

G. J. THOMAS.
 VARIABLE SPEED GEARING.
 APPLICATION FILED MAR. 27, 1917.

1,234,966.

Patented July 31, 1917.
 2 SHEETS—SHEET 1.

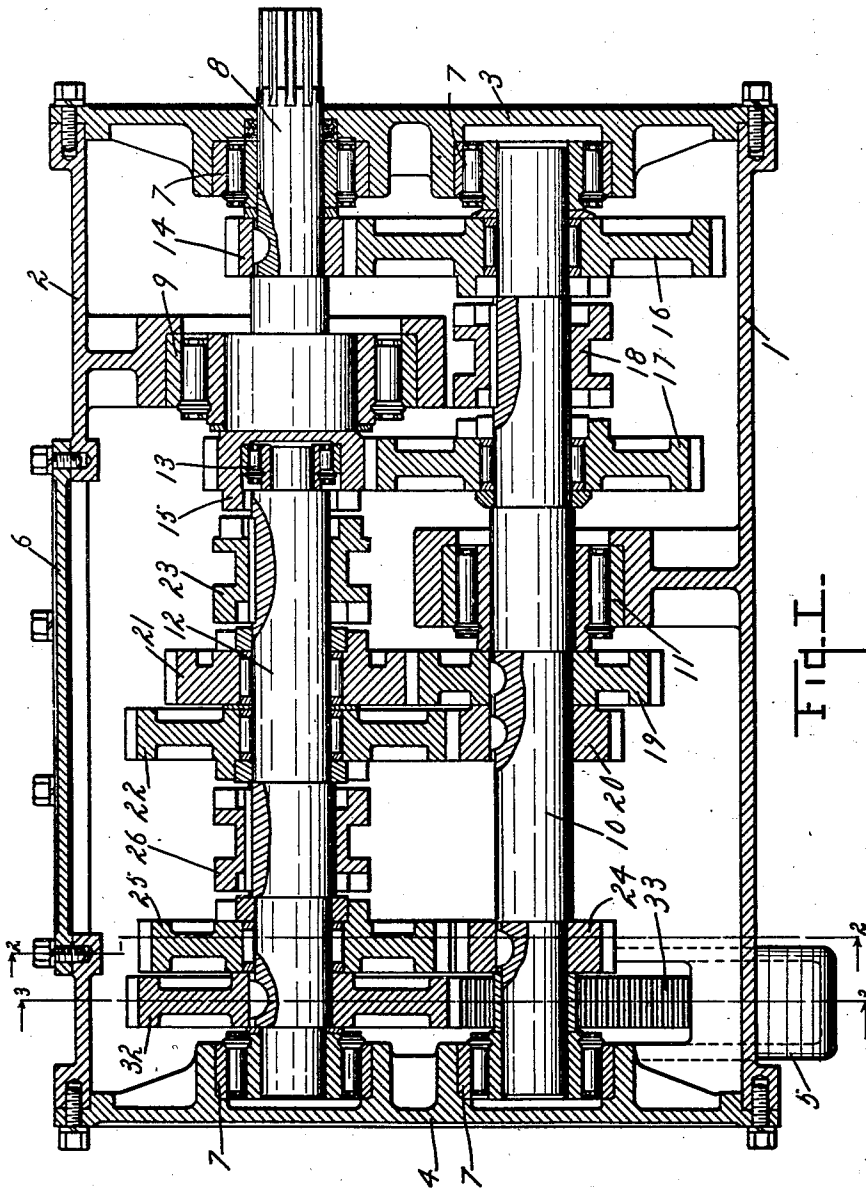


FIG. 1.

