nected for movement together under the control of said movable part of said means so as to operate said movable contact to thereby close said switch and said circuit within which the switch is included, one of said movable members of said switch being subsequently independently movable relative to the other movable member and under the control of said movable part of said means thus permitting further movement of said movable part of said means in said reverse or opposite direction after the circuit has been closed, and an electrically controlled automatic valve mechanism under the operative influence of said circuit when closed for causing the supply of air to the combustion chamber, in greater volume than is possible to enter through the carburetor because the area of the automatic valve port is greater than the capacity of the carburetor.

7. The combination with an internal combustion motor having a combustion chamber, a carburetor having a throttle, means whereby to control the throttle to supply an explosive fluid to the combustion chamber when a member or part of said means is moved in one direction, an electrical circuit, a switch in said circuit, said switch including an engaged contact and a movable engaging contact, which movable engaging contact comprises movable arms operatively connected for movement together under the control of said member or part of said means to operate said switch to thereby close said circuit when said member or part is moved in the reverse or opposite direction, one of said arms being subsequently independently movable relative to the other under the control of said member or part of said means in order to permit further movement of said member or part after the circuit has been closed by and because of the engagement of said contacts, an electrically controlled automatic valve mechanism under the operative influence of said circuit for causing the supply of air to the combustion chamber when said circuit is closed, and an air pressure control switch connected in the aforesaid circuit for coaction with the aforesaid switch whereby to open said circuit and thereby cause an automatic closing of said electric valve mechanism when the pressure effect of the air on said air control switch falls to or below a predetermined amount.

8. The combination with an internal combustion motor having a combustion chamber, a carburetor having a throttle, means whereby to control the throttle to supply an explosive mixture to the combustion chamber when said means is moved in one direction, an electrical circuit having a switch which is open when said means has been moved in said one direction, which switch in said circuit includes contacts, one of which contacts comprises movable arms operatively connected for movement together under the control of said means to operate said switch to thereby close said circuit when said means is moved in the opposite direction, one of said arms being independently movable under the control of said means to permit further movement of said means after the circuit has been closed, an electrically controlled automatic valve mechanism under the operative influence of said circuit when closed for the supply of air to the combustion chamber when the circuit is closed, and an air pressure controlled switch device connected in the aforesaid circuit for coaction by the aforesaid switch whereby to control the periods when said circuit can become or can stay closed and thus control the operation of said automatic electric valve mechanism.

9. The combination with an internal combustion motor for motor vehicles having a combustion chamber, a carburetor having a throttle, means whereby to control the throttle to supply an explosive to the combustion chamber when said means is moved in one direction, an electrical circuit comprising a switch which is open when said means has been moved in said one direction, which switch in said circuit includes an engaged contact and an engaging contact, the latter of which contacts comprises an operated arm and an operating arm, which arms are operatively connected for movement together under the control of said means to operate said switch to thereby cause said contacts to engage each other and thereby close said circuit, the operating arm being subsequently independently movable in respect to the operated arm and under the control of said means to permit further movement of said means after the circuit has been closed, an electrically controlled automatic valve mechanism in said circuit for the supply of air to the combustion chamber, an air pressure controlled switch device connected in the circuit for coaction with the aforesaid switch whereby to control said automatic electric valve mechanism and including a casing, a diaphragm carried by the casing and arranged to function to control the switch according to air pressure conditions against the diaphragm, and means carried by the casing for controlling the degree of actuation of the diaphragm and thereby the functioning of the diaphragm in accordance with the degree of locomotion of the vehicle.

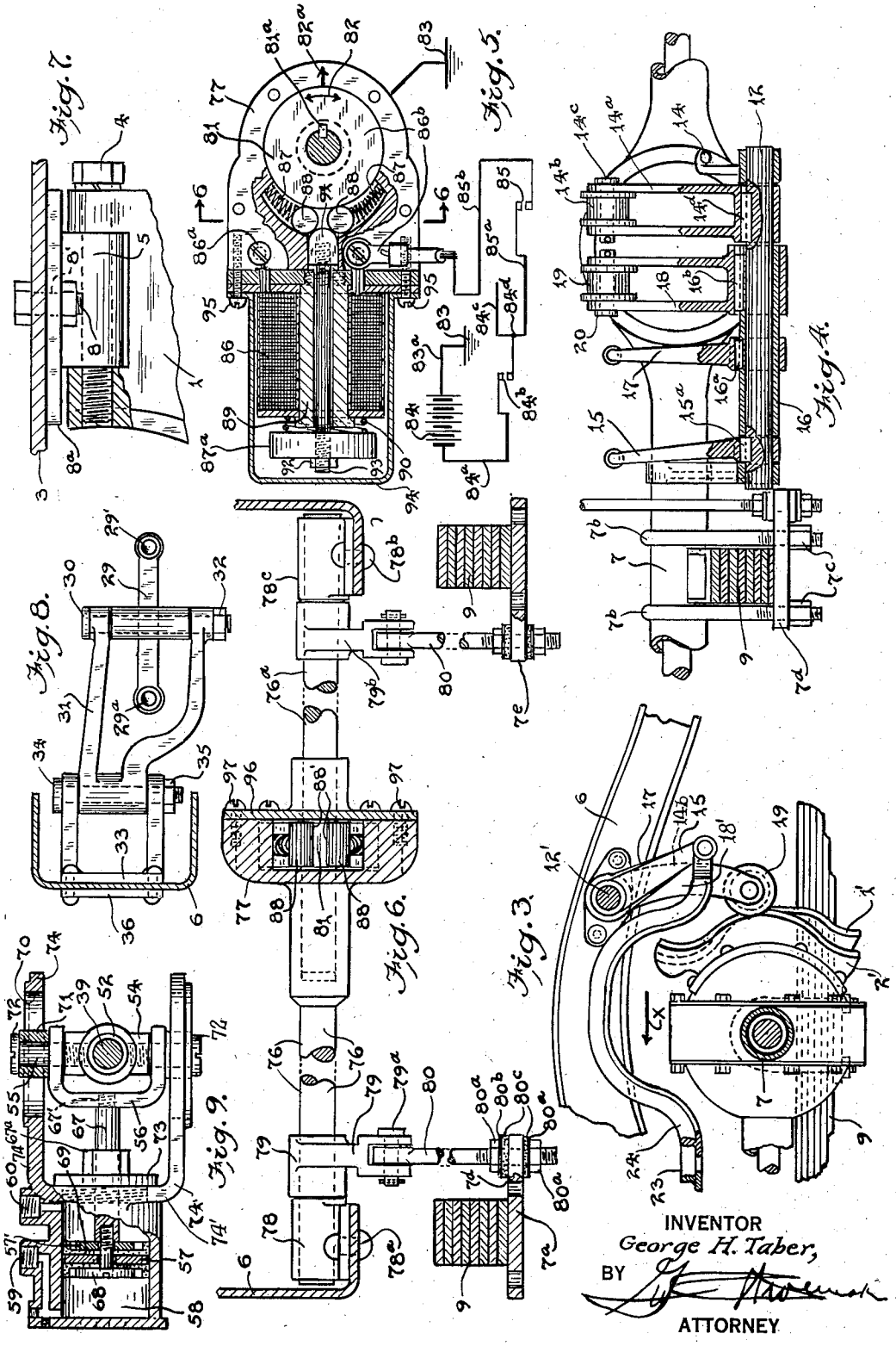
10. The combination with an internal combustion motor having a combustion chamber provided with an intake manifold and having a carburetor communicating with the intake manifold and provided with a throttle and an accelerator for actuating the throttle to control the supply of a combustible mixture from the carburetor to the combustion chamber through the intake manifold for power producing purposes, of an automatic operating valve including a casing having communication with the intake manifold at a point between the combustion chamber and the carburetor and an automatic valve member normally closing such communication said automatic valve member including a seat against which said valve member is normally seated, said valve member having a depending member providing a passage therein leading into the communication space between said valve member and the combustion chamber, a supplemental valve normally closing the passage in said depending member, and means for moving said valve member off said seat and simultaneously moving said supplemental valve therewith and off said depending member so as to establish communication through and past the automatic valve to the combustion chamber to permit the direct air supply to the latter in a manner to lessen the engine suction effect on the carburetor and thereby cause the exclusion of the supply of combustible mixture to the combustion chamber from the carburetor while the air is being supplied to the combustion chamber and regardless of the position of the carburetor throttle.

