No. 607,116. Patented July 12, 1898.

# E. HAYNES & E. APPERSON.

## MOTOR VEHICLE.

(Application filed July 19, 1897.)

(No Model.) 4 Sheets—Sheet 1.

Fig-1

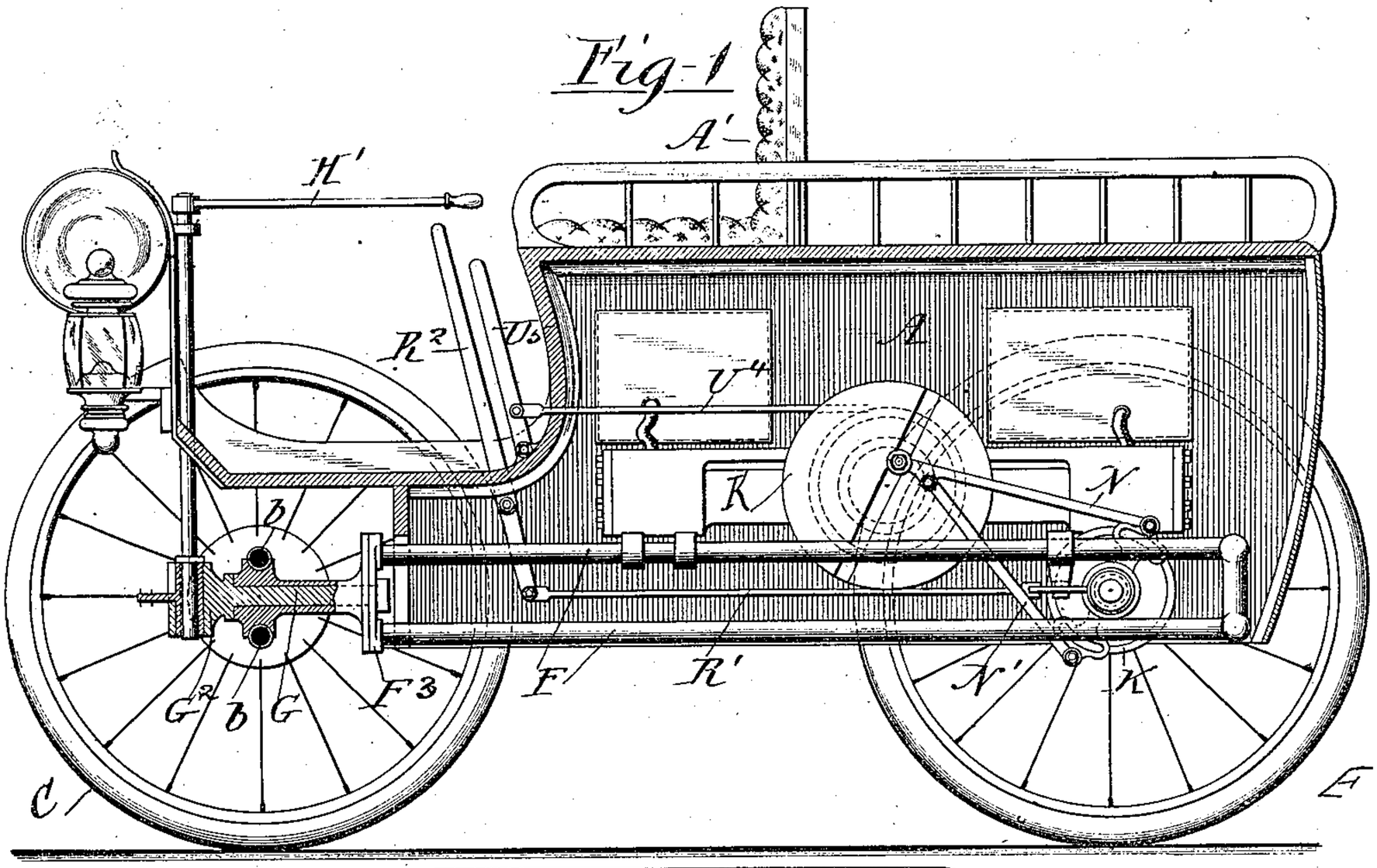
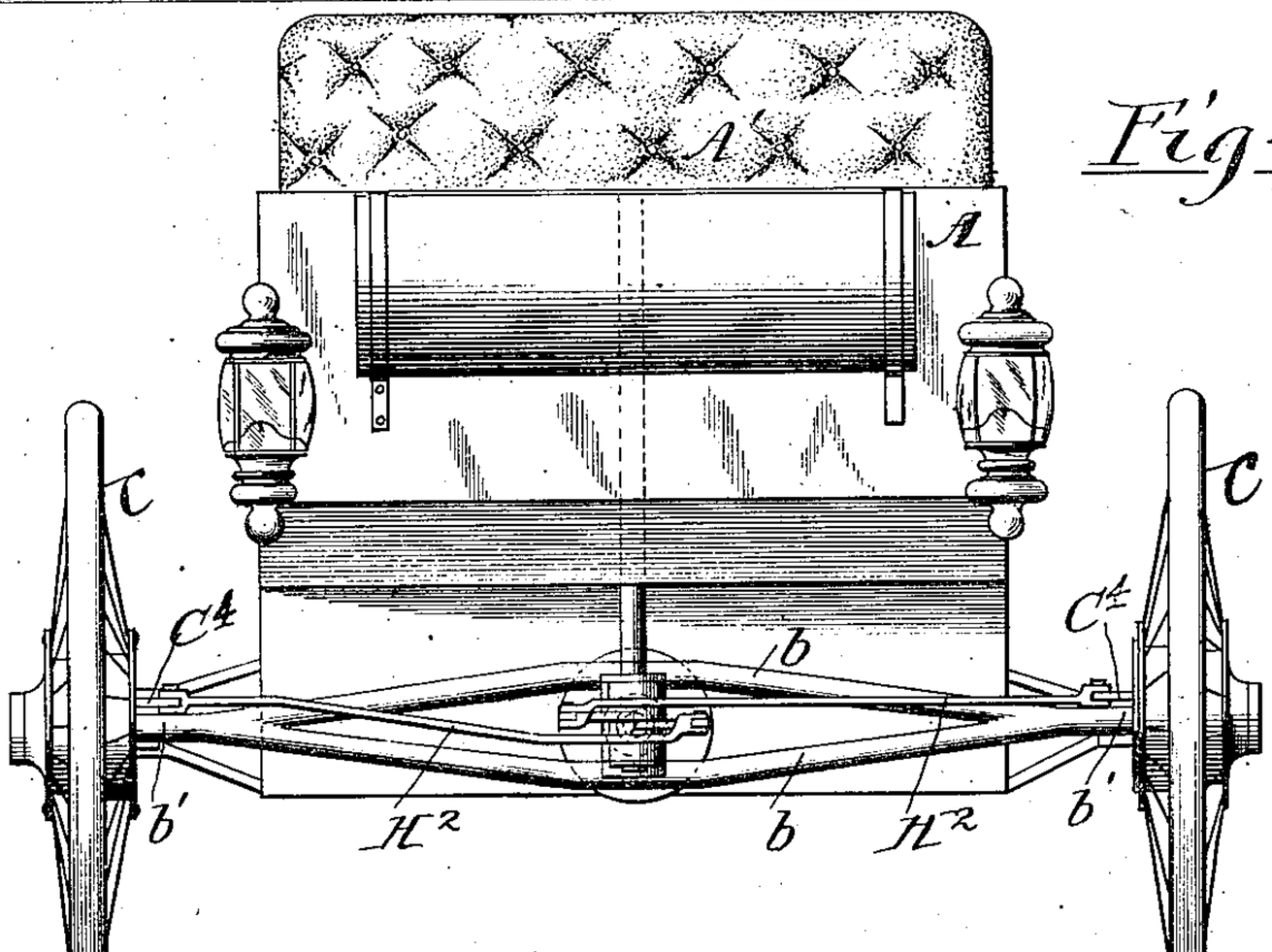



Fig-2.

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(No Model.) 4 Sheets—Sheet 2.

Fig-3.

