No. 652,943. Patented July 3, 1900.

G. E. WHITNEY.

MOTOR VEHICLE.

(Application filed June 10, 1899.)

(No Model.) 3 Sheets—Sheet 1.

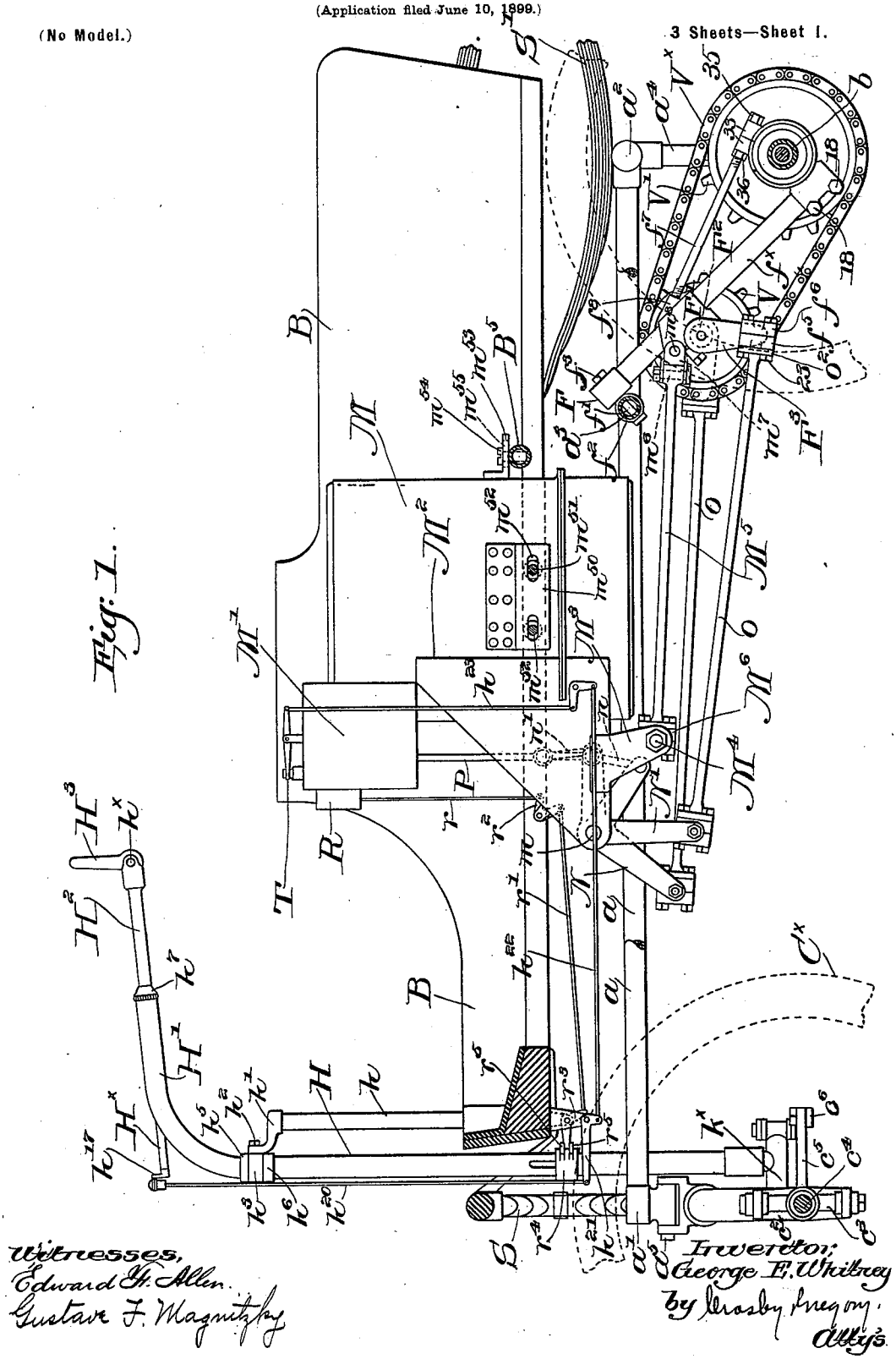

Fig. 1.

Witnesses,
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(No Model.) 3 Sheets—Sheet 2.

