F. M. OLSON.

DRIVING MECHANISM FOR MOTOR VEHICLES.

APPLICATION FILED JUNE 15, 1908.

960,688. Patented June 7, 1910.

3 SHEETS—SHEET 1.

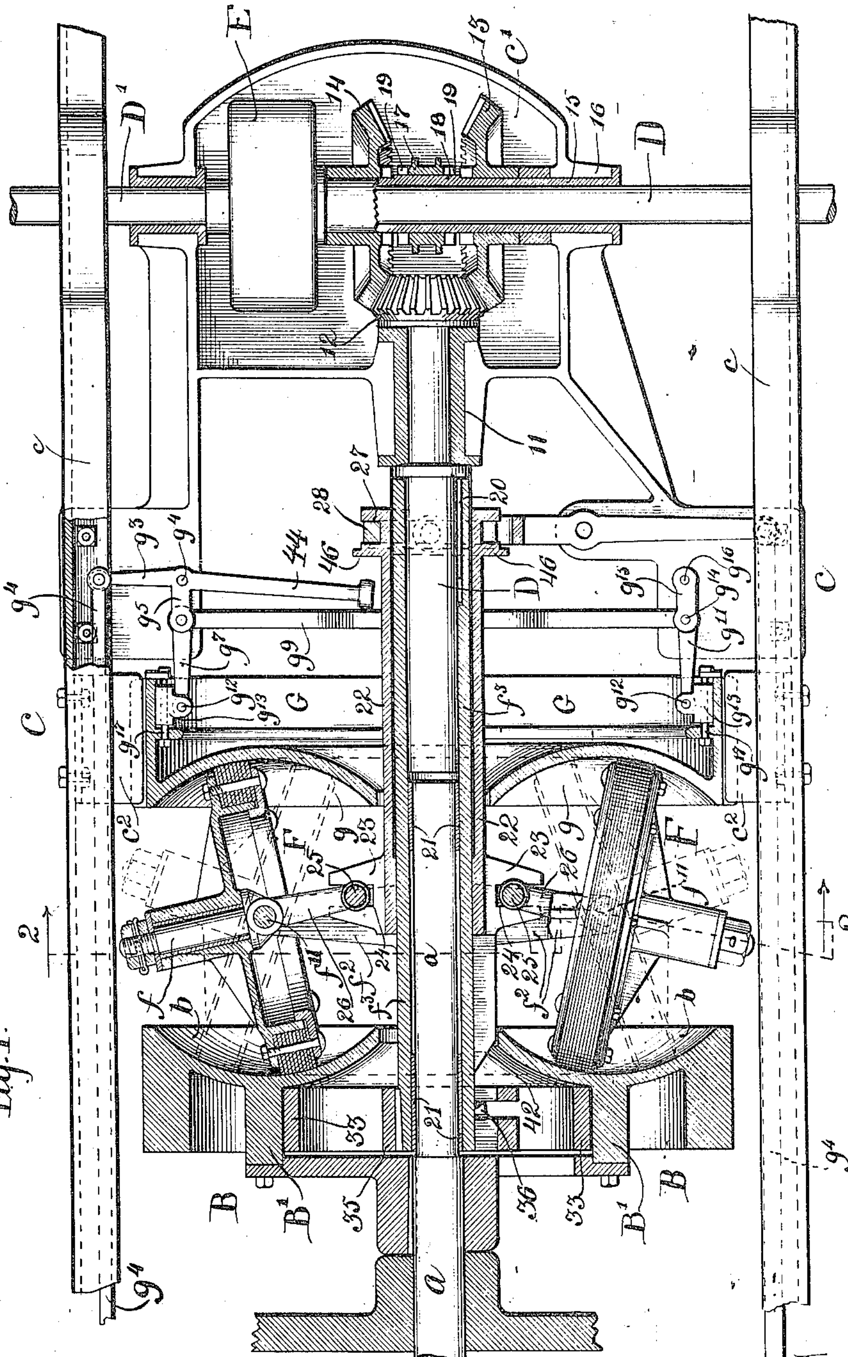

Fig. 1.

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Fig. 3.