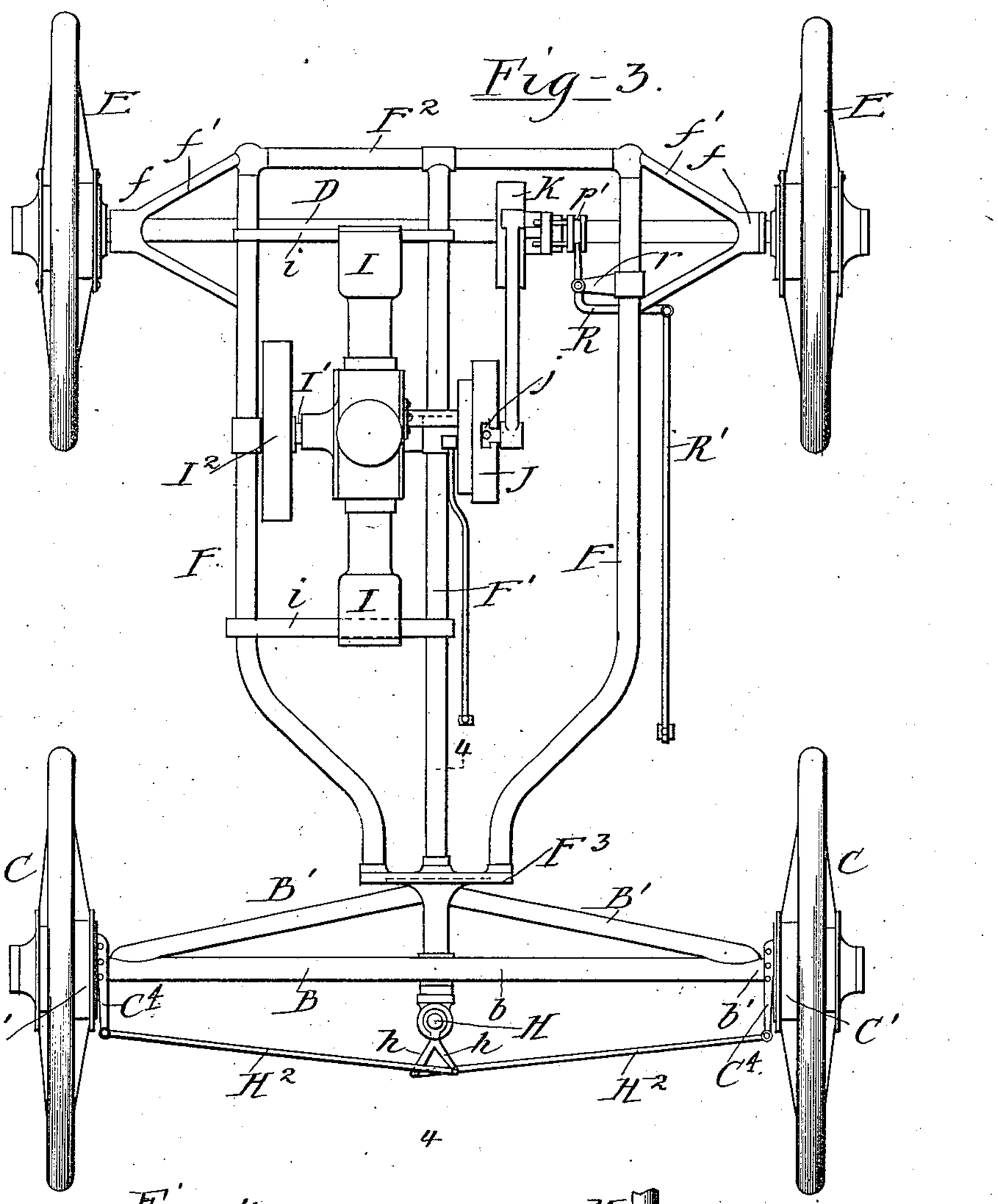


Fig-4

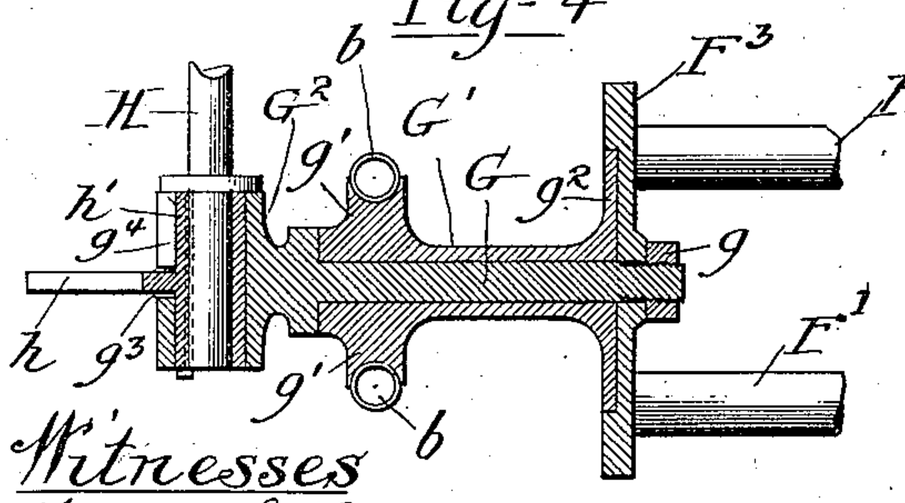


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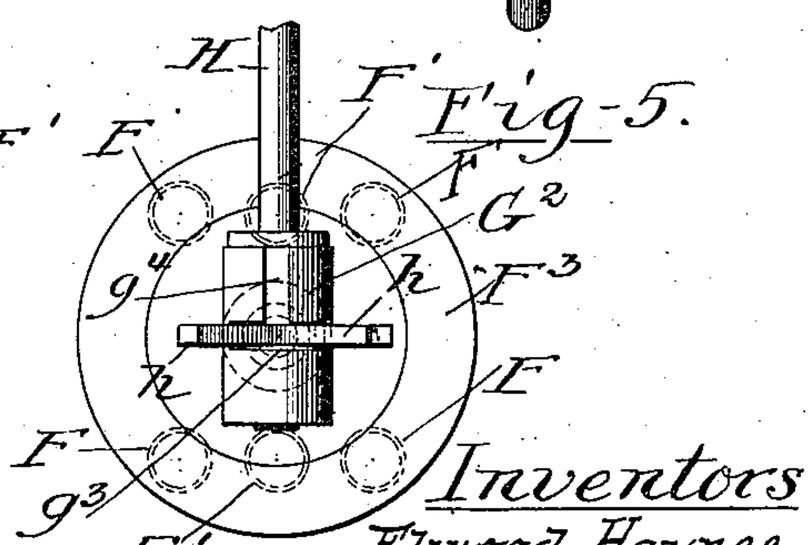
Fig-5.

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## MOTOR VEHICLE.

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(No Model.) 4 Sheets—Sheet 3.

Fig. 8.

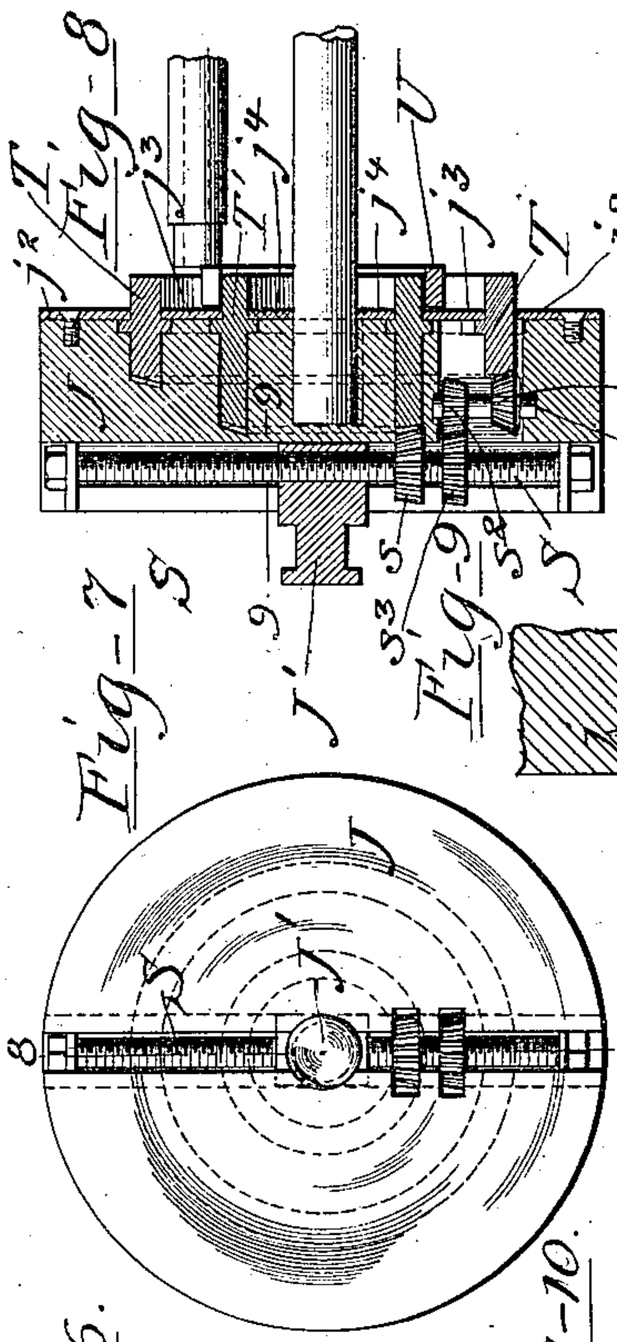



Fig. 7.