11. The combination with an internal combustion engine having a combustion chamber provided with an intake manifold, a carburetor having a throttle and an accelerator, a rod connect-

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VARIABLE COMPENSATION FOR CONTROLLING THE SUPPORTING STRENGTH OF VEHICLE BODY RESILIENT SUSPENSION MEANS

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VARIABLE COMPENSATION FOR CONTROLLING THE SUPPORTING STRENGTH OF VEHICLE BODY RESILIENT SUSPENSION MEANS

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This invention relates to a variable compensation means for controlling the supporting strength of vehicle body resilient suspension means.

It is well known in the motor vehicle art that the resilient supporting means or springs which support the vehicle body, if made weak enough to permit one passenger to ride comfortably, then, when more passengers enter the vehicle to be carried thereby, the extra weight thereof causes the resilient supporting means or springs to be compressed beyond the desired limit, and as a result, the body frame, to the discomfort of the passengers, is continually "striking" parts of the running gear of the vehicle. The "weak" springs, to the discomfort of the passengers, also permit undue side sway of the body as on suddenly steering the vehicle to the right or left from a straight course.

Heretofore, where the vehicle body has been resiliently supported on its running gear by springs of ample supporting strength for a fully loaded vehicle body, then, when only one passenger or a minimum load has been carried, the passenger or the light load, suffer the undesirable results of supporting springs that are far too strong for such a load. Strong springs for the resilient support of the vehicle body, therefore render greater resistance to the side sway of the vehicle body when making the aforesaid sudden turns to the right or left from a straight course.

By means of the present invention, it is possible to retain the advantage of the strong spring to support maximum loads and to resist side sway of the vehicle body, and coincident, to increase the range of the resilient supporting action of the vehicle springs through the instrumentality of a cam mechanism having contour surfaces which are operable in conjunction with other means, whereby a portion of said cam contours will resiliently support the vehicle body, with various degrees of supporting strength and adjustable to the weight of the varying loads, such supporting action being provided as, when, and after the spacing between the vehicle body frame and the running gear becomes so great that the vehicle springs do not render sufficient support to prevent sudden descent of the vehicle body as a result of the sudden maximum spacing between the body frame and the running gear.

The two-cam mechanism, in the present instance, is placed so that its controlling effects will act upon and between the body frame and the running gear at related locations which are situated near the middle of a running gear axle member having a wheel near each end thereof. By virtue of this arrangement, the strong vehicle springs resist side sway, whereas the mechanism controls against the normal variations in the strength of the vehicle springs so as to permit the running gear to move toward or from the body frame by the aid of the two-cam mechanism which prevents the occurrence of undesired changes in the supporting power or strength of the resilient supporting means, common to the ordinary vehicle spring action as it functions as a vehicle body resilient supporting means.

Due to the location of this two-cam controlling means being located so that its controlling effects will be active on the middle of the running gear axle member, an anti-side sway means is provided, which is under the control of the operator and which is normally set to be non-effective against side sway but which is so arranged as to resist side sway when the supporting action of the device is supporting the vehicle body frame at a mid or central point.

By virtue of the present invention there is provided a riding condition that is even or uniform to the passengers or loads, and which would be an impossibility were it not for its provision to adjust the strength of the vehicle springs, to permit desired space between the body frame and the running gear and thereby obtain the practical and comfortable riding condition.

It is, therefore, one object of the present invention to provide a cam device having two different contours for vehicle spring controlling purposes, one contour being for the proper control of the vehicle springs when the body frame is carrying a full load, the other cam contour being for the proper control of the vehicle suspension springs when there is a minimum load carried on the body frame and thereby permit the desired space between the body frame and the running gear.

Another object of the present invention is to provide a two-cam device for controlling against the normal variations in the strength of the resilient support of vehicle springs and to supply additional resilient support between the vehicle body frame and the running gear, as, when, and after the vehicle spring gradually ceases to render such support, due to a maximum of space between the body frame and the running gear, this extra range of resilient support being of various strengths to properly accommodate relative various weights of loads.

Another object of the present invention resides in the provision of an energy storing means, a two contoured cam device, and a compensating

means associated with the energy storing means and the cam device and operable so as to regulate the spacing between the body frame and the running gear with the compensating means adjustable to control the supporting strength of the vehicle springs so that the strength thereof will be correct for loads carried by the body frame that are less than the maximum load and more than the minimum load, the resilient support provided for the body frame beyond the limit of the vehicle springs being of a strength relative to the possible intermediate weights of supported loads.

Another object of the invention is to provide means under the control of the operator to resist side sway when the vehicle body frame is resiliently supported by the present device at a central point of the body frame, above the point where the body is supported by the vehicle springs, and which side sway controlling means is normally inoperative or inactive.

Another object of the invention is to provide means under the control of the operator which is operable to shift the effective contact of the controlling force from one cam contour to the other cam contour or to various locations intermediate to said effective contacts whereby the mechanism is adjustable to various loads carried by the body frame, the said controlling means being operable by the power of the propelling means or by manual effort.

A still further object of the present invention is to permit the wheeled running gear to move toward or from the vehicle body by assisting said movement in either direction through the instrumentality of stored energy and a cam mechanism as the means for creating said assistance to the running gear vertical movements toward or from the vehicle body.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and set forth in the claims hereto appended, it being understood that various changes in the form, proportion, and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit of the invention or sacrificing any of the advantages thereof.

In the drawings:—

Figure 1 illustrates a fragmentary portion of a power propelled vehicle in plan view, the load carrying body having been removed in order to illustrate the manner and arrangement or attachment of the invention to common parts of the vehicle.

Fig. 2 is a side elevation partly in section, illustrating the difference in contour of the two cam devices for the proper control of loads.

Fig. 3 illustrates a reversal of the cam arrangement of Fig. 2, the cam devices being shown as located directly on the axle of the vehicle instead of being fastened to a frame part as in Fig. 2.

Fig. 4 is a rear fragmentary view partly in elevation and partly in section.

Fig. 5 illustrates an electrical control device, diagrammatically and in fragmentary section and which is one embodiment of the invention whereby to control against the side sway of the vehicle body on turns or highly crowned roads as when the vehicle springs have lost their supporting effect due to extra space between the frame and the running gear.

Fig. 6 is a transverse sectional view through the body of the frame, parts being removed, the view being solely for the purpose of illustrating in a fragmentary manner the means for preventing side sway of the vehicle body and which is shown as taken on the line 6—6 of Fig. 5.

Fig. 7 illustrates partly in elevation and partly in section one particular means for swingingly or hingedly mounting the cam devices to the body frame.

Fig. 8 is a transverse sectional view on the line 8—8 of Fig. 1, illustrating the carrier link which supports the load compensation runway.

Fig. 9 is a sectional view on the line 9—9 of Fig. 1 illustrating partly in elevation and partly in section one type of hydraulic device or means adapted to operate the load compensating means so that the force of the storing energy means may be applied in desired degrees to either cam or to both cams.

