

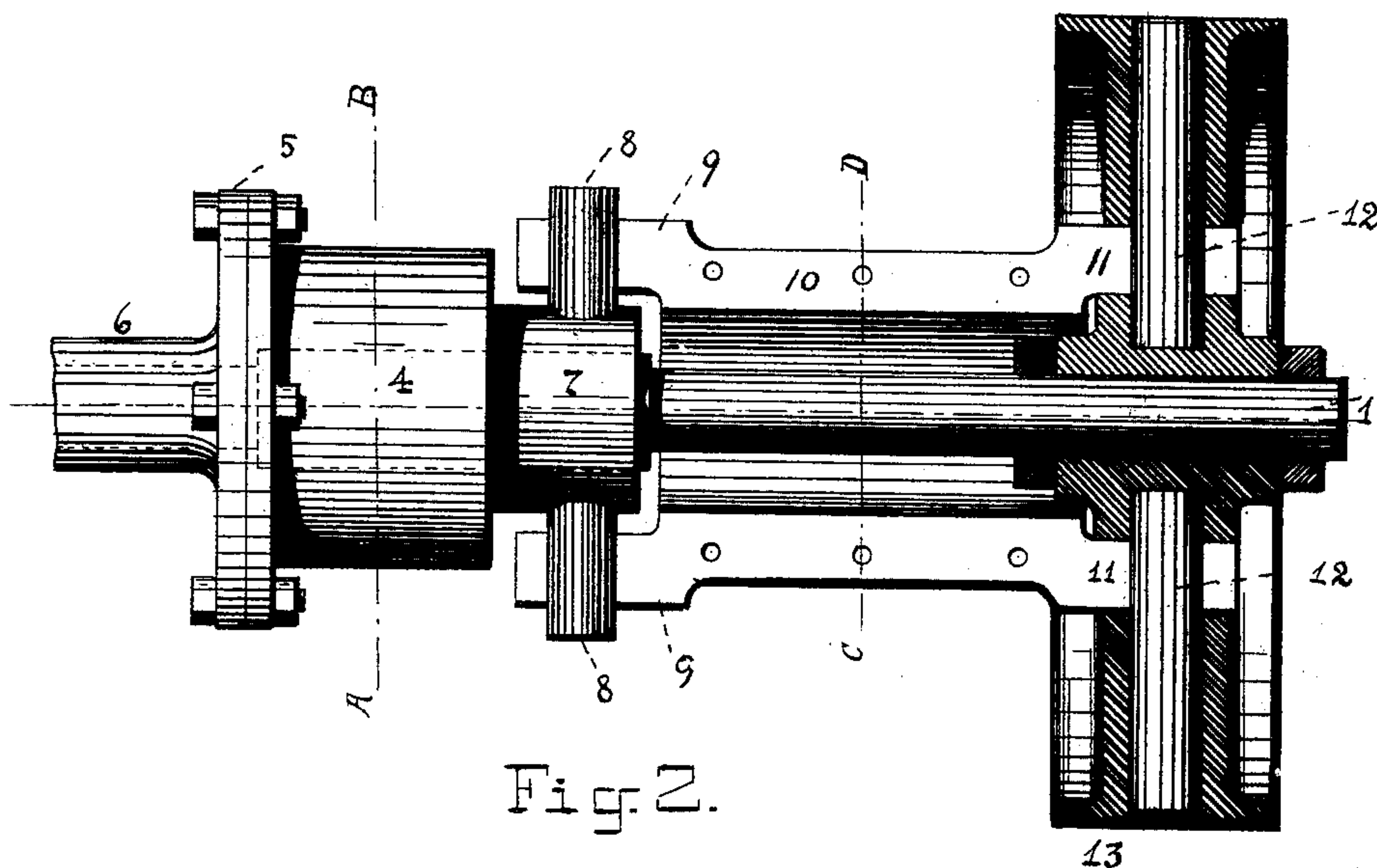