Fig. 9.

Fig. 11.

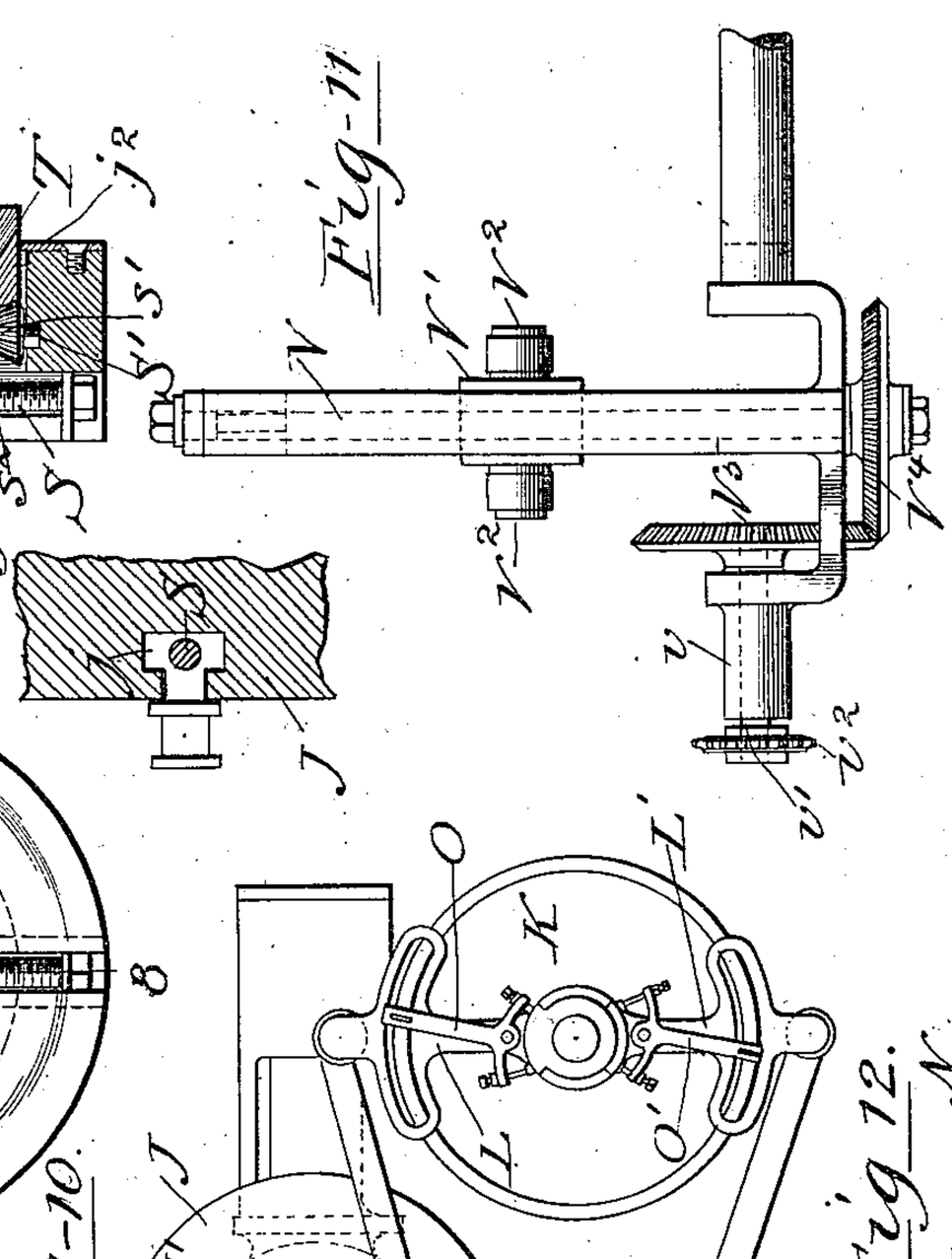
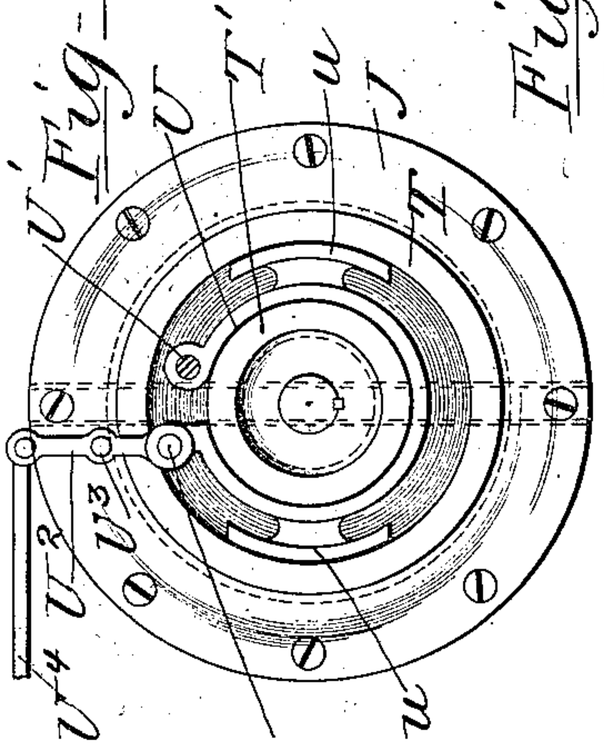



Fig. 10.




Fig. 6.



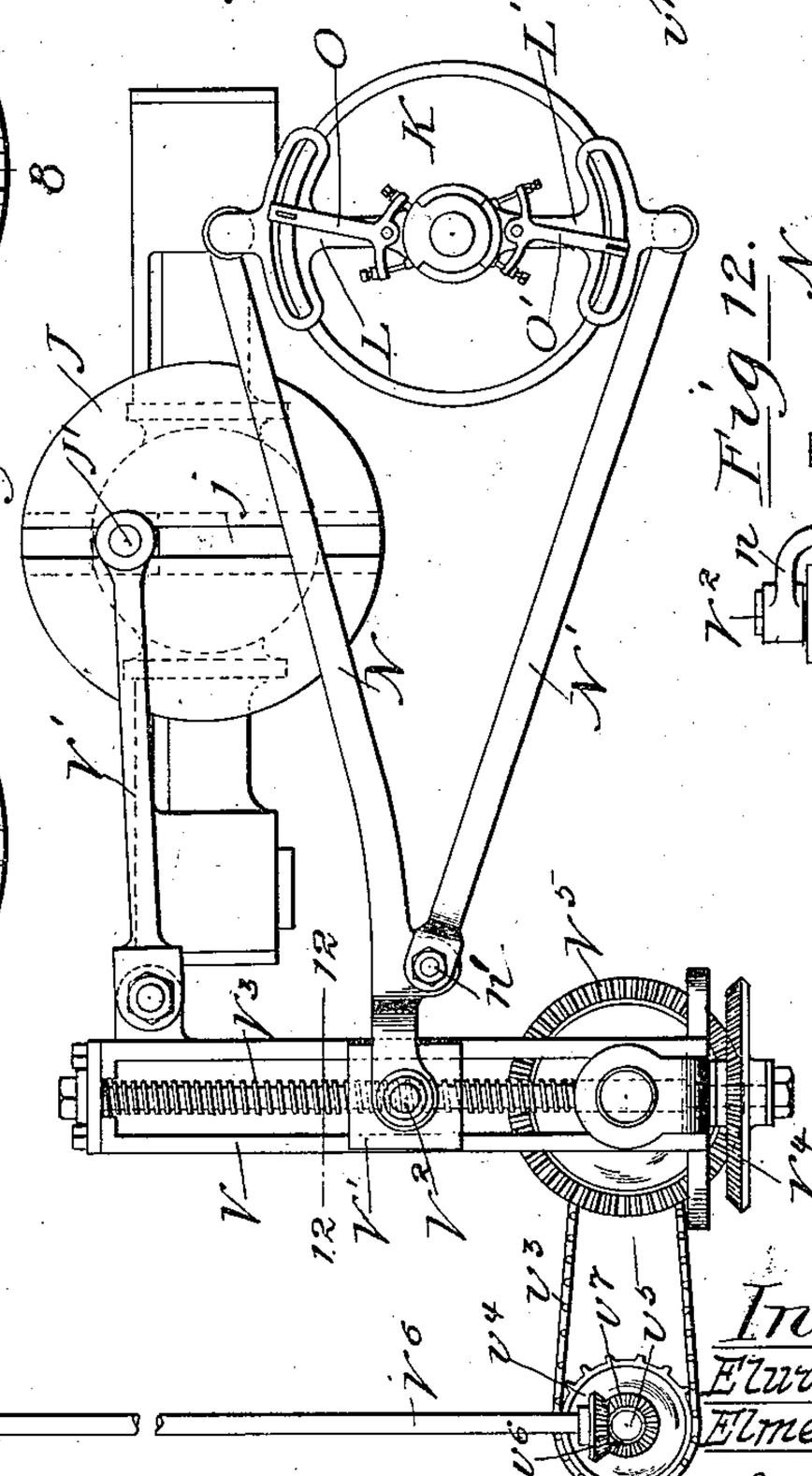
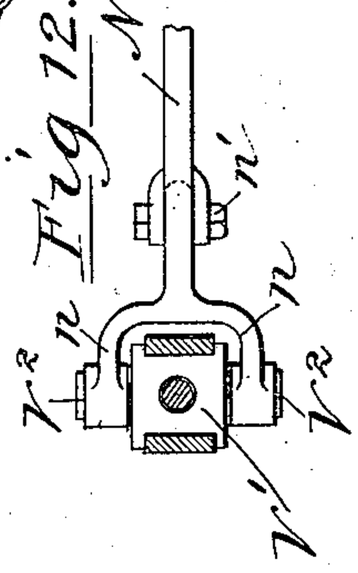