Referring now more particularly to the accompanying drawings, there is illustrated a cam mechanism which includes two spaced cam devices 1 and 2. The cam device 1 has an irregular cam contour designed to correspond to the force of the stored energy for controlling purposes and, therefore, it is formed relatively to the weight carried, the strength of the vehicle spring indicated at 9 and the desired speed of the permitted movements of the vehicle body. This cam is for the control of the vehicle spring when the maximum load is carried.

The cam 2 has a cam surface contour which differs from the cam surface contour of cam 1 and it is designed for controlling the strength of the vehicle springs for a minimum load on the vehicle body. The heavy dash marks or lines indicate the zones of the controlling action as C and D, as indicated in Fig. 2. In the D zone, the contour of cam 1, renders additional support of greater strength. This is required because of the heavier load. In zone D, the cam 2 does not provide as much additional support because the carried weight or load is much less.

The cam devices 1 and 2 are anchored in hinged relation or to swing from a frame cross member 3, there being a bolt 4 for each cam. The bolts have threaded engagement with the respective cams 1 and 2 and the hinge bolts each preferably swing in a tubular member 5 so as to compensate for the emergency arising in the event of the body frame 6 departing from a substantially parallel relation with the axle 7. The swinging or hinging means is illustrated on an enlarged scale and more particularly in detail in Fig. 7. The members 5 in which said bolts 4 operate whereby to hingedly mount the cams are anchored preferably on a cross member 3 of the body frame by means of bolts 8 which pass through apertures 8' in a plate 8a.

The vehicle body frame 6 is resiliently supported in the usual manner by common types of springs, one of which is indicated at 9. The spring 9 is mounted on the axle housing 7 in which housing the axle 7e is located and which axle carries the wheel 7f. The spring is secured at its forward end to the body frame by means of an eye bolt 10 or in any other common manner and it is also provided with a common shackle and shackle bolts connection at the other end and in the usual manner, but which is not illustrated and which is believed to be unnecessary for illustration when it is considered that the spring is connected to the vehicle body frame in the usual common manner.

The spring 9 may be fastened to the axle by means of the spring clips 7b and nuts 7c and the plate 7a. This is another common mounting or connection of the spring 9 intermediate its ends of the axle or the housing thereof.

The character 11 indicates a supporting arm which is secured in any suitable manner to the axle housing 7 and at the outer end of this arm 11 there is a suitable bearing formed integral therewith for a working fit with a short transversely located shaft 12. This shaft 12 is journaled at its other end in a bracket bearing support 13 which is anchored to the axle housing by means of bolts 14 or in any other suitable manner. On this shaft 12, as shown particularly in Fig. 4, is a forked member 14a which is tightly keyed to the shaft 12. A flanged frictionless roller 14b is pivoted at the outer end of the forked arm 14a, by means of a pin 14c. This roller is adapted to revolve on said pin 14c as the roller moves over the controlling contour surface of the cam 1. The pin 14c may be held in place by a cotter pin in its smaller end, as shown.

An arm 15 at or near the other end of the shaft 12 is tightly keyed to the shaft 12, thus making the arm 15 and the forked arm 14a move together as if composed of a single part with the shaft 12. Key and key ways at 14d and 15a make possible this unitary structure.

A heavy tubular sleeve 16 is mounted on the shaft 12. An arm 17 and also a forked arm 18 is carried by this sleeve 16 by means of key ways and keys 16a and 16b. The arm 17 and the forked arm 18 are thereby caused to move as a unitary structure with the sleeve 16. A flanged roller 19 is mounted to revolve in the outer end of the forked arm 18 by means of a pin 20 in the same manner as is mounted the aforesaid flanged roller 14b in the forked arm 14a. These forked arms 14a and 18 may be herein referred to as forked arms or as pairs of arms.

The arms 15 and 17 are provided at their outer ends with ball shaped portions 15' and 17' respectively, which are adapted to have universal joint action in sockets 21' and 22' formed at the rear ends of socket members 21 and 22 adjustably carried by the push rods 23 and 24 leading forward preferably in parallelism of the body frame. Nuts 25 and 26 are preferably mounted on screw threaded portions 23' and 24' of the rods 23 and 24 in association with the socket members 21 and 22 to tighten the connections between the socket members and the respective rods when adjusted on said screw threaded portions of the rods. This arrangement is shown quite clearly in Fig. 2.

The rods 23 and 24 may or may not be reduced at their forward ends but as shown they are reduced and at their forward reduced ends these rods 23 and 24 are made preferably ball shaped, as indicated at 23a and 24a, respectively. These ball shaped forward ends of the rods 23 and 24 are adapted to fit in correspondingly shaped sockets 29' and 29a at opposite ends of a runway member 29. This run-way member 29 constitutes part of a compensation means for the variations in the weight of the carried loads and it is supported for movement, fore and aft, so that the controlling force of the stored energy means to be hereinafter referred to, may be applied in desirable degrees through the medium of the flanged frictionless rollers 14a and 19 to the aforesaid cams 1 and 2.

The run-way 29 is supported in any suitable manner but it is preferably pivotally mounted at 30 on a link or lever 31, the pivotal connection being indicated at 30. This link or lever 31 is preferably of forked formation, as shown particularly in Fig. 8, wherein the forked carrier lever or link 31 is illustrated in detail. This forked link or lever member 31 is preferably swingingly supported on the body frame 6, it being connected to a member 33 by means of a pivot bolt 34 carrying the nut 35.

The member 33 is bolted, riveted or otherwise secured to the frame 6. As shown there is a plate 36 which coacts with the back of the member 33 as a reinforcement to the frame and to the member 33.

The energy storing means, previously referred to, is indicated generally by the reference character A and this energy storing means A includes a ram rod 39, to the inner end of which a frictionless flanged roller 37 is carried in a yoke 38, which is rigidly secured to or formed with the ram rod 39. This metal roller 37 may be termed a power roller and is adapted to revolve on a pin 40 which is secured against loss by the cotter pin 41. This roller 37 is capable of limited movement over the straight edge or surface 29c of the run-way member 29 and with which straight edge or surface the roller 37 is in constant engagement for rolling relation therewith.

The energy storing means A is mounted at one end on a cross member 42 secured in any suitable manner to the vehicle body frame 6 and this cross member 42 is formed to act as an abutment for the stored energy means and it may be provided with a ball-socket depression 43 to receive a globular portion 44' of a metal stamping 44 so that the stamping member may thereby have a swivel action. This metal stamping member 44 is preferably of cup-shape as shown and the globular portion 44' thereof extends rearwardly of the same into the socket 43, as shown particularly in Fig. 1.

The metal stamping 44 being cup-shaped, it provides an annular flange 44a which acts as a retainer for the forward ends of the outer and inner energy storing springs 45 and 46.

The springs 45 and 46 of the energy storing means are capable of having stored in them sufficient or potential power which will be able through the medium of the cams to properly control the strength of the vehicle springs or other resilient supporting means in a manner that reduces the vehicle body movement to a minimum coincident to the increased vertical speed and range of the running gear movement. The ram rod or power rod 39 is encircled by the inner and outer energy storing power springs 45 and 46, as shown and this ram or power rod 39 is in sliding engagement with the inside of the small or globular part 44' of the aforesaid stamped member 44, as indicated at 47 and as shown particularly in Fig. 1 wherein the globular part 44 is provided with the sleeve extension 47a to provide for a substantially slidable bearing connection between the stamped member 44 and the rod 39 and to insure laterally swinging movements of the rod 39 with the springs 45 and 46 or, in other words, to provide for an effective laterally swinging movement in opposite directions of the energy storing means A for a purpose presently understood.

