No. 729,289. PATENTED MAY 26, 1903.

A. A. DE LOACH.

VARIABLE SPEED MECHANISM.

APPLICATION FILED NOV. 15, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.

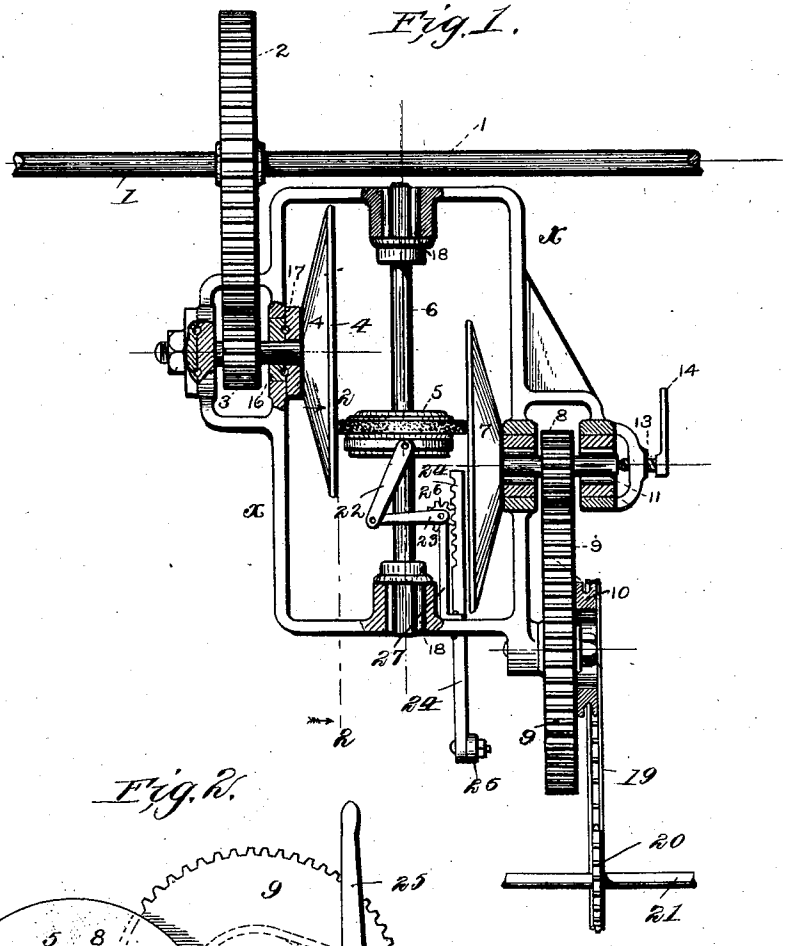
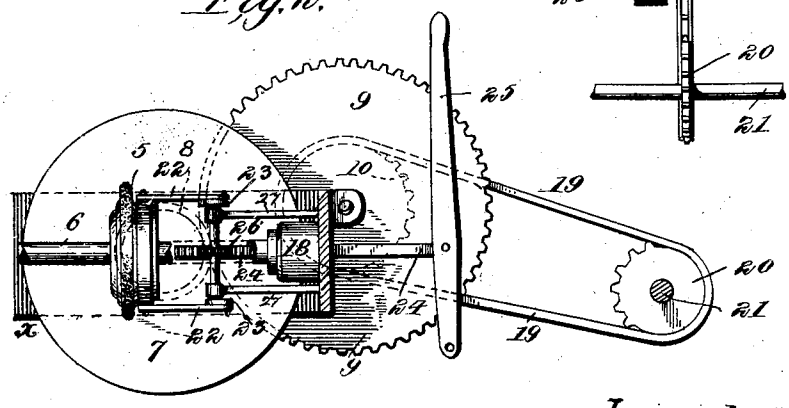


Fig. 2.



Witnesses

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 3.

