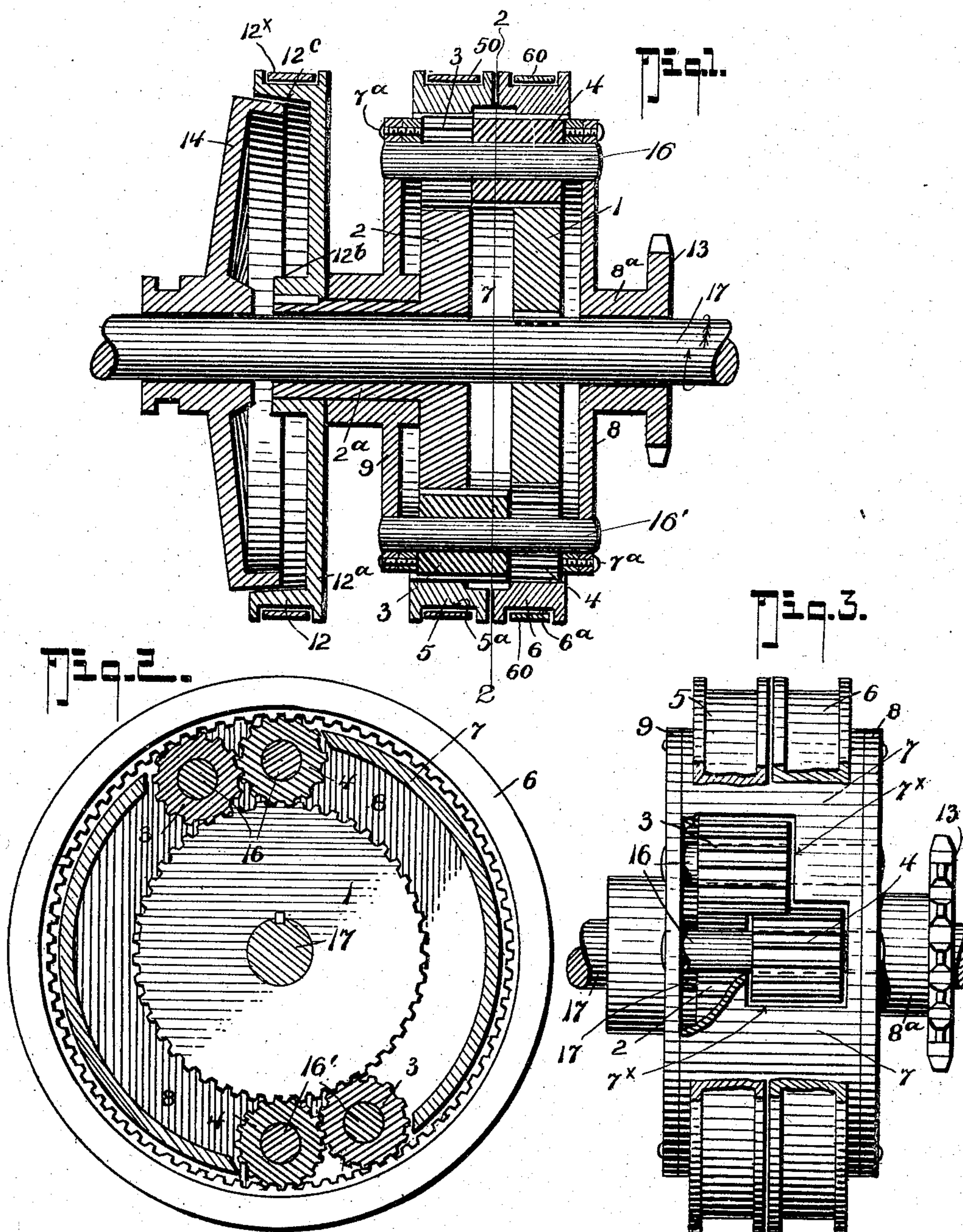


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B. M. COFFEE.
VARIABLE SPEED GEARING.
APPLICATION FILED DEC. 31, 1902.



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VARIABLE-SPEED GEARING.

SPECIFICATION forming part of Letters Patent No. 782,547, dated February 14, 1905.

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To all whom it may concern:

Be it known that I, BASSETT M. COFFEE, residing at Richmond, in the county of Henrico and State of Virginia, have invented certain
5 new and useful Improvements in Variable-Speed Gearing, of which the following is a specification.

