A. L. SLEE.

CHANGEABLE SPEED TRANSMISSION MECHANISM.

APPLICATION FILED APR. 20, 1908.

939,643. Patented Nov. 9, 1909.

Fig. 1.

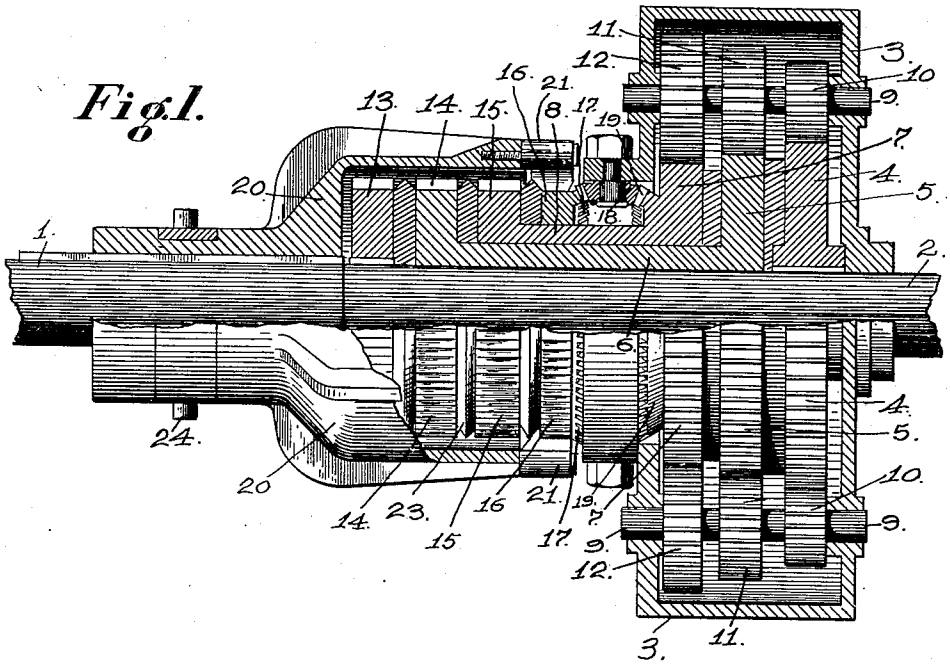
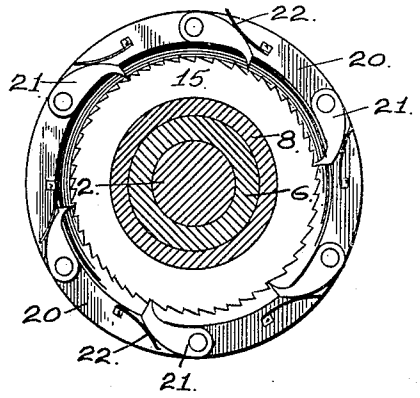


Fig. 2.



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CHANGEABLE-SPEED TRANSMISSION MECHANISM.

939,643. Specification of Letters Patent. Patented Nov. 9, 1909.

Application filed April 20, 1908. Serial No. 428,011.

To all whom it may concern:

Be it known that I, ARTHUR L. SLEE, a citizen of the United States, residing at Berkeley, in the county of Alameda and State of California, have invented certain new and useful Improvements in Changeable-Speed Transmission Mechanisms, of which the following is a specification.

My invention relates to the class of transmission-gearing which involves changeable or variable speeds, and is especially applicable to automobiles, as it provides for any number of "speeds ahead", and for the "reverse".

The general object of my invention is to simplify the mechanism, both in construction and operation, as I shall, hereinafter, more specifically point out; and to this end my invention consists in the novel constructions, arrangements and combinations which I shall now fully describe, by reference to the accompanying drawings in which—

Figure 1 is a broken, sectional view of my changeable-speed transmission mechanism. Fig. 2 is an end view of the pawl-carrier showing the engagement of its pawls with one of the ratchets.

