No. 648,235. Patented Apr. 24, 1900.

J. H. BULLARD.

FRICTIONAL DRIVING MECHANISM.

(Application filed Sept. 30, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

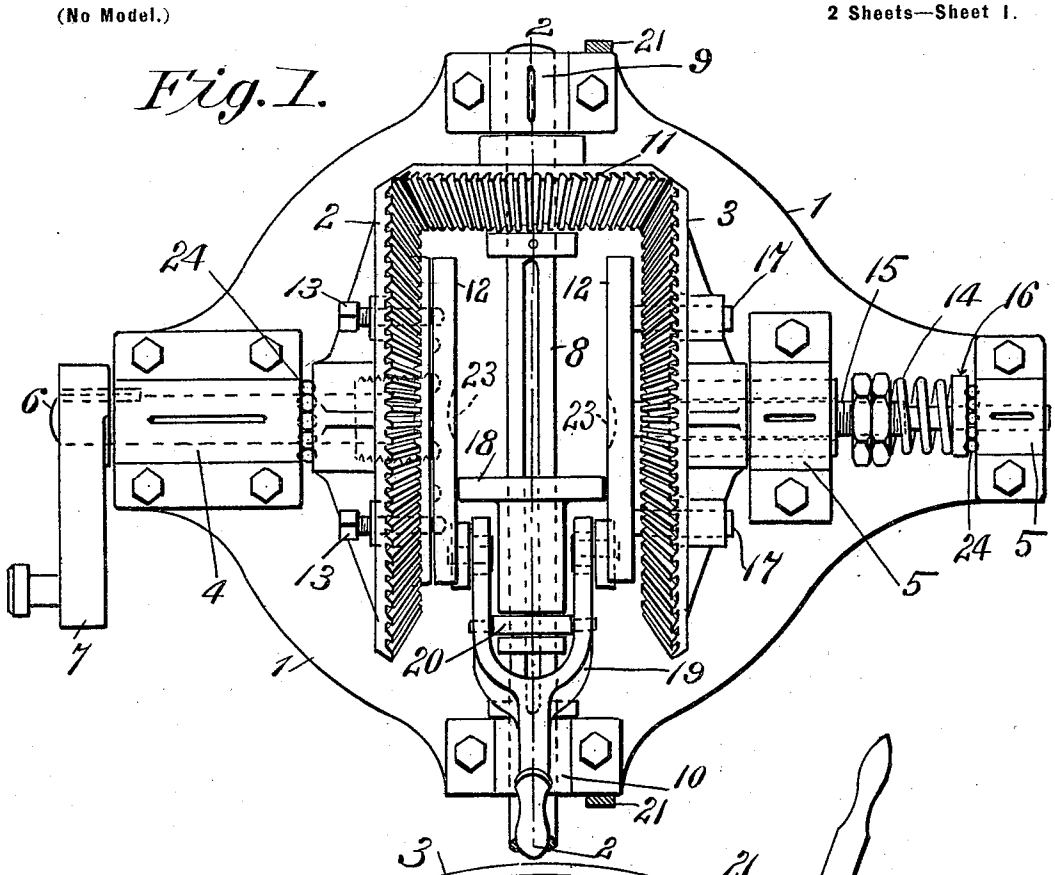

Fig. 2.

