No. 691,789. Patented Jan. 28, 1902.

R. B. MANN.

POWER TRANSMITTING DEVICE.

(Application filed Mar. 18, 1901.)

(No Model.) 2 Sheets—Sheet I.

Fig I

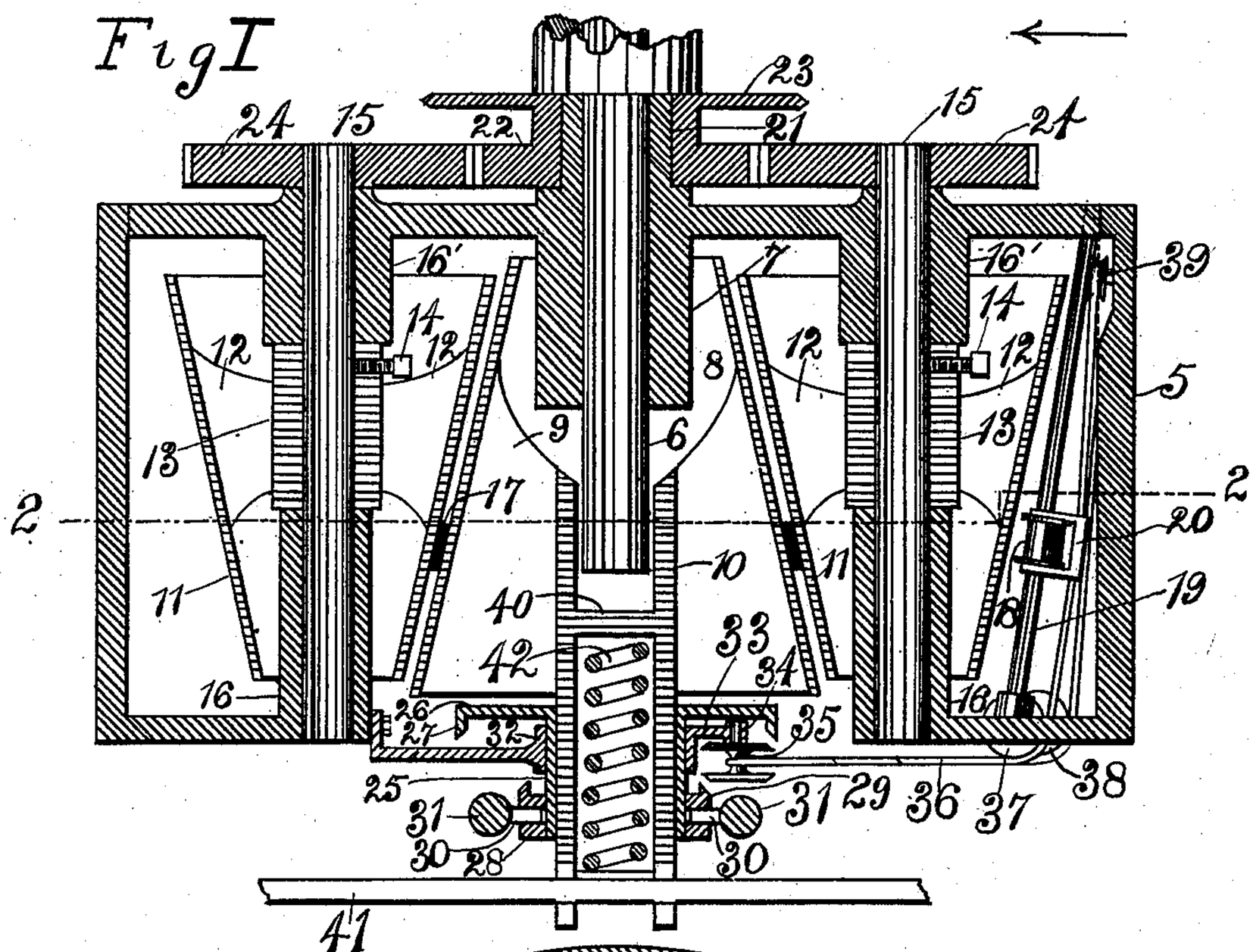
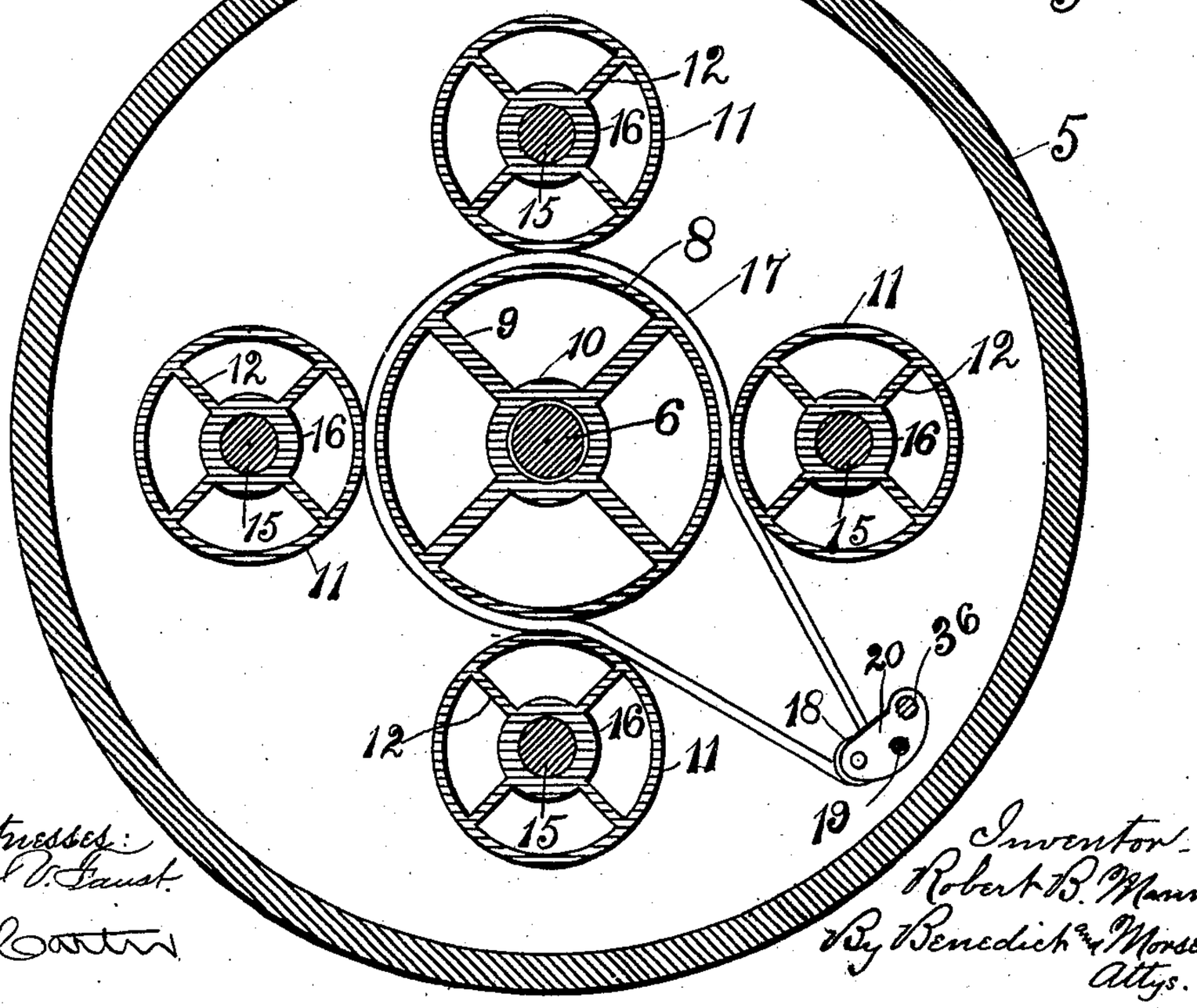


