DRIVING MECHANISM FOR MOTOR VEHICLES.

Fig. 2.

Fig. 3.

Witnesses:

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DRIVING MECHANISM FOR MOTOR VEHICLES.

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To all whom it may concern:

Be it known that I, GUSTAV MEES, engineer, 
as a subject of the Emperor of Germany, residing
5 at Wetzikon, Canton Zurich, in the Republic
of Switzerland, have invented certain new and useful Improvements in Driving
Mechanism for Motor-Vehicles, (of which I have made application in Switzerland June
7, 1898, under the application No. 18,604, and
in Germany June, 1898,) of which the following
is a specification.

Reference being had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the views, Figure 1 is a horizontal cross-sectional view of my improved driving mechanism. Fig. 2 is a vertical section on the plane C D of Fig. 1. Fig. 3 is a detail view of one of the brake-wheels and brake mechanism, being a section of Fig. 1 taken on line A B. Fig. 4 is an end view showing the reversing-levers. Fig. 5 is a side elevation showing the casing for the gearing. Fig. 6 is a detail view of the toothed segments of the reversing-levers. Figs. 7, 8, and 9 are diagrammatic views showing the different positions of the brake-levers.

This invention has for its object a gearing by means of which the power of a motor working with a constant number of revolutions in always the same direction of rotation is transmitted by an intermediate shaft in such a way that the latter may be operated in both directions of rotation and also driven at different speeds.

This I accomplish by means of three separate sets of gearings arranged on a common intermediate shaft W, Fig. 1, which are operated from the motor-shaft M by means of bevel-gear K K', and the driving of two of the gearings takes place by means of the wheel K' traveling to the right (forward travel) and that of the third gearing from the wheel K rotating to the left (backward travel.) In order to obtain an engagement of the separate gearings free from shock, they are arranged on the planet-wheel system—that is to say, a suitable number of so-called "planet-wheels" P P P, Figs. 1 and 2, in the present instance three,) are in constant engagement on the one hand with a central internal wheel J J J and on the other hand with an outer ring or wheel Z Z Z, having internal teeth. When one gearing is running without driving the vehicle, the planet-wheels P P P are carried planet-fashion around the inner wheel J J J by the ring of internal teeth Z Z Z and carry with them a brake-wheel S S S on which they are mounted by means of bolts b b b (Fig. 1.) If, however, the circeling of the planet-wheels be stopped by rendering the brake-wheel S S S stationary at any time, the brake-wheel Z Z Z is the driving-wheel. If the toothed ring Z Z is the driving-wheel, the transmission will take place from the larger diameter of the wheel to the smaller diameter of the internal wheel J J—(Figs. 1, 2, and 3)—that is to say, an increase of speed will be attained for rapid traveling, while, vice versa, the movement will be retarded or rendered slower if the smaller internal wheel be the driving one—that is to say, the transfer will then take place from the interior to the outside, for instance, for climbing hills.

The combination of the three gearings is such, as already hereinbefore described, that the gearings Z P J P J are operated by the bevel-wheel K, running to the right, and the gearings Z P J P J are operated by the bevel-wheel K', running to the left. If, accordingly, one of the two first-named gearings be thrown into action, the carriage will travel forward slowly or rapidly, according to the gearing engaged. On the other hand, the carriage will travel backward when the gearings Z P J P J are thrown into gear. If the brake B be applied for rapid traveling or high gear, the power is conveyed from the 95 bevel-wheel K' by means of the toothed ring Z, planet-wheels P, and internal wheel J directly to the intermediateshaft W. If, on the other hand, the gearing be thrown into action for hill-climbing (low gear,) the transmission of power will take place from the wheel K', through the arms and the hub of a wheel T, on which K' is mounted, to the internal wheel J J, keyed on the said wheel, and thus to the
planet-wheels $P^3$, which then drive the toothed ring $Z'$, which is mounted on a wheel $C$, keyed on the intermediate shaft, which thus receives the power. Similarly on the gear being thrown into action for the rearward movement the power passes from the bevel-wheel $K^2$ through a wheel $F$, on which same is mounted, to the internal wheel $J^3$, keyed on the hub of said wheel $F$, and thence to the planet-wheels $P^3$ and toothed ring $Z'$, mounted on a wheel $E$, keyed on the shaft, which thus receives the power.