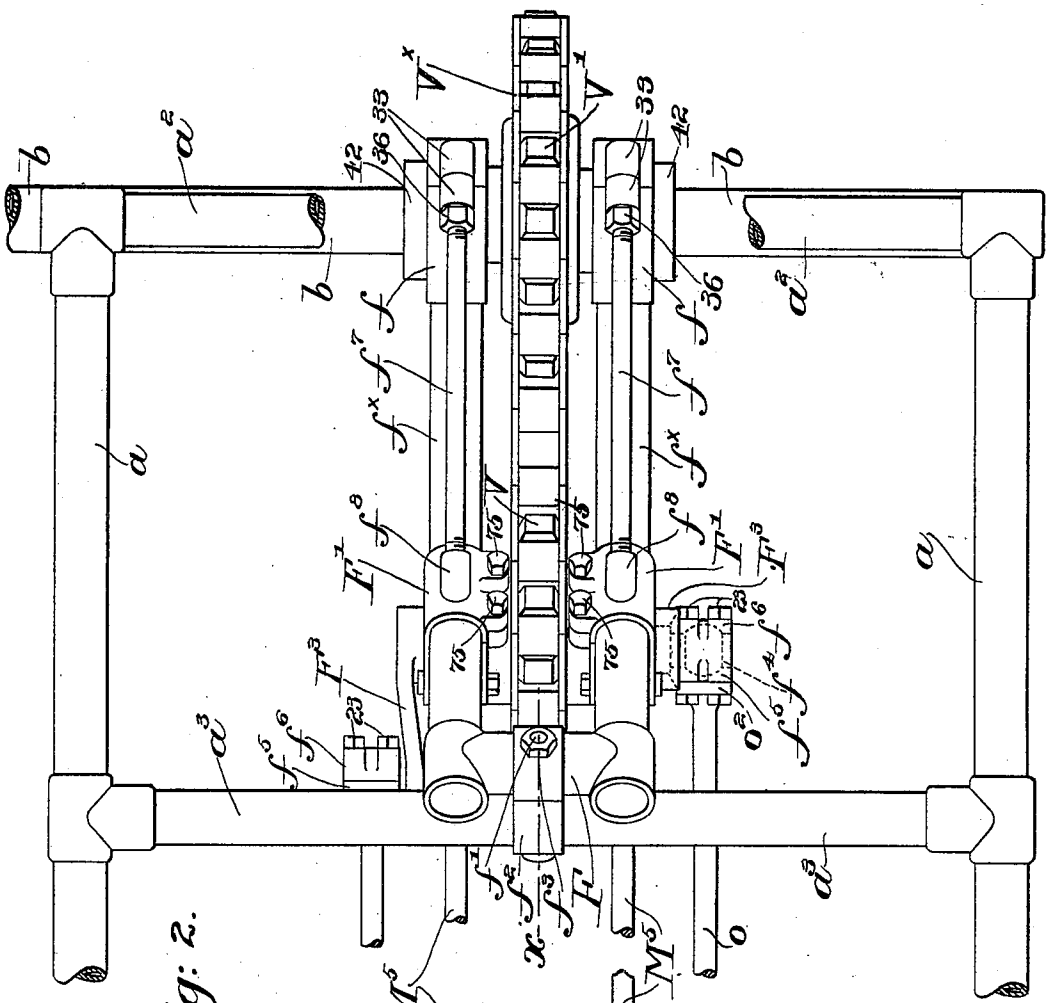

Fig. 2.

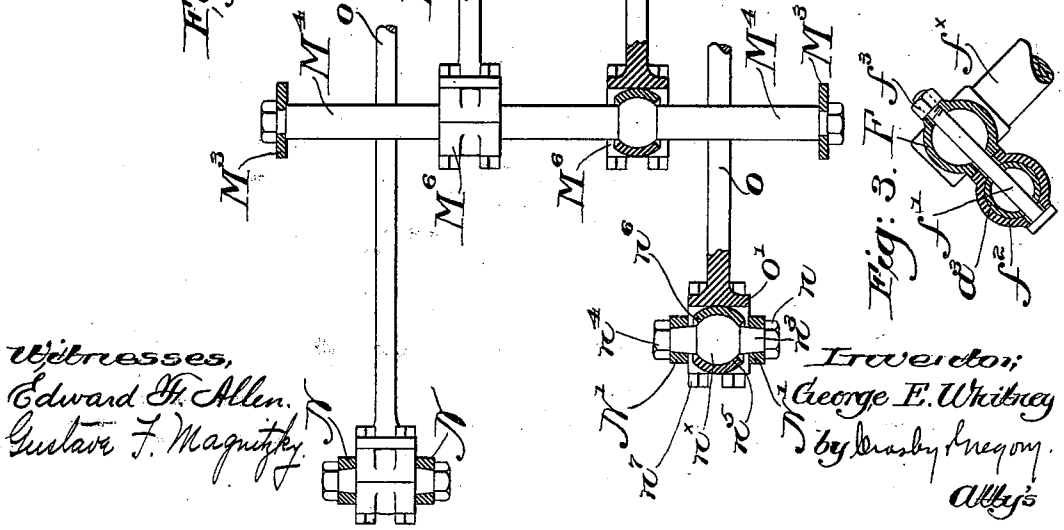

Fig. 3.

