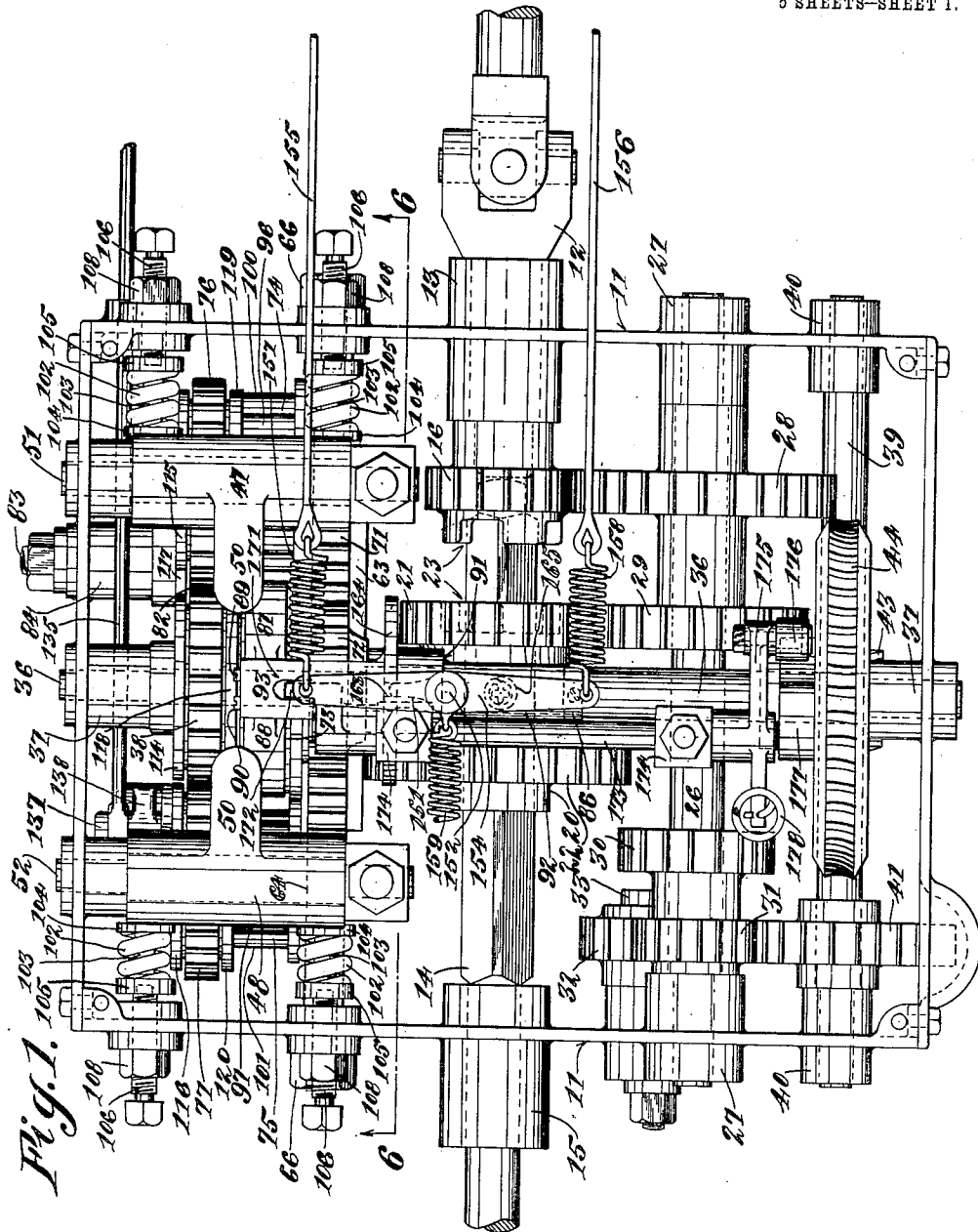


A. E. REUSS & O. SCHNITZLER.
SPEED CHANGING MECHANISM.
APPLICATION FILED OCT. 16, 1911.

1,058,265.

Patented Apr. 8, 1913.

5 SHEETS—SHEET 1.



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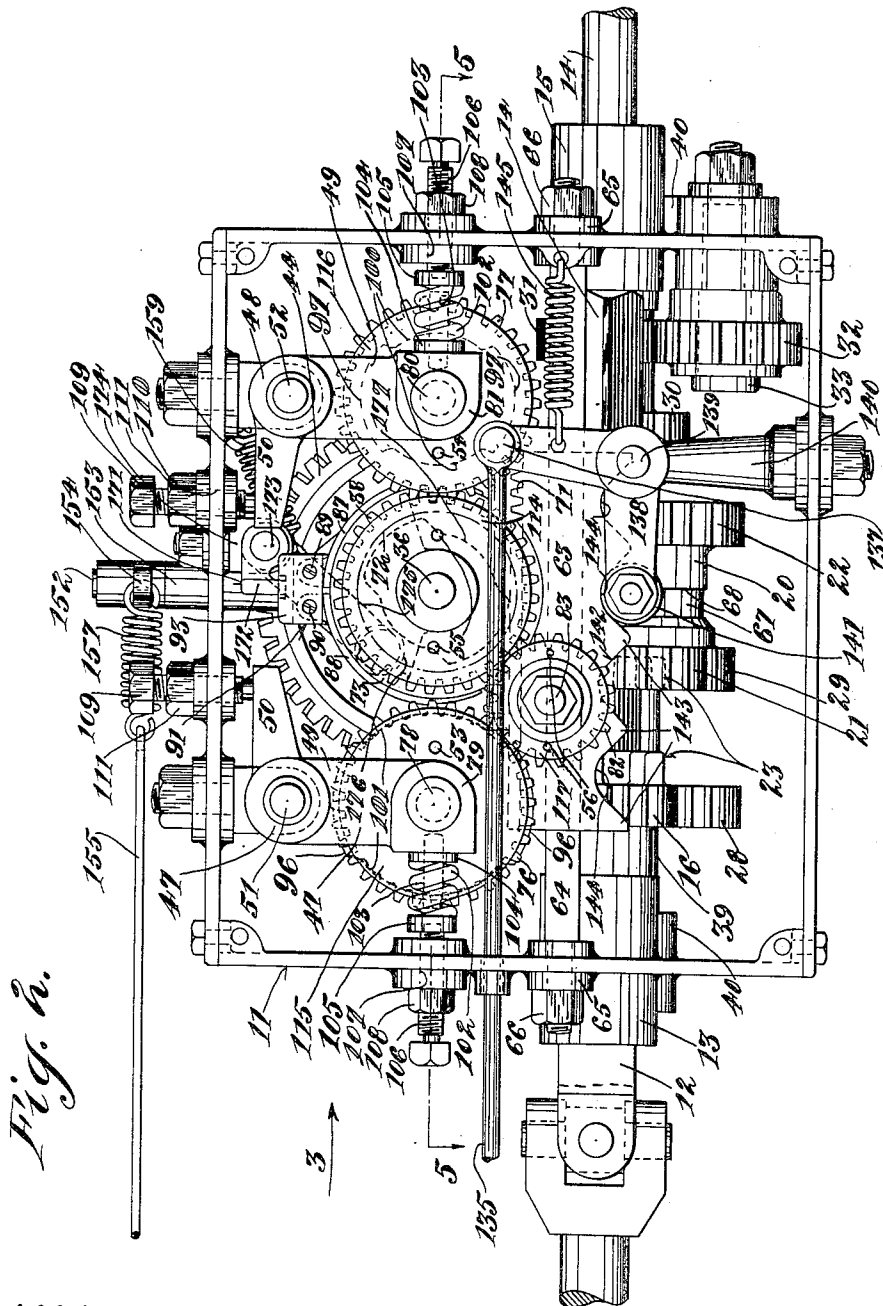


