

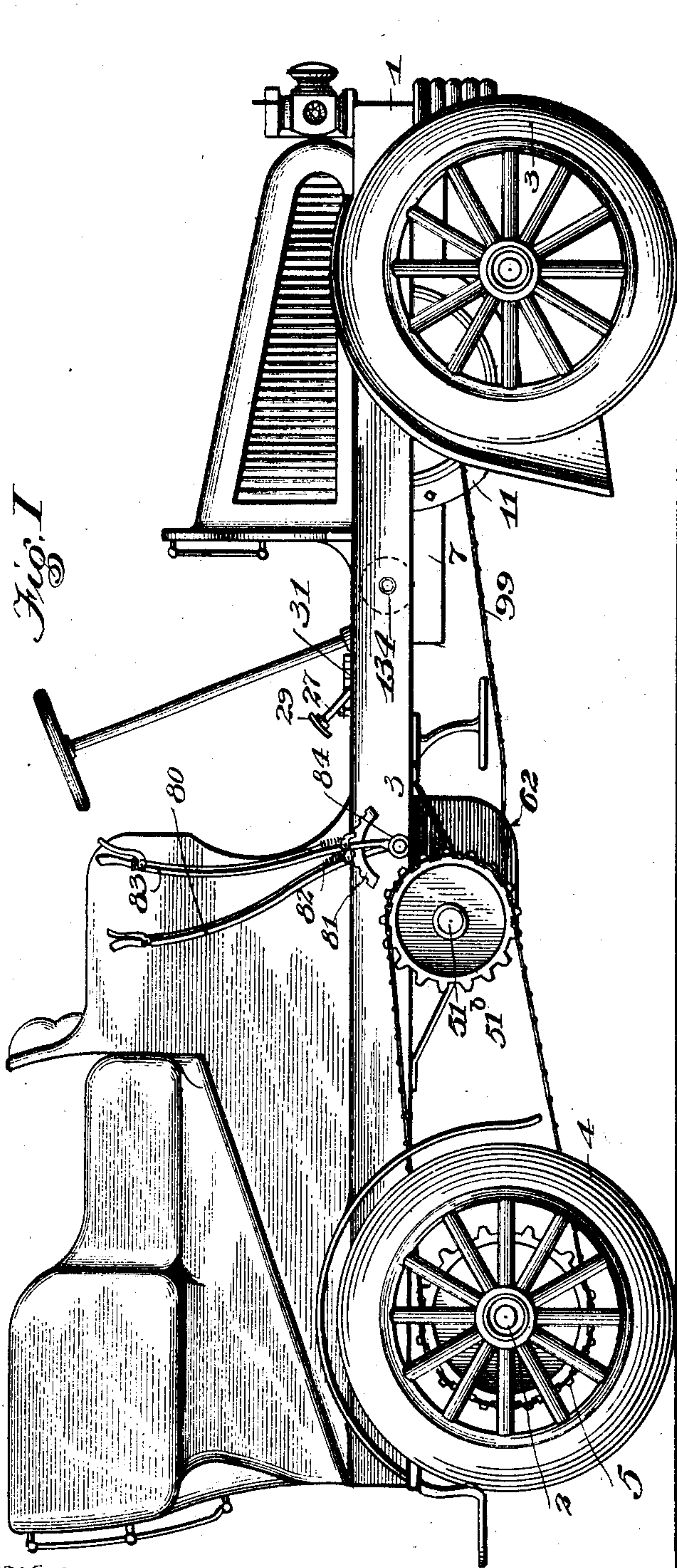
No. 791,210.

PATENTED MAY 30, 1905.

R. M. G. PHILLIPS.  
MOTOR VEHICLE.

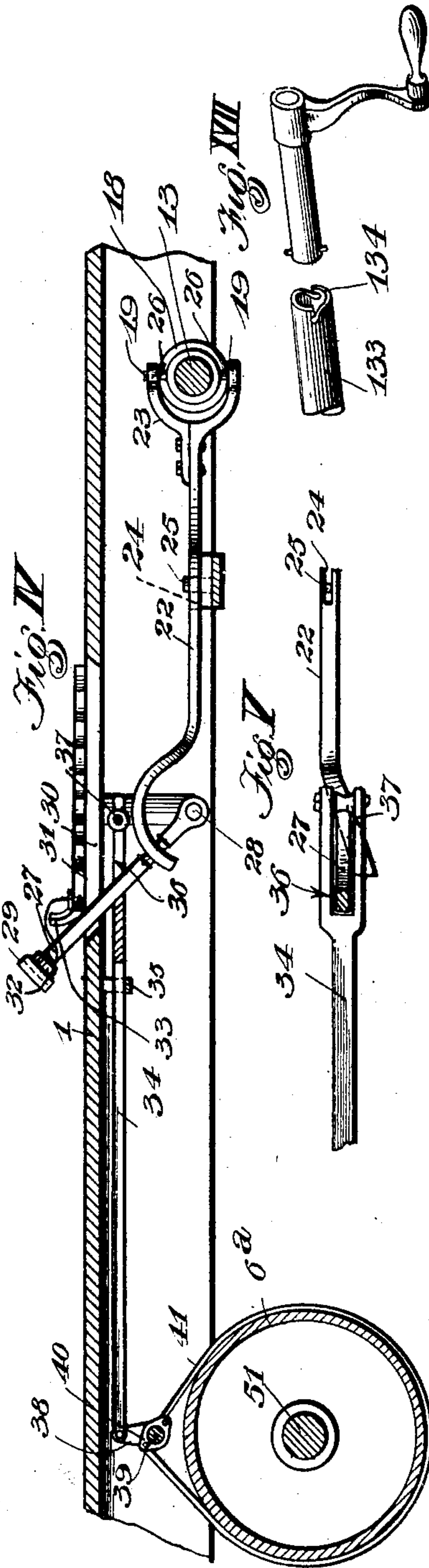
APPLICATION FILED MAR. 24, 1903.

4 SHEETS—SHEET 1.



Witnesses

Samuel A. Strayer,  
G. T. Hackley



Inventor  
Ross M. G. Phillips.

by Townsend Brooks  
his atty



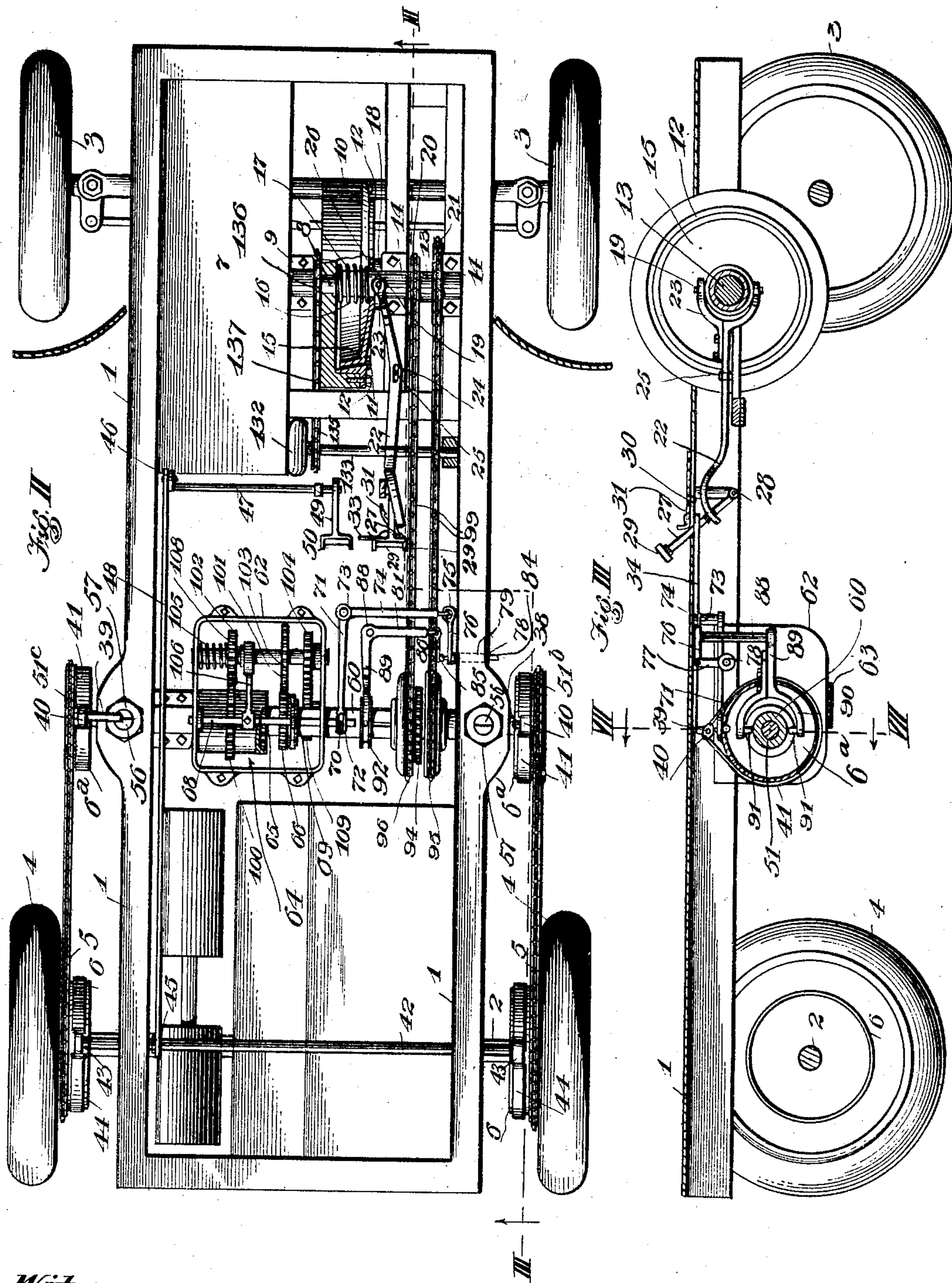
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4 SHEETS—SHEET 2.



### *Witnesses*

Edmund A. Francis  
 G. T. Hackley

*Inventor*

by Ross M. G. Phillips  
Townsend Bros  
his attys.