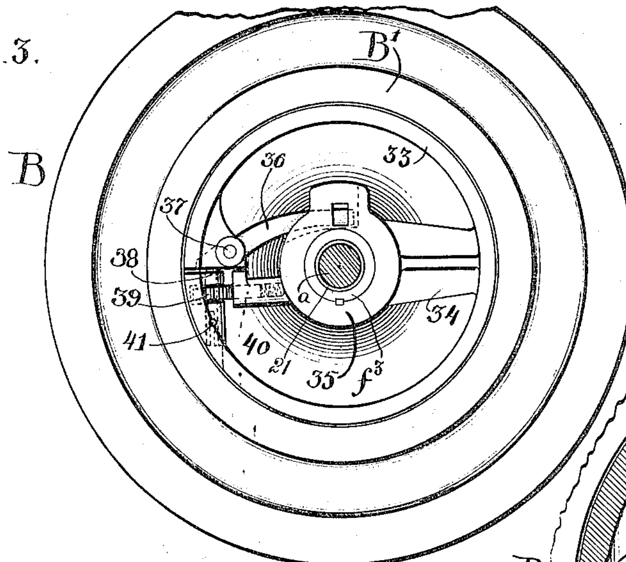


Fig. 4.

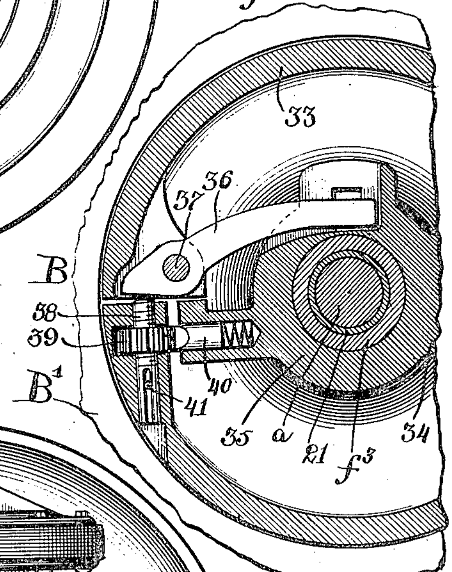
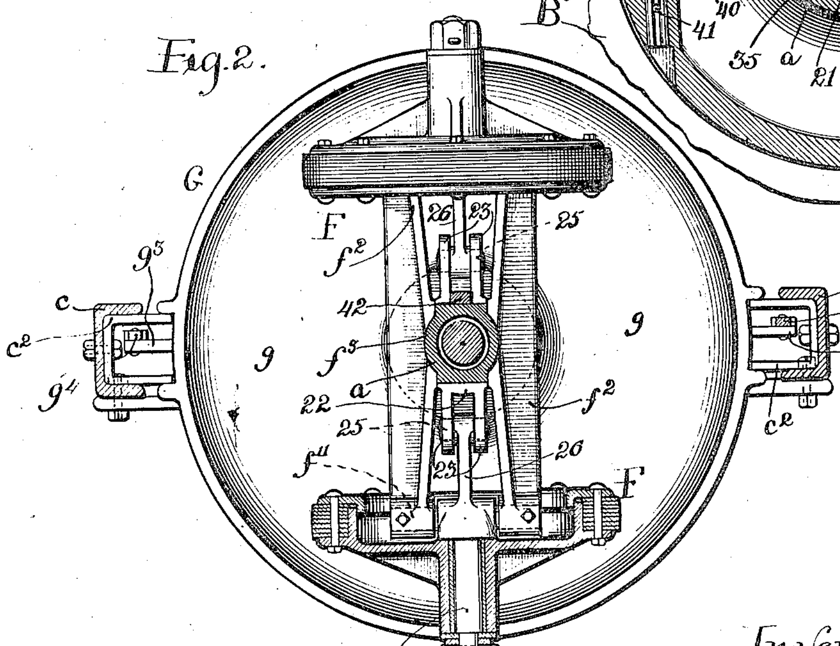


Fig. 2.