Fig II



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(No Model.) 2 Sheets—Sheet 2.

Fig III

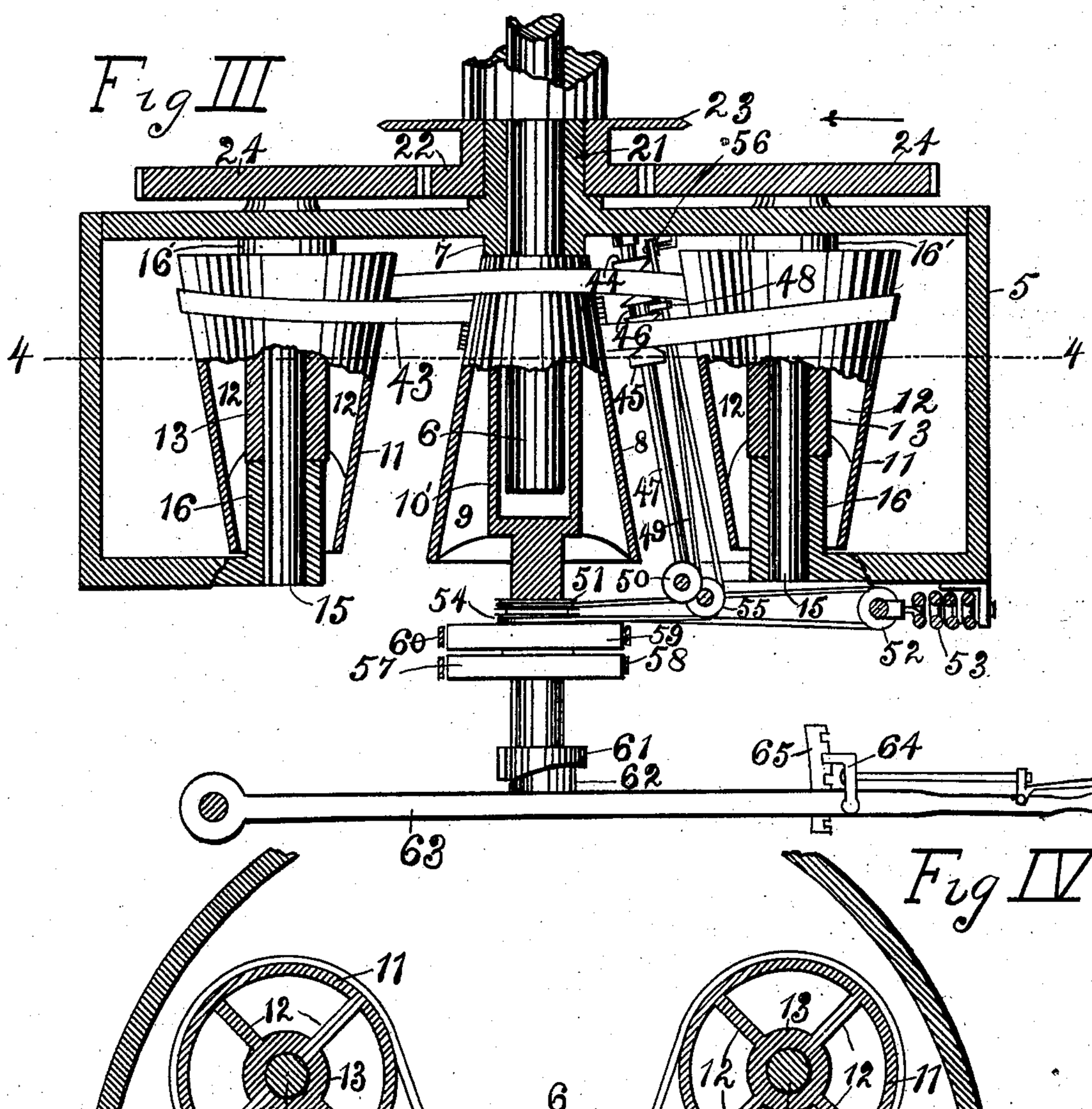
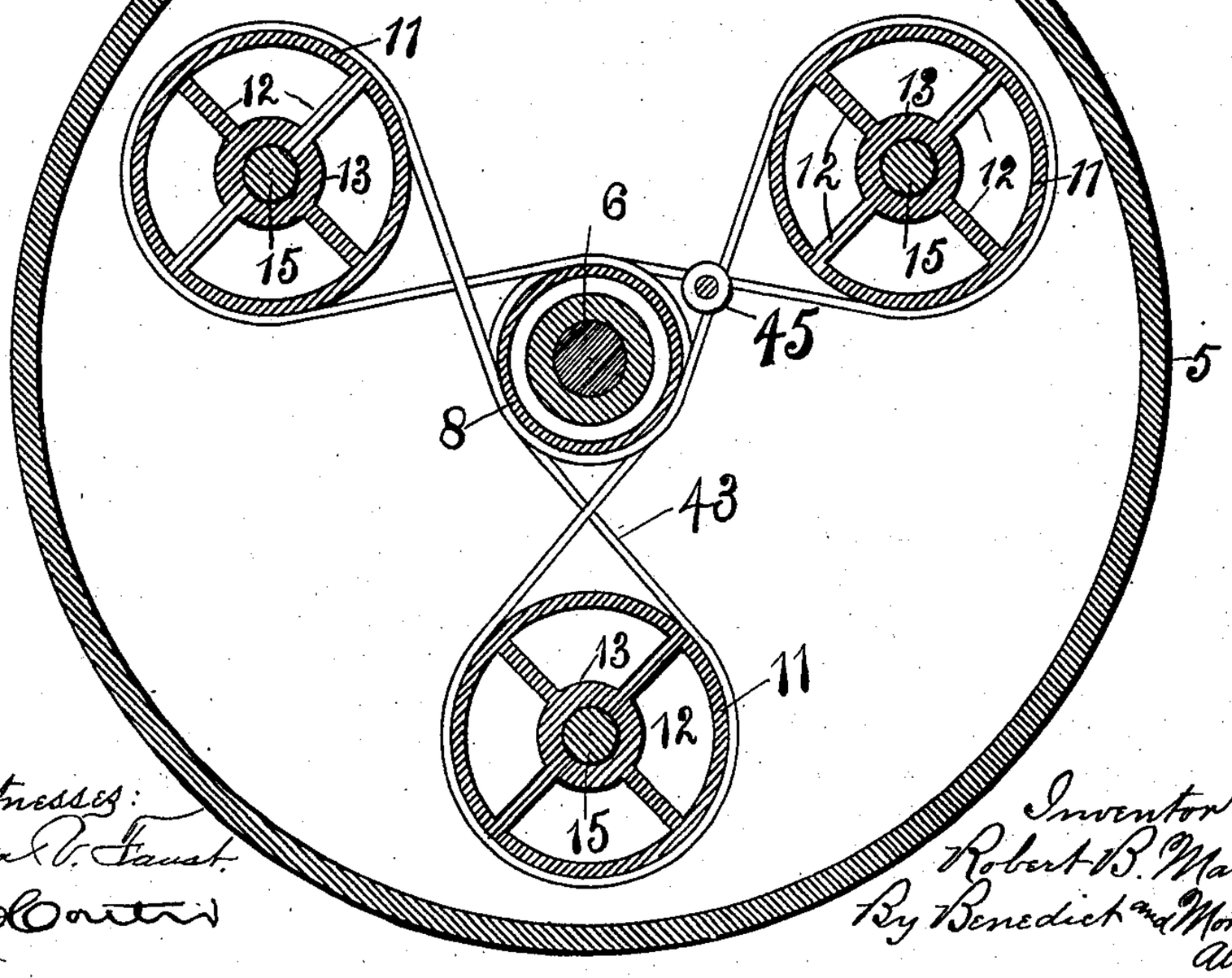


