No. 780,633. PATENTED JAN. 24, 1905.

DE LONSON E. BARNARD.

SPEED CHANGING, DRIVING, AND REVERSING DEVICE FOR MOTOR VEHICLES.

APPLICATION FILED MAR. 21, 1904.

2 SHEETS—SHEET 1.

Fig. 4.

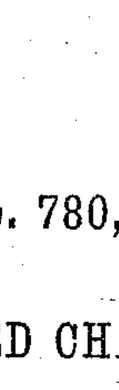
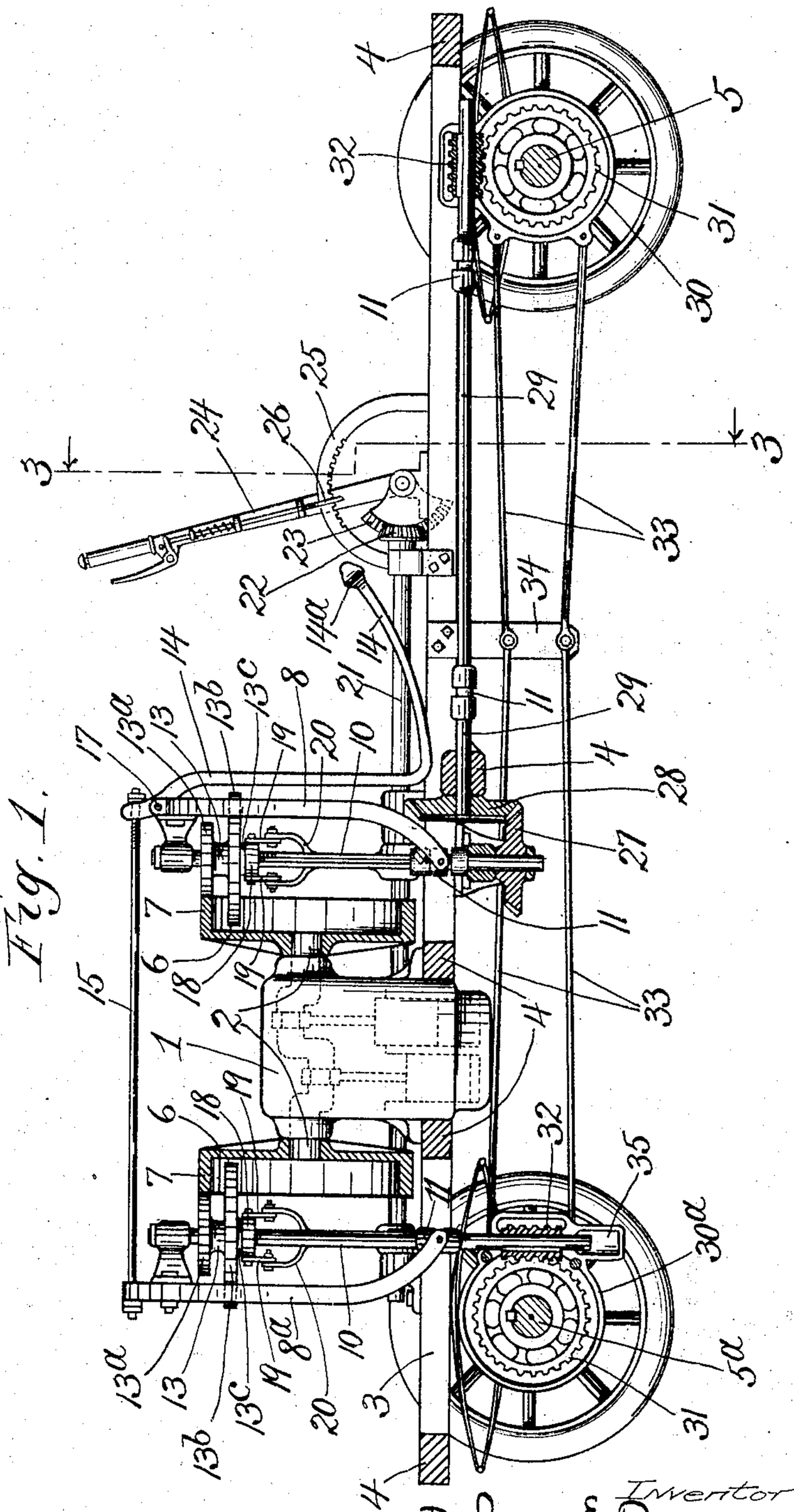


Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 3.

