F. HENRIOD-SCHWEIZER.

CHANGE SPEED GEAR.

APPLICATION FILED MAY 4, 1915.

1,239,272.

Patented Sept. 4, 1917.

4 SHEETS—SHEET 1.

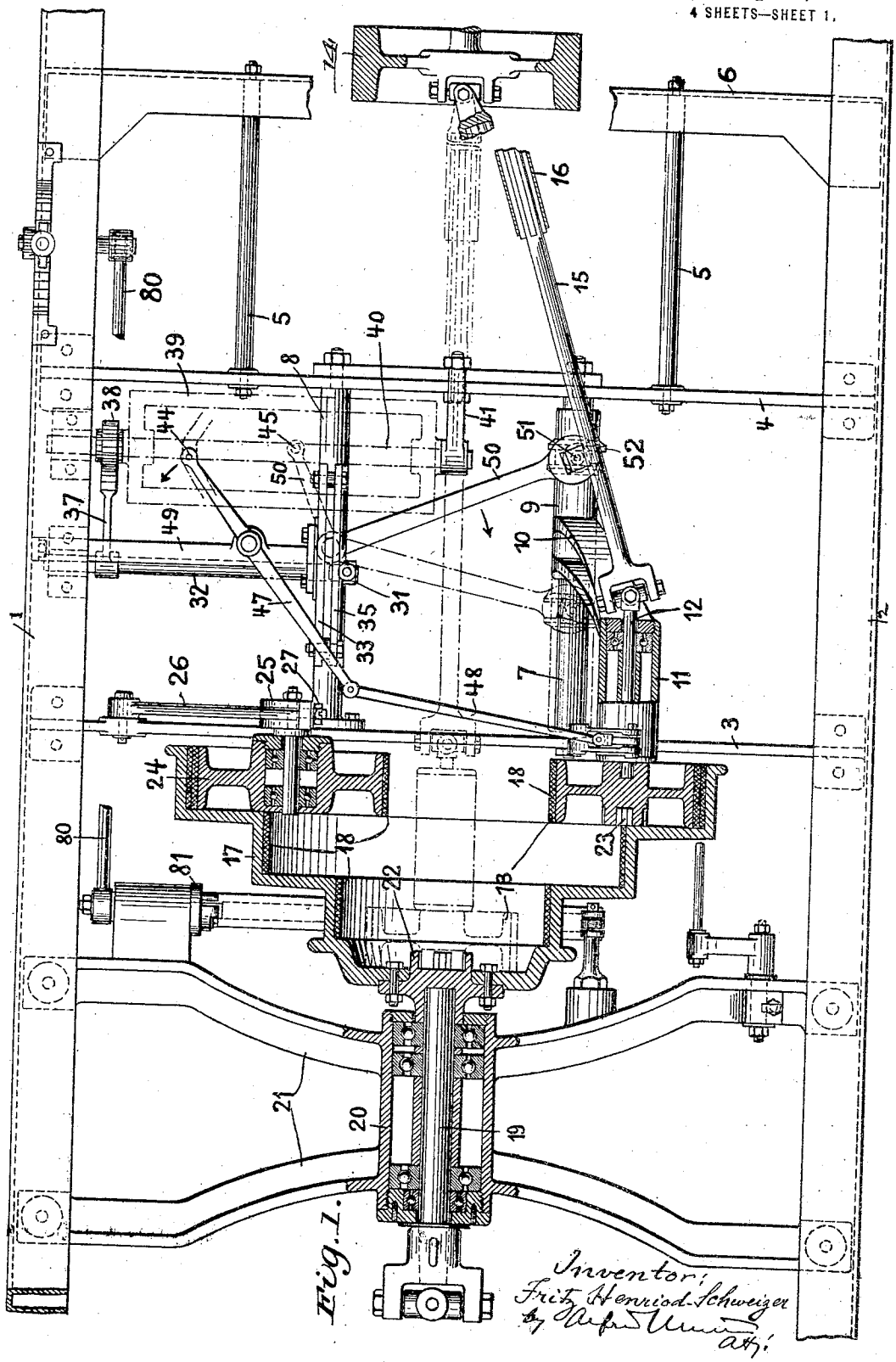


Fig. 1.