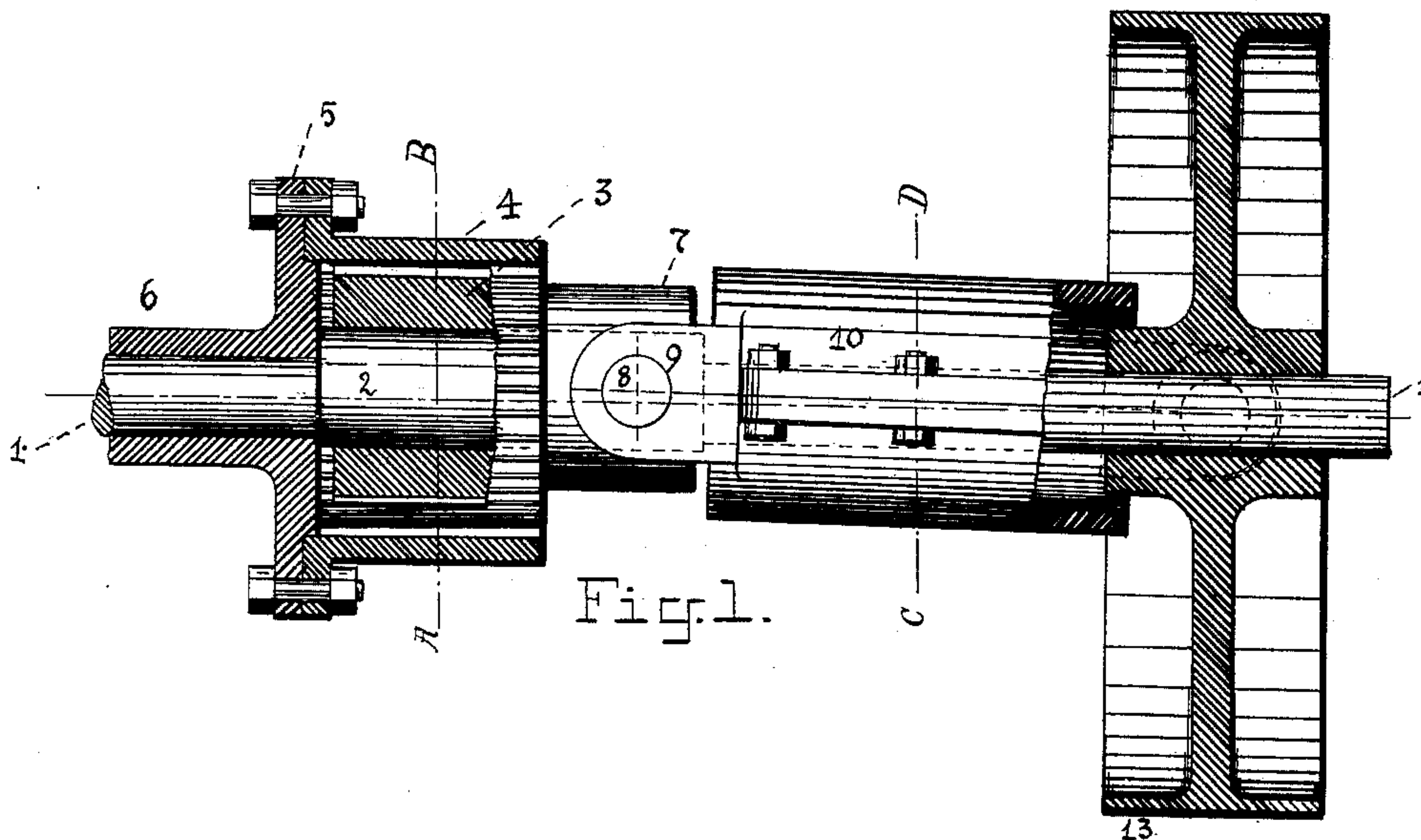
(No Model.)

