(No Model.) 2 Sheets—Sheet 1.

E. B. SMITH.

VEHICLE SPRING.

No. 389,609. Patented Sept. 18, 1888.

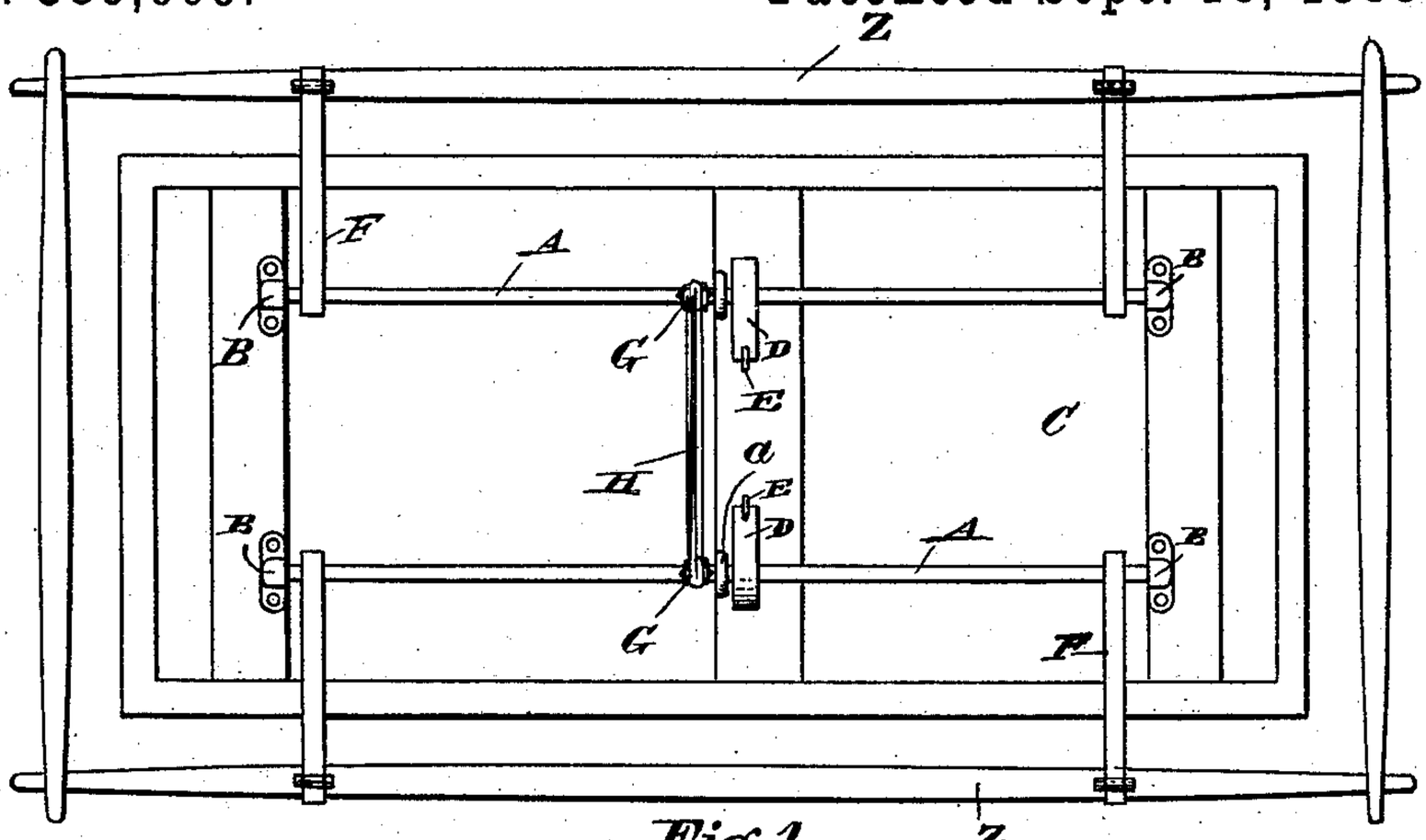

Fig. 1.