The degree of stored energy desired to be attained in the springs 45 and 46 of the energy storing means A is governed or regulated by the threaded portion 48 of the rod 39 by means of the two nuts 49 and 49', provided for adjusting and

locking the same. These nuts 49 and 49' cooperate with a member 50 which is slidably mounted on the power rod 39 and which member 50 is cup-shaped to act as a spring retainer as does the cup 44. In other words, the cup 44 provides a retainer for the outer ends of the springs 45 and 46 while the cup 50 provides a retainer for the inner ends thereof. The spring retainer 50 also acts as a pressure plate between the nuts 49 and 49' and the springs 45 and 46. The power rod 39 has a threaded portion 51 whereat a sleeve may be slidably mounted over the rod 39. This sleeve is indicated at 39' at the left of Fig. 1 and is adapted to abut against the small extended bearing portion of the globular part 45' of the cup 44. The sleeve is held on the power rod 39 by means of a nut 51' operating on the threaded part 51 of the rod 39 whereby to compress the springs 45 and 46 sufficiently to permit easy installation or removal of any of the parts of the energy storing means structure. This nut 51' is of a size small enough to permit it to slide through the ball socket depression of the cross member 42, as for instance, when removal or installation of the energy storing means is desired.

The power roller 37 previously referred to, is illustrated in Fig. 2 as at a mid location on the straight edge or surface 29' of the run-way 29. In this position of the power roller 37, after all proper adjustments have been made, the mechanism herein illustrated and described will provide for an ideal riding condition and for a "half load" because the force of the stored energy means is applied in "halves" to each one of the two spring controlling cams 1 and 2. It is obvious that the flanged power roller 37 is limited in its travel over the straight edge of the run-way 29 and the purpose of this restriction of movement is to provide for a sufficient minimum pressure between the flanged rollers 19 and 14b and the respective cam surfaces of the respective cams so that rattling or disengagement between the cam rollers and the respective cams cannot occur from a lack of sufficient pressure between such parts.

When a full load is carried by the vehicle the power roller 37 assumes the dotted line position Z. When the minimum load is carried by the vehicle then the flanged power roller 37 occupies the position or location represented by the dotted lines Y.

It is now evident that loads less than the maximum and heavier than the minimum may be correctly compensated for by the location of the flanged power roller 37 at various points along the straight edge of the run-way 29 to correspond to the load carried, so that the space between the frame and the running gear may be adjusted to the desirable clearance and at the same time permit a preferred riding condition regardless of the load carried.

To provide for the said movements of the power roller 37 to different positions with relation to the run-way 29 it follows that the energy storing means A including its power shaft 39 must have lateral sliding movement in opposite directions and there is provided means for effecting these lateral movements of the energy storing means. For instance, the power rod 39 is slidable in a bearing 52, shown in detail in Fig. 9 and in section in Fig. 2. This bearing 52 is in the nature of a bushing and it is pressed in a cross head member 54. The cross head 54 is pivotally held to a desired position by stud bolts 55 which are in threaded engagement and locked thereby with the cross head 54. A forked yoke 56 has pivotal connection with the cross head 54 by means of the headed stud bolts 55 which pass through proper size openings in the forked yoke 56.

To shift the energy storing means and particularly the power shaft 39 and the power roller 37 to different locations along the run-way 29 it is necessary to use means capable to provide ample power or force to do so, and therefore, in this instance, a hydraulic actuator may be employed, such as shown particularly in Fig. 9 for such purpose. This hydraulic device is caused to be actuated from the influence of the hydraulic pump which in turn is operated by the energy of the motor of the vehicle or by hand, any common valved means being employed whereby the pressure of any hydraulic pump will cause the plunger or piston 57 (Fig. 9) to be forcibly moved to either end of its cylinder 58 or to any position midway thereof and thereafter to cause the piston 57 to remain as where desired by effectively blocking the passages 59 and 60 of the cylinder coincident to the blocking of the communicating pipes or tubes 61 and 62 which may be connected to any suitable common hydraulic pump (not shown). These pipes 61 and 62 are connected to the cylinder 58 as shown, by means of couplings as for instance, as indicated at 63 and 64 in Fig. 1.

The hydraulic actuator is anchored to the frame 6 in any suitable manner. As shown this is accomplished by means of the bolts 65 and 66. A forked yoke 56 is securely fastened to the piston rod 67, as at 67' and the piston assembly 57 is held to the piston rod 67 by means of the screw head 68. This piston assembly may consist of the piston head 57, the disk 57', packing cups 69 and 69', all held operatively together by means of a headed bolt or screw 68.

A yoke 74' projects from the cylinder head 73. This cylinder head has screw threaded engagement with the cylinder of the hydraulic actuating means and includes spaced arms 74 which project transversely of the vehicle beyond the longitudinally extending power shaft 39, as shown particularly in Figs. 1 and 9. Each arm 74 has a slot 70 therein. Bearings 71 on the aforesaid headed stud bolts 55 slide as bearings in said slots 70 of the arm 74. These bearings 71 have flat sides, as shown in Fig. 1, providing greater bearing area than would the stud bolts if the latter acted as the slide bearings. These bearings 71 are held between the legs or arms of yoke 56 and the heads 72 of the stud bolts 55. The stud bolts 55 extend through the bearings 71 and through the legs or arms of yoke 56 and into the cross head 54, as illustrated in Fig. 9, and by virtue of the even reciprocating movement of the slide bearings 71 in the slot 70 of the arms 74 of the yoke 74', there is a true line reciprocating movement of the piston rod 67, such as to prevent radial movement liable to cause looseness of the common piston rod packing (not shown) confined within the bushing 67a. As previously stated, the hydraulic mechanism may be operated by hand or by a suitable hydraulic pump or it may be operated by the energy of the motor of the vehicle.

Due to the two controlling cams 1 and 2, being located at the middle of the body frame or, in other words, substantially midway between the ends of an axle or substantially midway between oppositely disposed wheels of the vehicle, it is only natural that when the controlling means itself supports the body and the load

weight of the vehicle, after the vehicle springs have ceased to do so, because of the abnormal separation of the frame from the running gear, to the extent that the vehicle body is supported only by the resilient support of the controlling means that this controlled supporting action being located as stated, may result in or permit a side sway of the vehicle frame and consequently, a side sway of the vehicle body (not shown), due to the central point of resilient support, and therefore, a control for this ill effect may be required or at least is provided in the present instance, and by a means such as shown in Figs. 5 and 6. A number of different structures may be employed to prevent this side sway, due to the central or mid location of the artificial resilient supporting means. The means illustrated in Figs. 5 and 6 illustrates one means to accomplish the control against side sway and it is incidentally under the control of the operator of the vehicle. In this particular structure illustrated it is possible for the operator to prevent side sway by enclosing an electric circuit at his will, closing the circuit by means of a switch, when the vehicle body tends to sway or tip too much, for instance, when the frame and the running gear have moved the maximum distance from each other.

Referring to Figs. 5 and 6 there will be seen illustrated separated aligning shafts 76 and 76*a*. The section 76 of the shaft is formed preferably integral with a female clutch member 77. This shaft section 76 is journaled in a bearing member 78 secured by means of rivets 78*a* or otherwise to the body frame member 6.

An arm 79 is securely fastened to the shaft 76 by a key or other means and this arm has a jaw or yoke end provided with a hole for a pin 79*a* which acts as a pivot for the eyed connecting rod 80. The lower end of the connecting rod 80 is threaded and passes through a spring clip plate 7*a* forming part of the spring clip for securing the spring 9 intermediate its ends. Nuts 80*a* arranged on opposite sides of the plate 7*d* and coacting with the washers 80*b* and rubber like washers 80*c* properly connect the rod 80 to the plate 7*d*. Movement between the body frame 6 and the running gear member 7*d* will cause the shaft 76 to oscillate in the bearing member 78.