Witnesses,
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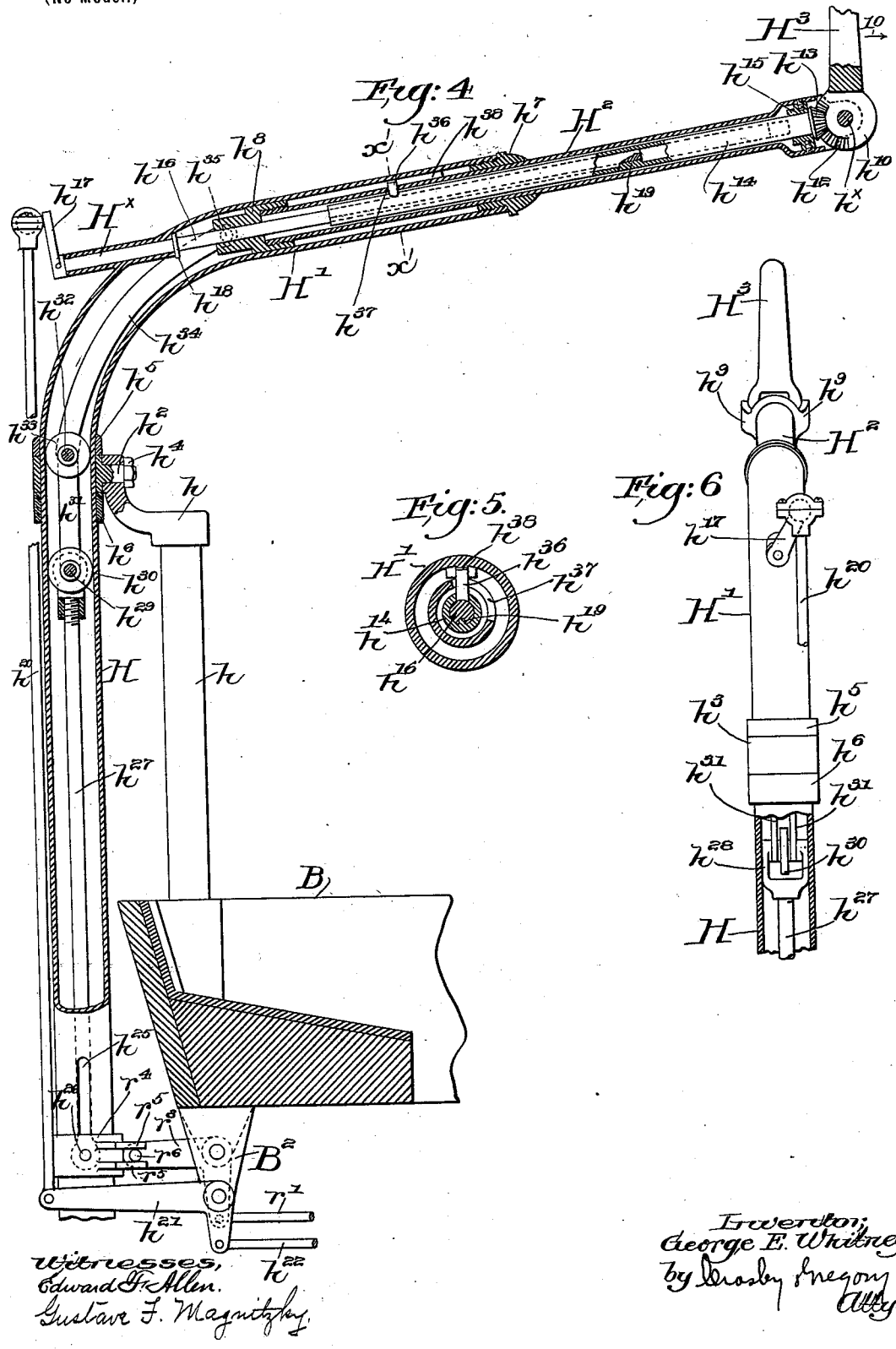

Fig: 4

Fig: 5.

Fig: 6

Witnesses,
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Gustave F. Magnitzky.

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UNITED STATES PATENT OFFICE.

GEORGE E. WHITNEY, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE WHITNEY MOTOR WAGON COMPANY, OF SAME PLACE.

MOTOR-VEHICLE.

SPECIFICATION forming part of Letters Patent No. 652,943, dated July 3, 1900.

Application filed June 10, 1899. Serial No. 720,030. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. WHITNEY, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Motor-Vehicles, of which the following description, in connection with the accompanying drawings, is a specification, like letters and numerals on the drawings representing like parts.

This invention relates to automobile or motor vehicles, and more particularly to that type wherein the motive power employed is steam or other expansible medium, although certain portions of the invention to be hereinafter referred to are applicable to a vehicle propelled by any variety of mechanical motive power.

In another application, Serial No. 719,876, filed by me the 9th day of June, A. D. 1899, I have shown the motor as connected directly yet flexibly to a crank driving-shaft to which the driving-wheels of the vehicle are attached, with a compensating mechanism of peculiar construction applied to the shaft.

My present invention has for one of its objects the utilization of a direct-connected motor and crank driving member with a wheel-carrying shaft provided with compensating mechanism of usual construction, the power being transmitted from the crank to the wheel-shaft, preferably by a sprocket-chain. I am thereby enabled to combine the advantages of the direct-connection mode of driving with a simple form of compensating mechanism, and I can also readily and effectively employ speed or power changing means between the crank driving member and the wheel-shaft.

Various novel features of my invention will be hereinafter described, and particularly pointed out in the following claims.