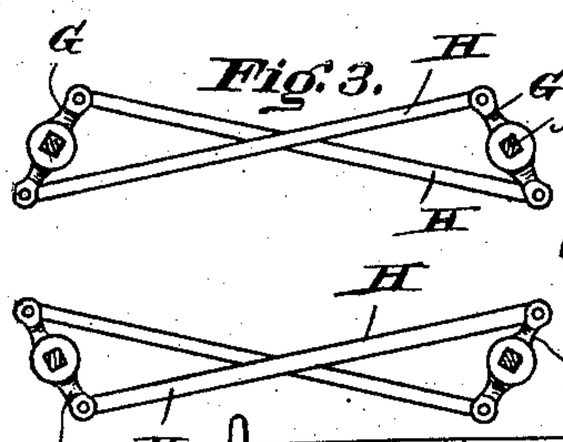

Fig. 3.

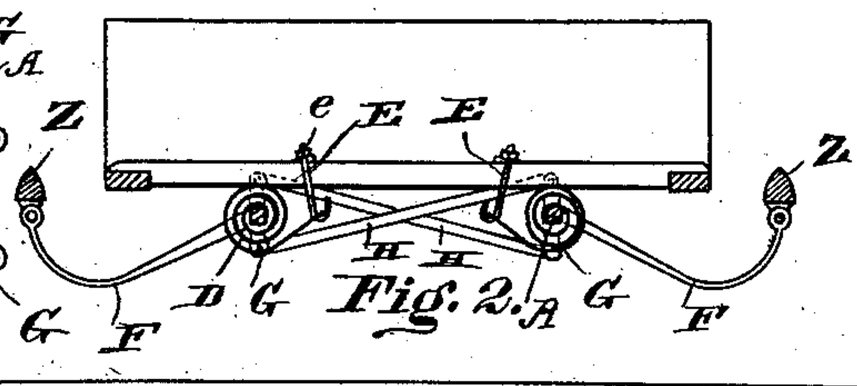

Fig. 2.

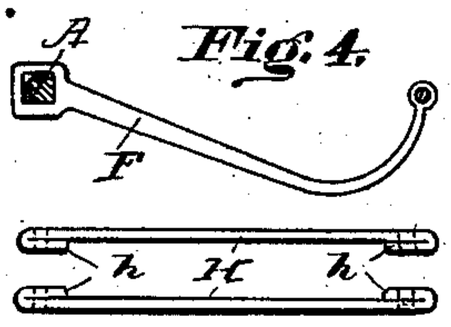

Fig. 4.

Fig. 5.