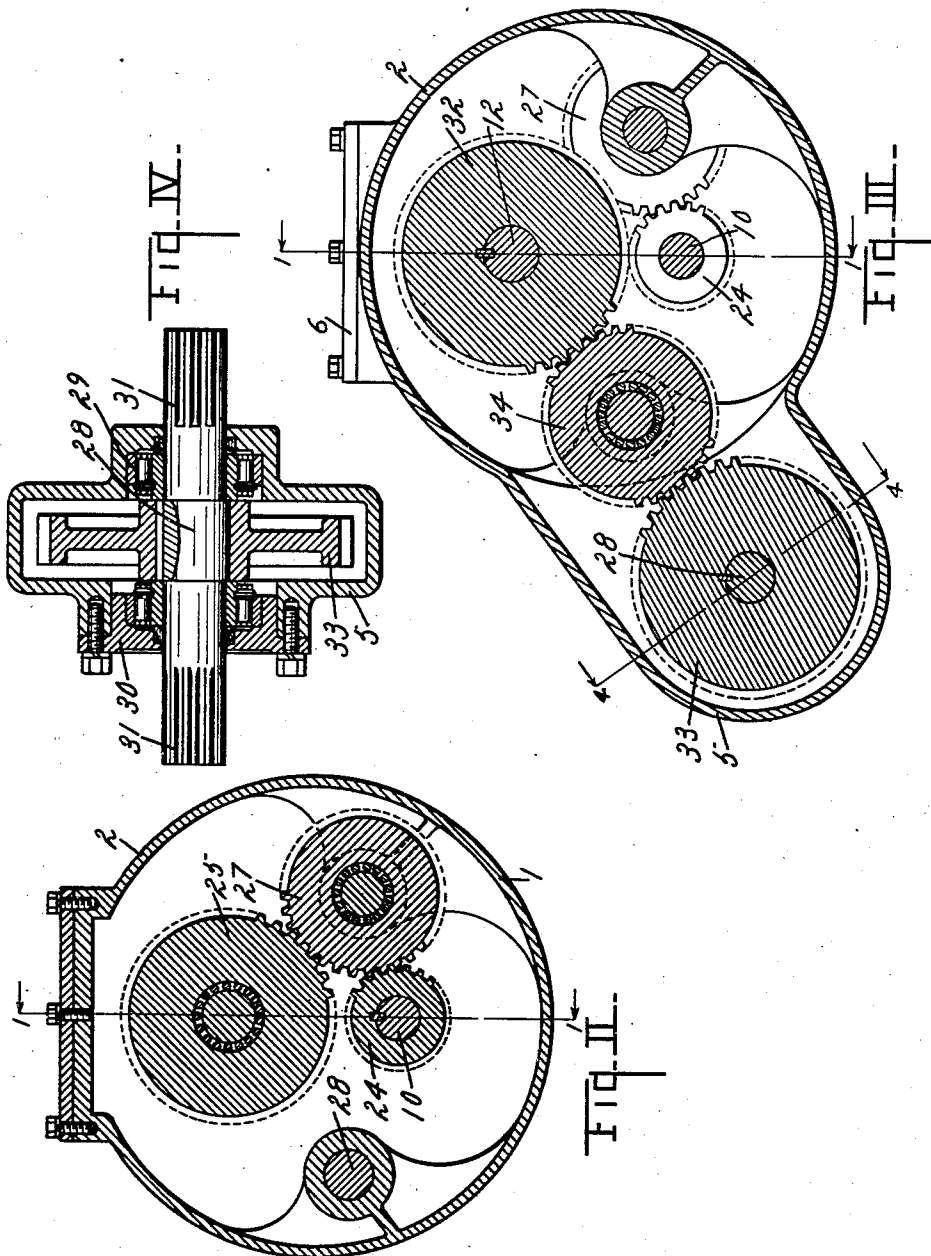
WITNESSES:
Luther Blake
Lenn Gilman

INVENTOR.
George J. Thomas
 BY *Chaffell & Co.*
 ATTORNEYS.

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UNITED STATES PATENT OFFICE.

GEORGE J. THOMAS, OF LANSING, MICHIGAN, ASSIGNOR TO DUPLEX TRUCK COMPANY,
OF LANSING, MICHIGAN.

VARIABLE-SPEED GEARING.

1,234,966.

Specification of Letters Patent.

Patented July 31, 1917.

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To all whom it may concern:

Be it known that I, GEORGE J. THOMAS, a citizen of the United States, residing at Lansing, county of Ingham, State of Michigan, have invented certain new and useful Improvements in Variable-Speed Gearing, of which the following is a specification.

This invention relates to improvements in variable speed gearing.

The main objects of this invention are:

First, to provide an improved variable speed gearing which is compact and simple in structure and at the same time provides for a considerable number of variations in speed.

Second, to provide an improved variable speed gearing which is well adapted for use in four-wheel drive motor vehicles.

Further objects, and objects relating to structural details, will definitely appear from the detailed description to follow.

I accomplish the objects of my invention by the devices and means described in the following specification. The invention is clearly defined and pointed out in the claims.

