No. 649,020. Patented May 8, 1900.

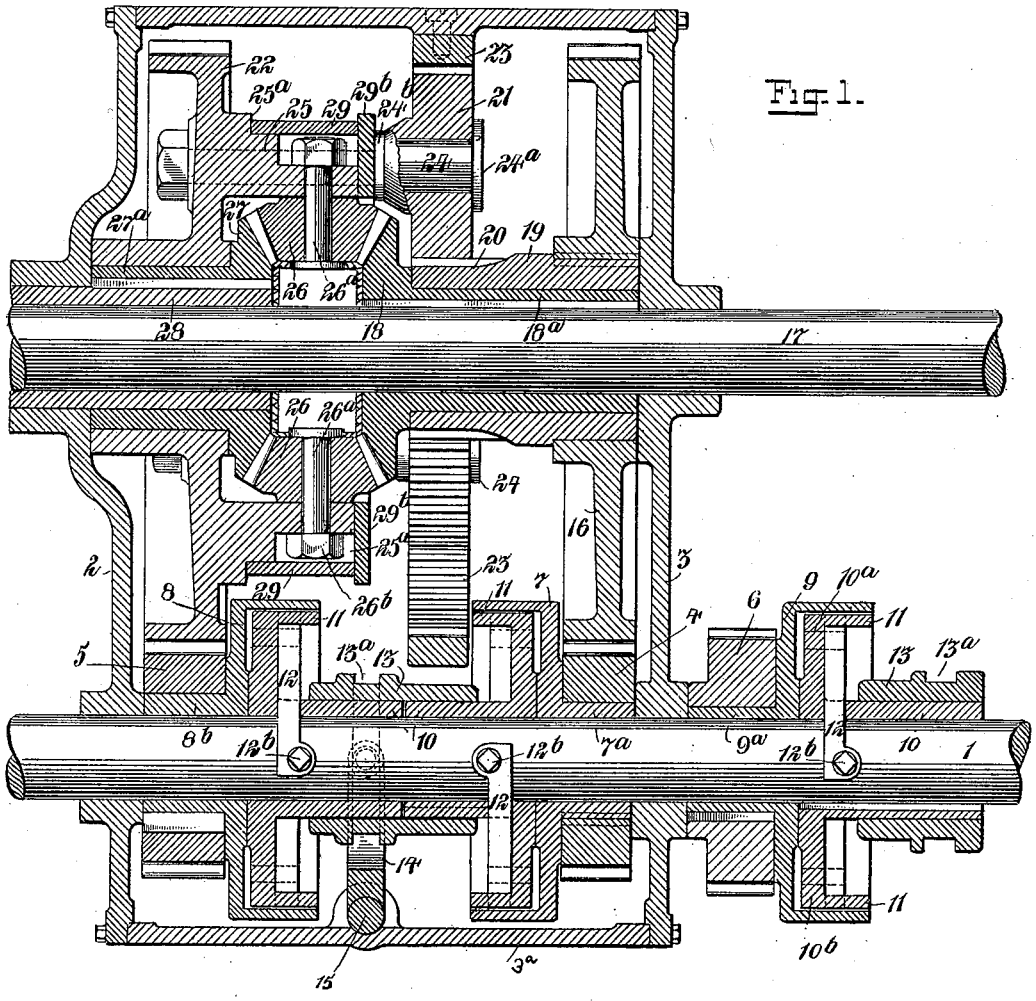
C. UPTON.

VARIABLE GEARING.

