(No Model.)

J. LUDLUM.

SPIRAL SPRING.

No. 303,302. Patented Aug. 12, 1884.

Fig. 1.

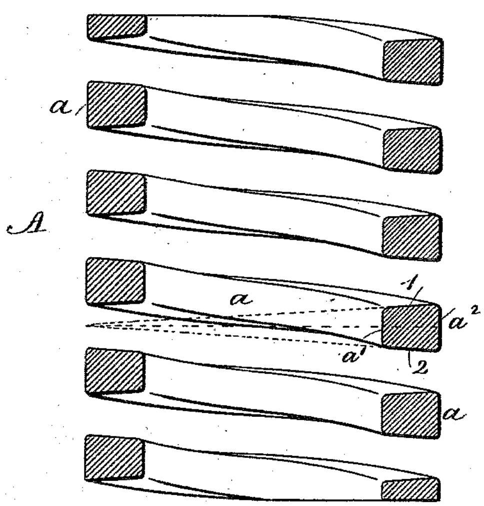
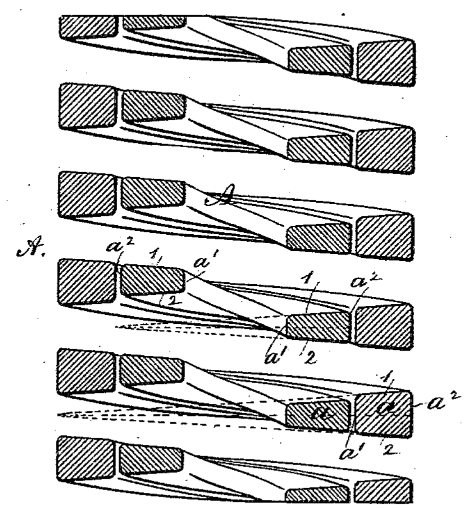


Fig. 2.



Witnesses
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UNITED STATES PATENT OFFICE.

JAMES LUDLUM, OF POMPTON, NEW JERSEY.

SPIRAL SPRING.

SPECIFICATION forming part of Letters Patent No. 303,302, dated August 12, 1884.

Application filed July 26, 1883. (No model.)

To all whom it may concern:

Be it known that I, JAMES LUDLUM, of Pompton, in the county of Passaic and State of New Jersey, have invented a certain new and useful Improvement in Spiral Springs; and the following is declared to be a description of the same.

It is well known that spiral springs have been made from bars whose section was square, rectangular, oval, &c., and that these springs have been made by rolling said bars flat or edgewise upon a mandrel, and that in rolling the upsetting of the part next the mandrel spread or widened the same so that the vertical inner edge was wider than the outer edge; and spiral springs have been made from bars having one edge thicker than the other, so that when rolled edgewise the inner vertical edge would be considerably thicker than the outer edge; and springs have also been formed from a bar rolled against a slightly-thinner inner edge, so that when the spring is coiled said inner edge will flatten out or be leveled and become practically of the same width as the outer edge, the upsetting tending only to spread the metal sufficiently for this purpose. In these springs the metal was not distributed so as to give the best working results.

My invention relates to spiral springs wherein the outer edge is thicker than the inner edge, and wherein a section of the spring is similar to a section of an isosceles triangle, the two equal sides of which angle are formed by lines drawn or radiating from the exterior circumference of the spring on one side across to the other side. The divergence of the lines forming these equal sides will depend upon the diameter of the coiled spring and the side of the bar used. I propose to employ bars for coiling these springs whose cross-sections shall vary according to the size and form and strength of spring to be made, allowing in all cases for the upsetting action upon the inner or narrower edge.

In the drawings, Figure 1 is a vertical section of a spiral spring made on my improved plan; and Fig. 2 is a vertical section of two coiled springs, one within the other.

The spiral spring A may be of any size, width, or pitch desired, the metal of the spring being in all cases of a sectional shape similar to the section of an isosceles triangle. The two sides 1 2 are on lines converging to a point at opposite sides of the spring, the vertical inner edge, a', being narrower than the vertical outer edge, a^2. The edges of the metal I prefer to round, as shown.

In Fig. 2 I have shown sectionally one spiral spring within another, and the sections of these springs are companion sections of the same isosceles triangle, as will be seen by their position and the dotted lines in the said figure; but it is not essential that all the spirals shall be so formed. Each one may be independent of the other, according to the power desired for it.

It is well known that if a steel bar of a given section is coiled into a spring of small diameter it will be stiffer than a spring made from the same kind of bar when coiled into a spring of larger diameter. Of course the small coil of the same length and pitch will not require as long a bar as a coil of larger diameter.

In heavy coiled or helical springs for railway-cars, vehicles, &c., the same condition holds good. The inner edge of the coil is not as long as the outer edge of the same coil; and if the inner edge is as thick as the outer edge the inner edge will take more than its own share of pressure, because the inner edge is the stiffer. For these reasons heavy coiled springs are liable to rupture on the inner parts of the coil, and the springs are unduly rigid and liable to lose their elasticity, or to give a harsh movement to the vehicle when the wheels are exposed to concussion.

I have discovered that the parts of the metal in coiled springs will all take their proportionate strain when the steel bar is trapezoidal in sectional shape, the converging lines, if prolonged, meeting at a point—that is, a distance corresponding (or nearly so) to the diameter of the coil forming the spring. When made in this manner, the inner coil (shown in Fig. 2) will require the same force (or nearly so) as the outer coil to compress it a given distance, and it will not be liable to be broken, whereas, if the inner coil were a bar of the same section as the outer coil, it would be much the stiffer and be liable to break. It will now be apparent that if the spring were made of a bar which, when rolled up, was of the sectional shape corresponding to the two coils, Fig. 2, if united, each part of the spring would take its proportion of the load. These general principles are applicable to all heavy-coiled springs. The bars made use of should be trapezoidal in section, and the converging sides should incline upon lines which, if prolonged, would reach (or nearly so) the opposite side of the coil.

I claim as my invention—

A coiled spring made of a steel bar of trapezoidal sectional form, rolled up with the narrowest edge inwardly, the thickness of the metal at the outer and inner portions being proportioned to the diameter of the spring, substantially as specified, so that each portion of the spring is adapted to take its share of the load, as set forth.

Signed by me this 17th day of July, A. D. 1883.

JAS. LUDLUM.

Witnesses:
GEO. T. PINCKNEY,
HAROLD SERRELL.