Fig. 12.

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## MOTOR VEHICLE.

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(No Model.) 4 Sheets—Sheet 4.

Fig. 13.

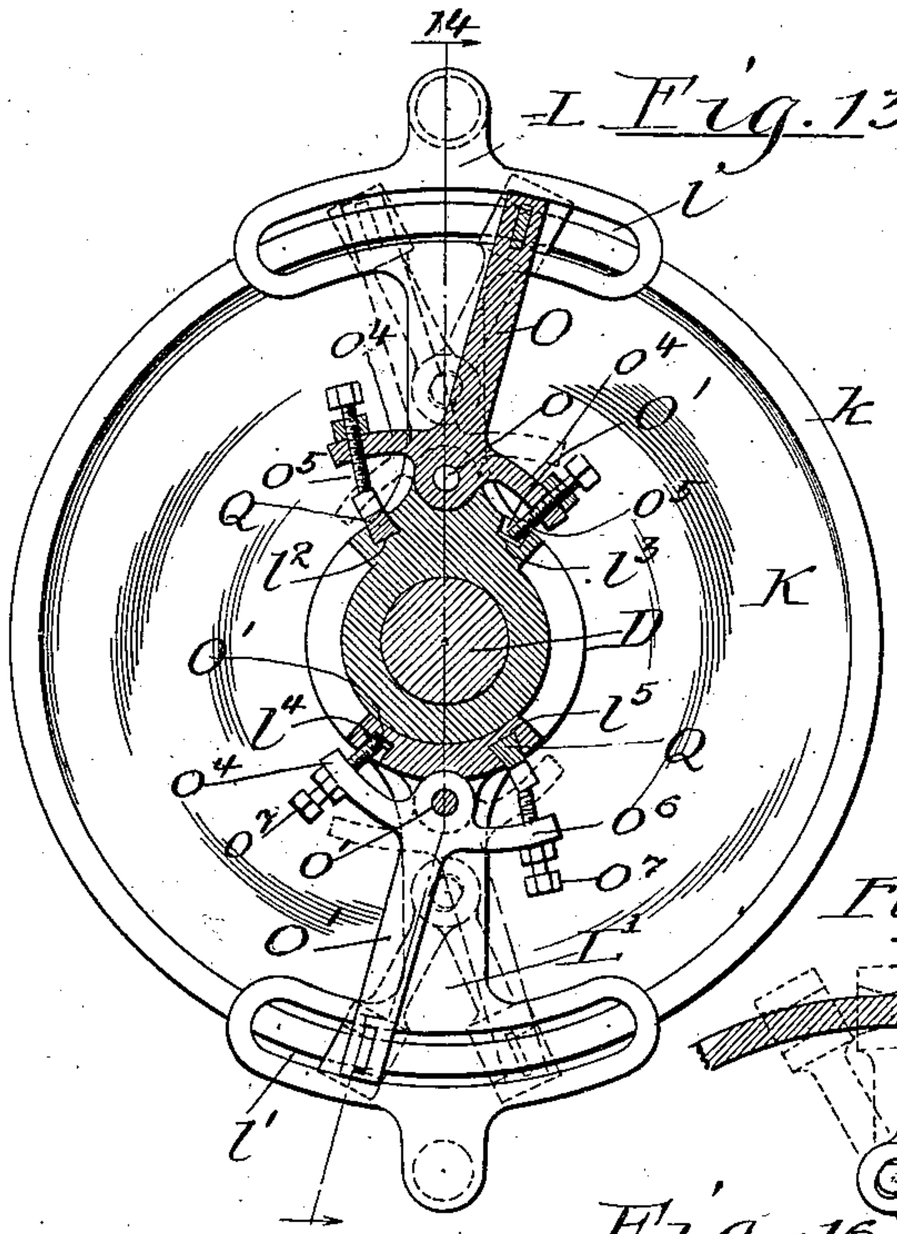



Fig. 14.

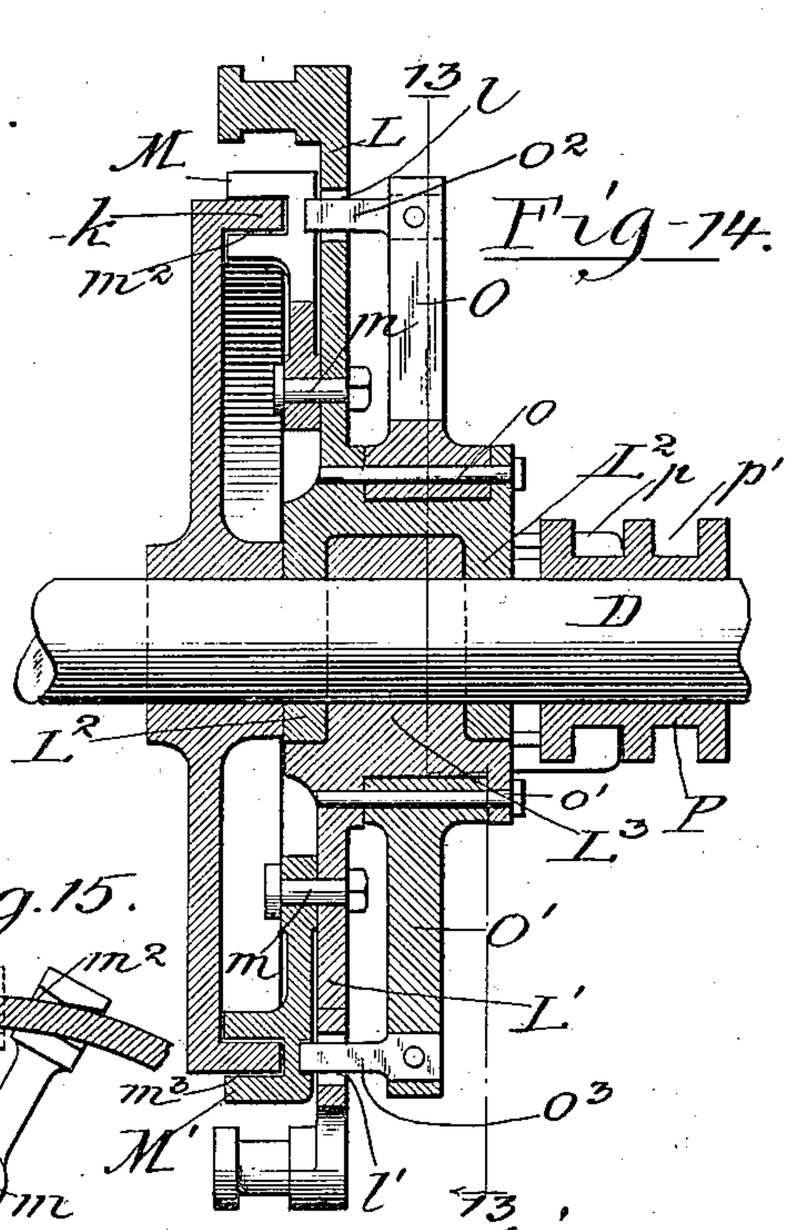



Fig. 15.