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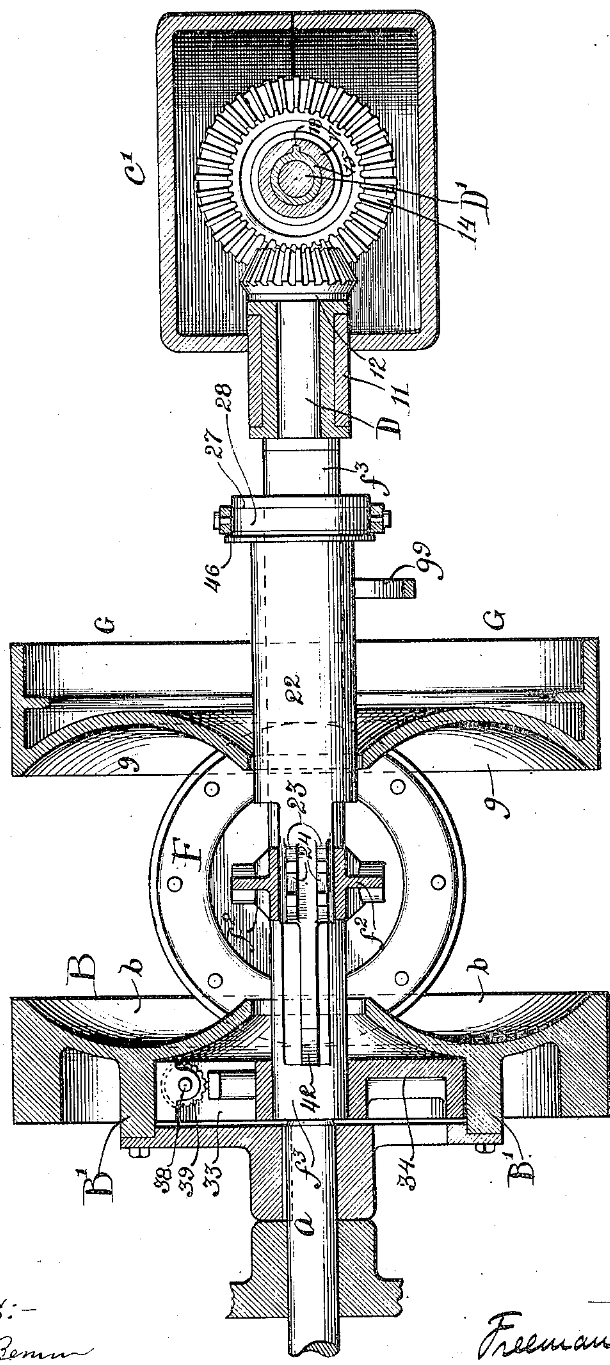

Fig. 5.

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UNITED STATES PATENT OFFICE.

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DRIVING MECHANISM FOR MOTOR-VEHICLES.

960,688. Specification of Letters Patent. Patented June 7, 1910.

Application filed June 15, 1908. Serial No. 438,482.

To all whom it may concern:

Be it known that I, FREEMAN M. OLSON, a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Driving Mechanism for Motor-Vehicles, of which the following is a full, clear, and exact description.

The invention relates to friction driving-mechanism, such as is susceptible of embodiment in motor-vehicles.

A desideratum in friction driving-mechanism is to avoid slippage between the friction-surfaces, and it is further desirable to avoid the loss of power incident to the pressure necessary to hold the surfaces in operative engagement. Heretofore gear-mechanism has been more generally adopted for motor-vehicles in which much power is required for propulsion, as in trucks and touring cars.

The invention designs to provide an improved friction driving-mechanism in which resultant slippage and loss of power is avoided, thus adapting it for efficient use in the heavier types of vehicles as well as in vehicles in which less power is used for propulsion.

The invention consists in the several novel features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings: Figure 1 is a horizontal section of a friction driving-mechanism for motor-vehicles embodying the invention. Fig. 2 is a vertical section on line 2—2 of Fig. 1. Fig. 3 is a detail of the fly-wheel and the clutch for directly operating the shaft for driving the vehicle therefrom. Fig. 4 is a detail of the clutch for directly connecting the driven shaft to the main drive shaft. Fig. 5 is a central vertical longitudinal section, the controller sleeve being shown in elevation.

An important feature of the invention consists in mechanism for operating one or more pulleys in a circular path and driving the vehicle as a result of the circular movement of the pulleys. In the embodiment of the invention illustrated, the friction driving-mechanism comprises two friction-surfaces between which are disposed, friction-pulleys which are mounted for circular movement and are operated in a circular path. Resultantly the pulleys may be firmly held between and caused to revolve by said surfaces, so that the power will not be derived as a direct result of the rotation of the pulleys but be dependent on the circular travel of the pulleys. In this manner the surface-speed of the pulley may be less than the circular speed of the driven part so that in effect leverage is obtained by means of the pulley for driving the driven element or mechanism. Furthermore, the pulley is held in firm engagement and rolling-contact with the friction-surfaces and loss of power and slippage are effectively overcome.