My invention has for its purpose to provide a simple and compact construction of power-transmission-gear mechanism more especially adapted for use on motor-vehicles, which can be readily adjusted to impart four different speed changes in a quick and positive manner without undue jar, shock, or strain on the op-
15 erating parts.

In its generic nature my invention comprehends a means for obtaining an intermediate speed forward, coöperatively combined with means for obtaining a high speed forward, a low speed forward, and a low reverse speed, the last-mentioned means including suitable clutch devices on the drive-shaft for effecting the high speed and a system of planetary gears for producing the low forward and low re-
20 verse speeds, the several coöperatively combined means having interdependent connection, but being capable of independent adjustments, whereby they can be readily manipulated by the operator to produce the variable
25 speeds and directions stated.

In its more complete nature my invention includes a means for effecting the intermediate speed forward comprising a pinion loosely mounted on the drive-shaft having an axial sleeve to which is fixedly attached a brake-drum arranged to be acted on by an ordinary band-brake device, whereby to hold the drum and the sleeve-equipped pinion stationary when it is desired to bring the intermediate
30 speed into operation, which pinion when stationary acts as a sun-gear with which the planetary-gear mechanism coacts. The peculiar combination of the latter with the drive-shaft and the loose drum-carrying pinion and the
35 details of the several parts will hereinafter be fully explained, and specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of my improved variable-speed gearing. Fig. 50 2 is a central vertical section thereof, taken practically on the line 2 2 of Fig. 1. Fig. 3 is a perspective view of portions thereof and illustrating more clearly the correlation of the planet-gears, the fast or loose sun or drive
55 pinions mounted on the drive-shaft, and the internally-gearred band-rims that coact therewith.

Referring now to the details of construction, 17 designates the drive-shaft, which may represent the drive-axle of any ordinary construction of motor-vehicle, and upon this shaft is keyed or otherwise fixedly attached a drive-pinion or sun-gear 1 of suitable diameter, and adjacent said gear 1 and opposing it is a second
60 similar gear 2 of like diameter, which is loosely mounted on the shaft 17 and has an integral outwardly-extending sleeve 2^a. The gears 1 and 2 are covered by a cylindrical casing 7 and opposite heads or disks 8 and 9, the one, 70 8, being loosely mounted on the shaft 17 and having an outwardly-extending hub 8^a, that carries the drive-sprocket 13, and the other, 9, being loosely mounted on the sleeve 2^a of the drive-gear 2, and both heads or disks 8 and 9
75 are fixedly connected to the cylindrical member 7 by bolts or screws 7^a 7^a, as shown.

44 indicate a series of planet-gears, of which there may be two or more, two being shown, properly spaced around the pinion 1, with
80 which they mesh, and 3 3 designate similar gears that mesh with the pinion 2, and the several gears 3 and 4 are disposed in close relation to each other and are of sufficient length to extend inwardly beyond the adjacent faces of
85 the pinions 1 and 2, whereby to mesh with each other, as clearly shown in Figs. 2 and 3, and the several gears 3 are loosely journaled on short shafts 16, that extend across from one head, 8, to the other, 9, and are made fast there-
90 to, the gears 4 4 being loosely mounted on shafts 16', similarly held on the heads or disks 8 and 9, as shown.

At points adjacent the gears 4 and 3 the cylindrical casing member 7 is cut out, as at
95 7^x, to permit the gears 4 and 3 extending there-

through, whereby to mesh with internally-toothed rims or bands 6 and 5, respectively, which are loosely mounted relatively to the casing 7 and have grooves 6^a 5^a to receive brake-bands, that may be actuated in any approved manner. 12 designates a third band-rim of like diameter of the rims 6 and 5, formed on the perimeter of a disk 12^a, having a hub 12^b mounted on and fixedly joined with the hub 2^a of the pinion 2, and the said rim 12 has an internal clutch-face 12^c to coact with a clutch member 14, shiftably mounted on the shaft 17 and actuated in any well-known manner.

