-planet gear,
15 so that it shall assume successive positions of strict parallelism with itself, and graduating the restraining force, thereby permitting partial rotation of the oscillating member of the gear for the purpose of putting the mechanism into operation gradually or of varying
20 from time to time the speed of transmission. This method may be carried out in a large variety of ways and by the use of an indefinitely-varied construction of mechanism.

One of the constructions of mechanism adapted for the purpose is illustrated in the accompanying drawings, wherein—

30 Figure 1 is a side elevation, partly in section, of the said mechanism. Fig. 2 is a plan view. Fig. 3 is a section on the line 3 3 of Fig. 1, the point of view being to the left of said figure; and Fig. 4 is a section taken on the same line, the point of view being to the
35 right of said figure.

In the drawings, 1 indicates a driving-shaft adapted to be operated from any convenient source of power—as, for instance, a motor for driving a vehicle. This shaft carries fast upon
40 it an eccentric 2, which moves freely within a circular opening in a gear-wheel 3, which constitutes the fixed or initial member of the sun-and-planet series. Outside of and about this gear-wheel is an annular gear 4 concentric with the driving-shaft 1 and bolted to a
45 flange 5 of a sleeve or hollow shaft 6, mounted upon the main shaft and carrying at its center a flange 7, to which are bolted the two halves 8 and 9 of a gear-wheel, from which
50 the power is transmitted to the driven mechanism, which would be in the case supposed

the driving-axle of the vehicle. The sleeve 6 rests in any suitable bearings, as 10. At the opposite end of the sleeve is a second flange 11, with which is connected a second set of
55 devices identical with those above described, except that the ratio between the inner and outer gear-wheels is varied, this additional mechanism being provided in order that it may be possible to vary the speed of the
60 driven mechanism. These two devices at the ends of the sleeve in Fig. 1 being identical in construction, with the exception, as stated, that the ratio between the gear-wheels varies, the same numbers of reference have been applied to the parts in each case, and the following description may be understood as applicable to both parts of the device.

It should be here stated that the devices are herein shown in duplicate in order to preserve uniformity between this application and the other several applications filed of even date herewith, and that a single set of devices only is essential to the proper carrying out of my method.

75 To the inner gear-wheel 3 is rigidly fixed a slide 12, from the center of which projects an annular screw-threaded rim 13, which enters the interior of the gear and is locked therein, as shown in the left-hand part of Fig. 1. 80 This slide is provided with lugs 14, which fit a recess in a cross-head 15, in turn provided with cylindrical lugs 19, fitting cylindrical sockets 16, formed in a pulley 17, mounted upon and rotating about the main shaft. 85 This pulley 17 is made up of two castings 17' 17'', bolted together, as shown, one of the castings 17'' having a hub 18, which constitutes the bearing-wheel. The cross-head 15 has an oblong central opening, which permits
90 it to move in the direction of its lugs 19 over the main shaft 1. It is obvious that the gear 3 and the pulley 17 will maintain fixed positions relative to each other as regards rotation, their absolute relative positions changing as the shaft 1 revolves to the extent of the sliding motion of the slide with reference to the gear and of the cross-head with reference to the pulley, caused by the eccentric position of the gear 3 with reference to the
95 axis of the pulley 17, the slide 12 and pulley 17 constituting double slides, moving in right
100

lines, and uniting the gear and the pulley as regards circular motion. Consequently when the pulley 17 freely revolves about its axis the gear 3 is also free and will convey no power from the shaft to the outer gear 4. When, however, the pulley 17 is restrained or held fast in one position, the gear 3 will be carried about by the eccentric in a position constantly parallel to itself, and will communicate to the outer gear 4 a rotating motion reduced to an extent dependent upon the ratio between the two gears. The amount of this reduction may be readily calculated according to well-known rules which require no special explanation here.

It is necessary to provide devices for the restraining of the pulley 17 in order to effect the transmission of power through the gears, and for this purpose I prefer to use a friction-clutch, although any other form of clutch mechanism—for instance, a spring-clutch—may be employed, as illustrated in Figs. 1 and 2, wherein a strap 20 passes about the pulley 17, the ends of the strap being pivoted to a cross-piece 21, fastened upon a shaft 22, which shaft is revolved, as desired, by a handle 23, attached thereto, whereby the strap is tightened or loosened to restrain or release the pulley.

The double slides and pulley constitute one form of restraining or guide mechanism with which the rotation of the oscillating member of the sun-and-planet series of gear may be restrained.

My invention further includes the gradual initiation of power transmission through the gears, so that the shock and jar to the driven machinery may be avoided, and also so that a very slow rate of movement may be used while the inertia of the driven mechanism in starting is being overcome. This I accomplish by graduating the restraining force applied to the oscillating gear-wheel. In the case of the mechanism herein described it is accomplished by gradually applying friction to the pulley 17. The effect of this is to at first only partially restrain the rotation of the oscillating gear-wheel 3, the result being, instead of the normal speed of transmission, a speed dependent upon the amount of friction applied, and which may be very slow. In the same manner I may graduate the restraining force to vary the speed of transmission after starting is effected, if desired.

In the mechanism shown two friction-straps are used—one for each pulley—so connected with their arms 21 that in one position of the

shaft 22 one of the said pulleys is restrained and the other released, and in the other position thereof the action of the straps upon the pulleys is reversed. By the use of this mechanism either one of the two sets of gears may be brought into operation, according to the speed desired to be given to the driven mechanism. If more than two speeds are desired for the driven mechanism, the number of sets of gears may be accordingly increased.

While in the foregoing description I have set forth a particular form of apparatus whereby my improved method may be successfully practiced, I desire to be distinctly understood as intending to vary the said apparatus as occasion may require.

The mechanism by which the rotation of the oscillating gear-wheel is restricted, and the said wheel thus caused to assume successive positions of parallelism to itself, finds additional illustration in various forms of apparatus for the purpose shown in other applications filed by me—to wit, Serial Nos. 248,011, 276,982, 276,983, 276,985, 276,986, and 276,987.

Having thus described my invention, what I claim, and desire to protect by Letters Patent, is—

1. The method of obtaining uniformity of motion in the driven member of a sun-and-planet gear and graduating the speed of transmission from the driving member thereof, which consists in restraining the rotation of the oscillating member, so that said member shall assume successive positions of parallelism with itself, and graduating the restraining force to correspond to the speed of transmission desired, substantially as described.

2. The method of obtaining uniformity of motion in the driven member of a sun-and-planet gear and graduating the speed of transmission from the driving member thereof, which consists in restraining the rotation of the oscillating member of the gear by the application of friction, so that said member shall assume successive positions of parallelism with itself, and graduating the amount of friction so applied to correspond to the speed of transmission desired.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM MAIN.

Witnesses:

T. H. PALMER,
J. J. KENNEDY.