A structure which is a preferred embodiment of my invention is clearly illustrated in the accompanying drawing, forming a part of this specification, in which:

Figure I is a detail longitudinal section of my improved transmission taken on a line corresponding to line 1—1 of Figs. II and III, the shafts being shown in full lines, the supports or hanger attaching lugs for the gear box or casing being omitted; the operating means for the clutches and the springs in the casing to accommodate the same are also omitted.

Fig. II is a transverse section on a line corresponding to line 2—2 of Fig. I.

Fig. III is a transverse section on a line corresponding to line 3—3 of Fig. I.

Fig. IV is a detail longitudinal section on a line corresponding to line 4—4 of Fig. III.

In the drawing similar reference characters refer to similar parts throughout the several views, and the sectional views are taken looking in the direction of the little arrows at the ends of the section lines.

Referring to the drawing, the casing or gear box, designated generally by the numeral 1, preferably comprises a barrel-like body portion 2 with detachable heads 3 and

4. At one side the body portion 2 is provided with a lobe-like extension 5, the purpose of which will appear later. The casing illustrated is provided with a removable cover 6.

The casing head 3 is provided with a bearing, designated generally by the numeral 7, for the outer end of the driving shaft 8. A bearing, designated generally by the numeral 9, is provided within the casing for the inner end of the driving shaft. A jack or intermediate shaft 10 is disposed parallel with the driving shaft, the heads 3 and 4 being provided to support the ends of the jack shaft. A bearing 11 supports the jack shaft at an intermediate point.

The driven shaft 12 is arranged in alignment with the driving shaft. The driving shaft is provided with a bearing 13 for the inner end of the driven shaft, the outer end of the driven shaft being supported by a bearing 7 on the casing head 4.

The projecting end of the driving shaft 8 is adapted to be connected to the engine shaft or other source of power. A pair of driving gears 14 and 15 is fixed with the driving shaft. These gears are disposed one at each side of the bearing 9 and are of different sizes. A pair of driven gears 16 and 17 is rotatably mounted on the jack shaft 10 to mesh with the gears 14 and 15, respectively. A double jawed clutch 18 is splined to the jack shaft between the gears 16 and 17 and adapted to be shifted to secure either of the driven gears 16 and 17 to the jack shaft and thus secure variable speed therefor, or to a neutral position, as shown in Fig. I. The means for shifting the clutch 18 is not shown, as suitable means are well known.

In the embodiment illustrated the jack shaft is provided with a pair of variable speed driving gears 19 and 20 fixed thereto and meshing with the variable speed driven gears 21 and 22 rotatably mounted upon the driven shaft. A double jawed clutch 23 is splined to the driven shaft between the gear 21 thereon and the gear 15 of the driving shaft and adapted to connect either the driving shaft directly to the driven shaft or the gear 21 to the driven shaft.

The jack shaft is provided with a driving

reverse gear 24, while the driven shaft is provided with a driven reverse gear 25, the driving reverse gear being keyed to the jack shaft, while the driven reverse gear is rotatably mounted upon the driven shaft.

5 A double jawed clutch 26 is splined to the driven shaft between the variable speed driven gear 22 and the reverse driven gear 25 and is adapted to be adjusted to connect either of these gears to the driven shaft. 10 The gears 24 and 25 are connected by the idler 27,—see Figs. II and III, thereby securing the reverse of the driven shaft when the clutch 26 is engaged with the gear 25. 15 The operating means for the clutches 23 and 26 are not illustrated, as they form no part of this invention and suitable means are well known in the art.

20 The embodiment of my invention illustrated is especially designed by me for use on four wheel driven motor trucks, and, to facilitate connection to the front and rear propeller shafts, I provide a transmission shaft 28, which is disposed in the extension 25 of the casing with its ends projecting therefrom. The casing is provided with bearings 29 and 30 for this shaft, the bearing 30 being removable for convenience in assembling. The projecting ends 31 of the shaft 28 are each adapted for connection to 30 the propeller or other power delivery shafts.

The shaft 28 is connected to the driven shaft 12 by means of the gear 32 on the driven shaft 12, the gear 33 on the shaft 28 and an intermediate connecting gear 34,—see 35 Fig. III. Other connecting means might be employed, such as sprocket wheels and chain, or the power may be delivered directly from the driven shaft or other suitable transfer connections made thereto. 40

In the embodiment illustrated I provide five speeds forward and two reverse, there being two speed connections for the driving shaft to the jack shaft and two speed connections for the jack shaft to the driven shaft and means for connecting the driven shaft directly to the jack shaft. The reverse is through the reversing gears 24 and 25, as described. 45

50 My improved variable speed gearing is especially designed by me for embodiment in trucks where a number of variations in speed are desirable to accommodate various road and load conditions, but is desirable 55 and readily adapted for use in various relations and has the advantage of being compact and comparatively simple and economical in structure and also strong and durable.

