N° 5738 A.D. 1911

Date of Application, 7th Mar., 1911—Accepted, 15th June, 1911

COMPLETE SPECIFICATION.

Improvements in or relating to Change Speed Gears for Motor-cars.

I, VINCENZO LANCIA, Manufacturer, of 31 via Petrarca, Turin, Italy, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a system of change speed gear by means of which it is possible to have two or more live axle or direct engagement speeds, the transmission being obtained by means of a single toothed wheel adjustable on the driving spindle and capable of giving other reduced speeds, as well as the reverse, by means of counter-shafts.

The accompanying drawings show several constructions according to this invention,

Figure 1 being a plan and section through the axis of the driving spindle, of a change speed gear with three speeds,

Figure 2 shows the same type modified, so as to obtain four speeds, and

Figure 3 is a section on line X—X of Figure 1,

Figure 4 shows on an enlarged scale a detail of the gear for shifting the wheel transmitting the movement,

Figures 5—7 show diagrammatically three methods of mounting the change-speed gear on the chassis of the car,

Figure 8 shows on an enlarged scale the method of fitting in accordance with Figure 6,

Figures 9 and 10 are respectively front and side elevation of the transmission of the drive gear, and

Figure 11 shows on an enlarged scale the fitting according to Figure 7.

As will be seen in Figure 1, the driving spindle 1 is mounted on bearings 2 and 3, and carries a toothed wheel 4 longitudinally adjustable on it, but keyed to the spindle itself by means of projections 5 (Figure 3). In line with the spindle 1, is mounted by means of bearings 2 and 6, a spindle 7 engaging at one of the ends with the rim of the differential, whilst at the other end it is provided with a cylindrical cap 8 with inner teeth 9. Concentrically with the spindle 7, and so as to rotate on the latter, is mounted a tubular spindle 10 resting also on bearings 12, 13 secured to the change-speed gear box.

The said tubular spindle 10, intended to transmit the movement direct to the rear spindle, is provided at its front end with a cylindrical drum surrounding the cap 8 and provided with inner teeth 15 identical with the teeth 9. If the drum 14 is provided with an outer toothed wheel 16, it will be possible to obtain, by means of a counter-shaft 17 carrying the wheels 18 and 19, a reduced speed, and in the same way, with a double toothed wheel, the reversing will be obtained.

The toothed wheel 19 of the countershaft 17, or the corresponding wheels of any other counter-shafts that may be used, must have their pitch circle tangential to the cylinder on which are arranged the pitch circles of the toothed wheels 9 and 15.

In that way, the longitudinally adjustable pinion 4 keyed to the driving spindle 1 can be brought into engagement with the inner toothed wheels 9 and 15, as well as with the wheel or wheels 19, and thus two speeds in direct engagement and the reduced speed can be obtained by means of a single pinion 4.

[Price 8d.]

If the pinion 4 is brought into the position I on the spindle 1, it will engage with the toothed wheel 9 of the cap 8, and the rotation of the spindle 1 will be transmitted direct to the spindle 7, and by the bevel pinion 24, to the rim 25 secured to the differential.

If the pinion 4 is in the position shown in Figure 1, the rotation of the spindle 1 is not transmitted to the rear axle, whilst if the pinion 4 is in the position II, it will engage with the toothed wheel 15, and the driving spindle is then connected by means of the cylinder 14 to the spindle 10, the pinion 26 of which engages with the rim 27 secured to the differential.

If the pinion 4 is brought into the position II^1, there will be no transmission. In the position III, the pinion 4 is in engagement with the wheel 19 mounted on the spindle 17 which, by means of the toothed wheel gear 16, 18, transmits to the drum 14 a reduced speed. The position III^1 of the pinion 4 does not give any transmission, and the position IV can be used for reversing by engagement with the pinion of a countershaft (not shown in the drawing).

In order to bring about the shifting of the pinion 4 on the driving spindle 1, a fork engaging with the pinion 4 in the well known manner could be used. A rod 20 is used, mounted in the interior of the spindle 1 which is consequently tubular, and the pinion 4 is connected to the rod 20 by means of a pin 21 held in place by a screw socket 22, the spindle 1 being provided with two slots 23 in which the spindle 21 can move (Figure 4).