1 is the driving shaft, and 2 is the driven shaft, the two being alined, as shown. Surrounding the driven shaft is the gear-case 3 which is to be suitably fixed in place. Within the gear case is a gear 4 which is fast upon the driven shaft 2. Within said gear-case is also a gear 5 which is carried by a sleeve 6 rotatably mounted on the driven shaft; and there is also in said case a gear 7 which is carried by a sleeve 8 rotatably mounted on the sleeve 6. In the gear-case are mounted short counter-shafts 9, arranged in annular series in any suitable number; I contemplate six. Upon each counter-shaft 9 is fixed a small pinion 10 which meshes with the driven-shaft gear 4; an intermediate pinion 11 which meshes with the sleeve-gear 5, and a large pinion 12 which meshes with the sleeve-gear 7.

Upon the driven shaft 2, near its end adjacent to the driving shaft, is fixed a ratchet 13. The outer end of the sleeve 6 carries a ratchet 14, and the outer end of the sleeve 8 carries a ratchet 15. Rotatably mounted on the sleeve 8 is a ratchet 16. One side of the ratchet 16 is formed or provided with an annular gear 17. This gear meshes with an idler pinion 18 of which there may be any number, arranged in annular series. These pinions 18 also mesh with an annular gear 19 on the side of the gear 7. Slidably mounted upon the driving shaft 1 is a pawl-carrier 20, which has secured to it the pawls 21 arranged in annular series and adapted to engage any of the ratchets, said pawls being controlled by the springs 22. Between the ratchets are spacing rings 23 with beveled rims, to insure the riding over, from one ratchet to the other, of the pawls, and to insure the clearance of said pawls from one ratchet before engaging another. The lugs 24 on the pawl-carrier indicate a portion of any suitable connection, by which said carrier may be moved to its several positions.

The following description of the operation of the entire mechanism, will make its construction clearer. Suppose the pawl-carrier 20 to be moved back along the driving shaft 1 to a position in which its pawls 21 will engage the ratchet 13 which is fast on the driven shaft 2. The two shafts 1 and 2 will now be connected through the pawls and said ratchet, and the power transmitted will be a direct drive from shaft 1 to shaft 2, or, as it has come to be termed, a "high-speed". Now suppose the pawl-carrier 20 to be moved forward, so that its pawls, riding over the spacing ring 23, will leave the ratchet 13 and come to engagement with the ratchet 14. The power of shaft 1 will now be transmitted through ratchet 14, sleeve 6, gear 5, intermediate pinions 11, counter-shafts 9, small pinions 10 and gear 4, to the driven shaft 2; and this results in an "intermediate" speed. If now the pawl-carrier 20 be moved still farther forward, so that its pawls will engage ratchet 15, the transmission will then be through ratchet 15, sleeve 8, gear 7, large pinions 12, counter-shafts 9, small pinions 10 and gear 4, to the driven shaft 2, resulting in a "low" speed. Thus three speeds ahead are provided for. The final movement results in the "reverse". The pawl-carrier 20 is moved still farther to a position, (shown in Fig. 1) in which the pawls engage the ratchet 16. The transmission will then be through ratchet 16, its annular gear 17, the idler pinions 18, which reverse the direction of movement, the annular gear 19, gear 7, large pinions 12, counter-shafts 9, small pinions 10 and gear 4 to the driven shaft 2, which will thus be reversed on the low speed.

The whole device is simple in construc-

tion, compact, durable, and noiseless. It provides for every contingency of automobile transmission, and for increasing the number of speeds, for it is obvious that any number of speeds may intervene between the high and the low, by simply increasing the number of nested sleeves with their appropriate ratchets, gears and pinions. There are no sliding gears to change their mesh, and be the occasion of noise, wear and breakage. The "reverse" is an intimate part of the device and not a separate movement, its relation being such that the change from the "low" to the "reverse" and back again is part of the same movement by which all the changes are effected. The device also has the advantage, by alining the driving and driven shafts, of enabling all the mechanism to be immediately and intimately clustered around them, and of transmitting all the speeds practically direct, that is, by a direct "clutching" of one by the other, the only difference in the speeds being in the character of the respective connections which join the two alined shafts. The provision of the annular series of counter-shafts with their pinions, is of advantage in equalizing the pressure on the gear 4, causing the shaft 2 to be driven, as it were, by its own circumferential bearings, resulting in smoothness of transmission and compactness in construction. This is true, also, of the annular series of reversing pinions 18 and of the plurality of pawls on the pawl-carrier.