60 I have illustrated and described my improvements in a practical embodiment. I believe the disclosure made will enable those skilled in the art to which this invention relates to embody or adapt the same as may 65 be desired.

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

1. The combination of a casing, a driving shaft, a bearing for the inner end of said driving shaft, a pair of driving gears on said driving shaft disposed one at each side of said bearing, a jack shaft disposed parallel with said driving shaft, a pair of driven gears rotatably mounted on said jack shaft to mesh with said driving gears of said driving shaft, a clutch disposed on said jack shaft between said gears thereon whereby either may be connected thereto to secure variable speeds for said jack shaft, a driven shaft disposed in alinement with said driving shaft, said driving and driven shafts being provided with coacting bearings, a pair of variable speed driving gears on said jack shaft, a pair of variable speed driven gears on said driven shaft meshing with said variable speed driving gears of said jack shaft, a clutch disposed on said driven shaft between one of said variable speed driven gears thereof and the end of said driving shaft and adapted to connect said driving shaft or such gear to said driven shaft, a driving reverse gear on said jack shaft, a driven reverse gear on said driven shaft, a clutch disposed between said driven reverse gear and the other variable speed driven gear of said driven shaft and adapted to connect either to said driven shaft, and driving connections for said reverse gears. 70 75 80 85 90 95

2. The combination of a casing provided with a lobe-like extension at one side, a driving shaft, a driven shaft disposed in alinement with said driving shaft, driving gears fixed to said driving shaft, a jack shaft, driven gears rotatably mounted on said jack shaft, and meshing with said gears on said driving shaft, clutch means whereby said driven gears may be connected to said jack shaft to secure variable speeds therefor, variable speed driving gears on said jack shaft and coacting driven gears on said driven shaft, reverse driving and driven gears on said jack shaft and driven shaft, a reverse idler connecting said reverse gears, clutch means for connecting said variable speed and reverse driven gears to said driven shaft or connecting said driven shaft directly to said driving shaft, a transmission shaft adapted to receive driving connections at each end disposed through said casing extension to project at each end, and a train of gears connecting said transmission and driven shafts and comprising gears on said shafts and an intermediate coacting gear. 100 105 110 115 120

3. The combination of a casing provided with a lobe-like extension at one side, a driving shaft, a driven shaft disposed in alinement with said driving shaft, driving gears fixed to said driving shaft, a jack shaft, driven gears rotatably mounted on said jack 125 130

shaft and meshing with said gears on said driving shaft, clutch means whereby said driven gears may be connected to said jack shaft to secure variable speeds therefor, 5 variable speed driving gears on said jack shaft and coacting driven gears on said driven shaft, reverse driving and driven gears on said jack shaft and driven shaft, a reverse idler connecting said reverse gears, 10 clutch means for connecting said variable speed and reverse driven gears to said driven shaft or connecting said driven shaft directly to said driving shaft, a transmission shaft disposed in said casing extension, and 15 a train of gears connecting said transmission and driven shafts and comprising gears on said shafts and an intermediate, coacting gear.

4. The combination of a driving shaft, a 20 driven shaft disposed in alinement with said driving shaft, driving gears fixed to said driving shaft, a jack shaft, driven gears rotatably mounted on said jack shaft and meshing with said gears on said driving 25 shaft, clutch means whereby said driven gears may be connected to said jack shaft to secure variable speeds therefor, variable speed driving gears on said jack shaft and coacting driven gears on said driven shaft, 30 reverse driving and driven gears on said jack shaft and driven shaft, a reverse idler connecting said reverse gears, clutch means for connecting said variable speed and reverse driven gears to said driven shaft or 35 connecting said driven shaft directly to said driving shaft.

5. The combination of a casing provided with a lobe-like extension at one side, a 40 driving shaft, a driven shaft disposed in alinement with said driving shaft, driving gears fixed to said driving shaft, a jack shaft, driven gears rotatably mounted on said jack shaft and meshing with said gears on said driving shaft, means whereby said 45 driven gears may be connected to said jack shaft to secure variable speeds therefor, variable speed driving gears on said jack shaft and coacting driven gears on said driven shaft, means for connecting said variable speed driven gears to said driven shaft 50 or connecting said driven shaft directly to said driving shaft, a transmission shaft adapted to receive driving connections at each end disposed through said casing extension to project at each end, and driving 55 connections for said transmission and driven shafts.

