

(No Model.)

E. SPAULDING.
VEHICLE SPRING.

No. 245,097.

Patented Aug. 2, 1881.

Fig. 1.

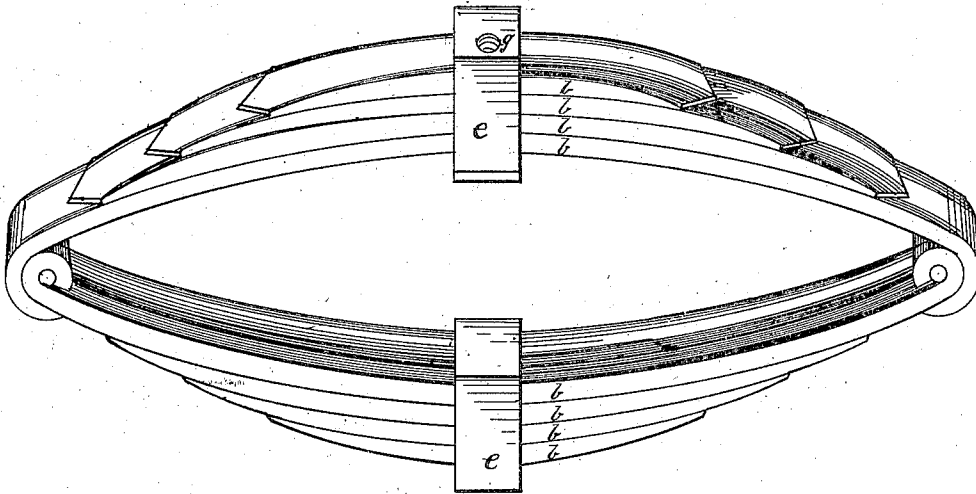


Fig. 2.

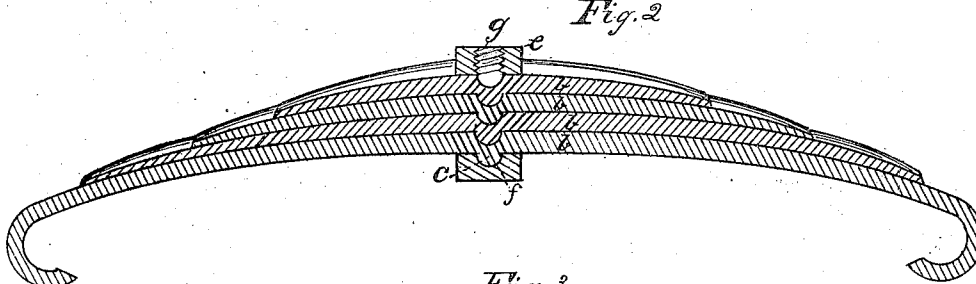


Fig. 3.

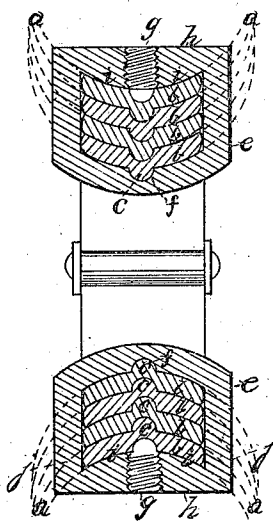
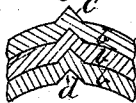


Fig. 4.



Witnesses:

O. H. Morgan
E. H. Morgan

Inventor.
E. O. Spaulding
By *A. P. Thayer* atty

UNITED STATES PATENT OFFICE.

EDWARD SPAULDING, OF BROOKLYN, NEW YORK.

VEHICLE-SPRING.

SPECIFICATION forming part of Letters Patent No. 245,097, dated August 2, 1881.

Application filed May 31, 1881. (No model.)

To all whom it may concern:

Be it known that I, EDWARD SPAULDING, of Brooklyn, Kings county, and State of New York, have invented a new and useful Improvement in Vehicle-Springs, of which the following is a specification.