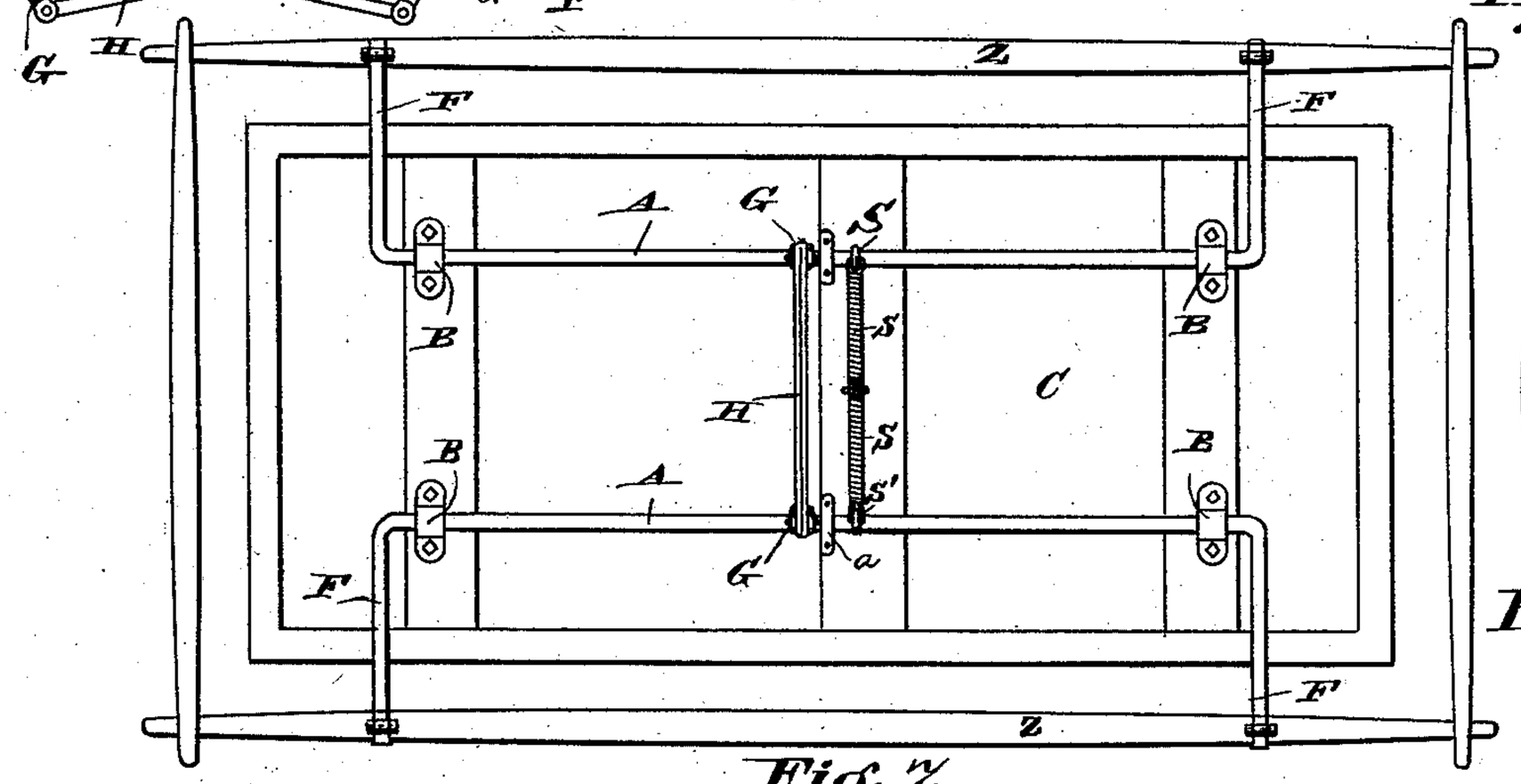

Fig. 7.

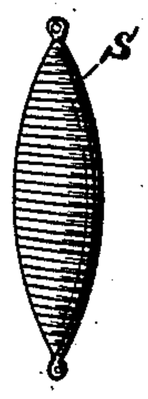

Fig. 11

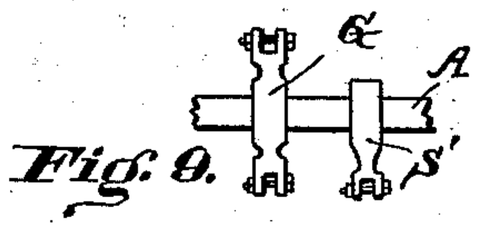

Fig. 9.

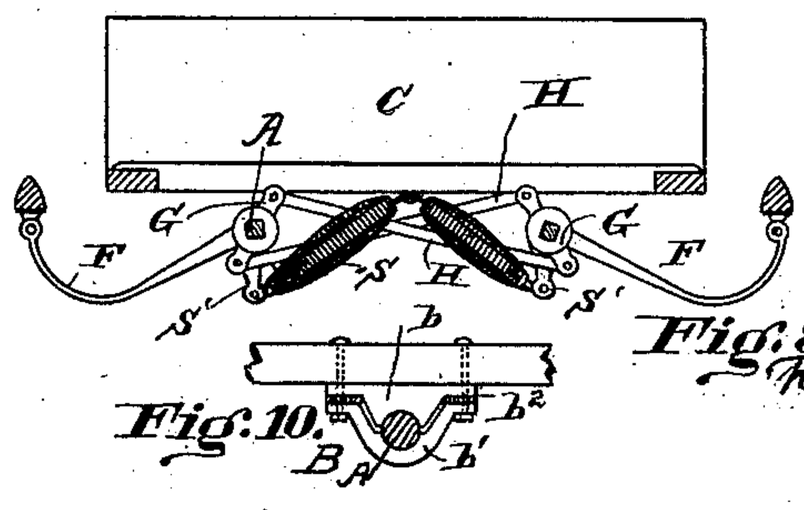

Fig. 10.