Figure 1, in side elevation and partly broken out in non-essential features, represents a motor-vehicle embodying one form of my invention, a portion of the vehicle-body being shown in section. Fig. 2 is an enlarged plan view, partly broken out to save space, of the vehicle-frame, showing the crank and driving-wheel shafts, their power-transmitting connection, and the connecting members between the crank-shaft and actuating members of the motor, the latter being omitted. Fig. 3 is a sectional detail taken on the line x, Fig. 2. Fig. 4 is an enlarged sectional view of the steering-head of the vehicle, the manually-actuated controller, and the connections between said controller and different mechanisms governed thereby. Fig. 5 is a transverse section thereof on the line x' x', Fig. 4; and Fig. 6 is a front elevation of the upper portion of the steering-head and the controller, a portion of the head being broken out to show the contained devices.

The frame of the vehicle is represented as comprising side bars or perches a, front and rear cross-bars a' a^2, respectively, and an intermediate cross-bar a^3 near the rear end of the frame, and in order to secure strength, lightness, and a certain amount of resiliency or flexibility the frame is preferably made of tubing connected and held together by suitable joints. Depending standards a^4, only one of which is shown in Fig. 1, are provided with suitable bearings for the wheel-carrying axle or shaft b, provided with any suitable compensating mechanism to permit differential rotation of the wheels when the vehicle is turning corners or running on a curved path, and a suitable body B, Fig. 1, is shown herein as yieldingly supported by springs S S', mounted on the frame.

The front end of the frame is connected by a horizontal king-bolt a^5 with a truss or other form of front axle C, having at its ends yokes c^2, which support vertical pivots c^3 of horizontal outwardly-extended wheel-spindles c^4 for the steering-wheels $C^\times$, inwardly-inclined lever-arms c^5 forming a part of the spindles and being pivotally connected at their free ends with a connecting-rod c^6. The front wheels are thus swung bodily on their vertical fulcra, and the steering of the vehicle is greatly facilitated thereby, it being understood that the arms c^5 will be moved in unison in well-known manner, but the wheel at the side toward which the vehicle is to be turned will be deflected more than the opposite wheel, preventing sidewise scraping of the wheels in turning corners.

The vehicle body-frame has secured to its front end an upright standard h, Figs. 1 and 4, provided at its upper end with a cap h', through which is horizontally extended the

shank h^2 of a collar h^3, free to rock on its shank, a nut h^4 retaining the shank in place on the cap.

A steering head or post H, represented as tubular and bent at its upper end to form an overhanging rearwardly-extended arm H′, is rotatably extended through the collar h^3, flanges or rings h^5 h^6, secured to the steering-head above and below the swiveled collar h^3, respectively, preventing longitudinal movement of the head, while permitting its rotative movement. The steering-head at its lower end is provided with a foot $k^\times$, pivoted at its inner or rear end with the connecting-rod c^6 and suitably supported at its outer end, substantially as shown and described in another application, Serial No. 667,391, filed by me January 21, 1898. The rotative movement of the steering-head serves to swing the wheel-spindles in one direction or the other to steer the vehicle. This particular mechanism is not described in detail herein, as it forms no part of this invention. The overhanging upper end of the steering-head is provided with a suitable nut h^7, which forms a bearing for a sliding tubular extension H^2, rigidly connected at its inner end with a sliding block h^8, movable longitudinally within and supported by the overhanging arm H′. The extension H^2 is provided at its outer end with ears h^9, in which is mounted the transverse or substantially-horizontal pivot $h^\times$ of a hand-controller H^3, the controller being upturned, as shown in Figs. 1, 4, and 6, relatively to the extension H^2 and shaped to be conveniently grasped by the hand of the operator, the base h^{10} of the controller being represented in Fig. 4 as having segmental teeth h^{12} to mesh with a beveled pinion h^{13}, fast on a tubular shaft h^{14} within the extension H^2, a bearing h^{15} within the enlarged outer end of the extension supporting the tubular shaft h^{14} adjacent the pinion. Inside of the tubular shaft is extended a second shaft h^{16}, mounted at its outer end in a long bearing $H^\times$, preferably forming a part of the overhanging arm, said shaft member h^{16} having at the outer end of the bearing a crank h^{17} and at its inner end a ring or flange h^{18}, thereby preventing any longitudinal movement of the shaft h^{16}, it, however, being connected to rotate with the concentric hollow shaft h^{14} by a spline or feather, as h^{19}, Fig. 4. The controller H^3 is manually operated and is adapted to be grasped by the hand of the operator and manipulated, as will be described, to control the movement of the vehicle. A tipping movement of the controller on its fulcrum $h^\times$ in the direction of the arrow 10, Fig. 4, effects rotation of the concentric shaft members h^{14} h^{16} to thereby rock the crank h^{17}, the latter being pivotally connected by a link h^{20} with a bell-crank lever h^{21}, mounted on a suitable bracket B^2, depending from the vehicle-body. This bell-crank lever, as shown in Fig. 1, operates and controls by the connections h^{22} h^{23} the throttle T of the motor, as herein represented, and thereby the speed of the vehicle will be controlled by a tipping movement of the controller H^3, it being of course understood that the throttle is the controlling device for a steam or other expansible-medium motor, and my invention is not restricted to the use of such motor, as manifestly the control of the speed of the vehicle may be effected by the tipping movement of the controller and suitable intermediate connections with any type or character of motor.