The brakes, Figs. 1, 3, 4, and 5, necessary for throwing the gear into action are operated by two levers $V^R$, arranged at the side of the carriage-frame, which are keyed on two shafts $v$ and $r$, mounted concentrically one within the other in eyes or bearings $a$. The front lever $V$, mounted on the lever-shaft $v$, controls the brakes $B^2$ and $B^2'$ for the two forward gearings by means of levers $v^2$ and $v^2'$, keyed firmly on said shaft, while the reversing-lever $R$, lying behind it, controls the two brakes $B^2$ and $B^2'$ arranged on a single brake-wheel $S^3$ by means of the hollow shaft $r$ and levers $r^2$ and $r^2'$.

In Figs. 7, 8, and 9 the positions of the levers are shown diagrammatically. If both levers stand in a middle position, none of the four brakes are applied, and all three gearings consequently run without driving the vehicle. If the lever $V$ for the forward gearings be moved to the right, the brake $B^2$ is put on and the gearing for rapid travel is set in action.

In that case also the forward gearing for the slow traveling is first placed out of action and immediately afterward the brake $B^2$ for the backward gearing is put on. The power of the motor is transferred from the shaft $W$, which is driven by one of the three planet-wheel gearings, by a differential gearing, Figs. 1 and 2, to the shafts $w$ and $w'$, on the ends of which chain-wheels $p'$ and $p''$ are keyed to allow of the carriage-wheels being directly driven therewith. The shaft $w$ is mounted in the hollow shaft $W$ of the planet-wheel gearing and for the purpose of a better guidance projects a little into the shaft $w'$, which is also a hollow one and which forms a continuation of the shaft $W$. The differential gear consists of the differential wheels $D^1$ and $D^2$, which are in engagement with one another and are carried along by a capsule-shaped disk $N^3$, keyed on the shaft $W$ by means of bolts $c^3$. The disk $N^3$ serves for incasing the whole gear.

The mode of working of the differential gear is as follows: If the resistance of both carriage-wheels is equal, which is the case when traveling in a straight line, the two wheels $D^1$ and $D^2$, and therewith also the corresponding shafts $w$ and $w'$, are simultaneously operated by the intermediate wheels $d'$ and $d''$, which are stationary on the connecting bolts $c^3$. If, however, the vehicle be moved in sharp curves or turns, the resistance of the inner wheel of the car, which is describing a smaller arc, is greater than that of the outer wheel, which travels over a longer course. The disturbance of the equilibrium of the forces thereby produced in the differential wheels $D^1$ and $D^2$.
D'dD'd is again automatically re-established by the differential wheel D' in consequence of the rotation of the intermediate wheels D'dD'd on the connecting-bolts lagging to an extent equal to what the wheel D'D travels in advance, or vice versa, according as the greatest resistance arises on the wheels D' or D'. Thus the carriage-wheel traveling in a smaller arc is operated more slowly than the outer wheel which is traveling in a larger arc in accordance with the difference of length of the two curves. If both wheels were driven at an equal speed, the inner wheel, in order to equalize this difference, would slip on the ground, so that the steering would be rendered difficult if not impossible.

In case it be not desired to utilize the backward travel and to limit the movement to both speeds for forward traveling, the bevel-wheel R, wheel F, and backward-travel gearing (consisting of Z', J', I', and E') may be omitted. In this case, in order to render it possible to stop the vehicle immediately in spite of the omission of the backward-traveling gear by gripping the reversing (or in this case only brake) lever, the brake-wheel S' is firmly connected with the shaft W or with the capsule of the differential gear, on which wheel S' the two brakes B2 and B1, acting in opposite directions, are mounted.

The difference between the gear containing the mechanisms for backward travel and the gearing without the same consists in that in the former case the back-travel gear is set in action, in case the brake-disk S' is held fast long enough, by means of one of the brakes, while in the latter case the carriage is only stopped when the brake-wheels are held fast still longer.