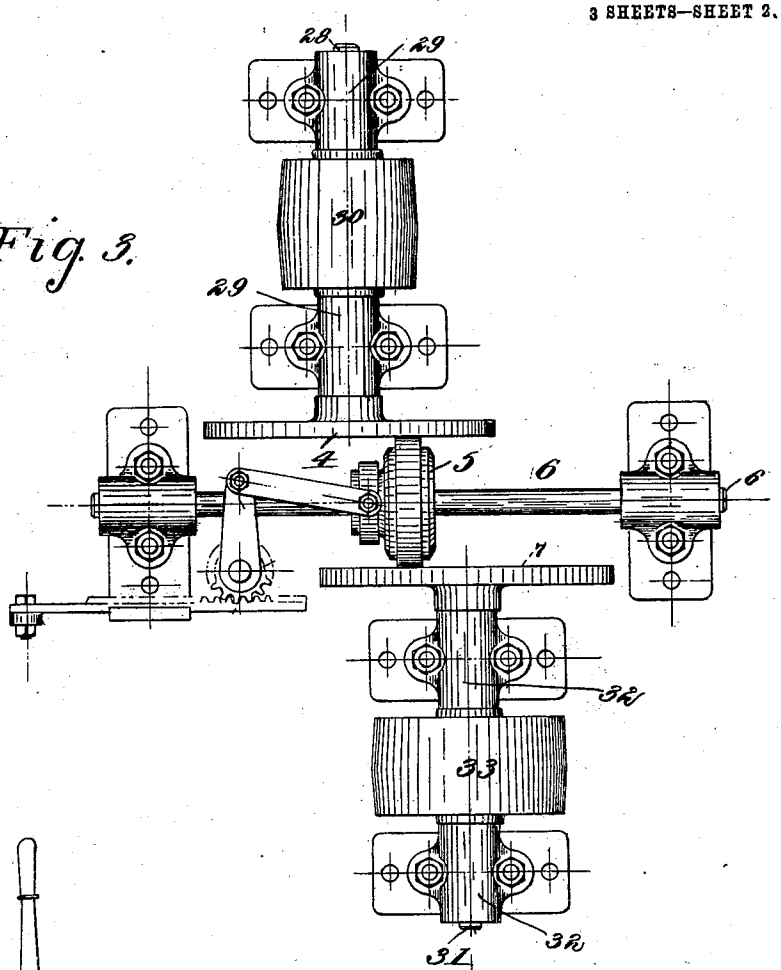
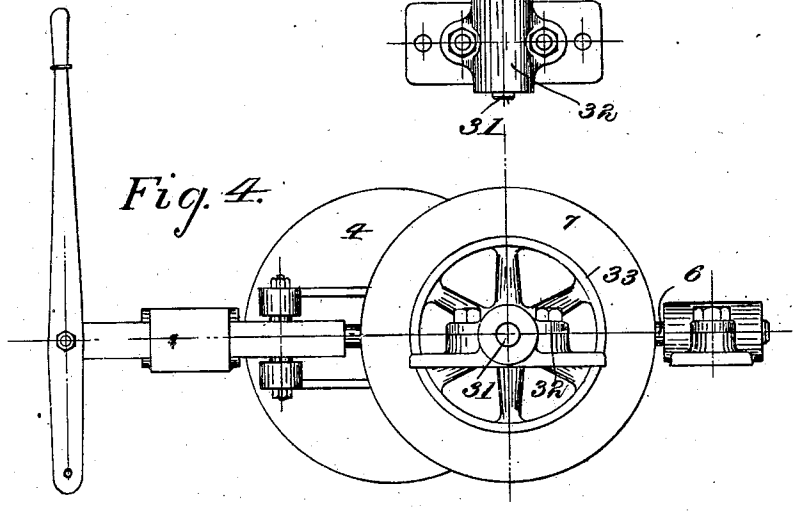


Fig. 4.