Fig. 16.

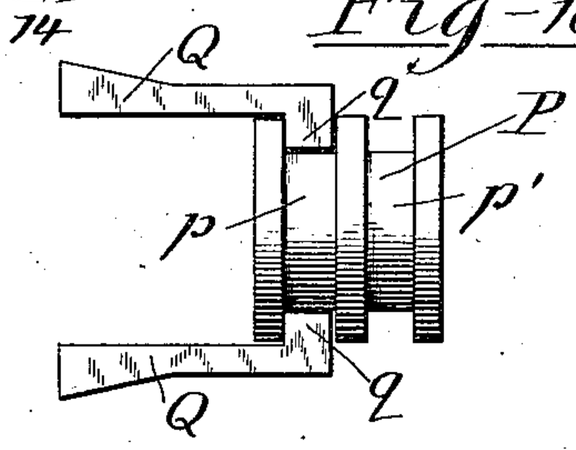



Fig. 17.

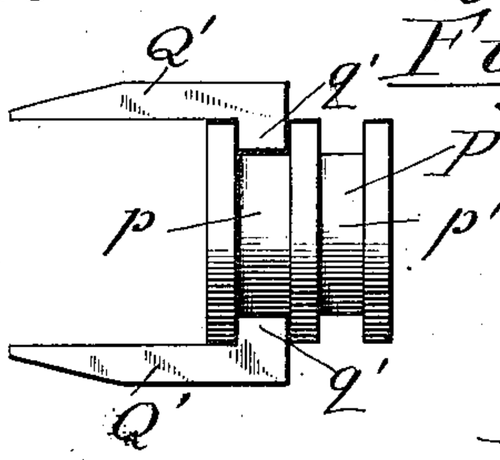



Fig. 18.

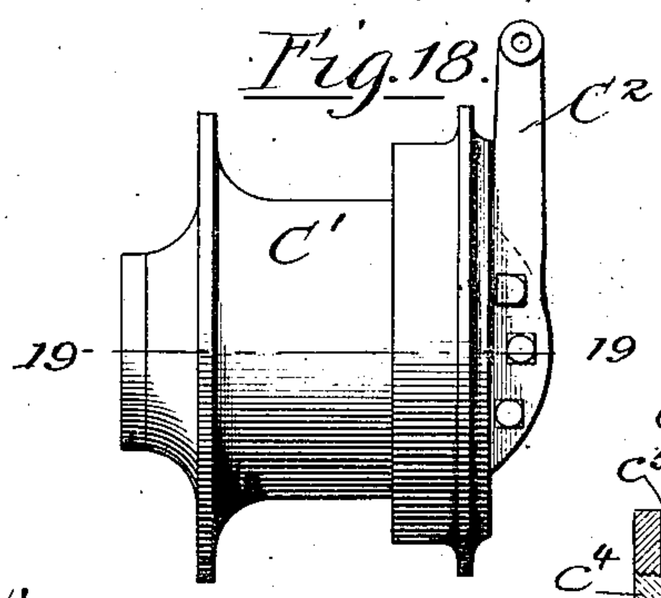



Fig. 19

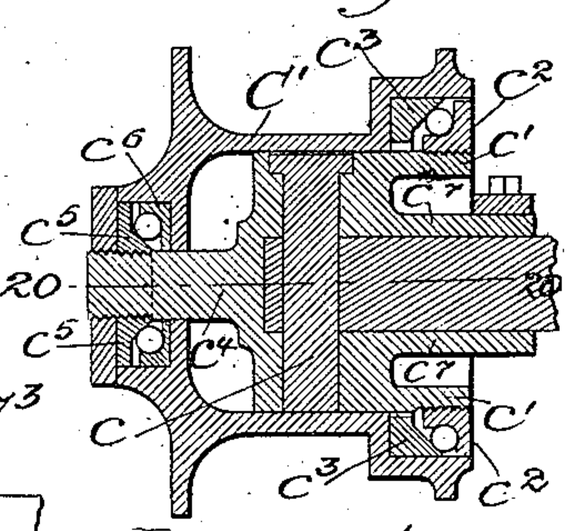
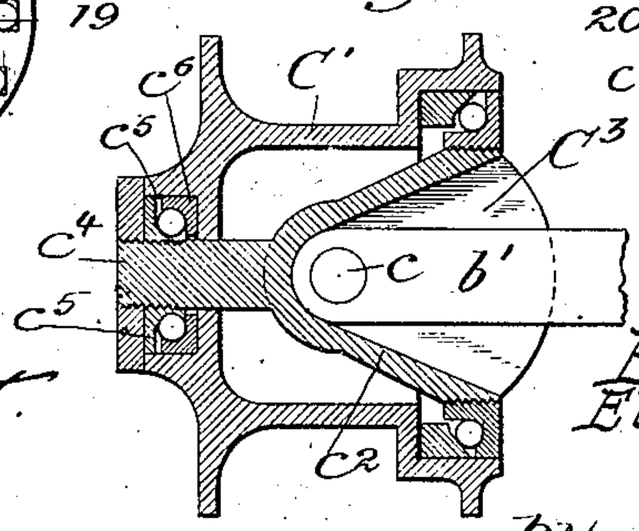



Fig. 20

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# UNITED STATES PATENT OFFICE.

ELWOOD HAYNES AND ELMER APPERSON, OF KOKOMO, INDIANA.

## MOTOR-VEHICLE.

SPECIFICATION forming part of Letters Patent No. 607,116, dated July 12, 1898.

Application filed July 19, 1897. Serial No. 645,143. (No model.)

*To all whom it may concern:*

Be it known that we, ELWOOD HAYNES and ELMER APPERSON, of Kokomo, in the county of Howard and State of Indiana, have invented certain new and useful Improvements in Motor-Vehicles; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in motor-vehicles, the same having reference more especially to the running-gear of such vehicles and to the gearing by which motion is transmitted from the motor to the driving-wheels.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

Our invention is illustrated in the accompanying drawings, in which—

Figure 1 is a view of a motor-vehicle embodying our invention, the running-gear thereof being shown in side elevation and partially in central section and the side wall of the body of the vehicle being removed to show the interior parts. Fig. 2 is a front view of the vehicle. Fig. 3 is a plan view of the running-gear of the vehicle with the body removed. Fig. 4 is a detail section of the front part of the running-gear, taken on line 4 4 of Fig. 3. Fig. 5 is a front elevation of the parts shown in Fig. 4. Fig. 6 is a view in side elevation of the crank-disk and speed-regulating devices thereon. Fig. 7 is a face view of said disk, showing the side thereof opposite to that seen in Fig. 6. Fig. 8 is a sectional view taken on line 8 8 of Fig. 7. Fig. 9 is a detail section taken on line 9 9 of Fig. 8. Fig. 10 is an enlarged detail side elevation of a motor and modified form of gearing connecting the same with the rear axle. Fig. 11 is a detail face view of a part of the speed-regulating device shown in Fig. 10. Fig. 12 is a detail section taken on line 12 12 of Fig. 10. Fig. 13 is a view in side elevation, with parts in section, taken on line 13 13 of Fig. 14, of the clutch-disk. Fig. 14 is a sectional view of the clutch-disk, taken on line 14 14 of Fig. 13. Fig. 15 is a detail view showing the clutch-dog in changed position. Figs. 16 and 17 are detail views showing the sliding sleeve and wedges which control the movement of the parts of the clutch. Fig. 18 is a plan view of one of the forward wheel-hubs. Fig. 19 is a sectional view thereof, taken on a horizontal plane and on line 19 19 of Fig. 18. Fig. 20 is a sectional view thereof, taken on a vertical plane and on the line 20 20 of Fig. 19.