(Application filed June 7, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

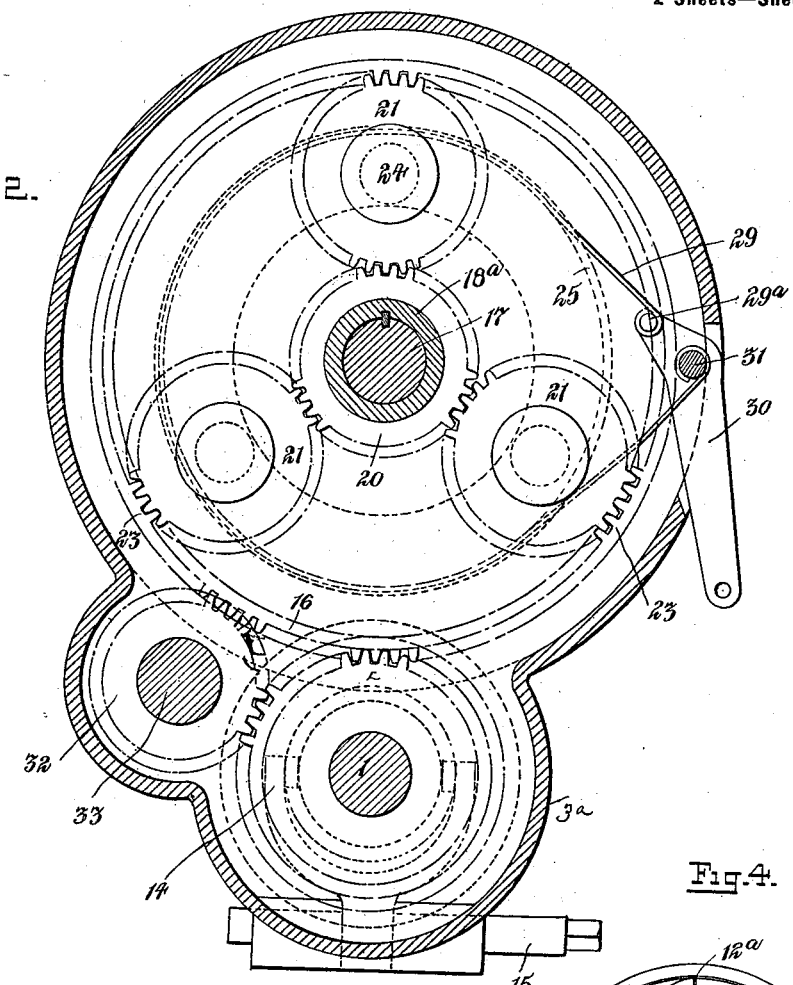


Fig. 4.

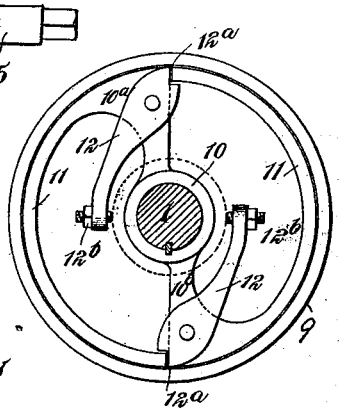
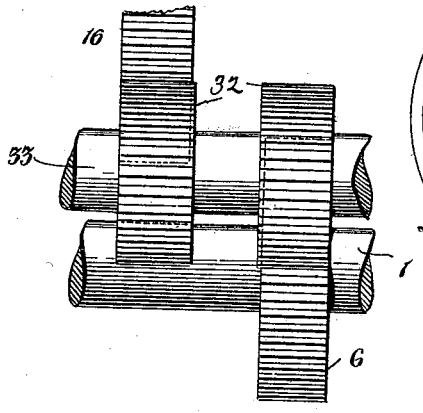


Fig. 3.



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UNITED STATES PATENT OFFICE.

COLCORD UPTON, OF BEVERLY, MASSACHUSETTS.

VARIABLE GEARING.

SPECIFICATION forming part of Letters Patent No. 649,020, dated May 8, 1900.

Application filed June 7, 1899. Serial No. 719,664. (No model.)

To all whom it may concern:

Be it known that I, COLCORD UPTON, a citizen of the United States, residing in Beverly, Essex county, State of Massachusetts, have invented certain new and useful Improvements in Variable Gearing, of which the following is a specification.