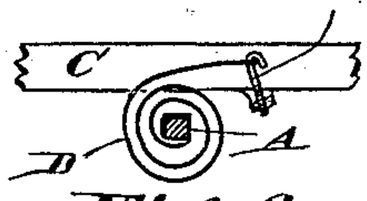

Fig. 6.

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Fig. 8.

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(No Model.) 2 Sheets—Sheet 2.

E. B. SMITH.

VEHICLE SPRING.

No. 389,609. Patented Sept. 18, 1888.

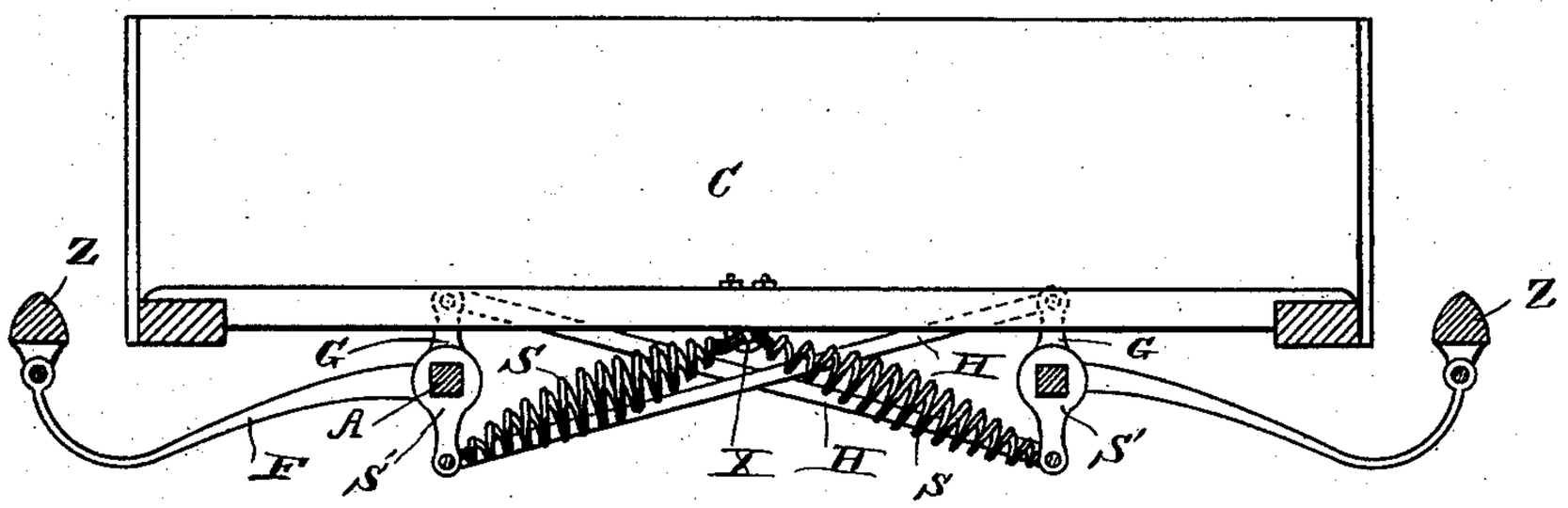

Fig. 12.