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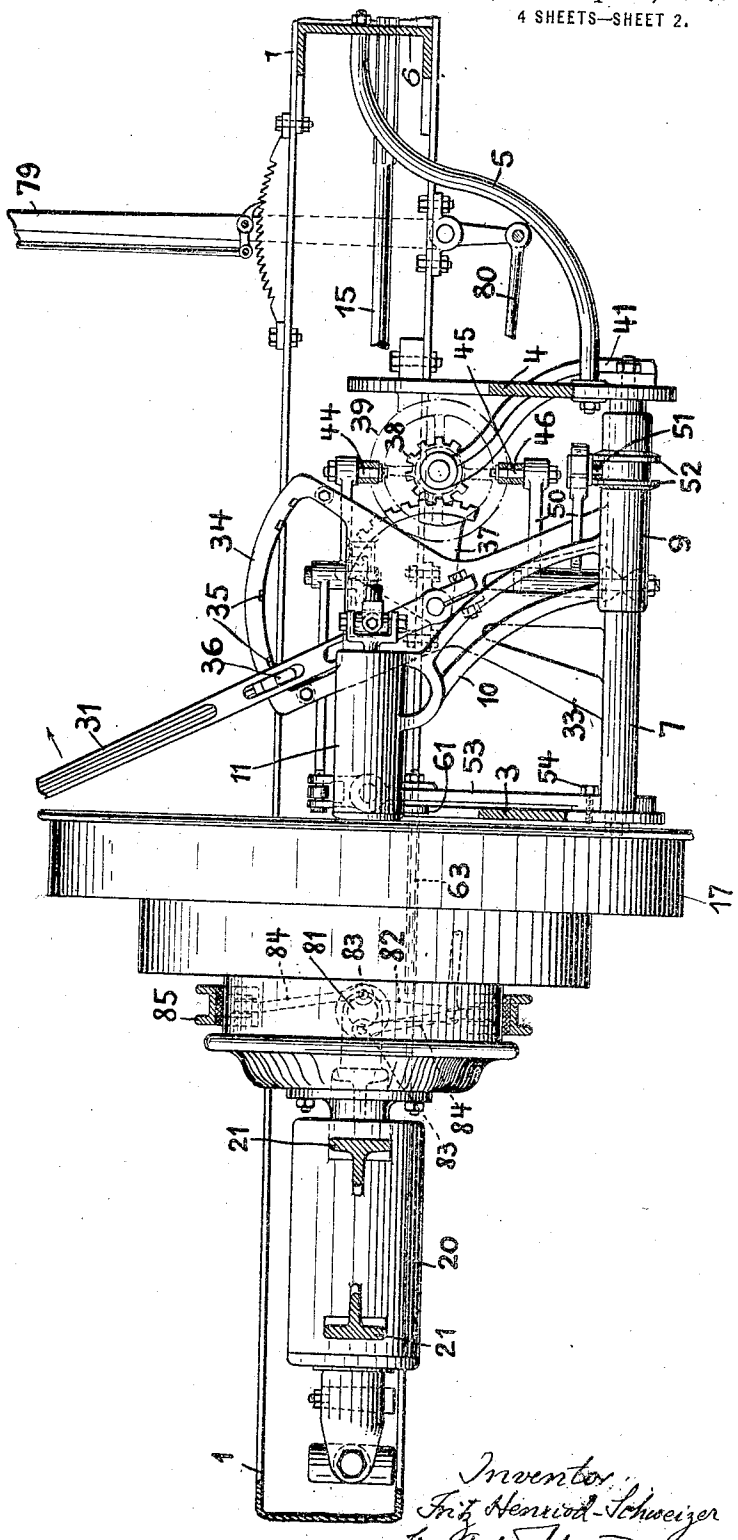
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4 SHEETS—SHEET 2.