2 Sheets—Sheet 1.

W. MAIN.
POWER TRANSMITTING DEVICE.

No. 407,091.

Patented July 16, 1889.



Witnesses
J. Kennedy
J. H. Palmer

Inventor
William Main

By his Attorney, *Philip R. Phelps*

(No Model.)

2 Sheets—Sheet 2.

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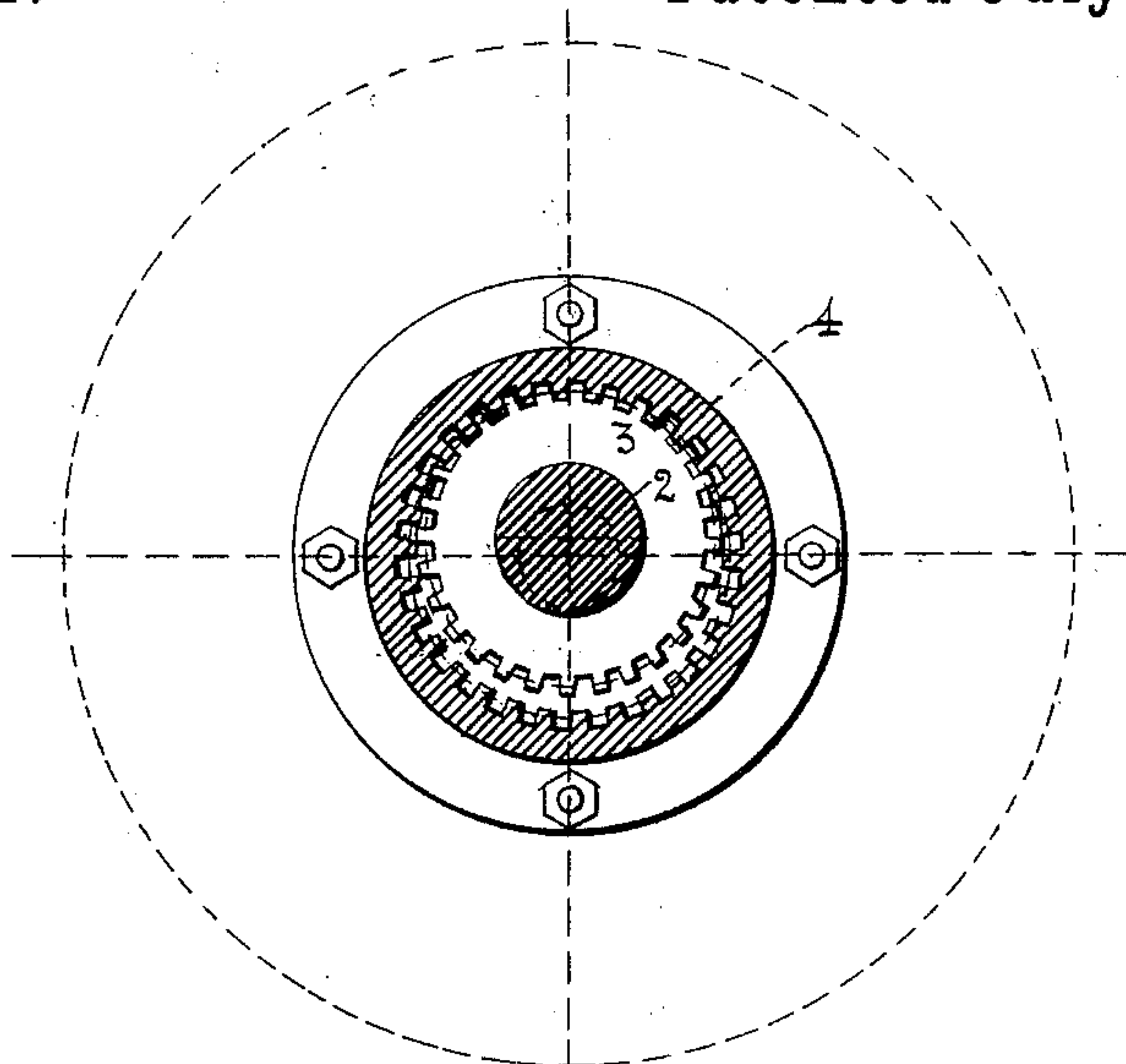


Fig. 3.