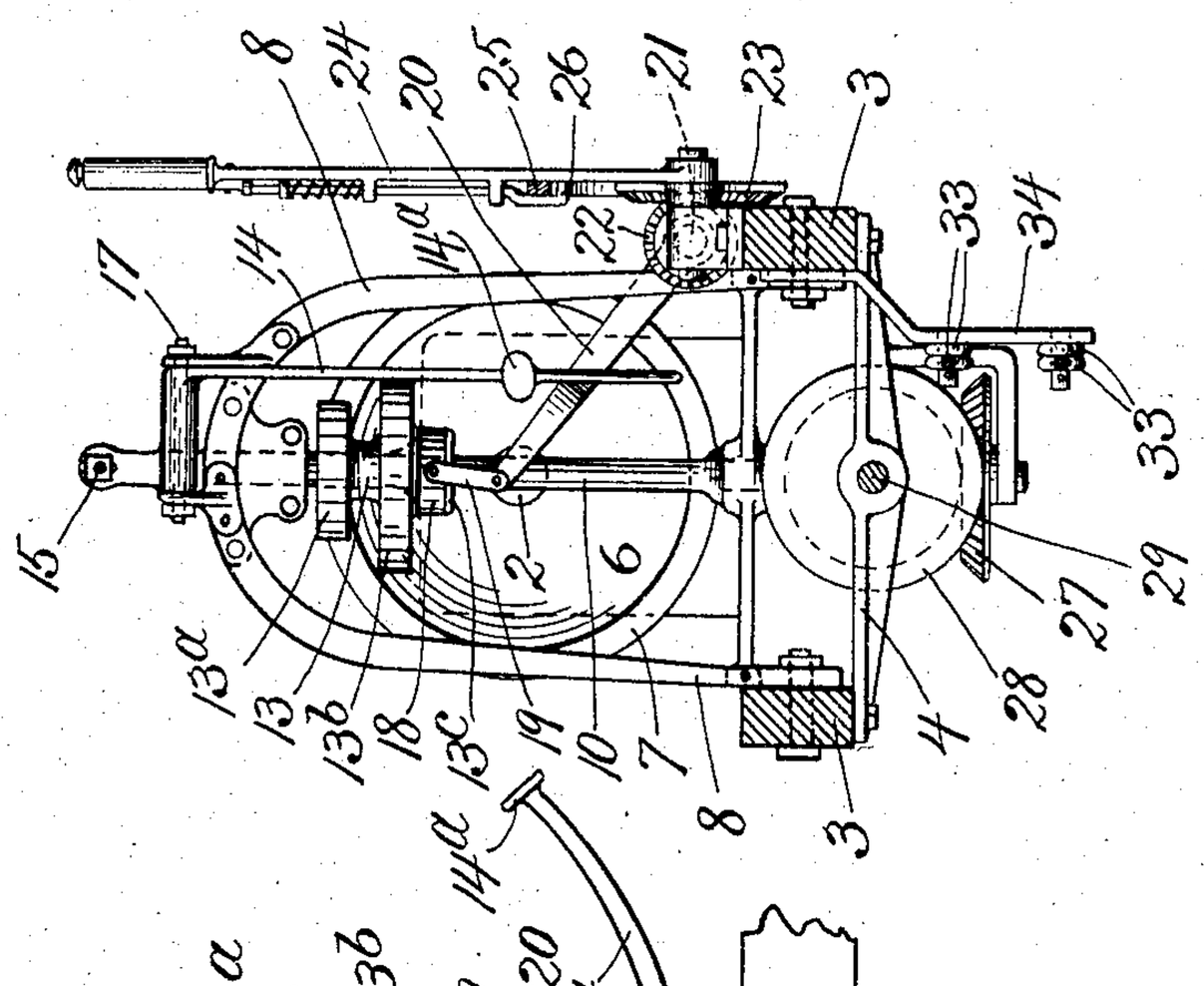