Fig. 2.

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5 SHEETS—SHEET 3.

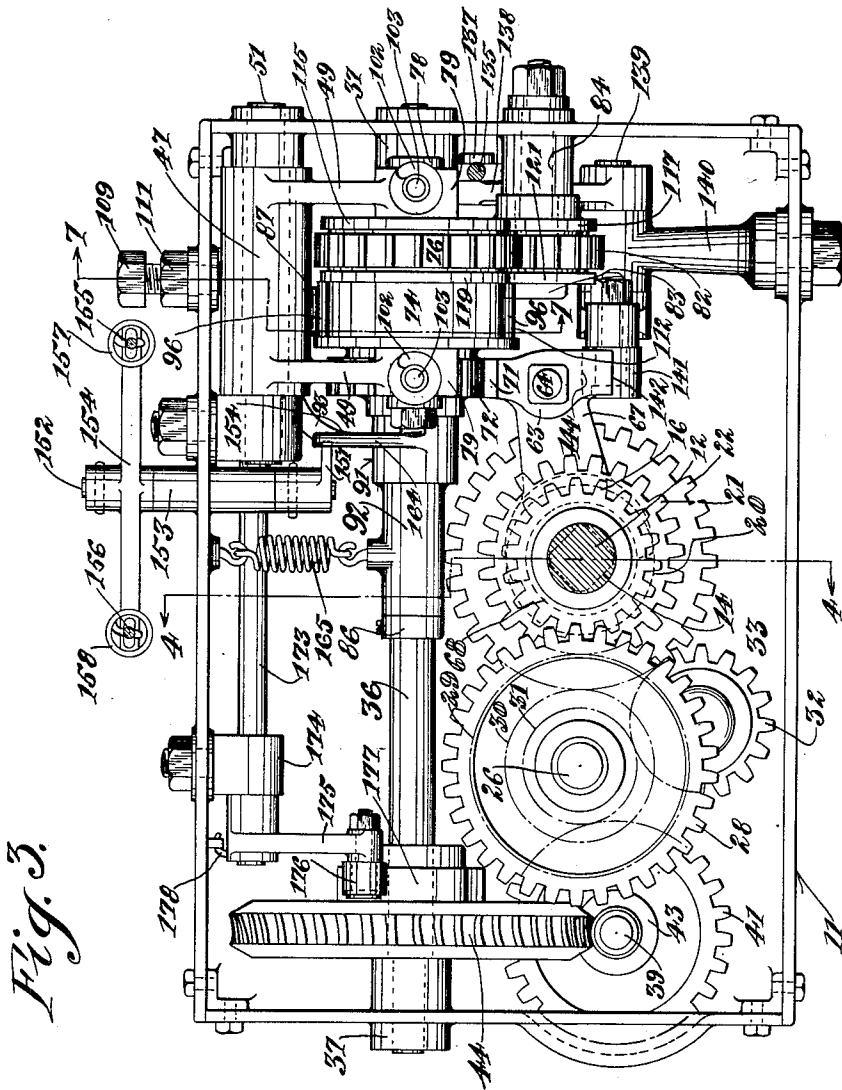


Fig. 3.

