B. O. LARSON.

SPRING.

APPLICATION FILED OCT. 5, 1910.

992,215. Patented May 16, 1911.

Fig. 1.

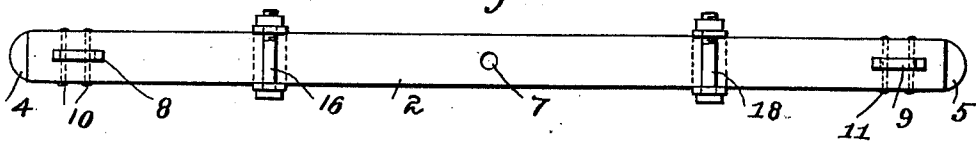


Fig. 2.

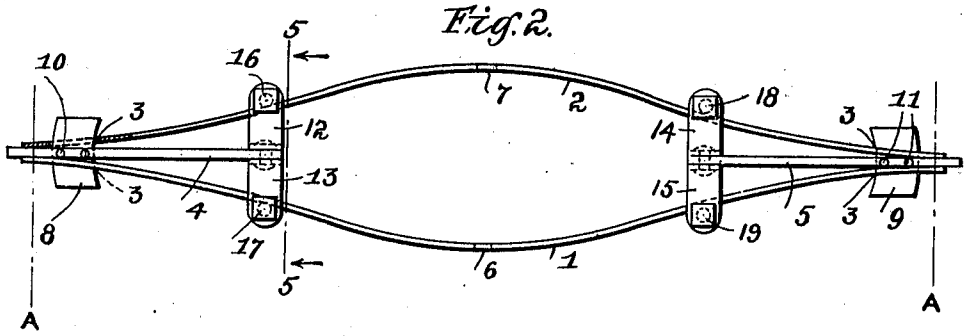


Fig. 3.

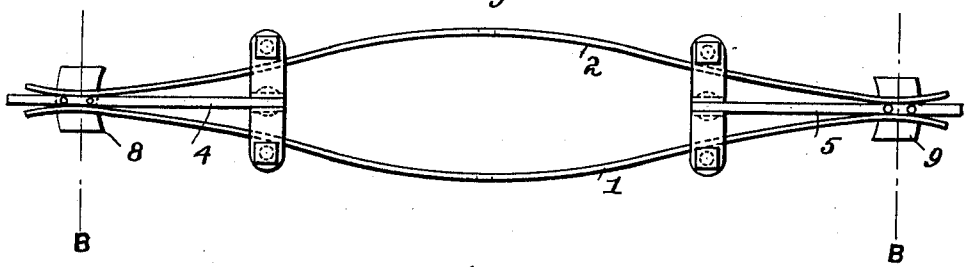


Fig. 4.

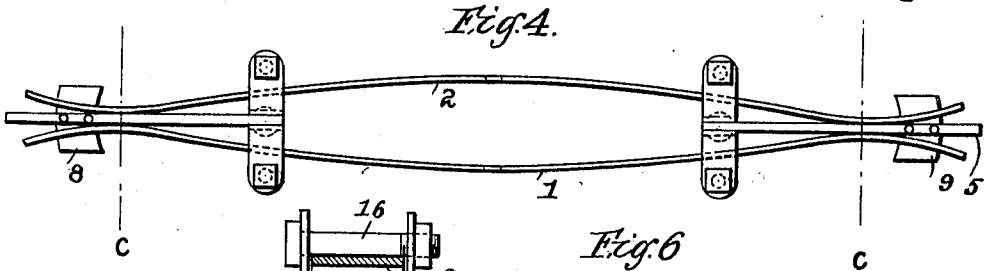


Fig. 5.

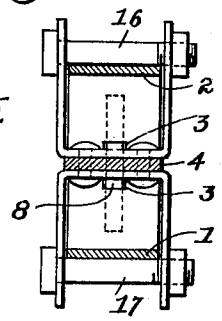
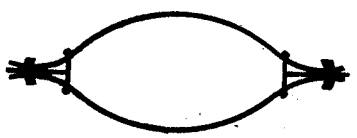


Fig. 6.



Witnesses
Wm. M. Rheem.
A. B. Lindsay.

