No. 736,459. PATENTED AUG. 18, 1903.

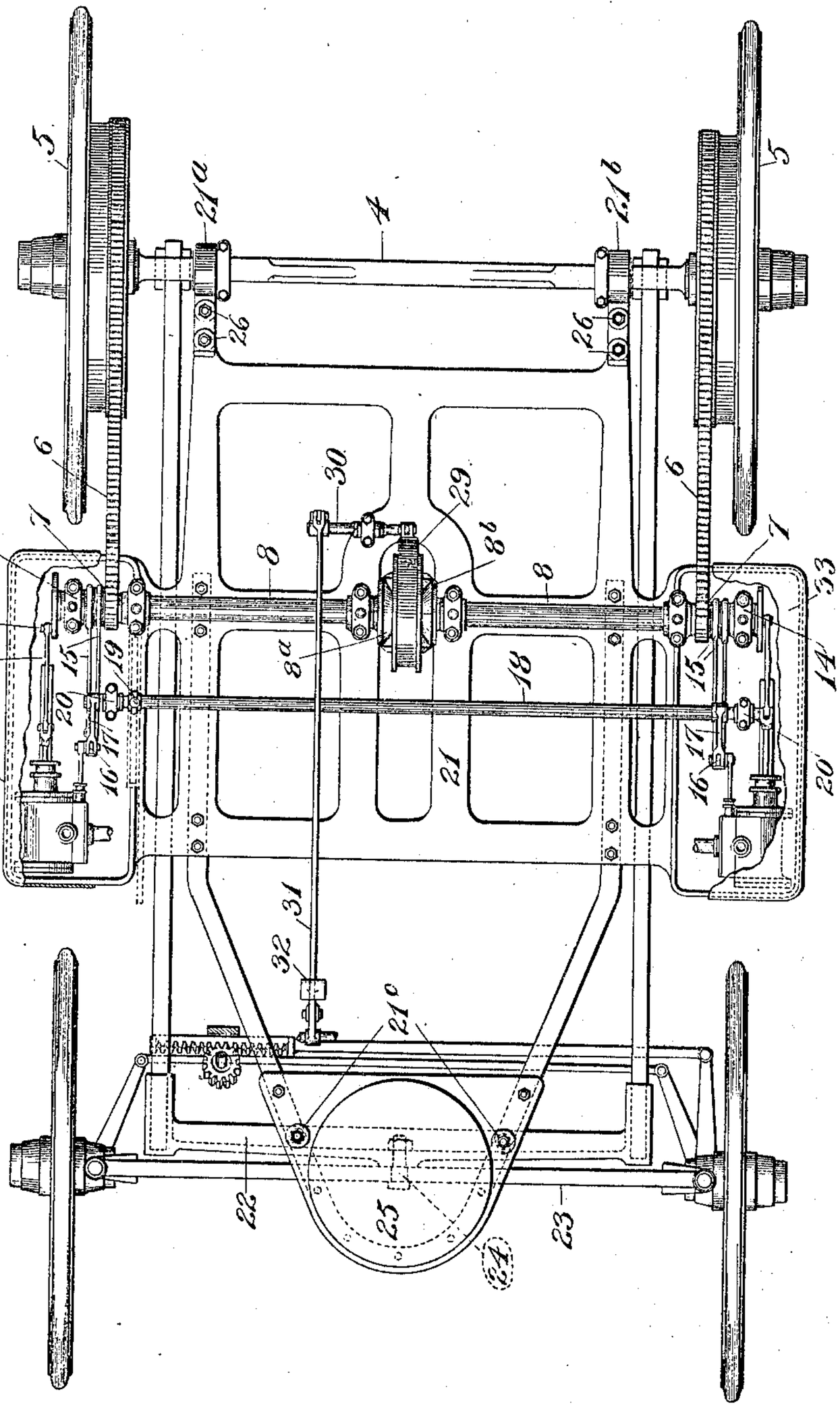
# P. SYNNESTVEDT.