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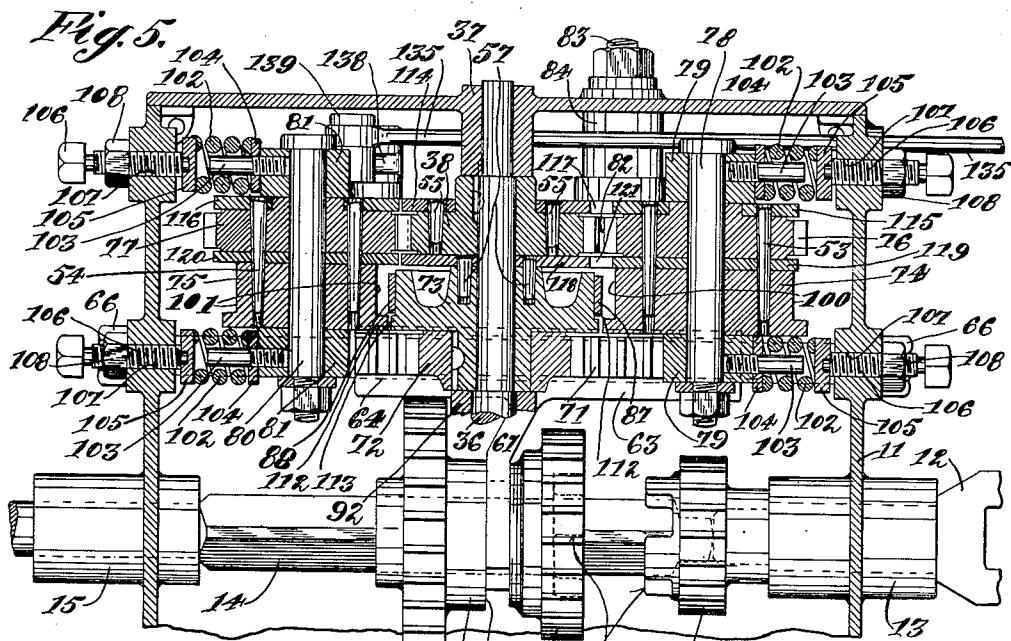
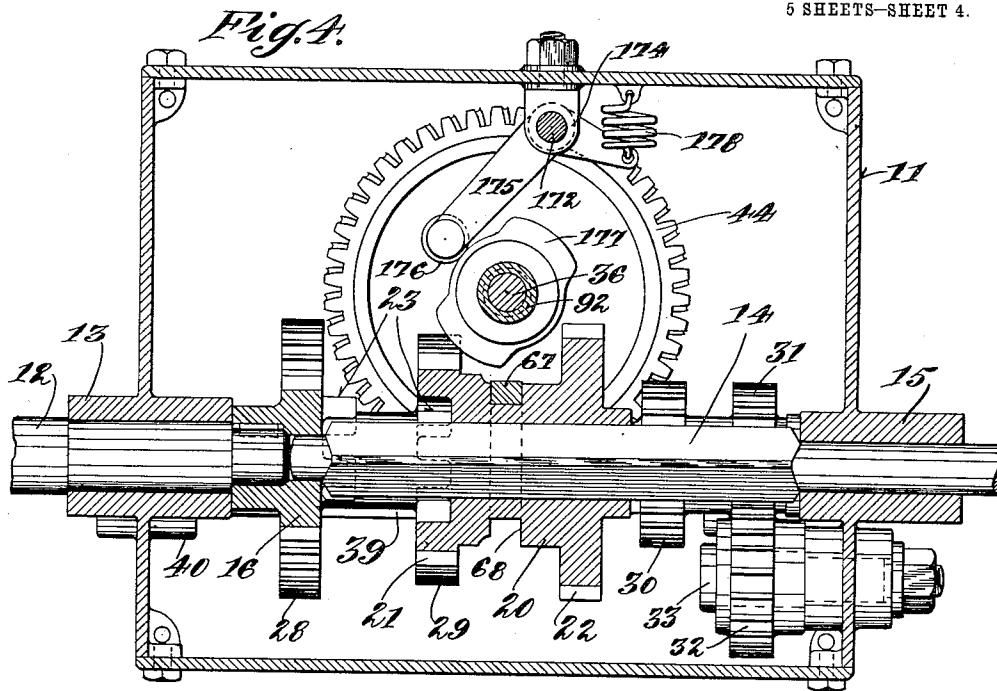
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5 SHEETS—SHEET 4.



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5 SHEETS—SHEET 5.

Fig. 6.

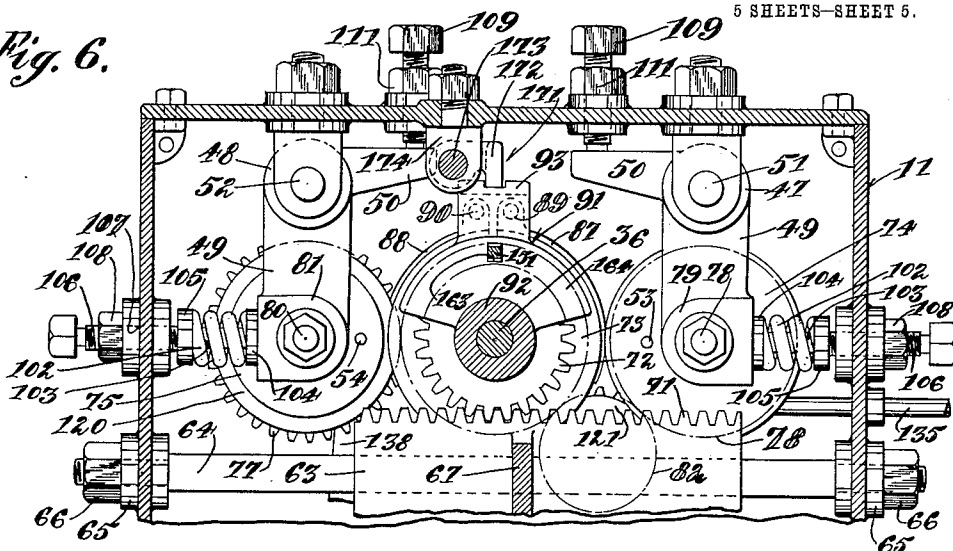


Fig. 7.

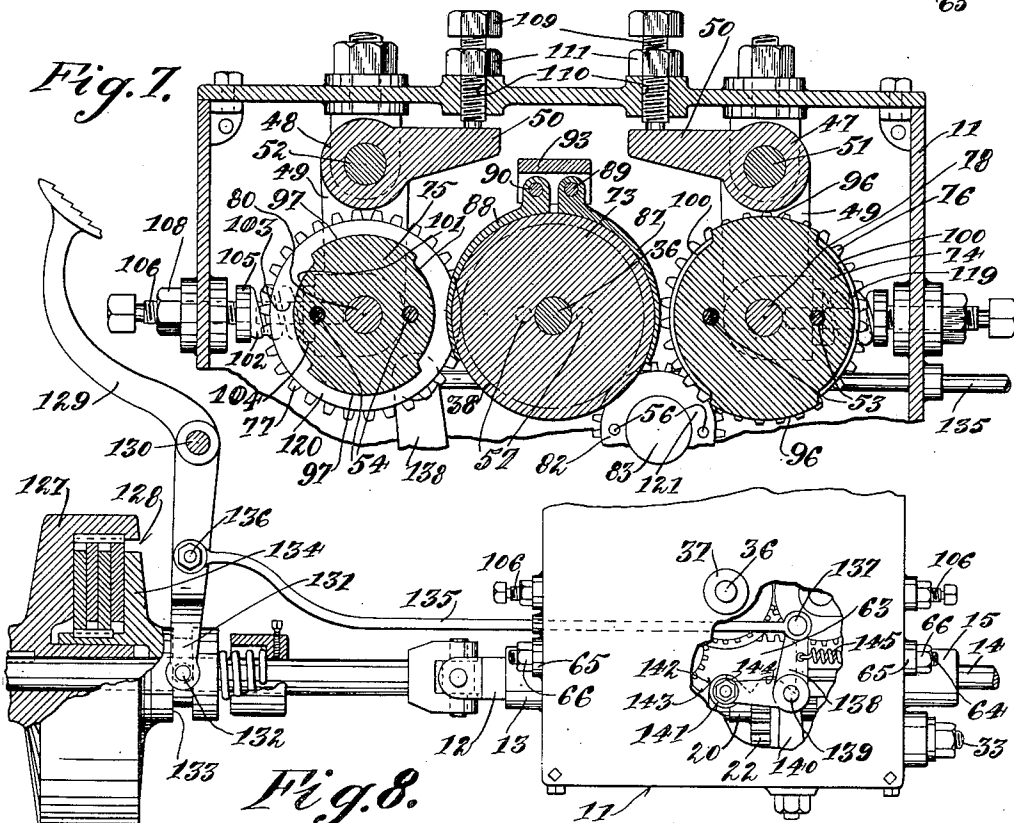


Fig. 8.