Inventor
Benjamin O. Larson
by Mitchell Claudsen & Kent.
his attorneys.

UNITED STATES PATENT OFFICE.

BENJAMIN O. LARSON, OF BOSTON, MASSACHUSETTS.

SPRING.

992,215. Specification of Letters Patent. Patented May 16, 1911.

Application filed October 5, 1910. Serial No. 585,435.

To all whom it may concern:

Be it known that I, BENJAMIN O. LARSON, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Springs, of which the following is a specification.

My invention is a bow spring, for vehicles or other uses to which such a spring can be applied, of simple construction as contrasted with the duplex construction of previous bow springs and working, in performing its functions practically without friction.

In the accompanying drawings: Figure 1 is a plan view of my invention; Fig. 2 is a side elevation of the same, the elastic bow members being shown in the state of their utmost expansion; Fig. 3 is a similar view, the elastic bow members being shown in a state of partial compression; Fig. 4 is a similar view, the elastic bow members being shown in a still greater state of compression. Fig. 5 is a section taken on the line 5, 5 of Fig. 2 viewed in the direction indicated by the arrows; and Fig. 6 is a line sketch of the spring under violent rebound.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

In the present well known type of vehicle spring, and the type which is now in most common use, the bow shaped elastic members are built up of laminated, curved or bow shaped layers, the outer members of which are progressively shorter for the purpose of gradually stiffening these compound elastic members from the point where they are linked together at the ends to the center of the spring where the load or pressure is applied. Thus the load is first supported by the innermost and longest of these layers and as the load increases the inner members of the spring are distorted from their curved or bowed form and the next layer or lamination adds its resistance to that of the first layer, to take up the increased load, and so on until all of the layers are brought into play. By this mode of operation increased resistance to the pressure is necessarily provided by the series of curved leaves or spring parts.

In carrying out my invention I provide a pair of bow shaped elastic members 1 and 2, preferably rectangular in cross section, and composed of some flexible and elastic material such as spring steel, which has been properly tempered, so as to return to normal shape after being subjected to any distorting pressure. These members are arranged opposed to each other, as shown in Fig. 2, and the free ends of each member are provided with a slot 3. Interposed between the ends of the members 1 and 2 are the plates 4 and 5, the ends of the members resting on the plates, that is to say, the left end of the member 1 and the left end of the member 2 rest upon the plate 4, this plate being interposed between the two ends, and the right end of the member 1 and the right end of the member 2 rest upon the plate 5, said plate being interposed between these two ends. Each of the members 1 and 2 is provided with the bolt holes 6 and 7 respectively, the member 1 resting on the axle or running gear of the vehicle and secured thereon by a bolt passing through the hole 6 and the member 2 being adapted to receive the carriage or body part of the vehicle and to be secured thereto by a bolt passing through the hole 7, or the well known clips may be substituted as a connecting means instead of bolts.

The outer ends of the plates 4 and 5 are provided with the segment shaped lugs 8 and 9 respectively, said lugs being secured thereto in any convenient manner, such as passing through slots in the respective plates and secured by the rivets 10 and 11, an equal portion of each lug projecting on either side of its respective plate and the concave sides of the lugs being opposed and directed toward the center of the spring.

To the inner ends of the plates 4 and 5 are secured guide pieces or forks, adapted to guide and control the members 1 and 2 relatively thereto. These guide pieces may be of any convenient form or configuration, such as the U-shaped piece 12, which is riveted to the upper side of the plate 4 and forms a fork between which the left end of the member 2 is guided and the corresponding U-shaped piece 13 secured to the under side of the plate 4, and between the forked arms of which the left end of the member 1 is guided. The corresponding U-shaped pieces 14 and 15 secured to the plate 5 serve to guide the right ends of the members 1 and 2 in a like manner. The outer extremities

of the forked arms of the U-shaped pieces 12, 13, 14 and 15 are provided with apertures through which the bolts 16, 17, 18 and 19 pass respectively. These bolts lie across the outer surfaces of the members 1 and 2 and serve to restrain said members in their designed relations. The slots 3, 3, in the ends of the elastic members 1 and 2 are adapted to receive the lugs 8 and 9 and to have a sliding fit thereon, that is to say, the slot 3 in the left end of the elastic member 1 receives the lower projection of the lug segment 8, the slot 3 in the left end of the elastic member 2 receives the upper projection of the lug segment 8, the slot 3 in the right end of the elastic member 1 receives the lower projection of the lug segment 9 and the slot 3 in the right end of the elastic member 2 receives the upper projection of the lug segment 9.

