(No Model.)

E. J. HESS.

SPRING.

No. 598,516. Patented Feb. 8, 1898.

Fig. 1.

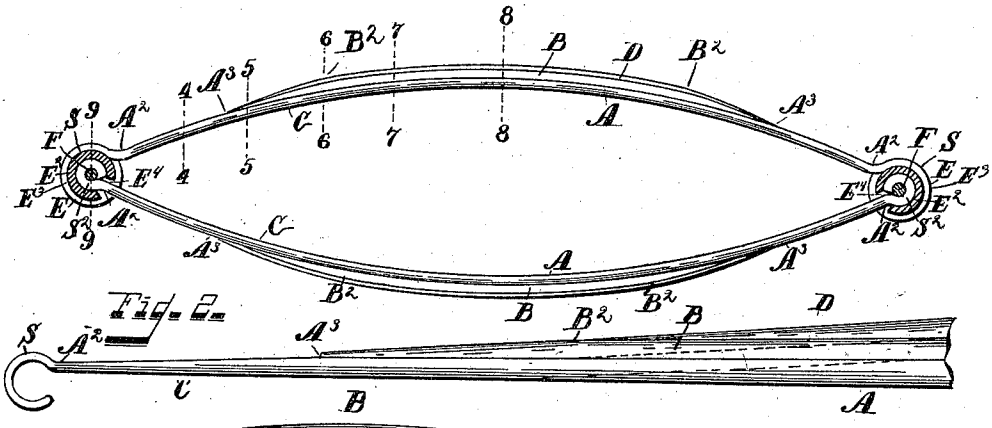


Fig. 2.

Fig. 3.

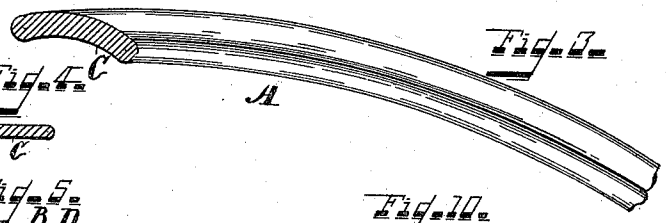


Fig. 4.

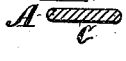


Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

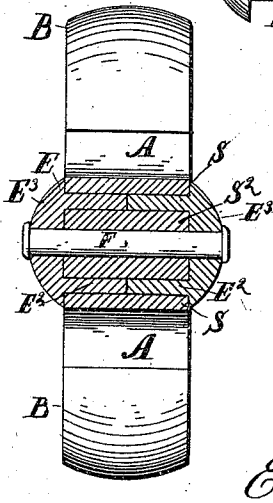


Fig. 10.

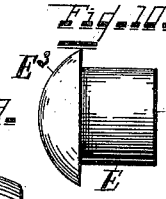
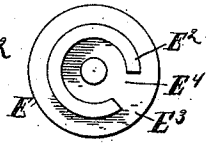


Fig. 11.



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SPRING.

SPECIFICATION forming part of Letters Patent No. 598,516, dated February 8, 1898.

Application filed July 27, 1896. Serial No. 600,580. (No model.)

To all whom it may concern:

Be it known that I, ELMER J. HESS, a citizen of the United States, and a resident of the village of Wyoming, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Springs, of which the following is a specification.

One of the important features of my invention relates to a novel construction of the spring whereby it is endowed with an increased amount of resilient resistance without increasing the thickness of the metal. One of the advantages of this construction is that it can constitute a part of its initial construction, and hence the cost of the extra weight of metal heretofore necessary is dispensed with. A considerable saving in the cost of the production of the spring is thereby effected. Some of the other advantages of such construction will be hereinafter specified after this construction and its modifications have been described.

Another important feature of my invention is a novel and economical means of uniting together the opposite halves of an elliptic spring, whereby I am enabled to couple the adjacent ends of the half-elliptic springs in such a manner that they turn easily relative to one another and are yet kept apart, so that their wear is lessened and the period of their useful durability lengthened.

In the accompanying drawings, making a part of this specification and in which similar letters of reference indicate corresponding parts, Figure 1 represents a side elevation of an elliptic spring embodying my invention. Fig. 2 represents in side elevation a one-half portion from end to mid-length of a three-leaved half-elliptic spring, illustrating certain features of my invention. Fig. 3 represents in perspective a portion of the single leaf (or in case of more than one leaf then of the main leaf) of a spring, illustrating certain features of my invention. Figs. 4, 5, 6, 7, and 8 are transverse vertical sections of the upper half or limb of the spring, said sections being respectively taken in the planes of the dotted lines 4 4, 5 5, 6 6, 7 7, and 8 8. Fig. 9 represents a vertical central section through the coupling at the plane of the dotted line 9 9 of Fig. 1 and looking toward the spring, the connecting-bolt being shown in elevation. Fig. 10 is a side elevation of either half of the coupling, exclusive of the bolt. Fig. 11 is a view of that end of this coupling which faces toward the right in Fig. 10.

