No. 766,438. PATENTED AUG. 2, 1904.

H. W. GARDNER.

DIFFERENTIAL SPEED GEARING.

APPLICATION FILED SEPT. 21, 1903.

NO MODEL.

Fig. 1.

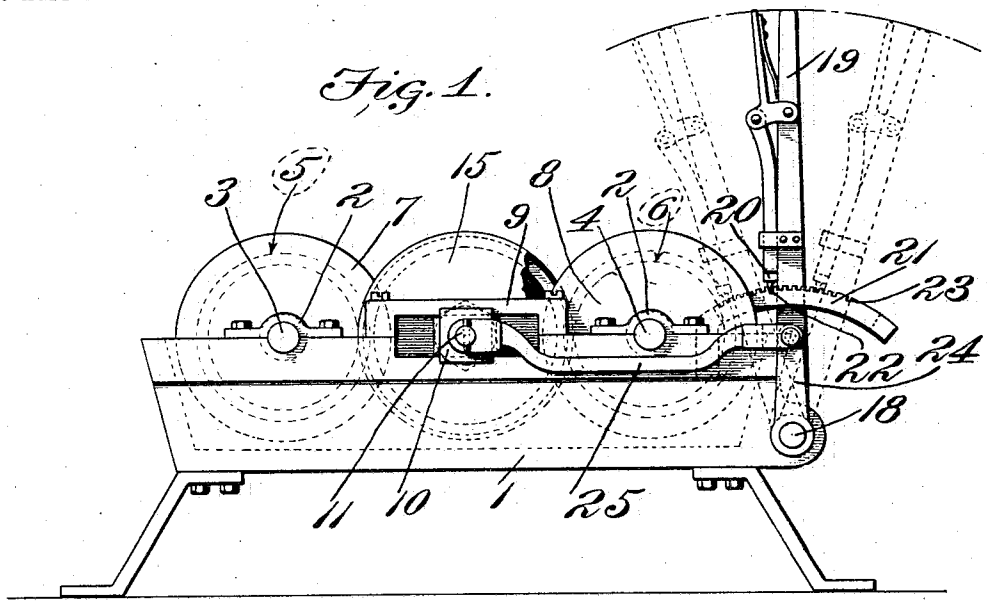


Fig. 2.

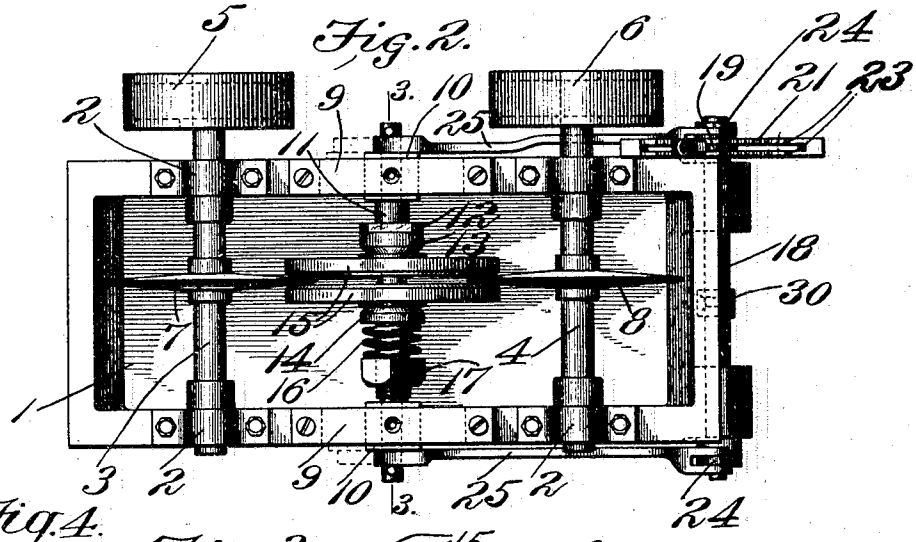


Fig. 4.

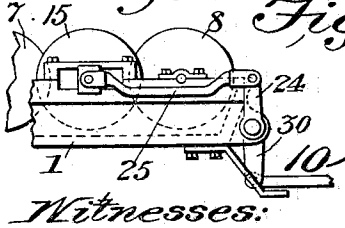
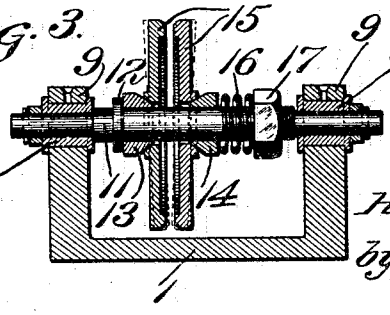


Fig. 3.