By moving the controller H^3 laterally—that is to say, swinging it to the right or left with its support H^2, which is the longitudinally-movable extension of the overhanging arm H′—the steering-head H will be rotated to thereby steer the vehicle in one direction or the other, and the tipping movement of the controller can be effected at any part of the lateral path of movement of the overhanging arm and the controller carried thereby.

It is desirable to provide convenient and effective means for quickly reversing the direction of movement of a motor-vehicle, and this reversal is effected in the present instance of my invention by a bodily longitudinal movement of the hand-actuated controller, as by moving the extension H^2 longitudinally within or relatively to the overhanging arm of the steering-head. When the extension is so moved, it is supported and guided by the nut h^7 and slide-block h^8. Any suitable reversing mechanism (indicated at R, Fig. 1) may be employed, and the reversing mechanism is connected by links r r' and bell-crank levers r^2 r^3 with the extension H^2 by means to be described.

The lower end of the steering-head is embraced by a sliding collar r^4, having horizontal segmental ears r^5 in parallelism and adapted to receive in them a pin r^6 on the bell-crank lever r^3. The head H is vertically slotted at h^{25} to receive therethrough a pin h^{26}, having its ends secured to the sliding collar r^4 and connected with the lower end of a link h^{27} within the head, said link at its upper end having rigidly attached to it a yoke h^{28}. The axle h^{29} of a roll h^{30} is mounted rotatably in the arms of the yoke, said roll traveling within the steering-head, and short links h^{31} are pivotally mounted at their lower ends on the axle h^{29} and at their upper ends to the axle h^{32} of a second roll h^{33}, the axle h^{32} being in turn connected by a pair of curved links h^{34} with the slide-block h^8 by suitable pivots h^{35}, only one of the links h^{34} being shown in Fig. 4. The rolls h^{30} and h^{32} simply act as antifriction supports or guides for the jointed connection between the extension H^2 and the sliding collar r^4, and by an inspection of Fig. 4 it will be seen that the longitudinal movement of said extension will raise or lower the sliding collar r^4 to thereby rock the bell-crank r^3 and operate the reversing mechanism R. The hollow shaft h^{14} moves longitudinally with the extension H^2, but by the spline or feather h^{19} it can be

moved longitudinally relatively to the shaft h^{16} without correspondingly moving the latter.

When a steam or other expansible-medium motor is used, it is very desirable to prevent any reversal of the motor unless the throttle be closed, and for this purpose I have provided the tubular shaft h^{14} with a lug or ear h^{36}, extended through a transverse segmental slot h^{37} in the extension H^2 and adapted when the parts are in the position shown in Fig. 4 to enter and move longitudinally in the slot or groove h^{38}, formed in the interior of the overhanging arm. When the lug h^{36} is in the slot or groove h^{38}, rotative movement of the sleeve h^{14} will be prevented, so that during the operation of reversing the throttle or other speed-controlling device of the motor must be in such condition as to stop the latter.

In Fig. 4 the parts are shown in position to go ahead and the throttle of the motor is supposed to be shut, so that tipping of the controller H^3 in the direction of the arrow 10 will start the motor, and hence the vehicle will be propelled in a forward direction. If it be desired to reverse the vehicle, the controller must be brought back to the position shown in Fig. 4, thus bringing the lug h^{36} opposite to the guide-slot h^{38} in position to enter the latter and then a bodily longitudinal movement to the right, viewing Fig. 4, will draw the extension H^2 in the same direction sufficiently to operate the reversing device, and when the lug has passed from the right-hand end of the groove h^{38} the throttle can be again opened and the vehicle will move backward.

I have herein represented a steam-motor which may be substantially such as shown in the United States Patent No. 601,218, granted to me the 22d day of March, 1898, and comprising an upright boiler M, suitably mounted on the vehicle-body B, the upright cylinder or cylinders being contained in a casing M′, secured to the exterior of the boiler and communicating with the interior thereof, as in the patent referred to. Strong brackets or webs M^2 are secured to the boiler to form a support for a transverse axis m, on which are mounted two, as herein shown, actuators N N′, shown as bell-crank levers connected at their inner ends by short rods n n' with the piston-rods of the cylinders, one of such rods, as P, being shown in Fig. 1. The bell-cranks are preferably made double or bifurcated at their free ends and form bearings for tapered lugs n^8, (see Fig. 2,) oppositely extended from the ball member $n^\times$ of a ball-and-socket joint, the ball member being held in place by suitable retaining-nuts n^4. The boxes forming the socket member of the joint are made in two parts n^5 n^6, and, as shown in Fig. 2, they are cupped out or properly shaped to receive the ball $n^\times$, while permitting some slight rotative movement of the ball relative to the socket member. The socket members n^5 n^6 are held together by suitable bolts n^7, which latter also pass through the flattened head o' of the connecting-rod o, which transmits the rocking movement of the actuating members N N′ in the rotative movement of the crank-shaft, to be described, the rocking actuators being set angularly relative to each other to correspond to the setting of the cranks of the crank-shaft, as shown best in Fig. 1.