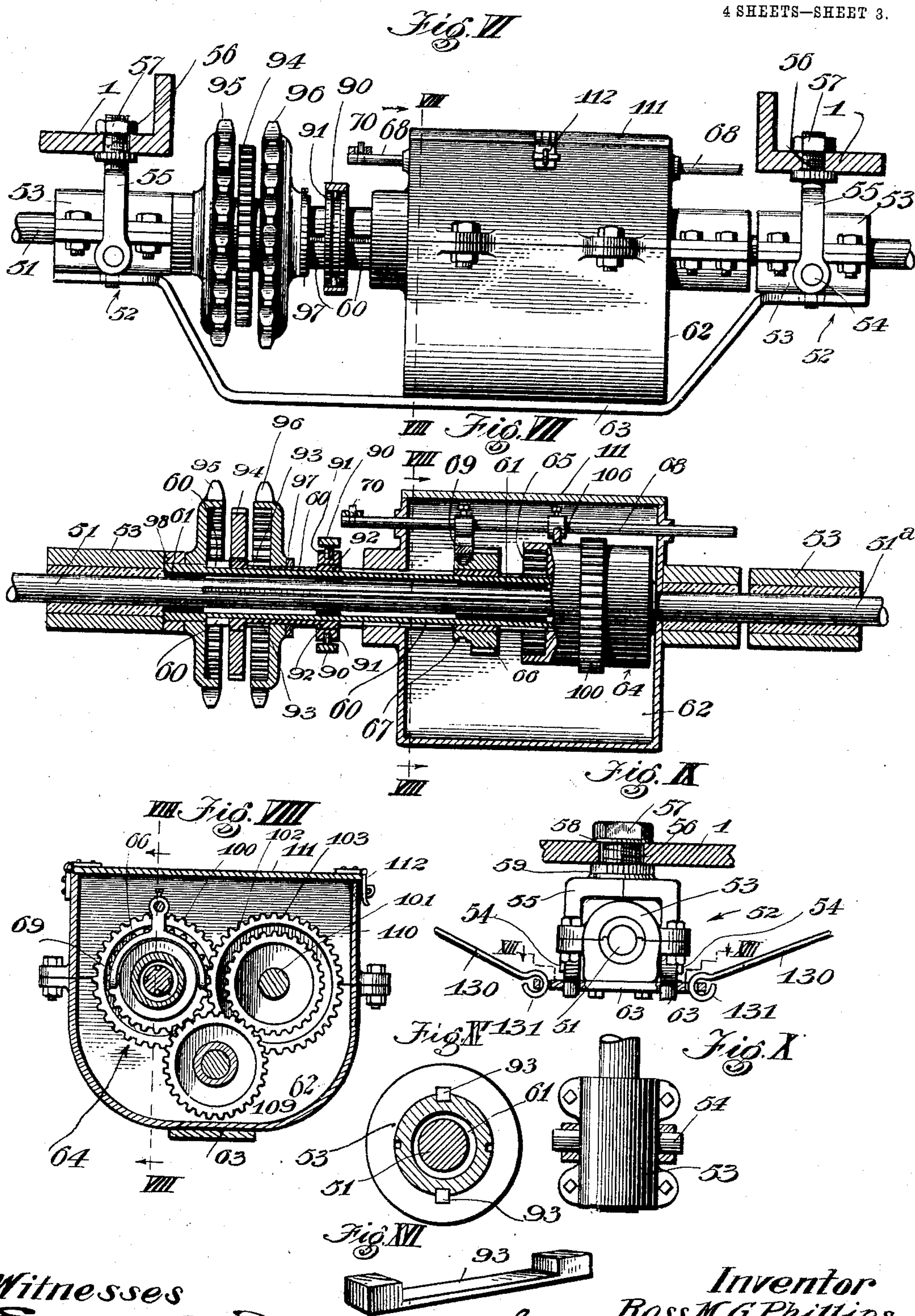
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4 SHEETS—SHEET 3.



Witnesses

*E. A. Strayer*  
*J. T. Hackley*

Inventor

*Ross M. G. Phillips.*  
*Townsend Bros*  
*his attys.*



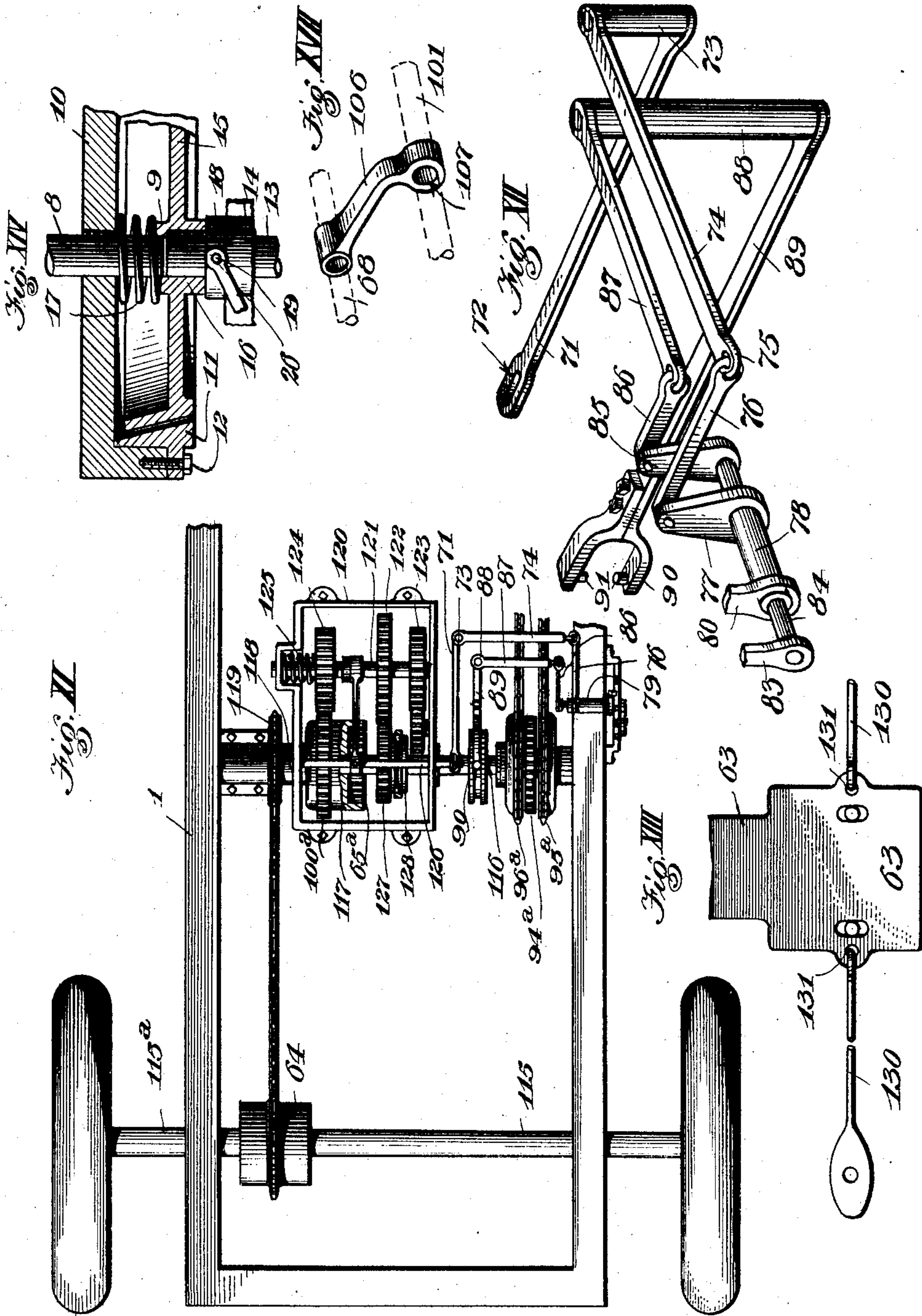
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R. M. G. PHILLIPS.  
MOTOR VEHICLE.

APPLICATION FILED MAR. 24, 1903.

4 SHEETS—SHEET 4.



Witnesses

Edmund A. Straube.

J. P. Hackley

Inventor

Ross M. G. Phillips.

by Townsend Bros.  
his attys



# UNITED STATES PATENT OFFICE.

ROSS M. G. PHILLIPS, OF LOS ANGELES, CALIFORNIA.

## MOTOR-VEHICLE.

SPECIFICATION forming part of Letters Patent No. 791,210, dated May 30, 1905.

Application filed March 24, 1903. Serial No. 149,250.

*To all whom it may concern:*

Be it known that I, ROSS M. G. PHILLIPS, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Motor-Vehicles, of which the following is a specification.

My invention relates particularly to the gearing and braking apparatus of motor-vehicles.

One object of my invention is to provide a gearing which may be considered as practically two systems, in which one system may be used for high-speed work and the other system be used for slow-speed work, the high-speed system having two speeds ahead and the slow-speed system having also two speeds ahead.

Another object is to provide for a plurality of high speeds ahead and secure the same with direct connections without the medium of intermediate rotating gears and to thus avoid noise, wear of parts, and vibration of vehicle and lost motion.

Another object of my invention is to provide means whereby the speed of the vehicle and the action of the brake are controlled by a single lever.

Another object is to provide a construction for the elimination of strains on the intermediate shaft, which carries the gearing, which is frequently caused when the vehicle-frame is straining.

Another object is to provide for a quick removal of the intermediate shaft and gearing it carries.

Another object is to provide a construction of gearing which is simple and compact and to which access may readily be had.

Another object is to provide a good hill-climbing machine.

These objects are attained by the mechanism illustrated in the accompanying drawings, in which—

Figure I is a side elevation of a motor-vehicle equipped with my improvements. Fig. II is a plan view of the frame and gearing with the box or upper works removed. Part of the forward friction-clutch is shown in

section and the top of the gear-case is removed. Fig. III is a view taken on the section-line III III, Fig. II, with the journal-box near the forward friction-clutch removed. Fig. IV is an enlarged detail of the braking mechanism, which is shown in Fig. III, part of the vehicle-frame being in section. Fig. V is an enlarged fragmental detail plan showing the connection of the forward clutch-rod and brake-rod. Fig. VI is an elevation, looking toward the rear of the machine, of the transmission gear-case, connecting-sprockets, shaft, and swivel journal-boxes. Fig. VII is a vertical section taken longitudinally through the mechanism illustrated in Fig. VI and on line VII VII, Fig. III. Fig. VIII is a sectional view through the differential-gear case or box, taken on the line VIII VIII, Figs. VI and VII, looking in the direction of the arrow. Fig. IX is a detail of one of the swivel journal-boxes which support the intermediate shaft, the vehicle-frame being sectioned. Fig. X is a plan view of one of the journal-boxes shown in Fig. IX, the split yoke removed and the lower ends of the arms of the yoke being shown in section. Fig. XI shows a modification. The view is a plan of the rear part of the vehicle with upper works removed. The top of the gear-case is removed and the gearing and gear-controlling mechanism are seen. The differential gear is shown as coupled directly to the rear shaft. Fig. XII is a perspective view showing the hand-levers and the connection therefrom to the gearing. Fig. XIII is a sectional plan view taken on line XIII XIII, Fig. IX. Fig. XIV is a detail sectional view through the forward friction-wheel. Fig. XV is a detail view of the clutch-operating sleeve. Fig. XVI is a detail perspective of the shift-rod arm which controls one of the reducing-gears. Fig. XVII is a perspective of the end of the starting-shaft 134 and crank for starting same.

1 designates the frame of the vehicle.

2 designates the rear axle.

3 designates the front wheels.

4 designates the rear wheels, which are mounted on the axle 2.



5 designates sprockets on each rear wheel.  
6 designates brake-drums, one for each rear wheel.

7 designates the engine, mounted at the front end of the vehicle on the frame 1.

*Forward friction-clutch.*—8 designates the engine-shaft, the outer end of which is supported by a journal 9.

10 designates a clutch-cap which is keyed to the shaft 8.

11 designates an annular seat, which lines the cap, the bore of the seat being conical. The seat 11 may be detachably fastened to the cap 10 by means of bolts 12.

13 is a sprocket-shaft which is mounted in boxes 14. One end of the sprocket-shaft 13 carries a conical cupped friction-wheel 15, which is housed within the cap 10. The friction-wheel 15 is provided with a hub 16, which is splined to the sprocket-shaft 13.