My invention relates to gearing particularly adapted for use in vehicles; and one object of the invention is to provide means for communicating variable speeds from a driving to a driven part, and also to permit reversing the direction of rotation of the driven part; and another object of my invention is to provide compensating means to enable a vehicle to readily travel on a curve or around corners.

The invention consists in the novel details of improvement and the combinations of parts, that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming part hereof, wherein—

Figure 1 is a central section through a gearing embodying my invention. Fig. 2 is a diagrammatical view, the casing being in section. Fig. 3 is a detail view of part of the gearing, and Fig. 4 is a partly-sectional detail view of a friction-clutch.

Similar numerals of reference indicate corresponding parts in the several views.

1 indicates a main shaft to be driven, which may be journaled in any suitable bearings and rotated by any suitable means, such as a motor or the like. I have shown the shaft 1 as journaled in bearings in a casing, of which 2 3 are the side walls, and 3^a is an inclosing shell to which the side walls are secured, all of which may be of suitable construction, and the casing may be mounted in a vehicle in suitable manner. Upon the shaft 1 are loosely mounted pinions 4 5 6, adapted to communicate motion to the driven shaft or axle. I provide friction devices or clutches adapted to rotatively connect either of said pinions with shaft 1, as may be desired. The devices I have shown for this purpose are as follows: 7 8 9 are friction-drums having internal friction-surfaces and shown provided with hubs 7^a 8^a 9^a, which drums and their hubs are loosely mounted on shaft 1. The pinions 4 5 6 are mounted upon the hubs 7^a 8^a 9^a, respectively, and are secured thereto, as by a key or in any other suitable manner. The friction members are all substantially alike and comprise a hub 10, having arms 10^a 10^b, from which project curved webs 11, that lie within the friction-surfaces of the drums 7 8 9 and are adapted to be expanded into engagement with said drum. To the arms 10^a 10^b are pivoted levers 12, that extend across and in line with shaft 1 and whose outer ends 12^a abut against the corresponding end of the web 11, whereby when the inner ends of the levers 12 are swung outwardly their opposite ends by pressing against the webs 11 will expand the latter into contact with the friction-drum. (See Fig. 4.) The hubs 10 are mounted upon shaft 1 and secured thereto, as by keys, and upon the hubs 10 are loosely mounted sliding sleeves 13, that are adapted to pass under the inner ends of levers 12 to press the latter outwardly. By preference the levers 12 carry set-screws or adjusting-pieces 12^b, that are adapted to be engaged by the sleeves 13, whereby proper adjustment can be made to enable the desired amount of frictional contact to be produced between the friction-drums and the friction-webs 11. The sleeves 13 can be slid along the hubs 10 by any suitable means. I have shown these sleeves provided with annular grooves 13^a to receive pins or the like at the ends of yokes 14 for reciprocating the sleeves. The yokes may be supported and operated in any suitable manner. I have shown the yoke 14 as projecting from a shaft 15, journaled in bearings in the shell 3^a, and any suitable means may be provided for rocking the shaft 15. In the frictional devices that operate the drums 7 8 I have shown the sleeves 10 as adjacent and preferably in contact and provided at opposite ends with the pairs of webs 11 and the corresponding operative parts and a single sleeve 13, mounted upon both hubs, adapted to operate both friction-webs, but only one at a time. It will be understood that when the sleeve 13 is moved into engagement with the desired levers 12 the corresponding drum 7, 8, or 9 will be brought into frictional engagement with shaft 1, whereby said shaft will rotate either of the pinions 4 5 6. It will be under-

stood, however, that any other suitable or desired means may be provided for connecting the pinions 4 5 6 rotatively with shaft 1.