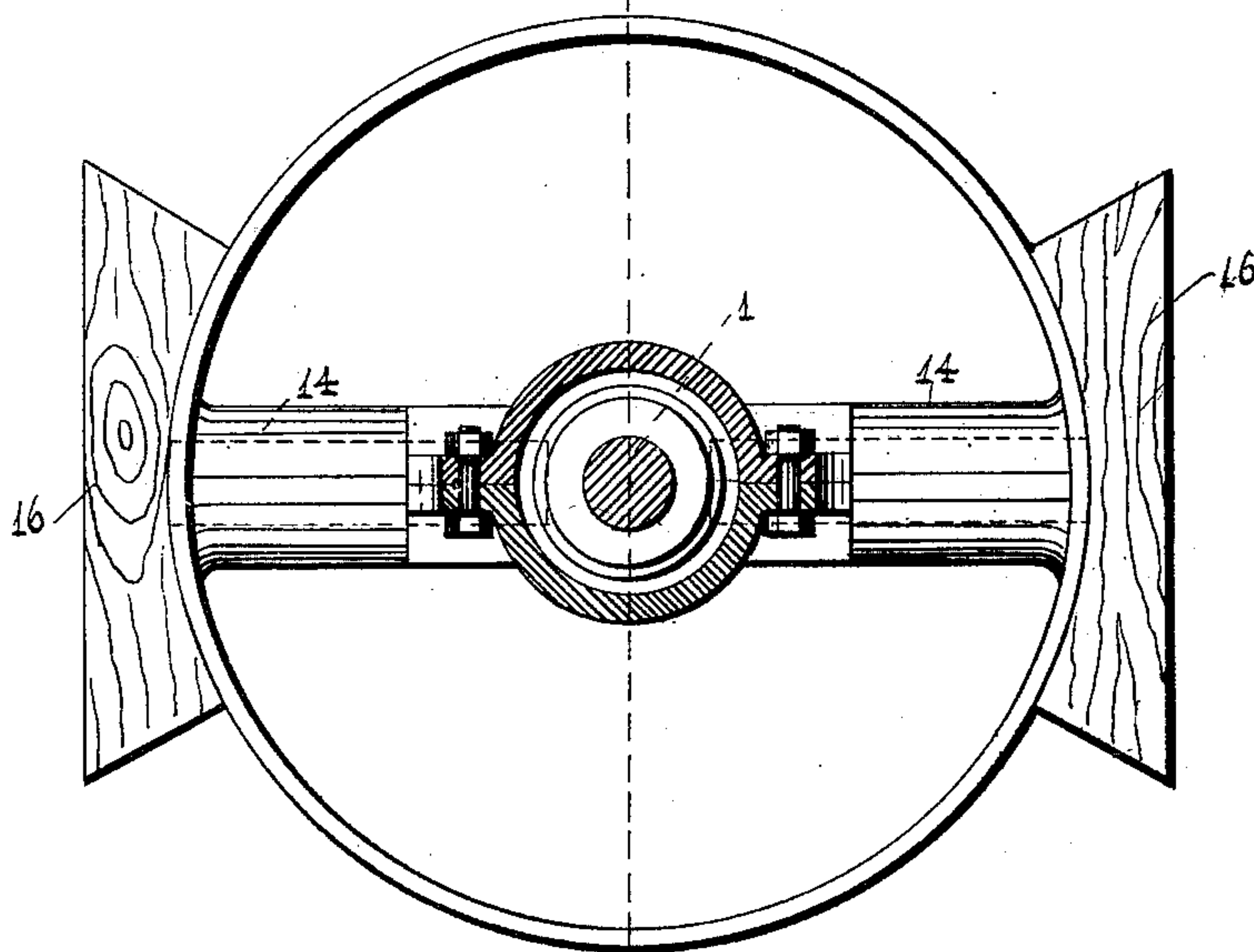


Fig. 4.