17 is a compression-spring which is mounted between the friction-wheel 15 and the flat wall of the clutch-cap 10.

18 is a sleeve, provided with diametrical lugs 19, which is loosely mounted on the shaft 13 and lies against the outside of the friction-wheel 15.

20 and 21 are small and large sprockets; respectively, which are rigidly mounted on the shaft 13.

The tendency of the spring 17 is to force the friction-wheel 15 against the conical seat 11, and thus transmit motion from the engine, through the medium of the clutch-cap 10 and friction-wheel 15, to the sprocket-shaft 13. By throwing the friction-wheel 15 out of frictional engagement with the seat 11 the connection between the engine-shaft and sprocket-shaft is broken.

*Clutch and brake operating mechanism.*—22 is the clutch-rod, the front end of which is provided with a yoke 23. The rear end of the clutch-rod is curved in an arc of a circle, and the curved part is inclined at an angle from the shank of the clutch-rod. The center portion of the clutch-rod 22 is provided with an elongated slot 24.

25 is a stationary pin which is carried by the frame 1 and which forms a pivot and guide for the clutch-rod 22.

Each arm of the yoke 23 is provided with an eye 26, into which eyes the lug 19 projects.

27 is a foot-lever pivoted at 28 to the frame. The pivotal point 28 is concentric with the arc of the rear end of the clutch-rod. The free end of the foot-lever 27 is provided with a pedal 29. The floor is slotted, as at 30, to permit of rocking the foot-lever 27.

31 is a rack pivoted at 32 to the frame 1. The rack 31 is provided with a foot-piece 33, whereby it may be operated.

31<sup>a</sup> is a spring for normally holding the rack out of engagement with the foot-lever.

The rack 31 acts as a latch for holding the foot-lever 27 in the desired position and may

be operated by the chauffeur pressing his foot against the foot-piece 33.

34 is a brake-rod, the forward end of which is slidably mounted in a lug 35, depending from the frame, and is provided with a slot 36, through which passes the foot-lever 27, and journaled in the forward end of the slot 36 is an antifriction-roller 37. The rear end of the brake-rod 34 is connected to a rock-arm 38, which rock-arm is rigidly mounted on a shaft 39, which shaft extends across the vehicle and is rotatable in the frame 1.

40 designates double arms, one of which is provided for each end of the shaft 39, to which they are rigidly secured.

41 designates brake-bands.

6<sup>a</sup> represents brake-drums mounted on an intermediate split shaft 51 51<sup>a</sup>. Each brake-band encircles a brake-drum 6<sup>a</sup>, and the opposite ends of each brake-band are attached to opposite ends of a double arm 40.

By throwing forward the pedal 29 the lever 27 rubs against the inclined end of the clutch-rod 22, which gradually tilts the clutch-rod 22 and tilts its forward end toward the engine 7, thereby carrying the friction-wheel 15 away from the seat 11, thus breaking the frictional connection between the engine-shaft 8 and sprocket-shaft 13. Inasmuch as the spring 17 tends to hold the friction-wheel 15 against the seat 11, in order to hold the friction-wheel out of contact with the seat 11 the foot-piece 33 may be pushed forward, which will throw the rack 31 into engagement with the lever 27, thus holding the lever 27 in its forward position, clutch-rod 22 stationary, and thereby holding the friction-wheel 15 out of engagement. If it is desired to also apply the brake to the vehicle, the forward movement of the pedal 29 may be continued and the lever 27 will be brought into engagement with the antifriction-roller 37 and the brake-rod 34 advanced thereby, which will rock the shaft 39 through the medium of arms 40, which will contract the brake-bands 41 and cause them to grip the peripheries of the brake-drums 6.

*Auxiliary brake mechanism.*—42 is a rock-shaft rotatably mounted in the frame 1 and in this embodiment lying directly over the rear axle 2. Each end of the shaft 42 is provided with double arms 43, similar to the arms 40, previously described. Attached to each arm 43 and encircling brake-drums 6, which are mounted on the rear axle 2, are a pair of friction-bands 44, similar to the friction-bands 41, previously described. 45 is an arm rigidly mounted on the rock-shaft 42. 46 is an arm rigidly mounted on a rock-shaft 47, which rock-shaft is rotatably mounted on the frame 1, and connecting the arms 46 and 45 is a connecting-rod 48. 49 is a foot-lever rigidly mounted on the rock-shaft 47 and carries a pedal 50. By pushing forward the pedal 50 the rock-shaft 47 is rocked, which rocks the



shaft 42 through the medium of connecting-rod 48, and the brake-bands 44 are thus contracted to grip the brake-drums 6 in a manner similar to the operation of the brake-bands 41. This auxiliary brake is useful in emergencies or for securing additional check to the vehicle's momentum and affords a positive brake on the driving-wheels in the event of the gearing or forward driving mechanism breaking or becoming inoperative.

*Driving and reversing gears.*—51 51<sup>a</sup> represent a double shaft, which I term the "intermediate" shaft, which is mounted in swivel-journals, (designated in general by 52.) Each swivel-journal consists of an ordinary journal-box 53, which is provided with opposite trunnions 54.

55 designates a split yoke, which comprises two symmetrical members. The upper end of the split yoke 55 is formed in a neck 56, which is swiveled in the frame 1.

57 is a nut on the neck 56, and 58 is a ring between the nut 57 and frame 1, while another ring, 59, is interposed between the body of the split yoke and the frame 1.

Mounted between the arms of the yoke 55 is the journal-box, which is supported by the trunnions 54.

The two members which form the split yoke are securely held together by the rings 58 and 59 and also by the nut 57.

It will be observed that any twisting or cramping of the frame of the vehicle will not be imparted to the gearing which is carried by the shaft 51, inasmuch as the latter is mounted in the swivel-journals 52, which are, so to speak, flexibly connected to the frame.

Mounted on the intermediate split shaft 51 and hollow shaft 60 are bushings 61 for reducing the friction between the shafts.

62 is a gear-case, which is supported by a strap 63, each end of the strap 63 being fastened to the box 53. Each end of the strap 63 is provided with a pair of parallel elongated slots. The width of each slot is just sufficient to allow for the passage of an arm of the split yoke 55, while the length of the slots allows for the tilting action which the box 53 may take relatively to the yoke 55. This compensates for any straining of the vehicle-frame. (See Figs. XIII and IX.)

64 is a differential gear of the ordinary type, which is within the gear-case 62 and is mounted upon the shaft 51<sup>a</sup>. One end of the differential-gear case is provided with internal teeth 65.

66 is a spur-gear which at times does duty as a clutch, which is splined to the hollow shaft 60 and which is provided with a grooved collar 67.

68 is a shift-rod which is slidably mounted in the upper part of the gear-case 62, and rigidly attached to the shift-rod 68 is a yoke 69, which engages the grooved collar 67. The

end of the shift-rod 68 extends through the gear-case 62 and is provided with a pin 70.

71 is a lever, one end of which is slotted at 72, which engages the pin 70. The lever 71 extends from a short stem 73, (see Figs. III and XII,) which is pivoted to the frame 1. Extending from the upper end of the stem 73 and at substantially right angles to the lever 71 is an arm 74, the outer end of which is provided with an eye 75.

76 is a link which is attached to the eye 75.

The link 76 is attached to a short arm 77, which arm is rigidly mounted on a sleeve 78, which sleeve is mounted in a lug 79 on the frame 1. Attached to the sleeve 78 is a hand-lever 80, and 81 is a sector, (see Fig. I,) which is mounted on the frame 1, preferably on the side of the vehicle near the seat. The hand-lever 80 is provided with a suitable finger-controlled latch mechanism 82 for engaging

the sector 81 and holding the hand-lever 80 in a desired position. 83 is another hand-lever, similar to the hand-lever 80, which is

carried by a shaft 84. The shaft 84 passes through and beyond the sleeve 78 and has attached to it an arm 85, which arm is connected

by a link 86 with an arm 87, the arm 87 being attached to the upper end of a stem 88, which is pivoted to the frame 1. The stem

88 is provided at its lower end with another arm 89, which arm is provided with a yoke

90. The arms of the yoke 90 are provided with trunnions 91, each trunnion bearing in a grooved sleeve 92. The sleeve 92 is connected

by arms 93, which lie in longitudinal grooves in the hollow shaft 60, with a clutch 94. The diameter of the hollow shaft 60 is enlarged

near the clutch 94, and abutting against the shoulders formed by each end of the enlargement are oppositely-disposed sprockets 95 and 96, which are loosely mounted on the hollow

shaft, and both of which sprockets are provided with internal teeth adapted to receive and be engaged by the clutch 94 when the

latter is shifted into either of the sprockets. The clutch 94 rotates the hollow shaft 60, which prevents lateral movement of the sprockets 96. The sprocket 95 is held from

lateral play, for the reason that it is interposed between the other shoulder of the enlargement and a ring or washer 98, which bears against the box 53. The sprockets 95 and 96 are connected with the driving-sprockets 21 and 20, respectively, by means of chains 99.

100 is an annular gear carried by the jacket of the differential gear 64.

101 is a shaft which carries the spur-gears 102 103 104. The shaft 101 is rotatably mounted on the gear-case 62, and interposed between the gear 102 and the wall of the gear-case 62 is a compression-spring 105. The gear 102 is splined on the shaft 101.

106 is an arm rigidly attached to the shift-



rod 68, and one end of the arm 106 is provided with an eye 107, in which the shaft 101 is free to revolve.

108 designates a collar on one side of the eye 107.

When the parts are in the position shown in Fig. II, gear 102 is in mesh with the gear 100. When the shift-rod 68 is moved to the left of the vehicle, the gear 102 is moved along the shaft 101 through the medium of the arm 106, compressing the spring 105 and carrying the gear 102 out of mesh with the gear 100.

109 is a reversing-idler, rotatably mounted on the gear-case 62. The idler 109 permanently meshes with the gear 104.

When the parts are in the position shown in Fig. II, the gear 66 is in mesh with the gear 103, and when the shift-rod 68 is actuated to the left of the vehicle the gear 66 is moved out of engagement with the gear 103 and enters into engagement with the internal clutch-teeth 65.

The gear-case 62 is provided with a removable top 110, which is bolted to the lower part of the case. The top 110 has a hinged lid 111.

112 is a catch for holding the lid closed.

Convenient access is given to the gear-case 62 by the lid 111.

From the foregoing it will be seen that the lever 83 is for controlling the clutch 94, while the lever 80 is for controlling the gearing associated with the differential gear and includes the reversing-gear.