A denotes the main drive or engine-shaft to which power may be applied by a motor (not shown) in any suitable manner. A main drive-wheel B is rigidly secured to the drive shaft A, being revoluble therewith and which may be formed to serve as a fly-wheel as well as a drive-wheel for the variable speed friction drive-mechanism. A supporting-frame C of any suitable construction may be provided, that shown being adapted for a motor-vehicle and comprising side-bars *c* and a gear-frame or case C′, secured to said side-bars. A shaft D exemplifies the driven element for driving a motor-vehicle and is mounted in a journal 11 mounted in the gear-case C′.

Drive-wheel B is provided with an annular concave friction-surface *b* with which friction-pulleys F are adapted to engage. An oppositely disposed concentric stationary disk G is also provided with an annular concave friction-surface *g*. Friction-pulleys F are disposed between the friction surfaces *b* and *g* so that the peripheries of said pulleys will be in engagement with the oppositely disposed friction-surfaces when the mechanism is operated. Resultantly, the friction-pulleys may be firmly held in operative relation with respect to the driving-surface *b* to maintain rolling-contact with both of the oppositely disposed friction-surfaces and when the drive-wheel is operated the pulleys will be rotated between the oppositely disposed friction-surfaces to travel in a circular path.

Pulleys F are each journaled on a stud *f* which is mounted for circular movement in arms f^2 of a hollow shaft or sleeve f^3, which is operatively connected to the driven shaft D by a key 20. The inner end of said sleeve is journaled on an extension a of the drive-shaft A, Bushings 21 being interposed between said extension and the sleeve.

As a result of the mechanism described, the drive wheel B will cause the pulleys F to travel in a circular path, said pulleys being held between the friction surfaces b and g and in rolling contact with both of them. The friction-pulleys being confined between the oppositely disposed friction-surfaces are maintained in rolling contact therewith and therebetween so that slippage and loss of power are avoided. The circular movement being less than the surface-speed of the peripheries of the pulleys provides a construction by which a heavy load may be driven by the hollow shaft f^3 which is operated by the circular movement of the pulleys.

In some instances it is desirable to provide means for rendering the driven-mechanism inoperative while the drive-wheel B remains operative. For this purpose the friction-disk G is slidably mounted on brackets c^2 secured to the side-bars c of the supporting-frame so that it may be shifted longitudinally out of engagement with the friction-pulleys. When the disk G is withdrawn from engagement with the friction-pulleys F the latter will be free to revolve about studs f without effecting circular movement of the pulleys and so that the latter will not be firmly held in engagement with the driving-face b of the drive-wheel B. A lever g^3 is connected to control the longitudinal disposition of disk G and to cause it to be held in assigned position for the operation of pulleys F for circular movement thereof. Lever g^3 is pivoted to the frame at g^4 and provided with an arm g^5 which is connected to a link g^7 and by a bar g^9 to a corresponding link g^{11} at the opposite side of the disk. Links g^7 and g^{11} are pivotally connected at g^{12} to adjustable brackets g^{13} secured to the disk. The pivot g^{14} between bar g^9 and link g^{11} is also connected to a link g^{15} which is pivoted to the frame at g^{16}. Lever g^3 may be connected to a suitable controlling-lever (not shown) by a bar g^4. Resultantly, when lever g^3 is operated, arm g^5 will be correspondingly operated to shift links g^7 and g^{11} to shift the slidable disk G longitudinally into or out of operative position. Brackets g^{13} are adjustably connected to the disk by screws g^{17} so that the disk may be adjusted to be held in engagement with the pulleys F.