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UNITED STATES PATENT OFFICE.

WILLIAM MAIN, OF BROOKLYN, NEW YORK.

POWER-TRANSMITTING DEVICE.

SPECIFICATION forming part of Letters Patent No. 407,091, dated July 16, 1889.

Application filed June 13, 1888. Serial No. 276,986. (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 Power-Transmitting Devices, 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 simple and compact device for transmitting motion from a power-shaft or the like to mechanism to be driven thereby.

My invention relates to the application for
15 the transmission of power of what is known as the "Watt sun-and-planet gear" by means of mechanically-practical mountings and connections in such manner as to impart motion to the driven mechanism only when the oscillating member of said gear is restrained to
20 constant parallelism by means of a connection or guide extending from the oscillating gear to a guide-bearing, which guide-bearing moves with it when the power is not to be
25 transmitted, but may be arrested or retarded, so as to throw the driving and driven mechanism into operative connection, and in such manner that uniformity of speed shall be imparted to the driven mechanism.

30 In another application, filed June 13, 1888, Serial No. 276,982, I have shown and described a variety of mechanisms embodying my invention, and have explained at length the character of the said mechanism, generically
35 considered.

My present application has for its object the protection by Letters Patent of my invention embodied in mechanism wherein the connection or guide governing the action of
40 the oscillating gear-wheel consists of parts in which a swinging motion is combined with a sliding motion, both in a plane parallel to the axis of rotation of the driving-gear.

In other applications filed of even date herewith I have described and claimed specifically
45 my invention applied in connection with the other types of guides mentioned in said generic application No. 276,982, and in still another application, filed of even date herewith, I
50 have claimed the method involved in the practice of my invention. The above-mentioned

subject-matters I therefore do not claim in this application.

An important part of my invention, generically considered, and which I claim here in
55 combination with the particular form of guide herein shown and claimed, consists of a bearing for the guide, which moves in unison with the driving-gear of the sun-and-planet series of gear-wheels, but which may be restrained
60 or retarded, so as to throw the driving and driven mechanism into operative connection. The restraint or retardation of this bearing may be gradually accomplished by a friction-brake or other suitable device, and the power
65 of the shaft and the momentum stored up in its rotating connections may be thus gradually and without shock or jar transferred to the driven mechanism.

In the drawings forming a part of this
70 specification and illustrating one general type of my invention, Figure 1 is a side elevation partly in section. Fig. 2 is a plan view partly in section. Fig. 3 is a cross-section on the line A B of Figs. 1 and 2, and Fig. 4 is a cross-
75 section on the line C D of Figs. 1 and 2.

The shaft 1 is a driving-shaft adapted to be operated from any convenient source of power, and it carries fast upon it an eccentric
80 2, which moves freely within a circular opening in the oscillating gear-wheel 3, which constitutes the initial member of the sun-and-planet series. Outside of and about this gear-wheel is an annular gear-wheel 4, concentric with the driving-shaft 1 and rigidly bolted to
85 a flange 5 upon the driven shaft 6, from which power is conveyed by any appropriate connection to the driven machinery, which driven shaft and connected driven machinery I term
90 herein "driven mechanism," the driven shaft being herein shown as illustrative of any form of driven machinery, to which the power conveyed through the gear-wheels may be applied. The oscillating gear-wheel 3 is provided at its outer end with a basal projection
95 7, carrying trunnion-pins 8. These trunnion-pins have a bearing within lugs 9, projecting from a hollow two-part sleeve 10, said sleeve being provided at its outer end with lugs 11, swinging upon trunnion-pins 12, which have
100 their bearings in the pulley 13. The trunnions permit the necessary swinging motion