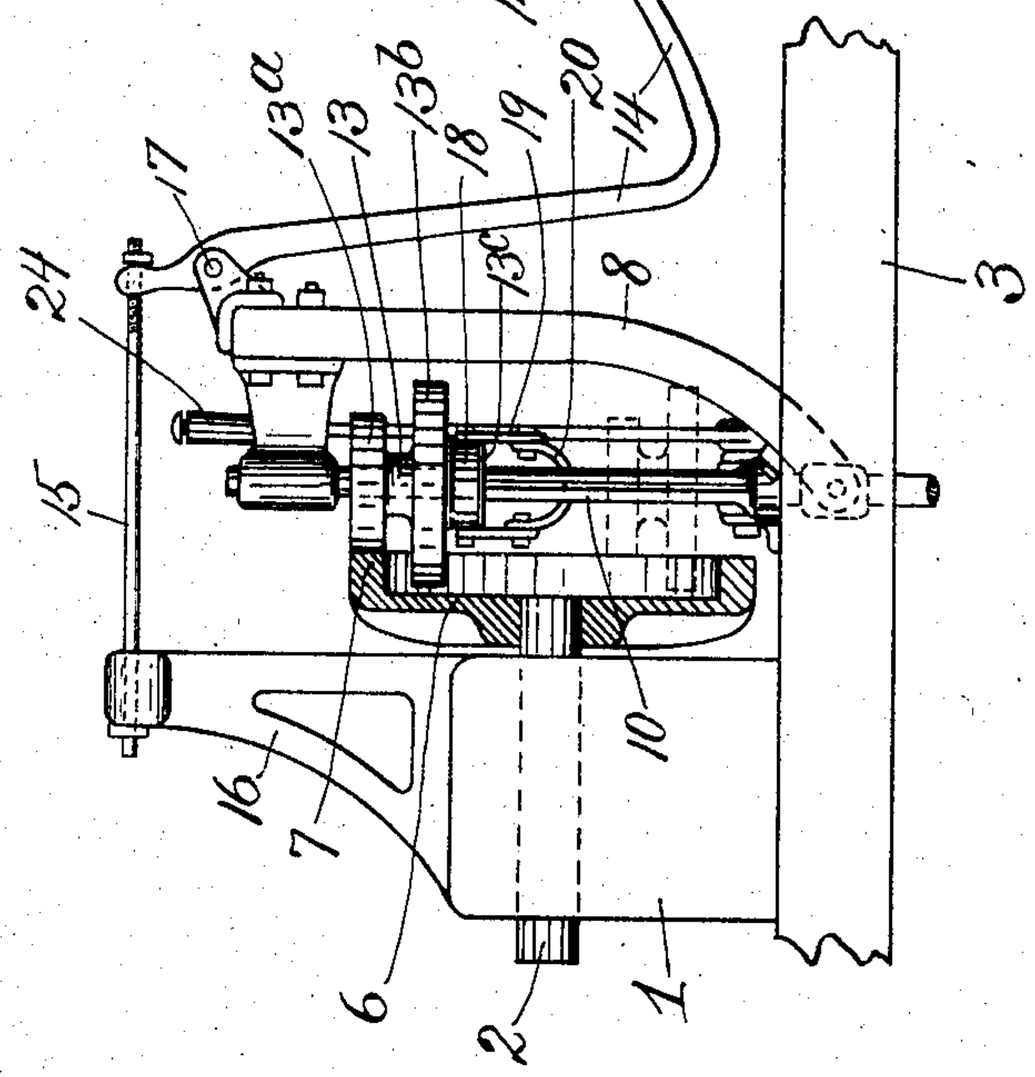