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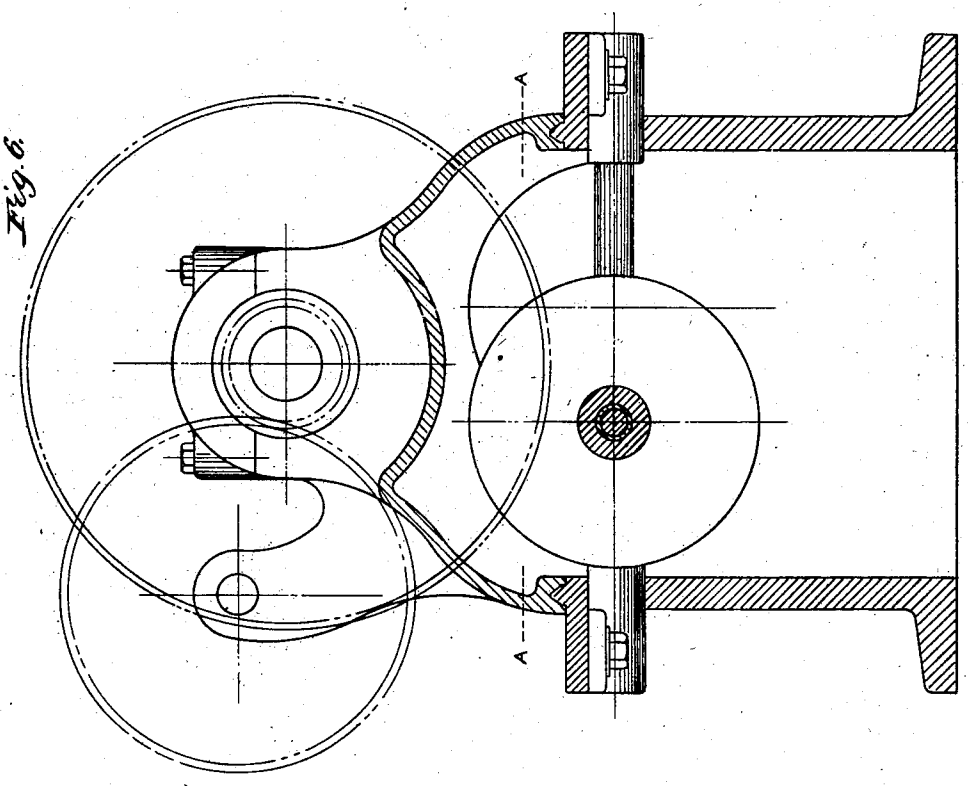
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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 6.



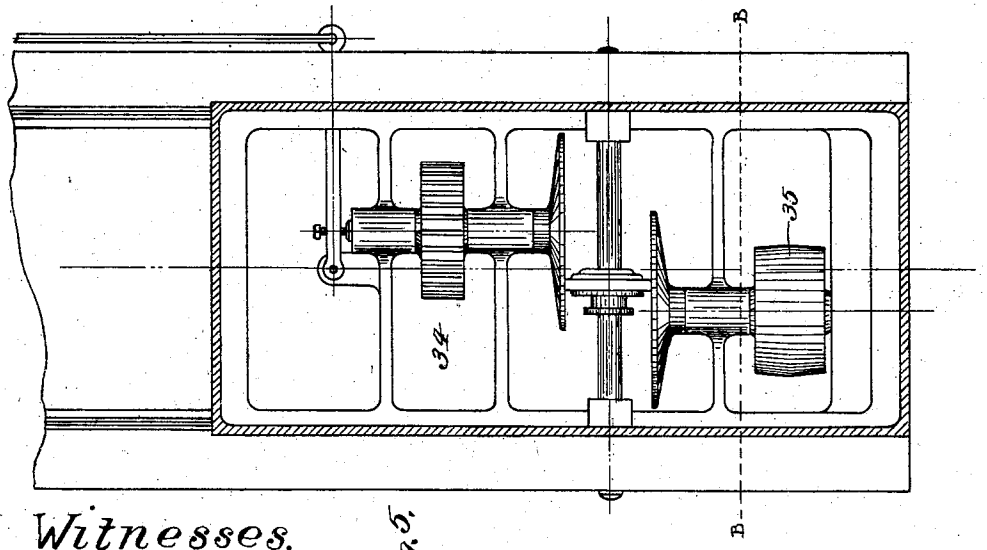


Fig. 5.

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No. 729,289. Patented May 26, 1903.

UNITED STATES PATENT OFFICE.

ALONZO AARON DE LOACH, OF ATLANTA, GEORGIA.

VARIABLE-SPEED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 729,289, dated May 26, 1903.

Application filed November 15, 1902. Serial No. 131,519. (No model.)

To all whom it may concern:

Be it known that I, ALONZO AARON DE LOACH, a citizen of the United States, and a resident of Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Variable-Speed Mechanism, of which the following is a specification.