in one direction and also a sliding motion at right angles thereto. The oscillating gear-wheel and the pulley 13 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 swinging and sliding motions referred to by reason of the eccentric position of the gear 3 with reference to the axis of the pulley 13. The sleeve 10 constitutes in this mechanism the guide by which the oscillating gear-wheel is connected to the guide-bearing represented in this mechanism by pulley 13, by the restraint of which guide-bearing the control of the oscillating gear-wheel is effected. When the pulley 13 is free to revolve about its axis, the gear 3 is also free, and will convey no power from the shaft 1 to the outer gear 4. When, however, the pulley is locked 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 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.

In addition to the motions above referred to, there will take place also a longitudinal sliding motion of the oscillating gear itself equal to the distance between the middle point of the arc of swinging motion of the sleeve and the chord of said arc. The movement of the oscillating gear will therefore be a resultant of a movement in three planes. The line of the governing-points of the gear 3, which in this case we may conceive to be the trunnions 8, is constrained to always maintain, as the gear 3 oscillates, positions of parallelism with reference to a fixed line, (represented in this case by the guides 14 of the pulley 13,) the mechanism effecting the constraint being the swinging sleeve 10 and its connections respectively to the oscillating gear-wheel and to the pulley.

Brakes of any suitable construction are required to control the pulley 13, in order to effect transmission of power through the gears, and I have shown two brake-shoes 16 applied to the pulley in Fig. 1.

It is true that that part of the mechanism which represents the line fixed in space, and which, for convenience, I will term a "guide-bearing," may be absolutely so fixed instead of having a motion; but it is desirable that it should be movable, in order that the power may be imparted to the driven machinery gradually and without jar. The preferable sort of motion for this part of it permits a convenient application of brakes, and thereby the speed of power-transmission may be varied within wide limits, depending upon the amount of pressure applied to the brakes. I do not confine myself, however, in claiming this invention, to a movable or rotary guide-bearing or the use of friction-brakes, but

have shown these several devices as convenient forms of construction. Neither do I confine myself to the particular form of those parts which constitute the connections between the oscillating gear and the guide-bearing, since these forms may be indefinitely varied while maintaining the double swinging and sliding motion in a plane parallel with the axis of rotation of the oscillating gear-wheel.

I wish it understood that my invention, claimed in the present application, embraces any form of mechanism constituting a guide, the parts thereof having a swinging motion in one direction and a sliding motion in one or more other directions, all of said motions being in a plane parallel with the axis of rotation of the oscillating member of a series of gear-wheels, and connecting that member with a restrainable guide-bearing. I do not confine myself to that form of sun-and-planet gear in which the driving member is within the driven member. The driving member may be without, as in the original invention of Watt. So, too, the power may be transmitted with an increase as well as with a reduction of speed, and the oscillating member may be the driven instead of the driving gear; nor do I limit myself to a sun-and-planet system in which there are but two gears. There may be intermediate gear-wheels between the driving and driven gears, and the restraining mechanism may be applied to any one of these gear-wheels.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. A power-transmitting device for connecting a driving-shaft with a driven mechanism, consisting of a series of gear-wheels, one of said gear-wheels having a rotary and also an oscillating motion, a restrainable guide-bearing normally rotating with said oscillating wheel, and a guide mechanism for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide mechanism having a swinging motion in one direction and a sliding motion in another direction, said motions being in planes parallel with the axis of rotation of the oscillating gear-wheel, substantially as described.

2. A power-transmitting device for connecting a driving-shaft with a driven mechanism, consisting of a series of gear-wheels, one of said gear-wheels having a rotary and also an oscillating motion, a restrainable guide-bearing normally rotating with said oscillating wheel, a guide mechanism for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide mechanism having a swinging motion in one direction and a sliding motion in another direction, said motions being in planes parallel with the axis of rotation of the oscillating gear-wheel, and a brake for restraining the rotation of said guide-bearing, substantially as described.