The invention relates to elliptic or semi-elliptic springs the plates of which are of concavo-convex form in cross-section, and are so arranged in the spring that the edges of the plates are subject to compression only in service, while the tension is borne by the intervening web between the edges in a manner calculated to add greatly to the sustaining capacity of the metal as compared with the arrangement of such concavo-convex plates that the edges are exposed to the tension, because the compression of the edges tends to prevent the opening of the slight cracks or fissures of the edges of the metal where it is weakest and the breaks begin, whereas the tension acts the reverse on said edges.

The first part of the invention consists of making these plates of greater thickness in the middle portion, which sustains the tension, than the edges, which are subject to the compression, and also making both sides of these concavo-convex plates upon the same radius or curvature in cross-section, whereby two important advantages are obtained over all springs of this character heretofore made, viz: First, the metal is thus disposed more naturally in accordance with the demands of the service by giving the larger portion, and also that portion which is best adapted to resist tension, to the locality where the tension is sustained and the lesser to the parts of compression, and thus for given quantities of metal greater power is secured; second, the plates bear alike upon each other throughout their whole area, and thereby are less injured by friction and their sustaining power is increased.

The second part of the invention consists of making the studs of these concavo-convex plates that are struck up on one side by indenting the other side for keeping the plates in position to project from the convex side of said plates, whereby they are more in conformity with the shape of the plates than they would be on the other side, and the continuity of the surface is less disturbed and broken, and con-

vexity of surface corresponding to the general convexity of the plate is presented to the tension, whereas if struck up on the other side the convex surface of the plate would be broken by the indentations, which would weaken the plate to a great extent by making abrupt angles, favorable to cracks.

The third part of the invention consists of making the band which is employed to hold the several plates of the spring together and to form a bearing-surface between the spring and the part of the carriage to which it is attached with a flat outside surface for said bearing and a convex inner side corresponding with and fitting in the concave outer surface of the outer concave plate, and thereby making said outside bearing adapted to the carriage, and the inside bearing adapted to the spring and supporting it across the whole breadth; but I do not limit myself to this construction of the band, for I may use a separate piece fitted in the space between the concave side of the spring and the band, if the latter is straight on the inside.

Figure 1 in the accompanying is a perspective view of an elliptic spring made of concavo-convex plates arranged for the convex sides to sustain the tension while the edges take the compression. Fig. 2 is a longitudinal section of a half-spring of similar arrangement, and it shows my arrangement of the studs and cavities for confining the plates. Fig. 3 is a transverse section of Fig. 1, showing both sides of the plates constructed on the same curvature and made thicker in the middle and thinner at the edges, in accordance with the present invention. It also shows my arrangement of the studs and cavities for confining the plates with relation to said concavo-convex plates. Fig. 4 shows a slight modification of the form of these studs and cavities.

By reference to Figs. 1 and 2 it will be readily observed that the effect of a load upon springs constructed of concavo-convex plates as there represented, and arranged with the convex sides toward the chord of the arc formed by the longitudinal direction of the spring, is to produce tension on the middle web and compression on the edges. Now, it is evident that the effect of compression is much less destructive to the integrity of the metal than that of

tension; hence if the metal is so disposed in the construction of the plates as to make them thinnest at the edges and thickest at the middle, it is best arranged to suit the requirements of the plates of this form and arrangement, and thus will be best adapted to secure the best results with the least amount of metal, a matter of great importance in the way of economy of metal, also labor in the construction of the springs, for the smaller the quantity of metal the less the amount of labor and power required to shape them, and for vehicle-springs lightness is also of great importance. Again, it will be observed that by this same construction of these concavo-convex plates, thicker at the middle and thinner at the edges, they are made to bear the one upon the other with uniformity throughout their whole surface, so that the friction and wear are no greater on one part than another and each plate is sustained by the other, and the effect of the load is evenly distributed over the whole spring so as to have the best effects, whereas if the plates have parallel sides, or are thicker at the edges than the middle web, they can only bear along the edges, where they will, as a matter of course, wear faster and unequally, and they will be less powerful, both singly and together. For this part—that is, to cause the plates to bear fairly upon each other—both sides should be formed on the same radius or curvatures, as indicated by the dotted lines *a*, Fig. 3, which are prolonged beyond the edges of the plates *b*, to show more clearly the taper of the plates from the middle to the edges; but for the advantage of the thicker middle and thinner edges, merely in point of the best distribution of the metal—for instance, in a spring having only one plate—I do not confine myself to the same radius for both sides of the plate, for the concave side may be of a greater radius, making the edges still thinner in proportion to the middle, if desired.