The arrangement shown in Figure 2 indicates the method for obtaining two or more reduced speeds by means of a single counter-shaft, with the advantage that during the driving with one of the speeds in direct engagement, there is no toothed wheel in engagement, except one of the toothed wheels 26, 27 or 24, 25, which improves the efficiency and reduces noise during driving.

To that end, to the spindle 7 is keyed in a longitudinally adjustable manner a sleeve 36 provided with toothed rims 37 and 38 which can engage respectively with the toothed wheels 39, 40 of the drum 14.

In order to bring the pinion 37 or the pinion 38 into engagement with the corresponding toothed wheel of the drum 14, the sleeve 37 is surrounded by a fork 41 connected to the rod 42 longitudinally sliding in the brackets 43 and controlled by means of an arm 44 by a collar 45 mounted on the driving spindle 1. This collar 45 is connected by means of a screw 46 passing through the slots 47 of the driving spindle 1, to a tube 48 surrounding the rod 20 used for operating the pinion 4.

By manipulating in any suitable manner the tube 48, it is obvious that one of the wheels 37 or 38 of the counter-shaft 17 can be brought into engagement with the corresponding toothed wheel of the drum 14, independently of the device for bringing the pinion 4 into engagement with the pinion 19 of the counter-shaft 17.

The change speed gear *a* can be mounted in the chassis next to the differential *b*, as diagrammatically shown in Figure 5, in which case the spindle 7 is provided at its end with a pinion 24 engaging with the bevel wheel 25 secured to the differential (Figure 1), and the tubular spindle 10 is also provided with a pinion 26 engaging with the wheel 27 secured to the differential and having a greater diameter than that of the wheel 25.

When the change speed gear *a* is arranged immediately behind the universal joint, it is mounted on a fork *c* which can oscillate about a horizontal axis correspondingly with the articulation of the joint (Figure 6).

The change speed gear is not modified by its different arrangement, which is shown in Fig. 8. Only the spindle 7 must be extended to the differential, and the tubular spindle 10 provided with an extension 10^1. The drum 35 on which the jaws of the foot-brake act, can be secured to the parts 34 connecting together the spindles 10 and 10^1. The control of the pinion 4 is obtained in that case by means of a fork 30 engaging with a collar 30^1 loose on the driving spindle and

connected to the movable pinion 4. The fork 30 is connected by means of the rod 31 to a guide 32 (Figures 9 and 10) with which engages the knob of the lever 33, the rotation of which is brought about by the operating lever. The guide 32 is of such shape as to enable the lever 33 to oscillate about the horizontal axis *z*—*z* relatively to which the change speed gear box can oscillate and which passes through the centre of the universal joint, for the purpose of preventing the oscillations of the system from producing a movement of the rod 31, and consequently of the adjustable pinion 4.

If, on the contrary, as shown diagrammatically in Figure 7, the change speed gear *a* is mounted near the engine *d*, each of the spindles 7 and 10, Fig. 11, must be provided with a universal joint 28 and 29, so as to make possible the oscillation of the rear axle relatively to the chassis of the vehicle about the spindle *z*—*z*.

This change speed gear makes it possible in any case to obtain two or more speeds in direct engagement (live axle drive) and reduced speeds as well as reversing, by operating a single pinion mounted in a longitudinally adjustable manner on the driving shaft, the control of said pinion being effected, if desired, by means of a rod provided inside the spindle, and independently of the operating gear—which can also be an inner one—for obtaining one or the other of the reduced speeds.

It must be pointed out as a characteristic feature of the construction that the tubular driving shaft 10, as well as the drum 14, is mounted in the gear-casing and on the spindle 7, so as to rotate on ball bearings and without pressing on the said spindle 7.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A change speed gear for motor-cars, with two or more speeds in direct engagement, in which a single pinion adjustable on the driving shaft is capable of being brought into engagement with the inner toothed wheels of cylindrical drums secured to the concentric driven spindles as well as with other pinions producing, by means of countershafts, reduced speeds or the reverse drive.