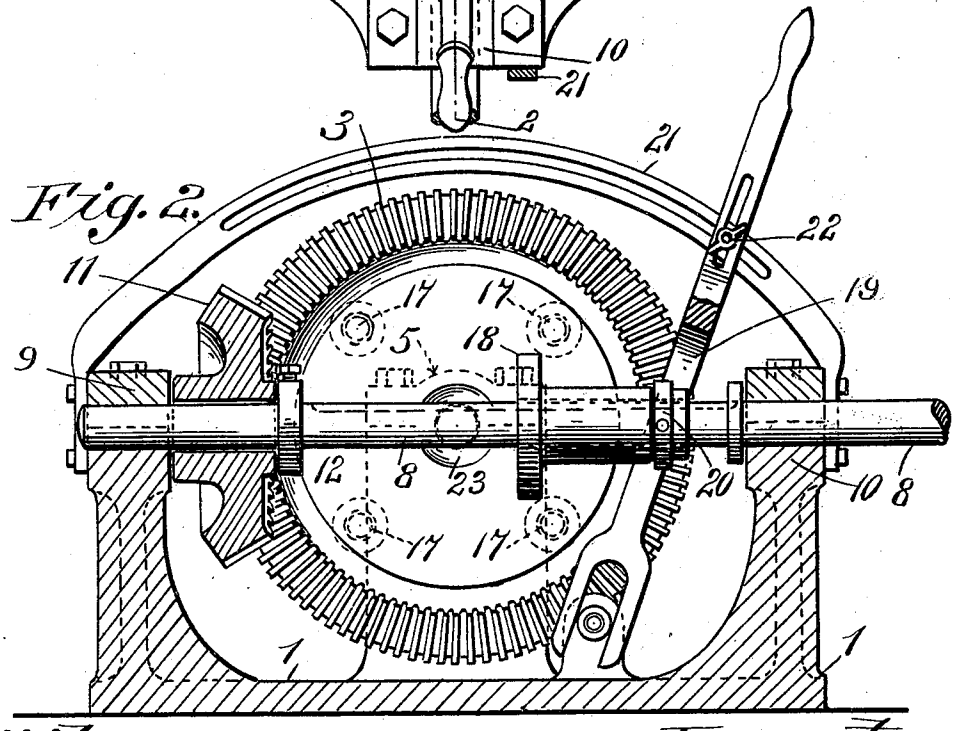

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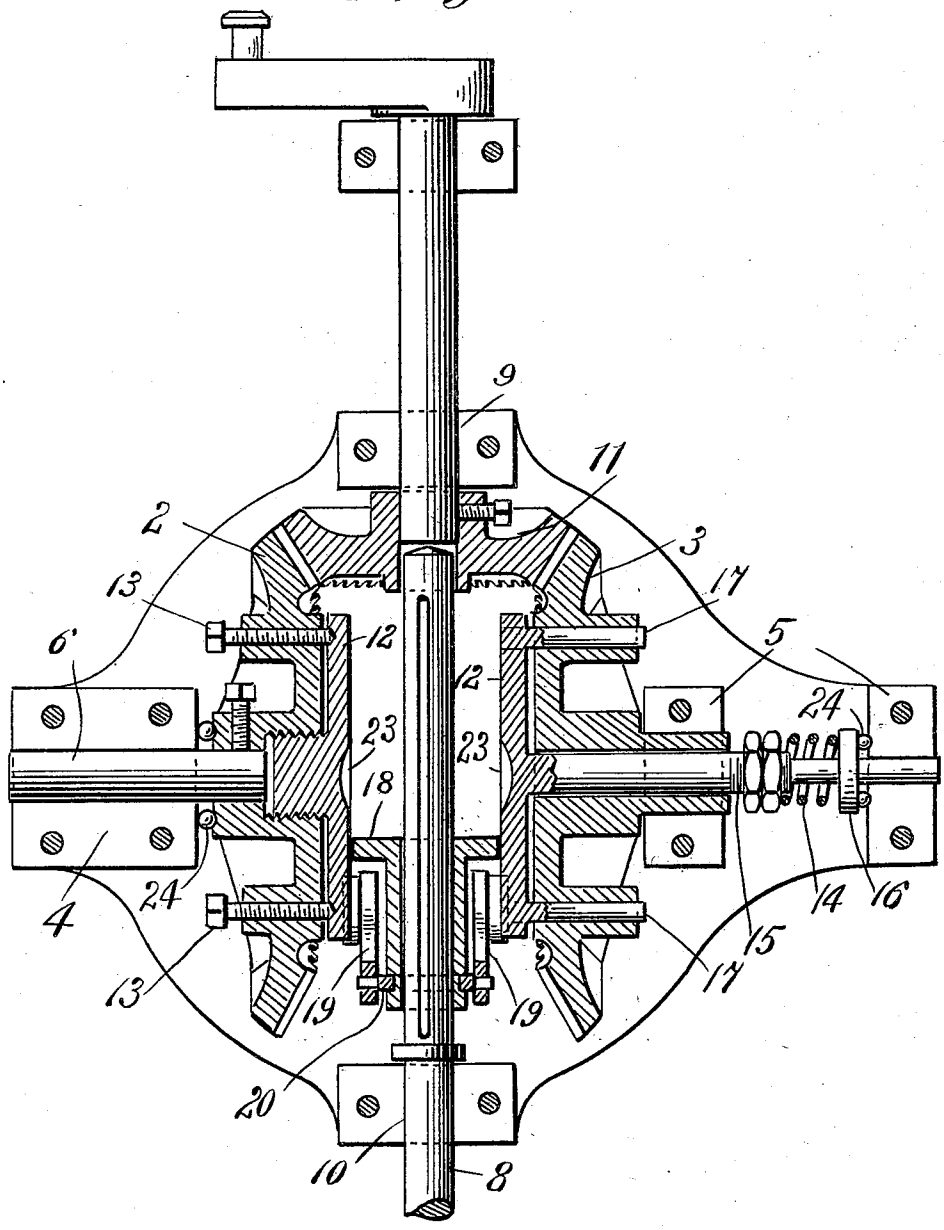
Fig. 3.



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UNITED STATES PATENT OFFICE.