The wheel-shaft has intermediate bearings f, (see Figs. 1 and 2,) preferably located near and at opposite sides of the center of the shaft, said bearings forming part of a hanger comprising, preferably, stout tubular members $f^\times$, held in place in socketed portions of the bearings below the shaft by bolts 18 and upwardly and forwardly inclined to pass above the intermediate cross-bar a^3 of the frame, the upper ends of said tubular members being rigidly connected by a T-coupling F, to which they are braced or secured in other suitable manner, the said coupling having a pivot-bolt f' extended through it and through the cross-bar a^3, the latter being embraced and strengthened by a collar f^2 below the coupling and through which the pivot-bolt extends, the latter being headed at one end and secured in place by a suitable nut f^3 at its other end, the collar also serving as a bearing for the coupling F, as shown in Fig. 3. The members $f^\times$ practically form the sides of the yoke, connecting the crank-shaft and the wheel-shaft b to prevent any relative twisting movement of said shafts, so that the latter will always be maintained in parallelism. Upon the side bars or distance members $f^\times$ of the hanger are rigidly secured by bolts 75 bearing-blocks F′, which support below the said members, as herein shown, a shaft F^2, provided at its ends with cranks F^3, represented as set quartering and jointed, respectively, to the connecting-rods o, extended from the rocking members N N′ of the motor, the rocking movement of the actuators effecting rotative movement of the crank-shaft. The cranks are provided with partly-spherical crank-pins f^4, one of which is shown in dotted lines in Fig. 2, which enter socket members f^5 f^6, held together by bolts 23, which also pass through and secure to the socket member the flattened upset end o^2 of the connecting-rod, and by referring to Fig. 2 it will be seen that the said connecting-rods are jointed or attached to the rocking actuators of the motor and to the cranks of the crank-shaft by universal joints.

The motor, it will be remembered, is yieldingly supported upon and relatively to the frame of the vehicle, and the crank and wheel shafts are mounted in bearings carried by the latter, and the joining of the connecting-rods to the crank-shaft and actuating members of the motor, as described, permits the various relative movements of the body and frame without beuding, twisting, or in any manner straining the connecting-rods o, while the latter are longitudinally inflexible and act alternately as compression and tension members. This particular feature of construction is not broadly claimed herein, as the same

forms the subject-matter of claims in my other application hereinbefore referred to and filed concurrently herewith.

The crank and wheel shafts are connected or made to coöperate by any suitable power transmitting and changing connection, herein shown as a sprocket-chain $V^{\times}$, passing around suitable sprocket-wheels V V', mounted upon and rotatable with the crank and wheel shafts, respectively, the wheel V being mounted between the bearings F', while the sprocket-wheel V' is mounted on the wheel-shaft between its intermediate bearings *f*. Distance-rods f^7 are herein shown as screwed into the threaded bosses f^8 on the crank-shaft bearings F' and extended through ears 33 of the bearings *f* and securely held in place in the ears by check-nuts 35 36, Fig. 1, the brace-rods f^7 being connected to the bearings *f* above the wheel-shaft and serving to additionally brace, strengthen, and stiffen the hanger. When the chain becomes slack from wear or from any other cause, it can be tightened by means of the distance-rods f^7, the check-nuts 35 and 36 being manipulated to increase the distance between the wheel-carrying shaft and the crank-shaft after the bolts 75 of the bearings F' have been loosened. Such increase of distance between the shafts necessitates the adjustment of the bearings F' to a point nearer the forward upper end of the hanger, and they are clamped when adjusted by the bolts 75. Obviously the change in the position of the crank-shaft requires a change in the position of the motor on its support, as the distance between the motor and crank-shaft is maintained constant by the distance-rods M^5, to be described. Accordingly the boiler M is represented as having laterally extended and depending ears m^{50}, Fig. 1, at each side to receive bolts m^{51}, extended into the vehicle-body, said bolts passing through longitudinal slots m^{52} in the ears, so that when the bolts are loosened the motor can be adjusted longitudinally relative to the body or other support. A slotted ear m^{53} is shown in Fig. 1 secured to the back of the boiler to rest upon a cross-bar B^5 of the body, a retaining-bolt m^{54} passing through the slot m^{55} in the plate. Should there be any flexure of the frame, the hanger can turn slightly on its pivot-bolt *f'*, but when so turning the crank and wheel shafts will still be maintained in parallelism and equidistant from each other.

I have herein represented the sprocket-wheel V' as larger than the crank-shaft sprocket-wheel, indicating a reduction in speed, and it will be manifest that by varying the relative diameter of the two sprocket-wheels I can increase driving power at the expense of speed, or vice versa, and not only this, but I am not restricted to one rotation of the wheel-shaft for each rotation of the crank-shaft, the latter operating in unison, of course, with the motor. In applying this propelling mechanism to heavy vehicles—such, for instance, as trucks—it is desirable to utilize all of the power possible at the expense of some speed, and the construction herein shown is well adapted for such use. By bringing the crank and wheel shafts near together the length of the transmitting sprocket-chain is greatly shortened, and its cost thus reduced, and I am also enabled to conveniently incase or cover the chain in a suitable protective covering to prevent the access of dust and dirt thereto.

In the vehicle forming the subject-matter of my application Serial No. 667,391 the wheel-shaft is connected directly with the motor by a power-transmitting chain which must of necessity be quite long, and said chain must also of necessity depart from a true plane passing at right angles through the wheel-axle when the body and frame of the vehicle have relative movement, and this tends to and does more or less twist the sprocket-chain, so that the wear upon it is greatly increased; but in the construction herein shown the chain must always travel in the same path and without any twist owing to the rigid connection between the crank and wheel shafts.