2. A change speed gear of the kind set forth in Claim 1, in which a sleeve provided with pinions is adjustably mounted on the countershaft which can be controlled by the pinion of the driving shaft, the pinions of which sleeve can be brought, by means of an operating gear, into engagement with the corresponding toothed wheels of the drum secured to one of the driven spindles, so that when driving at one of the speeds in direct engagement, the wheels for reduced speeds remain stationary.

3. A change speed gear of the kind set forth in the preceding claims, in which the pinion mounted on the driving shaft is controlled by means of a rod arranged in the interior of the shaft and connected to the said pinion by a pin capable of sliding in the slots provided in the driving spindle.

4. A change speed gear of the kind set forth in Claim 2, in which the movable sleeve mounted on the countershaft which can be operated by the pinion of the driving shaft, is controlled by means of a collar mounted on the driving spindle and connected to a tube inside the driving shaft and surrounding the central rod intended to control the adjustable pinion 4.

5. A change speed gear of the kind set forth in Claims 1 and 2, in which the control is obtained by means of an outer fork surrounding a collar adjustable on the spindle and connected to the adjustable pinion, the said fork being operated by a lever connected to the controlling rod in such a manner that the oscillations of the change speed gear box (when it is mounted behind the universal joint), cannot produce a movement of the fork.

6. A change speed gear of the kind set forth in Claims 1 and 2, in which the two driven shafts are provided with universal joints, one inside the other in

order to enable the gear to be mounted near the engine, and consequently in front of the universal joint.

7. A change speed gear of the kind set forth in the preceding claims, in which the outer tubular spindle transmitting one of the speeds in direct engagement, rests on ball bearings mounted in the gear casing and on the inner spindle.

8. The change speed gear for motor cars substantially as described or as illustrated in the accompanying drawings.

Dated this 7th day of March, 1911.

BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London, E.C.,
Chartered Patent Agents.

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A.D. 1911. March 7. N° 5738.
LANCIA'S Complete Specification.

(1 Sheet)

