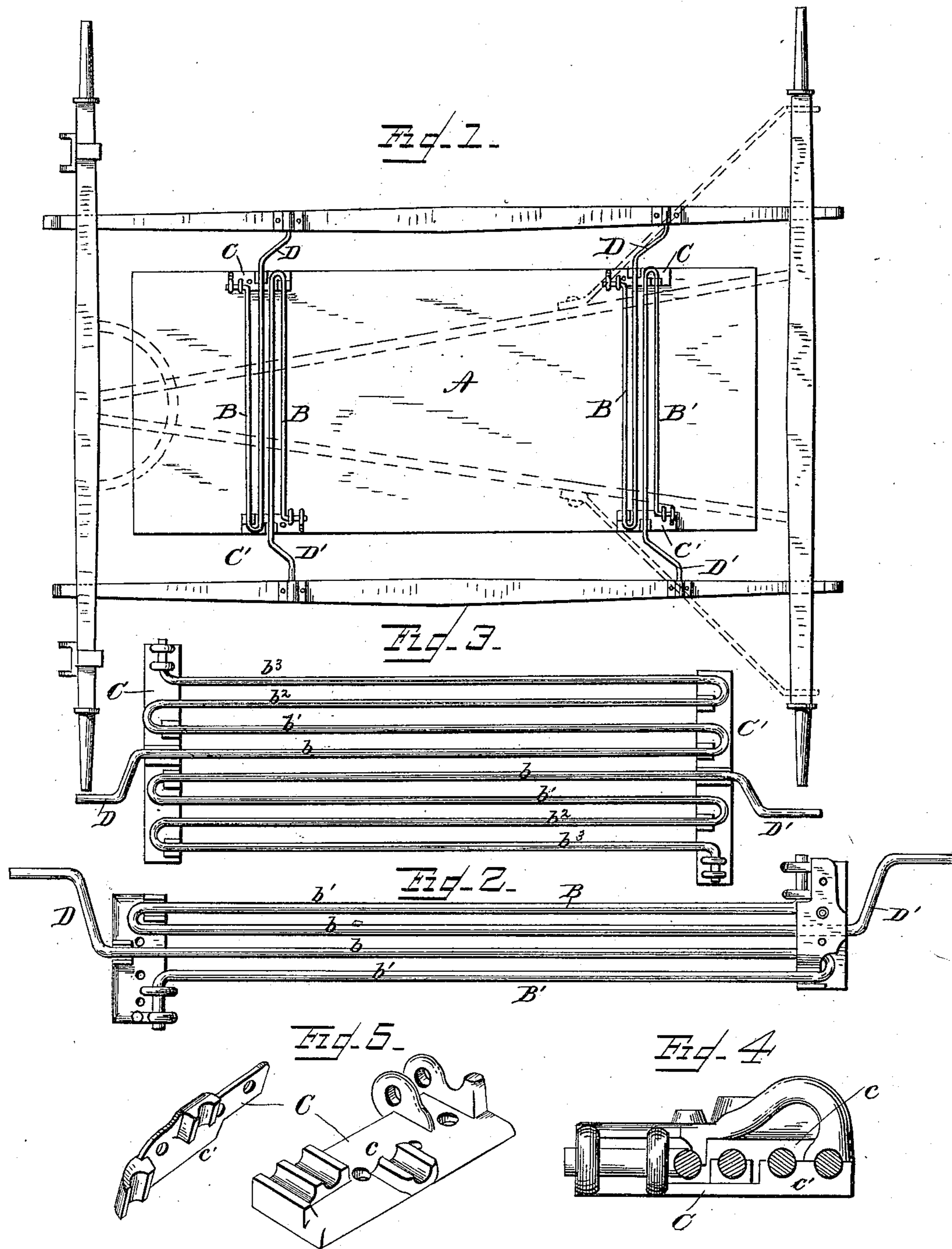


(No Model.)

M. G. HUBBARD.
SPRING VEHICLE.

No. 300,978.

Patented June 24, 1884.



WITNESSES
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MOSES G. HUBBARD, OF NORRISTOWN, PENNSYLVANIA.

SPRING-VEHICLE.

SPECIFICATION forming part of Letters Patent No. 300,978, dated June 24, 1884.

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To all whom it may concern:

Be it known that I, MOSES G. HUBBARD, of Norristown, county of Montgomery, and State of Pennsylvania, have invented a new and useful Improvement in Spring-Vehicles, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification.

My invention relates to a novel construction and arrangement of crank-arms and springs for vehicles; and it consists in the combination, with U-shaped or recurved torsion-springs, of short crank-arms adapted by the elasticity of the spring and under the pressure of the load to swing to a position approximating their dead-centers, and thereby to cushion the springs and the load thereon, and to limit the strain of the springs without producing jarring or other unpleasant effect usual in the ordinary arrangement of springs at the limit of their throw or movement; in the rigid attachment of each spring to its own journal-box, and of each pair of U-shaped or recurved springs in a pair of journal-boxes; and in the arrangement of the springs with the cranks inclining backward from their center of motion, whereby the movement of the load will be downward and backward, for a purpose and all substantially as hereinafter explained.

In the accompanying drawings, Figure 1 represents a bottom view of a light road-wagon with my improved springs applied; Fig. 2, a plan view of one pair of the U-shaped springs and their journal-boxes detached; Fig. 3, a similar view showing the springs elongated and recurved in zigzag form, and Figs. 4 and 5 detail views of the journal-boxes enlarged.