6. The combination of a casing provided with a lobe-like extension at one side, a 60 driving shaft, a driven shaft disposed in alinement with said driving shaft, driving gears fixed to said driving shaft, a jack shaft, driven gears rotatably mounted on said jack shaft and meshing with said gears on said 65 driving shaft, means whereby said driven

gears may be connected to said jack shaft to secure variable speeds therefor, variable speed driving gears on said jack shaft and coacting driven gears on said driven shaft, means for connecting said variable speed 70 driven gears to said driven shaft or connecting said driven shaft directly to said driving shaft, a transmission shaft disposed in said casing extension, and driving connections for said transmission and driven 75 shafts.

7. The combination of a driving shaft, a driven shaft disposed in alinement with said driving shaft, driving gears fixed to said driving shaft, a jack shaft, driven gears 80 rotatably mounted on said jack shaft and meshing with said gears on said driving shaft, means whereby said driven gears may be connected to said jack shaft to secure variable speeds therefor, variable speed 85 driving gears on said jack shaft and coacting driven gears on said driven shaft, means for connecting said variable speed driven gears to said driven shaft or connecting said driven shaft directly to said driving shaft. 90

8. The combination of a casing provided with a lobe-like extension at one side, a driving shaft, a driven shaft, a jack shaft, coacting variable speed driving and driven 95 gears on said driving and jack shafts, means for controlling said gears to secure variable speeds for said jack shaft, coacting variable speed driving and driven gears on said jack and driven shafts, reverse driving and 100 driven gears on said jack and driven shafts, a reverse idler connecting said reverse gears, means for controlling said gears to secure variable speeds for said driven shaft and to reverse the same, a transmission shaft adapted 105 to receive driving connections at each end disposed through said casing extension to project at each end, and driving connections for said driven and transmission shaft.

9. The combination of a casing provided with a lobe-like extension at one side, a driving shaft, a driven shaft, a jack shaft, coacting variable speed driving and driven 110 gears on said driving and jack shafts, coacting variable speed driving and driven gears on said jack and driven shafts, reverse driving and driven gears on said jack and driven 115 shafts, a reverse idler connecting said reverse gears, means for controlling said gears to secure variable speeds for said driven shaft and to reverse the same, a transmission 120 shaft disposed in said casing extension, and driving connections for said driven and transmission shaft.

10. The combination of a driving shaft, a driven shaft, a jack shaft, coacting variable 125 speed driving and driven gears on said driving and jack shafts, means for controlling said gears to secure variable speeds for said jack shaft, coacting variable speed driving and driven gears on said jack and driven 130

shafts, reverse driving and driven gears on said jack and driven shafts, a reverse idler connecting said reverse gears, means for controlling said gears to secure variable speeds for said driven shaft and to reverse the same.

11. The combination of a casing provided with a lobe-like extension at one side, a driving shaft, a driven shaft, a jack shaft, coacting variable speed driving and driven gears on said driving and jack shafts, means for controlling said gears to secure variable speeds for said jack shaft, coacting variable speed driving and driven gears on said jack and driven shafts, means for controlling said gears to secure variable speeds for said driven shaft, a transmission shaft adapted to receive driving connections at each end disposed through said casing extension to project at each end, and driving connections for said driven and transmission shaft.

12. The combination of a driving shaft, a driven shaft, a jack shaft, coacting variable speed driving and driven gears on said driving and jack shafts, means for controlling

said gears to secure variable speeds for said jack shaft, coacting variable speed driving and driven gears on said jack and driven shafts, means for controlling said gears to secure variable speeds for said driven shaft.

13. The combination of a driving shaft, a driven shaft, a jack shaft, coacting variable speed driving and driven gears on said driving and jack shafts, means for controlling said gears to secure variable speeds for said jack shaft, coacting variable speed driving and driven gears on said jack and driven shafts, reverse driving connections for said jack and driven shafts, and means for controlling said gears to secure variable speeds for said driven shaft and to reverse the same.

In witness whereof, I have hereunto set my hand and seal in the presence of two witnesses.

GEORGE J. THOMAS. [L. s.]

Witnesses:

H. M. LEE,

G. W. HEWITT.