(No Model.)

C. N. WATERHOUSE.

TORSION SPRING FOR VEHICLES.

No. 402,789. Patented May 7, 1889.

Fig. I.

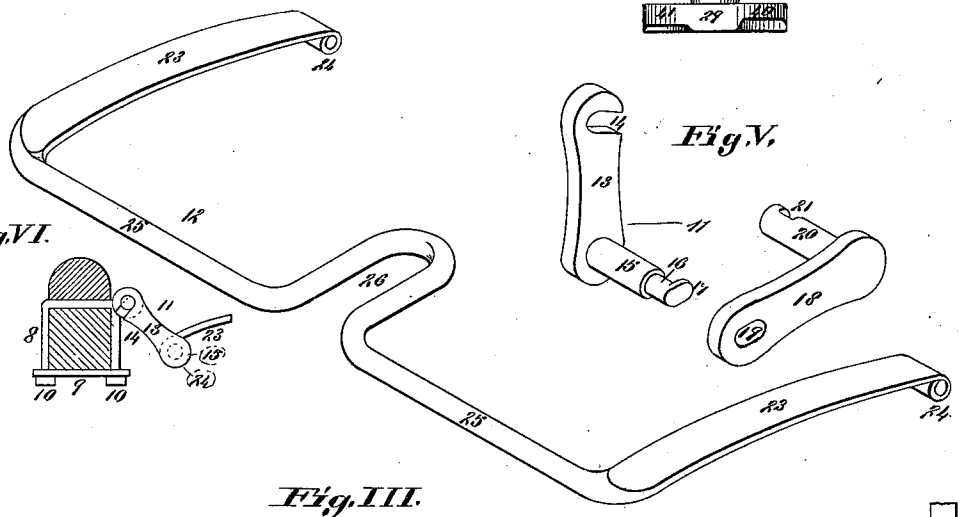


Fig. II.

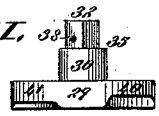


Fig. V.

Fig. VI.

Fig. III.

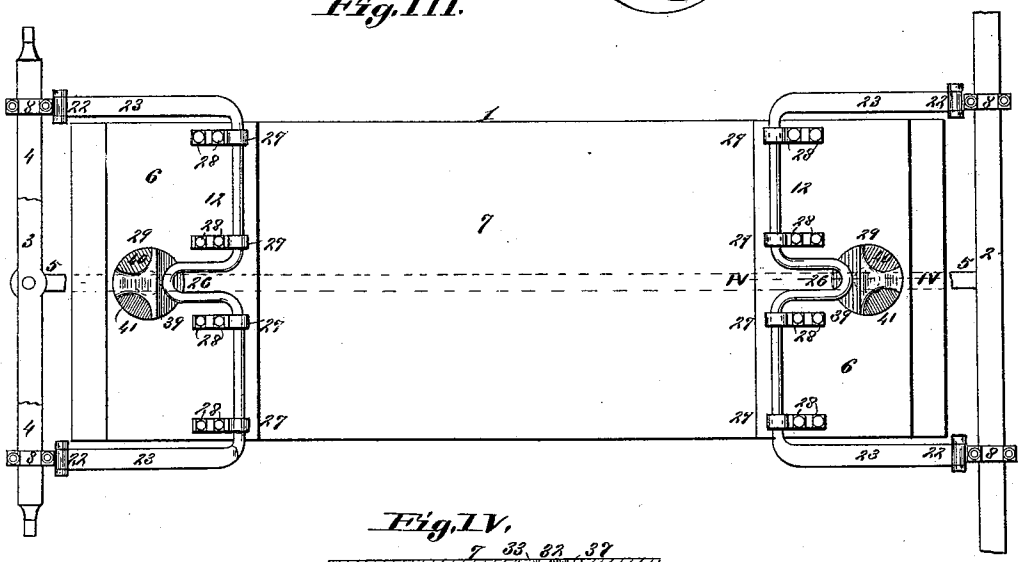
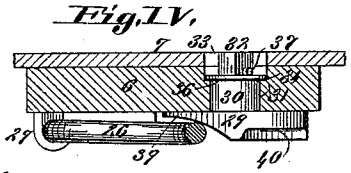


Fig. IV.



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UNITED STATES PATENT OFFICE.

CHARLES N. WATERHOUSE, OF ST. LOUIS, MISSOURI.