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UNITED STATES PATENT OFFICE.

ARTHUR E. REUSS, OF CINCINNATI, AND OSCAR SCHNITZLER, OF REMINGTON, OHIO.

SPEED-CHANGING MECHANISM.

1,058,265.

Specification of Letters Patent.

Patented Apr. 8, 1913.

Application filed October 16, 1911. Serial No. 654,869.

To all whom it may concern:

Be it known that we, ARTHUR E. REUSS and OSCAR SCHNITZLER, citizens of the United States, residing, respectively, at Cincinnati and at Remington, in the county of Hamilton and State of Ohio, have jointly invented certain new and useful Improvements in Speed-Changing Mechanism, of which the following is a specification.

Our invention relates to speed changing mechanism, and it is the object of our invention to provide novel means whereby change in speed may be automatically effected; further to provide power transmitting elements embracing a movable member and means for moving said movable member embracing power actuating means normally in inactive relation and a connecting member therefor arranged to be moved for forming operative connection in said power actuating means, and novel initiating means for controlling said connecting member; further to provide transmitting mechanism embracing a movable member having novel main-clutch connection; further to provide power transmitting mechanism embracing a movable member for effecting speed-change therein and novel means for operating said movable member; further to provide novel initiating means for causing operative relation in said actuating means, and further to provide novel locking means for said initiating means.

The invention will be further readily understood from the following description and claims, and from the drawings, in which latter:

Figure 1 is a plan view of our improved device with the top of the casing removed. Fig. 2 is a side elevation of the same with the side of the casing removed. Fig. 3 is an end elevation of our improved device, looking in the direction of the arrow 3 of Fig. 2. Fig. 4 is a longitudinal section of our improved device taken on the irregular line 4-4 of Fig. 3. Fig. 5 is a section on the line 5-5 of Fig. 2 bisecting the axial planes of the operating hub and rollers. Fig. 6 is a cross-section of the operating mechanism taken on the line 6-6 of Fig. 1. Fig. 7 is a cross-section of the same, taken on the line 7-7 of Fig. 3; and, Fig. 8 is a side elevation of our improved device showing

its connection with the main drive-clutch, partly broken away.

11 represents a casing, in which our improved mechanism may be supported and protected from dirt and dust.

12 represents the drive-shaft, which may have suitable connection with the source of power, which may be, for instance, the crank-shaft of a suitable gasoline or other motor. Our invention is applicable in various relations but is primarily intended for the propulsion of a traveling vehicle, for instance an automobile, and is arranged to be controlled preferably by a suitable controlling mechanism such as shown and described for instance in our copending applications Serial No. 630,094, filed May 29, 1911, and Serial No. 654,610, filed October 14, 1911, the latter application being executed of even date herewith.

The drive-shaft is journaled in a bearing 13 in the casing. 14 is a driven shaft journaled in a bearing 15 in the casing. The shaft 14 has a journal-end which receives bearing in a gear 16 rigidly secured to the drive-shaft.

20 is a sleeve which rotates with, but is slidable longitudinally of the shaft 14, this shaft being shown polygonal in cross-section, the bore of the sleeve being similarly formed. It has gears 21 and 22 thereon and one of the clutch-faces of a transmitting clutch 23, the other clutch-face whereof is on the gear 16.

26 is an intermediate shaft journaled in bearings 27 in the casing, and has rigid therewith a gear 28, which meshes continuously with the gear 16, and gears 29, 30, and 31.

32 is a gear journaled on a stud 33 secured to the casing and is arranged to be in continuous mesh with the gear 31.

The sleeve 20 is slidable lengthwise of the shaft 14, for placing the clutch-faces of the transmitting clutch 23 in transmitting engagement, for transmitting, for instance, a high speed directly from the shaft 12 to the shaft 14, or for bringing the gear 21 into mesh with the gear 29, for transmitting an intermediate speed from the drive-shaft through the gears 16, 28, 29 and 21 to the driven shaft, or for causing meshing relation between the gears 22 and 30 for transmit-

ting low speed from the driving shaft to the driven shaft through the gears 16, 28, 30 and 22, or for sliding said sleeve farther for causing meshing relation between the gear 22 and the gear 32, whereupon reversed motion will be transmitted from the drive-shaft to the driven shaft through the gears 16, 28, 31, 32 and 22.

The sleeve 20 constitutes a movable member of the power transmitting mechanism. It is of course obvious that other power transmitting mechanism may be employed without departing from the spirit of our invention. The movable member is shifted by novel power driven operating mechanism which we will now describe.

36 is an operating shaft journaled in bearings 37 in the casing and having an operating gear 38 fast thereon.

39 is a shaft journaled in bearings 40 in the casing. This shaft has a gear 41 fast thereon which meshes with the gear 31. The shaft 39 has a worm 43 fast thereon which meshes with a worm-wheel 44 fast on the operating shaft 36. Continuous power rotation is thus imparted to the operating shaft from one of the elements of the power transmitting mechanism, which is exemplified as the intermediate shaft 26, through the medium of the gears 31 and 41.

47, 48, are swinging frames which comprise the arms 49, 50, forming bell-crank formed frames. These frames are pivoted at 51, 52, to the casing. Each of these frames carries a gear which receives motion from the operating gear 38 and an interrupted actuating member, these actuating members rotating in opposite directions and arranged to coast with an intermediate actuating member which has connection with the gear-sleeve 20 for shifting the same. This connection with the gear-sleeve is shown accomplished by means of a shifting-sleeve 63 which slides longitudinally on a rod 64 received in bearings 65 in the casing and rigidly clamped thereto, as by nuts 66. The rod is shown polygonal in cross-section, the bore of the shifting-sleeve being correspondingly formed for preventing turning of the shifting-sleeve, but permitting its longitudinal movement.

67 is a fork which extends from the shifting-sleeve and is received in an annular groove 68 in the gear-sleeve for causing simultaneous movement of the shifting-sleeve and gear-sleeve. The shifting-sleeve has a rack 71 thereon which is meshed by a pinion 72 fast on an intermittently rotating actuating member 73, shown as a friction-hub, which is loosely journaled about the operating shaft 36.