The pinions 4 5 are designed to communicate direct motion to the part to be driven, and the pinion 6 is intended to communicate reverse motion to said part. The pinion 4 meshes with a gear 16, that is supported by and adapted to rotate freely around a shaft 17 that is to be driven, which shaft is supported in suitable bearings in the sides 2 3. To the shaft 17 is secured a bevel-gear 18, shown provided with a hub 18^a, keyed or otherwise attached to shaft 17, and upon hub 18^a is mounted to rotate a hub or sleeve 19, keyed or otherwise secured to gear 16, or it could be made a part thereof. The hub or sleeve 19 is provided with gear-teeth 20, that mesh with a pinion or pinions 21, that are carried by a gear 22, mounted to rotate around shaft 17. I have shown three pinions 21 all in mesh with teeth 20 and all also in mesh with an internal gear ring or rack 23, secured within the casing and shown attached to shell 3^a. The pivots 24 of the pinions 21 may be suitably secured to gear 22. I have shown the gear 22 as provided with an annular flange 25, projecting from one face, and the pivots 24 are shown as passing through flange 25 and gear 22 and secured by means of nuts, the pivots 24 being shown provided with heads 24^a at their outer ends and having washers 24^b, between which heads and washers the pinions 21 rotate. From this it will be understood that the gear or teeth 20 will rotate the pinions 21, and as they are in mesh with the internal rack 23 they will be caused to travel around the same, and will thereby carry gear 22 around with them.

The gear 22 supports one or more bevel-pinions 26, that mesh with gear 18 and also with a gear 27, shown provided with a hub 27^a and mounted upon and keyed or otherwise secured to a sleeve 28, mounted freely upon shaft 17 and shown supported in bearings in the side 2 of the casing, the gear 22 being in turn mounted upon hub 27^a, so as to rotate freely thereon. The gear 22 is in mesh with pinion 5. One of the drive-wheels of the vehicle will be secured to shaft 17 and the opposite wheel will be secured to sleeve 28. The pivots or shafts 26^a of the pinions 26 are shown provided with heads to retain the pinions in position and are secured to the flange 25, which has countersunk bores 25^a to receive the nuts 26^b. The flange 25 also affords an annular friction-surface for a brake-band 29, and the countersunk bores 25^a keep the nuts 26^b from interfering with said brake-band. Any suitable means may be provided for tightening the band 29 upon the friction surface or brake-shoe 25. For this purpose I have shown a lever 30, hung upon a pivot 31, carried by the casing, and one end of the band 29 is shown attached to lever 30 at 29^a, and the other end is shown attached to pivot 31. It will be understood that as the lever 30 is moved in the proper direction the band 29 will be drawn upon to apply the brake to the friction surface or shoe 25. 29^b is a ring secured to the end of flange or shoe 25, and band 29 lies between an annular shoulder 25^a and ring 29^b, and is thus kept in place.

To communicate reverse motion to gear 16, I provide pinions 32, which are mounted upon a shaft 33, suitably supported, as by the casing 2 3 3^a, which pinions respectively mesh with pinion 6 and with gear 16, and yet are placed in such position as to be entirely out of contact with pinion 4. (See Figs. 2 and 3.)

The operation of the gearing is as follows: Suppose it is desired to drive forwardly at the slow speed. The friction-webs 11 will be forced into engagement with drum 7, whereupon pinion 4 will be rotated by shaft 1, and thus gears 16 and 20 will communicate motion to pinions 21, which by traveling around rack 23 will carry gear 22 with them, and if the resistance to the wheels attached to shaft 17 and sleeve 28 is equal the pinions 26 will not rotate and will thereupon carry gears 18 and 27 around, thus communicating equal rotation to shaft 17 and sleeve 28, and thus to the drive-wheels. If the vehicle is turning a curve, the rotation of the wheels will be unequal, and thereupon the pinions 26 can rotate independently at more or less speed, thereby properly compensating for the difference in rotation of the drive-wheels, while at the same time said wheels will be driven forwardly. If it is desired to drive forwardly at the high speed, the friction between drum 7 and webs 11 will be released and the friction will be set against drum 8, whereupon pinion 5 will rotate gear 22, and thereupon pinions 21 will travel around gear 20 and rack 23, but without communicating motion to shaft 1 through pinion 4, and the same action with respect to pinions 26 and gears 18 and 27 will take place, as before described. When it is desired to drive in a reverse direction, the friction at drums 7 and 8 is released and the friction at drum 9 is thrown in, whereupon the pinions 6 and 32 will rotate gear 16 in the reverse direction to that before described; but the action of the parts controlled by gear 16 will be substantially the same as that previously described, excepting that the parts will all rotate in a reverse direction.