Fig IV



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UNITED STATES PATENT OFFICE.

ROBERT B. MANN, OF MILWAUKEE, WISCONSIN.

POWER-TRANSMITTING DEVICE.

SPECIFICATION forming part of Letters Patent No. 691,789, dated January 28, 1902.

Application filed March 18, 1901. Serial No 51,611. (No model.)

To all whom it may concern:

Be it known that I, ROBERT B. MANN, residing in Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a new and useful Improvement in Power-Transmitting Devices, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention has relation to improvements in power-transmitting devices.

The object of the invention is to provide an improved construction of such character as to allow the motor to be constantly run at the speed for which it is designed, thereby yielding its highest efficiency.

A further object is to allow the speed of the driven mechanism to be altered while running and without interrupting the running of the driving mechanism in order to comply with the instantaneous resistance to be overcome.

A further object is to provide for reducing the speed of the driven mechanism, even to zero, without at all interrupting the running of the motor or driving mechanism, so that said motor or driving mechanism may be run uninterruptedly, thereby permitting the mechanism which is operated to stand still while yet the motor or driving mechanism is running.

A further object, more specifically stated, is to provide a continuously-operating variable-speed-transmitting mechanism between the engine-shaft or on auxiliary shaft and a sun-and-planet gearing, whereby the driving means continuously operates even when the shifting mechanism for variable speed or for stoppage is operated, the said shifting operation at the same time not interfering with the continuous operation of the driven mechanism, even though it is desired to entirely stop said driven mechanism.

With the above and other incidental objects in view the invention consists of the devices and parts or their equivalents, as hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is a vertical sectional view of my improved power-transmitting mechanism. Fig. 2 is a horizontal section on the line 2 2 of Fig. 1. Fig. 3 is a vertical section of a modified form of construction, and Fig. 4 is a horizontal section on the line 4 4 of Fig. 3.

Referring to the drawings, the numeral 5 indicates a frame, which may be of any desirable form suited to the requirements. This frame has mounted centrally therein a shaft 6, and this shaft may be either the engine or motor shaft or an auxiliary shaft. The shaft may be surrounded by a downwardly-extending tubular portion 7 from the frame, in which tubular portion the shaft is held fast by any desirable means, preferably by a key. (Not shown.) Centrally within the frame is a non-rotatable cone 8. The interior of this cone is formed with webs 9, which connect with a tubular upwardly-extending standard 10. The lower end of the shaft 6 extends into the upper end of this tubular standard; but the bore of the standard is of sufficient diameter to leave a space between it and the shaft.