74, 75, are friction-rollers which coast with the friction-hub and are respectively fast with gears 76, 77, as by pins 53, 54. The friction-roller 74 and gear 76 are journaled

about a rod 78 secured in bearings 79 of the oscillating frame 47, and friction-roller 75 and gear 77 are journaled about a rod 80 secured in bearings 81 of the oscillating frame 48. The gear 76 meshes with an intermediate gear 82 journaled on a stud 83 secured in a bearing 84 in the casing, the gear 82 meshing with the operating gear 38. The gear 77 meshes with the operating gear 38. By these means the friction-rollers 74, 75, are continuously rotated in opposite directions.

87, 88, are a pair of tongues pivoted respectively at 89, 90, to a rocker-frame 91 having a bearing 92 about the operating shaft 36, held against endwise movement thereon by a collar 86. The said tongues are pivoted on a bracket 93 of said rocker-frame. These tongues are shown as tapering tongues, tapering toward their outer ends, the tongues being curved and received about the friction-hub 73, against which said respective tongues are arranged to be temporarily clamped or pinched by the coasting clamp-faces 96, 97, of the coasting members 74, 75, therefor. These coasting members shown in the form of friction-rollers, being provided with said engaging faces 96, 97, having interruptions 100, 101, therein.

The friction-rollers 74, 75, are continuously rotated in opposite directions, the engaging faces thereon normally passing the tongues 87, 88, without making operative engagement therewith. If however, either tongue is shifted about the axis of the rocker-frame 91, by means to be hereinafter explained, one of said engaging faces will impinge said tongue for pinching it between said engaging face and the friction-hub 73, momentarily causing said tongue and friction-hub to move or rotate with the friction-roller which impinges said tongue, this movement continuing until the interruption following said engaging face arrives opposite said pinched tongue, whereupon said tongue is snapped back into normal position by the mechanism hereinafter described. In the meantime however, a longitudinal shifting of the shifting sleeve 63 and of the gear-sleeve 20 will have taken place for shifting said gear-sleeve from a position of power transmission at a given speed to its next positions of speed transmission in either increasing or decreasing ratio, dependent on which of the tongues has been engaged. For urging said friction-rollers toward said friction-hub for making proper grip upon the tongue and permitting yielding of said roller, we provide springs 102. As shown, each of these springs is received about a pin 103, secured in the bearing at each end of the rod about which the friction-rollers are received, the springs being located between a washer 104 received against said bearing and a washer 105 on a

screw-rod 106 received through a threaded bearing 107 in the casing, and having a nut 108 thereabout for positioning the same, this construction adjusting the tension of the springs. For adjustably limiting approach of said friction-rollers toward the friction-hub, we provide a set-screw 109 for the arm 50 of each of said swinging frames, the set-screw being threaded in a threaded bearing 110 in the casing and having a lock-nut 111 received thereover, this positioning means being provided for regulating the approach of the engaging faces on the friction-rollers toward the friction-tongues, and adjustably limiting said approach. The tongues are arranged to be received in an annular rabbet 112 of the friction-hub formed by an annular flange 113 thereabout.

It is desired that the friction-rollers 74, 75, rotate in unison with each other, so that the engagement between either of said rollers and its mating tongue may take place at substantially the same point in the revolution of either roller, for accomplishing the movement of said sleeves in either direction. For preventing too close approach between the gears which rotate said friction-rollers we provide distancing flanges for said gears which are respectively of diameters equal to the diameters of the pitch-lines of said gears so that when the edges of adjacent spacing plates are substantially in engagement, the gears will be in their proper pitch-line relations. We provide similar plates for preventing too close approach between the friction-rollers and the friction-hub. Thus 114, 115, 116, and 117 are spacing disks at one side of the gears 38, 76, 77 and 82, the spacing disks preferably rotating with said gears, respectively as by means of pins 55, the pins 53, 54, and pins 56. 118 is a spacing disk at one side of the hub 73, secured thereto as by pins 57, and 119, 120, are spacing disks at one side of the friction-rollers 74, 75, respectively rotating therewith, as by means of the pins 53, 54, for preventing too close approach of the latter to the former, and a spacing disk 121 rotating with the gear 82, as by means of pin 56, may coact with the spacing disks 118, 119. We further provide means whereby, when a speed-change is taking place, the positive drive from the motor may be interrupted, the momentum of the parts however completing the change. Thus 127 represents the fly-wheel of the engine and 128 the main drive-clutch between said fly-wheel and the drive-shaft. This clutch in usual constructions is arranged to be operated by a treadle-lever 129 pivoted on a pivot 130 to a suitable stationary part, for instance of the automobile, the treadle-lever having a fork 131 provided with a pin or pins 132 received in an annular groove 133 of the movable member 134 of the main

drive-clutch. In our improved construction we provide power operating connection with said treadle-lever, shown as a rod 135 pivoted to the treadle-lever at 136 and having articulation 137 with a lever 138 shown as a bell-crank lever pivoted at 139 to a pedestal 140 in the casing, the rod 135 being articulated to one arm of said bell-crank lever. The other arm of said lever carries a roller 141 which coacts with a scalloped face 142 on the shifting-sleeve 63, said scalloped face having raised portions 143 and depressions 144. When the roller 141 is in a depression the main drive-clutch will be in clutching position. When a change in speed is taking place the shifting-sleeve will shift, causing the roller to ride up one of the raised portions 143, thereby releasing the drive-clutch, which consequently releases the driving connection between the engine and the power transmitting gearing for permitting the gears of the power transmitting gearing to mesh each other with ease in their new relations. The construction is such further, that after the roller has passed the high point of the raised portion with which it momentarily coacts, it will aid in completing the shifting of the shifting-sleeve, this movement being further aided by the spring 145 acting on the lever 138.

For initiating movement in the power operating means for the movable member of the power transmitting gearing, we prefer to provide a shifter element 151, shown as a rocking finger on a rock shaft 152 journaled in a bearing 153 in the casing and projecting outside said casing, where an arm 154 is secured to said rock-shaft, connections 155, 156, connecting with the respective ends of said arms, preferably through the intervention of springs 157, 158. The said connections may lead to a suitable controlling mechanism, for instance such as shown, described and claimed in our co-pending applications Serial Nos. 630,094 and 654,610 aforesaid, the said connections corresponding for instance to the respective connections 124, 125, described in said last-named application. The arm 154 is maintained in normal or neutral position preferably by a spring 159 acting between said arm and the casing.