Fig. 2



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Fig. 3

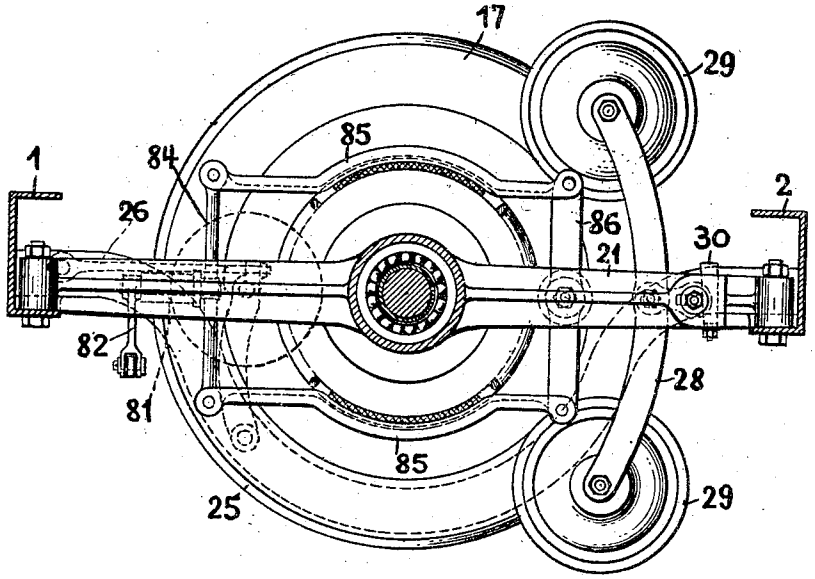
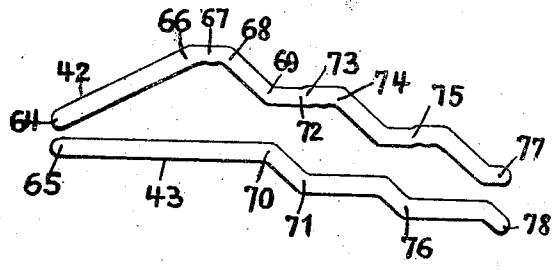


Fig. 4



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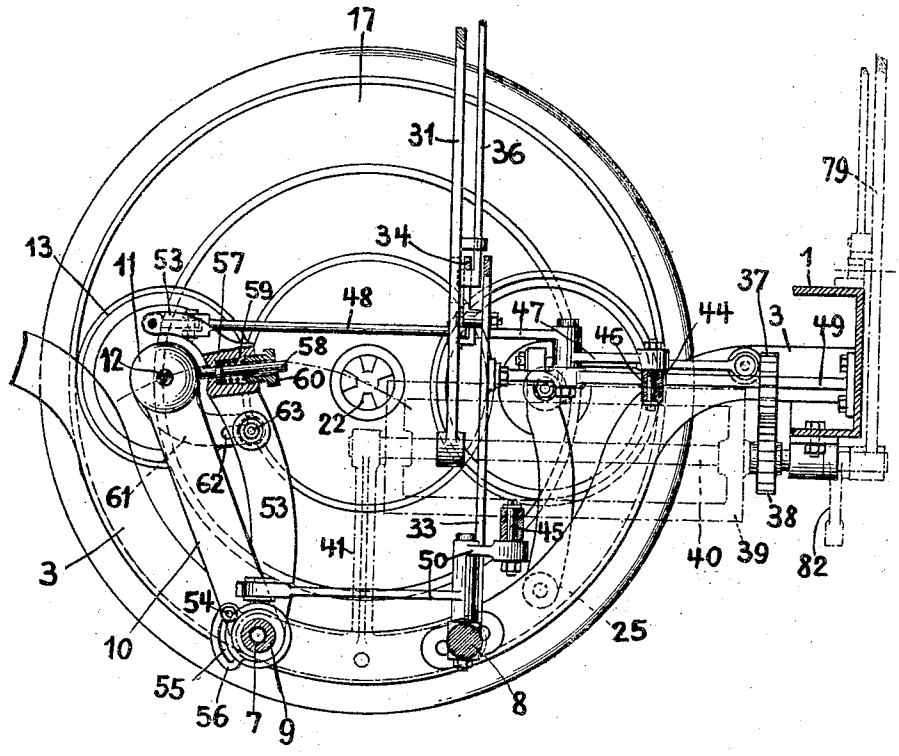
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4 SHEETS—SHEET 4.

Fig. 5



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UNITED STATES PATENT OFFICE.

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CHANGE-SPEED GEAR.

1,239,272. Specification of Letters Patent. Patented Sept. 4, 1917.

Application filed May 4, 1915. Serial No. 25,872.