On the other side of the vehicle is another bearing member 78*c* which is anchored or secured to the body frame 6 by means of rivets 78*b* or otherwise. A stub shaft 76*a* is journaled in this bearing 78*c*. An arm 79*b* is connected to the shaft 76*a* and depends therefrom and it is connected with the running gear member 7*e* in the same manner as is the arm 80 connected to the member 7*d*.

When the running gear or axle departs from parallel relation to the frame, then a degree of circular movement takes place, of a hardened and ground to size member 81 which is keyed to the shaft 76*a* by means of the key 81*a*.

The character 81 indicates a clutch member that may oscillate within the hardened and ground interior of its coacting part 77 which is in the nature of a female clutch member. The female clutch member 77 of the clutch and the male member 81 of the clutch are normally disengaged or separated with relation to each other so that circular movement may occur in the directions of the double pointed arrow 82 (Fig. 5) in respect to the "no movement" arrow 82*a* (Fig. 5). This normally declutched means to control against side sway or tip is constructed and functions in the following manner:—

Electrical energy being available, and represented by the battery symbol 84, has one terminal connected by wire 83*a* to ground 83. Wire 84*a* leads to the ignition switch 84*b*. When the ignition switch 84*b* is open or closed the circuit is controlled accordingly. This hook-up is desirable so that the operator will not forget to open the sway control circuit, which control circuit is indicated by the wire 84*c* leading from the common ignition coil, timer and distributor of a common ignition system (not shown) to the ignition switch 84*b*, there being a junction at 84*d* which makes it possible to completely close the sway control circuit when the "operator actuated" switch 85 is closed by means of the wires 85*a* and 85*b*. Then by means of the shaft sections 76 and 76*a* and the respective members 78 and 78*a* the sway control circuit, after passing through the magnet winding 86 is completed back to the ground.

86*a* is a screw that grounds one end of the magnet winding 86. The character 86*b* is a terminal for the circuit wire 85*b*. The reference numeral 87 indicates springs which are associated with clutch rollers 88—88 to keep the latter from wedging in the respective tapered recesses 88'—88' and to cause these rollers to release their locking action so as to permit movement between the clutch parts 77 and 81.

After the ignition switch 84*b* has been turned on, and the operator switch 85 has been closed, then the magnet core 89 attracts the armature 87*a* with sufficient force to crowd the rollers 88—88 into wedging engagement in said recesses 88'—88' between the clutch members 81 and 77, thereby locking the shaft section 76 to the shaft section 76*a* or clutching the same together as will be understood.

A spring of non-magnetic metal 90 is designed to force the armature 87*a* to a released position when the magnet winding is deenergized. The non-magnetic metal member 91 is semi-spherical at the outer end and it is designed to spread the rollers 88—88 apart. This spreading member 91 has screw threaded connection with the non-magnetic rod 93 on which the armature 87*a* is mounted.

By virtue of the screw threaded connection of the non-magnetic rod 93 adjustments may be made through operation of the nut 92 on the screw threaded outer end of the non-magnetic rod 93. A cover 94 may be employed for the protection of the magnet and its armature and this cover 94 is held or secured to the parts 77 by means of screws 95—95. A side plate cover 96 is fastened to the body 77 by the screws 97.

It may not always be convenient to mount the two cams 1 and 2 in the manner shown in Figs. 1, 2, and 7 on account of locations of gas tanks or the like, and in such an event, the said cams may be attached to the axle member while the roller carrying arms are supported by the body frame. Such a hook-up is shown in Fig. 3 and in this instance the force is thereby in the direction of the arrow X. In this alternate arrangement the power storage springs and the load compensation run-way are to correspond in accordance with the descriptive matter as referred to herein in every functonal matter. For instance, without going to any great extent into detail the two cams 1' and 2' of Fig. 3 are riveted or otherwise secured to the cover of the rear axle housing and the roller arms 18' and 14*b* which correspond with

the aforesaid roller carrying arms 18 and 14a are supported by the body frame 6, as shown in Fig. 3, being swingingly mounted from the point 12' and mounted one on a sleeve and the other on a shaft as in the form and arrangement illustrated in Fig. 4. It is believed that further detail description of this modification is entirely unnecessary.

It will be understood that the body of a motor driven vehicle when resiliently supported by springs arranged between the vehicle body frame and the running gear, that the body frame is neither easily raised nor lowered through a person's strength alone, because a person needs the strength or aid of others or something in the way of a mechanical nature to aid in raising or lowering the vehicle body or frame. Therefore, it will be understood that one of the important features of this invention is to provide a power propelled vehicle which provides for super ease of riding and still retain the desired spacing between the body frame and the running gear regardless of load changes or obstacles incident to uneven roadways. Ease of riding is made possible by assisting the movement of the running gear toward the body frame when encountering obstructions and to add resilient support in proportions of strength to the load carried as the running gear is forced away from the body frame on encountering depressions or obstructions in the roadway so as to support the body frame against sudden descent.

To resist the sudden descent of the body frame, the cam contours of the cam devices employed in this instance permits the power of the energy storing means to create a greater range of the desired support, which is effective, after the supporting strength of the vehicle has been reduced to a substantial zero.

When the various parts of my invention are properly adjusted it is then possible for a person of normal strength to raise or lower the end of the vehicle by his own strength for the reason that the structural parts and their arrangement assist the person in such movements of the vehicle. The present device makes for ease with respect to raising and lowering the end of a body of a vehicle and makes for an easy riding of the vehicle irrespective of the number of passengers or load on the vehicle body. In other words, by means of the cams, and the power applied thereto as controlling means the running gear is given greater movement toward or from the body frame without undue variations in the supporting strength of the vehicle spring or springs. The body weight being far in excess to that of the lighter running gear, causes very near or practically all of the movement to be confined to the running gear, and for this reason, the body movement, in respect to the vertical, is reduced to a desired limit of comfort for the passenger or for the safety of a fragile cargo. This controlling effect for easy riding terminates at a spacing between the body frame and the running gear so as to resist striking between parts of the running gear and parts of the body frame as is indicated in Fig. 2 on the cams as at E. The extra range of resilient support as provided by this invention, after the vehicle springs no longer provide such, terminates in the zone as indicated at F on the cams in Fig. 2.

When a full load is on the vehicle body frame, the power roller 37 is moved by its actuator means to the location at Z so as to reduce the controlling pressure on the push rod 23. In this way the controlling force is effective by means of rod 24 to arm 15 on cam 1 which is contoured for the desired riding qualities for a full load and provides a correspondingly greater resilient support in ratio to the full load as shown by the dotted line contour at G of cam 1 in Fig. 2. For a minimum load, the power roller 37 is shifted to the location shown by the dotted roller Y so that the controlling power, will in effect, be active in controlling due to the absence of the load which was correctly controlled by the cam 1. It will be noted that the contour of the cam 2 at H has greater horizontal inclination as the means to control the strong vehicle spring in the absence of a load to be supported by the vehicle spring.

It will be observed that the run-way 29 acts as a lever between the cams 1 and 2 and that the power roller 37 acts as a movable fulcrum and is influenced to act as such by the power of the stored energy of the energy storing means A. It should be readily understood that by locating the power roller 37 to different locations on the compensating means or run-way 29, will effect desired riding conditions regardless of loads that range from maximum to minimum and at the same time being able to permit the operator to regulate the desired spacing between the body frame and the running gear at any time.