I will now proceed to describe the spring. In the present illustrative instance both the upper and lower halves of the spring are constructed alike, excepting the scrolls, curls, or eyes at the end. Therefore the description which I will now give of the upper half as to its construction for resiliency, resilient resistance, and graduated elasticity will suffice for a description of the lower half.

A indicates the main limb or leaf of the spring, extending from end to end of the latter. B indicates a second shorter leaf laid upon the main leaf A and duly secured to the latter. I impart to each of the leaves a tapered form, (in vertical longitudinal section,) beginning at each end of the spring and extending for some distance therefrom toward the mid-length. For example, I taper the main spring some six inches, as from A^2 to A^3, and I taper the second leaf B from A^3 for some six inches to B^2. I have here a graduated elasticity for the distance of twelve inches from either (each) end of the spring. From this point—to wit, B^2—I begin a regular and graduated corrugation, and I increase the depth of this corrugation until I reach the mid-length of the spring or arrive quite near to this mid-length. This corrugation consists, preferably, of a single curve extending across the spring-leaf, usually from edge to edge, substantially as shown in the drawings. At a given distance from the extremity A^2, as at B^2, the sides—viz., the upper face B and the lower face C—of the springs are somewhat curved, preferably from edge to edge. (See Fig. 5.) At a still greater given distance from the extremity A^2—viz., at 6—the leaf A is curved still more on top and bottom, (see Fig. 6,) and at a still greater distance from the extremity A^2, as at 7, the curvature is increased, (see Fig. 7,) and at the mid-length, as at 8, the curvature is greatest. (See Fig. 8.) While I increase the curvature, I do not increase the weight of metal. This is uniform from where the corrugation begins,

as at 5, to the mid-length of the spring. Thus the leaf A gradually increases in resistive strength from the point 4 toward the mid-length 8. I am thus enabled to increase the carrying capacity of the spring without increasing the weight of metal for this purpose, and I can vary this capacity at will in the construction of the spring by varying the depth or greatness of the corrugation. I am thus enabled to stiffen the spring at its mid-length and in the middle portion more or less, as desired, and to diminish the resistance from the mid-length toward the extremities in any given ratio, as desired, and can retain a desired elasticity in the spring, and while attaining these paramount objects and accomplishing these beneficial results I can use a metal blank of the same size throughout the spring leaf or limb A from given points, as B^2 B^2. Heretofore to accomplish this result the metal blank was required to be thicker toward and at the mid-length and whenever increased resistance or stiffness was necessary.

The great saving of metal by my invention is one of the marked advantages it possesses over springs as heretofore made.

Where a spring consists of three or more leaves, as is usually the case, each additional leaf, as D, may and usually will be curved substantially in like manner as has been specified of the leaves already described. The ends of the added leaf or leaves will usually be tapered, as is usual with said leaves. Such curvature of each added leaf will greatly add to the resistive capacity of the spring and correspondingly increase the aggregate capacity of the spring for resilient resistance. If the curvature of this leaf B is varied from that of the leaf A at any given point or points, the resistance of leaf B will be varied and so will its compound action in connection with leaf A, and the same is true of a variation of curvature in the added leaf. The principle of construction can be employed in a single leaf-spring; but to obtain all of the novel features of construction and their consequent valuable effects arising from the combination of their new shapes in their new interrelations two or more leaves are to be employed. I am thus enabled to obtain in a spring a graduated elasticity from blanks of the same or substantially the same weight of metal by means of a proper and intentional combination of taper and graduated cross curvature or corrugation.

The improved coupling for uniting together the adjacent ends of the two halves of the elliptic spring is as follows: This coupling consists of what may be called a "bushing" E, consisting of a partial ring or sleeve E^2, interrupted at E^4 for the reception of the leaf of the spring-carrying scroll S^2, and a flange or rim E^3. The bushing enters between the eyes or scrolls S and S^2 of the adjacent ends of the halves of elliptic spring, and the flange E^3 rests against that edge of each of these eyes which is in the same plane. A bolt F, passing through the interior of the inner scroll S^2, holds the bushing in place. It will be understood that the preferred construction consists of two of these bushings E. One of these enters between the eyes S S^2 from one direction and the other bushing from the other direction. The bolt F is then introduced, as heretofore indicated, and passing through the two bushings is secured in place, preferably by riveting it there. This construction and arrangement of parts of the coupling is shown in the drawings, Figs. 1, 8, 9, and 10.

The advantages of my improved mode and means for uniting adjacent ends of the half-elliptic springs over the ordinary ways and means of uniting them will now be apparent to those skilled in the art. Some of the principal advantages of those features of my invention which relate to this coupling will now be mentioned.

In the ordinary and common way of heretofore uniting the half-elliptic springs the end scroll, as S^2, of the one half-spring fits closely within the adjacent end scroll S of the other half-spring, these two scrolls being formed of a size to closely fit each other. A bolt passed through the inner scroll holds the scrolls together by means of the sufficiently-enlarged bolt-head at one end or adjacent edge of each scroll and a washer at the other adjacent edges of the scrolls, the bolt passing through the washer and at the outer side of the latter, being secured in place by being rivet-headed or by a nut screwed thereon in the usual manner.