In motor-vehicles it is also necessary to vary the speed of the driven shaft f^3 and for this purpose the friction-pulleys F are adjustable between the oppositely disposed friction-surfaces to engage the driving-surface b at different radii so that different surface-speeds of the friction-pulleys will result, the circular movement being variable with the surface-speed of the peripheries of the pulleys. In the embodiment of the invention illustrated, the studs f constituting the journals for the friction-pulleys F are pivotally mounted on a cross-pin f^{11} which is secured in the arms f^2 on the driven shaft f^3 so that the pulleys may be shifted to engage the friction-surface b at one side at different radii and at the other side to engage the stationary friction-surface at different radii, thus providing a construction by which the surface-speed and the circular movement of the friction-pulleys may be varied without variation of the speed of the drive-wheel B. The friction-pulleys, in rolling-contact with the driving and the stationary friction-surface b and g at opposite sides respectively, are thus caused to travel in circular paths at different speeds, determined by the radius of the points of engagement of the pulleys with the driving-surface b and the radius of the engaging points of the friction pulleys and the friction-surfaces b and g respectively, *e. g.*, if the friction-pulleys are in position indicated by dotted lines in Fig. 1, the pulleys will be in engagement with the driving-surface b at a greater radius than when they are in the position indicated in full lines and the opposite portions of the pulleys will engage the stationary surface g at a relatively shorter radius, so that the surface-speed of the periphery of the pulley will be greater and the circular path of the pulleys at the points where they engage the friction-surface g will be less so that the circular movement will be greater both as the result of the greater radius of the points of engagement between the pulleys and the driving-surface b and the relatively shorter path of rolling contact between the pulleys and the stationary surface g. Resultantly, the pivotally supported friction-pulleys may be angularly varied between the friction-surfaces to vary the surface-speed of the peripheries of the pulleys, the circular travel of the pulleys, and the speed of the driven shaft f^3. The axes of cross-pins f^{11} tre cenarally disposed so they will intersect the center of the peripheries of the pulleys respectively.

The mechanism for shifting the adjustable friction-pulleys and for controlling their angular disposition between the friction-surfaces comprises, a sleeve 22 provided with forked extensions 23 which are provided with slots 24 wherein are held studs 25 secured to the ends of arms 26 formed integrally with the journal studs f for the friction-pulleys respectively. Longitudinal movement of the sleeve 22 will conjointly effect equal angular displacement of the friction-pulleys so that the friction-surfaces b and g will properly engage the friction-pulleys in their different angular adjustments. Said surfaces are each of annular concave formation. Sleeve 22 is longitudinally movable on shaft f^3 and rotates therewith. At one end said sleeve is provided with an annular groove 27 for a collar 28 of a suitable connection (not shown) whereby the longitudinal movement of the sleeve may be controlled from any desired part of the vehicle. If desired, the shaft f^3 to which the pulley carrying-arms are secured may have a slight play with respect to shaft D so that when the friction-faces b—g are brought together to operate the friction-pulleys F, the pulley-pivots will be free to travel in a circular path and be relieved of longitudinal pressure by reason of any tendency of the friction-disk G to force the pulleys into engagement with the surface b.

When the pulleys are angularly adjusted to drive the mechanism or vehicle at the maximum speed, the speed of the driven shaft f^3 may be so near that of the drive-shaft A that it may be directly driven from the drive-shaft A or drive-wheel B and by driving the shaft f^3 without the use of the pulleys, wear and use of the frictional drive-mechanism will be avoided. For this purpose, a friction-clutch is interposed between the hollow shaft f^3 and the drive-wheel B, whereby they may be directly connected and shaft f^3 driven directly from shaft A. This clutch comprises a resilient shoe 33 secured to an arm 34 having a hub 35 which is keyed to the hollow shaft f^3. The ends of the shoe 33 are slightly yielding so that they may be spread by a lever 36 which is pivoted at 37 at one of the ends of the shoe and is adapted to engage an adjustable screw or abutment 38 suitably mounted in the other end of the shoe, a nut 39 being provided for adjusting said screw. A spring-pressed pin 40 serves to secure the nut 39 in assigned position and against rotation. Screw 38 is secured against rotation by a pin 41 which extends through a slot in the bolt so that the latter will be adjusted longitudinally when the nut 39 is rotated. Lever 36 is extended into position to be engaged and shifted by a cam 42 on the sleeve 22 which controls the position of and adjusts friction-pulleys F. This cam 42 is disposed to engage the inner end of lever 36 when the pulleys are adjusted into position to drive the vehicle at substantially maximum speed, so that the lever 36 will be operated about its pivot 37 to spread the shoe 33 into frictional contact with a rim B′ on the drive-wheel B. Resultantly, when the controller-sleeve 22 is adjusted to cause the mechanism or vehicle to be driven at approximately maximum speed, it will automatically operate the clutch to drive the shaft f^3 directly from the drive-wheel B.