My invention relates to an improvement in variable-speed mechanism which is particularly adapted for automobiles, engine-lathes, and various other forms of light machinery.

In the accompanying drawings I illustrate the application of my invention under several forms.

The details of construction, arrangement, and operation of parts are as hereinafter described and claimed.

In the said drawings, Figure 1 is a plan view, part being in section, of my invention as applied in a form of improved automobile driving-gear. Fig. 2 is a longitudinal section on the line 2 2 of Fig. 1. Fig. 3 is a plan view illustrating the application of my invention for driving light but fixed machinery. Fig. 4 is an end view of the apparatus shown in Fig. 3. Fig. 5 is a horizontal section on the line A A of Fig. 6 and illustrating my invention applied to an engine-lathe. Fig. 6 is a vertical cross-section on the line B B of Fig. 5.

It is particularly requisite that the speed of automobiles may be quickly varied and that the direction of movement of the vehicle may be quickly reversed, also that these results shall be attained without jar and with minimum physical exertion on the part of the driver.

The application of my invention in a form of improved automobile driving-gear, as illustrated in Figs. 1 and 2, will now be described. 1 indicates the engine or motor shaft from which the gearing is driven, and 21 the axle of the automobile, the same being arranged parallel to the shaft 1. The frame X, by which the gearing is mainly supported, is rectangular or oblong and arranged horizontally between the shaft 1 and axle 21. A large spur-gear 2 is keyed on the driving-shaft 1 and meshes with the pinion 3, mounted upon a shaft carrying a friction-disk 4. The shaft 1 is supposed to be driven at a constant speed, and therefore the disk 4 will have a constant speed. A similar friction-disk 7 is arranged diagonally opposite the disk 4, with its face parallel to the same plane. The disk 7 is carried by a shaft upon which is fixed a pinion 8, that gears with a large gear 9, to which is attached a sprocket 10. A chain 19 runs from this sprocket to a similar one, 20, on the axle 21. Between and at an equal distance from the two friction-disks 4 and 7 is arranged a feathered shaft 6, having antifriction or roller bearings 18 in the ends of the frame X. Upon said shaft is mounted a friction-wheel 5, the same being adapted to slide on the feather, and thus rotating with the shaft. Means are provided for adjusting this transfer-wheel 5, which runs in contact with the two opposite disks 4 and 7. For this purpose I employ a rack 24 and hand-lever 25, the rack sliding in suitable guides on the frame and engaging a pinion 26, having its bearings in a frame 27, (see Fig. 2,) which forms a rigid attachment of the frame. Lever-arms 23 are rigidly connected with the axle of the pinion 26 and pivotally connected with arms 22, which are in turn pivoted to a band encircling a grooved hub of the transfer-wheel 5. It is obvious that by shifting the lever 25 the pinion 26 will be rotated and the friction-wheel 5 shifted along the shaft 6. As shown in Fig. 1, the wheel 5 is at such a point on the face of the driving-disk 4—that is to say, at such distance from the axis of such disk—that it receives a relatively high speed; but it runs on the driven disk 7 at a point near the axis of the same, and therefore the pinion 8 will drive the gear 9 at a double speed, which will be transferred to the axle 21 through the medium of the sprocket-gearing. It is apparent that if the transfer-wheel 5 be moved toward the center of the disk 4 its speed will be reduced, since it is being driven by a smaller diameter, and that such rotation of speed is practically doubled by reason of the fact that the wheel 5 in such movement is carried out on the disk 7 to a greater diameter, whereby the speed of the pinion 8, and consequently the axle 21, will be reduced correspondingly.