JAMES HERBERT BULLARD, OF SPRINGFIELD, MASSACHUSETTS.

FRICTIONAL DRIVING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 648,235, dated April 24, 1900.

Application filed September 30, 1899. Serial No. 732,191. (No model.)

To all whom it may concern:

Be it known that I, JAMES HERBERT BULLARD, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Frictional Driving Mechanism, of which the following is a specification.

This invention relates to frictionally-driven variable-speed devices, and has for one object the construction of mechanism of this class whereby greater efficiency is attained and whereby means are provided for the disengagement of the driving and driven members of the device at a point where the speed of the driven member is reduced to zero; and a further object of the invention lies in the construction of means for compensating for the wear of the engaging surfaces of the driving or driven members, whereby the member through which the variable speed is attained may never be subjected to any lateral pressure which would tend to deflect the axis thereof from a straight line and cause it to bind in its bearings; and the invention consists in the construction hereinafter fully described and claimed.

In the drawings forming part of this specification, Figure 1 is a plan view of a construction embodying this invention. Fig. 2 is a sectional elevation thereof on line 2 2, Fig. 1. Fig. 3 is a plan view showing a modification of the construction shown in Fig. 1.

This invention has particular reference to that class of devices in which two disks are employed whose axes are located at right angles one to the other and the edge of one of which disks bears on the side of the other, which is the driving member, and is movable radially thereon for the purpose of effecting a variation in the speed of rotation of the driven member. This construction is old and is impracticable, except for the transmission of a small amount of power, because of the fact that the amount of power which can be transmitted through devices of this kind depends entirely on the frictional engagement between the edge of one of said disks with the side of the other. To make this engagement constant, the driven member has sometimes been located between two disks having a common axis, one of which disks has served as a driving-disk and the other being idle and spring-pressed toward the said driving-disk. Sometimes the driven disk is otherwise forced against the driver. Such a construction of course has no advantage in point of efficiency over a construction in which one disk is pressed against the other by any other means, for but one of the disks is a driver.

In carrying out this invention a suitable base-plate 1 is provided, on which two bevel-gears 2 and 3 are mounted in suitable bearings 4 and 5 for rotation on a common axis. The gear 2 is provided with a short shaft 6, on the end of which, outside of its bearing, is fixed a crank 7 or other means for rotating said shaft and gear. The opposite gear 3 is supported on its own hub, which is made of sufficient length to extend through the bearing 5. Intermediate between said bevel-gears 2 and 3 is located the driven shaft 8, at right angles to and passing through the axis of said gears, said shaft being supported for rotation in suitable bearings 9 and 10 on said base-plate 1. Loose on said shaft is an intermediate gear 11, in mesh with both of the said gears 2 and 3. Thus the said crank 7 in revolving will rotate the gear 2, and the latter, through the intermediate gear 11, will cause the rotation of the gear 3 in the opposite direction. Each of said gears is provided with a circular face-plate 12, adjustable toward and from the sides of their respective gears and each other. Said plate 12 on the gear 2 is provided with a screw-threaded hub and screws into the said gear axially, and a number of screws 13 in the body of the gear are turned up against the back of said plate to lock it in any desired position relative to the side of the gear. Preferably the points of these screws enter depressions in the back of the plate, as shown in Figs. 1 and 3 of the drawings. On the said gear 3 the plate 12 is made adjustable in the direction stated by means of a spring 14, one end of which bears against the collar 16, interposed between the bearing 5 and said spring, and the other end against a nut screwed onto the stud 15, centrally located on said plate and extending axially through the hub of said gear 3, the latter rotating in its bearings in a fixed plane, and said stud 15, carrying the plate 12, being movable endwise through said hub. A number of short studs

17, located on the plate 12, enter suitable holes in the body of the gear 3 and prevent the rotation of said plate independently of the gear, and, furthermore, together with the central stud 15, serve as guides for said plate 12 in its movements relative to the side of the gear. A disk 18 is mounted on said driven shaft 8 and adapted to slide endwise thereon and to rotate therewith. Endwise movements are imparted to said disk by any suitable means. In the drawings the means shown consist of a forked lever 19, straddling the hub of said disk 18 and engaging the trunnions of a loose collar 20 on said hub, the lower end of said lever 19 swinging on a suitable pivot on the base-plate 1. By swinging said lever in the direction of the length of the driven shaft 8 said disk 18 may be moved radially of said plates 12. A suitable device for locking said lever in any desired position is shown in Fig. 2 and consists in a slotted curved arm 21, provided with a bolt and thumb-nut 22, passing through a slot in said lever 19. When the disk 18 has been mounted on the driven shaft 8, the said screws 13 of the gear 2 are loosened and turned back, and the plate 12 of that gear is then screwed out of the hub of the gear until it bears with the desired force against the edge of said disk. The nuts on the stud 15 are then set up to compress the spring 14 to whatever point may be necessary to produce a pressure of the plate 12 on the gear 3 against the disk 18 substantially equal to that with which the plate on the gear 2 bears against it. The screws 13 are then turned up into engagement with the plate 12 on the gear 2. With the parts in this position the rotation of the driving means, as the crank 7, for example, will cause the gears 2 and 3, through the connection of the intermediate gear 11, to rotate in opposite directions, and as the plates 12 on these gears bear equally against opposite points on the edge of the disk 18 the driving effect on said disk is twice what it would be if the two gears 2 and 3 were not connected by the intermediate gear. Furthermore, the adjustability of the two plates 12 toward each other permits the disk 18 to be gripped between the said plates with practically equal force from each side thereof, and hence the driving-shaft 8 will not be deflected in the slightest degree from a straight line, and the running parts therefore will rotate as freely with the plates 12 set up hard against the disk as they would if said plates had only a slight frictional engagement therewith.