c represents the studs, thrust out on one side by indentations *d* made on the other, to secure the plates in position within the band *e*, by the stud of one plate fitting in the indentation of another, as is common in springs; but in this case these studs, being formed on these concavo-convex plates, are, according to my invention, arranged to project from the convex sides for maintaining the continuity of the convex surface, as before described, and thereby preserving the advantage gained by presenting the convexity of the spring to the tension of service.

The curvature which I prefer for the cross-section of the plates is that of which the chord of the concave side of the plate equals the radius of the circle, but it may be varied at will and the plates may have parallel edges from middle section to end or be tapered, and the

curvature may vary from middle to end, if desired.

That side of the band *e* which crosses the outer concave side of the spring is required to be flat on its outside, *h*, for properly connecting with the carriage. At the same time, the concavity of the plate must be filled inside of the band, to afford substantial rest and holding for the plate. Therefore, in order to accomplish this without the use of an additional piece to be shaped and fitted in for that purpose, I propose to make the band with one of its sides flat outside, at *h*, and convex inside, at *i*, in conformity with the concavity.

It is designed to fit on the band *e* while hot and enlarged enough to admit the stud *c* of the bottom plate to its cavity *f* in the band, and after the band has shrunk tight fit in the binding-screw *g*.

I claim—

1. In elliptic or half-elliptic springs made of one or more plates of concavo-convex form in cross-section, and so arranged that the load causes compression on the edges and tension on the middle web of said plate or plates, the said plate or plates made thickest in the middle and thinner at and toward the edges, substantially as described.

2. In elliptic or half-elliptic springs made of one or more plates of concavo-convex form in cross-section, and so arranged that the load causes compression on the edges and tension on the middle webs of said plates, the said plates having both their concave and convex sides constructed on one and the same curvature or radius, and thereby made thicker in the middle than at the edges, and also made to bear uniformly and alike upon each other from edge to edge, substantially as described.

3. In elliptic or half-elliptic springs made of a concavo-convex plate or plates in cross-section, and arranged so that the load causes the compression on the edges and tension on the middle web of said plate or plates, the stud or studs for securing the plate or plates in position struck up on the convex side thereof by indentation of the concave side, substantially as described.

4. The combination, with a spring, the plate or plates of which are of concavo-convex form in cross-section, of a band, *e*, that is convex on that portion of the inner side that crosses the concave side of the spring, and fitting the concavity thereof, and is shaped on the outside of said portion in flat or other equivalent form, adapted for the bearing-connection with the carriage, substantially as described.

EDWD. SPAULDING.

Witnesses:

W. J. MORGAN,
S. H. MORGAN.

It is hereby certified that in Letters Patent No. 245,097, issued August 2, 1881, to Edward Spaulding for an improvement in "Vehicle Springs," on page 1 of the printed specification attached to and forming a part of the said Letters Patent, in line 76, the word "accompanying" was erroneously printed "accompanyings;" also that the word "drawing" was erroneously omitted after said word "accompanying;" that the proper corrections have been made in the files and records pertaining to the case in the Patent Office, and are hereby made in said Letters Patent.

Signed, countersigned, and sealed this 27th day of September, A. D. 1881.

[SEAL.]

E. M. MARBLE,
Commissioner of Patents.

A. BELL,
Acting Secretary of the Interior.