It is desirable to preserve a fixed and uniform distance between the fulcra of the actuating members N N' of the motor and the crank-shaft, and for this purpose distance-rods M^5 are shown as connected at their forward ends by a ball-and-socket joint M^6 with a cross-bar M^4, secured at its ends to hangers M^3, rigidly secured to and depending from the webs M^2, one of the ball-and-socket connections being shown in section in Fig. 2 and not needing detailed description, as the same is similar to the ball-and-socket connection between the connecting-rods and the parts to which they are jointed. The rear end of each connecting-rod is connected by an upright pivot m^6 (see dotted lines, Fig. 1) with a yoke m^7, connected by a transverse pivot m^8 with each crank-shaft bearing-block F', the pivots m^8 providing for up-and-down movement of the motor relative to the frame of the vehicle, while sidewise movement of the motor is provided for by the upright pivots m^6, the latter being substantially at right angles to the pivot members m^8.

I have not shown in detail herein any compensating mechanism for the wheel-shaft, as such mechanism may be of any suitable construction, and the sprocket-wheel V' will form the driving member of such mechanism substantially as shown in my application Serial No. 667,391.

I have herein shown and described one practical embodiment of my invention without attempting to illustrate the various changes and alterations which may be made therein without departing from the spirit and scope of my invention.

Collars 42 may be secured to the wheel-shaft at the outer sides of the bearings *f* to prevent longitudinal movement of the shaft relative thereto.

Among the advantages accruing from the

use of a vertical acting motor, such substantially as herein shown, one of the most important is the reduction or neutralization of the vibrations which the operation of the motor tends to set up as the vibrations of the vertical and horizontal acting members to a very considerable degree operate against each other. Again, the close proximity of the engine proper to the steam-generator shortens the necessary steam passages or connections, thereby reducing to a minimum the condensation due to such connections, and by its elevated position the engine is further removed from and better protected from the action of the dust of the highway over which the vehicle travels.

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

1. In a road-vehicle, propulsion devices, steering, speed-regulating, and reversing mechanisms, a manually-operated controller for the vehicle, controlling means intermediate said controller and said mechanisms, the said controller having a main swinging movement to steer the vehicle, and auxiliary fore-and-aft tipping and bodily longitudinal movements, whereby the speed-regulating and reversing mechanisms are governed as to their operation by the auxiliary movements of the controller.

2. In a road-vehicle, propulsion devices, steering, speed-regulating, and reversing mechanisms, a common manually-operated controller for the vehicle, operating connections between the controller and said mechanisms, said controller having a lateral movement to steer the vehicle, and also having auxiliary independent fore-and-aft tipping and bodily longitudinal movements at all points in the path of lateral movement, one of said auxiliary movements governing the speed-regulating mechanism, the other auxiliary movement governing the reversing movement.

3. In a road-vehicle, propulsion devices, steering, speed-regulating, and reversing mechanisms, a common manually-operated controller for the vehicle, operating connections between the controller and said mechanisms, said controller having a lateral movement to steer the vehicle, and also having auxiliary independent tipping and bodily longitudinal movements in the path of lateral movement, one of said auxiliary movements governing the speed-regulating mechanism, and the other auxiliary movement governing the reversing movement, and means to prevent bodily movement of said controller when the speed-regulating mechanism is in operation.

4. A road-vehicle having steering and propelling mechanisms, speed-regulating and reversing devices for the latter, and controlling means for the vehicle, including a manually-operated member movable in a single path to steer the vehicle, said member being also capable of bodily longitudinal movement in and at any part of said path, and of tipping in the direction of such longitudinal movement to vary the speed of and to reverse the direction of movement of the vehicle, by said movements.

5. In a road-vehicle, propelling mechanism and devices for regulating the speed of and reversing the same, and steering mechanism for the vehicle, including a steering-head, combined with a manually-actuated controlling member, a support therefor rigidly mounted on the head and movable laterally by and with corresponding movement of said member to steer the vehicle, said controlling member being constructed to tip fore and aft relative to said support and to be moved bodily longitudinally relative to the support, and connections between the controlling member and the speed-regulating and the reversing devices, to operate the said devices by the tipping and the bodily longitudinal movements of the controlling member to thereby regulate the speed and reverse the direction of movement of the vehicle.

6. In a road-vehicle, propelling mechanism having speed-regulating and reversing devices, a steering-head for the vehicle, having an overhanging arm adapted to be swung laterally, a manually-controlled tipping member mounted to slide longitudinally on said arm and also adapted to tip fore and aft relatively to the arm, connections between said member and the speed-regulating device, to operate the latter by the tipping of said member, and connections between the latter and the reversing device, to be operated by bodily longitudinal movement of said manually-actuated member.

7. In a motor-vehicle, driving-wheels, a motor, a crank-driving member, a longitudinally-rigid, universally-jointed, actuating connecting member between the motor and crank member, and power-changing transmitting means between the crank member and the driving-wheels.

