J. T. HARDAKER.

CHANGE SPEED GEARING.

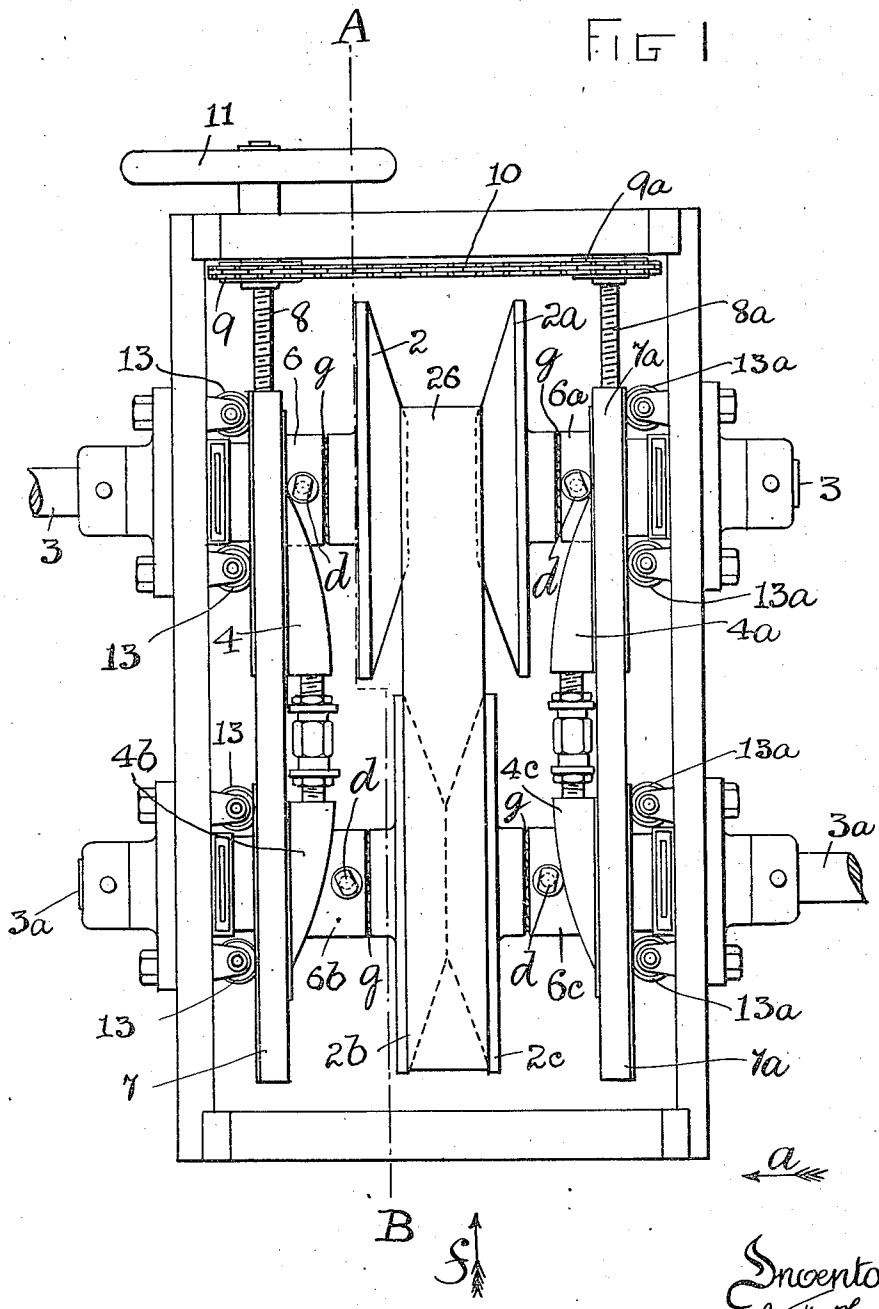
APPLICATION FILED OCT. 4, 1915.

1,235,794.

Patented Aug. 7, 1917.

2 SHEETS—SHEET 1.

FIG 1



Inventor
J. T. Hardaker
by Wright Brown Quinby & May
Attorneys.