TORSION-SPRING FOR VEHICLES.

SPECIFICATION forming part of Letters Patent No. 402,789, dated May 7, 1889.

Application filed February 26, 1889. Serial No. 301,254. (No model.)

To all whom it may concern:

Be it known that I, CHARLES N. WATERHOUSE, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Combined Strap and Torsion Vehicle-Springs, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to a vehicle-spring with combined features of construction exercising the functions of both a torsion and strap spring having a self-adjusting shackle attachment and tension adjustment; and the invention consists in features of novelty, hereinafter fully described, and pointed out in the claims.

Figure I is a perspective view of the combined strap and torsion spring and shows the central crank-turn of the spring on which is exercised the tension to adjust its stiffness. Fig. II is a perspective view of the eccentric rotary cam by which the stiffness of the spring is adjusted. Fig. III is an under view of a vehicle-body to which my combination-spring is attached. Fig. IV is an enlarged vertical section taken on line IV IV, Fig. III, and shows the respective positions of the eccentric rotary cam and the crank turn of the spring on which it operates. Fig. V is an enlarged perspective detached view of the sections of the adjustable shackle by which the spring is secured to the attachment clip; and Fig. VI is a vertical section showing the respective positions of the shackle to the spring it carries and the clip to which it is attached.

Referring to the drawings, 1 represents the body of the vehicle to which my combined strap and torsion adjustable spring is secured.

2 is the rear axle that carries the rear spring. 3 the front axle, and 4 the cross-tree that surmounts said front axle and carries the front spring.

5 represents the reach that connects the axles, and 6 the cross-sills that support the floor 7 of the body.

8 represents the attachment-clips, which are respectively secured to the rear axle and the cross-tree that carries the front spring by their coupling-strap 9 and screw-nuts 10.

11 represents the sectional self-adjusting shackles, which carry the springs 12 and are secured to the attachment-clips 8. The shackles are made in two integral or rigid crank-sections, as shown in Fig. V, the one section, 13, being provided with a cut-away open slot, 14, near the upper end, which opens out to the outside, and a journal-spindle, 15, that projects at a right angle from near the lower end, at the outer end of which spindle is a journal, 16, which is provided at its terminal with a projecting key-button, 17. The other section, 18, of the shackle is provided at its lower end with an elongated bearing-slot, 19, and at its upper end a journal-spindle, 20, that projects at a right angle from near its upper end, at near the outer end of which spindle is provided a cut-away notch, 21.

22 represents a perforated lug, that projects from each of the attachment-clips 8 and provides journal-bearings for the crank-arms 20 of the shackles.

The combined strap and torsion springs, as shown in Figs. I and III, are each constructed of two broad longitudinal strap-spring sections, 23, the outer terminals of which are provided with attachment-loops 24, and their inner ends connected by a round torsion-spring section-bar, 25, the middle of which is turned inward with a crank or U-shaped bend, 26, which is adapted for tension purposes, as will be hereinafter described. The round torsion-spring sections are secured to the bottom of the cross-sills 6 of the vehicle in loose torsion-bearings by the journal-straps 27, which straps are attached to said sills by the screw-bolts 28.

I will now describe the self-adjusting sectional shackle attachment of the springs to the attachment-clips on the running-gears of the vehicle.

The journal-spindles 15 of the sections 13 of the shackles are placed through the loops 24 at the terminals of the springs, and the elongated slot-bearings at the lower ends of the sections 18 of said shackles are then slipped over the button-keys 17 at the terminals of the lower spindles, 15. The sections 18 are then partly turned around nearly into their working normal positions, but stopping

sufficiently short of the entrance of their spindles 20 into their slotted seats 14 in the section 13 to allow the free passage of said spindles through the perforate lugs 22, that project from the attachment-clips. The notched ends 21 of said spindles are then slipped into their open slotted seats 14 in the coadjutary section of the shackle, and the self-adjusting shackle attachment is complete, and cannot become detached until removed by hand, as the gravity of the weight they carry has a continuous tendency to preserve the junction of the parts intact.