To all whom it may concern:

Be it known that I, FRITZ HENRIOD-SCHWEIZER, a citizen of the Swiss Confederation, and residing at Villamont 29, Neuchatel, Switzerland, have invented certain new and useful Improvements in Change-Speed Gears, of which the following is a specification.

The present invention relates to a speed gear which is chiefly intended for motor cars.

Hitherto the only speed gear which has stood the test in practice is the sliding gear device. The drawbacks of this gear are too well known to be enumerated here. The object of my invention is to remove these drawbacks. According to my invention the speed gear is provided with a driving pulley and a step pulley, driven by said driving pulley, the latter being fixed to the motor shaft and having an axial displacement thereon, sidewise with reference to the step pulley, which displacement is automatic and controlled by means of a lever operated by hand in a plane parallel to the axis of the step pulley, without any lateral movement being required.

Some illustrative embodiments of my invention are diagrammatically represented by way of example in the accompanying drawings, wherein:—

Figure 1 is a plan view, partly showing a horizontal section;

Fig. 2 is a side elevation;

Fig. 3 is a rear view, partly in vertical section, on a reduced scale;

Fig. 4 is a detail, and

Fig. 5 is a front view, partly in vertical section.

On the beams 1 and 2 of the motor car frame are fixed two off-set cross-pieces 3 and 4 (Figs. 1 and 5) the latter of which is coupled by means of two stay bolts 5 to a cross-piece 6 of the frame. Between the two cross-pieces 3 and 4 are fixed parallel to each other a tube 7 and a supporting rod 8. On the tube is fitted a slide-piece 9 which carries on two arms 10 a bearing box 11. In the latter is journaled a shaft 12 for the driving pulley 13, the said shaft 12 being coupled by means of a rotary connecting rod and two universal joints with the fly wheel 14 of the motor. This connecting rod consists of two parts 15 and 16, respectively, of which the one, 15, coupled to the shaft 12 may slide but not revolve in the other 16, so that the rod telescopes and may be lengthened or shortened automatically. The driving pulley 13 drives by friction a step or cone pulley 17. The three steps of this cone pulley correspond to the first, second and third speed respectively of the car, and the inside of these steps as well as the face of the driving pulley 13 are provided with a suitable lining 18 which insures an effective friction and allows of a perfect adhesion at a minimum pressure. The cone pulley 17 is fixed on a shaft 19 which runs in ball bearings of which the box 20 is carried by four arms 21 secured to the beams 1 and 2. The shaft 19 is coupled to the shaft of the differential gear of the driving axle, not shown in the drawing. The head of the shaft 19 has four claws 22 (Figs. 1 and 5) corresponding to four other claws 23 in the boss of the pulley 13. When the claws 22 engage, in the manner described hereinafter, in the spaces between the claws 23, the motor shaft and the shaft 19 are coupled directly one with another, which corresponds to the fourth speed of the car. For taking up the pressure of the pulley 13 a counter-pressure pulley 24 has been provided, which bears against the inside face of the largest step of cone pulley 17, and which is fitted, the same as pulley 13, with a suitable lining 18. The shaft of pulley 24 is carried in a pivotally-disposed arm 25 (Figs. 1 and 3) secured to the cross-piece 3. To this arm is secured a rod 26 which is likewise pivotally fitted to the cross-piece 3 and the end of which is threaded and carries a nut 27. By unscrewing or tightening this nut the degree of pressure of pulley 24 may be regulated at will. To one of the arms 21 is pivoted a rock beam 28 (Fig. 3) which is fitted at its ends with two pulleys 29 which bear against the outer face of the second step of cone pulley 17. These pulleys are chiefly employed with heavy loads, for example with motor vans which require a stronger pressure of the driving pulley 13, and also with cars of high horsepower. In Figs. 1 and 2 they have been omitted for the sake of greater clearness. The suitable position of pulleys 29 with regard to the cone pulley may be regulated by means of a wedge 30.

The mechanism for controlling the driving pulley 13 consists of an operating lever 31 (Figs. 1 and 2) fitted to a shaft 32 which rocks on one side in a bearing 33 made in one piece with the supporting rod 8 and on

the other side in a bearing fitted to beam 1. The upper part of bearing 33 is provided with a quadrant 34 in which are provided the notches 35 for the latch 36 of the operating lever, each notch corresponding to one of the four speeds and the return of the car respectively.