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig.1

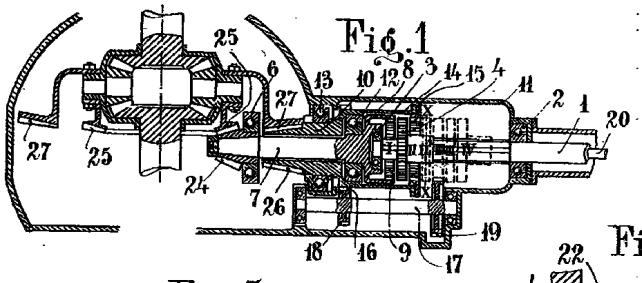

Fig.2

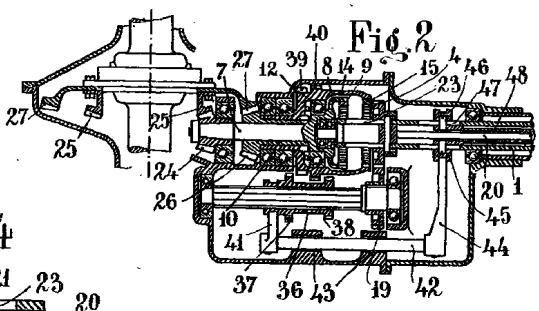

Fig.4

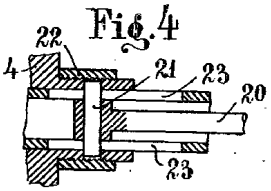

Fig.5

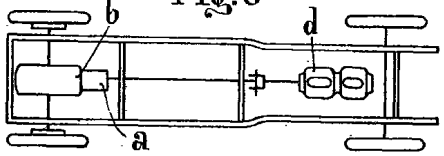

Fig.3

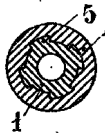

Fig.8

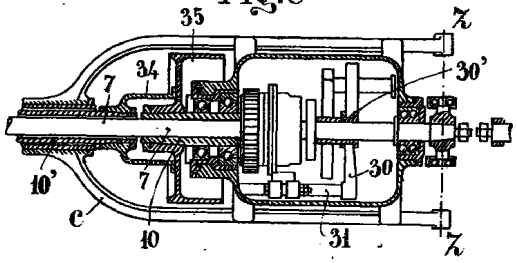

Fig.6

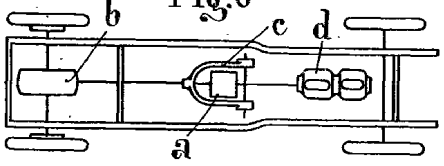

Fig.9

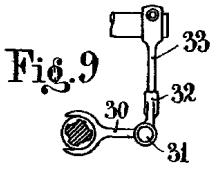

Fig.7

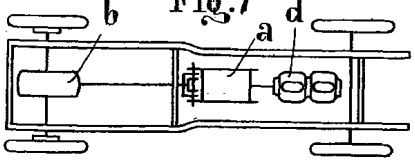

Fig.10

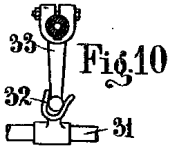

Fig.11

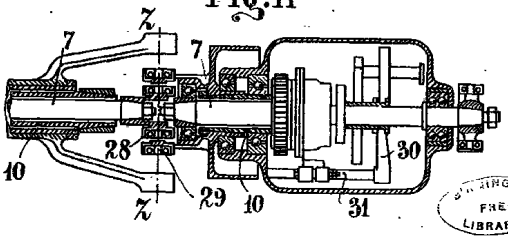

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Fig. 1

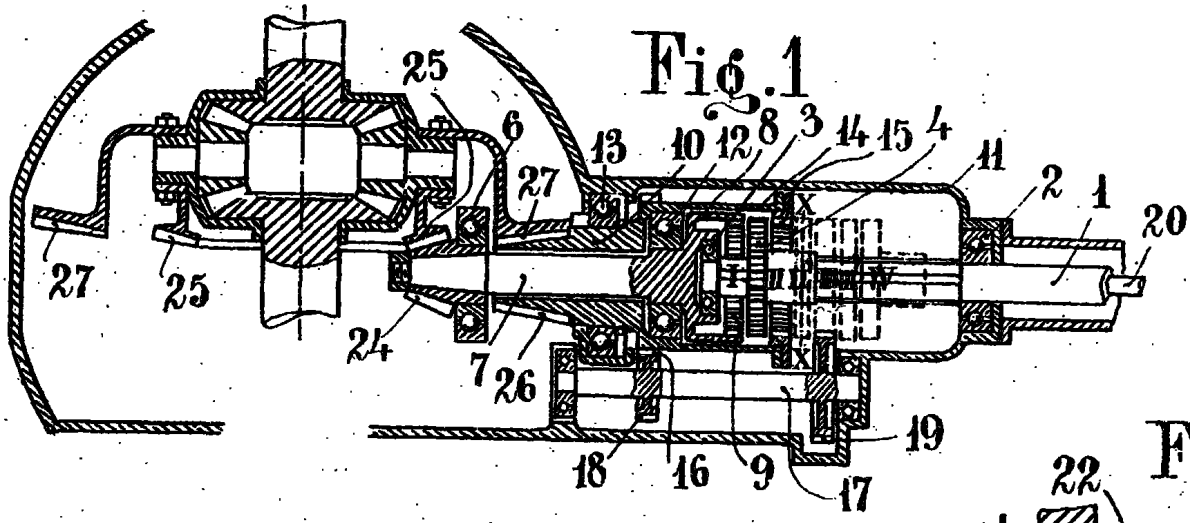


Fig. 4

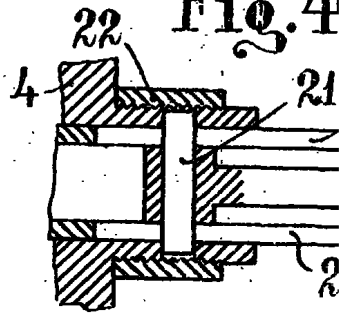
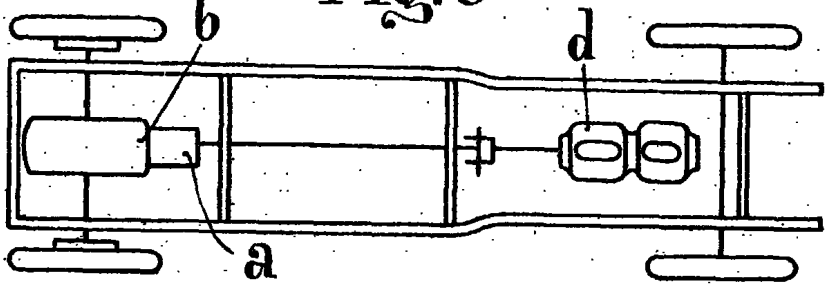