Fig. 2.



WITNESSES.

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UNITED STATES PATENT OFFICE.

DE LONSON E. BARNARD, OF CHICAGO, ILLINOIS.

SPEED-CHANGING, DRIVING, AND REVERSING DEVICE FOR MOTOR-VEHICLES.

SPECIFICATION forming part of Letters Patent No. 780,633, dated January 24, 1905.

Application filed March 21, 1904. Serial No. 199,322.

To all whom it may concern:

Be it known that I, DE LONSON E. BARNARD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Speed-Changing, Driving, and Reversing Devices for Motor-Vehicles, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates to motor-vehicles of the type in which the power is furnished by an expansive-fluid motor of any familiar type. It has to do with the mode of applying the power, and particularly with the means for changing the speed and reversing.

It consists of the features set out in the claims.

In the drawings, Figure 1 is a partly-sectional side elevation of a structure embodying my invention, the vehicle-frame and certain train-wheels being shown in longitudinal section at the vertical plane of the main crank-shaft axis. Fig. 2 is a partly-sectional side elevation of a slight modification for driving only one axle, section being made in vertical axial section through the main friction driving-disk. Fig. 3 is a partly-sectional rear elevation, section being made across the side frame-bars at the line 3 3 on Fig. 1. Fig. 4 is a detail section of a universal joint employed in several of the shafts.

The motor is conventionally represented at 1 in the form of an engine having its cylinders vertical and operating a longitudinal crank-shaft 2. At each end of said shaft 2 it has rigid with it a friction-disk 6, which has a friction flange or track 7 at the outer margin projecting off from the general plane of the friction-surface of the disk. To the main supporting-frame structure represented by the longitudinal sills 3 3 and cross-bars 4 4 there are pivoted lever-frames 8 and 8^a, in each of which there is journaled a shaft 10, which has at 11 a universal joint, beyond which it has connections, hereinafter described, for communicating power to the rear and front axles 5 and 5^a, respectively. On each shaft 10 there is mounted for rotation therewith, but for sliding thereon, a wheel 13, comprising two rigid friction-disks 13^a and 13^b of different diameters, the difference in their radii being slightly less than the projection of the friction track or flange 7 off from the general plane of the lateral surface of the disk 6. A foot-lever 14, fulcrumed adjustably on the end of a rod 15, extending from such adjustable connection forward to the upper end of the lever-frame 8^a, is pivotally connected at 17 with the upper end of the frame 8, so that the pressure of the driver's foot upon the pedal 14^a at the end of said pedal-lever operates to swing both frames 8 and 8^a toward the respective friction-disks 6 6 for pressing against said disks one or the other of the friction-disks 13^a 13^b of the wheels 13. Each of said wheels 13 is provided with means for sliding it on its shaft 10, consisting of a flanged hub 13^c at the lower end of said wheel, with which there is engaged a ring 18, connected by links 19 19 with the two arms of the forked shipping-lever 20, which is rigid with a rock-shaft 21. Said rock-shaft has at the rear end a beveled pinion 22, which meshes with a segment-rack 23, pivoted at its center on a fixed bearing and provided with a lever-arm 24 for rocking it to cause the segment to communicate rocking movement to the shaft 21 and operate the lever-arm 20 up and down for sliding the wheels 13 on the shafts 10 10. When said wheel 13 is at the position shown in Fig. 1, the smaller disk 13^a is in position to be forced into frictional engagement with the marginal flange or track 7 of the disk 6, the pressure of the driver's foot upon the pedal 14^a being the means by which frictional engagement may be made more or less severe and effective. This engagement between the friction-disk at its point of largest circumference and the smaller of the two wheels gives a higher speed to the shaft 10, and thereby to the axle of the vehicle for high speed of the latter. When lower speed is desired, the segment 23, being rocked by means of its lever-arm 24, will cause the wheel 13 to be depressed on the shaft 10, and when it has been so depressed far enough to carry the disk 13 entirely clear of the track 7, so that it may enter within said track, the pressure of the driver's foot upon the pedal 14^a will carry the larger disk 13^b of each wheel 13 into contact with the face of corresponding disk 6,

and the slower movement of rotation will be thereby communicated to the shafts 10 and to the vehicle-axles.

The advantage of the construction shown consists, in part at least, in the fact that the reduction of speed being effected by a change which amounts to diminishing the diameter of the driving-wheel is not dependent wholly upon such diminution, but is further caused by the increase in diameter of the driven wheel, so that the reduction of power communicated, which would occur if the change were made wholly by reducing the effective or working diameter of the driving-wheel operating against a driven wheel of the same diameter as before, is avoided and a more powerful action is obtained within certain limits—that is to say, until the point of frictional engagement between the disk 6 and the disk 13^b becomes so near the center of the former that the loss of power due to the difference of speed of the driving-disk at points separated by the amount of the width of the friction-face of the driven disk becomes considerable.