In any case in both arrangements the vehicle may be immediately brought to a standstill by a single grip or gripping movement with the reversing or brake lever.

I declare that what I claim is—

1. In a driving mechanism, a driving-shaft comprising two hollow shafts and an internal shaft, and means for transmitting power from one of the outer shafts to the internal shaft and to the second hollow shaft, substantially as described.

2. The combination with a motor-shaft, of a driving-shaft comprising concentrically-arranged shafting, means for transmitting the power from the motor-shaft to the outer one of the concentric shafts and from the latter to the inner one, each of said concentric shafts adapted to transmit power to independent mechanisms and means for varying the speed of said shafts, for the purpose set forth.

3. In a driving mechanism, a driving-shaft comprising two hollow shafts and an internal shaft, means for transmitting power from the outer shaft to the inner shaft and to the second hollow shaft, and mechanism for reversing the direction of rotation of all the shafts, substantially as described.

4. In a driving mechanism, a driving-shaft comprising two hollow shafts and an internal shaft, means for communicating motion from one of the outer shafts to the other and to the internal shaft and for automatically producing differential motion between the inner shaft and one of the outer shafts substantially as and for the purpose set forth.

5. In a driving mechanism, a hollow driven shaft, a second hollow shaft in alignment therewith, a shaft inside said hollow shaft and means for driving and automatically varying the speed of the internal shaft and second hollow shaft, substantially as and for the purpose set forth.

6. In a driving mechanism, a hollow driven shaft, a shaft inside thereof, and a second hollow shaft, bevel-pinion carried by the hollow shaft and bevel-gears on the inner shaft and second hollow shaft meshing with the bevel-pinion, substantially as described.

7. In a driving mechanism, a hollow driven shaft, a shaft inside thereof and a second hollow shaft in alignment with both of said shafts, a casing secured to one of the hollow shafts, bevel-pinion carried by the casing, bevel-gears meshing with said pinions and carried by the second hollow shaft and internal shaft, substantially as and for the purpose set forth.

8. A driving mechanism comprising a gear-shaft, a shaft, three brake-wheels loose on said shaft carrying planet-wheels, whereby motion is communicated to said shaft through intermediate gears, band-lever-controlled band-brakes for each of said brake-wheels, two of said brakes controlled by a single lever, a second lever controlling the third brake-wheel, and means for coupling the levers, to simultaneously control all the brakes, substantially as set forth.

9. In a driving mechanism, a brake-control comprising a shaft operating two band-brakes, a shorter concentric shaft operating two band-brakes on the same wheel, levers adapted to turn each shaft, a rack and pawl for one of said levers, a second rack carried by the first lever adapted to cooperate with a pawl on the second lever whereby both levers may be locked together and simultaneously operated, substantially as set forth.

10. A driving mechanism comprising a hollow shaft, an internal concentric shaft and a second hollow shaft, driven planet-wheel gearing communicating motion to one of said hollow shafts controlling brake mechanism for the planet-gearing, and means for driving and for automatically varying the speed of the second hollow shaft and internal shaft, substantially as and for the purpose set forth.

11. A driving mechanism comprising a hollow shaft, a second shaft concentric therewith, a driven internal gear loose on the hollow shaft, a gear fixed on said hollow shaft, a brake-wheel loose on said hollow shaft carrying planet-wheels, said planet-wheels meshing with the internal gear and the gear fixed
on the hollow shaft and means for communicating motion from the hollow shaft to the concentric shaft, substantially as set forth.

12. A driving mechanism comprising a shaft, a driven internal gear thereon, a gear-wheel fixed on said shaft, a brake-wheel loosely on said shaft carrying planet-wheels, said planet-wheels meshing with the internal gear and the gear-wheel on the shaft, and a second brake-wheel fixed on said shaft, substantially as set forth.

