G. E. GRAY.
Spiral Spring.

No. 202,019. Patented April 2, 1878.

Fig. 1.

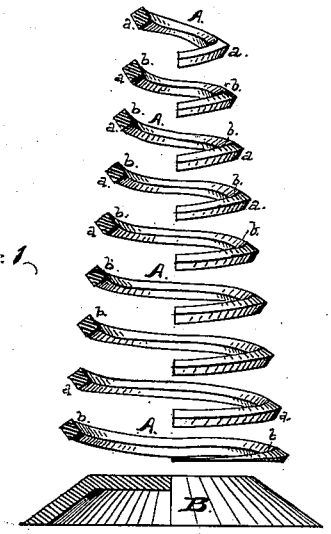


Fig. 2.

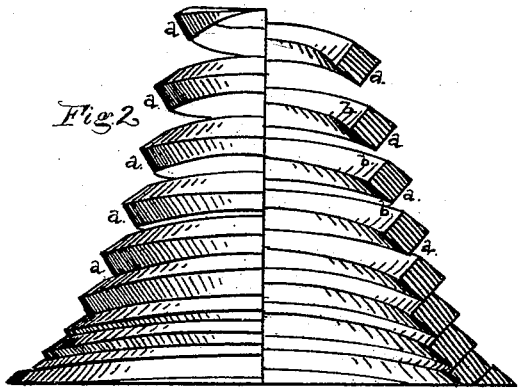
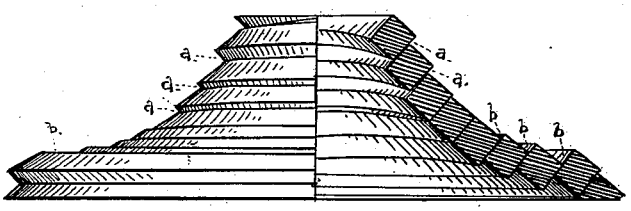


Fig. 3.



Witnesses:
Edward E. Osborn
A. J. Lothy

Inventor:
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By C. W. M. Smith his Atty.

UNITED STATES PATENT OFFICE.

GEORGE E. GRAY, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN SPIRAL SPRINGS.

Specification forming part of Letters Patent No. **202,019**, dated April 2, 1878; application filed November 7, 1877.

To all whom it may concern:

Be it known that I, GEORGE E. GRAY, of the city and county of San Francisco, in the State of California, have invented a new and useful Improvement in Spiral Springs for Rail-road-Cars and other purposes, which invention is fully set forth and described in the following specification and accompanying drawing.

In the drawing referred to, Figure 1 is a perspective view of my improved spring when at rest, and a sectional view of the bed-plate used therewith. Fig. 2 is a vertical section through the spring when it is in a state of partial compression. Fig. 3 is a similar section of the spring when it is still further compressed, showing its action under a heavy load.

The object of my invention is to produce a spring which is nearly equally elastic under light or heavy loads, and which does not allow the load to impinge with a shock when the ordinary bearing power of the spring is overtaxed. This is accomplished by constructing the spring in such a manner that an extraordinary and supplementary elasticity possessed by the spring is called into play as the weight increases and the ordinary elasticity is exhausted, or nearly so.

To this end my invention consists in forming a spiral spring, of conoidal shape, from any suitable material, having such cross-section that the coils, when compressed together, will slide upon and into each other on inclined surfaces, the outer surface of one coil pressing against the inner surface of the other next below it, and acting to throw it outward as the weight of the load increases. The coils thus enlarge their diameters until each coil is compressed within the next larger one.

This action is facilitated by the use of a bed-plate, of conoidal shape, upon which the spring is placed to assist in the expansion of the larger coils; and this part of my invention may be used with the spring to increase its lateral elastic power or resilience, when desired.

Referring to the accompanying drawing, Fig. 1 represents a spiral spring made in accordance with the principles of my invention. Its form is that of a conoid, with the spirals increasing in regular manner, and of such diameters that the outer under face of one coil is over and in line with the inner upper face of the next larger coil below it. Thus when compression takes place the coils are brought in contact, and slide upon and into each other with an expansive force upon the lower coils.

The wire or metal of which this spring is composed and constructed is shown as having a cross-section of rectangular shape; but other shapes, both angular and round, may be employed, as the same lateral expansion of the spring constructed from material having any such shapes can be produced by forming the spring after the manner above described—that is to say, with the spirals increasing in such regular manner, one beneath the other, that the outer face of one coil shall be over and in line with the inner face of the next larger coil beneath it when the spring is at rest or but lightly loaded.

A spring constructed of such conoidal form has the pitch of the several spirals constantly increasing as the diameters of the spirals decrease, so that the smallest coils have a greater pitch than the largest one; and this is necessary in order to bring the outer face of one coil immediately over or in line with the inner face of the next larger coil below it, that when compression takes place the coils will come in contact and slide upon and within each other.

This spring, when heavily loaded, has a supplemental or additional elastic power, caused by the lateral expansion of the coils, or the tendency of each coil to return to its normal position, from which it has been forced by the compression of one coil within the other. By such action they sustain each other, and the spring remains elastic until entire compression may take place by added weight. In connection with this spring I use a base or bed plate, (shown at B in section in Fig. 1 of the drawing,) which can be employed to assist in the expansion of the larger coils; but the action of the spring is not dependent upon the use of the bed-plate in every case, and it may be used only where an increased size of spring is employed and a heavy load is sustained—where the resilience of the larger coils of the spring would be better brought into play.

When this conoidal bed-plate is used the last coil of the spring need not be tapered off;

but in all other cases the bottom as well as the top coil of the spring is tapered off to form a flat bearing-surface.

In the drawing, A A represent the coils of the spring; *a b*, the faces of the coils, that are in contact and slide upon each other when the spring is compressed; and B, the conoidal bed-plate, upon which the last coil of the spring is placed when an additional action is required.

As thus constructed my invention combines elasticity with great strength, and requires less material to sustain the same load than any other form of spring known to me; and it possesses greater elasticity and sensitiveness to motion, even under a heavy load; for the sliding action of the coils and their expansion, when pressed against each other, gives an additional movement beyond the vertical resilient action of the spring.

Having thus fully described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. A conical spiral spring, the meeting faces of the coils A of which are inclined inwardly at every point, so that when the spring is compressed the coils will slide upon each other, substantially as and for the purposes set forth.

2. In combination with the spiral conoidal spring A, constructed substantially as herein described, the conoidal bed-plate B, of the shape and operating substantially as herein described, for the purposes set forth.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 15th day of October, 1877.

GEORGE E. GRAY. [L. S.]

Witnesses:
EDWARD E. OSBORN,
CHARLES J. TORBERT.