The key-button 17 on the spindle 15, at the lower junction of the shackle, enters freely through the elongated slot 19 through the coadjutary section 18 of said shackle, when it is placed in the right position so to do, as shown in Fig. V, yet when, after coupling, the upper end of said section of the shackle is raised to its working position the button 17 holds the sections at bottom from spreading and detachment. The projection beyond the notch 21 in the spindle 20, when said spindle is seated in the open slot 14 of the coadjutary section of the shackle, also holds the upper ends of the sections of said shackle from spreading and consequent detachment. Now, it will be seen that by my self-adjusting shackle attachment of the springs I provide means of compensation, as the curved sections 23 of the springs, yielding to the pressure of the load, straighten out, and thus lengthen, for as the spring (a detail of which is shown in Fig. VI) straightens out it is evident that the shackle (swinging like a bail on its pivoted attachment) accommodates itself freely to the pressure, and thus obviates the adverse buckling action of the springs. This provision is of great importance, especially when vehicles pass over rough roadways, or it may be (after dark, unexpectedly to the driver) dump through a mud-hole or mount over an obstruction. It is evident that by this device is avoided a fruitful source of injury to the vehicle, discomfort to the passengers, with frequent breakage and injury to the springs themselves.

29 represents two eccentric rotary cams, which have surmounting round stems 30, that are seated in perforate bearings 31 through the cross-sills 6, on which rest the bottom of the vehicle. Square extensions 32 surmount said stems and pass up through open boxings 33 in the floor, coming just flush with the top thereof and forming seats for the wrench. The said boxings are of larger diameter than the bearings in which the stems work and descend both through the floor and for a short distance into the cross-sills to allow the seating of the collar-washers 34, which are passed down around the square wrench-seats and rest on the shoulders 35, presented by the stem beneath and overlapping the same, also rest on the shoulders 36, formed by the increased diameter of the boxings 33 over that of the perforate bearings 31. Keys 37 pass through the perforate key-seats 38 in said square extension of the stems, above the collar-washers, and hold said washers to their seats on the stems and the stems to their seats in the cross-sills.

The under faces of the eccentric rotary cams are provided with three differential seats of different thickness, 39, 40, and 41, grading in increase of thickness in the rotation indicated.

As shown in Figs. III and IV, it will be seen that the said rotary tension-cam operates between the sill 6 and the U-shaped inner or crank bend, 26, of the torsion-spring. When the least tension is exerted on the spring, the said crank-bend 26 rests against the seat 39 of the rotary cam, as shown in Figs. III and IV, in which condition the spring is the most pliable and best suited for light loads. When it is desired to fix the tension and stiffness of the spring to an intermediate degree, the cam is turned by the action of the carriage-wrench on the wrench-seat 32, so that the seat 40 of the cam then becomes operative.

Should the load be still further increased, so that it is desired to still further stiffen the springs that carry it, the cam is again turned by the wrench, so that the seat 41, that exerts extreme action on the spring, becomes operative, and the springs are stiffened and adapted to operate under the heaviest load that the vehicle is intended to carry. Now it will be seen that the rotation of the eccentric cams and the stiffening of either or both of the springs thereby is readily effected by the occupants of the vehicle by the use of the carriage-wrench without having to alight from the vehicle or even stop the same. It will also be seen that the respective stiffness of either of the springs can be differentially adjusted with regard to each other while the vehicle is in progress. Thus, when going up a steep grade it is of great advantage to stiffen the rear spring, and on a steep downgrade the front spring, and in each case lessen the stiffness of the other spring. So, also, with jump-seat vehicles, which are now in extensive use, the stiffness of either or both of the springs can easily be adapted to the change of position of the seats, and so, also, in all other changes and interchanges of the lading of the vehicle; and now I would call attention to the especial construction of my combination-spring, which largely combines the advantages of a torsion, a strap, and a side-bar spring, and added thereto an effective means for stiffening or reducing the stiffness of said springs.

It will be seen that by the combination of my flat side strap-sections as a coadjutant of the torsion-spring I am enabled to attach the spring fore and aft without the usual side bars that are generally adopted where torsion-springs are used. In consequence a ve-

hicle with my combination-springs can turn much shorter than it could had it side bars, or than any other vehicle with side bars could do, and with less danger of injury to the vehicle. Again, the wide side strap-sections, 23, of the springs brace against side sway and the various sections of the combination are arranged for their varied functions to combine ease of movement, adjustment of stiffness, and the level carriage of the vehicle that they support.