13. A driving mechanism consisting of a shaft, high-speed gearing comprising a driven internal gear loose on said shaft, a gear fixed to said shaft, and planet-wheels meshing with the internal gear and gear-wheel fixed to the shaft, and a low-speed gearing comprising a gear fixed to the nave of the internal gear, an internal gear fixed to said shaft, planet-wheels meshing with the last-mentioned internal gear and the wheel on the nave of the loose internal gear and means for placing the planet-wheels into and out of effective operation, substantially as set forth.

14. A driving mechanism, consisting of a shaft, high-speed gearing comprising an internal gear loose and a gear-wheel fixed on said shaft, planet-wheels meshing with both of said gears, a low-speed gearing comprising a gear fixed on the nave of the aforesaid internal gear, an internal gear fixed on the shaft, planet-wheels meshing with the last-mentioned internal gear and the gear on the nave of the first-mentioned gear, and means for simultaneously rendering one set of planet-wheels operative and the other inoperative, substantially as set forth.

15. A driving mechanism comprising a shaft, a driven internal gear loosely mounted thereon, means for communicating motion from the internal gear to the shaft through planet-wheels, a second wheel driven in an opposite direction, also loose on the shaft, a pinion carried on the nave of said wheel, and means for communicating motion from said pinion, through planet-wheels to the shaft, substantially as set forth.

16. A driving mechanism comprising a shaft, a driven internal gear loosely mounted thereon, means for communicating motion from the internal gear to the shaft through planet-wheels, a second wheel driven in an opposite direction, also loose on the shaft, a pinion carried on the nave of said wheel, means for communicating motion from said pinion through planet-wheels to the shaft, and means for simultaneously causing one set of planet-wheels to be put into and the other out of operation, substantially as set forth.

17. A driving mechanism consisting of a shaft, a driven internal gear, means for communicating the motion of said gear through planet-wheels to the shaft, a gear-wheel mounted on the nave of the internal gear and means for communicating motion from the latter, through a second set of planet-wheels and internal gear to the shaft, a driven wheel carrying a pinion on its nave, means for communicating through a third set of planet-wheels and internal gear the motion thereof to the shaft, and means for placing any set of planet-wheels into and out of operation.

18. In a driving mechanism in combination with a driven shaft and a driving-pinion, a bevel-gear driven thereby carrying an internal gear loose on said shaft, a brake-wheel loose on and a gear-wheel fixed on said shaft, planet-wheels carried by the brake-wheel and meshing with the internal gear and the gear-wheel fixed on the shaft, a gear-wheel mounted on the nave of the internal gear, a second internal gear mounted on the shaft, a second brake-wheel revoluble on the hub of the last-mentioned gear-wheel, planet-wheels carried by said second brake-wheel and meshing with the last-mentioned gear and second internal gear, a second bevel-gear opposite driven by the driving-pinion and carrying a pinion on its nave, a brake-wheel revoluble on the hub of said pinion, a third internal gear secured to the driven shaft, planet-wheels gear- ing with the pinion and third internal gear, and brakes adapted to be applied to any one of said brake-wheels, substantially as set forth.

19. A driving mechanism for motor-vehicles comprising the arrangement of bevel-gear K mounted on the motor-shaft M said gear engaging with a bevel-wheel K' mounted on a wheel T carrying a ring Z' provided with internal teeth, an inner wheel J being firmly mounted on the nave of said disk, in such a way that while on the one hand one or more planet-wheels mounted by means of bolts b on a brake-wheel S' loosely revoluble on the nave of the said inner wheel J to a second toothed ring Z which toward the axis of the bevel-gear K' is communicated from the other inner wheel J through one or more planet-wheels and the brake-wheel S' loosely revoluble on the nave of the said inner wheel J to a second toothed ring Z' having internal teeth and thereby to a wheel connected with the shaft W, substantially as hereinafore set forth.