It may be noted that although the plates 4 and 5 with their respective guide forks and segment lugs have been described as separate parts riveted together, that it is obviously not essential that the particular construction should be followed out in practice for, as a matter of fact, the plates 4 and 5 might be castings having their respective guide forks and segment lugs cast integral therewith or these parts may be made of forgings.

Referring to Fig. 2 of the drawings, the spring is shown in its normal state, that is under normal tension in an unloaded vehicle, the ends of the elastic members resting on the plates and the portion of the elastic members passing between the forked guides resting within the bolts 16, 17, 18 and 19, thus the spring parts are secured together yet in flexible relation. When the elastic members are subjected to additional pressure, as shown in Fig. 3, the ends thereof yield progressively and substantially equally at both ends and the pressure is progressively taken, as the spring members flex, at a point farther and farther away from the ends of the spring members and nearer and nearer to the center of the spring. This action is illustrated in the drawings by the vertical lines A, B, C, in Figs. 2, 3 and 4, the result being that, though the spring as a whole lengthens somewhat under increased flexure, the effective spring becomes progressively shorter and consequently stiffer as flexure increases under increased load or sudden stress. This increase of stiffness and resistance of the spring may be calculated as desired for any particular use and by proper design and curvature of the parts and selection of the proper cross-section of material for the parts any desired result may be obtained as will be clear to any one skilled in the art.

While the lugs 8 and 9, plates 4 and 5 and yoke pieces 12—13; 14—15, are well adapted for their purpose of holding the spring members in operative and proper relation, it is obvious that other holding means might be provided. The position of the plates 4, 5, interposed between the ends of the spring members, is one of convenience merely, since the spring members would react together if their ends were in contact. The holding of the spring members in their relation to one another is not alone important when the spring is subjected to pressure or swaying but the restraint of the spring members at points intermediate their ends, as, for example, by the yoke or stirrup members, 12—13; 14—15; is especially necessary in resisting undue stresses of rebound, which tend to expand the spring outside its normal shape. In preventing this the same progressive shortening of the effective length of the spring and consequently, increased resistance, takes place. This is illustrated in Figs. 2 and 6. Fig. 2 shows normal position and Fig. 6 the action of the spring when an abnormal jolt throws the load upward, leaving the axle and wheels hanging upon the lower half of the spring. It will be observed that the restraining members 12—13; 14—15; now serve as a fulcrum about which the spring members are flexed, the bearing of the ends of the spring members opposed to each other progressively shifting, as was illustrated under opposite conditions of flexure in Figs. 3 and 4. The same result follows, the spring increasing in stiffness by this progressive shortening of the effective spring length, to meet the unusual stress. In this operation of the spring the lugs which connect the ends of the spring members serve the purpose of an abutment for the restraining members 12—13; 14—15, which are held in position against the pressure of the distorted spring members which tend to force the restraining members toward the ends of the spring and thus neutralize their effect.

I claim:

1. A spring, comprising a pair of flexible members, curved outwardly at their middle opposed portions and opposed at their respective ends; a slot in each opposed end and a lug passing through said slot to hold said ends in fixed longitudinal relation while permitting them to separate in a direction perpendicular to their faces.

2. A spring, comprising a pair of opposed flexible members curved outward, at their middle opposed portions and approaching toward parallelism at their opposed ends; a pair of restraining members, intermediate the length of the spring, an abutment at each end of the spring engaged therewith and a link from each abutment to each restraining member.

3. A vehicle spring comprising a pair of bow-shaped elastic members arranged oppo-

site to each other with respect to their formation, plates interposed between the ends of said members, restraining forks adapted to receive the elastic members therebetween and connected to the respective plates and lugs connected to the elastic members and the plates, substantially as described.

Signed by me at Boston, Massachusetts, this third day of October, 1910.

BENJAMIN O. LARSON.

Witnesses:
HENRY RUSSELL,
ROBERT W. PALMER.