My sectional shackles provide ready means for the attachment and detachment of the vehicle-body and its springs to the running-gears, so that changes can easily be made from covered to open carriages, or bodies of any other desired construction, by their attachment to the one set of running-gears. At the same time the self-adjustment of the shackles, as heretofore described, easily and without a jar accommodate themselves to the varied length of the springs when straightened out under a heavy load or sprung back to their normal position under a light one, and with still more importance are they self-accommodating with a swinging bail movement during any sudden jerk or lunge, as the wheels may pass through a mud-hole or over an impediment.

In conclusion, I also call attention to the fact that by the combination of the flat strap-sections 23 with the torsion-section 25 of my spring the torsion-section is braced from the shearing or twisting action, that results in the crystallization of the steel and the well-known rapid decadence in quality that torsion-springs are subject to in consequence.

I claim as my invention—

1. In a vehicle-spring, the combination of a torsion-spring, the central inwardly-turned crank-bend, 26, and the differential eccentric rotary cam 29, that exercises a varied tension on said crank-bend, and by its leverage on said torsion-spring adjusts the tension and stiffness of the spring, substantially as described, and for the purpose set forth.

2. In a vehicle-spring, the combination of the spring-bar having two longitudinal flat strap sections or parts integral with the connecting transverse torsion section or part, the central inwardly-turned crank-bend, 26, and the differential eccentric rotary cam 29, that exercises a varied tension on said crank-bend and by its leverage of said part adjusts the tension and stiffness of the spring, substantially as described, and for the purpose set forth.

3. In a vehicle-spring, the combination of the combined strap and torsion spring, constituted of the integral sections or parts 25, 26, and 23, and provided with looped attachment-terminals 24, the hanging swinging sectional shackles 11, that are pivotally secured in the loops 24, the clips 8 on the running-gears of the vehicle, and the perforate lugs 22, that project from said clips and that provide the upper bearings for said shackles, substantially as described, and for the purpose set forth.

4. In a vehicle-spring, the combination of the combined strap and torsion spring constituted of the integral sections of parts 25, 26, and 23, and provided with looped attachment-terminals 24, the swinging sectional shackles 11, that form self-adjusting attachments of the springs to the attachment-clips that are secured to the running-gears of the vehicle, and the eccentric rotary cams 29, that work between the cross-sills and the crank-bend 26 in the middle of the torsion-section of said spring, the said cam being provided with differential seats to adjust the stiffness of the springs, substantially as described, and for the purpose set forth.

5. In a vehicle-spring, the combination of the combined strap and torsion spring, the section 13 of a swinging shackle, which shackle is self-adjusting to the varying position of the springs, the upper end of said section being provided with an open slot, 14, the spindle 15, that projects at a right angle from near the lower end of said section, the journal 16 on said spindle, the key-button 17, the section 18 of said swinging shackle, the lower part of which section is provided with an elongated slotted bearing, 19, through which the button 17 is passed and in which the journal 16 engages when the sections of the shackle are coupled, and the spindle 20, that projects at a right angle from near the upper end of the section 18, the said spindle being provided with a notch, 21, which notched portion of said spindle engages in the open slot 14 near the upper end of section 13 of said swinging shackle when the sections of said shackle are brought into complete operative combination, substantially as described, and for the purpose set forth.

6. In a vehicle-spring, the combination of the combined strap and torsion spring, the said spring constituted of the integral sections or parts 25, 26, and 23, and provided with looped attachment-terminals 24, the sectional swinging shackles 11, having bearings in said hooks and that secure and self-adjustingly hold the springs to the running-gears of the vehicle that they support, the eccentric rotary cam 29, the said cam having a differential face with seats of varied thickness that are rotated between the cross-sill of the vehicle and the crank-bend 26 of the spring to adjust the tension and consequent stiffness of said spring, the said eccentric rotary cam having a surmounting stem, 30, with perforate bearings in the cross-sill 6, a square extension, 32, that forms a wrench-seat and that surmounts said stem, and is seated in a key-boxing in said sill and in the floor of the vehicle, the collar-washer 34, that fits around said square extension and on top of the shoul-

der 35 of the stem 30, and the key 37, that holds said washer to its seat, the said eccentric rotary cam and the square wrench-stem that turns it being arranged as the differential face of said cam is turned to exert a varied tension on the crank-bend 26 of the spring, and thus adjust the stiffness of the same, substantially as described, and for the purpose set forth.

CHARLES N. WATERHOUSE.

In presence of—
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SAML. KNIGHT.