By locating this two cam spring and load controlling device at or near the middle of the running gear member, it is possible for the stiffness of the vehicle springs to resist side sway of the vehicle body so long as the springs support the body and load weight. When the vehicle springs are opened up because of extreme separation between the body frame and the running gear, then a stabilizing means against side sway is afforded and may automatically operate after the operator has conditioned the means to prevent side sway, to prevent uncomfortable tilting or side sway, because of such extreme separation, and due to the ample supporting strength supplied to the vehicle body from the middle of the axle or running gear.

In the use of the present invention it is possible to employ very strong suspension springs between the body frame and the running gear because it is possible to regulate or provide for free and easy riding through the instrumentality of controlling the degree of the flexibility of the vehicle springs in their status as resilient supporting means and to utilize the extra strength of the vehicle springs as means to prevent abnormal side sway, under straight ahead movement or particularly when making turns.

What is claimed is:

1. In a power propelled vehicle, the combination with a body frame, a running gear, a resilient supporting means between the body frame and the running gear to yieldably support the body frame in spaced relation to the running gear, of means operatively connected with the body frame, and the resilient supporting means for controlling against the characteristic variations in the supporting strength of the resilient supporting means to control the degree of space between the body frame and the running gear incident to varying loads on the body frame, comprising an energy storing means, a cam mechanism including two spaced cam elements having different cam contours and a roller to ride over each cam contour, a compensating means between the energy storing means and the cam mechanism, operative connections between the energy storing means and the com-

pensating means, operative connections between the compensating means and the cam mechanism and supporting said rollers of the cam mechanism, said compensating means being operable to selectively change and control the degrees of forces from the energy storing means to said different contours of the cam mechanism to thereby control the supporting strength of the resilient supporting means and the space between the running gear and the body frame according to varying loads carried by the body frame, and means for actuating the compensating means so as to control the same for governing the control of the strength of the resilient supporting means for the purposes stated.

2. The combination with a load transporting vehicle, including a body frame and a running gear and a spring arranged to resiliently support the body frame on the running gear in varying spaced relation thereto to permit movements between the body frame and the running gear, of means to control against the variations in the strength of said spring incident to variations in the strength thereof due to uneven roadways and also to control the supporting strength of said spring incident to variations in the strength thereof due to varying loads on the frame body, comprising an energy storing means, two cam devices, each including a cam surface different in contour from the cam contour of the other cam surface, a roller for movable coaction with each cam surface, an interposed compensating means between the energy storing means and said cam devices, operative connections between the energy storing means and said compensating means, operative connections between the compensating means and the said rollers and supporting the latter to maintain them in running contact with the respective cam contours to control the degrees of forces from the energy storing means to the rollers of the cam devices, the contour of one of the cam devices being shaped to control the vehicle spring to govern the space between the body frame and the vehicle running gear when a minimum load is carried on the body frame and the cam contour of the other cam device being shaped to control the vehicle spring to govern the space between the body frame and vehicle running gear when a maximum load is carried on the body frame, said compensating means being also operable to control the strength of the vehicle spring for loads between the minimum and maximum capacities of control, and means operable to operate said compensating means to change and control the degrees of forces from the energy storing means to said different cam contours through the compensating means and the respective rollers to thereby regulate the space between the body frame and running gear accordance to minimum or maximum loads or loads of weight between the same.

3. The combination with a resilient supporting force of a constant or fixed rate and which is subject to variations in strength incident to varying loads in the separated resilient support of two members, one of which is subjected to unavoidable source of movement with relation to the other member and the other member being less affected by the movement of the first member, of means to control against the variations in the strength of said resilient supporting force, comprising an energy storing means, a cam device operatively connected to the energy storing means and having a cam surface contoured to control the degrees of energy from the energy storing means to the cam device, so as to withstand the maximum load, according to a desired space between said resiliently connected members, another cam device operatively connected to the energy storing device and having a cam surface contoured to control the degrees of energy from the energy storing device to the second cam device for controlling and preventing maximum separation of said members by an abnormal strength of said resilient supporting means, means controllable for adjustment of the desired normal space between said two members, and a compensating means interposed between the energy storing means and said cam devices and connected in the aforesaid operative connections between the energy storing means and the respective cams so that by adjustment of said adjusting means to provide for strength in the resilient supporting means such as to permit changes in the spacing relation between said two members according to intermediate load changes.

4. The combination with a power propelled vehicle including a body frame capable of carrying varying loads and a running gear including wheels and a resilient spring interposed between the body frame and the running gear to yieldably support the former on the latter in a desired spaced relation thereto and permit movements between the same incident to highway travel, of means in addition to said resilient spring to control variations in the strength of the latter to provide artificial and more uniform strength of resilient support between the body frame and the running gear, comprising an energy storing means mounted on the vehicle, means for releasing and restoring power from and to the energy storing means including two cams mounted on the vehicle and each having a different shaped cam contour, a roller to travel over each cam contour surface, operative connections between the energy storing means and the cams and supporting the respective rollers with respect to the respective cam surfaces for controlling against the normal variations in the strength of the resilient vehicle spring, one cam surface contour corresponding to the desired supporting strength to remain in the vehicle spring when a full load on the body frame is supported by the vehicle spring relative to a desired space between the body frame and the running gear, the other cam contour corresponding to the desired supporting strength to be constrained in the vehicle spring when a minimum load on the body frame is supported by the vehicle spring relative to a desired space between the body frame and the running gear, and means to shift the controlling force of the energy storing means for effectively controlling the strength of the vehicle spring to and through either one of the cam rollers or both of said rollers on the respective cam contours so as to desirably space the body frame from the running gear, and means for actuating the shifting means.

5. The combination with a power propelled vehicle including a body frame, a running gear, a resilient supporting means between the body frame and the running gear to yieldably support the former above the latter in spaced relation thereto for movements relative to each other incident to highway travel, of means operatively connected to the body frame and the running gear to control the supporting strength of the resilient supporting means and maintain a uniform resilient supporting strength between the body frame and the running gear after the resil-

ient supporting means no longer adequately supports the body load, comprising an energy storing means, a cam mechanism including two cams having different cam contours and a roller to ride over each cam contour, operative connections between the energy storing means and the cam mechanism and supporting said rollers, the cam surface contour of one cam being such as to permit the controlling force of the energy storing means to supply additional resilient supporting strength to the body frame in related proportion to the full load on the body frame, the cam surface contour of the other cam being such as to control the strength of the resilient supporting means and the load on the body frame with relation to minimum loads and the space between the body frame and the running gear, and means for selectively controlling the effective contact of the controlling force from one cam contour to the other cam contour.

6. The combination with a power propelled vehicle including an axle and wheels, a body, a running gear, a resilient supporting means between the body frame and the running gear to yieldably support the former above the latter in predetermined spaced relation thereto, of means between the body frame and its resilient supporting means for controlling the strength of the resilient supporting means so as to maintain normal spacing between the body frame and the running gear, comprising an energy storing means and two cam devices supported substantially midway of the ends of an axle of the vehicle, the cam devices having differently formed cam surfaces and a roller to ride over each cam surface, operative connections between the energy storing means and the cam devices and supporting the cam rollers, a shiftable energy transmitting means connected up with said operative connections between the energy storing means and said cam devices and operable to selectively operatively connect the energy storing means with the respective cam devices so as to increase or decrease the effective controlling-force from the energy storing means to the respective cam devices through said operative connections and said rollers to thereby increase or decrease the strength of the resilient supporting means, and means for actuating said shiftable energy transmitting means.