I do not limit my invention to the details of construction shown and described, as they may be varied without departing from the spirit thereof.

Having now described my invention, what I claim is—

1. The combination of a toothed wheel, a pinion carried thereby, a pair of gears in mesh with said pinion, another pinion carried by said toothed wheel, a rack in mesh with said pinion, means for rotating said pinion on its axis, and means for rotating said toothed wheel, substantially as described.

2. The combination of a toothed wheel, a pinion carried thereby, a pair of gears with

which said pinion meshes, another pinion carried by the toothed wheel, a rack in mesh with said pinion, a gear in mesh with said pinion for rotating the latter on its axis, a toothed wheel to rotate said gear, and means for rotating the toothed wheels independently, substantially as described.

3. The combination of a toothed wheel having a flange, a pinion carried by said flange, a pair of gears with which said pinion meshes, another pinion carried by said flange, a rack with which said pinion meshes, a gear to rotate said pinion on its axis, and means for rotating the toothed wheel and the last-mentioned gear independently, substantially as described.

4. The combination of a toothed wheel, a pinion carried thereby, a pair of gears in mesh with said pinion, a sleeve connected with one of said gears and a shaft connected with the other gear and journaled in said sleeve, another pinion carried by the toothed wheel, a rack with which said pinion meshes, and a gear in mesh with said pinion, substantially as described.

5. The combination of a shaft, a sleeve surrounding said shaft, gears connected with said shaft and sleeve, a pinion in mesh with said gears, a toothed wheel carrying said pinion and mounted to rotate around said sleeve, another pinion carried by said toothed wheel, a rack in mesh with said pinion, a gear in mesh with said pinion and mounted to rotate around said shaft, and a toothed wheel connected with the last-mentioned gear, substantially as described.

6. The combination of a shaft, a pair of pinions mounted to rotate thereon, means for independently connecting said pinions rotatively with said shaft, toothed wheels to be operated by said pinions, a pinion carried by one wheel, a pair of gears in mesh with said pinion, a shaft connected with one of said gears, a sleeve connected with the other of said gears, another pinion connected with said wheel, and gear-teeth in mesh with said pinion and connected with the other of said toothed wheels, substantially as described.

7. The combination of a shaft, pinions carried thereby, means for independently connecting said pinions rotatively with said shaft, a toothed wheel to be operated by one pinion, reversing-gear connecting the other pinion with said toothed wheel, gear-teeth connected with said wheel, a shaft upon which said wheel is mounted, another toothed wheel, a pinion carried thereby and in mesh with said gear-teeth, a rack in mesh with said pinion, another pinion carried by the last-mentioned gear, a wheel secured to said shaft and in mesh with said pinion, a sleeve, and a gear secured thereto and in mesh with said pinion, substantially as described.

8. The combination of a driving part, a driven part, a rack, a pinion in mesh with said rack, means for communicating independent rotation from the driving part to said pinion, and means intermediate said pinion and the driven part to actuate the latter by the movement of said pinion along said rack, substantially as described.

9. The combination of a driving part, a driven part, a rack, a pinion in mesh therewith, means for communicating motion from the driving part to said pinion to cause the latter to travel along said rack, a rotative support for said pinion, and differential gearing intermediate said support and the driven part, whereby as the pinion travels along said rack it will communicate motion to said support to actuate the driven part by said gearing, substantially as described.

10. The combination of a driving part, a driven part, an annular rack, a pinion in mesh therewith, a rotative support for said pinion, means for communicating motion from the driving part to said pinion to thereby rotate said support, differential gearing intermediate said support and the driven part, and means for communicating motion to said support independently of said pinion, substantially as described.

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