Operation: When the parts are in the position shown in Fig. II, the friction-wheel 15 is in engagement with the seat 11 and the power is transmitted from the engine-shaft 8 to the sprockets 20 and 21; but no power is transmitted to the intermediate shafts 51 and 51<sup>a</sup>, for the reason that the clutch 94 is not in engagement with either of the sprockets 95 or 96. Therefore while the engine may be running the vehicle is not being propelled. If it is desired to go ahead at full speed, the chauffeur throws the lever 83 to its farthest notch forward, which tilts the arms 87 and 89 and throws the clutch 94 into engagement with the internal teeth of the sprocket 95 through the medium of the sleeve 92 and arms 93, and thus locks the sprocket 95 to the hollow shaft 60, and motion is transmitted from the larger sprocket 21 to the hollow shaft 60. He also throws the lever 80 backward, actuating the shift-rod 68 toward the left of the vehicle, which carries the gear 66 out of engagement with the gear 103, and at the same time the gear 102 is shifted by arm 106 out of mesh with gear 100, compressing spring 105. The chauffeur continues moving the lever 80 backward until the gear 66 has been thrown into engagement with the clutch 65 in the end of the differential-gear jacket, at which time the differential gear is locked with the hollow shaft 60, and motion is thus transmitted from the largest

driving-sprocket 21 to the hollow shaft 60 and differential gear 64, and from the latter the two intermediate shafts 51 and 51<sup>a</sup> are driven and the sprockets 51<sup>b</sup> and 51<sup>c</sup> rotated, in turn driving the rear sprockets 5 and wheels 4. This gives the highest forward speed, the motion being transmitted from the largest driving-sprocket direct to the differential gear, and the motion of the latter is imparted to the wheels 4 without the medium of intermediate rotating gears, thus minimizing lost motion, obviating rattle of gearing, eliminating wear of parts, and reducing vibration of the vehicle.

If the next highest speed ahead is desired, the chauffeur hooks up the lever 83 to its back notch to throw the clutch 94 into engagement with the sprocket 96, and power is then transmitted from the smaller driving-sprocket 20 to the sprocket 96, and from the latter the power is transmitted directly to the differential gear through the medium of the hollow shaft 60 and from the two shafts 51 and 51<sup>a</sup> to the driving-wheels 4, as before described. If a still slower speed is desired, the chauffeur throws the lever 83 to its forward notch, which throws the clutch 94 into engagement with the sprocket 95, and he also throws the lever 80 into its middle notch, actuating, through the medium of the links 76, arms 74 and 71, shift-rod 68, which throws the gear 66 into engagement with the gear 103. When the lever 83 is in this position, the gear 102 is left in mesh with gear 100. It will be seen that when the parts are in this position power is transmitted from the engine-shaft 8, through the medium of the driving-sprocket 21, to sprocket 95, to hollow shaft 60, through gear 66 to spur-gear 103, through shaft 101 to small gear 102, and from small gear 102 to the larger gear 100, driving the differential-gear jacket 66 and rotating the intermediate shafts 51 and 51<sup>a</sup> and from them the driving-wheels 4, thus propelling the vehicle forward at the third fastest speed. If it is desired to propel the vehicle at the next speed of the engine, with the parts standing as just described, the chauffeur will throw back lever 83 and throw the clutch 94 into engagement with the internal teeth of the sprocket 96, and power will then be transmitted from the engine-shaft 8, through, small sprocket 20, to sprocket 96, through hollow shaft 60 to gear 66, to spur-gear 103, through shaft 101, to smaller gear 102, and from the latter to gear 100, thus driving the differential gear at the lowest speed ahead and through the medium of the latter driving the intermediate shafts 51 and 51<sup>a</sup> and sprockets 51<sup>b</sup> and 51<sup>c</sup> and from them through the described connections the driving-wheels 4.

The vehicle may be stopped in one way by manipulation of the pedal 29, which throws the lever 27 forward, rocking the friction clutch-rod 22, which throws the friction-wheel



15 out of contact with the seat 11 and breaking the frictional connection between the engine-shaft 8 and the sprocket-shaft 13, and as the foot-lever 27 reaches its forward position it ultimately applies the forward brake, as before described, through shifting forward the brake-rod 34. This will usually be sufficient to stop the vehicle; but a further check may be given, if desired, by applying the auxiliary brake, which is done by actuating pedal 50, foot-lever 49, and rocking shaft 47, and thereby shifting the brake-rod 48 and through the medium of the latter tightening the auxiliary brake-bands 44, before described. Another method of stopping the vehicle is to throw the gear-lever 80 into mid-notch, in which position the clutch 94 will stand centrally between sprockets 95 and 96, and while both of the latter sprockets will be revolving no motion will be imparted to the hollow shaft 60, and either the forward brake or the rear auxiliary brake may be applied, if desired, to check the speed. The gear 66 is movable out of mesh to stop. To the methods of stopping the vehicle, just described, might obviously be added shutting down the engine.

To reverse the vehicle and propel it backward at the slowest speed, the chauffeur throws the clutch 94 into engagement with sprocket 96 by placing lever 83 in its most rearward notch. He also throws gear-lever 80 to farthest forward notch, which actuates the arms 74 and 71, and shifts the rod 68 to the extreme right, which throws the gear 66 also to right and into engagement with the idler reversing-gear 109, which gives a reverse rotation of the gear 104, and the gear 102 thus revolves the gear 100 and differential gear reversely, and from the latter the vehicle is propelled backward. If a higher speed backward is required, the chauffeur will shift the clutch 94 from sprocket 96 to sprocket 95 by throwing lever 83 to front notch, so that the hollow shaft 60 will derive its motion, through the medium of sprocket 95, from the larger driving-sprocket 21.

From the foregoing it will be apparent that with the engine running at a certain speed four speeds ahead may be obtained and two speeds backward are attainable. This makes the mechanism forming my invention very convenient for all around use, and it is adapted for high-speed work with connections arranged to give direct transmission of power to the driving-wheels, while for slow-speed work intermediate gearing, as shown, is utilized, and for running backward the two speeds which may be secured are all that are required.

In the modification shown in Fig. XI the differential gear is carried directly on the rear shaft, which is double and designated by 115 115<sup>a</sup>. 116 is an intermediate shaft which is mounted on the frame 1, and loosely mounted on the shaft 116 is a clutch 117, provided

with internal clutch-teeth 65<sup>a</sup> and with an annular gear 100<sup>a</sup>. The clutch 117 is provided with a hub 118, which carries a sprocket 119, the latter being connected by a chain with the differential gear on the rear shaft. 120 is a gear-case, and mounted thereon is a side shaft 121, which carries large and small spur-gears 122 and 123, respectively. 124 is a spur-gear which is splined on the shaft 121, and interposed between the gear 124 and the wall of the case 120 is a compression-spring 125. The gear 124 meshes normally with the annular gear 100<sup>a</sup>, being held in that position by the spring 125. 126 is a reversing idler-gear permanently in mesh with the gear 123. 127 is a clutching-gear splined on the shaft 116 and provided with a grooved collar 128. 95<sup>a</sup> and 96<sup>a</sup> are clutch-sprockets similar to the sprockets 95 and 96 previously described, which are loosely mounted on the shaft 116. 94<sup>a</sup> is a clutch mounted between the clutch-sprockets 95<sup>a</sup> and 96<sup>a</sup> and is similar to the clutch 94 previously described. The clutch 94<sup>a</sup> is operated by mechanism similar to that which operates clutch 94, while the clutching-gear 127 is operated by mechanism similar to the mechanism which operates the before-described clutching-gear 66. The gear 124 is also operated by mechanism similar to that which operates the gear 102. By actuating the shift-rod to throw the gear 124 out of mesh with the gear 100<sup>a</sup> and to throw the gear 127 into engagement with the clutch 65<sup>a</sup>, then with either of the sprockets 96<sup>a</sup> or 95<sup>a</sup> locked to the shaft 116 power is transmitted directly through the medium of clutch 117 and sprocket 119, which is mounted on its hub 118 to the differential gear on the rear shaft. The speed at which the differential gear is actuated will depend upon which of the sprockets 95<sup>a</sup> 96<sup>a</sup> is doing the work. When the gear 127 is in mesh with the gear 122, the gear 124 will be in mesh with the gear 100<sup>a</sup> and power will be transmitted through the gear 121 to the gear 124, from gear 124 to gear 100<sup>a</sup>, and from clutch 117 to sprocket 119, and thus to the differential gear through the chain connections. When the gear 127 is shifted into mesh with the reversing-gear 126, the motion will be transmitted, through the side shaft 121 and its attached gear, in the reverse direction.

It may be desirable to substitute bevel-gearing for the chain connection, and it is evident that such substitution would lie within the skill of any mechanic.

130 represents braces extending to front and rear from each end of the supporting-strap 63, to which they are flexibly connected, having eyes 131, as shown.

132 designates a pump on the engine 7.

133 is a shaft extending from the pump 132 through and lying flush with the right-hand side of the frame. The end of the shaft 133 is bevel-slotted, as at 134, to receive a crank. (See Fig. XVII.)



135 is a sprocket mounted on the shaft 133 near the pump 132.

136 is a sprocket on the engine-shaft 8, which is connected with sprocket 135 by chain 137.

5 In starting the vehicle the crank may be placed on the end of the shaft 133 and to start the pump 132, and as the pump 132 is started the engine is also started. It will be observed that the position of the crank is in the most  
10 convenient place.

It is not necessary to have a friction-clutch on the engine-shaft, as the engine and sprocket shafts could be one solid shaft. A friction-clutch could be substituted for the sprocket-  
15 clutch on the intermediate shaft, which could be operated by a suitable connection from the lever 83.

It is obvious that various changes might be made in the herein-described embodiment  
20 without departing from the spirit of my invention.

Having described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

25 1. In combination, an engine, engine-shaft, a sprocket-shaft, a clutch connecting said shafts, running-gear connected to the sprocket-shaft, a brake for the running-gear, an operating-lever, a friction-clutch lever one end of  
30 which is attached to means for operating the clutch, said friction-clutch lever being pivotally mounted and provided with means allowing it longitudinal movement, the other end of the friction-clutch lever having an inclined  
35 face which is in the path of movement of the operating-lever, a brake-rod connected to the brake, and a connection between the brake-rod and the operating-lever embracing means for allowing a certain movement of the oper-  
40 ating-lever before moving the brake-rod.

2. In combination, an engine, an engine-shaft, a sprocket-shaft, a clutch connecting said shafts, running-gear connected with the sprocket-shaft, a brake for the running-gear,  
45 an operating foot-lever, a friction-clutch lever one end of which is attached to means for operating the clutch, said friction-clutch lever having an elongated slot, a stationary pin passing through said slot, the other end of  
50 the friction-clutch lever being inclined and lying at the path of movement of the foot-lever, a brake-rod connected to the brake, one end of the brake-rod being slotted, an antifriction-roller mounted near the end of the  
55 slot, said foot-lever passing through the latter slot.

3. In a motor-vehicle, means for propelling the vehicle embracing an engine, an engine-shaft, a journal on the engine supporting the shaft, a recessed clutch-cap mounted on the  
60 engine-shaft close to the journal, the engine-shaft terminating at the bottom of the recess in the clutch-cap, a sprocket-shaft in line with the engine-shaft, a pair of journals support-  
65 ing the sprocket-shaft, a cupped friction-

wheel with a hub loosely fitting the sprocket-shaft and splined thereon, a sleeve provided with diametrically opposite pins which is loosely mounted on the sprocket-shaft be-  
70 tween one of the latter-named journals and the friction-wheel, and a pivoted clutch-lever connected with the said pins.