## VEHICLE DRIVING MECHANISM.

APPLICATION FILED DEC. 23, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

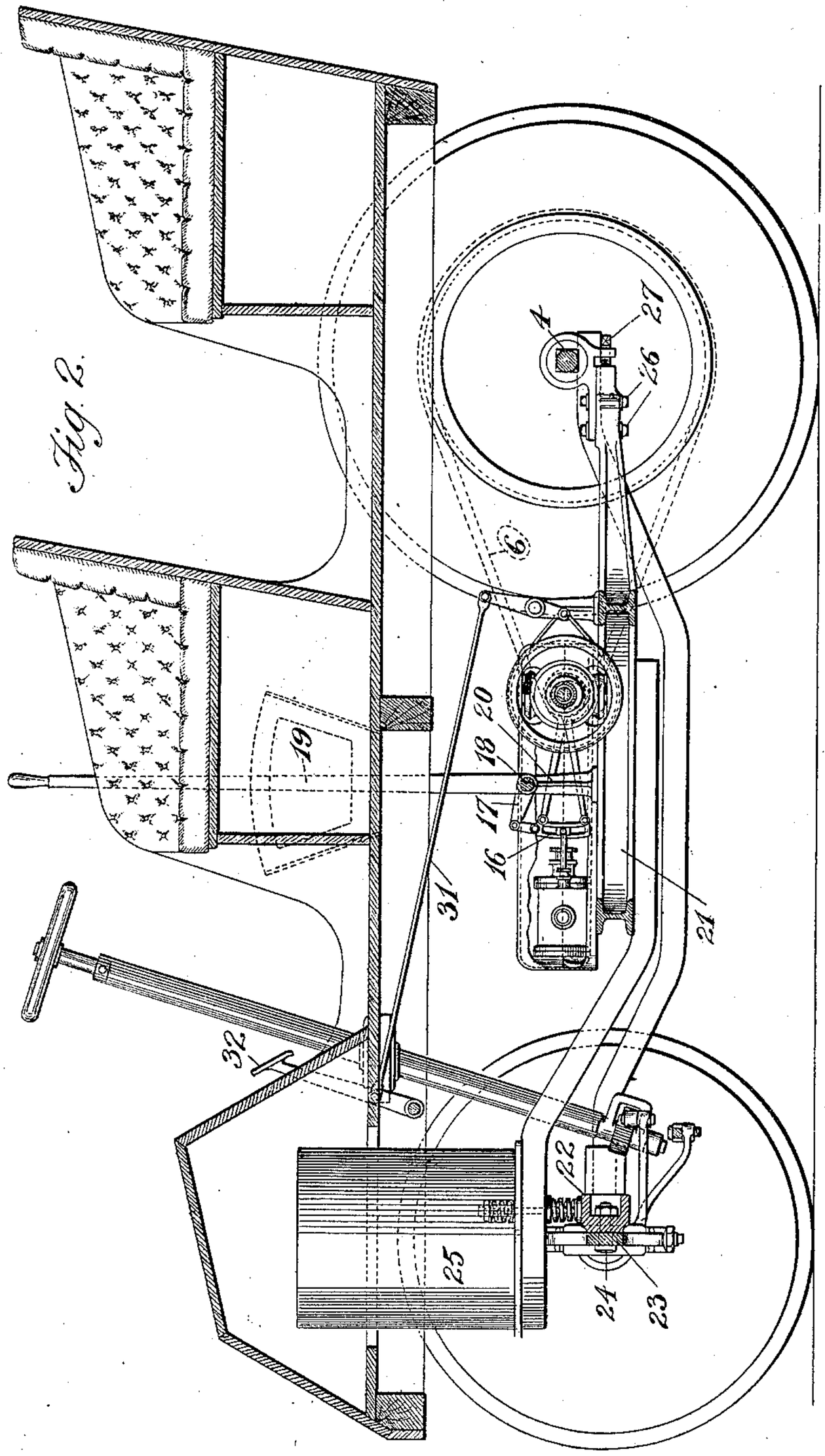
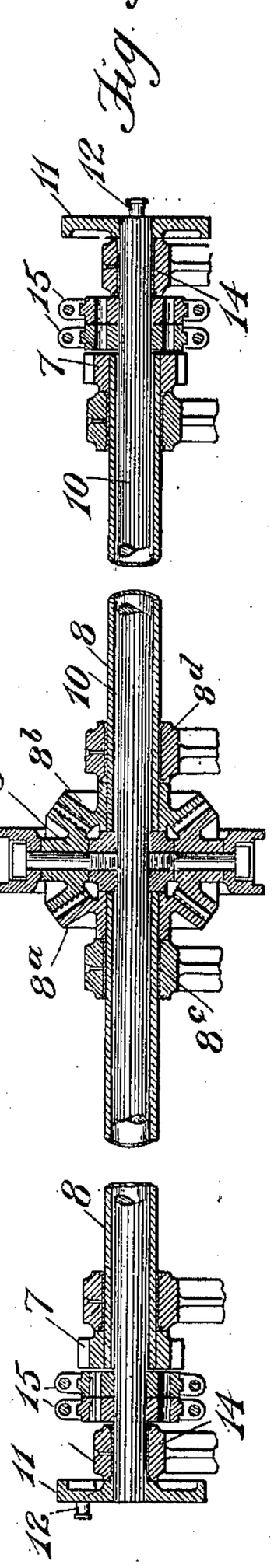



Fig. 3.

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No. 736,459. Patented August 18, 1903.

# UNITED STATES PATENT OFFICE.

PAUL SYNNESTVEDT, OF GLENVIEW, ILLINOIS.