Referring first to the general construction of the vehicle-frame, as illustrated in Figs. 1, 2, and 3, A indicates the vehicle-body, which is supported upon the running-gear and is preferably so shaped as to cover or inclose the motor and all of the working parts of the vehicle, said body being provided at its front end with a seat A′ for the operator. The running-gear consists generally of a front axle B, provided with wheels C C, a rear axle D, provided with wheels E E, two pairs of external longitudinal frame-pieces F F, a pair of central longitudinal frame members F′ F′, and two rear transverse frame members $F^2$ $F^2$, located somewhat to the rear of the rear axle, the frame members constituting each pair being located one above another, so that the upper one of the pair only appears in the plan view, Fig. 3.

The front axle B consists of upper and lower parts *b b*, which converge and meet at the outer ends of the axle to form the axle ends *b′*. Said front axle is connected with the front ends of the main frame by a swivel-joint or pivotal connection adapted to permit the front axle to swing on a central horizontal pivot, said front axle having fixed relation to the frame so far as any horizontal motion is concerned and provision being made for the steering of the vehicle through the medium of the pivotal connection of the front wheel-bearings with the ends of the axle, as will hereinafter appear. The pivotal connection of the front axle with the frame is shown as formed by means of a horizontal longitudinal pivot-shaft G, Fig. 4, which is rigidly attached to the front end of the frame and passes through a bearing-sleeve G′, which is secured to the front axle. Details of construction by which strong and durable construction is provided in these parts are herein shown as follows:

The front ends of the six frame members F F′ are attached to a vertically-arranged

plate or disk $F^3$, the central frame parts F' being attached at their front ends to the upper and lower parts of the disk, while the side frame-bars are bent inwardly at their front ends and secured at opposite sides of the central parts. The pivot-shaft G is secured to the center of said disk, conveniently by being inserted through the central aperture in the disk and secured therein by a nut *g*, Fig. 4. At its forward end the sleeve G' is provided with upwardly and downwardly projecting parts *g'* for the attachment of the upper and lower portions *b* of the front axle. At its rear end the said sleeve is provided at its inner end with an annular integral bearing ring or flange $g^2$, which rests against the front face of the disk $F^3$ and aids in maintaining the said sleeve at all times in perpendicular relation to the disk, said flange thereby taking part of the lateral strain from the bearing-shaft G. The front axle is further shown as provided with rear oblique braces B' B', which extend from the outer ends thereof rearwardly and inwardly and are attached to the rear end of the sleeve G', as clearly seen in Fig. 3. The said pivot-shaft G carries at its front end a vertical bearing-sleeve $G^2$, which affords support for the lower end of a vertically-arranged rock-shaft II, through the medium of which the vehicle is steered, said shaft having at its upper end a hand-lever II', Fig. 1, by means of which the rock-shaft may be actuated by the operator.

Now referring to the pivotal connection of the front wheels with the front axle, by which the steering is accomplished, this feature of the invention is illustrated in Figs. 2, 3, 18, 19, and 20 and is constructed as follows: In said figures, *b'* indicates the extremity of the front axle, which latter, as before stated, is incapable of any horizontal movement with respect to the main frame. The axle ends *b'* extend to points centrally within the wheel-hubs C' and are there connected by vertical pivots *c* with axle-sections $C^2$, on which the hubs are mounted and which correspond in function with the axle of an ordinary carriage. Said axle-section $C^2$ is provided with a recess $C^3$ to receive the end *b'* of the axle, which recess is made of sufficient horizontal width to admit of a considerable range of oscillatory movement of the axle-section with relation to the axle, the recess being conveniently made with outwardly-flaring side walls, as seen in Fig. 20. To provide room for such recess, the axle-section $C^2$ is made of considerable diameter at its inner end, while the hub C' is enlarged to correspond therewith. In the particular construction herein shown the inner part of the axle-section $C^2$ is provided with an annular portion *c'*, Fig. 19, upon which is placed a bearing-ring $c^4$, forming a part of a ball-bearing, the outer part of which bearing consists of a ring $c^5$, which is fitted within a suitable annular recess in the hub C'. The outer end of the axle-section, exterior to the recess $C^3$, is preferably made in the form of a spindle $c^4$, on which is mounted a ring $c^5$, forming the inner member of a ball-bearing, the outer member of said ball-bearing being formed by a ring $c^6$, inserted in an annular recess at the outer end of the hub.

A rigid connection of the axle end with the axle-section $C^2$ is of course afforded by the pivot-pin *c;* but in order to take a part of the strain from said pivot-pin and to more certainly hold the axle-section rigidly in place with respect to the axle, while allowing said axle-section to swing horizontally on said pivot-pin, the top and bottom walls of the recess $C^3$ are made horizontal and parallel with each other and adapted to fit closely against the top and bottom surfaces of the axle, and which latter is provided with flat top and bottom bearing-surfaces for engagement with the upper and lower walls of the recess. In the particular construction illustrated such horizontal guide-surfaces at the top and bottom of the recess are formed by means of horizontal flanges $c^7$, which preferably extend inwardly from the inner end of the hub in order to afford a more extended bearing of the pivoted axle-section upon the axle.

The pivotal connection between the axle end and the axle-section on which the wheel-hub is mounted being located between the inner and outer faces of the wheel-hub, it follows that the pivot-pin is in approximately the same vertical plane with the wheel-rim. The wheel as a whole is therefore pivotally connected with the axle, so as to swing on a vertical axis passing through its point of contact with the ground or supporting-surface. This construction is of very great advantage in the practical use of the motor, for the reason that the wheel when thus mounted has no tendency upon striking an obstacle to swing or oscillate in one direction or the other, and this is true whether the obstacle be a high or a low one, or, in other words, whether the resistance to the forward movement of the wheel acts upon the wheel at a point near the ground or at a point horizontally opposite the axle. By the construction described, therefore, the difficulty of steering the vehicle is very greatly reduced, it being obvious that whether the wheels be inclined to the right or left in turning or are held straight for moving in a straight line the striking of an obstacle by the wheel will have no tendency to swing the wheel in either direction, and thus contact of a wheel with such obstacle will not, therefore, cause the vehicle to depart from its correct course.

Now referring to the means for actuating or moving the wheels from the steering rock-shaft H, each of the axle-sections $C^2$ is provided on its inner end with a rigid forwardly-projecting arm $C^4$, Figs. 3, 18, and 19, and to the forward ends of said arms are pivotally joined connecting-rods $H^2$, the opposite or inner ends of which are pivoted to forwardly-projecting arms *h h* on the said rock-shaft H. In the particular construction illustrated

the said arms *h* are attached to a sleeve *h'*, which is attached to the lower end of the rock-shaft II and surrounds the same within the supporting-sleeve $G^2$, said sleeve being provided between its upper and lower ends with a horizontal slot $g^3$, through which the arms project, and having a vertical slot $g^4$, through which the arms are carried in inserting the sleeve *h'* into the sleeve $G^2$.

The rear or driving axle D is mounted in bearings *f f*, which are attached, by means of inclined braces *f' f'*, to the upper and lower external longitudinal frame-bars F F.

The motor illustrated in connection with the machine described is an explosive-gas engine provided with two oppositely-disposed horizontally-arranged power-cylinders I I and a crank-shaft I', on which is mounted a balance-wheel $I^2$. Said engine is mounted on the upper longitudinal frame-pieces F F' at one side of the machine-frame, with the cylinders arranged longitudinally of the frame and the crank-shaft transversely thereto or parallel with the rear axle. The engine is shown as supported on the frame-pieces by means of cross-girths *i i*, Fig. 3.

Now referring to the gearing by which the rear axle is driven from the said motor, these parts are constructed as follows: J is a crank-disk which is mounted on the end of the crank-shaft I' at the side of the motor opposite the fly-wheel $I^2$, said crank-disk in the construction illustrated being near the center of the frame. Across the outer face of said crank-disk extends a T-groove *j*, in which is secured a wrist-pin J', the wrist-pin being movably mounted in said groove for a purpose hereinafter described.

The devices for transmitting motion from the crank-pin J' to the rear axle consist generally of a clutch-disk K, Figs. 1, 3, 13, and 14, oscillatory clutch-arms L L', carrying clutch-dogs M M', which engage the margin of said disk, and two connecting-rods N N', Fig. 1, which serve to connect the wrist-pin J' with the vibratory clutch-carrying arms L L', said clutch-carrying arms being disposed at opposite sides of the clutch-disk, so that when both clutch-levers are oscillated through the medium of the connecting-rods M one clutch-dog will make its power or propelling stroke at the time the other one is making its rearward or return stroke, and both of them together will maintain the clutch-disk constantly in rotation. The clutch-disk K is shown as mounted directly upon the rear axle, and in Figs. 1, 2, 6, 7, 8, and 9 devices are shown for moving the wrist-pin J' inwardly and outwardly across the face of the disk K for the purpose of varying the speed of the vehicle. In Figs. 10, 11, and 12, however, is shown a modification of the driving-gear wherein the speed-regulating devices instead of being located in the crank-disk are mounted on a separate oscillatory part actuated from the said crank-disk.