For reversing it is only necessary to continue the movement of the lever 24 in the same direction as it is moved for reducing the speed until the disk 13^b passes the center of the disk 6 and comes into position to be engaged at the opposite side thereof, and so to derive rotation in the opposite direction. Since it is never desired to operate at high speed in reverse direction, as for backing the vehicle, it is not material that this mode of adjustment can never bring the high-speed disk 13^a into engagement with the track 7 at the opposite side of the center.

A notched segment 25 and a suitable locking-dog 26 for engagement therewith, mounted alongside the lever 24, serve for holding the friction-disks at the position to which they may be adjusted for desired speed or direction of movement.

For transmitting the power from the rear shaft 10 to the rear axle said shaft has at the lower end, below its universal joint 11, a beveled gear 27, which meshes with a beveled gear 28 on the forward end of a longitudinal shaft 29, suitably journaled in one of the cross-bars 4 of the frame and also in a gear-housing 30, which is mounted on the rear axle, inclosing a worm-gear 31, fast on said axle, which meshes with a worm 32, fast on the shaft 29 and engaged with the housing between the bearings of the shaft therein. Said shaft 29 has between its front and rear bearings two universal joints 11 of familiar construction (represented in Fig. 4) to accommodate the springing and torsion of the vehicle-frame and prevent the shaft from being bound in its bearings thereby. The housing 30 is stayed against rotation about the rear axle 5 by stay-rods 33 33, extending from separated points on the periphery of the housing to a bracket 34, secured rigidly to the frame-bars. For communicating power to the forward axle the forward shaft 10 has below its universal joint 11 a worm 32, which is fast on said shaft between the bearings of the latter in the housing 30^a, mounted loosely on the forward axle and inclosing the worm-gear 31 thereon, with which the worm 32 meshes for driving the axle. I have shown at the lower end of the bearing of the forward shaft 10 in the gear-housing an oil-cup 35. The housing 30^a is stayed in the same manner as the housing 30 by similar stay-rods 33 33, extending to the same bracket 34.

I claim—

1. In a motor-vehicle, in combination with the front and rear axles, a motor mounted upon the vehicle-frame intermediate the vertical planes of said axles, comprising a longitudinal main shaft; friction-disks on the opposite ends of said shaft; frictionally-driven trains of which said friction-disks respectively are the initial wheels; frames in which the secondary wheels of said trains are journaled, said frames being pivoted for carrying said secondary wheels toward and from the initial wheels respectively; connections between said pivoted frames for moving them simultaneously, and means at one end for operating said frames to carry said secondary wheels into and out of frictional engagement at will.

2. In a motor-vehicle, in combination with the front and rear axles, a motor mounted on the vehicle-frame intermediate the vertical planes of said axles, said motor having a longitudinal main shaft and friction-disks at opposite ends of said shaft, each of said disks having a laterally-projecting marginal flange; a shaft at each end of said main shaft extending transversely thereto; a friction-wheel mounted on each of said transversely-situated shafts for rotation therewith and sliding thereon; frames in which said transversely-situated shafts respectively are journaled, said frames being pivotally mounted on the vehicle-frame for carrying said shafts toward and from the friction-disks on the main shaft; a lever pivoted to one of said pivoted frames at the end remote from the pivot of the frame, and a rod connecting said lever with the other pivoted frame at the corresponding end thereof to adapt the lever to swing said pivoted frames together and apart for carrying the friction-wheels thereon toward and from the friction-disks on the main shaft respectively.

3. In a motor-vehicle, in combination with a longitudinal shaft and the motor by which it is rotated, friction-disks at the front and rear ends of said shaft, and trains operated thereby respectively for communicating power to the front and rear axles respectively; frames affording support for the driven friction-wheels in said trains respectively; means connecting said frames adapted to cause said frames to have like movement into and out of frictional

engagement with the respective friction-disks, and means for operating said connections at will.