## VEHICLE-DRIVING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 736,459, dated August 18, 1903.

Application filed December 23, 1901. Serial No. 86,948. (No model.)

*To all whom it may concern:*

Be it known that I, PAUL SYNNESTVEDT, a citizen of the United States, and a resident of Glenview, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Vehicle-Driving Mechanism, (Case No. 5,) of which the following, taken in connection with the accompanying drawings, is a specification.

This improvement has reference to the provision of novel means for transmitting power from a driving-shaft to a pair of driving-wheels mounted upon a non-rotatable axle (the power being preferably steam or other like motive force) acting upon a compound driving-shaft through the central rod thereof, all of which will be more apparent from an examination of the accompanying drawings, in which—

Figure 1 shows in plan view a vehicle having my improved driving mechanism applied thereto. Fig. 2 is a vertical section thereof, and Fig. 3 is a sectional view showing the arrangement of the parts of the driving-shaft.

Referring now more particularly to Fig. 1, it will be seen that I provide a non-rotatable axle 4 for carrying a couple of rotatable driving-wheels 5, adapted to be driven by a flexible driving connection 6 (preferably a chain) from sprockets 7, each of which is carried upon the outer end of a sleeve 8, (see Fig. 3,) the sleeve being driven by beveled gears of a differential, (marked $8^a$ and $8^b$, respectively,) which receive motion through the central member of the differential 9, which is keyed to the central rod 10, which passes through the sleeves 8 and at each end has fastened to it by keys or other suitable devices a crank-disk 11, with the crank-pins 12 of which the pitmen 13 of the engines engage. The rod 10 is supported next the crank-disk at each end by bearings 14, and within the bearings there are attached to the rod the eccentrics 15, which, together with the link-motion devices 16, form the usual controlling and reversing mechanism for a steam-engine gear.

The links are provided with connections to a rocker-arm 17, carried on a rocker-shaft 18, which is operated by the hand-lever 19 in controlling the operation of the motor. The shaft 18 is carried in brackets 20, supported upon a frame 21, which also supports the motor and the bearings of the motor driving-shaft, the said frame 21 being supported pivotally about the axle at points $21^a$ and $21^b$, as shown, and spring-supported at the other end from the vehicle-frame 22, to which the forward axle 23 is pivotally connected at 24. The frame 21 is arranged at its forward end also to carry the boiler 25, so that there need be no flexible connections between the boiler and the engine-cylinders, and the boiler is given the benefit of the spring-support at the forward end of the frame 21.

In order to afford a convenient means for regulating the tension on the driving-chains 6, I provide slidable connections in the supporting-arms, which are carried at $21^a$ and $21^b$, respectively, which slidable connections comprise, in combination, besides the two slidable parts of the arms the locking-bolts 26 and the adjusting-screws 27, the operation whereof will be apparent from an examination of Fig. 2 of the drawings.

It will be observed that the arrangement of the steam-engine and gears which I employ is substantially that of an ordinary locomotive, the crank-pins being, as usual, set at an angle of ninety degrees relative to each other and both being carried upon a common shaft—namely, the inner rod 10 of the double driving-shaft. The rod 10 being securely fastened to the central member of the differential gear, as stated, therefore drives both sides of the differential gear through said central member 9 and by means of the sleeves 8 imparts driving movement to the pinions 7, at the same time permitting the compensating action of the differential gear in turning corners, which is so important in this class of mechanism. Upon the outside of the central member of the differential gear 9 I provide a brake-band wheel 28, operated by the brake-band 29 through the rocker-shaft 30 and the rod connection 31 and foot-lever 32.

In the arrangement which I have hereinabove described, and shown in the accompanying drawings, in which I place the cylinders of the motor at a considerable distance apart and project the same outside of the plane of the wheels, I have provided the cylinders and moving parts of the motor at the sides of the vehicle with a projecting guard-frame and coverings 33. These can be made

readily removable, thus exposing the motor for inspection or repair in a very accessible manner on account of the location thereof in such a convenient place. The boiler being mounted as shown not only, as stated, gets the benefit of the spring-support of the forward end of the motor-frame and can be attached by pipes to the engine without any flexible joints intervening, but can also be provided with a steam-gage and water-glass and other attachments, all visible from the driving-seat without the use of mirrors, such as are commonly employed.

In order to secure perfect alinement of the several parts of the driving-shaft, the motor or driving frame 21 is constructed with bearings for said driving-shaft, both for the sleeve portions thereof and the inner rod, there being shown on the drawings two bearings for the sleeve portions at each side of the differential gear (marked, respectively, $8^c$ and $8^d$) and one for each end of the inner rod, to which I have already referred, as shown by the reference-numeral 14. All of these several bearings being formed integral with or fast to the main driving-frame, which also carries the engine, the rocker-shaft which controls the link-motion of the engine, and the boiler, I have thus secured a steam driving-gear which is, as it were, self-contained and at the same time mounted so as to drive, by the flexible connections 6 upon the driving-wheels, directly instead of through the rear axle and which is capable of movement as a whole when it is desired to adjust or regulate the tension of the said flexible driving connections 6, and this without disarranging the relative disposition of any of the several parts of the driving mechanism or throwing anything out of alinement.