Within the frame 5 and surrounding the central cone are a series of cones 11. These cones are in reverse position to the position of the central cone—that is to say, they are arranged with their bases uppermost. Any desired number of these cones 11 may be provided, only one or even a greater number than shown. In Fig. 2 of the drawings I have shown four of said cones. The interior of each cone 11 is formed with webs 12, which connect with a central hub 13, and each of these hubs surrounds and is connected by set-screws 14 or equivalent means to an upright shaft 15. Each shaft 15 has its bearings in tubular extensions 16 16′ from the upper and lower portions, respectively, of the frame 5, the hub of each cone being located between said extensions. In the Sheet 1 form of construction it will be seen that the surrounding cones 11 are quite close to the central cone 8. Surrounding this central cone is an endless belt 17, the space between the central cone and the surrounding cones being such that all of said surrounding cones will bear frictionally against the belt 17. The belt is continued from the cone 8 to and around a small grooved pulley 18, mounted on an inclined rod 19, the said pulley being arranged between the arms of a bracket 20, through which arms the rod 19 also passes. The tubular portion 7 of the frame 5 is also extended upwardly a desired distance above the top of

said frame, as indicated by the numeral 21, and loosely surrounding this upward extension 21 is a gear-wheel 22. This gear-wheel is provided with an upwardly-extending hub, and said hub has fast thereto or integral therewith a sprocket-wheel 23. The upper end of each of the shafts 15 projects slightly above the top of the frame 5, and this projecting end has mounted thereon a gear-wheel 24. The several gear-wheels 24 are in mesh with the gear-wheel 22. This system of gearing forms what is known as a "sun-and-planet" gearing. While I have herein shown and described the toothed gear-wheels 22 and 24, yet I do not wish to be understood as restricting myself thereto, as friction-gearing or any other desirable form of gearing may be substituted therefor without departing from the spirit and scope of my invention. I therefore wish it understood that in referring to these wheels as "gear-wheels" throughout the specification I do not restrict them to toothed gear-wheels, but intend to include by such designation any desirable form of transmitting mechanism from the shafts 15. The wheel 23 also need not necessarily be a sprocket-wheel, but may be any other form of wheel or device for transmitting its rotation.

Surrounding the lower portion of the standard 10 is a slidable sleeve 25. This sleeve is formed or provided at its upper end with a disk-shaped plate 26, and the outer edge of this plate is provided with a downwardly-extending flange 27, the under edge of this flange being beveled. Surrounding the lower end of the sleeve 25 and fast thereto is a ring 28. The ring is provided with an upwardly-extending flange 29, and the upper edge of this flange is beveled. The ring at diametrically opposite points is provided with openings or recesses, in which are fitted pins 30 30. The outer ends of these pins are advisably provided with rounded handpieces 31 31. By grasping these handpieces and exerting either an upward or downward pressure thereon the sleeve 25 is slid either upwardly or downwardly. Loosely surrounding the sleeve 25 is another ring 32. This ring, while free to revolve with the frame 5 around the sleeve 25, is yet held against vertical movement, the sleeve sliding vertically freely therein. This ring 32 is provided with an outwardly-extending arm 33, from which arm is hung a pin 34. On this pin is mounted a rotatable pulley 35, each side flange of the pulley having its outer edge beveled, as clearly shown.

The numeral 36 indicates a rope or cable, which is secured at one end to the bracket 20 and is then continued downwardly from the bracket around a pulley 37, thence to and around pulley 35, thence continued from said pulley around another pulley 38, thence upwardly and around an upper pulley 39, and finally downwardly for attachment to the bracket 20.

In the operation of the invention when the shaft 6 is rotated from the engine or motor the frame 5 will necessarily be carried around therewith, and as the shafts of the cones 11 are mounted in the frame said cones are necessarily carried around with the frame; also, as the cones 11 are in frictional contact with the central stationary cone 8 through the medium of the belt 17 it is evident that as the frame 5 thus revolves and carries around therewith the cones 11 said cones 11 through the frictional engagement referred to are also given an independent rotation, and as the gear-wheels 24 are fast to the shafts of the cones 11 said gear-wheels are also necessarily rotated, and as the gear-wheels 24 are in mesh with the loose gear-wheel 22 said gear-wheel 22 is caused to rotate and its rotation necessarily imparted to the sprocket-wheel 23. From the sprocket-wheel the power may be transmitted, by means of a sprocket-chain, (not shown,) to any suitable mechanism to be operated—as, for instance, to the rear axle of an automobile. From the operation described it will be seen that the cones 11 not only turn on their axes, but also describe a circular orbit around the shaft 6 as an axis.