Witnesses:

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No. 766,438. Patented August 2, 1904.

UNITED STATES PATENT OFFICE.

HENRY WILLIAM GARDNER, OF FISHER, LOUISIANA.

DIFFERENTIAL-SPEED GEARING.

SPECIFICATION forming part of Letters Patent No. 766,438, dated August 2, 1904.

Application filed September 21, 1903. Serial No. 174,037. (No model.)

To all whom it may concern:

Be it known that I, HENRY WILLIAM GARDNER, a citizen of the United States, residing at Fisher, Louisiana, have invented a certain new and useful Improvement in Differential-Speed Gearing, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevational view of my improved differential-speed gearing. Fig. 2 is a top plan view of the same. Fig. 3 is a vertical cross-sectional view on line 3 3 of Fig. 2, and Fig. 4 is a fragmentary view of the base or casting on which the differential-speed gearing is arranged and illustrates a slightly-modified form of actuating device.

This invention relates to a new and useful improvement in differential-speed gearing, the object being to construct a device of the character described which is portable and which can be applied in any position either vertically or horizontally without interfering with the operation of the device. This differential-speed gearing is especially designed to drive the feed of other machines to regulate the amount of material fed through manufacturing machines. For instance, the gearing is adapted for controlling the speed of carriages on turning-lathes, the feed of a spindle of a boring-machine, or the downfeed of a drill-press, giving all graduation required in the feed of any machine.

With these objects in view the invention consists in the construction, arrangement, and combination of the several parts, all as will hereinafter be described, and afterward pointed out in the claims.

In the drawings, 1 indicates the base-casting, and 2 shows journal-boxes in which are mounted shafts 3 and 4, each of said shafts having a pulley 5 and 6 on its end, either of which pulleys may be the driving or the driven pulley, as the case may be. Shafts 3 and 4 have mounted thereon disks 7 and 8, which are tapered from their upper portions toward their peripheries. Base-casting 1 is formed with guideways, preferably covered by a removable plate 9, in which guideways are mounted sliding journal-boxes 10, said boxes carrying a shaft 11. This shaft has a shoulder 12, which may be in the form of a fixed collar, against which abuts a cone-bearing 13. 14 indicates a companion cone-bearing, preferably loose on the shaft 11 and facing the cone 13. These cone-bearings or "take-up collars," as they might be called, carry disks 15, which are so mounted as to have a slight rocking or oscillating movement on their respective cones. 16 indicates a spring back of the tapered collar 14, tending to force the same and its carried disk 15 toward the companion members, the outer end of said spring finding a bearing against a nut 17, threaded on the shaft, by which the tension of the spring may be regulated.

18 indicates a rock-shaft from which extends an operating-lever 19, said operating-lever having a manually-operable dog 20, engaging with the teeth of a segment-rack 21, mounted on the base-casting 1. By this means the lever and rock-shaft may be adjusted and held in its adjusted position. I prefer to enlarge the central notch of the segment, as at 22, so that when the dog is located therein the operator may know that the relation of the pulleys is one to one. When the dog is located in the notches to either side of this central notch, the relation of the pulleys is of course changed. I may also arrange two notches 23 at the extreme ends of the segment and isolated from the group of notches, so that when the dog is in either of these two extreme notches one or the other of the tapered disks is out of engagemement with the companion spring-held disks 15.

The rock-shaft 18 has rock-arms 24 on its ends, to which are connected links 25, said links extending inwardly and being connected to the sliding boxes containing the shaft 11. Thus when the rock-shaft 18 is operated the boxes and their carried shaft 11 are moved toward or away from one or the other of shafts 3 and 4, as the case may be.