The quadrant 34 may also be omitted, and in this case the locking of the operating lever 31 in the four positions is obtained by the roller 39.

In the embodiment shown in the drawings, the lever 31 is placed almost in the middle line of the car frame so that the steering wheel of the car may be arranged on the left. When the steering wheel is to be arranged on the right, the lever 31 and the quadrant 34 are placed on the right side of the frame. The shaft 32 also carries a toothed sector 37 in mesh with a pinion 38 secured to the shaft 40 of a cam roller 39. This shaft 40 is pivoted at one of its ends in a bearing attached to the beam 1, and at the other end in an arm 41 fitted to the cross-piece 4. The roller 39 is provided with two grooves 42 and 43 running transversely, the development of which grooves is shown in Fig. 4. In each of these grooves engages a pin 44 and 45, respectively, each pin carrying a small roller 46 to facilitate the movement in the said grooves. The pin 44 is provided on one arm of a double lever 47, the other arm of which is linked to a connecting rod 48. The lever 47 is fulcrumed on a support 49 secured on one side to the bearing 33 and at the other side to the beam 1 (Fig. 3). The pin 45 is secured to one arm of a bell crank 50 which is pivoted on the rod 8, the other end of which carries a fork 51 having a pin engaging between two collars 52 on the slide-piece 9.

The connecting rod 48 is coupled by a universal joint to the upper part of a rocking arm 53 (Fig. 5) pivoted on the tube 7, and secured to the cross-piece 3 by means of a screw 54 which crosses the mouth 55 of a collar 56 of a rocking arm 53. In one piece with the latter is made a hollow cylinder 57 in which is fitted a push-rod 58 which bears against the box 11 under action of a coiled spring 59, the tension of which may be regulated by means of a screw 60. This screw, therefore, regulates the pressure of the driving pulley 13 against the step pulley 17. An arm 61, made in one piece with the box 11, has in its free end an opening 62 through which passes a rod 63 (Fig. 2) which is secured to the arm 53. This rod 63 reaches up to the third step of the cone pulley and serves as a guide for the sliding mechanism composed by the members 9, 10 and 11.

On the beam 1 and close to the bearing of shaft 40 of the cam roller 39 is arranged a rock lever 79 (Figs. 1, 2 and 3), of known design, for operating the brake by means of a rod 80. This rod is linked to a lever 82, fitted to a pin 81, which pivots in one of the arms 21. The said pin terminates in two small pins 83, each of which is secured to a rod 84. The two rods 84 are coupled to the one end of two brake jaws 85, the other ends of which are pivotally connected by two links 86 fitted to one of the arms 21. The jaws 85 bear against the outer face of the third or smallest step of the cone pulley. They are tightened and released, respectively, by the operation of lever 79 in the one or other direction. The hereinafter described brake is chiefly used when the car is to be stopped.

When the operating lever 31 is in the position shown in Fig. 2 the driving pulley 13 bears against the pulley 24 for the return travel. The pin 44 of lever 47 engaging in the groove 42 in cam roller 39 is at 64 (Fig. 4) and the pin 45 of lever 50 is at 65 in the groove 43. When the lever 31 is pulled in the direction indicated by the arrow in Fig. 2 the cam roller 39 is turned simultaneously by the sector 37 and the pinion 38. By this movement of the cam roller 39 the pin 44, engaging in the groove 42, is laterally displaced, sliding along the path 64, 66 in the said groove, so that the lever 47 is turned in the direction of the arrow in Fig. 1. This movement of the lever 47 is transmitted to the rocking arm 53 by means of the connecting rod 48 so that the said arm rocks on the tube 7 and simultaneously displaces the box 11 and the driving pulley 13 toward the inside face of the largest step of the cone pulley 17. At the same moment when the pin 44 has reached the point 66 of the groove 42, the lining of pulley 13 acts on the lining of the said step of the cone pulley. When the lever 31 is pulled so far that its latch is opposite the second notch in the quadrant 34, the pin 44 is moved to the point 67 of the groove 42, and the push-rod 58 is pressed against the box 11. This pressure is transmitted to the driving pulley 13 which is thus locked with the largest step of the cone pulley 17, so that the car starts at the first speed (position of pulley 13 being shown in full lines in Fig. 1). When the movement of the lever 31 is continued in the same direction the pin 44 reaches the point 68 of the groove 42, whereby the pressure of pulley 13 against the cone pulley is discontinued. The pulley 13 is, therefore, withdrawn from the cone pulley toward the central axis of the latter according to the degree the pin 44 approaches the point 69 of the groove 42, because by this approach the lever 47 is turned opposite to the direction of the arrow in Fig. 1. At the moment when the pin 44 has reached the point 69, the pulley 13 will be on a level with and at the entrance of the second step of the cone pulley. At the end of the to-and-fro travel