Fig. 5



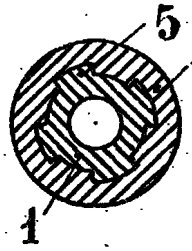


Fig. 3

Fig. 6

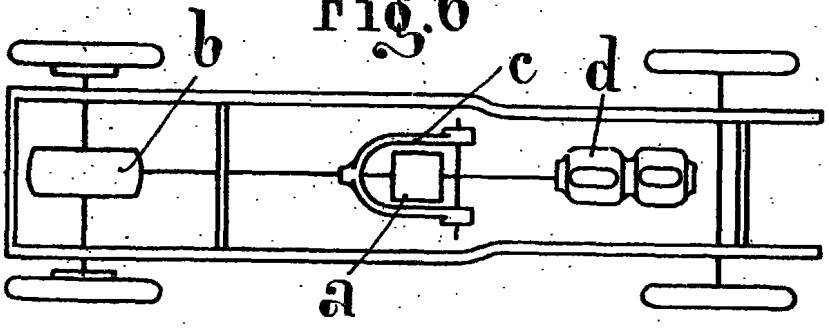


Fig. 9

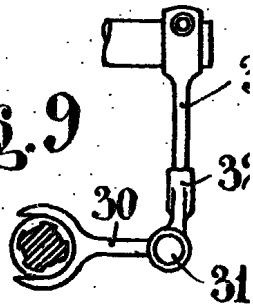


Fig. 7

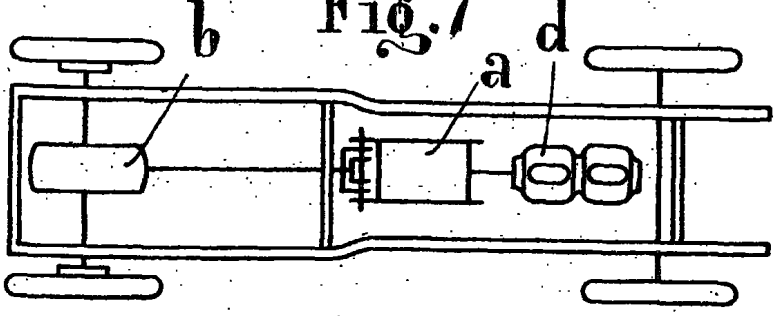


Fig. 10

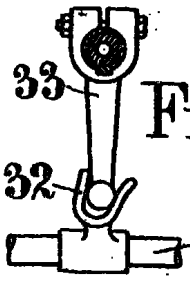
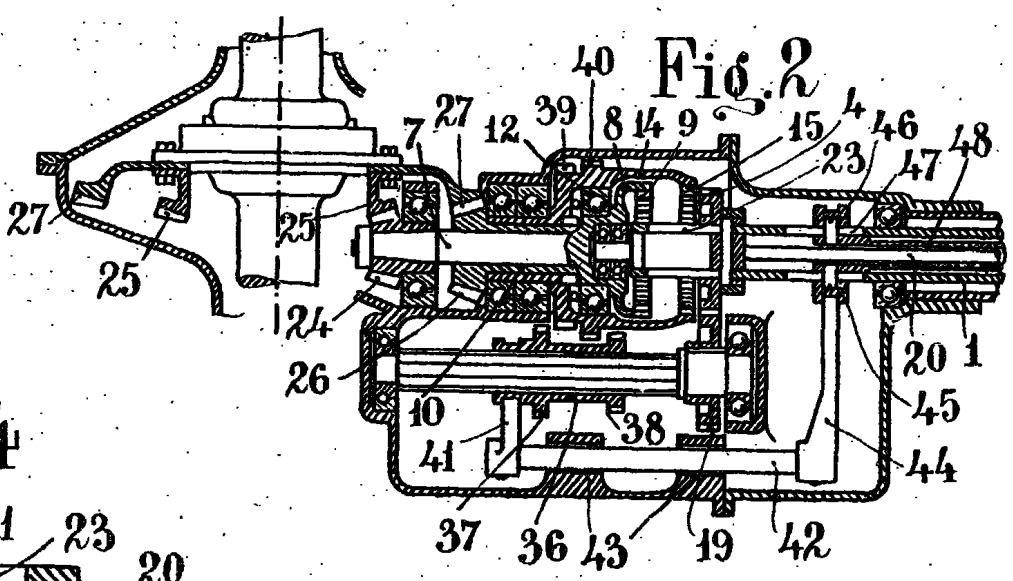