To illustrate my improvements I will describe their application to an ordinary light wagon-body mounted on the common side-bar gearing in such manner as to permit the use of a long limber spring, avoid the violent concussions in passing over obstructions incident to other applications of light springs, also to limit the strain upon the spring to avoid overstraining it, and to avoid the violent rebound which ordinary springs cause by their sudden reaction when they are depressed; and as my improved springs are attached at nearly the same point at which they sustain the

weight, all unnecessary strain upon light wagon-bodies is avoided. To accomplish these results I suspend the body A on long bars of steel, B B', bent into U form, each spring being attached to its own journal-box C or C', and terminating at its other end in a short crank-arm, D or D', so arranged that it may swing on or approach near to its dead-center by the downward thrust or force of the load. This full action of the crank-arms is permitted by using the long limber springs in connection with them, and the long limber spring is attained, in convenient space and form, by the employment of the U-shaped or recurved springs arranged as shown. By this combination a great vertical stiffness is attained, because the limber spring is acted upon by a rapidly-diminishing leverage as the short crank-arm approaches its dead-center, and ample vertical movement of the body is attained with a short crank-arm, because the long limber spring permits the full dead-center movement. When this form of spring is thus combined with the dead-center crank-arm, and arranged to act as described and shown, three results are reached which it is important to unite in the action of a carriage-spring—viz., the cushioning of the termination of the downward movement of the load, the limiting of possible strain upon the springs, and greatly diminishing the violence of the reaction or rebound of the spring when depressed. In this U form of spring the bent bar acts something in the nature of both a twisted coil and a torsion spring, and yields all of the elasticity which can be developed by its great length, with the least possibility to break when strained to the limit required for the full movement of the dead-center crank-arms, and as this peculiar movement of the crank-arms not only limits the ultimate strain which can be given to the spring, but also checks the downward movement of the load by the rapidly-diminishing leverage of the cranks as they approach their dead centers, all concussion is avoided, and as the sudden reaction or rebound is correspondingly prevented by the time the arms have risen to a horizontal position, the force of the springs is so far spent as to cause only a gentle and agreeable movement of the body, and it will be observed that during this gradual ver-

tical or upward movement of the body it has not acquired the momentum to carry it above its normal position, which would have resulted from the sudden and violent reaction of an ordinary spring. All of these causes combine to make the vehicle ride with the greatest possible freedom from the vibration and jar of ordinary vehicles on ordinary roads, and if the crank-arms are so arranged that they will incline backward from their point of attachment to the body an additional advantage is secured in passing over obstacles. I have found that when these arms are inclined forward the load in (relatively) descending, when the wheel drops into a rut or passes over an obstacle, must also either get an accelerated forward movement or else it must tend to pull the vehicle backward, and this effect, combined with the check to the wheel when it strikes the obstacle, gives first a greatly-increased check to the vehicle, and then a greatly-increased forward jerk on the vehicle by the horse, and thus the agreeable action of the springs is in a great measure lost; but when the crank-arms are inclined backward they have an important influence in helping to pull the wheel over an obstacle by their peculiar action, as it is obvious that when the load descends or the wheel rises the load must either be pulled backward by the action of the crank-arms or it will tend to pull the wheel over the obstacle. The action in use is really to help pull the wheel over the obstacle, avoiding all sudden check to the vehicle in its forward movement over the obstacle, relieving the shock on the body entirely and all backward jerk on the horse. I journal each one of these springs in a metallic journal-box, C or C' , and attach one end of each spring to its own journal-box, so that both the weight of the load and the strain of the spring are sustained at the same point, thus avoiding all unnecessary strain upon light carriage-bodies. The other or loop end of the spring may have its weight sustained freely in a portion of the opposite journal-box, or by any other convenient support, so that it is left free to revolve about half as much as the crank end of the spring when the **U** form is used, and proportionally when the spring is recurved, as I will now more fully explain. When it is desired to construct this spring for heavier loads, the bars may be recurved to increase

the aggregate length of the springs to permit the use of larger bars of steel in proportion to the load to be carried. In detached view, Fig. 3, is shown a pair of these springs recurved, of greatly-increased length, and the method of attaching them and journaling their loop or curved ends. This method of attaching is important, as previously explained, and the way shown for supporting the looped or curved ends is perhaps the best for permitting sufficient rotary movement and preventing rattling of the springs. Each section of the spring will move less than the one preceding it, b' moving one-half as much as b , b^2 one-half as much as b' , and b^3 one-half as much as b^2 , and so through any number of recurvatures. The journal-boxes are all formed half in plate c and half in plate c' , so that when the two plates are firmly riveted together, with the springs between them, a connected pair of very long springs is made, in convenient form for attachment to the vehicle.

Having now described my invention, I claim as new—

1. In a spring-vehicle, the **U**-shaped or recurved springs, in combination with short crank-arms on said springs, adapted to swing to their dead-centers, and thereby to cushion the movements of the load and limit the strain on the springs, substantially as described.

2. In a spring-vehicle, the recurved springs, having their fixed ends rigidly secured to the boxes in which their crank ends are journaled, substantially as specified.

3. In a spring-vehicle, the **U**-shaped or recurved springs, arranged in pairs and extending back and forth across the body of the vehicle, with all of the loop ends of each pair of springs journaled in a pair of journal-boxes, to which their rigid ends are secured, thereby forming a connected pair of springs, substantially as described and shown.

4. In a spring-vehicle, the **U**-shaped or recurved springs provided with crank-arms inclined backward from their center of motion, for the purpose and substantially as set forth.

In testimony whereof I have hereunto set my hand.

MOSES G. HUBBARD.

Witnesses:

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