4. In a motor-vehicle, in combination with the front and rear axles and a longitudinal shaft, friction-disks at opposite ends of said shaft; a motor and connections therefrom to said shaft between the friction-disks; trains comprising wheels driven by frictional engagement with said disks respectively, and driving connections therefrom to the axles respectively; frames in which said frictionally-driven wheels are mounted, movable to carry said wheels toward and from the friction-disks respectively on the longitudinal shaft; connections between said frames adapted to cause movement of either frame to communicate corresponding movement to the other, and means for giving one of the frames at will movement for carrying the disk thereon into and out of engagement with the driving-disk.

5. In a motor-vehicle, in combination with the front and rear axles, a longitudinal shaft; a motor and connections therefrom to said shaft between the ends; friction-disks on the opposite ends of said shaft; a shaft at each end of said longitudinal shaft extending transversely thereto; a friction-wheel mounted on each of said shafts for rotation therewith and sliding thereon; driven friction-disks on said shafts respectively in position for frictional engagement with the side of the respectively corresponding driving-disks on the longitudinal shaft; a rock-shaft parallel with said longitudinal shaft, and connections therefrom for sliding said driven disks on said transverse shafts respectively, and means for rocking the shaft at will to move the driven disks toward and from the center of the driving-disks for varying the speed communicated from the latter to the axles.

6. In a motor-vehicle, in combination with a motor-operated shaft, a friction-disk thereon having a laterally-projecting marginal flange; a wheel mounted for rotation with its axis at right angles to said motor-driven shaft, and means for adjusting it along its axis of rotation, such wheel having two friction-disks of different diameters, the difference in their radii being less than the projection of the marginal flange of the first-mentioned friction-disk, and means for pressing such wheel toward the friction-disk.

7. In a motor-vehicle, in combination with a driving-shaft, a driven shaft at right angles thereto, and connections therefrom for rotating the vehicle drive-wheels; a friction-disk on the driving-shaft having a laterally-projecting marginal flange; a friction-wheel on the driven shaft having two friction-disks differing in radius by less than the height of the flange on the driving-shaft disk, and means for adjusting the driven wheel along its shaft for bringing the smaller of said disks in position for frictional engagement with the flange of the driving-wheel disk, or its larger disk in position for engagement with the face of said driving-wheel disk; a pivoted frame in which the driven shaft is journaled, and means for rocking the frame to carry the driving-wheel toward and from the driving-shaft disk.

8. In a motor-vehicle, in combination with a driving-shaft for each axle, a friction driving-train for each axle, each train consisting of a friction-disk on the driving-shaft having a laterally-projecting marginal flange; a driven shaft at right angles to the driving-shaft; a wheel on the driven shaft having two disks differing in radius by an amount less than the height of such flange; a pivoted frame in which such shaft is journaled; means for moving the driven wheel to carry its said disks into engagement respectively with the flange and with the side of the driving-disk, and means for rocking the frame to press the driven wheel against the driving-disk, the said adjusting means for the two trains being operatively connected, for simultaneous and equal operation.

9. In a motor-vehicle, in combination with a driving-shaft and a friction-train for each axle, each of said trains comprising a driving friction-disk on the driving-shaft having a laterally-projecting marginal flange; a driven wheel having two friction-disks differing in radius by an amount less than the height of said flange; means for adjusting the driven wheel to cause its larger and smaller disks to come into frictional engagement respectively with the flange and face of the driving-disk; means for pressing said driven wheel against said driving-disk; connections between the adjusting means for the two trains, and connections between the pressing means for the two trains, said connections being adapted to operate said adjusting means and said pressing means respectively for both trains, and means for actuating said connections at will.

10. In a motor-vehicle, in combination with a driving-shaft, a driving friction-disk thereon; a driven shaft and a driven wheel thereon having two friction-disks differing in radius, the driving-disk having a marginal flange whose height is less than said difference in radius; a shaft on which said driven wheel is mounted for rotation and sliding; a shipping-lever and connections therefrom to the wheel on said shaft for sliding it; a frame in which said driven shaft is journaled mounted for movement in direction to carry said shaft toward and from the driving-disk, and a pedal-lever for so moving said frame.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 15th day of March, 1904.

DE LONSON E. BARNARD.

In presence of—

FREDK. G. FISCHER,

J. S. ABBOTT.