of the pulley 13, just described, the pin 45, which engages in the groove 43, is at the point 70 of the said groove. As may be seen from Fig. 4, the section 65, 70 of this groove is parallel to the path of roller 39. Therefore the pin 45 has, until then, not received any lateral movement. When the pin 45 reaches the section 70, 71, which is at an angle to the section 65, 70, the pin 45 is shifted and in consequence thereof the lever 50 is moved in the direction of the arrow shown in Fig. 1. By such movement the lever 50 causes the slide-piece 9 to slide on the tube 7 whereby a similar movement of the box 11, guided by the arm 61 and the rod 63, and of driving pulley 13 is produced, said pulley being at the end of such movement exactly opposite the second step of the cone pulley. During this time the section 69, 72 of groove 42, which is parallel to section 65, 70 of groove 43, has passed the pin 44 which thereupon enters the section 73, 74, pressing thereby the driving pulley 13 against the second step of the cone pulley and starting the car at the second speed. It is evident that when the lever 31 is moved still farther in the same direction, the driving pulley 13 will be pressed against the third step of the cone pulley, thereby engaging the third speed at the moment when the pins 44, 45 have reached the points 75 and 76, respectively, in the grooves 42 and 43, respectively. The direct engagement, shown in dotted lines in Fig. 1, between the teeth of the boss of pulley 13 and the teeth 22 of the head of shaft 19, corresponding to the fourth speed of the car, is effected without any pressure of the push-rod 58 at the moment when the pins 44, 45, reach the points 77, 78, respectively, in the two grooves. During such direct engagement, the latch of operating lever 31 engages in the notch which is provided at the extreme right of the quadrant 34 (Fig. 2).

The arrangement may also be constructed in such manner that the position of lever 31 in Fig. 2 corresponds to the direct engagement, whereas the reverse motion is obtained when the said lever is at the extreme right of the quadrant 34 (Fig. 2).

It is obvious that by one single pull of the operating lever it is possible to pass from the direct engagement to the reverse motion, or from the reverse motion to the third speed at which the car may also be started. Furthermore, it is evident that for the purpose of changing from one speed to the next it is only necessary to move the operating lever 31 to the notch corresponding to such speed to be engaged. The lever is thus always moved in the same plane and does not require any lateral movement as is necessary with known speed gears, specially with those employing step pulleys.

In case the brakes should fail, the reverse motion may be engaged, even while the car is running forward, and by such operation the car may be stopped without any danger to the gear.

It is self-evident that the pulleys may be replaced by toothed wheels, and that the speed gear may be arranged for a smaller or greater number of speeds.

I claim:—

1. In a change speed gear the combination with the motor shaft and the driven shaft, of a stepped driven member, a driving member, slidable means coupling said driving member to said motor shaft, a slidable support for said driving member adapted to be rocked transversely of its sliding movement, a mechanism adapted to impart a rocking and sliding movement to said driving member for positioning it relative to said stepped driven member to cause the driving member to engage said driven member for the speed desired, and manual means for operating the said mechanism.

2. In a change speed gear the combination with the motor shaft and the driven shaft, of a stepped driven member, a driving member, slidable means coupling said driving member to said motor shaft, a slidable support for said driving member adapted to be rocked transversely of its sliding movement, a mechanism adapted to impart a rocking and sliding movement to said driving member for positioning it relative to said stepped driven member to cause the driving member to engage said driven member for the speed desired, manual means for operating the said mechanism, and means on said driving member to couple it directly with the driven shaft.