The primary object had in view by the invention is to secure a variable rotation or a complete stoppage of the driven mechanism while yet the driving mechanism is continuously operated. This important function is herein shown as being secured by means of the shifting mechanism employed, whereby the position of the belt 17 with relation to the cones is readily changed. In the position of said belt shown in the drawings the driven mechanism is rotated at a normal rate of speed, and when running at this normal speed the pulley 35 occupies a position in which neither of the beveled edges of its side flanges are in engagement with either the beveled flange 27 of the plate 26 or the beveled flange 29 of the ring 28, this position of said pulley 35 being shown in Fig. 1 of the drawings. If now it is desired to increase the rate of speed above the normal, and if, for instance, the frame 5 is rotating in the direction of the arrow, Fig. 1, the handpieces 31 are grasped and up pressure given thereto. This will cause the sleeve 25 to slide upwardly, and thereby bring the beveled edge of the flange 29 of the ring 28 into engagement with the beveled edge of the lower side flange of the pulley 35. As the ring 32 is connected up to the frame 5, so as to be carried around therewith, the moment this contact is made a rotation is imparted to the pulley 35, and this will cause a pull on the rope or cable 36 in a direction to cause a down movement of the bracket 20, and as this bracket carries the pulley 18 around which the belt 17 passes said belt is necessarily carried downwardly, and this down movement, as stated, causes an increase of speed, which increase will reach the maximum point when the shifter-pulley 18 has been shifted to its lowest limit. When a decrease of speed is desired, the reverse operation takes place—that is to say, the handpieces 31 are grasped

and a down pressure exerted thereon, whereby the sleeve 25 is moved downwardly until the beveled edge of the flange 27 thereof contacts with the beveled edge of the upper side flange of the pulley 35. When this contact takes place, the pulley 35 is rotated in a direction to cause a pull on the rope or cable 36 in a direction to force the belt 17 upwardly, and consequently thereby reduce the speed.

It will be evident that the change of the speed is accomplished without the necessity of stopping the driving mechanism.

When a complete stoppage of the driven mechanism is desired or required, the belt is shifted to such position that the planet-gears 24 are run at such a speed the reverse of that produced by the rotation of the frame 5 that the backward motion of these gears 24, due to the rotation of cones 11 about cone 8, exactly neutralizes the forward motion of the sun-gear 22. When this neutralization takes place, it is apparent that no rotation whatever is imparted to the sun-gear 22. In the construction shown the zero-point is reached when the belt 17 is shifted upwardly above a given point.

It is desirable that the central gear 8 should be capable of a slight vertical movement in order that it may automatically adjust itself upwardly, so as to closely bind frictionally against the belt 17, no matter in what position said belt may be shifted on the cone. On Sheet 1 of the drawings I have shown a convenient construction for accomplishing this purpose. The standard 10, as previously stated, is tubular in form, and the bore of this tube is interrupted by a cross-piece 40. The lower end of the tubular standard is free to pass through a frame-piece 41. Within the bore of the standard and below the cross-piece 40 is a coiled spring 42, the lower end of said coiled spring bearing against the frame-piece 41 and the upper end of said coiled spring against the cross-piece 40. This spring constantly exerts an upward pressure against the cross-piece 40, and thereby automatically adjusts the central cone 8 upwardly, so as to bear tightly against the belt 17.

Referring to the modification shown on Sheet 2 of the drawings, I illustrate therein a different form of belt for rotating the outer cones from the central cone; also, a modified form of shifting mechanism. I furthermore show in this modified form a safety device, wherein means are provided for permitting the central cone to turn, and thereby cause a stoppage of the driven mechanism, in addition to the means for stopping by the shifting of the belt. It may be necessary in extreme cases to provide for stopping the driven mechanism by mechanical means other than the mere shifting of the belt, and hence the extra means adopted by me. Referring to this Sheet 2 form of construction, it will be seen that instead of the surrounding cones 11 being close to the central cone 8 and said surrounding cones being rotated by reason of being in frictional contact with a belt 17 said surrounding cones 11 are a distance removed from the central cone. In this form but three of the surrounding cones 11 are shown, and a belt 43 is passed a plurality of times around the central cone, thence crossed between said central cone and the surrounding cones and passed around said surrounding cones. At one of the crossing-points of the belt one strand thereof engages in a groove of a pulley 44 and the other strand in the groove of a similar pulley 45, said two pulleys being united by means of a connection 46. These pulleys are slidingly mounted on a rod 47, and the connection 46 has projecting therefrom a finger 48. To this finger is connected a rope or cable 49. This rope or cable is extended downwardly from the finger to and around a pulley 50, thence to and around a pulley 51, loosely sleeved on the axis 10′, thence from said pulley to and around a pulley 52, carried by a spring-tensioning device 53, (which spring-tensioning device is for the purpose of taking up slack in the cable,) thence from pulley 52 to and around a lower pulley 54, also loosely sleeved on the axis 10′, thence from said pulley 54 to and around a lower guide-pulley 55, thence upwardly to and around an upper guide-pulley 56, and finally downwardly for connection to the finger 48. The sleeve of the pulley 51 extends to and is connected with a brake-wheel 57, said brake-wheel being surrounded by a brake-band 58, which band is normally out of frictional engagement with the wheel 57. The sleeve of the pulley 54 surrounds the sleeve of the pulley 51, and said sleeve of the pulley 54 extends to and connects with a brake-wheel 59. This brake-wheel is surrounded by a brake-band 60, which is normally out of frictional engagement with said brake-wheel. The brake-bands 58 and 60 may be thrown into frictional engagement with their respective brake-wheels by any of the well-known means for that purpose. Now if it is supposed that the frame 5 is rotating in the direction of the arrow, Fig. 3, and the band 58 is applied to the brake-wheel 57, so as to hold pulley 51 stationary, the shifter is moved upwardly, and consequently the belt 43 is carried upwardly therewith, and thereby causes a reduction of the speed. If the brake-band 58 is released and the brake-band 60 applied to the brake-wheel 59, then the lower pulley 54 is held stationary and the shifter caused to descend, and consequently the belt thereby moved downwardly, in order to produce an increase of speed.