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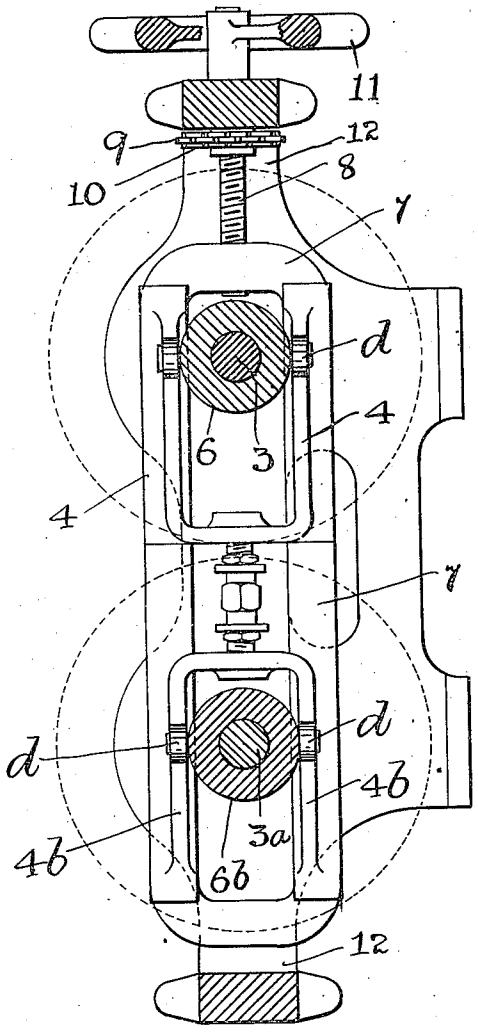
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2 SHEETS—SHEET 2.

FIG 2



Inventor
J. T. Hardaker
by Wright Brown Quinby & May
Attorneys

UNITED STATES PATENT OFFICE.

JOHN THOMAS HARDAKER, OF BRADFORD, ENGLAND.

CHANGE-SPEED GEARING.

1,235,794. Specification of Letters Patent. Patented Aug. 7, 1917.

Application filed October 4, 1915. Serial No. 53,876.

To all whom it may concern:

Be it known that I, JOHN THOMAS HARDAKER, a subject of the King of Great Britain, and resident of Bowling Iron Works, Bradford, in the county of York, England, have invented a certain new and useful Improvement in Change-Speed Gearing, of which the following description, having reference to the accompanying sheets of drawings, is a specification.

This invention relates to the class or type of change speed driving gear wherein two pairs of coned driving disks are made use of, one pair being mounted upon the driving shaft while the other pair is mounted upon the driven shaft, the driving belt extending from one pair to the other. In this type of driving gear the advancing of one pair of cones toward each other to increase their effective diameter while the other pair of cones are simultaneously receding from each other to decrease their effective diameter, and vice versa, is the method followed of varying the speed of the driven shaft relatively with the driving shaft. It is known that the distances through which each advancing and receding movement respectively of said cones is carried out are not equal, that is to say, the advancing movement of one pair of cones from a central position must be greater than the receding motion of the other pair of cones from a like position, in order to keep the tension of the belt even throughout. To attain this object heretofore lever devices have been made use of wherein the advancing movement of one arm of the lever varies from the receding movement of the other arm of the lever relatively with the paths through which the advancing and receding disks are made to move. However, the employment of these lever devices does not attain the object desired with that precision that is necessary because of the fixed relative ratios that exist between the movement of a lever and the paths in which the disks follow, neither can such levers be altered or varied as circumstances may require. To overcome this difficulty and produce means whereby the disks which recede from each other may be moved through spaces which vary from the spaces through which the disks which are advancing toward each other, move, and that any alterations necessary to attain this with the greatest accuracy may be easily and readily effected, is the object of my invention.

In the accompanying sheets of drawings which are illustrative of my invention:—

Figure 1 is an elevation illustrating the formation and arrangement of devices that I make use of.

Fig. 2 is a sectional elevation taken on line A—B of the parts shown by Fig. 1 and as seen in the direction indicated by the arrow *a*.