7. The combination with a vehicle body frame and a running gear therefor and a resilient supporting means therebetween for the yieldable support of the body frame, of an energy storing means supported on the body, cam elements having cam contours of different shapes and hingedly mounted on the body frame and depending therefrom, a flanged roller to ride on each contour surface of each cam element, operative connections between the energy storing means and said rollers and supporting the latter in engagement with the contours of the respective cam elements and held thereagainst by the force of the energy storing means, the flanges of the rollers preventing lateral displacement of the rollers with relation to the cam elements, compensating means connected with said operative connections between the energy storing means and the cam rollers operable to selectively change and control the degrees of forces from the energy storing means to said rollers to thereby control the strength of the resilient supporting means, and means for actuating said compensating means.

8. The combination with a vehicle body frame, a running gear therefor and a resilient supporting means for the yieldable support of the frame body on the running gear, of means for controlling variations in the strength of the resilient supporting means according to varying loads and with relation to the space between the frame body and the running gear, comprising an energy storing means, a cam mechanism, operative connections between the energy storing means and the cam mechanism, means to mount the energy storing means for lateral swinging movements, shiftable means arranged in said operative connections between the energy storing means and the cam mechanism to permit said lateral movements of the energy storing means, and means for actuating the energy storing means to effect the lateral movements thereof.

9. The combination with a power propelled vehicle including a body frame and a running gear including wheels and a resilient supporting means between the body frame and the running gear to yieldably support the former on the latter in a desired spaced relation thereto, and permit movements between the same incident to highway travel, of means operatively connected with the body frame and the resilient supporting means for controlling against the characteristic variations in the supporting strength of the resilient supporting means to control the degree of space between the body frame and the running gear incident to varying loads on the body frame, comprising an energy storing means, a cam mechanism including two spaced cams, having different cam contours and a roller to ride over each cam contour, a rocker shaft, a sleeve movable on said rocker shaft, a pair of arms secured to said rocker shaft in alignment with one of said cam elements and supporting the respective roller in cooperative riding engagement with the contour of the respective cam element, a pair of arms fixedly secured to said sleeve and disposed in alignment with the other of said cam devices for the support of the respective roller in riding engagement with the contour of the respective cam element, whereby the movement of one pair of roller supporting arms is independent of the movement of the other pair of roller supporting arms, the contours of said cam elements being of different form, operative connections between said energy storing means and the rocker shaft and the sleeve on the latter, means arranged within said operative connections for operation to increase or decrease the degree of pressure of a controlling force of the rollers on the cam surface contours of said cam elements from said energy storing means so as to regulate the strength and consequent supporting action of the resilient supporting means, and means for actuating the said controlling means selectively with respect to said cam elements having different cam surface contours so as to thereby regulate the force of the energy storing means with respect to said cam elements.

10. The combination with a power propelled vehicle including a body frame, a running gear, including an axle and wheels, and a resilient supporting means interposed between the body frame and the running gear to yieldably support the former on the latter in a desired spaced relation thereto and permit movements between the same incident to highway travel or according to varying loads, of a load controlling device comprising an energy storing means and a cam mechanism provided with two different cam surface contours, operative connections between said energy storing means and said cam mechanism

and the resilient supporting means, the cam mechanism being supported and suspended from the body frame substantially midway of the ends of the axle and spaced therefrom, means arranged within the said operative connections between the energy storing means and said cam mechanism to actuate said operative connections to exert a controlling force between the body frame and the running gear on the resilient supporting means to control the strength of the latter, and means for shifting said controlling means to selectively operatively connect the energy storing means in effective operative connection with the cam elements of different contours to thereby regulate the degree of control of the strength of the resilient supporting means.

11. The combination with a power propelled vehicle including a body frame, a running gear, a resilient supporting means between the body frame and the running gear to space the same and permit movements between the same, of means operatively connected with the body frame and the running gear and the resilient supporting means to control the strength of the resilient supporting means to thereby govern the degree of space between the body frame and the running gear irrespective of varying loads on the body frame, comprising an energy storing means including a rod mounted for lateral swinging movement, a cam mechanism including two cam elements having different cam surface contours and a roller to ride over each cam surface contour, spaced pairs of separatively mounted swinging arms for the support of said rollers, a pivotally supported member mounted on the body frame and having a run-way extending transversely of the vehicle, spaced rods pivoted at their inner ends to said pivotally mounted member and extending rearwardly of the vehicle from opposite ends of said pivotally mounted member and having operative connection at their rear ends with the said swinging arms, a roller carried by the rod of the energy storing means for running engagement with the run-way of said pivotally mounted member, and means for moving the energy storing means rod laterally and thereby moving the roller of said rod along the run-way of said pivotally mounted member to regulate the degrees of forces from the energy storing means to the cam rollers for the control of the strength of the resilient supporting means irrespective of varying loads on the body frame and to control the degree of spacing between the body frame and the running gear.

12. The combination with a power propelled vehicle including a body frame, a running gear, a resilient supporting means between the body frame and the running gear to yieldably support the latter and permit movements between the body frame and running gear in accordance with varying loads placed on the body frame, of means to increase and decrease the supporting strength of the resilient supporting means, comprising an energy storing means of predetermined power, a cam mechanism including cam elements having irregular and different cam contours and a roller to ride over each cam surface, operative connections between the energy storing means and the rollers of the cam devices to increase or decrease the force of power from the energy storing means to the cam contours through said rollers, the contours of the cam surfaces being shaped in accordance with the movements between the body frame and the running gear, the power of the energy storing means and the loads carried by the body frame.

13. The combination with a power propelled vehicle including a body frame, a running gear, a resilient supporting means between the body frame and the running gear to space the same and permit movements between the same, of means operatively connected with the body frame and the running gear and the resilient supporting means to control the strength of the resilient supporting means to thereby govern the degree of space between the body frame and the running gear irrespective of varying loads on the body frame, comprising an energy storing means including a rod mounted for lateral swinging movement, a cam mechanism, including two cam elements having different cam surface contours and a roller to ride over each cam surface contour, spaced separatively mounted swinging arms for the support of the respective cam rollers, a lever-like element constituting a compensating member arranged on the body frame, spaced rods pivoted at their inner ends to the ends of said compensating member and having operative connection at their opposite ends with the said swinging arms, a power roller carried at the inner end of said rod of the energy storing means for riding engagement with said compensating member, and means for moving said energy storing means rod laterally to move said power roller within certain limits over said compensating member so as to at all times provide a pressure between either of said cam rollers and the respective cam surfaces sufficient under minimum pressure to prevent disengagement of the cam rollers from the respective cam elements and obviate rattle.

14. In a power propelled vehicle, the combination with a body frame, a running gear, a resilient supporting means between the body frame and the running gear to yieldably support the latter and provide for a normal spacing of the body frame from the running gear, of an energy storing means including a compressible spring and rod mounted on the body frame and extending longitudinally of the latter and having lateral movements in opposite directions, a lever-like device swingingly mounted on the body frame and including an element having a straight surface extending transversely of the body frame, a power roller on the rod of the energy storing means in constant engagement with the straight surface of the lever-like device, two cams suspended from the body frame substantially midway of the sides of the body frame and having different shaped contours, flanged rollers to ride, one over each cam contour, arms swingingly mounted between the body frame and the running gear for the support of the cam rollers, rods operatively connected with said lever-like device and arranged in parallel relation and operatively connected, one with each cam supporting arm whereby the energy storing means maintains the cam rollers in engagement with the cam surface contours of the cams and the cams incident to vertical movement with the body upon separation of the body releasing and restoring power from and to the energy storing means in accordance with the positions of the cam rollers on the irregular contour surfaces of the respective cams, and means for moving the energy storing means laterally in opposite directions to shift said power roller in opposite directions along the straight surface of the lever-like device so as to thereby render operatively effective one or the other of

said means for the release or restoration of the power from and to said energy storing means and thereby control the effective strength of the resilient supporting means for varying loads and to maintain a substantially normal space between the body frame and the running gear irrespective of varying loads and uneven roadways.