The finger 151 is received in a recess 163 of the bracket 93, the bracket, in the range of the finger, being preferably in the form of a plate 164. Said finger moves the rocker-frame 91, on which said bracket is located, by impinging against one or the other side wall of the recess 163, whereby one of the tongues 87, 88, is moved into contacting relation between one of the friction-rollers 74, 75, and the friction-hub 73, for causing a partial rotation of said hub, whereby the rack-gear 72 and the rack in mesh therewith are actuated, thereby shift-

ing the rack-sleeve and consequently the gear-sleeve, for causing a speed-change in increasing or decreasing speed relation between the power transmitting members, dependent on which of the connections 155, 156, is pulled. The said rocker-frame, is returned to normal position by a spring 165 acting between said rocker-frame and the casing, when the interruption in the friction-roller reaches a point opposite said tongue. In order to maintain said finger in position to reengage its recess when said swinging frame is so returned to normal position, the end of said finger maintains slipping engagement with said plate 164.

It is desirable that engagement of the engaging faces on the friction-rollers with the tongues respectively shall be effected throughout the length of said engaging faces, so that the extent of movement of the rack-sleeve may always be the same, for insuring complete shifting of said rack-sleeve and the gear-sleeve, when said shifting has once been initiated. In order to insure this relation we provide a lock 171 for said rocker-frame. This lock in the present exemplification comprises a keeper 172 secured to a rock-shaft 173 journaled in a bearing 174 in the casing and having an arm 175 thereon which carries a roller 176 received against a cam 177 on the operating shaft 36. This cam is provided with high points or releasing faces corresponding in number to the engaging faces of the friction-rollers 74, 75, and are so related thereto in position that said lock is released just prior to the time any engaging face on said friction-rollers comes opposite one of the tongues 87, 88, so as to insure that the beginning of said engaging face will contact said tongue and said tongue be moved around the axis of the friction-hub 73 throughout the full angular distance of travel of said engaging face. A spring 178 acts on the rock-shaft 173 for urging said keeper into locking relation. The springs 157, 158, are provided for the purpose of preventing undue strain upon the connections 155, 156, if strain should be exerted on said connections during the time that said lock is in locking relation.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member embracing a normally rotating member and a normally inactive member, said normally rotating member having operative connection with an element of said power transmitting mechanism for rotating the same, connecting means between said normally inactive member and said mov-

able member for moving the latter, and a connecting member arranged to be inserted between said normally rotating member and said normally inactive member for rendering the latter active.

2. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member embracing a normally rotating member and a normally inactive member, said normally rotating member having operative connection with an element of said power transmitting mechanism for rotating the same, connecting means between said normally inactive member and said movable member for moving the latter, and a connecting member arranged to be inserted between said normally rotating member and said normally inactive member for rendering the latter active, and yieldable shifting means for the latter.

3. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member embracing a normally rotating member and a normally inactive member, said normally rotating member having operative connection with an element of said power transmitting mechanism for rotating the same, connecting means between said normally inactive member and said movable member for moving the latter, and a connecting member arranged to be inserted between said normally rotating member and said normally inactive member for rendering the latter active, a lock for said connecting member, and means for releasing said lock having operative connection with said normally rotating member for relatively timing their operations.

4. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member having connection with a member of said power transmitting mechanism for driving the same and embracing a normally rotating part having an interrupted operating face, a normally inactive part, and a connecting member arranged to be inserted between said operating face and said normally inactive part for rendering said inactive part active, a lock for said connecting member, means for releasing said lock, and connecting means between the latter and said normally rotating part for relatively timing their operations.

5. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in

changing the speed of transmission thereof, power operating means for said movable member embracing a normally rotating member having connection with a member of said power transmitting mechanism for driving the same, a normally stationary member having operative connection with said movable member for moving the same, and a connecting member arranged to be moved between said normally rotating member and said normally stationary member for transmitting motion from the former to the latter, and means for initiating movement of said connecting member.

6. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member embracing a normally rotating member having connection with a member of said power transmitting mechanism for driving the same, a normally stationary member having operative connection with said movable member for moving the same, and a connecting member arranged to be moved between said normally rotating member and said normally stationary member for transmitting motion from the former to the latter, means for initiating movement of said connecting member, a lock for said connecting member, and releasing means for said lock.

7. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member embracing a pair of normally rotating members rotating in opposite directions and having connection with a member of said power transmitting mechanism for driving the same, a normally stationary member having operative connection with said movable member for moving the same, and a connecting member arranged to be moved between said normally rotating members and said normally stationary member for transmitting motion from the former to the latter, and means for initiating movement of said connecting member.

8. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member embracing a pair of normally rotating members rotating in opposite directions and having interrupted driving faces, a normally stationary member having operative connection with said movable member for moving the same, and a connecting member arranged to be moved between said normally rotating members and said normally stationary member for being squeezed by

one of said driving faces and thereby transmitting movement to said normally stationary member in the direction of movement controlled by said last-named driving face.

9. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member embracing a pair of normally rotating members rotating in opposite directions and having interrupted driving faces, a normally stationary member having operative connection with said movable member for moving the same, and a connecting member arranged to be moved between said normally rotating members and said normally stationary member for being squeezed by one of said driving faces and thereby transmitting movement to said normally stationary member in the direction of movement controlled by said last-named driving face, a lock for said connecting member, and cam-mechanism having operative connection with said interrupted driving faces for timing the movement thereof with relation to said driving faces.

10. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member and a drive-clutch, a lever for operating said drive-clutch, a shiftable sleeve having connection with said movable member for moving the same and provided with a rack and a scalloped face, a gear rotatable in opposite directions meshing with said rack, and said lever coacting with said scalloped face for actuating said main drive-clutch.

11. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof in increasing and decreasing ratios, a main drive-clutch, a shiftable sleeve having a rack and a scalloped face thereon, the depressions of said scalloped face corresponding with engaging positions of said movable member and the elevations of said scalloped face corresponding with disengaging relations of said movable member, a gear rotatable in opposite directions coacting with said rack for moving said shiftable sleeve endwise in opposite directions, and connecting means between said scalloped face and main drive-clutch, said connecting means embracing a part coacting with said scalloped face.

12. In speed changing mechanism, the combination of power transmitting mechanism embracing a longitudinally movable gear-sleeve employed in changing the speed of transmission thereof, a main drive-clutch, a longitudinally shiftable sleeve having a toothed rack and a scalloped face thereon, a

lever having a contact-part thereon coacting with said scalloped face, connecting means between said lever and said main drive-clutch, and a gear rotatable in opposite directions meshing with said rack for shifting the same endwise in opposite directions, the said contact-part on said lever and said gear being at opposite sides of said shiftable sleeve.