Referring to the combined safety device and automatic belt-tightening mechanism illustrated in connection with this modified form of construction, the lower end of the axis 10′ is formed with a cam 61. This cam normally rests on another cam 62, which latter cam is carried by a pivoted lever 63. This lever is provided with a detent or dog 64, constructed to engage a toothed segment 65 to

thereby hold the lever in adjusted position. Normally the lever is adjusted to the position shown in Fig. 3—that is to say, with the cam 62 in engagement with the cam 61. When the cams are thus engaged, the axis 10′ is locked against rotation, and at the same time there is a tendency to shift axis 10′ and cone 8 upward, thereby tightening belt 43, which tendency, as it is proportional to the force tending to turn cone 8 about shaft 6, will increase the tension on belt 43 in proportion to the work transmitted through said belt 43. If now the detent is released from the segment 65 and the lever 63 turned downwardly, the cam 62 is carried out of engagement with the cam 61, and the axis 10′ and the cone 8, fast thereto, then become loose, and it will then be evident that the belt 43 will not transmit power.

While I have herein shown and described certain details of construction, yet I do not wish to be understood as restricting myself thereto, inasmuch as modifications and variations may be resorted to without departing from the spirit and scope of my invention. For instance, as previously stated, instead of toothed gearing any other desirable form of gearing or transmitting mechanism could be employed; also, any desired number of surrounding cones 11 might be employed; also, any desired means other than the belting could be employed for transmitting rotation to the surrounding cones, and, furthermore, instead of cones any other mechanism could be used if such mechanism be of a character as to permit of the same being continuously operated notwithstanding any change of speed that may be desired up to and including the zero-point. In order to produce a reverse motion of the sun-gear 22, the belt 17 or belt 43 must be shifted beyond the zero-point, so that the reverse motion of the gears 24, produced by the rotation of the cones 11 about cone 8, is insufficient to neutralize the forward motion of the sun-gear 22, due to the rotation of the frame 5 and gears 24 about sun-gear 22. I would also call attention to the fact that the shaft 6 in place of being keyed to the hub 7 could be keyed to the gear 22, thereby transmitting power from gear 22 to gears 24, and so to frame 5, from which the power could be taken by any suitable means, and I therefore wish this variation to be considered as within the spirit and scope of my invention.

What I claim as my invention is—

1. In a power-transmitting device, the combination of a driving-shaft, a sun and planet gearing, the sun-gearing adapted for transmitting motion to machinery to be operated, and a continuously-operating variable-speed-transmitting mechanism between the driving-shaft and the sun and planet gearing, one element of said continuously-operating variable-speed-transmitting mechanism, together with its axis, adapted to revolve about a central axis.

2. In a power-transmitting device, the combination of a driving-shaft, a frame, a sun-gearing, one of the two latter parts being rotatable with the driving-shaft, a planet-gearing meshing with the sun-gearing, a shaft carried by the frame and having the planet-gearing fast thereon, and a continuously-operating variable-speed-transmitting mechanism between the driving-shaft and the sun and planet gearing, one element of said continuously-operating variable-speed-transmitting mechanism revolving about the same axis as the planet-gearing.

3. In a power-transmitting device, the combination of a driving-shaft, a frame, a gear-wheel, one of the two latter parts being rotatable with the shaft, a non-rotatable cone unconnected to but arranged within the frame, a series of reversed cones rotatably mounted in the frame, gear-wheels mounted on the axes of said rotatable cones, and in mesh with the first-referred-to gear-wheel, and means for rotating the rotatable cones from the non-rotatable cone at variable speeds.

4. In a power-transmitting device, the combination of a driving-shaft, a frame, a gear-wheel, one of the two latter parts being rotatable with the shaft, a non-rotatable cone unconnected to but arranged within the frame, a reversed cone rotatably mounted in the frame, a gear-wheel mounted on the axis of the reversed cone, and in mesh with the other gear-wheel, a belt engaging the several cones, and means for shifting the position of said belt upon the cones so as to impart variable speeds to the rotatable cone.