4. In combination, an engine, engine-shaft, a sprocket-shaft, a clutch connecting said shafts, running-gear connected to the sprocket-  
75 shaft, a brake for the running-gear, an operating-lever, a friction-clutch lever one end of which is attached to means for operating the clutch, said friction-clutch lever being pivotally mounted and provided with means al-  
80 lowing it longitudinal movement, the friction-clutch lever having an inclined face which is in the path of movement of the operating-lever, a brake-rod connected to the brake, a connection between the brake-rod and the op-  
85 erating-lever embracing means for allowing a certain movement of the operating-lever before moving the brake-rod, and means for locking said operating-lever.

5. In combination, an engine, an engine-  
90 shaft, a sprocket-shaft, a clutch connecting said shafts, running-gear connected with the sprocket-shaft, a brake for the running-gear, an operating foot-lever, a friction-clutch lever one end of which is attached to means for  
95 operating the clutch, said friction-clutch lever having an elongated slot, a stationary pin passing through said slot, the other end of the friction-clutch lever being inclined and lying in the path of movement of the foot-lever, a  
100 brake-rod connected to the brake, one end of the brake-rod being slotted, an antifriction-roller mounted near the end of the slot, said foot-lever passing through the latter slot, and means for locking said operating foot-lever.  
105

6. In a motor-vehicle, means for propelling the vehicle embracing, an engine, an engine-shaft, a journal on the engine supporting the shaft, a recessed clutch-cap mounted on the  
110 engine-shaft close to the journal, the engine-shaft terminating at the bottom of the recess in the clutch-cap, a sprocket-shaft in line with the engine-shaft, a pair of journals supporting the sprocket-shaft, a cupped friction-  
115 wheel with the hub loosely fitting the sprocket-shaft and splined thereon, a sleeve provided with diametrically opposite pins which is loosely mounted on the sprocket-shaft between one of the latter-named journals and the  
120 friction-wheel, and a pivoted clutch-lever connected with the said pins, and means for locking said clutch-lever.

7. In a motor-vehicle, means for propelling the vehicle embracing an engine, an engine-shaft, a journal on the engine supporting the  
125 shaft, a recessed clutch-cap mounted on the engine-shaft close to the journal, the engine-shaft terminating at the flat face of the recess in the clutch-cap, a sprocket-shaft in line with the engine-shaft, a pair of journals support-  
130



ing the sprocket-shaft, a cupped friction-wheel provided with a hub loosely fitting the sprocket-shaft and splined thereon, a sleeve provided with diametrically opposite pins which is loosely mounted on the sprocket-shaft between one of the latter-named journals and the friction-wheel, a pivoted clutch-lever connected with the said pins, means for rocking said clutch-lever, and means for locking said last-named means.

8. In combination an engine, an engine-shaft, a sprocket-shaft, a clutch connecting said shafts, running-gear connected to the sprocket-shaft, a brake for the running-gear, a lever, and means connected thereto for operating said clutch and brake, said means embracing a pivoted foot-lever and a pivoted rack, which is movable into engagement with said foot-lever.

9. In combination an engine, an engine-shaft, a sprocket-shaft, a clutch connecting said shafts, running-gear, a brake for the running-gear, a lever, a foot-lever, sprockets of varying sizes rigidly mounted on the sprocket-shaft, an intermediate shaft, connections therefrom to the running-gear, intermediate sprockets loosely mounted on the intermediate-shaft connections from said latter sprockets to said first sprockets, and means for locking either of the intermediate sprockets to said intermediate shaft.

10. In combination, an engine, engine-shaft, a sprocket-shaft, a clutch connecting said shafts, running-gear, a brake for the running-gear, a lever, a foot-lever, driving-sprockets of varying sizes rigidly mounted on the sprocket-shaft, an intermediate shaft, connections therefrom to the running-gear, intermediate sprockets loosely mounted on the intermediate shaft, connections from said latter sprockets to said driving-sprockets, and means for locking either of said intermediate sprockets to said intermediate shaft.

11. In combination, an engine, an engine-shaft, a sprocket-shaft, a clutch-cap rigidly mounted on the engine-shaft, said clutch-cap having a conical chamber, the rim of the chamber having the smaller diameter, a conical friction-wheel slidably mounted on the sprocket-shaft, yielding means for normally pressing the two members of the clutch together, an intermediate shaft, intermediate sprockets loosely mounted thereon, driving-sprockets rigidly mounted on the sprocket-shaft and connected to the intermediate sprockets, and means for locking either of said intermediate sprockets to said intermediate shaft.

12. In combination, an engine, an engine-shaft, a sprocket-shaft, a clutch-cap rigidly mounted on the engine-shaft, said clutch-cap having a conical chamber, the rim of the chamber having the smaller diameter, a conical friction-wheel slidably mounted on the sprocket-shaft, yielding means for normally pressing the two members of the clutch together, means

for controlling the clutch, an intermediate shaft, intermediate sprockets loosely mounted thereon, driving-sprockets rigidly mounted on the sprocket-shaft connected to the intermediate sprockets, and means for locking either of said intermediate sprockets to said intermediate shaft.

13. In combination, an engine, an engine-shaft, a sprocket-shaft, driving-sprockets thereon, a clutch-cap rigidly mounted on the engine-shaft, said clutch-cap having a conical chamber, the rim of the chamber having the smaller diameter, a conical friction-wheel slidably mounted on the sprocket-shaft, a compression-spring interposed between the clutch-cap and the friction-wheel for normally pressing the two members of the clutch together, an intermediate shaft, intermediate sprockets rigidly mounted on the intermediate shaft and connected to the driving-sprockets, and means for locking either of said intermediate sprockets to said intermediate shaft.

14. In combination, an engine, an engine-shaft, a sprocket-shaft, a chambered clutch-cap, an annular lining having a conical bore in the clutch-cap, the outer rim of the lining having the smaller diameter, a conical dished friction-wheel with a hub loosely fitting and splined on the sprocket-shaft, yielding means for pressing the friction-wheel outwardly against the annular lining, means for throwing the friction-wheel back from the lining, an intermediate shaft, intermediate sprockets loosely mounted thereon, driving-sprockets rigidly mounted on the sprocket-shaft and connected to the intermediate shafts, and means for locking either of said intermediate sprockets to said intermediate shaft.

15. In combination, an engine, an engine-shaft, a sprocket-shaft, a chambered clutch-cap, an annular lining having a conical bore in the clutch-cap the outer rim of the lining having the smaller diameter, a conical dished friction-wheel with a hub loosely fitting and splined on the sprocket-shaft, yielding means for pressing the friction-wheel outwardly against the annular lining, means for throwing the friction-wheel back from the lining, an intermediate shaft, intermediate sprockets loosely mounted thereon, driving-sprockets rigidly mounted on the sprocket-shaft, and connected to the intermediate sprockets, and means for locking either of said intermediate sprockets to said intermediate shaft.

16. In combination, an engine, an engine-shaft, a sprocket-shaft, a chambered clutch-cap, an annular lining having a conical bore in the clutch-cap and detachably fastened thereto, the outer rim of the lining having the smaller diameter, a conical dished friction-wheel with a hub loosely fitting and splined on the sprocket-shaft, yielding means for pressing the friction-wheel outwardly against the annular lining, means for throwing the friction-wheel back from the lining, an inter-



mediate shaft, intermediate sprockets loosely mounted thereon, driving-sprockets rigidly mounted on the sprocket-shaft and connected to the intermediate sprockets, and means for  
5 locking either of said intermediate sprockets to said intermediate shaft.

17. In combination, an engine, engine-shaft, a sprocket-shaft, a clutch connecting said shafts, running-gear, a brake for the running-  
10 gear, an operating-lever, a friction-clutch lever one end of which is attached to means for operating the clutch, said friction-clutch lever being pivotally mounted and provided with means allowing it longitudinal move-  
15 ment, the other end of the friction-clutch lever having an inclined face, which is in the path of movement of the operating-lever, a brake-rod connected to the brake, and a connection between the brake-rod and the operating-lever  
20 embracing means for allowing a certain movement of the operating-lever before moving the brake-rod, an intermediate shaft, intermediate sprockets loosely mounted thereon, driving-sprockets rigidly mounted on the  
25 sprocket-shaft and connected to the intermediate sprockets, and means for locking either of said intermediate sprockets to said intermediate shaft.

18. In combination, an engine, an engine-  
30 shaft, a sprocket-shaft, a clutch connecting said shafts, running-gear, a brake for the running-gear, an operating foot-lever, a friction-clutch lever one end of which is attached to means for operating the clutch, said friction-  
35 clutch lever having an elongated slot, a stationary pin passing through said slot, the other end of the friction-clutch lever being inclined and lying in the path of movement of the foot-lever, a brake-rod connected to the  
40 brake, one end of the brake-rod being slotted, an antifriction-roller mounted near the end of the slot, said foot-lever passing through the latter slot, an intermediate shaft, intermediate sprockets loosely mounted thereon, driving-  
45 sprockets rigidly mounted on the sprocket-shaft, and connected to the intermediate sprocket, and means for locking either of said intermediate sprockets to said intermediate shaft.

50 19. In a motor-vehicle, means for propelling the vehicle embracing an engine, an engine-shaft, a journal on the engine supporting the shaft, a recessed clutch-cap mounted on the engine-shaft close to the journal, the engine-  
55 shaft terminating at the bottom of the recess in the clutch-cap, a sprocket-shaft in line with the engine-shaft, a pair of journals supporting the sprocket-shaft, a cupped friction-wheel with a hub loosely fitting the sprocket-shaft  
60 and splined thereon, a sleeve provided with diametrically opposite pins which is loosely mounted on the sprocket-shaft between one of the latter-named journals and the friction-wheel, a pivoted clutch-lever connected with  
65 said pins, an intermediate shaft, intermediate

sprockets loosely mounted thereon, driving-sprockets rigidly mounted on the sprocket-shaft and connected to the intermediate sprockets, and means for locking either of said intermediate sprockets to said intermediate shaft.

20. In combination, an engine, engine-shaft, a sprocket-shaft, a clutch connecting said shafts, running-gear, a brake for the running-gear, a lever, means connected to the lever for operating said clutch and brake, an intermediate hollow shaft, connections therefrom to the running-gear, shoulders on said hollow shaft, intermediate sprockets on the hollow shaft abutting against the shoulders, said intermediate sprockets being provided with clutch-teeth, a clutch slidably mounted on said hollow shaft between said intermediate sprockets, driving-sprockets of varying sizes rigidly mounted on the sprocket-shaft, connections from the driving-sprockets to the intermediate sprockets, and means for sliding said clutch on said hollow shaft into engagement with either of said intermediate sprockets.

21. In combination, an engine, engine-shaft, a sprocket-shaft, a clutch connecting said shafts, running-gear, a brake for the running-gear, an operating-lever, a friction-clutch lever one end of which is attached to means for operating the clutch, said friction-clutch lever being pivotally mounted and provided with means allowing it longitudinal movement, the other end of the friction-clutch lever having an inclined face, which is in the path of movement of the operating-lever, a brake-rod connected to the brake and a connection between the brake-rod and the operating-lever embracing means for allowing a certain movement of the operating-lever before moving the brake-rod, an intermediate hollow shaft provided with an enlargement forming shoulders, intermediate sprockets loosely mounted on said hollow shaft abutting against said shoulders, said intermediate sprockets being provided with teeth and slidably mounted on said hollow shaft between said sprockets, and driving-sprockets rigidly mounted on the sprocket-shaft, connections between the driving-sprockets and the intermediate sprockets, and means for sliding said clutch into engagement with either of said intermediate sprockets.