3. In a change speed gear the combination with the motor shaft and the driven shaft of a stepped driven member, a driving member, slidable means coupling said driving member to said motor shaft, a slidable support for said driving member adapted to be rocked transversely of its sliding movement, a mechanism adapted to impart a rocking and sliding movement to said driving member for positioning it relative to said stepped driven member to cause the driving member to engage said driven member for the speed desired, manual means for operating the said mechanism, an adjustable pressure member adapted to bear against a step of said stepped driven member to take up the pressure of the said driving member against the said driven member, and means for controlling the position of said pressure member.

4. In a change speed gear, the combination with the motor shaft and the driven shaft, of a stepped driven member, a driving member, slidable means coupling said driving member to said motor shaft, a slidable support for said driving member

adapted to be rocked transversely of its sliding movement, a mechanism adapted to impart a rocking and sliding movement to said driving member for positioning it relative to said stepped driven member to cause the driving member to engage said driven member for the speed desired, manual means for operating the said mechanism, an adjustable pressure member adapted to bear against a step of said stepped driven member to take up the pressure of the said driving member against the said driven member, means for controlling the position of said pressure member, and a frictional lining between said driven member on the one hand and the said driving member and the said pressure member on the other hand.

5. In a change speed gear, the combination with the motor shaft and the driven shaft, of a stepped pulley secured to said driven shaft, a driving pulley adapted to be brought into engagement with the various steps of said stepped pulley, a slidable connecting rod and universal joints for connecting said driving pulley to the said motor shaft, a slidable support for said driving pulley adapted to rock transversely of its longitudinal movement, a cam roller having two cam grooves, connecting links engaging said grooves and the said support, one for rocking said support transversely and the other for moving it lengthwise to position the driving pulley relative to the steps of the driven pulley for the speed desired, and an operating lever for controlling the movement of said cam roller.

6. In a change speed gear, the combination with the motor shaft and the driven shaft, of a stepped pulley secured to said driven shaft, a driving pulley adapted to be brought into engagement with the various steps of said stepped pulley, a slidable connecting rod and universal joints for connecting said driving pulley to the said motor shaft, a slidable support for said driving pulley adapted to be rocked transversely of its longitudinal movement, a cam roller having two cam grooves, connecting links engaging said grooves and the said support, one for rocking said support transversely and the other for moving it lengthwise to position the said driving pulley relative to the steps of the driven pulley for the desired speed, an operating lever for controlling the movement of said cam roller, an adjustable counter-pressure pulley adapted to bear against one of the steps of said driven pulley, and means for regulating the pressure of said counter pressure pulley, the latter also being used for reverse drive.

7. In a change speed gear, the combination with the motor shaft and the driven shaft, of a stepped pulley secured to said driven shaft, a driving pulley adapted to be brought into engagement with the various steps of said stepped pulley, a slidable connecting rod and universal joints for connecting said driving pulley to the said motor shaft, a slidable support for said driving pulley adapted to rock transversely of its longitudinal movement, a cam roller having two cam grooves, connecting links engaging said grooves and the said support, one for rocking it transversely and the other for moving it lengthwise to position the driving pulley relative to the steps of the driven pulley for the speed desired, an operating lever for controlling the movement of said cam roller, a rocking lever (53) pivotally connected to one of said connecting links, a spring-pressed pin carried by the free end of the said rocking lever and adapted to press against the bearing of said driving pulley to force same into closer contact with said driven pulley, and means for connecting the said rocking lever (53) with the support for the said driving pulley.

8. In a change speed gear, the combination with the motor shaft and the driven shaft, of a stepped pulley secured to said driven shaft, a driving pulley adapted to be brought into engagement with the various steps of said stepped pulley, a slidable connecting rod and universal joints connecting said driving pulley to the said motor shaft, a slidable support for the said driving pulley adapted to be rocked transversely of its longitudinal movement, a cam roller having two cam grooves, connecting links engaging said grooves and the said support one for rocking said support transversely and the other for moving it lengthwise to position the driving pulley relative to the steps of the driven pulley for the speed desired, an operating lever for controlling the movement of said cam roller, a couple of backing pulleys (29) adapted to bear against one of the steps of said stepped pulley, a rocking lever (28) carrying said backing pulleys, and means for regulating the position of said backing pulleys relative to said step pulley.

In testimony whereof, I affix my signature.

FRITZ HENRIOD-SCHWEIZER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."