In operation if we assume that pulley 5 is the driving-pulley when the shaft 11 is adjusted near shaft 3 by moving the hand-lever outwardly to the last notch of the series it

will be obvious that the spring-pressed disks 15 will engage the taper disk on shaft 3 near its axis of rotation, while said spring-pressed disks 15 will engage the taper disk on shaft 4 farther away from its axis of rotation. Consequently shaft 4 will be driven at a lower rate of speed than the driving-shaft 3. According to the proportion of parts shown in the drawings one revolution of shaft 3 under the conditions just mentioned will drive shaft 4 one-half a revolution. If the hand-lever is now adjusted inwardly, so as to locate the dog in the larger central notch, it follows as the inner peripheral edges of the spring-pressed disks 15 engage the taper disks on shafts 3 and 4 at equal distances from their axis of rotation that one revolution imparted to shaft 3 will drive the shaft 4 the same distance, or one revolution also. By adjusting the hand-lever inwardly to the last notch of the series the peripheral engagement of disks 15 with the taper disk on shaft 3 is farther away from its axis of rotation and nearer to the axis of rotation of the taper disk on shaft 4. Consequently under this condition shaft 4 will be driven at a more rapid rate of speed than shaft 3, the proportion of the parts indicated in the drawings being when the hand-lever is so adjusted two to one. In other words, shaft 4 will be rotated two complete revolutions while the driving-shaft makes one complete revolution.

From the above it will be seen that the ratio of the driving and driven shafts ranges from two to one to one to two. In the machine shown and within this range various intermediate ratios may be obtained by adjusting the dog in the several notches of the segment.

In the event that it is desired to throw out the differential gearing of any kind it is only necessary to move the hand-lever to the extreme notch in either direction to disengage either one of the taper disks from the companion disks 15.

Instead of using the hand-lever to make the adjustments of the companion disks a rock-arm 30, depending from shaft 18, may be employed, said rock-arm being connected to a link or lever, so that the differential-speed gearing may be adjusted from a distance, as illustrated in Fig. 4.

By adjusting the tension of spring 16 on shaft 11 it will be evident that the friction of the disks 15 on the taper disks may be increased or diminished. It will also be noted with respect to my differential-speed gearing that the same acts like a friction-clutch with respect to a suddenly-applied load on the machine to which power is being imparted. Any resistance on the part of the driving-shaft and speed-gearing device which is too great to be overcome by the friction contact of disks 15 will permit either the driving taper disk or the disks 15 to rotate independently without danger of forcing the machine to which power is being transmitted, and thus accidents and breakage are avoided.

The taper or cone collars 13 and 14 permit companion disks 15 to accommodate themselves to various adjustments and impose but little frictional resistance to the operation of the device. Of course there is also friction between the inner peripheral edges of the disks 15 and the taper disks on the shafts 3 and 4; but this is not a serious objection, as it is a rolling friction and does not impede or retard the free movement of the parts to any appreciable extent. In fact, there is no lateral or transverse thrusts on any of the shafts due to frictional resistance, the device running free at all times.

I am aware that minor changes in the construction, arrangement, and combination of the several parts of my device can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

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

1. In a differential-speed gearing, a supporting-base having parallel guideways, journal-bearings slidable in said guideways, removable locking-plates extending over the guideways to secure the bearings therein, a shaft carried by the bearings, clutch means carried by the shaft, and rotatable disks mounted in fixed bearings on the base and for engagement by the clutch means.

2. In a differential-speed gearing, a supporting-base having parallel guideways, journal-bearings slidable in said guideways, arched locking means secured to the base and bridging the guideways to slidably secure the journal-bearings therein, a shaft carried by the bearings, clutch means carried by the shaft, and rotatable disks mounted in fixed bearings on the base and for engagement with the clutch means.

3. In a differential-speed gearing, a supporting-base having parallel guideways, journal-bearings slidable in said guideways, removable locking-plates extending over the guideways to secure the bearings therein, a shaft carried by the bearings, clutch means carried by the shaft, rotatable disks mounted in fixed bearings on the base and for engagement by the clutch means, a rock-shaft carried by the base, link-connected to the bearings and the rock-shaft, and means for actuating the rock-shaft.

4. In a differential gearing, a base having a pair of rotatable disks in fixed bearings, a clutch means for variable engagement with the respective disks, sliding bearings carrying said clutch means, means for moving the bearings to a predetermined position with relation to the first-named disks, said bearing-moving means comprising a pivoted lever con-

nected to the bearings, a dog carried by the lever, a rack-bar for engagement by the dog, the teeth of the rack being spaced apart at intervals to a greater degree than spaces of the teeth adjacent thereto, to indicate the degree of engagement of the clutch means with the disk.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 16th day of September, 1903.

HENRY WILLIAM GARDNER.

Witnesses:

C. P. DUNCAN,

T. R. MALIN.