20. A driving mechanism for motor-vehicles comprising the arrangement of bevel-gear K mounted on the motor-shaft M, to gear with a bevel-wheel K' fixed on a wheel T having a ring Z' provided with internal teeth, an inner wheel J being firmly on the nave of said disk in such a way that while on the one hand one or more planet-wheels mounted by means of bolts b on a brake-wheel S' loosely revoluble on a shaft W engage in the teeth of the toothed ring Z' which toward the axis of the bevel-gear K' is communicated from the other inner wheel J through one or more planet-wheels on the shaft W, on the other hand the movement of the bevel-wheel K' is communicated from the other inner wheel J to a second toothed ring Z having internal teeth and thereby to a wheel connected with the shaft W, substantially as hereinafore set forth.
one or more planet-wheels mounted by means of bolts \( b^3 \) on a second brake-wheel \( S^3 \) loosely revolvable on the nave of the said inner wheel \( J^3 \), to a second toothed ring \( Z^2 \) having internal teeth and thereby to a wheel \( C \) connected with the shaft \( W \), in combination with another bevel-wheel \( K^1 \) gearing with the first bevel-gear \( K \) and which is loosely mounted on the shaft \( W \) by means of a wheel \( F \) having a toothed wheel \( J^3 \) fixed on its nave, which toothed wheel by means of one or more planet-wheels fixed by bolts \( b^2 \) on a brake-wheel \( S^3 \) loosely revolvable on the nave of the said toothed wheel \( J^3 \) gears with an internally-toothed ring \( Z^2 \) being connected with the shaft \( W \) by means of a disk \( E \) substantially as hereinbefore described.

21. In a driving mechanism for motor-vehicles a controlling-lever \( V \) for the forward movement, the nave of which lever is mounted on a shaft \( v \) which is connected with two brake devices \( B^3 \) and \( B^2 \) for throwing into action one of two speeds, and a lever \( R \) the nave of which is mounted on a shaft \( r \) concentric to the other shaft \( v \), said lever being connected with two brake devices \( B^3 \) and \( B^2 \) mounted on a single brake-wheel \( S^3 \) which is loosely and revolubly mounted on the nave of the wheel \( J^3 \) which is provided with a gear for the backward travel of the motor-vehicle, in combination with a toothed segment or locking-piece \( l \) mounted on the car-frame, for the reversing-lever \( R \) and a similar piece \( l' \) mounted on a cross-arm \( q u \) of the reversing-lever \( R \) for locking the forward controlling-lever \( V \), whereby the latter may be shifted independently of the reversing-lever \( R \) while however on the reversing-lever \( R \) being shifted, the forward-movement lever \( V \) is carried with it to a suitable extent with the object of enabling the forward travel of the vehicle to be stopped by a single grip or pull on the lever \( R \), loosening the respective brake device \( B^3 \) or \( B^2 \) simultaneously acting the respective brake device \( B^3 \) or \( B^2 \) substantially as hereinbefore described.

22. In a driving mechanism for motor-vehicles a controlling-lever \( V \) for the forward movement, the nave of which lever is mounted on a shaft \( v \) which is connected with two brake devices \( B^3 \) and \( B^2 \) for throwing into action one of two speeds, and a reversing-lever \( R \) the nave of which is mounted on a shaft \( r \) concentric to the other shaft \( v \), said lever being connected with two brake devices \( B^3 \) and \( B^2 \) mounted on a single brake-wheel \( S^3 \) which is loosely and revolubly mounted on the nave of the wheel \( J^3 \) which is provided with a gear for the backward travel of the motor-vehicle, in combination with a toothed segment or locking-piece \( l \) mounted on the car-frame, for the reversing-lever \( R \) and a similar piece \( l' \) mounted on a cross-arm \( q u \) of the reversing-lever \( R \) for locking the forward controlling-lever \( V \), whereby the latter may be shifted independently of the reversing-lever \( R \) while however on the reversing-lever \( R \) being shifted, the forward-movement lever \( V \) is carried with it to a suitable extent with the object of enabling the forward travel of the vehicle to be stopped by a single grip or pull on the lever \( R \), loosening the respective brake device \( B^3 \) or \( B^2 \) simultaneously acting the respective reversing brake device \( B^3 \) or \( B^2 \) substantially as hereinbefore described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

GUSTAV MEES.

Witnesses:
Moritz Veith,
A. Lieberknecht.