The manner in which my upwardly variable speed and transmission gear mechanism is adjusted to effect the various speed movements hereinbefore specified is best explained as follows: To secure a slow speed forward, the rim or rack 6 is held stationary by applying the brake-band 60. Shaft 17, with its pinion 1 revolving in the direction of the arrow, drives gear 4 in a direction opposite to that which the shaft 17 and pinion 1 turns and causes the gear 4 to travel around the internal gear-rim of the member 6 in the same direction as shaft 17 revolves, since the member 6 is held immovable by the brake-band. Gears 4 4, traveling around, as stated, carry the casing and sprocket 13, as the shafts 16 are fixedly connected to the heads of the casing, and thereby cause the sprocket 13 to revolve in the same direction with the shaft 17, but at a very much lower speed, it being understood that under the adjustment of the parts stated the gears 3 3 2 and rim 12 run loose. To secure a reverse slow speed, the internally-toothed rack or band-rim 5 is held stationary by applying the brake-band 50. Shaft 17, revolving and carrying pinion 1, as before, drives gears 4 in the opposite direction to the movement of the shaft 17, which gears now drive gears 3 3 in opposite direction themselves and cause said gears 3 to travel around the rack or rim 5 5, since said rack is held immovable, and as the gears 3 3 travel around in a direction opposite to the rotation of the shaft 17 they carry with it in the same reverse direction casing members 7, 8, and 9 and the sprocket 13 in a like direction at a very much lower speed than shaft 17. To obtain the middle or intermediate speed forward, which is the important advantage obtained by my peculiar construction of gearing, the band-rim 12 is held stationary by the brake-band 12^x. Shaft 17 revolving in the forward direction and with it the pinion 1, as before, motion is imparted to the gears 4 4 in a direction opposite to that of pinion 1 and shaft 17. Gears 4 impart motion to gears 3 in a reverse direction to themselves, which then have a planetary movement upon and around pinion 2, which is now held stationary, since it is attached to sleeve 2^a and drum 12. Gears 3 in traveling around the pinion

2 carry the casing members 9 7 8 and the sprocket-wheel 13 in the same direction of the shaft 17 and at one-half the speed of said shaft 17 when the pinions 3 4 and 1 and 2 are of the same diameter, respectively. The slow speed forward is about one-fourth the speed of shaft 17, the high speed forward the same as the speed of the shaft 17, and the low reverse speed is about one-fourth that of the speed of shaft 17. High speed forward is obtained by shifting the clutch-ring 14 to tightly engage the clutch-face of the band rim or wheel 12, which locks all of the gears together as a whole and rotates them and the sprocket 13 with the shaft 17.

From the foregoing, taken in connection with the accompanying drawings, it is believed the advantages of my invention will be readily apparent to those familiar with mechanisms of this kind.

While I prefer to arrange the parts as shown and described, it is obvious the details of construction may be modified without departing from my invention as defined by the appended claims.

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

1. A variable-speed gearing, comprising a drive-shaft, a drive-pinion fixedly secured thereto, a second pinion adjacent the first pinion loosely mounted on the said shaft, a casing loosely mounted on the drive-shaft and having cut-away portions, a sprocket-wheel axially and fixedly connected to the casing, two sets of planet-gears carried by the casing and projecting through the cut-away portion, one set of which meshes with the fixedly-held pinion, the other set meshing with the loosely-held pinion, said planet-gears also meshing with each other, a pair of brake-rims mounted on the periphery of the casing each having an internal rack-face, one of said rims meshing with one set of planet-gears, and the other rim meshing with the other set of planet-gears, a means for braking either one of said rims, substantially as shown and for the purposes described.

2. A variable-speed gearing comprising a drive-shaft, a pair of adjacently-disposed drive-pinions, one of which is fast and the other loose on the shaft, a casing loosely mounted on the drive-shaft and partly inclosing said pinions, planet-gears mounted within and revoluble with the casing, one set of which engages the loose pinion and the other set the fixed pinion, said gears also meshing with each other, a pair of independently-acting brake-rims mounted on the periphery of the casing, one for each of the loose and fast pinions, said rims having internal racks for meshing with their respective gears, means for holding either of said rims from movement, and a separate means for holding the loosely-mounted

pinion on the shaft stationary, all being arranged substantially as shown and for the purposes described.

3. A variable-speed gearing, comprising in combination; the drive-shaft 17, the fast and loose pinions 1 and 2, the pinion 2 having a sleeve 2^a, the casing ends 8 and 9, the end 8 being loosely mounted on the shaft 17 and having a sprocket-equipped hub 8^a, the end 9 being loosely mounted on the hub 2^a, the said ends being rigidly connected with each other, shafts 16 16' mounted transversely in the casing ends 8 and 9, the pinions 3 and 4 mounted on the said shafts 16 16' respectively, and held in mesh with each other, the brake-bands and the rack-rims 5 and 6 held in mesh with the pinions 3 and 4 respectively, the brake-band rim 12 fixedly mounted on the hub 2^a and having a clutch-face, and a clutch mechanism mounted on the drive-shaft, all being arranged substantially as shown and described.