22. In combination, an engine, an engine-shaft, a sprocket-shaft, a clutch connecting said shaft, running-gear, a brake for the running-gear, a lever, means connected to the lever for operating said clutch and brake, an intermediate hollow shaft, said intermediate shaft being provided with an enlargement forming two shoulders, intermediate sprockets loosely mounted on said intermediate shaft and abutting against said shoulders, connections from the intermediate shaft to the running-gear, said hollow shaft having longitudinal grooves, a sleeve provided with arms which



lie in said grooves, a clutch carried by said arms and lying between said intermediate sprockets, said intermediate sprockets being provided with clutch-teeth, and means for sliding said sleeve on said hollow shaft and thereby sliding said clutch into engagement with either of said sprockets.

23. In a motor-vehicle, in combination with the frame thereof, an intermediate shaft, means for supporting said shaft embracing a journal-box, trunnions projecting at right angles to the bore thereof, a swivel-yoke formed of two symmetrical members, each member terminating in an arm, each arm being provided with a perforation, the two members being joined and forming a neck, a ring encircling the neck and holding the two members together, said neck passing through said frame, and a nut screwed on the end of the neck and serving to hold the two members together and also holding the yoke in position, said trunnions projecting through the perforations in said arms.

24. In a motor-vehicle, in combination with the frame thereof, an intermediate shaft, means for supporting said shaft, embracing a journal-box, trunnions projecting at right angles to the bore thereof, a swivel-yoke formed of two symmetrical members, each member terminating in an arm, each arm being provided with a perforation, the two members being joined and forming a neck, a ring encircling the neck and holding the two members together, said neck passing through said frame, and a nut screwed on the end of the neck and serving to hold the two members together and also holding the yoke into position, said trunnions projecting through the perforations in said arms, and additional means engaging the extreme ends of the arms for holding the two members together.

25. In a motor-vehicle, in combination with the frame thereof, an intermediate shaft, means for supporting the intermediate shaft embracing a pair of swiveled yokes, each yoke consisting of two symmetrical joining members, each member of a yoke terminating in an arm and the two members together forming a neck, a ring encircling the neck and holding the two members together, the neck of said yoke passing through said frame and being secured thereto by means of retaining-nuts, each arm of the yoke being provided with perforations, a journal-box provided with opposite trunnions which lie in said perforations, the axes of the trunnions being at right angles to the axes of the boxes, said yokes being arranged opposite each other and the axes of the boxes being in line, a strap connecting the two boxes, each end of the strap being bolted to the journal-box, and each end of the strap having a pair of opposite elongated slots in which lie the ends of the arms of a yoke the longest diameter of each slot lying parallel with the axes of the boxes.

26. In a motor-vehicle, in combination with intermediate sprockets and their shaft, and a clutch for engaging said sprocket, of means for operating said clutch embracing a grooved sleeve connected to the clutch and slidably mounted on said shaft, an arm extending from the stem, the end of the arm being bifurcated and forming a yoke, pins extending from the yoke into the groove in said sleeve, a suitable hand-lever mounted on the frame of the vehicle and a connection from the hand-lever to said lever.

27. In a motor-vehicle, in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear connected thereto, a clutch on the end of the differential gear, a gear splined on one member of the double shaft, a side shaft, a gear thereon adapted to mesh with said first gear, and means for sliding said first gear on the double shaft out of mesh with the second gear and its engagement with said clutch.

28. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear attached to the double shaft, an annular gear on the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a gear thereon meshing with the annular gear, another gear on the side shaft meshing with the clutching-gear, and means for sliding the clutching-gear out of engagement with the third-named gear.

29. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear attached to the double shaft, an annular gear on the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a gear thereon splined on the side shaft meshing with the annular gear, another gear on the side shaft meshing with the clutching-gear, and means for first sliding the clutching-gear out of engagement with the third-named gear.

30. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear attached to the double shaft, an annular gear on the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a gear thereon splined on the side shaft meshing with the annular gear, another gear on the side shaft meshing with the clutching-gear, and means for first sliding the clutching-gear out of engagement with the third-named gear and then sliding said second gear out of engagement with the annular gear.

31. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear attached to the double shaft, an annular gear on the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a gear thereon meshing



with the annular gear, another gear on the side shaft meshing with the clutching-gear, and means for sliding the clutching-gear out of engagement with the third-named gear, and  
5 spring-pressed means for holding said second gear in mesh with the annular gear.

32. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear  
10 attached to the double shaft, an annular gear on the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a gear thereon splined on  
15 the side shaft meshing with the annular gear, another gear on the side shaft meshing with the clutching-gear, and means for first sliding the clutching-gear out of engagement with the third-named gear and then sliding said  
20 second gear out of engagement with the annular gear, and spring-pressed means for holding said second gear in mesh with the annular gear.

33. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear  
25 attached to the double shaft, a gear on the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a gear thereon splined on  
30 the side shaft meshing with the annular gear, another gear on the side shaft meshing with the clutching-gear, and means for sliding the clutching-gear out of engagement with the third-named gear.

34. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear  
35 attached to the double shaft, an annular gear on the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a gear thereon splined  
40 on the side shaft meshing with the annular gear, another gear on the side shaft meshing with the clutching-gear, and means for first sliding the clutching-gear out of engagement  
45 with the third-named gear and then sliding said second gear out of engagement with the annular gear, and sliding said clutching-gear into engagement with the clutch on the differential gear.  
50

35. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear  
55 attached to the double shaft, an annular gear on the shaft of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a gear thereon meshing normally with the annular gear, another  
60 gear on the side shaft normally meshing with the clutching-gear, a shift-rod, means carried by the shift-rod for sliding said clutching-gear and means for actuating said shift-rod.

36. In a motor-vehicle in combination with the running-gear, means for driving the same  
65 embracing a double shaft, an annular gear on

the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a slidable gear thereon normally meshing with the annular gear, another gear on the side shaft normally meshing  
70 with the clutching-gear, a shift-rod, an arm mounted on the shift-rod, and means for shifting said shift-rod and through the medium of said arm moving said slidable gear out of engagement with said annular gear.  
75

37. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, an annular gear on the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a slidable gear thereon normally meshing with the annular gear, another gear on the side shaft normally meshing  
80 with the clutching-gear, a shift-rod, an arm mounted on the shift-rod, and means for shifting said shift-rod and through the medium of said arm moving said slidable gear out of engagement with said annular gear, and  
85 a yoke carried by the shift-rod engaging said clutching-gear.  
90

38. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear attached to the double shaft, an annular gear  
95 on the jacket of the differential gear, a clutching-gear slidably mounted on one member of the double shaft, a side shaft, a slidable gear thereon normally meshing with the annular gear, another gear on the side shaft meshing  
100 with said clutching-gear, a shift-rod slidably mounted on means carried by said vehicle, means carried by said shift-rod for first moving said clutching-gear out of mesh with its described associated gear and at the same  
105 time moving said slidable gear on the side shaft out of mesh with the annular gear and then moving said clutching-gear into engagement with the end of the differential gear, and means for automatically restoring the slidable  
110 gear on the side shaft to its normal engagement with the annular gear.

39. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear attached to the double shaft, an annular gear  
115 on the jacket of the differential gear, a clutching-gear slidably mounted on one member of the double shaft, a side shaft, a slidable gear thereon normally meshing with the annular gear, another gear on the side shaft meshing  
120 with said clutching-gear, a shift-rod slidably mounted on means carried by said vehicle, means carried by said shift-rod for first moving said clutching-gear out of mesh with its described associated gear and at the same time  
125 moving said slidable gear on the side shaft out of mesh with the annular gear and then moving said clutching-gear into engagement with the end of the differential gear.

40. In a motor-vehicle in combination with



the running-gear, means for driving the same embracing a gear-case mounted on the vehicle, a double shaft passing through said case, a side shaft mounted in said case, a differential gear mounted on said double shaft, a shift-rod slidably mounted in said gear-case, an annular gear on the differential-gear jacket, a gear splined on the side shaft normally meshing with the annular gear, a spring interposed between said splined gear and said gear-case, an arm adjustably attached to the shift-rod, one end of said arm lying near said splined gear, a clutching-gear splined on one member of the double shaft, another gear on the side shaft meshing with said clutching-gear, a yoke adjustably attached to said shift-rod, said clutching-gear being provided with a grooved collar, which is engaged by said yoke.

41. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a gear-case mounted on the vehicle, a double shaft passing through said case, a side shaft mounted in said case, a differential gear mounted on said double shaft, a shift-rod slidably mounted in said gear-case, an annular gear on the differential-gear jacket, a gear splined on the side shaft normally meshing with the annular gear, a spring interposed between said splined gear and said gear-case, an arm adjustably attached to the shift-rod, one end of said arm lying near said splined gear, a clutching-gear splined on one member of the double shaft, another gear on the side shaft meshing with said clutching-gear, a yoke adjustably attached to said shift-rod, said clutching-gear being provided with a grooved collar, which is engaged by said yoke, the end of the jacket of the differential gear being provided with a clutch for engaging the clutching-gear when the latter is shifted.

42. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a gear-case, a differential gear mounted on the double shaft within said gear-case, a clutch on the end of the differential gear, a clutching-gear slidably mounted on one member of the double shaft movable into engagement with the clutch on the end of the differential-gear jacket, an annular gear on the jacket of the differential gear, a gear splined on the side shaft and normally meshing with the annular gear, a shift-rod, an arm thereon being provided with an eye in which the side shaft is free to revolve, the end of said arm being near said gear which meshes with said annular gear, a yoke mounted on the shift-rod, a grooved collar carried by a clutching-gear and engaging said yoke.

43. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a gear-case, a differential gear mounted on the double shaft within said gear-case, a clutch on the end of the differential gear, a clutching-gear slidably

mounted on one member of the double shaft movable into engagement with the clutch on the end of the differential-gear jacket, an annular gear on the jacket of the differential gear, a gear splined on the side shaft and normally meshing with the annular gear, a shift-rod, an arm thereon being provided with an eye in which the side shaft is free to revolve, the end of said arm being near said gear which meshes with said annular gear, a yoke mounted on the shift-rod, a grooved collar carried by a clutching-gear and engaging said yoke, an idler-gear mounted inside the gear-case, a third gear on the side shaft meshing with said idler-gear, and means for shifting said shift-rod and moving said clutching-gear into mesh with said idler-gear.

44. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a gear-case, a double shaft, a differential gear attached to the double shaft, an annular gear on the jacket of the differential gear, internal teeth in the end of the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a gear splined on the side shaft and meshing with the annular gear, a second gear on the side shaft, a third gear on the side shaft, an idler-gear on the gear-case meshing with said third gear, the pitch diameter of said first side-shaft gear being less than the pitch diameter of the second side-shaft gear and the pitch diameter of the clutching-gear being less than the pitch diameter of the second side-shaft gear, a shift-rod slidably mounted on said gear-case and means carried by said shift-rod for shifting said clutch-gear into engagement with the internal teeth of the differential gear, or into engagement with the second gear-shaft, or into engagement with the idler-gear.

45. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a gear-case, a double shaft, a differential gear attached to the double shaft, an annular gear on the jacket of the differential gear, internal teeth in the end of the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a gear splined on the side shaft and meshing with the annular gear, a second gear on the side shaft, a third gear on the side shaft, an idler-gear on the gear-case meshing with said third gear, the pitch diameter of said first side-shaft gear being less than the pitch diameter of the second side-shaft gear and the pitch diameter of the clutching-gear being less than the pitch diameter of the second-side shaft gear, a shift-rod slidably mounted on said gear-case and means carried by said shift-rod for shifting said clutch-gear into engagement with the internal teeth of the differential gear, or into engagement with the second shaft-gear, or into engagement with the idler-gear, and means for first shifting said clutching-



gear out of engagement with said second side-shaft gear and at the same time shifting said first side-shaft gear out of engagement with said annular gear then shifting said clutching-gear into engagement with the internal teeth of the differential gear.

46. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear attached to the double shaft, a clutch on the differential gear, a clutching-gear slidably mounted on one member of the double shaft, a side shaft mounted parallel with the double shaft, an annular gear on the differential gear, a first gear splined on the side shaft meshing with the annular gear, a second gear on the side shaft, an idler-gear, a third gear on the side shaft meshing with the idler-gear, said clutching-gear being provided with a grooved collar, a shift-rod, an arm adjustably attached to the shift-rod for operating said first side-shaft gear, and a yoke adjustably mounted on the shift-rod and engaging the grooved collar.

47. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear attached to the double shaft, an annular gear on the shaft of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a gear thereon meshing normally with the annular gear, another gear on the side shaft normally meshing with the clutching-gear, a shift-rod, means carried by the shift-rod for sliding said clutching-gear and means for actuating said shift-rod, and means for sliding said shift-rod embracing a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

48. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, an annular gear on the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a slidable gear thereon normally meshing with the annular gear, another gear on the side shaft normally meshing with the clutching-gear, a shift-rod, an arm mounted on the shift-rod, and means for shifting said shift-rod and through the medium of said arm moving said slidable gear out of engagement with said annular gear, and means for sliding said shift-rod embracing a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

49. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, an annular gear on

the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a side shaft, a slidable gear thereon normally meshing with the annular gear, another gear on the side shaft normally meshing with the clutching-gear, a shift-rod, an arm mounted on the shift-rod, and means for shifting said rod and through the medium of said arm moving said slidable gear out of engagement with said annular gear, and a yoke carried by the shift-rod engaging said clutching-gear, and means for sliding said shift-rod embracing a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

50. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear attached to the double shaft, an annular gear on the jacket of the differential gear, a clutching-gear slidably mounted on one member of the double shaft, a side shaft, a slidable gear thereon normally meshing with the annular gear, another gear on the side shaft meshing with said clutching-gear, a shift-rod slidably mounted on means carried by said vehicle, means carried by said shift-rod for first moving said clutching-gear out of mesh with its described associated gear and at the same time moving said slidable gear on the side shaft out of mesh with the annular gear and then moving said clutching-gear into engagement with the end of the differential gear, the means for sliding said shift-rod embracing a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

51. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear attached to the double shaft, an annular gear on the jacket of the differential gear, a clutching-gear slidably mounted on one member of the double shaft, a side shaft, a slidable gear thereon normally meshing with the annular gear, another gear on the side shaft meshing with said clutching-gear, a shift-rod slidably mounted on means carried by said vehicle, means carried by said shift-rod for first moving said clutching-gear out of mesh with its described associated gear and at the same time moving said slidable gear on the side shaft out of mesh with the annular gear and then moving said clutching-gear into engagement with the end of the differential gear, and means for automatically restoring the slidable gear on the side shaft to its normal engagement with the annular gear, the means for sliding said shift-rod embracing a stem, an arm on



said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

52. In a motor-vehicle in combination with the running-gears, means for driving the same embracing a gear-case mounted on the vehicle, a double shaft passing through said case, a side shaft mounted in said case, a differential gear mounted on said double shaft, a shift-rod slidably mounted in said gear-case, an annular gear on the differential-gear jacket, a gear splined on the side shaft normally meshing with the annular gear, a spring interposed between said splined gear and said gear-case, an arm adjustably attached to the shift-rod, one end of said arm lying near said splined gear, a clutching-gear splined on one member of the double shaft, another gear on the side shaft meshing with said clutching-gear, a yoke adjustably attached to said shift-rod, said clutching-gear being provided with a grooved collar, which is engaged by said yoke, the means for sliding said shift-rod embracing a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

53. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a gear-case mounted on the vehicle, a double shaft passing through said case, a side shaft mounted in said case, a differential gear mounted on said double shaft, a shift-rod slidably mounted in said gear-case, an annular gear on the differential-gear jacket, a gear splined on the side normally meshing with the annular gear, a spring interposed between said splined gear and said gear-case, an arm adjustably attached to the shift-rod, one end of said arm lying near said splined gear, a clutching-gear on one member of the double shaft, another gear on the side shaft meshing with said clutching-gear, a yoke adjustably attached to said shift-rod, said clutching-gear being provided with a grooved collar, which is engaged by said yoke, the means for sliding said shift-rod embracing a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

54. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a gear-case, a differential gear mounted on the double shaft within said gear-case, a clutch on the end of the differential gear, a clutching-gear slidably mounted on one member of the double shaft movable into engagement with the clutch on

the end of the differential-gear jacket, an annular gear on the jacket of the differential gear, a gear splined on the side shaft and normally meshing with the annular gear, an arm being provided with an eye in which the side shaft is free to revolve, the end of said arm being near said gear which meshes with said annular gear, a yoke mounted on the shift-rod, a grooved collar carried by a clutching-gear and engaging said yoke, the means for sliding said shift-rod embracing a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named means.

55. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a gear-case, a differential gear mounted on the double shaft within said gear-case, a clutch on the end of the differential gear, a clutching-gear slidably mounted on one member of the double shaft movable into engagement with the clutch on the end of the differential-gear jacket, an annular gear on the jacket of the differential gear, a gear splined on the side shaft and normally meshing with the annular gear, an arm being provided with an eye in which the side shaft is free to revolve, the end of said arm being near said gear which meshes with said annular gear, a yoke mounted on the shift-rod, a grooved collar carried by a clutching-gear and engaging said yoke, an idler-gear mounted inside the gear-case, a third gear on the side shaft meshing with said idler-gear, and means for shifting said shift-rod and moving said clutching-gear into mesh with said idler-gear, the means for sliding said shift-rod embracing a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

56. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a gear-case, a double shaft, a differential gear attached to the double shaft, an annular gear on the jacket of the differential gear, internal teeth in the end of the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a gear splined on the side shaft and meshing with the annular gear, a second gear on the side shaft, a third gear on the side shaft, an idler-gear on the gear-case meshing with said third gear, the pitch diameter of said first side-shaft gear being less than the pitch diameter of the second side-shaft gear and the pitch diameter of the clutching-gear being less than the pitch diameter of the second side-shaft gear, a shift-rod slidably mounted on said gear-case and means carried by said shift-rod



for shifting said clutch-gear into engagement with the internal teeth of the differential gear, or into engagement with the second shaft-gear, or into engagement with the idler-gear, the means for sliding said shift-rod embracing a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

57. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a gear-case, a double shaft, a differential gear attached to the double shaft, an annular gear on the jacket of the differential gear, internal teeth in the end of the jacket of the differential gear, a clutching-gear splined on one member of the double shaft, a gear splined on the side shaft and meshing with the annular gear, a second gear on the side shaft, a third gear on the side shaft, an idler-gear on the gear-case meshing with said third gear, the pitch diameter of said first side-shaft gear being less than the pitch diameter of the second side-shaft gear and the pitch diameter of the clutching-gear being less than the pitch diameter of the second side-shaft gear, a shift-rod slidably mounted on said gear-case, and means carried by said shift-rod for shifting said clutch-gear into engagement with the internal teeth of the differential gear, or into engagement with the second shaft-gear, or into engagement with the idler-gear, and means for first shifting said clutching-gear out of engagement with said second side-shaft gear and at the same time shifting said first side-shaft gear out of engagement with said annular gear then shifting said clutching-gear in the internal teeth of the differential gear, the means for sliding said shift-rod embracing a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

58. In a motor-vehicle in combination with the running-gear, means for driving the same embracing a double shaft, a differential gear attached to the double shaft, a clutch on the differential gear, a clutching-gear slidably mounted on one member of the double shaft, a side shaft mounted parallel with the double shaft, an annular gear on the differential gear, a first gear splined on the side shaft meshing with the annular gear, a second gear on the side shaft, an idler-gear, a third gear on the side shaft meshing with the idler-gear, said clutching-gear being provided with a grooved collar, a shift-rod, an arm adjustably attached to the shift-rod for operating said first side-shaft gear, and a yoke adjustably mounted on the shift-rod and engaging the grooved collar, the means for sliding said shift-rod embracing

a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

59. In a motor-vehicle, in combination with the running-gear, means for driving the same embracing a double shaft, a hollow shaft mounted on one member of said double shaft, a double clutch mounted on said hollow shaft, a differential gear on said double shaft but unconnected with the said hollow shaft, means for locking said differential gear with said hollow shaft, gearing intermediate of the hollow shaft and differential gear, means for throwing said gear into operation when the direct connection between the differential gear and hollow shaft is broken, means for operating said clutch embracing a hand-lever, a shaft carried by said hand-lever, a connection from the shaft to said clutch, means for operating the differential-gear clutch and associated gearing embracing another hand-lever, a hollow shaft carrying said hand-lever, said hollow shaft inclosing the shaft which carries the first-named hand-lever and being mounted in a lug on the vehicle and a connection from said hollow shaft to the differential-gear clutch and its associated gear.

60. In a motor-vehicle in combination, means for propelling the same embracing a pair of hand-levers, a shaft carrying one of said hand-levers, a hollow shaft carrying the other hand-lever, both of said shafts being provided with arms, a pair of stems pivoted to the vehicle-frame, both of said stems being provided with arms, a link connecting the arm of one stem with the arm of one shaft, another link connecting the arm of the other stem with the arm of the other shaft, operating-arms carried by said stems, a double clutch connected with one of said operating-arms, and a differential gear and its associated clutch and gearing connected with the other operating-arm.

61. In a motor-vehicle, in combination with the running-gear, means for driving the same embracing a double shaft, a hollow shaft mounted on one member of said double shaft, a double clutch mounted on said hollow shaft, a differential gear on said double shaft but unconnected with the said hollow shaft, means for locking said differential gear with said hollow shaft, gearing intermediate of the hollow shaft and differential gear, means for throwing said gear into operation when the direct connection between the differential gear and hollow shaft is broken, means for operating said clutch embracing a hand-lever, a shaft carried by said hand-lever, a connection from the shaft to said clutch, means for operating the differential-gear clutch and associated gearing embracing another hand-lever, a hollow shaft carrying said hand-lever, said hollow shaft inclosing the shaft which carries the first-



named hand-lever and being mounted in a lug on the vehicle and a connection from said hollow shaft to the differential-gear clutch and its associated gear, the means for sliding said shift-rod embracing a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

62. In a motor-vehicle in combination, means for propelling the same embracing a pair of hand-levers, a shaft carrying one of said hand-levers, a hollow shaft carrying the other hand-lever, both of said shafts being provided with arms, a pair of stems pivoted to the vehicle-frame, both of said stems being provided with arms, a link connecting the arm of one stem with the arm of one shaft, another link connecting the arm of the other stem with the arm of the other shaft, operating-arms carried by said stems, a double clutch connected with one of said operating-arms, and a differential gear and its associated clutch and gearing connected with the other operating-arm, the means for sliding said shift-rod embracing a stem, an arm on said stem flexibly connected to said shift-rod, another arm on said stem substantially at right angles to said first arm, a hand-lever pivoted to the vehicle-frame, and a connection from said hand-lever to said second-named arm.