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

1. In a changeable speed transmission mechanism, the combination of a driving and a driven shaft in alinement, variable speed gears independently rotatable about the axis of the driven shaft, a gear fast on the driven shaft, gear connections between the variable speed gears and said driven shaft gear, means for connecting the driving shaft with any of said variable speed gears, and means for reversing the direction of movement of one of the variable speed gears to reverse the movement of the driven shaft.

2. In a changeable-speed transmission mechanism, the combination of a driving and a driven shaft in alinement; variable-speed gears independently rotatable about the axis of the driven shaft; a gear fast on the driven shaft; a counter shaft; variable-speed pinions on said counter shaft, separately engaging said variable-speed gears and said driven-shaft gear; means for connecting the driving shaft with any of said variable-speed gears; means for directly connecting and disconnecting said driving shaft with and from the driven shaft; and means for reversing the direction of movement of one of the variable-speed gears, to reverse the driven shaft.

3. In a changeable-speed transmission mechanism, the combination of a driving and a driven shaft in alinement; a gear fast on the driven shaft; a sleeve rotatably mounted on the driven shaft; a gear carried by said sleeve; a counter-shaft; pinions carried thereby meshing respectively with the sleeve-gear and with the driven shaft-gear; a ratchet carried by said sleeve; and a slidable pawl-carrier on the driving shaft, and a pawl carried thereby adapted to be moved into and out of engagement with said ratchet.

4. In a changeable-speed transmission mechanism, the combination of a driving and a driven shaft in alinement; a gear fast on the driven shaft; a plurality of concentric sleeves independently rotatable about the axis of the driven shaft; a gear carried by each sleeve; a counter-shaft; pinions thereon respectively engaging each sleeve-gear and the driven shaft-gear; a ratchet carried by each sleeve; and a slidable pawl-carrier on the driving shaft, and pawls carried thereby to separately and successively engage and release any of said ratchets.

5. In a changeable-speed transmission mechanism, the combination of a driving and a driven shaft in alinement; a gear fast on the driven shaft; a sleeve rotatably mounted on the driven shaft; a gear carried by said sleeve; a counter-shaft; pinions thereon meshing respectively with the sleeve-gear and with the driven shaft-gear; a ratchet carried by said sleeve; a second ratchet fast on the driven shaft; and a pawl-carrier slidably mounted on the driving shaft and pawls on said carrier adapted to engage with and to be disengaged from either of said ratchets.

6. In a changeable-speed transmission mechanism, the combination of a driving and a driven shaft in alinement; a gear fast on the driven shaft; a plurality of concentric sleeves independently rotatable about the axis of the driven shaft; a gear carried by each sleeve; a counter-shaft; pinions thereon engaging respectively with each sleeve-gear and with the driven shaft-gear; a ratchet carried by each sleeve; a ratchet fast on the driven shaft; and a pawl-carrier slidably mounted on the driving shaft and pawls on said carrier adapted to engage with and to be disengaged from any of said ratchets.

7. In a changeable-speed transmission mechanism, the combination of a driving and a driven shaft in alinement; a gear fast on the driven shaft; a sleeve independently rotatable about the axis of the driven shaft; a counter-shaft; pinions thereon engaging respectively the sleeve gear and the driven shaft-gear; a ratchet fast on the sleeve; a second ratchet turnable on said

sleeve; opposing annular gears, one on the turnable ratchet and the other on the sleeve-gear; intervening pinions engaging said annular gears; and a slidable pawl-carrier on the driving shaft, and pawls carried thereby adapted to engage either of said ratchets.

8. In a changeable-speed transmission mechanism, the combination of a driving and a driven shaft in alinement; a gear fast on the driven shaft; a plurality of concentric sleeves independently rotatable about the axis of the driven shaft; a gear carried by each sleeve; a counter-shaft; pinions thereon engaging respectively each sleeve-gear and the driven shaft-gear; a ratchet carried by each sleeve; a ratchet fast on the driven shaft; a ratchet turnable on the outermost sleeve; opposing annular gears, one on said last-named ratchet and the other on the adjacent sleeve-gear, idler pinions between and engaging said annular gears; and a pawl-carrier slidably mounted on the driving shaft and pawls on said carrier adapted to engage with and to be disengaged from any of said ratchets.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR L. SLEE.

Witnesses:
WM. F. BOOTH,
D. B. RICHARDS.