To attain the object of my invention I make use of the usual form or shape of cone driving disks 2, 2^a, 2^b, 2^c and arrange same to slide on their driving and driven shafts 3, 3^a as heretofore. However, instead of relying on lever actions for transmitting motion to these disks 2—2^c I introduce four pairs of incline or cam surfaces 4, 4^a, 4^b and 4^c. The type of sliding inclines 4—4^c as will be observed, may be shaped or cut to the exact requirements that any variations in the sliding movements of the disks 2—2^c necessitate. In the arrangement of the inclines or sliding cam surfaces illustrated, I make use of sleeves 6, 6^a, 6^b, 6^c, that will slide upon the shafts 3 and 3^a respectively, but which are held against rotation by the sliding bars 7 and 7^a engaging flattened parts of said sleeves, thus said sleeves while being permitted to slide through the central openings of the bars 7 and 7^a are by being spanned by said bars securely held against rotation as desired. Upon these bars 7 and 7^a I mount my series of inclines 4—4^c and these bars 7 and 7^a are arranged to slide over the two pairs of sleeves as they are actuated by the screws 8 and 8^a. The screw 8 has mounted upon it a sprocket wheel 9, while the sprocket wheel 9^a is fixed upon the screw 8^a, so that by coupling the two wheels 9 and 9^a together by a chain 10, when the hand wheel 11 is rotated (since it is fixed upon the outer end of the screw 8) both of said screws 8 and 8^a are rotated and transmit motion to their respective bars 7 and 7^a in one direction or the other according to the direction in which the hand wheel 11 is being rotated.

The shafts 3 and 3^a and their several bearings and parts are mounted upon framework 12, and upon this same framework are bearings carrying antifriction rollers 13, 13^a against which the bars 7 and 7^a may press

as they are being moved or slid over the sleeves 6—6ᶜ.

As the inclines 4—4ᶜ are thus moved by their respective bars 7 and 7ᵃ, they are caused to press upon rollers *d* carried by their respective sleeves 6 and 6ᶜ hence said inclines 4—4ᶜ as they advance and force the rollers *d* toward each other their respective sleeves 6—6ᶜ will also be forced to approach each other, and will thus force the pairs of disks 2—2ᵃ or 2ᵇ, 2ᶜ toward each other as will be understood; since the sleeves 6 and 6ᵃ abut against the hubs of the disk 2 and 2ᵃ, while the sleeves 6ᵇ and 6ᶜ abut or press against the sleeves of the disks 2ᵇ and 2ᶜ. The arrangement of the inclines 4—4ᶜ is such that when their respective bars 7 and 7ᵃ are moved in the direction indicated by the arrow *f*, the disks 2 and 2ᵃ will be made to approach each other, at which time the disks 2ᵇ and 2ᶜ will recede from each other the reverse motion of the bars 7 and 7ᵃ having the effect of reversing the actions of said disks 2, 2ᵃ, and 2ᵇ, 2ᶜ. In order to relieve the disks of excessive friction I mount between the sleeves 6—6ᶜ and their respective disks 2—2ᶜ at the parts *g* antifriction ball thrust bearings.

Such being the nature and object of my invention, what I claim is:—

1. In change speed mechanism, a driving shaft and a driven shaft having belt connection, complemental belt-engaging cone disks on each of said shafts, said cone disks on each of said shafts being movable laterally toward and from each other, and means operable to cause, simultaneously, the cone disks of one of said shafts to approach each other and permit the cone disks on the other of said shafts to recede unimpeded at a predetermined rate from each other, said means including a plurality of cam-carrying members arranged to be moved simultaneously transversely of the shafts, cams arranged on said cam-carrying members, anti-friction devices arranged between said cams and said cone disks, each of said anti-friction devices being provided with a cam-engaging part and a cone-disk-engaging part, and mechanism for moving said cam-carrying members in unison.

2. In change speed mechanism, a driving shaft and a driven shaft having belt connection, complemental belt-engaging cone disks on each of said shafts, said cone disks on each of said shafts being movable laterally toward and from each other, and controlling means operable to cause, simultaneously, the cone disks on one of said shafts to approach each other and to permit the cone disks on the other of said shafts to recede unimpeded at a predetermined rate from each other, said controlling means including a plurality of yoked cam-carrying members arranged to be moved in unison transversely of the shafts, cams arranged on said cam-carrying members, sleeves arranged on each of said shafts between said cams and said cone disks, each of said sleeves being provided with spaced-apart cam-engaging parts whereby a plurality of said cams may act upon the sleeve in unison, and each of said sleeves being provided with a cone-disk-engaging part, and manually operative mechanism for moving said yoked cam-carrying members in unison.

JOHN THOMAS HARDAKER.

Witnesses:

SAMUEL HEY,

AUGUSTUS E. INGRAM.