10 13. In speed changing mechanism, the combination of power transmitting mechanism embracing a drive-shaft, a main drive-clutch therefor, a driven shaft, an intermediate shaft, a plurality of gears thereon, a reversing pinion in mesh with one of said gears, a transmitting gear in mesh with another of said gears, a gear-sleeve in line with said transmitting gear and driving and driven shafts, gears thereon shiftable with relation to other gears on said intermediate shaft, a clutch between said sleeve and transmitting gear, and means for shifting said gear-sleeve longitudinally for causing selective engagement between the clutch-faces of said last-named clutch and between the gears on said gear-sleeve and said other gears on said intermediate shaft and said reversing gear, said means for shifting said gear-sleeve endwise comprising a shifter-sleeve having a rack and a scalloped face thereon, a gear coacting with said rack, a lever having a contact-part thereon for said scalloped face, said gear and contact-part acting opposite to each other on said shifter-sleeve, and connecting means between said lever and main drive-clutch, substantially as described.

14. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member and means for shifting said movable member embracing a normally stationary actuating member, normally oppositely rotating coacting parts therefor, and a pair of tongues arranged to be selectively operatively inserted between said last-named means and said actuating member for causing momentary actuation of said actuating member, said actuating member having operative connection with said movable member for moving the same.

15. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member and means for shifting said movable member embracing a normally stationary actuating member, normally oppositely rotating coacting parts therefor, provided with driving faces having interruptions, and a pair of tongues arranged to be selectively operatively inserted between said last-named driving faces and said actuating member for causing momentary actuation of said actuating member, and means for normally withdrawing said tongues at said interrup-

tions, said actuating member having operative connection with said movable member for moving the same.

16. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, operating means for said movable member embracing a normally stationary member having operative connection with said movable member for moving the same and a pair of normally rotating members rotating in opposite directions and having interrupted driving faces thereon, means for rotating said normally rotating faces in unison, and a tongue received about said normally stationary member and normally distanced from said driving faces, and means for moving said tongue in either direction for selectively inserting the same between either of said normally rotating members and said normally stationary member for rotating the latter by the squeezing of said tongue between said members, substantially for the purpose described.

17. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, operating means for said movable member embracing a normally stationary member having operative connection with said movable member for moving the same, and a pair of normally rotating members rotating in opposite directions and located at opposite sides of said normally stationary member and provided with driving faces having interruptions therein, a rocker-frame pivoted about the axis of rotation of said normally stationary member, oppositely extending tongues on said rocker-frame received about said normally stationary member, said tongues normally spaced from said driving faces, and means for moving said rocker-frame in opposite directions for causing impact between the driving face on either of said normally rotating members, one of said tongues and said normally stationary member for transferring rotary movement to said normally stationary member through said tongue.

18. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, operating means for said movable member embracing a normally stationary member having operative connection with said movable member for moving the same, a pair of normally rotating members rotating in opposite directions and located at opposite sides of said normally stationary member and provided with driving faces having interruptions therein, a rocker-frame pivoted about the axis of movement of said nor-

normally stationary member, and oppositely extending tongues on said rocker-frame received about said normally stationary member, said tongues normally spaced from said driving faces, and means for moving said rocker-frame in opposite directions for causing impact between the driving face on either of said normally rotating members, one of said tongues and said normally stationary member for transferring rotary movement to said normally stationary member through said tongue, a lock for said rocker-frame, and means for releasing said lock, said means embracing a train of driving mechanism having operative connection with said normally rotating members for timing the release of said lock with relation to said driving faces.

19. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member embracing a normally rotating member provided with an interrupted driving face, a normally stationary member having operative connection with said movable member for moving the same, a gear whose axis of rotation coincides with the axis of rotation of said normally stationary member, a gear in mesh therewith whose axis of rotation coincides with the axis of rotation of said normally rotating member, and a distancing plate for each of said gears and having a periphery whose diameter coincides substantially with the diameter of the pitch line of its gear.

20. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, operating means for said movable member embracing a normally stationary member having operative connection with said movable member for moving the same, a pair of normally rotating members rotating in opposite directions and having interrupted driving faces, gearing for driving the latter embracing a gear whose axis of rotation is coincident with the rotary axis of said normally stationary member and gears whose axes are respectively coincident with the axes of rotation of said normally rotating members, and an intermediate gear, a distancing plate for each of said gears whose axis of rotation is coincident with the axis of rotation of its gear and which is of a diameter substantially coincident with the pitch-diameter of said gear, and connecting means arranged to be received between said driving faces and said normally stationary member for momentarily rotating the same, substantially for the purpose described.

21. In speed changing mechanism, the

combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, operating means for said movable member embracing an intermittently rotatable friction-hub and a pair of oppositely rotating friction-rollers having interrupted friction faces thereon, a driving gear in line with said friction-hub, driven gears driven thereby in line with said friction-rollers, a rocker-frame rockable about the axis of rotation of said friction-hub, oppositely extending tongues thereon received about said friction-hub between the latter and said respective friction-rollers and normally distanced from said friction-faces on the latter, and means for rocking said rocker-frame for inserting said respective tongues between a friction-face on said respective rollers and said intermittently rotatable hub for causing rotation of the latter, substantially as described.

22. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member embracing a pair of normally rotating members rotating in opposite directions and provided with interrupted driving faces and an intermittently rotatable friction-hub, and a connecting member arranged to be moved between said hub and respective rollers, and means for moving said connecting member embracing a rocker-frame, a rockable finger coacting therewith, and a locating plate for said finger, said rocker-frame and hub having coincident axes of rotation.

23. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member embracing an intermittently rotatable friction-hub, a pair of oppositely rotating friction-rollers having interrupted driving faces thereon, a rocker-frame, and oppositely extending tongues on said rocker-frame received about said hub, and means for rocking said frame for inserting either of said tongues between said hub and one of said friction-rollers, said last-named means embracing a rockable finger and a plate on said rocker-frame provided with a recess with the walls of which said finger coacts for rocking said rocker-frame, said plate having lateral projections for locating said finger with relation to said recess.

24. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, operating means for said mov-

able member embracing an intermittently rotatable hub, oppositely rotatable friction-rollers having interrupted friction faces thereon, a tongue for each of said friction-rollers coacting with the friction face thereon arranged to be received between its friction-roller and hub and normally distanced from its coacting friction face, means for normally retracting each of said tongues and means for initiating engagement between each of said tongues and its coacting friction face.

25. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member embracing an intermittently rotatable friction-hub, a pair of oppositely rotating friction-rollers having interrupted driving faces thereon, a rocker-frame, and oppositely extending tongues on said rocker-frame received about said hub, and means for rocking said frame for inserting either of said tongues between said hub and one of said friction-rollers, a lock for said rocker-frame, and a cam for releasing said lock having operative connection with said friction-rollers for timing the operation of said lock with relation to the driving faces on said friction-rollers.

26. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, power operating means for said movable member embracing an intermittently rotatable friction-hub, a pair of oppositely rotating friction-rollers having interrupted driving faces thereon, a rocker-frame, and oppositely extending tongues on said rocker-frame received about said hub, and means for rocking said frame for inserting either of said tongues between said hub and one of said friction-rollers, a lock for said rocker-frame, a cam for releasing said lock having operative connection with said friction-rollers for timing the operation of said lock with relation to the driving faces on said friction-rollers and means for normally retracting said rocker-frame.

27. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, operating means for said movable member embracing an intermittently rotatable hub, a gear whose axis of rotation is coincident therewith, an oscillating frame, a gear cooperating with said last-named gear and a friction-roller cooperating with said hub, said last-named gear and friction-roller having coincident axes of rotation on said oscillating frame, and a tongue arranged to be received between

said friction-roller and hub and normally distanced from said friction-roller, means for inserting said tongue between the friction face on said friction-roller and said hub for momentarily transmitting rotary movement from said roller to said hub through said tongue, and spring pressure means urging said oscillating frame toward said hub.

28. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, operating means for said movable member embracing an intermittently rotatable hub, a gear whose axis of rotation is coincident therewith, an oscillating frame, a gear cooperating with said last-named gear and a friction-roller cooperating with said hub, said last-named gear and friction-roller having coincident axes of rotation on said oscillating frame, and a tongue arranged to be received between said friction-roller and hub and normally distanced from said friction-roller, means for inserting said tongue between the friction face on said friction-roller and said hub for momentarily transmitting rotary movement from said roller to said hub through said tongue, spring pressure means urging said oscillating frame toward said hub, and a stop for limiting said last-named movement.

29. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, and operating means for said movable member embracing an operating shaft, an intermittently rotatable hub loosely mounted thereabout, an operating gear on said shaft, a pair of driven gears rotated by the latter and a pair of friction-rollers, the gear and the friction-roller of said respective pairs having coincident axes of rotation, resilient means for urging said friction-rollers toward said hub, a rocker-frame received about said operating shaft, and oppositely extending tongues thereon received about said hub and normally spaced from the friction faces of said friction-rollers, and means for moving said rocker-frame in either direction for inserting said respective tongues between the respective friction faces and said hub for transmitting movement from said friction-rollers to said hub through said tongues respectively in opposite directions.

30. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, and operating means for said movable member embracing an operating shaft, an intermittently rotatable hub loosely mounted thereabout, an operating gear on

said shaft, a pair of driven gears rotated by the latter and a pair of friction-rollers, the gear and the friction-roller of said respective pairs having coincident axes of rotation, resilient means for urging said friction-rollers toward said hub, a rocker-frame received about said operating shaft, and oppositely extending tongues thereon received about said hub and normally spaced from the friction faces of said friction-rollers, means for moving said rocker-frame in either direction for inserting said respective tongues between the respective friction faces of said friction-rollers and said hub for transmitting movement from said friction-rollers to said hub through said tongues respectively in opposite directions, a lock for said rocker-frame, and a cam for releasing said lock having operative connection with said operating shaft for rotating the same.

31. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, operating means for said movable member embracing an operating shaft, an intermittently rotatable hub received loosely thereabout, an operating gear on said operating shaft, a pair of oscillating frames, a gear and a friction-roller having coincident axes of rotation on each of said last-named frames, each of said last-named gears driven by said operating gear and said friction-rollers having interrupted friction faces thereon, a rocker-frame pivoted about said operating shaft, and oppositely extending tongues on said rocker-frame received about said hub and normally distanced from said friction faces, and means for rocking said rocker-frame for inserting said tongues respectively between said friction faces for rotating said hub in opposite directions, and means for withdrawing said tongues.

32. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, operating means for said movable member embracing an operating shaft, an intermittently rotatable hub received loosely thereabout, an operating gear on said operating shaft, a pair of oscillating frames, a gear and a friction-roller having coincident axes of rotation on each of said last-named frames, each of said last-named gears driven by said operating gear, and said friction-roller having an interrupted friction face thereon, a rocker-frame pivoted about said operating shaft, and oppositely extending tongues on said rocker-frame received about said hub and normally distanced from said friction faces, means for rocking said rocker-frame for inserting said tongue respectively between said friction faces for

transmitting the rotary movements of said friction faces to said hub through said tongues and withdrawing means for said tongues.

33. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, operating means for said movable member embracing a normally stationary element having operative connection with said movable member and a normally rotating element, one of said elements provided with an interrupted driving face, and a connecting member between said elements normally spaced from said driving face, resilient means for moving said connecting member into coacting relation with said driving face, a lock for said connecting member, and means for releasing said lock having operative connection with said driving face for timing the release of said connecting member with relation to the travel of said driving face, substantially for the purpose described.

34. In speed changing mechanism, the combination of power transmitting mechanism embracing a movable member employed in changing the speed of transmission thereof, operating means for said movable member embracing a normally stationary element having operative connection with said movable member and a normally rotating element, one of said elements provided with an interrupted driving face, and a connecting member between said elements normally spaced from said driving face, resilient means for moving said connecting member into coacting relation with said driving face, a lock for said connecting member, means for releasing said lock having operative connection with said driving face for timing the release of said connecting member with relation to the travel of said driving face, and resilient means acting to withdraw said connecting member upon release of said driving face therefrom, substantially for the purpose described.

35. In a mechanism of the character described, the combination of a pair of groups of gears of different diameters, a slidable sleeve on which one of said groups of gears is located, a slide having a part thereon connecting with said sleeve, a rack on said slide, a shaft, a gear secured thereto, an intermittently rotatable member loose about said shaft, a gear secured to the latter in mesh with said rack, a pair of contact-parts rotatable in opposite directions at the sides of said intermittently rotatable member, gears in train with said first-named gear for rotating said contact parts, a pair of oppositely extending tongues between said intermittently rotatable member and contact-parts, a lock for the latter, and actuating

means having operative connection with
said tongues for moving the same respec-
tively into engagement with said respective
contact-parts, whereby said rack-gear is ro-
5 tated for sliding said gear-slide, substan-
tially as described.

In testimony whereof, we have signed our

names hereto in the presence of two sub-
scribing witnesses.

ARTHUR E. REUSS.
OSCAR SCHNITZLER.

Witnesses:

EDWARD SOUTHWORTH,
THERESA SILBER.