4. The combination with the shaft 17, the loose pinion 2 and the fast pinion 1 mounted thereon, the casing rotatable on the shaft, the cross-shafts 16 16' mounted in the casing, the gears 3 and 4 mounted on the cross-shafts 16 16' respectively and held in mesh with each other, said gears 3 and 4 engaging the pinions 2 and 1 respectively, and projected outside of the cylindrical wall of the casing, the brake-bands, a pair of internal-gear brake-rims 5 and 6 mounted on the casing, one of which, 5, engages the gears 3, and the other, 6, engages the gears 4 and the sprocket 13 axially connected with the one end of the casing, all being arranged substantially as shown and for the purposes described.

5. A variable-speed gearing comprising a drive-shaft 17, a pair of adjacently-disposed drive-pinions 1 2, one of which, 1, is fast and the other, 2, is loose on the shaft 17, and a casing, comprising the end sections 8 9 and the peripheral section 7, loosely mounted on the drive-shaft and inclosing said pinions, said casing having cut-away portions 7^x, planet-gears 3 and 4 mounted within and revoluble with the casing and projecting through said cut-away portions, one set of which planet-gears engages the loose pinion 2 and the other set 4 the fixed pinion 1, each set of gears 3 4 also meshing with the other, a pair of independently-acting brake-rims, 5 and 6 having internal racks of less width than the brake-rims for meshing with their respective gears, means for holding either of said rims from movement and a separate means for holding the loosely-mounted pinion 2 on the shaft, all being substantially arranged as shown, for the purposes specified.

6. A variable-speed gearing, comprising a drive-shaft, a drive-pinion fixedly secured thereto, a second pinion adjacent the drive-pinion and loosely mounted on the said shaft, a casing loosely mounted on the drive-shaft

and having cut-away portions, a sprocket-wheel axially and fixedly connected to the casing, two sets of planet-gears having their shafts rotatable in bearing-apertures in the side walls of the casing, said planet-gears projecting through the cut-away portion of the casing, one set of the gears meshing with the fixedly-held pinion, while the other set meshes with the loosely-held pinion, said planet-gears also meshing with each other, a pair of brake-rims rotatably mounted on the periphery of the casing, each of said rims having an internal-rack face, one of said rims meshing with one set of planet-gears and the other rim with the other set of planet-gears, and means for braking either one of said rims, substantially as shown and for the purposes specified.

7. A variable-speed gearing, comprising a drive-shaft, a pair of adjacently-disposed drive-pinions, one of which is fast and the other loose upon the shaft, a casing loosely mounted upon the drive-shaft and partly inclosing said pinions, said casing having bearing-apertures in its side walls, planet-gears having shafts and mounted within and revoluble with the casing with their shafts in the bearing-apertures of the casing, one set of which gears engages the loose pinion and the other set the fixed pinion, said gears also meshing with each other, a pair of independently-acting brake-rims rotatably mounted on the periphery of the casing, one for each of the loose and fast pinions, said rims having internal racks for meshing with their respective gears, means for holding either of said rims from movement, and a separate means for holding the loosely-mounted pinion on the shaft stationary, all being arranged substantially as shown and for the purposes described.

8. In a variable-speed gearing, a drive-shaft, a pair of adjacently-disposed drive-pinions, one of said pinions being fast upon the shaft, the other pinion being loosely mounted upon the shaft and being provided with a hub portion, a casing comprising a pair of side disks and a peripheral plate, one of said side disks having an integrally-formed hub and apertured to receive the drive-shaft, a sprocket-wheel integrally formed on said hub, the other side disk having a hub portion apertured to receive the hub of the loosely-mounted drive-pinion, said side disks having bearing-apertures, planet-gear shafts, planet-gears carried thereby and mounted within and revoluble with the casing with their shafts in the bearing-apertures of the side disks, one set of which gears meshes with the loose pinion and the other set with the fixed pinion, said gears also meshing with each other, said peripheral portion of the casing being cut away to allow said gears to project therethrough, a pair of independently-acting brake-rims rotatably mounted on the periphery of the casing and closing said cut-away portion thereof, one rim

for each of the loose and fast pinions, said rims having internal racks for meshing with their respective gears, means for holding either of said rims from movement, a pulley having a
5 clutch-face secured to the hub of the loosely-mounted pinion, a clutch member for coöperating with said pulley, said clutch member be-

ing mounted upon the drive-shaft, all being arranged substantially as shown and for the purposes described.

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