8. In a motor-vehicle, driving-wheels, an axle connecting them, a crank-shaft, an endless flexible power-transmitting connection between it and the wheel-axle, a yieldingly-supported motor for the vehicle and connecting-rods between the motor and crank-shaft, to rotate the latter, said connecting-rods being united by universal joints to the crank-shaft and the actuating members of the motor.

9. In a motor-vehicle, connected crank and wheel shafts, driving-wheels attached to the latter, a yieldingly-supported body, a motor mounted thereon, having rocking actuating members, connecting-rods between said members and the crank-shaft to effect rotation of the latter, universal joints between said rods and the parts to which they are attached, and longitudinally-constant distance members jointed to and connecting the motor and the crank-shaft bearings.

10. In a motor-vehicle, driving-wheels, a

shaft connecting them, a crank-shaft, a sprocket-wheel on each shaft and a sprocket-chain connecting them, means to maintain a fixed distance between said shafts, a yieldingly-supported motor, connecting-rods between its actuating members and the crank-shaft, to rotate the latter, universal joints connecting the rods with the actuating members and the crank-shaft, and distance members between the motor and crank-shaft.

11. In a motor-vehicle, a shaft, driving-wheels attached to it, a yieldingly-supported motor, a crank-shaft between it and the wheel-shaft, universally-jointed connecting-rods intermediate the motor and crank-shaft, to rotate the latter, and power-changing transmitting means connective of the crank and wheel shafts.

12. In a motor-vehicle, a frame, a shaft mounted in bearings on the frame, driving-wheels attached to the shaft, a hanger connected with the frame and having intermediate bearings for the wheel-shaft, a crank-shaft carried by the hanger, power-transmitting means connecting the shafts, a motor, and actuating connecting-rods between the motor and crank-shaft, to rotate the latter.

13. In a motor-vehicle, a frame having depending bearings at its rear end, a driving-wheel shaft mounted in said bearings, a bifurcated hanger pivotally connected with the frame and having center bearings for the wheel-shaft, a crank-shaft mounted on the hanger, a sprocket-chain and sprocket-wheels transmitting power from the crank to the wheel-shaft, a yieldingly-supported motor, and connecting-rods universally jointed to the actuating members of the motor and to the crank-shaft to rotate the latter.

14. In a motor-vehicle, a frame, driving-wheels and an intermediate connected gear, all supported by the frame, a bifurcated hanger attached at or near its apex to the frame and supported at two other points at opposite sides of the gear, a second gear mounted on the hanger, the gear axes being maintained in parallelism by the hanger, and power-transmitting means between the gears.

15. In a motor-vehicle, a frame, driving-wheels and an intermediate connected sprocket-wheel, all supported by the frame, a bifurcated hanger attached at or near its apex to the frame and supported at two other points at opposite sides of the sprocket-wheel a second sprocket-wheel adjustably mounted on the hanger, the latter maintaining the axes of said sprocket-wheels in parallelism, a sprocket-chain connecting the sprocket-wheels, and means to vary the distance between the latter, to take up slack of the chain.

16. In a motor-vehicle driving-wheels, a substantially vertically acting motor, a crank-shaft, means to convert the vertical action of the motor into substantially-horizontal action to operate the crank-shaft, and power changing and transmitting means between said crank-shaft and driving-wheels.

17. In a motor-vehicle, a frame, wheel-carrying and crank shafts mounted thereon, power-transmitting connections between said shafts, a yieldingly-supported motor, connecting-rods between the motor and crank-shaft, to rotate the latter, universal joints connective of said rods and the members to which they are attached, and longitudinally-rigid, universally-jointed distance members intermediate said motor and the crank-shaft to maintain a fixed distance therebetween while permitting free yielding movement of the motor.

18. In a motor-vehicle, a frame having bearings, a shaft mounted therein and driving-wheels attached to the shaft, a cross-bar on the frame, rigid hanger members connected at their upper ends to each other and to the cross-bar and having at their lower ends center bearings for the wheel-shaft, a crank-shaft, bearings therefor adjustably secured to the hanger members, a power-transmitting connection between the shafts, the latter being maintained in parallelism by the hanger members, and adjustable distance-rods between the crank and wheel shaft bearings.

19. In a motor-vehicle, motor mechanism comprising both vertical and horizontal acting driving members, with power-changing means intermediate the horizontal-acting members and the vehicle-driving wheels.

20. In a motor-vehicle, a frame, driving-wheels supported thereon, a yieldingly-supported motor, a shaft mounted on the frame, actuating means between the motor and said shaft, to rotate the latter, and power-transmitting connections between the shaft and the driving-wheels, and means to maintain the axes of said shaft and driving-wheels a predetermined distance apart and in parallelism.

21. In a motor-vehicle, a frame, driving-wheels, and a connecting-shaft therefor mounted on the frame, a gear on the said shaft, means having a single connection with the frame and connected with the wheel-shaft at each side of the gear thereon, a second gear mounted on said means, the latter maintaining the gears a predetermined distance apart with their axes in parallelism, and power-transmitting means between the gears.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE E. WHITNEY.

Witnesses:
GEORGE B. UPHAM,
NATHANIEL H. COOLEDGE.