Referring now to the clutch-disk and the operative parts by which the same is turned, these features are illustrated in Figs. 13 to 17 and are made as follows: The clutch-disk K is provided at its outer edge with a lateral cylindric flange *k*. Mounted concentrically with the axle D at the side of the disk at which said flange projects are the two oppositely-extending clutch-arms L L', said arms in this instance being mounted directly upon said axle. Said clutch-arms are shown as provided with overlapping parts, which are apertured for the passage of the axle D, these parts in the case of the upper clutch-arm L having the form of two annular parts or hubs $L^2$ $L^2$, which extend at opposite sides of the central annular part or hub $L^3$ of the lowermost clutch-arm L'. The clutch-dogs M M' are pivoted to the inner faces of the arms L L' by means of pivot-pins *m m*, located between the shaft and the periphery of the clutch-disk, and said clutch-dogs are provided at their outer ends with notches $m^2$ $m^3$, adapted to receive the flange *k* of the clutch-disk, said notches being so shaped and proportioned that when the clutch-dog stands in a radial position it may move freely along the flange, but when the dog is inclined in either direction the opposite sides of the notch will frictionally engage the said flange. The direction in which the dogs are inclined determines the direction of motion of the disk, so that by shifting said dogs from one side to the other of their central or radial position the direction of motion of the disk may be reversed at will. In order to give suitable freedom of movement to the clutch-dogs, necessary for the clutch action described, the openings through which the pivot-pins *m* pass are enlarged or elongated longitudinally of the clutch-dog, as clearly seen in Fig. 15, this construction also enabling the dog to be shifted from one side to the other of its central position, as is necessary in reversing the direction of motion of the vehicle. Mounted on the clutch-arms L L' are oscillatory dog-shifting levers O O', the same being pivoted at their inner ends on pivot-pins *o o'*, located near the inner ends of the clutch-arms and extending outwardly to points opposite the outer or free ends of the clutch-dogs, which latter are connected with said levers by means of spring-arms $o^2$ $o^3$, which spring-arms are attached to the outer ends of the levers O O', pass through circumferentially-elongated concentric slots *l l'* in the clutch-arms L L', and are engaged with the clutch-dogs by means of notches or recesses in the rear or outer faces of the latter. The dog-shifting levers O O' are for the purpose of shifting the dogs from one side to the other of their central position, as required to change the direction of motion of the clutch-disk, it being obvious that when the dog is swung at one side of its central position it will bite the flange when moved in one direction and when shifted to the opposite side of its central position it will bite the flange when

moving in the other or opposite direction. Such shifting of the dogs is accomplished by throwing the free or outer ends of the shifting-levers O O' laterally, and devices are provided for giving such motion to the said levers, as follows: Mounted on the axle D is an endwise-sliding sleeve P, provided with two annular grooves $p\,p'$. The groove $p$ is located at the end of the sleeve nearest the clutch-arms L L', and in said hub $L^2$ of the upper clutch-arm are formed longitudinal guide-grooves $l^2\,l^3$; while in the hub $L^3$ of the lower clutch-arm are formed two similar guide-grooves $l^4\,l^5$. In one pair of diametrically opposite grooves $l^2\,l^5$ are located sliding wedges Q Q, which are thicker at their inner than at their outer ends and which are engaged at their outer ends with the groove $p$ of the sleeve P by means of lugs $q\,q$. In the other pair of oppositely-arranged guide-grooves $l^3\,l^4$ are located other sliding wedges Q' Q', the same being thicker at their outer than at their inner parts and being also engaged with the groove $p$ by means of lugs $q'\,q'$. The dog-shifting lever A is provided near its inner or pivoted end with two oppositely-projecting arms $o^4\,o^4$, each adapted to engage at its end with the outer surfaces of the dissimilar wedges Q Q', which are mounted in the said lever L. The end portions of said arms $o^4\,o^4$, which engage said wedges, are shown herein as formed by means of threaded bolts $o^5\,o^5$, which are inserted through the said arms and are provided with jam-nuts, this construction affording means for accurately adjusting the contact-surfaces of the said arms with respect to the said wedges. The lower dog-shifting lever O' is similarly provided with arms $o^6\,o^6$ for engagement with the lowermost pair of wedges Q Q', said arms being similarly provided with bolts $o^7\,o^7$, which form adjustable contact-surfaces for engagement with the said wedges. The pairs Q Q' of sliding wedges when moved longitudinally obviously serve to swing or rock the shifting-levers on their pivots, it being clear that when said wedges are moved together in the same direction one will throw outward the shifting-lever arm opposed to it, while the oppositely-inclined wedge will permit the inward motion of the other arm on the same shifting-lever, and vice versa.

For giving endwise movement to the sleeve P any suitable actuating device may be employed, that herein shown consisting of a bent lever R, pivoted to a bracket $r$ on the main frame, engaged at its rear end with the groove $p'$ of said sleeve and connected at its forwardly and laterally extending end with a rod R', which extends forward to and is connected with a hand-lever $R^2$, adjacent to the driver's seat.

The shifting-levers O O', when moved by the action of the sliding sleeve P, the sliding wedges, and other parts described, obviously have the effect of swinging the clutch-dogs from one side to the other of their central position and of thereby reversing the direction of rotation of the driving-wheels, such rotation being produced by the action of said dogs on the clutch-disk when the clutch-levers L L' are oscillated through the action of the crank-pin and the connecting-rods N N', as hereinbefore stated. The spring-arms $o^2\,o^3$ obviously afford the necessary yielding connection between the shifting-levers O O' and the dogs required to enable the dogs to properly perform their function.

Now referring to the devices for changing the speed at which the rear axle is driven by the clutch device described, the same are illustrated in detail in Figs. 6 to 9 and in a modified form in Figs. 10 to 12. Referring first to the form of speed-changing devices shown in Figs. 6 to 9, the same consists generally of means upon the crank-disk J by which the crank-pin J' may be moved or shifted radially upon the disk through power applied by the operator to the parts. Inasmuch as said disk J is in constant rotation it is necessary to provide means for transmitting power for moving or shifting the crank-pin from stationary actuating parts upon the vehicle-body to the said revolving disk, and the present invention involves the feature of a frictional retarding device or brake applied to annular moving parts upon the said disk in order to retard said annular moving parts, and thus turn the same with respect to the disk, such annular posts being arranged to give motion to suitable gearing for shifting or moving the wrist-pin.

Referring now to the means illustrated by which these results are accomplished, the parts referred to are constructed in detail as follows: The wrist-pin J', which, as before stated, slides in a T-groove $j$, formed in the face of the disk J, is engaged with a screw-shaft S, mounted in the inner part of said groove and has screw-threaded engagement with the inner part of the wrist-pin, which latter thereby constitutes a nut upon said shaft.

For turning the screw-shaft S, and thereby giving motion to the wrist-pin, devices are provided as follows: In the rear or inner face of the crank-disk J are mounted cylindric toothed or gear rings T and T', said rings being mounted to turn in the disk, and for this purpose being preferably mounted in annular grooves formed in the body of the disk and confined therein by means of rings $j^2\,j^3\,j^4$, which are secured to the rear face of the disk by screws or otherwise and are arranged to overlap shoulders on the rings, so as to hold said rings from outward motion. Said gear-rings are provided on their inner edges with gear-teeth, and the innermost ring intermeshes with a gear-pinion $s$ on the shaft S, while the outermost ring intermeshes with a gear-pinion $s'$, which is mounted on a short counter-shaft S', which counter-shaft is provided with a gear-wheel $s^2$, that intermeshes with a similar gear-wheel $s^3$ on the screw-shaft S. The gear-rings T and T' project out-

side of the inner face of the crank-disk, so as to constitute, in effect, two annular flanges thereon, and between the projecting portions of said rings is located a brake-band U, which is adapted to embrace and frictionally engage the inner ring T' and is provided with external projections or shoes *u u*, adapted for frictional engagement with the inner surface of the outer ring T. The brake-band U is connected at one end with a stationary pivot U', Fig. 6, and at its opposite end is attached to the lower end of a vertically-arranged operating-lever $U^2$, which latter is pivoted between its ends upon a stationary pivot-stud $U^3$. Attached to the upper end of said lever $U^2$ is a horizontal connecting-rod $U^4$, which extends forward to a hand-lever $U^5$, located within reach of the operator, as seen in Fig. 1.