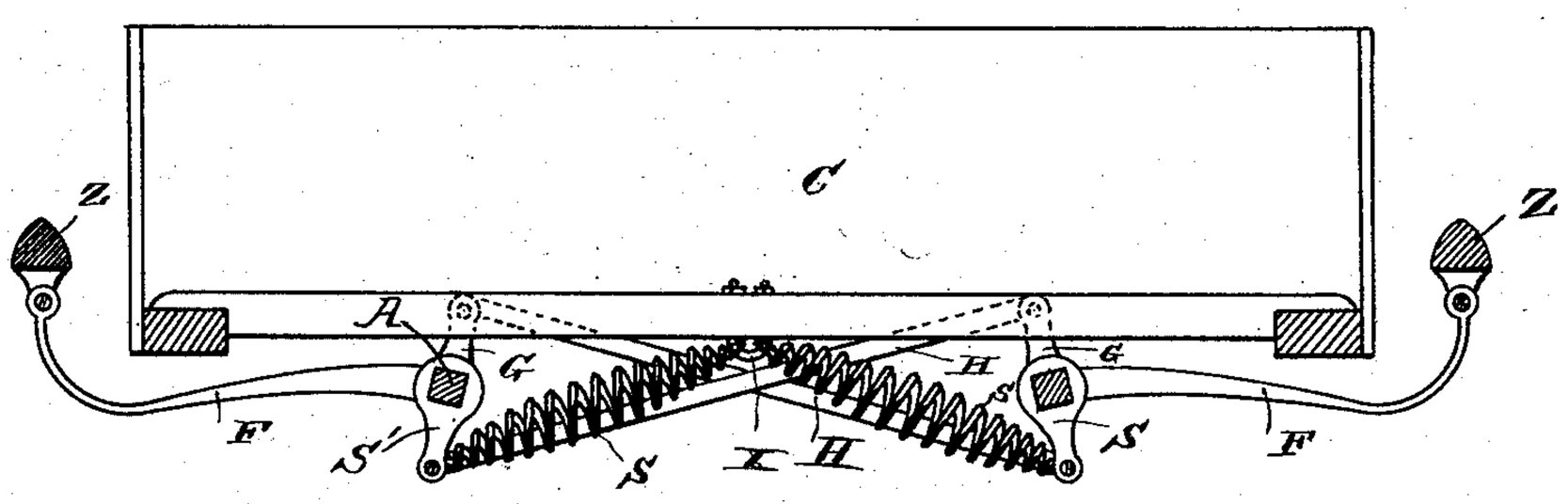

Fig. 13.

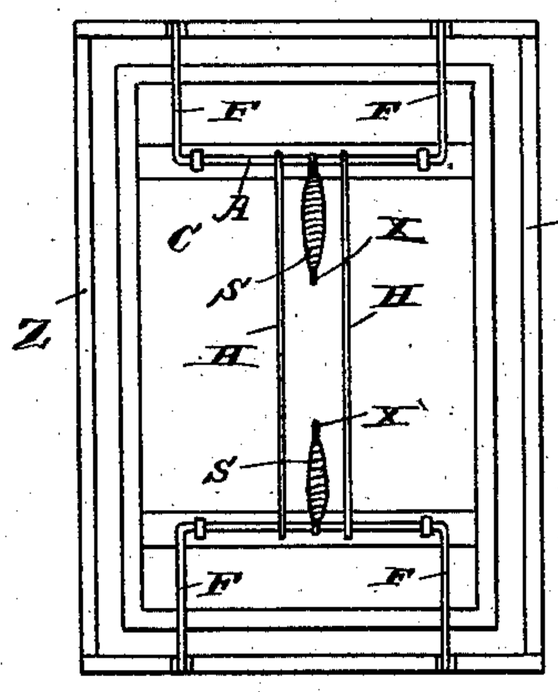

Fig. 14.

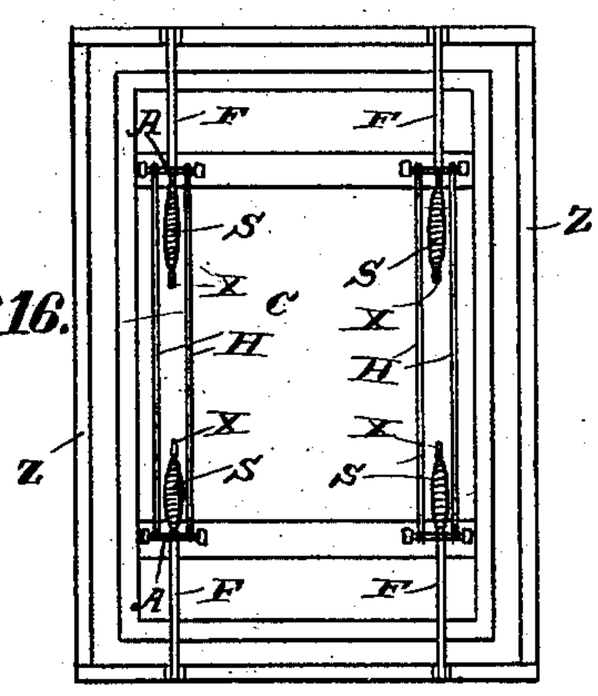

Fig. 16.