It is obvious that as the disk 18 is moved toward the center of the plates 12 the speed of rotation of said disk will decrease to zero at the true center thereof, and a further movement across the center will cause said disk to rotate in the opposite direction. It is very desirable, however, that when the disk 18 reaches a point near the center of the plate 12 the frictional engagement between said disk and said plates should be interrupted for two reasons—first, because the plates 12 would grind against the edge of the disk if the pressure between the parts were not relieved when the edge of the disk lies opposite the center of the plates, and, secondly, because as the disk approaches the center of the plates the shortening of the driving leverage causes more or less grinding action between the contacting surfaces of the plates and the edge of the disk, owing to the thickness of the latter. If the edge of the disk were rounded, this grinding action would not take place.

For the reasons above stated the surface of the plates 12 about their center of rotation is depressed, as shown at 23, to the end that the driven shaft 8 may be at rest for a certain period as the disk 18 approaches and passes by the center of said plates.

It is of course immaterial whether the gears 2 and 3, carrying the plates 12, be rotated by power applied to one of said gears or by power applied to the intermediate gear 11. Figs. 1 and 2 of the drawings show the power applied to the gear 2, which is the preferred method; but in Fig. 3 the power is shown applied to the gear 11. This change requires but a slight modification of the construction—viz., the making of the driven shaft 8 in two parts, the ends of which abut within the hub of said gear 11, the latter being secured to that part of the shaft extending outward through the bearing 9 and having a crank or other suitable means thereon for rotating it. This, in effect, is the same as allowing the intermediate gear 11 to rotate freely on the driven shaft 8, as shown in the other figures. In all other respects the constructions are the same.

Between the collar 16 and the end of the bearing 5 and between the hub of the gear 2 and the end of the bearing 4 suitable anti-friction-balls 24 are provided, which take the thrust of the plates 12.

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

1. The combination, in a frictional driving mechanism, of two driving-gears rotatable in parallel planes on a common axis, an intermediate gear in mesh with both of said driving-gears; face-plates on the contiguous sides of said driving-gears; a shaft and a disk thereon located between said plates and rotatable in a plane at right angles thereto, and in frictional contact therewith, and means for adjusting one of said face-plates toward and from the other, whereby their frictional contact with said disk may be increased or diminished, means whereby the driving-gears may be rotated, substantially as described.

2. In a frictional driving mechanism, two driving-gears rotatable on a common axis; an intermediate gear in mesh with both of said driving-gears; a circular plate adjustably supported close to the contiguous sides of each of said driving-gears; a shaft and a disk thereon supported between said plates in contact therewith, and adapted to rotate in a plane

at right angles thereto, combined with means for moving one of said plates positively and the other yieldingly against said disk, substantially as described.

3. In a frictional driving mechanism, two gears rotatable in parallel planes, a circular plate supported close to the contiguous sides of each of said gears, adapted to rotate therewith and movable axially relative thereto; a shaft and a disk thereon supported between said plates, the periphery of which is in contact with the latter, combined with means for moving said disk on said shaft diametrically of said plates, said plates having means for interrupting the contact of the disk and plates at and near the center of the latter, substantially as described.

4. In a frictional driving mechanism, two driving-gears rotatable in parallel planes, a shaft located midway between the contiguous sides of said gears and at right angles to and in the same plane as the axis of said driving-gears; an intermediate gear loose on said shaft and in mesh with both of said driving-gears; a disk on said shaft rotatable therewith and movable lengthwise thereon; a circular plate supported on the contiguous sides of each of said gears and adapted to rotate therewith, and to be moved toward each other into contact with the periphery of said disk, combined with means for moving said disk on said shaft diametrically of said plates said plates having means for interrupting the contact of said disk with said plates at and near the center of the latter, substantially as described.

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