Fig. 2



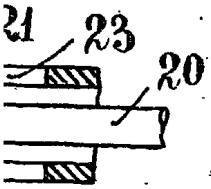


Fig. 8

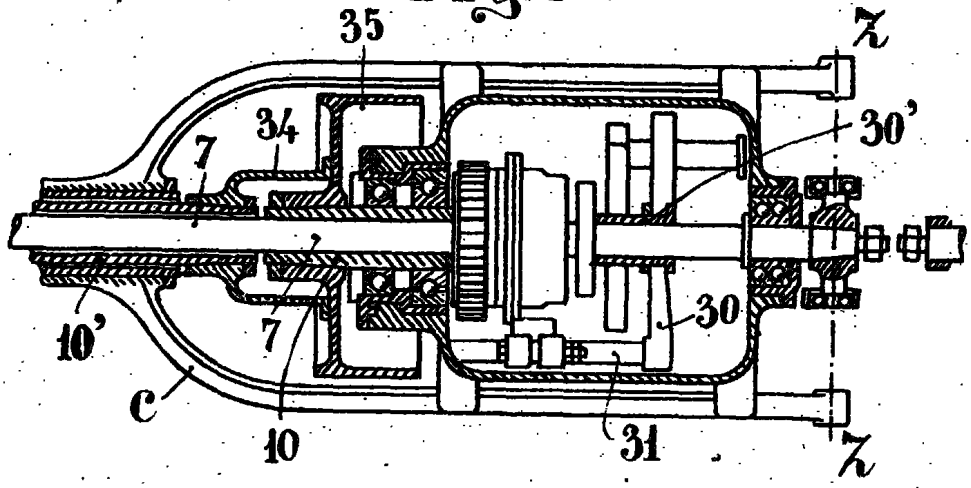


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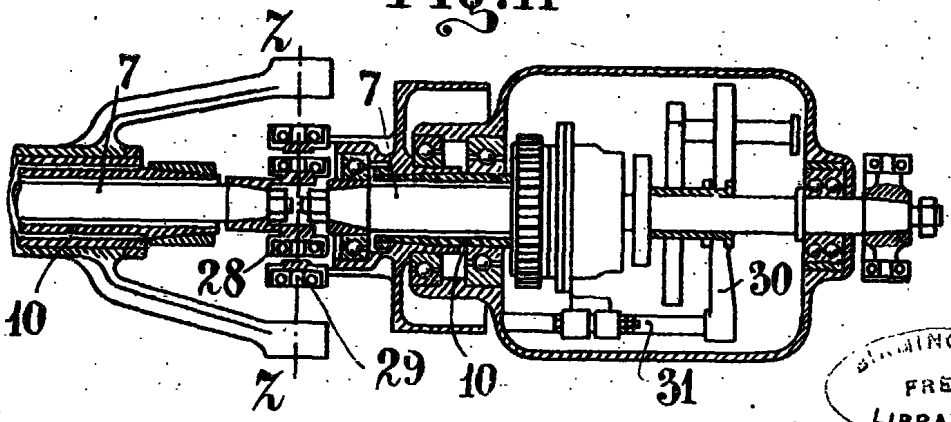
Fig. 11



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