In order to operate the throw-off for the friction-pulleys F when the clutch is rendered operative, lever g^3 is provided with an arm 44 which will be engaged by a flange 46 on the controller-sleeve to cause lever g^3 to be shifted to withdraw the disk G from engagement with the friction-pulleys so that the pulleys F will not be operated to travel cycloidally, being operated by the clutch, thus avoiding frictional wear and the necessity of driving the mechanism or vehicle by the friction-pulleys.

A driving-axle D′ for the traction-wheels of a motor-vehicle is suitably connected to the frame and is divided for differentially driving the traction-wheel at one side of the vehicle with respect to that at the other; a differential driving-mechanism E of any suitable construction being interposed between the sections of the driving-axle, as well understood in the art.

The mechanism for driving the axle from the shaft D which is driven by the variable speed friction driving-mechanism, comprises a bevel pinion 12 secured to one end of said shaft, which meshes at opposite sides with a pair of beveled gear-wheels 13 and 14 respectively. Said gear-wheels are adapted to drive the axle D in opposite directions. A sleeve 15 is journaled in a bearing 16 of the gear-case C′ and is operatively connected to the differential gear E, as well understood in the art. Gear-wheels 13 and 14 are journaled on said sleeve and a clutch-collar 17 is slidably mounted on the sleeve and operatively connected thereto by a key 18. This collar is provided at each of its ends with clutch-teeth 19 for engaging corresponding teeth on the gear-wheels 13 and 14 respectively. By shifting the clutch-collar 17 into engagement with gear-wheel 13 the sleeve 15 and the axle will be driven in one direction and when shifted into engagement with the gear-wheel 14 said parts will be driven in opposite directions. It will be understood that suitable controlling-means will be provided for the clutch-collar 17. When the collar is in neutral position the axle will be inoperative by the driving-mechanism. This gear-mechanism and clutch-collar serve as means for controlling and reversing the direction of travel of the vehicle.

The operation of the improved mechanism will be as follows: Assuming the parts to be in position illustrated in Fig. 1, the clutch-collar 17 to be shifted into engagement with one of the gear-wheels 13—14, and shaft A to be driven, revolution of the drive-wheel B will cause the friction-pulleys F to be rotated about their journals f. The pulleys being also in engagement with the stationary disk G will roll around the face of said disk and resultantly the pulleys will travel in a circular path and cause the journals f and arm f^2 to rotate the hollow shaft f^3 which will impart movement to gear-wheels 12, 13 and 14, to drive the differential gear E.

To increase the speed of the driven shaft D sleeve 22 will be shifted longitudinally and inwardly to rock pulley-journals f about their respective pivots to bring the peripheries of the pulleys into position to engage the drive-wheel B at a greater radius and the stationary disk G at a shorter radius. Resultantly, the surface-speed of the peripheries of the pulleys and the circular movement of the pulleys will be increased to drive the shaft f^3 at a higher speed. Reverse shift of the sleeve 22 will cause said shaft to be driven at a slower speed.

When the vehicle is to driven at the maximum speed, sleeve 22 will be shifted inwardly to bring cam 42 into position to operate lever 36 so that shaft f^3 will be driven directly from the drive-wheel B and flange 46 of said sleeve will shift lever-arm 44 inwardly to withdraw the disk G from engagement with the friction-pulleys. Shaft f^3, drive-wheel B and the pulleys will then rotate together.

When it is desired to render the shaft D inoperative by the circular movement of the pulleys, lever g^3 will be shifted to withdraw disk G from engagement with the pulleys F so that they will be free to revolve about their journals f without being operated in a circular path.

To reverse the direction of travel of the vehicle clutch-collar 17 will be shifted to operatively connect the sleeve 15 with one of the gear-wheels 13, 14, in direction to cause the vehicle to be driven in reverse direction.

The invention thus provides a variable speed friction drive mechanism in which slippage between the friction-surfaces is effectively overcome and in which loss of power is avoided. Any desired number of friction-pulleys F may be provided to insure balancing of the mechanism and friction-surfaces sufficient in number to positively impart movement to the driven element.