The construction described obviously provides a means for turning the screw-shaft S in either direction, and thereby moving the crank-pin inwardly and outwardly on the disk, it being obvious that if the brake-band U be tightened against the gear-ring T' said gear-ring will be held from turning with the crank-disk, and the screw-shafts will be thereby rotated by the action of the said gear-ring on the pinion *s*, and it being also obvious that if the said brake-band be expanded to bring the shoes *u* into contact with the outer gear-ring T said gear-ring by being retarded will turn the counter-shaft S' and that the motion of the latter will be transmitted to the screw-shaft, so as to turn the same in a direction opposite to that in which it was turned by the action of the inner gear-ring. It follows from the above that by moving the hand-lever $U^5$ out backward and forward the wrist-pin J' may be moved either inwardly or outwardly on the crank-disk, with the effect of increasing or decreasing the throw of the clutch-arms and correspondingly increasing or decreasing the rate of feed or rotation of the clutch-disk. It will be obvious, moreover, that if the crank-pin be shifted to the center of the disk no motion will be given to the clutch members and the machine will be stopped.

In Figs. 10 to 12 we have shown a construction wherein variation of speed is produced by devices generally like that before described, but in which the speed-changing mechanism is located in a movable part which is separated from the crank-disk. In this instance the wrist-pin J' is permanently clamped or secured in the groove *j* and is not intended to be moved, except for the purpose of adjustment. In this instance, moreover, the clutch-disk K, the clutch members, and the connecting-rods N N' are made in the same manner as before described; but the said connecting-rods instead of being engaged with the crank-pin J' are engaged with and given motion by an oscillatory or swinging frame V, which is operated by a connecting-rod N' from the crank-pin J'. The said frame V is provided at its lower end with suitable trunnions *v*, by which it is mounted in suitable bearings affording the necessary oscillatory movement in the upper part of the frame. The said frame consists generally of two parallel guide-bars, between which is located a sliding block V', to which the connecting-rods N N' are pivotally attached. Preferably the block V' has two wrist-pins $V^2$ at either side thereof, and the connecting-rod N is forked at its ends to form two arms *n n*, which are engaged at their ends with the said wrist-pins.

In the ends of the frame V is mounted a longitudinal screw-shaft $V^3$, to the lower end of which, below the frame, is attached a bevel gear-wheel $V^4$, said bevel gear-wheel meshing with a second similar wheel $V^5$, attached to a shaft *v'*, having bearings in one of the trunnions *v* of the frame. On the outer end of said shaft *v'* is secured a sprocket-wheel $V^2$, and over said wheel is trained a chain belt $v^3$, which also engages a sprocket-wheel $v^4$ on a counter-shaft $v^5$. An upright shaft $V^6$ extends upwardly from the shaft $v^5$ and is connected therewith by intermeshing gear-pinions $v^6$ $v^7$, said shaft $V^6$ having at its upper end a hand-wheel $V^7$, by which the shaft may be turned by the operator.

From the construction described it is obvious that through the medium of the shaft $V^6$ and gearing described the screw-shaft $V^3$ may be turned or rotated so as to carry the block V' toward or away from the center of oscillation of the frame V, and inasmuch as the extent of movement given to the connecting-rods N and N' will depend upon the distance of the wrist-pin from the center of oscillation of said frame it follows that the speed of the machine may be readily controlled by the use of the device described.

Both of the connecting-rods N and N' may be pivotally engaged with the wrist-pin J' or $V^2$; but as a more simple and preferable construction one of the connecting-rods, as N, is directly engaged with said wrist-pin, while the other connecting-rod, as N', is pivoted to the first connecting-rod near the wrist-pin by a pivot connection *n'*.

Several of the features of construction illustrated and above described may be used with advantage by themselves or in other combinations than that in which they are illustrated, and we do not therefore desire to be limited to any of the combinations of parts or details herein shown and described, except so far as the same may be specified in the accompanying claims.

We claim as our invention—

1. A running-gear for vehicles comprising a main frame having horizontal frame members and provided at its forward end with a vertical disk to which the frame members are attached at their front ends, and a front axle, which is connected with the frame by a horizontal pivot and is provided with an annular flange in contact with said disk.

2. A running-gear for vehicles comprising

a main frame having longitudinal frame members, and provided at its forward end with a vertical disk to which the frame members are attached, a pivot-shaft extending forwardly from said disk, and a front axle provided with a sleeve which surrounds the pivot-shaft and is provided with an annular flange in contact with said disk.

3. A running-gear for vehicles comprising a main frame having longitudinal frame members and provided at its forward end with a vertical disk and with a pivot-shaft extending forward from said disk, a front axle provided with a sleeve which surrounds said pivot-shaft and with a flange in contact with said disk, said pivot-shaft being provided at its forward end with a vertical sleeve which affords bearings for the rock-shaft of a steering mechanism, and said axle being provided at its ends with pivoted axle-sections on which the wheels are mounted and which have actuating connections with said shaft.

4. A driving-gear for motor-vehicles comprising a clutch-disk, two oppositely-arranged clutch-arms, clutch-dogs pivoted to said arms, actuating means connected with and giving vibratory motion to both of said clutch-arms, shifting-levers for said dogs pivoted to the said clutch-arms, and means for moving said levers comprising endwise-sliding wedges.

5. The combination with a clutch-disk, clutch-arms, and clutch-dogs pivoted to the arms, of shifting-levers pivoted to the clutch-arms near the inner ends of said arms and connected at their outer ends with said dogs by elastic or yielding connections and means mounted on the shaft for actuating said shifting-levers.

6. A driving-gear for motor-vehicles comprising a clutch-disk, two oppositely-arranged clutch-arms, clutch-dogs carried by said arms, a revolving crank-pin, and connecting-rods uniting the crank-pin with said clutch-arms, one of said connecting-rods being engaged directly with the crank-pin and the other connecting-rod being pivoted to the first one.

7. A change-speed gear for motor-vehicles comprising a clutch-disk, two vibratory clutch-arms, a crank-pin connected with and giving motion to both of said clutch-arms, said crank-pin being movable toward and from its center of motion, and means for shifting or moving said crank-pin.

8. A change-speed gear comprising a clutch-disk, two vibratory clutch-arms, a crank-pin connected with and giving motion to both of said clutch-arms, said crank-pin being movable toward and from its center of motion, and means for shifting said crank-pin comprising a screw-shaft having engagement with the crank-pin, and means under the control of the operator for giving rotary motion to the screw-shaft in either direction.

9. A change-speed gear comprising a clutch-disk, two vibratory clutch-arms, a crank-disk provided with a crank-pin which is movable radially upon the disk, and means under the control of the operator for shifting said crank-pin inwardly and outwardly upon said crank-disk.

10. A change-speed gear comprising a clutch-disk, two vibratory clutch-arms, a crank-disk provided with a crank-pin which is radially movable upon the disk, means for shifting or moving the crank-pin on the disk embracing the screw-shaft which engages the crank-pin, and means for actuating said screw-shaft.

11. The combination with a crank-disk and crank-pin adapted to move radially thereon, of means for moving the crank-pin comprising two rings mounted on the disk, and a friction-brake adapted to act upon one or the other of said rings at will, said rings being severally connected with and adapted to operate the crank-pin.

12. The combination with a crank-disk and a crank-pin sliding upon the disk, of two gear-rings mounted in said disk, a friction-brake arranged to operate upon either of said rings at will, a screw-shaft engaging said crank-pin, said screw-shaft having geared connection with one of said rings, and a counter-shaft provided with a gear-pinion which intermeshes with the other of said rings and which has geared connection with the said screw-shaft.

13. The combination with a crank-disk and crank-pin which slides upon the disk, of two gear-rings mounted in said disk, a friction-brake arranged to operate upon either of said rings at will, a screw-shaft engaging said crank-pin, said screw-shaft being provided with a gear-pinion which intermeshes with one of the rings, and a counter-shaft provided with a gear-pinion which intermeshes with the other gear-ring, said screw-shaft and counter-shaft being provided with intermeshing pinions.

In testimony that we claim the foregoing as our invention we affix our signatures, in presence of two witnesses, this 15th day of July, A. D. 1897.

ELWOOD HAYNES.
ELMER APPERSON

Witnesses:
J. FENIMORE COOPER,
FREEMAN COOPER.