3. A power-transmitting device for connecting a driving-shaft with a driven mechanism,

consisting of a series of gear-wheels, one of said gear-wheels having a rotary and also an oscillating motion, a restrainable guide-bearing normally rotating with said oscillating wheel, and a guide for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide being made up of a connecting-piece joined to the guide-bearing by trunnion-pins and to the oscillating wheel by trunnion-pins, substantially as described.

4. A power-transmitting device for connecting a driving-shaft with a driven mechanism, consisting of a series of gear-wheels, one of said gear-wheels having a rotary and also an oscillating motion, a restrainable guide-bearing normally rotating with said oscillating wheel, and a guide for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide consisting of a connecting-piece having a swinging motion in one direction and a sliding motion in another direction, said motions being in a plane parallel with the axis of rotation of the driving member of the gear, substantially as described.

5. A power-transmitting device for connecting a driving-shaft with a driven mechanism, consisting of a series of gear-wheels, one of said gear-wheels having a rotary and also an oscillating motion, a restrainable guide-bearing normally rotating with said oscillating wheel, a guide for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide consisting of a connecting-piece having a swinging motion in one direction and a sliding motion in another direction, said motions being in a plane parallel with the axis of rotation of the driving member of the gear, and a brake for restraining the rotation of said guide-bearing, substantially as described.

6. A power-transmitting device connecting a driving-shaft with a driven mechanism, consisting of a series of sun-and-planet gear-wheels, a restrainable guide-bearing normally rotating with the oscillating member of said gear-wheels, and a guide for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide consisting of a connecting-piece joined at one end to the guide-bearing by trunnion-pins and at the other end to the oscillating gear-wheel by trunnion-pins, substantially as described.

7. A power-transmitting device for connecting a driving-shaft with a driven mechanism, consisting of a series of sun-and-planet gear-wheels, a restrainable guide-bearing normally rotating with the oscillating member of said gear-wheels, and a guide for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide consisting of a sleeve connected at one end to the guide-bearing by trunnion-pins and at the other end to the oscillating gear-wheel by trunnion-pins, substantially as described.

8. A power-transmitting device for connecting a driving-shaft with a driven mechanism,

consisting of a series of sun-and-planet gear-wheels, a restrainable guide-bearing normally rotating with the oscillating member of said gear-wheels, a guide for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide consisting of a sleeve connected at one end to the guide-bearing by trunnion-pins and at the other end to the oscillating gear-wheel by trunnion-pins, and a brake for restraining the rotation of the said guide-bearing, substantially as described.

9. A power-transmitting device for connecting a driving-shaft with a driven mechanism, consisting of a series of sun-and-planet gear-wheels, the oscillating member of said gear-wheels being mounted within the other member, a restrainable guide-bearing normally rotating with said oscillating wheel, and a guide for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide consisting of a connecting-piece having a swinging motion in one direction and a sliding motion in another direction, said motions being in a plane parallel with the axis of rotation of the oscillating gear, substantially as described.

10. A power-transmitting device for connecting a driving-shaft with a driven mechanism, consisting of a series of sun-and-planet gear-wheels, the oscillating member of said gear-wheels being mounted within the other member, a restrainable guide-bearing normally rotating with said oscillating wheel, a guide for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide consisting of a connecting-piece having a swinging motion in one direction and a sliding motion in another direction, said motions being in a plane parallel with the axis of rotation of the oscillating gear, and a brake for restraining the rotation of said guide-bearing, substantially as described.