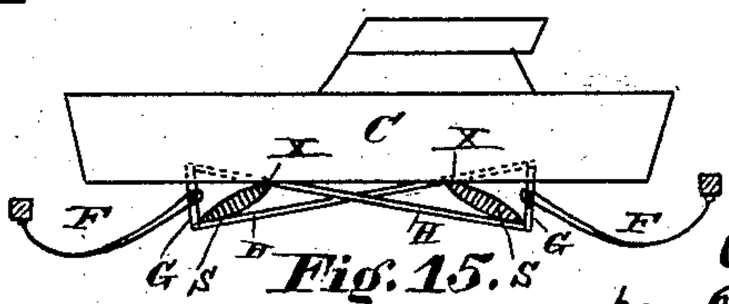

Fig. 15.

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per Wm. Hubbell Fisher
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UNITED STATES PATENT OFFICE.

EZRA B. SMITH, OF CINCINNATI, ASSIGNOR OF ONE-HALF TO HARRISON D. EMERSON, OF COLLEGE HILL, OHIO.

VEHICLE-SPRING.

SPECIFICATION forming part of Letters Patent No. 389,609, dated September 18, 1888.

Application filed December 10, 1887. Serial No. 257,477. (No model.)

To all whom it may concern:

Be it known that I, EZRA B. SMITH, of the city of Cincinnati, State of Ohio, have invented certain new and useful Improvements in Vehicle-Springs, of which the following is a specification.

The several features of my invention and the advantages arising from their use, conjointly or otherwise, will be apparent from the following description.

In the accompanying drawings, forming part of this specification, Figure 1 is a view of the under side of a side-bar-vehicle body provided with my improvements. Fig. 2 is a cross-section of the same. Fig. 3 illustrates the different positions of the equalizing-rods. Fig. 4 is a side elevation of one of the curved arms connecting the torsion-rods with the side bars. Fig. 5 is a top view of a pair of the preferred form of equalizing-rods. Fig. 6 illustrates one mode of attaching the coiled springs to the body. Fig. 7 is a view of the under side of a side-bar vehicle provided with the preferred form of my improvement. Fig. 8 is a cross-section of the device shown in Fig. 7. Fig. 9 illustrates the means for attaching the equalizing-rods and the spiral springs to the torsion-rods. Fig. 10 is an end elevation of the preferred form of journal-bearing for the torsion-rods. Fig. 11 illustrates the preferred form of spiral spring for use in the device. Fig. 12 is a cross-section of a buggy-body and side bars provided with my improvements, the body being unloaded. Fig. 13 is a view similar to Fig. 12, illustrating the action of the springs when the body is loaded. Fig. 14 is a plan view of a modification of my device. Fig. 15 is a side elevation of the device shown in Fig. 14. Fig. 16 is a plan view of another modification of my device.

The torsion-rods A extend lengthwise of the body C, and are journaled in the bearings B, attached to the under side of the body near their centers. The rods A are supported by bearings or staples *a*. The preferred form of bearing B consists of an inverted pillow-block, *b*, projecting some distance from the body and cap *b'*. The block and cap are held together by the same bolts which secure the bearing as a whole to the body. To prevent rattling, it is preferable that elastic gaskets b^2 be placed between the cap *b'* and the block *b*.

Each rod A has rigidly attached to it, near its center, a short arm, S', projecting downward. To each arm S' a spiral spring, S, is attached, the other end of the spring being attached to the body by a suitable connection near the median line, or at a point between the adjacent torsion-rod and side bar, or at any other suitable point on the body. The preferred form of spiral spring is that shown in Fig. 11.

Each torsion-rod A has rigidly attached to it, near each end, an arm, F, which extends downward and outward and upward, and is attached to the adjacent side bar, Z. Instead of separate arms F, the ends of the torsion-arms may be bent outwardly and connect with the side bars, as shown in Fig. 7.