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

1. A vehicle-driving mechanism comprising two driving-pinions, separate sleeves for driving said pinions, each of said sleeves driven by one side of the differential gear, a central member for said differential gear, a driving-rod within said sleeve for driving said central member of the differential gear, and a motor at each end of said central rod for driving the same, substantially as described.

2. A vehicle-driving mechanism comprising a non-rotatable axle, rotatable driving-wheels mounted upon said axle, driving connections for said wheels, pinions for driving said driving connections, sleeves for driving said pinions, a differential gear, a rod within said sleeves, constructed to transmit movement to said sleeves through said differential gear, and means for driving said rod, substantially as described.

3. In a driving mechanism for vehicles, the combination with a driving-rod, of sleeves mounted thereon, pinions driven by said sleeves, a differential gear for transmitting the movement of said driving-rod to said sleeves, a crank upon each end of said driving-rod, and a motor-piston connected to each of said cranks, substantially as described.

4. A vehicle-driving mechanism comprising a motor-frame, a fixed or non-rotatable axle, a pair of rotatable driving-wheels, said motor-frame being pivotally supported upon said non-rotatable axle at one end, and spring-supported from the vehicle-frame at the other end, a motor carried by said motor-frame, a power-generator for said motor also carried by said motor-frame, a driving-shaft for said motor, and driving connections between said driving-shaft and said driving-wheels, substantially as described.

5. In a vehicle-driving mechanism the combination of a driving-frame, a driving-shaft comprising an inner rod, and sleeves mounted about said rod, bearings for said sleeves carried by said frame, and bearings for said inner rod also carried by said frame, substantially as described.

6. In a vehicle-driving mechanism the combination of a driving-frame, a driving-shaft comprising an inner rod, and sleeves mounted about said rod, bearings for said sleeves carried by said frame, and bearings for said inner rod also carried by said frame, the bearings for said rod being beyond the ends of the sleeves, and a motor-driving connection for said rod upon the end thereof, substantially as described.

7. In a vehicle-driving mechanism the combination of a driving-frame, a driving-shaft comprising an inner rod, and sleeves mounted about said rod, bearings for said sleeves carried by said frame, and bearings for said inner rod also carried by said frame, the bearings for said rod being beyond the ends of the sleeves, and motor-driving connections for said rod outside said rod-bearings, substantially as described.

8. A vehicle-driving mechanism comprising a driving-shaft, composed of an inner rod and two sleeves surrounding said rod, driving connections between said inner rod and said sleeves, and a motor mounted at each end of said inner rod, and constructed to impart driving movement thereto, substantially as described.

9. A vehicle-driving mechanism comprising a driving-shaft, composed of an inner rod and two sleeves surrounding said rod, driving connections between said inner rod and said sleeves, and a motor mounted at each end of said inner rod, and constructed to impart driving movement thereto, a pair of rotatable driving-wheels, a non-rotatable axle, and a driving connection between each of said wheels and one of said sleeves, substantially as described.

10. A vehicle-driving mechanism comprising a driving-shaft, composed of an inner rod and two sleeves surrounding said rod, driving connections between said inner rod and said sleeves, and a motor mounted at each

end of said inner rod, and constructed to impart driving movement thereto, a pair of rotatable driving-wheels, a non-rotatable axle, and a flexible driving connection between each of said wheels and one of said sleeves, and adjusting means for regulating the tension of said flexible driving connection, substantially as described.

11. In vehicle-driving mechanism, in combination with a fixed axle and two driving-wheels thereon, a shaft with differential gear and two pinions having flexible connection with said wheels, two fluid-pressure motors geared to said shaft outside the pinions, and a fluid-pressure-supply vessel, said vessel and all the driving mechanism being fixed on a rigid motor-frame and said frame being pivoted to said fixed axle and spring-supported at its other end upon the frame of the vehicle.

12. In vehicle-driving mechanism, the combination with a vehicle-frame and a fixed axle having two driving-wheels thereon, of a motor-frame pivoted on the axle and spring-supported on the frame of the vehicle at its other end, a power-generator on the motor-frame, two motors on the frame geared to a shaft operating a differential gear, flexible driving connections between said gear and the wheels of the vehicle, the connections being attached inside the point of attachment of the said motors to said shaft, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

PAUL SYNNESTVEDT.

Witnesses:
PAUL CARPENTER,
H. W. SMALLEY.