5. In a power-transmitting device, the combination of a driving-shaft, a frame, a gear-wheel, one of the two latter parts being rotatable with the shaft, a non-rotatable cone unconnected to but arranged within the frame, a reversed cone rotatably mounted in the frame and close to but not in contact with the non-rotatable cone, a gear-wheel mounted on the axis of the reversed cone and in mesh with the other gear-wheel, a belt surrounding the non-rotatable cone and located in the space between said non-rotatable cone and the rotatable cone, whereby the several cones frictionally engage the belt, and means for shifting the position of the belt so as to impart variable speeds to the rotatable cone.

6. In a power-transmitting device, the combination of a driving-shaft, a frame, a gear-wheel, one of the two latter parts being rotatable with the shaft, a non-rotatable cone unconnected to but arranged within the frame, a reversed cone rotatably mounted in the frame, a gear-wheel mounted on the axis of the reversed cone and in mesh with the other gear-wheel, means for rotating the rotatable cone from the non-rotatable cone, and means for longitudinally adjusting the non-rotatable cone.

7. In a power-transmitting device, the combination of a driving-shaft, a frame, a gear-wheel, one of the two latter parts being rota-

table with the shaft, a non-rotatable cone unconnected to but arranged within the frame, a reversed cone rotatably mounted in the frame, a gear-wheel mounted on the axis of the reversed cone and in mesh with the other gear-wheel, a belt engaging the several cones, a slidable pulley around which said belt passes, and means for sliding the pulley.

8. In a power-transmitting device, the combination of a driving-shaft, a frame, a gear-wheel, one of the two latter parts being rotatable with the shaft, a non-rotatable cone unconnected to but arranged within the frame, a reversed cone rotatably mounted in the frame, a gear-wheel mounted on the axis of the reversed cone and in mesh with the other gear-wheel, a belt engaging the several cones, a pulley adapted to be engaged by the strands of the belt, a rod on which the pulley is slidably mounted, brake-controlled pulleys, the brake mechanism adapted to permit said pulleys to run either loose or fast, a guide-pulley, and a rope or cable connected at one end to the slidable pulley, thence extended to and around one of the brake-controlled pulleys, thence around the guide-pulley, thence around the other brake-controlled pulley, and thence extended for connection at its other end to the slidable pulley.

9. In a power-transmitting device, the combination of a driving-shaft, a frame, a gear-wheel, one of the two latter parts being rotatable with the shaft, a non-rotatable cone unconnected to but arranged within the frame, a reversed cone rotatably mounted in the frame, a gear-wheel mounted on the axis of the reversed cone and in mesh with the other gear-wheel, a belt engaging the several cones, a pulley adapted to be engaged by the strands of the belt, a rod on which the pulley is slidably mounted, brake-controlled pulleys, the brake mechanism adapted to permit said pulleys to run either loose or fast, a spring-tensioned guide-pulley, and a rope or cable connected at one end to the slidable pulley, thence extended to and around one of the brake-controlled pulleys, thence around the spring-tensioned guide-pulley, thence around the other brake-controlled pulley, and thence extended for connection at its other end to the slidable pulley.

10. In a power-transmitting device, the combination of a driving-shaft, a frame, a gear-wheel, one of the two latter parts being rotatable with the shaft, a normally non-rotatable cone unconnected to but arranged within the frame, a reversed cone rotatably mounted in the frame, a gear-wheel mounted on the axis of the reversed cone and in mesh with the other gear-wheel, means for rotating the rotatable cone from the normally non-rotatable cone at variable speeds, and means for permitting the normally non-rotatable cone to rotate.

11. In a power-transmitting device, the combination of a driving-shaft, a frame, a gear-wheel, one of the two latter parts being rotatable with the shaft, a normally non-rotatable cone unconnected to but arranged within the frame, the axis of said cone provided with a cam-surface, a reversed cone rotatably mounted in the frame, a gear-wheel mounted on the axis of the reversed cone and in mesh with the other gear-wheel, means for rotating the rotatable cone from the normally non-rotatable cone at variable speeds, a pivoted lever carrying a cam-surface, the lever being normally held in position to throw its cam-surface into engagement with the cam-surface of the axis of the normally non-rotatable cone, and means for releasing the lever so as to adapt the same to be turned on its pivot and thereby throw its cam out of engagement with the cam of the axis of the normally non-rotatable cone.

12. In a power-transmitting device, the combination of a driving-shaft, a frame, a gear-wheel, one of the two latter parts being rotatable with the shaft, a non-rotatable cone unconnected to but arranged within the frame, a reversed cone rotatably mounted in the frame, a gear-wheel mounted on the axis of the reversed cone and in mesh with the other gear-wheel, and means for rotating the rotatable cone from the non-rotatable cone at variable speeds.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT B. MANN.

Witnesses:
A. L. MORSELL,
ANNA V. FAUST.