Near the middle of each rod A there is rigidly attached a cross-arm, G, which extends on both sides of the rod A. The cross arms G are so set that when the body is at rest they occupy a vertical position. The cross-arms of the two sides are connected by equalizing-rods H. These equalizing-rods extend from the top of each cross-arm to the lower end of the opposite cross-arm.

It is convenient to provide each equalizing-rod H with a lateral boss, *h*, and this is most conveniently made by turning over the end of the rod, as shown in Fig. 5. This offset is a preferred provision for allowing the two bars to pass each other out of contact. Instead of the spiral springs S, I sometimes employ springs D, attached to the rods A near their centers and coiled about them, the other end of the spring being attached to a hook or bolt, E. The hook E, in the form shown in Fig. 2, passes through the bottom of the body and is held by the nut E, by means of which also the tension of the spring D may be regulated. In the form shown in Fig. 6 the hook E is placed between the spring and the edge of the body. In this position the hook is above and the nut below, so that the tension may be regulated from below the body instead of from within it.

The springs I employ need not be limited to two, but one alone may be used; or a greater

number of springs may be employed when desired.

In the foregoing description, where reference is made to the vehicle-body, the term "body" is to be understood as indicating any and all of the braces and strengthening bars and pieces attached to the body, and to which it may be desirable to connect the devices herein described as connected to the body.

The mode of operation of the device is as follows: When the vehicle is at rest, the various parts occupy the positions shown in Figs. 2 and 12. When the body is weighted and descends, the bearings and rods A are depressed. This carries down the inner ends of the arms F, while the outer ends are held up by the side bars. This movement of the arms F imparts an inward rotation of the torsion rods A, which rotation is resisted by the springs D or S, according to whichever form is used. The resultant position is shown in Fig. 13. Where the load is brought to bear on one side only of the body, the strain is first brought in the spring of that side; but the consequent movement of the torsion-rod of that side immediately imparts a corresponding movement in the torsion-rod of the opposite side through the medium of the equalizing-rods. Thus any strain is immediately equally distributed over the springs of both sides. When an extra heavy strain is put upon the springs and this latter reaches its highest tension, the additional strain comes upon the rod A, which acts as a tension-spring, and thus saves the spring proper from being broken.

There are several evident modifications of the device which deserve special mention. Instead of two equalizing-rods, it is evident that one only is absolutely essential for the purpose of distributing the load, and when equalization is not desired the equalizing-rods may be omitted and the spring still be operative. Similarly a single spring will be operative if made sufficiently strong; but a more comfortable vehicle is produced when two or more springs are employed.

The modification shown in Figs. 14 and 15 differs from the device as illustrated in Fig. 7 in having the spring-connections attached to the head-block in front and the axle behind instead of the side bars.

In the modification shown in Fig. 16 two independent sets of springs are employed—one on each side—attached to the head-block and axle. In this modification the torsion-rods are necessarily short.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a vehicle-body and rods held in bearings under the body, arms rigid with the rods and connecting with the adjacent side bars, a spring or springs imparting torsion resistance to the rods, and cross-arms rigidly attached to the rods and connected at opposite ends by equalizing rod or rods, substantially as described.

2. The combination of the vehicle-body, longitudinal rods A, supported in suitable bearings, arms F, connecting the rods with the side bars, arms S′, springs S, cross-arms G, rigidly attached to the said rods, and diagonal equalizing-rods H, connecting the arms G of one rod with those of the other rod, substantially as described.

3. The bearing consisting of the block *b*, cap *b′*, and elastic gasket *b²*, placed between the said block and cap, substantially as described.

4. The combination of a vehicle-body, longitudinal torsion-rods, cross-arms rigidly attached to the torsion-rods, and obliquely-crossing equalizing-rods connecting the cross-arms, substantially as described.

5. The combination of a vehicle-body, longitudinal torsion-rods, cross-arms rigidly attached to the torsion-rods and obliquely-crossing equalizing-rods H, having offsets *h* at their ends and connecting the cross-arms, substantially as described.

6. The combination of a vehicle-body, longitudinal rods A, cross-arms G, equalizing-rods H, arms S′, and bellied springs S, substantially as described.

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Attest:
WM. E. JONES,
CHAS. LUDLOW.