In brief, the nearer the friction-wheel 5 runs to the center of the friction-disk 4 the less the speed, and vice versa. It is to be noted, however, that the relative location or adjustment of the disks 4 and 7 is such that if the friction-wheel 5 be moved just past the center of the disk 4, as indicated by dotted lines, Fig. 1, it will cause reversal of the vehicle and at slow speed. Also if the wheel 5 be moved out to the edge of disk 4—*i. e.*, farther out than shown by full lines, Fig. 1—it will pass the center of the disk 7, and thereby the direction of motion of the latter will be reversed at high speed. The importance of these features in automobiling is obvious, and it would be of even greater advantage in certain other classes of driving-gear—as, for example, in screw-cutting on lathes. Therefore the provision of the shaft 6, more particularly its arrangement relative to the disks 4 and 7, it being equally distant and directly opposite their respective centers, and the adaptation of the friction-wheel 5 to move thereon past the centers of the two disks, is of great importance. Antifriction-bearings are provided for all the journals or shafts, as at 11, 17, and 18. For the purpose of adjusting the friction-disk 7 in order to relieve pressure between the transfer-wheel 5 and friction-disk 7, as when it is desired to stop running of the gearing, I apply a screw 13 (see Fig. 1) so as to bear upon the outer end of the shaft of disk 7, and I provide such screw with a lever-handle 14 for convenience of adjustment. The screw 13 has a fast pitch and double thread, so that but a slight movement of lever 14 is required to accomplish the result above referred to. The lever 14 will in practice be within reach of the driver of an automobile.

In the invention illustrated in Figs. 3 and 4 the friction-disks 4 and 7 are arranged as before described, and intermediately are placed the shaft 6 and transfer-wheel 5, with adjusting mechanism. The shafts 28 and 31 of the respective disks 4 and 7 are, however, mounted in fixed bearings 29 and 32, as shown. A band-pulley 30 is mounted on the driving-shaft 28 and a narrower pulley on the shaft 31. As thus arranged the apparatus is adapted for driving light machinery of various kinds and the speed of the same is controllable, or motion may be reversed, as in the case of the automobile mechanism above described.

In Figs. 5 and 6 my invention is applied to a metal-working engine-lathe. In this instance the friction-disks and the intermediate friction-wheel 5 and the shaft whereon it is slidable are arranged as before described. On the shaft of one of the friction-disks is arranged a spur-gear 34 and on the other shaft a broad band-pulley 35. This arrangement is designed to take the place of the ordinary cone-pulleys employed for variable speed. I secure a much broader range from high to low speed, the variation being effected in the slightest degree anywhere between the two extremes. In an ordinary engine-lathe in any shifting from one cone to another there is a change from fifty revolutions per minute to the next higher step, in the neighborhood of a hundred, whereas with my improvement the speed may be varied down to two or three revolutions per minute. Another important advantage in using one pulley instead of the cone-pulleys is that ample space is provided for use of a belt as wide as may be desired, whereby the capacity of the lathe is greatly increased in addition to the advantage of the variable speed. The life of the belt when made thus wide is also increased several hundred per cent. In order to obtain different speeds of the ordinary cone-pulleys, it is necessary that the belts hall be made narrower, and it being subject to great strain the lacing is frequently broken, and ordinarily a belt does not last more than a year. By using the broad belt more work is done and its durability is very greatly increased, so that it may last ten years or more, if properly cared for.

Thus in the several forms of my invention I provide for a minute adjustment of speed and for reversal by the same mechanism, both changes being effected without jar or serious strain.

I propose to employ my invention for operating all classes of machinery to which it is applicable.

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

1. The combination, with a friction driving-disk and a driven disk, arranged at diagonally opposite points and each projecting past the center of the other, of a shaft arranged centrally between such disks, and the friction transfer-wheel mounted slidably on the shaft and adapted to be shifted thereon past the center of each disk, means for shifting said wheel, and driven mechanism connected with the respective disks, substantially as shown and described.

2. In a variable-speed mechanism, the combination, with two diagonally opposite disks having their faces parallel and unobstructed, of a friction-wheel and a shaft therefor which is arranged equally distant from and parallel to the diameters of the respective disks, the said wheel being thus adapted to be moved freely over the face of either disk past the center thereof, substantially as shown and described.

3. The combination, with a power-shaft and a spur-gear, a pinion and a friction-disk mounted on the same shaft of a corresponding gear, pinion-shaft, and friction-disk, the two disks being arranged diagonally opposite and each extending past the center of the

other, a shaft arranged equally distant between and parallel to said disks, a friction transfer-wheel mounted on said shaft and adapted to slide each way past the center of the driven disk, and means for shifting the transfer-disk, a driven axle, sprockets, a chain, and a rack, pinion, and lever mechanism for adjusting the transfer-wheel substantially as shown and described.

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