63. In a motor-vehicle, in combination with the sprockets carried by the rear wheels, an intermediate double shaft carried by the frame of the vehicle, a sprocket carried by each member of the double shaft connecting the intermediate sprockets and rear sprockets, a hollow shaft mounted on one member of the double shaft, bushings between the hollow shaft and said member, said hollow shaft near one end being provided with shoulders, a pair of sprockets abutting against opposite shoulders and rotatably mounted on the hollow shaft, each of said sprockets being provided with internal clutching-teeth, a collar mounted on the hollow shaft and retaining one of said sprockets, a clutch mounted on said hollow shaft between said sprockets comprising a spider provided with a toothed rim, a sleeve slidably mounted on the hollow shaft, said hollow shaft being provided with a plurality of longitudinal grooved arms connecting said sleeve and spider, and lying in said groove, means for shifting said clutch into engagement with the internal teeth of either of said sprockets, driving-sprockets of unequal size mounted on the sprocket-shaft and chains connecting each of said driving-sprockets with each of said clutch-sprockets.

64. In a motor-vehicle, in combination with the sprockets carried by the rear wheels, an intermediate double shaft carried by the frame of the vehicle, a sprocket carried by each member of the double shaft connecting the in-

intermediate sprockets and rear sprockets, a hollow shaft mounted on one member of the double shaft, bushings between the hollow shaft and said member, said hollow shaft near one end being provided with shoulders, a pair of sprockets abutting against opposite shoulders and rotatably mounted on the hollow shaft, each of said sprockets being provided with internal clutching-teeth, a collar mounted on the hollow shaft and retaining one of said sprockets, a clutch mounted on said hollow shaft between said sprockets comprising a spider provided with a toothed rim, a sleeve slidably mounted on the hollow shaft, said hollow shaft being provided with a plurality of longitudinal grooved arms connecting said sleeve and spider, and lying in said groove, means for shifting said clutch into engagement with the internal teeth of said sprockets, driving-sprockets of unequal size mounted on the sprocket-shaft and chains connecting each of said driving-sprockets with each of said clutch-sprockets, and a pair of brake-drums mounted on each member of the double shaft, friction-bands encircling each brake-drum, and means for tightening said brake-bands.

65. In a motor-vehicle in combination, an intermediate double shaft, a hollow shaft mounted on one member of the double shaft, a differential gear mounted on the other member of the double shaft and means for locking said differential gear with said hollow shaft, intermediate gearing from the differential gear to the hollow shaft.

66. In a motor-vehicle, in combination, an intermediate double shaft, a hollow shaft, a differential gear mounted on the other member of the hollow shaft, gearing intermediate of the hollow shaft and said differential gear, a clutch on the differential gear, a combined clutch and gear on the hollow shaft movable into mesh with said clutch or into mesh with said gearing, and means for shifting said combined clutch and gear.

67. In a motor-vehicle, in combination, an intermediate double shaft, a differential gear on one member of the shaft, a hollow shaft on the other member of the double shaft, gearing intermediate of the hollow shaft and said differential gear, an idler-gear in mesh with said intermediate gear, a combined clutch and gear splined on the hollow shaft, and means for moving said combined clutch and gear into engagement with either the clutch on the differential gear, the intermediate gearing, or the reversing-gear.

68. In a motor-vehicle in combination, an intermediate double shaft, a differential gear mounted on one member of the double shaft, gearing intermediate of the differential gear and hollow shaft, an idler reversing-gear meshing with the intermediate gear, a clutch comprising internal teeth in the end of the differential-gear jacket, a combined clutch and gear splined on the hollow shaft, a shift-rod,



means carried by the shift-rod for sliding said combined clutch and gear into engagement with the clutch in the differential gear, into engagement with the intermediate gearing or into engagement with the reversing-gear, and means carried by the shift-rod for sliding one member of the intermediate gear out of engagement with the differential gear.

69. In a motor-vehicle in combination, an intermediate double shaft, a differential gear mounted on one member of the double shaft, gearing intermediate of the differential gear and hollow shaft, an idler reversing-gear meshing with the intermediate gear, a clutch comprising internal teeth in the end of the differential-gear jacket, a combined clutch and gear splined on the hollow shaft, a shift-rod, means carried by the shift-rod for sliding said combined clutch and gear into engagement with the clutch in the differential gear, into engagement with the intermediate gearing or into engagement with the reversing-gear, and means carried by the shift-rod for sliding one member of the intermediate gear out of engagement with the differential gear, said last two means consisting of a shift-rod, a yoke mounted on the shift-rod and engaging with said combined clutch and gear and an arm carried by the shift-rod and engaging one member of the intermediate gear.

70. In a motor-vehicle in combination, an intermediate double shaft, a differential gear mounted on one member of the double shaft, gearing intermediate of the differential gear and hollow shaft, an idler reversing-gear meshing with the intermediate gear, a clutch comprising internal teeth in the end of the differential-gear jacket, a combined clutch and gear splined on the hollow shaft, a shift-rod, means carried by the shift-rod for sliding said combined clutch and gear into engagement with the clutch in the differential gear, into engagement with the intermediate gearing, or into engagement with the reversing-gear, and means carried by the shift-rod for sliding one member of the intermediate gear out of engagement with the differential gear, said last two means consisting of a shift-rod, a yoke mounted on the shift-rod and engaging with said combined clutch and gear and an arm carried by the shift-rod and engaging one member of the intermediate gear, a pivoted hand-lever and connections from the hand-lever to said shift-rod.

71. In a motor-vehicle in combination, an intermediate double shaft, a differential gear mounted on one member of the double shaft, gearing intermediate of the differential gear and hollow shaft, an idler reversing-gear meshing with the intermediate gear, a clutch comprising internal teeth in the end of the differential-gear jacket, a combined clutch and gear splined on the hollow shaft, a shift-rod, means carried by the shift-rod for sliding said combined clutch and gear into en-

gagement with the clutch in the differential gear, into engagement with the intermediate gearing, or into engagement with the reversing-gear, and means carried by the shift-rod for sliding one member of the intermediate gear out of engagement with the differential gear, said last two means consisting of a shift-rod, a yoke mounted on the shift-rod and engaging with said combined clutch and gear and an arm carried by the shift-rod and engaging one member of the intermediate gear, a pivoted hand-lever and connections from the hand-lever to said shift-rod, and means for holding said hand-lever in various positions.

72. In a motor-vehicle in combination, an intermediate double shaft, a differential gear mounted on one member of the double shaft, gearing intermediate of the differential gear and hollow shaft, an idler reversing-gear meshing with the intermediate gear, a clutch comprising internal teeth in the end of the differential-gear jacket, a combined clutch and gear splined on the hollow shaft, a shift-rod, means carried by the shift-rod for sliding said combined clutch and gear into engagement with the clutch in the differential gear, into engagement with the intermediate gearing, or into engagement with the reversing-gear, and means carried by the shift-rod for sliding one member of the intermediate gear out of engagement with the differential gear, said last two means consisting of a shift-rod, a yoke mounted on the shift-rod and engaging with said combined clutch and gear and an arm carried by the shift-rod and engaging one member of the intermediate gear, a plurality of double sprockets, each provided with clutches loosely mounted on the hollow shaft, a clutch between said sprockets splined on the hollow shaft, and means for shifting said clutch into engagement with either of said sprockets.

73. In a motor-vehicle in combination, an intermediate double shaft, a differential gear mounted on one member of the double shaft, gearing intermediate of the differential gear and hollow shaft, an idler reversing-gear meshing with the intermediate gear, a clutch comprising internal teeth in the end of the differential-gear jacket, a combined clutch and gear splined on the hollow shaft, a shift-rod, means carried by the shift-rod for sliding said combined clutch and gear into engagement with the clutch in the differential gear, into engagement with the intermediate gearing, or into engagement with the reversing-gear, and means carried by the shift-rod for sliding one member of the intermediate gear out of engagement with the differential gear, said last two means consisting of a shift-rod, a yoke mounted on the shift-rod and engaging with said combined clutch and gear and an arm carried by the shift-rod and engaging one member of the intermediate gear, a plural



ity of double sprockets, each provided with clutches loosely mounted on the hollow shaft, a clutch between said sprockets splined on the hollow shaft, and means for shifting said clutch into engagement with either of said sprocket-clutches, said means embracing a pivoted hand-lever and connections therefrom to the clutch between said sprockets.

74. In a motor-vehicle in combination, an intermediate double shaft, a differential gear mounted on one member of the double shaft, gearing intermediate of the differential gear and hollow shaft, an idler reversing-gear meshing with the intermediate gear, a clutch comprising internal teeth in the end of the differential-gear jacket, a combined clutch and gear splined on the hollow shaft, a shift-rod, means carried by the shift-rod for sliding said combined clutch and gear into engagement with the clutch in the differential gear, into engagement with the intermediate gearing, or into engagement with the reversing-gear, and means carried by the shift-rod for sliding one member of the intermediate gear out of engagement with the differential gear, said last two means consisting of a shift-rod, a yoke mounted on the shift-rod and engaging with said combined clutch and gear and an arm carried by the shift-rod and engaging one member of the intermediate gear, a plurality of double sprockets, each provided with clutches loosely mounted on the hollow shaft, a clutch between said sprockets splined on the hollow shaft, and means for shifting said clutch into engagement with either of said sprocket-clutches, and means embracing a pivoted hand-

lever and connections therefrom to the clutch between said sprockets, and means for holding said hand-lever in a desired position.

75. In a motor-vehicle in combination, an intermediate double shaft, a hollow shaft 40 mounted on one member of the double shaft, a differential gear mounted on the other member of the double shaft, a reducing-gear intermediate of the hollow shaft and said differential gear, one member of the reducing-gear 45 being movable into and out of engagement with the differential gear, a combined clutch and gear splined on said hollow shaft, a pair of clutch-sprockets loosely mounted on the 50 hollow shaft, a clutch splined on the hollow shaft between said clutch-sprockets, a pair of pivoted hand-levers, a pair of bell-crank levers, each bell-crank lever being connected to its hand-lever, one of said bell-crank levers 55 being connected with the clutch which is between the clutch-sprockets, a shift-rod engaging said combined clutch and gear, an arm carried by said shift-rod engaging the movable member of the reducing-gear, and the other 60 of said bell-crank levers being connected to said shift-rod.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, at Toledo, in the county of 65 Lucas and State of Ohio, this 14th day of March, 1903.

ROSS M. G. PHILLIPS.

Witnesses:

PERCY H. HOWE,  
EGBERT H. VAN WEY.