My improved bushing-coupling enters between the inner scroll or eye S^2 and the outer scroll or eye S and keeps these scrolls apart. The scrolls are thereby prevented from wearing down by rubbing against one another. The bushing is made of phosphor-bronze or of brass, or of other metal which causes less friction when in contact with the scroll of the spring than the steel or iron of the one scroll would when in direct contact with or against the steel or iron of the adjacent scroll. The bushing constitutes a novel non-friction bearing of a most useful kind. Furthermore, this bearing is larger—that is to say, its surface in contact with the scrolls is greater than the surfaces of the scrolls when in direct contact, these scrolls in the latter instance usually being made smaller than I make them when I combine with them my novel bushing.

My improved bushing-coupling carries its own washers integral with itself and thus takes the place of two pieces. My bushing-coupling also makes the connection between the half-springs more steady. This coupling-bushing also confers increased durability upon the springs. Heretofore and in the former mode of coupling the springs themselves wore out at the scrolls and required to be replaced. Now the scrolls and springs last longer. Hence a marked advantage over the former mode of coupling the ends of the half-springs

together. In case the coupling-bushing after a time wears too much to be longer sufficient it can readily be replaced by a new one of its kind at a slight, in fact, nominal expense.

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

1. A spring, whose leaf is at each end portion tapered toward the end, but nevertheless flat on its upper and lower sides, the middle portion of its spring being everywhere of the same weight of metal and having a concavo-convex form or corrugation, this corrugation being graduated in degree as desired from the tapered portions to the center of the springs, in a given increasing ratio, substantially as and for the purposes specified.

2. In a spring, the leaf curved, above and below, transversely, the curvature increasing toward the center, for graduating the resilient resistance, and without increasing the weight of metal toward the center, this increasing curvature extending from edge to edge of the spring, substantially as and for the purposes specified.

3. A spring composed of several leaves, the foundation-leaf having each end portion tapered toward its end, but nevertheless flat on its upper and lower sides, the middle portion of the spring being everywhere of the same weight of metal and having a concavo-convex form or corrugation, this corrugation being graduated in degree as desired from the tapered portions to the center of the spring in a given increasing ratio, the additional leaves tapering at each end, but conforming in shape in cross-section to the shape of the main leaf, substantially as and for the purposes specified.

4. A spring composed of several leaves, the foundation-leaf having each end portion tapered toward its end, but nevertheless flat on its upper and lower sides, the middle portion of the spring being everywhere of the same weight of metal and having a concavo-convex form or corrugation, this corrugation being graduated in degree as desired from the tapered portions to the center of the spring in a given increasing ratio, the corrugation extending from edge to edge of the leaf, the additional leaves tapering at each end, but conforming in shape in cross-section to the shape of the main leaf, substantially as and for the purposes specified.

5. In a spring, the main leaf, provided with tapered extremities and with a graduated increasing corrugation therefrom toward the mid-length, and the corrugation extending from edge to edge of the spring, substantially as and for the purposes specified.

6. In an elliptic or double spring, each half or branch spring provided with a scroll, one of the scrolls as S encircling the other, in combination with a coupling-bushing having the interrupted sleeve E^2, located between the scrolls, and forming a bearing, and head E^3, and bolt F for securing the coupling-bushing in position, substantially as and for the purposes specified.

7. The combination of two couplings, each composed of a bushing, interrupted to receive thereat the limb of the spring, and each bushing having a flange or rim E^3, and the adjacent ends of two half or branch springs, each having a scroll, the one scroll encircling the other, and the bushings lying between the scrolls, and the scrolls between the flanges or rims E^3, and a securing-bolt, substantially as and for the purposes specified.

8. The combination of two couplings, each composed of a bushing, interrupted to receive thereat the limb of the spring, and each bushing having a flange or rim E^3, and the adjacent ends of two half or branch springs, each having a scroll, the one scroll encircling the other, and the bushings lying between the scrolls, and the scrolls between the flanges or rims E^3, and each bushing having the central perforation, and a securing-bolt passing through the bushings and securing them and the scrolls together, substantially as and for the purposes specified.

9. The combination of the elliptic spring having leaves whose mid-length portion is of the same weight of metal throughout, and curved transversely for their mid-length portion, the curvature being greatest at the center and diminishing toward the ends, and having end scrolls, and the coupling-bushing interposed between the scrolls, and having end rims, and a securing-bolt holding the couplings in place relative to the scrolls, substantially as and for the purposes specified.

10. The combination of an elliptic spring whose ends have scrolls, and coupling-bushings, whose sleeves are interrupted to receive the spring of the inner scroll, these coupling-bushings being made of phosphor-bronze, and having the function of a non-friction bearing as well as that of a coupling, substantially as and for the purposes specified.

ELMER J. HESS.

Attest:
WM. E. JONES,
K. SMITH.