11. A power-transmitting device for connecting a driving-shaft with a driven mechanism, consisting of a series of sun-and-planet gear-wheels, the oscillating member of said gear-wheels being mounted within the other member, a restrainable guide-bearing normally rotating with said oscillating wheel, and a guide for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide consisting of a connecting-piece joined at one end to the guide-bearing by trunnion-pins and at the other end to the oscillating gear-wheel by trunnion-pins, substantially as described.

12. A power-transmitting device for connecting a driving-shaft with a driven mechanism, consisting of a series of sun-and-planet gear-wheels, the oscillating member of said gear-wheels being mounted within the other member, a restrainable guide-bearing normally rotating with said oscillating wheel, a guide for restraining the rotary motion of said wheel when the guide-bearing is re-

strained, said guide consisting of a connecting-piece joined at one end to the guide-bearing by trunnion-pins and at the other end to the oscillating gear-wheel by trunnion-pins, and a brake for restraining the rotation of said guide-bearing, substantially as described.

13. A power-transmitting device for connecting a driving-shaft with a driven mechanism, consisting of a series of sun-and-planet gear-wheels, the oscillating member of said gear-wheels being mounted within the other member, a restrainable guide-bearing normally rotating with said oscillating wheel, a guide for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide consisting of a sleeve joined at one end to the guide-bearing by trunnion-pins, and at the other end to the oscillating gear-wheel by trunnion-pins, and a brake for restraining the rotation of said guide-bearing, substantially as described.

14. A power-transmitting device for connecting a driving-shaft with a driven mechanism, consisting of a series of sun-and-planet gear-wheels, the oscillating member of said wheels being mounted within the other member and being provided with a projection 7, a restrainable guide-bearing normally rotating with said oscillating gear-wheel, and a guide for restraining the rotary motion of said wheel when the guide-bearing is restrained, said guide consisting of a sleeve connected at one end to the guide-bearing by trunnion-pins and at the other end to the projection 7 by trunnion-pins, substantially as described.

15. In a power-transmitting device, the combination of the driving-shaft and driven mechanism, a set of gear-wheels connecting said shaft and mechanism, one of said gear-wheels having a rotary and also an oscillating motion, and a guide for restraining the rotary motion of said oscillating gear-wheel, said guide consisting of a connecting-piece having a swinging motion in one direction and a sliding motion in another direction, said motions being in a plane parallel with the axis of rotation of the oscillating gear-wheel and connecting said oscillating gear-wheel with a relatively-fixed guide-bearing, substantially as described.

16. In a power-transmitting device, the combination of a driving shaft and driven mechanism, a set of gear-wheels connecting said shaft and mechanism, one of said gear-wheels having a rotary and also an oscillating motion, and a guide for restraining the rotary motion of said oscillating gear-wheel, said guide consisting of a connecting-piece joined at one end to said oscillating gear-wheel by trunnion-pins and at its other end to a relatively-fixed guide-bearing by trunnion-pins, substantially as described.

17. In a power-transmitting device, the combination of a driving-shaft and driven mechanism, a set of gear-wheels connecting said shaft and mechanism, one of said gear-wheels having a rotary and also an oscillating motion, and a guide for restraining the rotary motion of said oscillating gear-wheel, said guide consisting of a sleeve joined at one end to said oscillating gear-wheel by trunnion-pins and at its other end to a relatively-fixed guide-bearing by trunnion-pins, substantially as described.

18. A power-transmitting device for connecting a driving-shaft with a driven mechanism, consisting of a series of sun-and-planet gear-wheels, the oscillating member of said gear-wheels being mounted within the other member and upon an eccentric formed on the driving-shaft, a restrainable guide-bearing loosely mounted upon the driving-shaft normally rotating with said oscillating wheel, a guide for restraining the rotary motion of said oscillating wheel when the guide-bearing is restrained, said guide consisting of a sleeve connected at one end to the guide-bearing by trunnion-pins and at the other end to the oscillating wheel by trunnion-pins, and a brake for restraining the rotation of said guide-bearing, substantially as described.

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.