The invention is not to be understood as restricted to the details illustrated and described since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

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

1. In friction driving-mechanism, the combination of a wheel having a friction-surface, a friction-pulley operatively connected to be rotated by said surface and mounted for cycloidal movement, means for causing the pulley to be operated in a circular path when it is rotated by said friction-surface, and means for rendering the pulley inoperative for circular movement.

2. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having friction-surfaces, a friction-pulley mounted between said surfaces for circular movement, a driven element operated by the circular movement of said pulley, and means for shifting one of said surfaces to render the pulley inoperative for circular movement.

3. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having concave friction surfaces, a friction-pulley mounted between said surfaces for circular movement, means for angularly adjusting said pulley to engage said surfaces at relatively different radii, and means for shifting one of said surfaces to render the pulley inoperative for circular movement.

4. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having friction-surfaces, a friction pulley mounted between said surfaces for circular movement, an element driven by the circular movement of the pulley, one of said oppositely disposed elements being longitudinally movable into and out of engagement with said pulley, and means for shifting the latter element to control the operation of the driven element by the pulley.

5. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having friction-surfaces, a pulley mounted between said surfaces for circular movement, one of said elements being slidably mounted, means for adjusting the pulley to engage said surfaces at different radii, and means for shifting said longitudinally movable element to control the operation of the driven element by said pulley.

6. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having friction-surfaces, a friction pulley between said surfaces for engaging them and mounted to travel in a circular path, means for adjusting the pulley to engage said surfaces at different radii, a shaft secured to one of said oppositely disposed elements and another shaft concentrically disposed with respect to said first shaft and operatively connected to said pulley.

7. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having friction-surfaces, a friction-pulley between said surfaces for engaging them and mounted to travel in a circular path, means for angularly adjusting the pulley, a shaft to which one of said elements is secured, a sleeve extending around said shaft and means connecting the pulley to said sleeve to rotate it when the pulley is operated in a circular path.

8. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having friction-surfaces, a friction-pulley between said surfaces for engaging them, a journal for revolubly sustaining the pulley, a pivotal support for said journal disposed in the pulley and mounted to be

rotated by the pulley, and means for angularly adjusting the journal to correspondingly adjust the pulley.

9. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having concave friction-surfaces, a friction-pulley between said elements and for engaging said surfaces, a journal for said pulley, a laterally extending pivotal support for said journal disposed within the pulley and means for angularly adjusting the support to correspondingly adjust the pulley.

10. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having concave friction-surfaces, a friction-pulley between said elements and for engaging said surfaces, a journal for revolubly sustaining said pulley, a laterally extending pivotal support for said journal disposed within the pulley and means for angularly adjusting the support to correspondingly adjust the pulley comprising an arm extending inwardly from said support and means for rocking said arm.

11. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having friction-surfaces, a friction-pulley between said surfaces and for engaging them, said pulley having an outwardly extending hub, a journal for said hub, a laterally extending support for said journal disposed in the pulley, said journal being pivotally sustained in said support, a driven element to which said support is connected and means for angularly adjusting the journal to correspondingly adjust the pulley.

12. In friction driving-mechanism, the combination of an element having a friction-surface, a pulley operatively connected thereto, one of said elements being driven, a shaft operatively connected to be driven by the other of said elements, a clutch for driving said shaft from said driven element, means for adjusting the pulley to vary the speed of said shaft, and means for rendering said clutch operative to drive said shaft when the friction-pulley is adjusted to drive said shaft at high speed.

13. In friction driving-mechanism, the combination of an element having a friction-surface, and a pulley operatively connected thereto, one of said elements being driven, a shaft operatively connected to be driven by the other of said elements, a clutch for driving said shaft from said driven element, means for adjusting the pulley to vary the speed of said shaft, and means for automatically rendering said clutch operative to drive said shaft when the friction-pulley is adjusted to drive said shaft at high speed.

14. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having friction-surfaces one of which is driven, a friction-pulley between said surfaces mounted for circular movement, a shaft operated by the circular movement of said pulley, a clutch for driving said shaft from said driven surface, means for adjusting the pulley to vary its circular speed, and means for rendering said clutch operative to drive said shaft.

15. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having friction-surfaces one of which is driven, a friction-pulley between said surfaces mounted for circular movement, a shaft operated by the circular movement of said pulley, a clutch for driving said shaft from said driven surface, means for adjusting the pulley to vary its circular speed, and means operated by the adjusting-means for rendering said clutch operative to drive said shaft.

16. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having friction-surfaces, one of which is driven and the other of which is stationary, a friction-pulley between said surfaces and mounted for circular movement, a shaft operated by the circular movement of said pulley, a clutch for driving said shaft from said driven surface, means for adjusting the pulley to vary the speed of said shaft, and means for rendering the clutch operative to drive said shaft.

17. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having friction-surfaces, one of which is driven and the other of which is stationary, a friction-pulley between said surfaces and mounted for circular movement, a shaft operated by the circular movement of said pulley, a clutch for driving said shaft from said driven surface, means for adjusting the pulley to vary the speed of said shaft, and means operated by the adjusting-means for rendering the clutch operative to drive said shaft when the friction-pulley is adjusted to drive said shaft at high speed.

18. In friction driving-mechanism, the combination of a wheel having a friction-surface and a pulley operatively connected thereto, one of said elements being driven, a shaft operatively connected to be driven by the other of said elements, a clutch for driving said shaft from said driven element, means for adjusting the pulley to vary the speed of said shaft, means for rendering said clutch operative to drive said shaft, and means for rendering the pulley inoperative for circular movement when the clutch is rendered operative to drive said shaft.

19. In friction driving-mechanism, the combination of a pair of oppositely disposed elements having friction-surfaces one of which is driven and the other of which is stationary, a friction-pulley between said surfaces and mounted for cycloidal movement, a shaft operated by the circular move-

ment of said pulley, a clutch for driving said shaft from said driven element, and means for adjusting the pulley to vary the speed of said shaft, means for rendering the clutch operative to drive said shaft, and means for shifting one of said surfaces to render said shaft inoperative by said pulley when the clutch is rendered operative.

20. In friction driving mechanism, the combination of an element having a friction-surface, a pulley operatively connected thereto, a drive-shaft for said element, an element driven by said pulley, a clutch driven by the drive-shaft and for driving the element driven by the pulley, means for adjusting the pulley to vary the speed of the element driven thereby, and means for rendering said clutch operative to drive the pulley driven-element.

21. In friction driving mechanism, the combination of an element having a friction-surface, a pulley operatively connected thereto, a drive-shaft for said element, an element driven by said pulley, a clutch driven by the drive-shaft and for driving the element driven by the pulley, means for adjusting the pulley to vary the speed of the element driven thereby, and means for rendering the clutch operative, and the pulley inoperative to drive said pulley-driven element.

22. In friction driving mechanism, the combination of an element having a friction surface, a pulley operatively connected thereto, a drive-shaft for said element, an element driven by said pulley, a clutch driven by the drive-shaft and for driving the pulley-driven element, means for adjusting the pulley to vary the speed of the element driven thereby, and means for automatically rendering the clutch operative to drive the pulley-driven element when the pulley is adjusted for driving at high speed.

23. In friction driving mechanism, the combination of an element having a friction-surface, a pulley operatively connected thereto, a shaft for driving said element, an element driven by said pulley, a clutch driven by said drive-shaft and for driving the pulley-driven element, means for adjusting the pulley to vary the speed of the element driven thereby, means for automatically rendering the clutch operative to drive the pulley-driven element when the pulley is adjusted for driving at high speed and means for rendering the pulley inoperative to drive said pulley-driven element when the clutch is rendered operative.

24. In friction driving mechanism, the combination of a wheel having a friction-surface, a pulley operatively connected thereto, a drive-shaft on which said wheel is mounted, a shaft driven by the pulley, a clutch for driving said driven-shaft, means for adjusting the pulley to vary the speed of the driven shaft, and means independent of the pulley for rendering said clutch operative to drive the driven shaft.

25. In friction driving mechanism, the combination of oppositely disposed elements having friction-surfaces, one of said elements being stationary, a shaft for driving the other element, a pulley mounted between said friction-surfaces, and for engaging them, a shaft driven by the pulley, means for adjusting the pulley to vary the speed of said driven shaft, a clutch for driving the said driven-shaft, and means for rendering the clutch operative and the pulley inoperative to drive said pulley driven element when the pulley is adjusted for driving at high speed.

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