15. In a power propelled vehicle including a body frame, a running gear, a resilient supporting means between the body frame and running gear to yieldably support the former on the latter in spaced relation thereto, of means to control the variations in the strength of the resilient supporting means comprising a swingingly mounted energy storing means, a plurality of cam devices including cam elements having different cam contours and rollers cooperative with said cam surfaces, a swingingly mounted member between the energy storing means and said cam devices, operative connections between said swingingly mounted member and the cam rollers and supporting the latter in operative relation with the respective cam contours, power rollers carried by the energy storing means and interposed between the latter and said swingingly mounted member to ride on the latter in opposite directions in accordance with the direction of swinging movement of the energy storing means to apply the effective operative contact of the controlling force on the cam contours for the various intermediate relations to release and restore energy from and to said energy storing means in accordance with varying loads carried on the body frame, and means for swinging the energy storing means and consequently moving the power roller over the said swingingly mounted member for the performance of the functions stated.

16. In a power propelled vehicle, the combination with a body frame, a running gear, means for yieldably supporting the body frame on the running gear in spaced relation thereto and including an energy storing means and a cam mechanism operatively connected together, of means operatively connected to the operative connections between the energy storing means and the cam mechanism to change and control the degrees of force from the energy storing means to said cam mechanism to thereby control the supporting strength of the resilient supporting means and the space between the latter and the body frame according to varying loads carried on the body frame.

17. The combination with a power propelled vehicle including a body frame capable of carrying varying loads and a running gear including wheels and a resilient spring interposed between the body frame and the running gear to yieldably support the former on the latter in a desired spaced relation thereto and permit movements between the same incident to highway travel, of means in addition to said resilient spring to control variations in the strength of the latter to provide an artificial and corrected strength of resilient support between the body frame and the running gear, comprising an energy storing means carried by the vehicle, means for releasing and restoring power from and to the energy storing means including two cams carried by the vehicle and each having a different shaped cam contour, a roller to travel over each cam contour surface, operative connections between the energy storing means and the cam rollers for controlling against the normal variation in the strength of the resilient vehicle spring, one cam surface contour corresponding to the desired supporting strength to remain in the vehicle spring when a full load on the body frame is supported by the vehicle spring relative to a desired space between the body frame and the running gear, the other cam contour corresponding to the desired supporting strength to be constrained in the vehicle spring when a minimum load on the body frame is supported by the vehicle spring relative to a desired space between the body frame and the running gear, and means for changing the controlling force of the energy storing means so as to effectively control the strength of the vehicle spring to and through the zero or neutral point of said rollers on the respective cam contours so as to desirably space the body frame from the running gear according to minimum or maximum loads or to loads of weight between minimum and maximum loads.

18. The combination with a vehicle frame and a running gear including a resilient supporting means between the frame and the running gear, of an energy storing device carried by the vehicle, means for connecting the running gear with the energy storing device and the vehicle, including spaced cam mechanisms carried by the vehicle and having spaced cam surfaces of different contours, a movable device between the energy storing device and the cam mechanisms and operatively arranged in the operative connections between the energy storing device and the cam mechanisms, said cam mechanisms being operable in conjunction with the energy storing device and said movable device to regulate the forces of the energy storing device on the cam surfaces of the cam mechanisms to control the supporting strength of the resilient supporting means to control vertical movements of the running gear relative to the vehicle frame and reduce the vehicle frame vertical movement to a minimum coincident to the speed of movements of the running gear toward and away from the vehicle frame when the vehicle encounters unevenness in the roadway and thereby maintain the vehicle frame substantially horizontal with respect to vertical movement.

19. The combination with a vehicle frame and a running gear including a resilient supporting means between the frame and the running gear, of an energy storing device carried by the vehicle, means for connecting the running gear with the energy storing device including spaced cam mechanisms operatively connected therewith and having cam surfaces of different contours, means included in said connecting means including a pivotally mounted member and a power roller for relative movement with relation to each other, means for effecting said relative movement of the power roller and said pivotally mounted member, said cam mechanisms being operable in conjunction with the energy storing device and said power roller and said pivotally mounted member to regulate the forces of the energy storing device on said cam contours to control the strength of the resilient supporting means and to control vertical movements of the running gear relative to the vehicle frame, and to actuate the energy storing device so as to apply its forces of energy between and to the body frame and the running gear in a manner to control the vertical movements of the running gear relative to said frame and reduce the vehicle frame vertical movement to a minimum coincident to the speed of movements of the running gear toward and

away from the vehicle frame when the vehicle encounters unevenness in the roadway and thereby maintain the vehicle frame substantially motionless with respect to vertical movement, a hydraulic actuator for producing said relative movement of the power roller and the pivotally mounted member, a connection between the hydraulic means and the power producing means of the vehicle, and means to make said hydraulic actuator active or inactive as a medium for moving said power roller by utilizing the energy of the propelling means so as to correct or change the strength of the resilient strength of the resilient supporting means.

20. The combination with a vehicle frame and a running gear including a resilient supporting means between the frame and the running gear, of means for controlling the supporting strength of said resilient supporting means coincident to controlling said resilient supporting means against normal variations of supporting strength as results from relative movement between said vehicle frame and said running gear, a frame member carried by the vehicle frame between the latter and the running gear and spaced from the resilient supporting means, said controlling means comprising an energy storing means pivotally mounted at one end in, on or to said frame member, whereby to permit swinging movements of a part of the energy storing means, and means for moving the energy storing means laterally.

21. The combination with a power propelled vehicle including a frame, a running gear therefor, and a resilient supporting means between the frame and the running gear, of means to adjustably control the strength of the resilient supporting means to maintain a predetermined degree of space between the frame and the running gear according to varying loads carried by the frame, said adjusting means including an energy storing device and separate cam mechanisms, each cam mechanism including a roller and a cam element having an irregular contour, the contour of each cam element differing from the contour of the other cam element, means interposed between the energy storing device and the cam mechanisms operable to shift the effective contact of the controlling force of the energy storing means from one cam contour to the other cam contour or to various locations intermediate to said effective contacts whereby the mechanism is adjustable according to varying loads carried by the frame and the normal space maintained between the frame and the running gear, and means for operatively connecting said controlling means with the propelling means of the vehicle for adjusting the controlling means.

22. The combination with a power driven vehicle including a frame, a running gear and a resilient supporting means between the frame and the running gear, of means for controlling the strength of the resilient supporting means, including an energy storing device having a power roller and spaced cam mechanisms, each cam mechanism including a roller and also a cam element having a contour of a different contour from the cam contour of the cam element of the other cam mechanism, an element between the power roller of the energy storing device and said cam rollers to vary the degree of force of engagement of the cam rollers with the respective cam contours, interchangeably, and means for effecting relatively movement of said power roller and said compensating element to vary the degree of pressure of the cam rollers on the contours of the respective cam elements.

23. The combination with a vehicle frame and a running gear including a resilient supporting means between the frame and the running gear, of an energy storing device carried by the vehicle, a cam mechanism carried by the vehicle, a member interposed between the energy storing device and the cam mechanism and having operative connection with the latter, a roller carried by the energy storing means and held by the latter against said member for movement over the latter and incident to the pressure exerted on said roller by the energy storing device against said member exerting pressure on the connections between said member and the cam mechanism to maintain the cam mechanism in operative condition, and means for operating the energy storing means to move said roller over said member.

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