(No Model.)

E. CLIFF.

GRADUATED SPIRAL SPRING.

No. 431,250. Patented July 1, 1890.

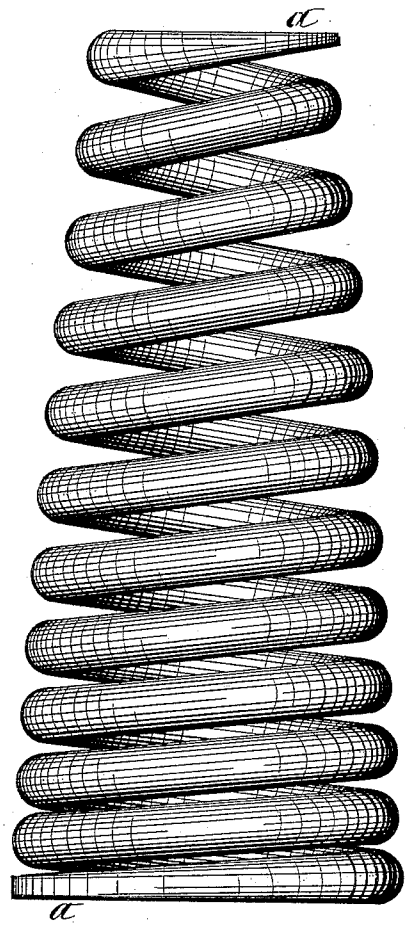


Fig. 1

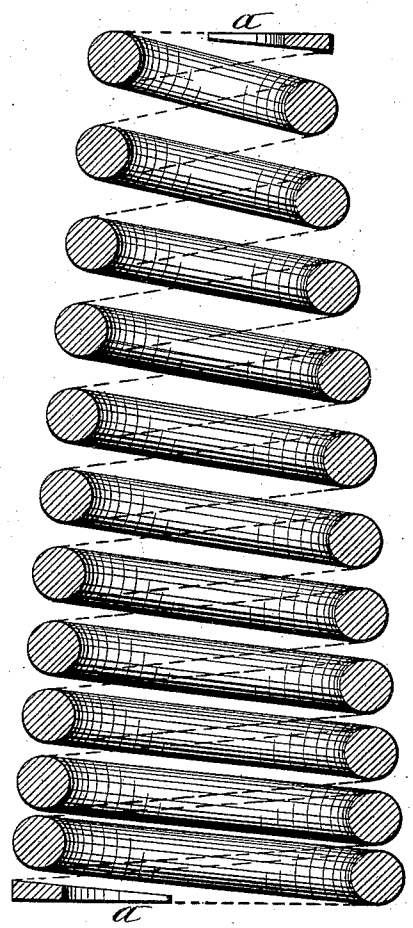


Fig. 2

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDWARD CLIFF, OF NYACK, NEW YORK.

GRADUATED SPIRAL SPRING.

SPECIFICATION forming part of Letters Patent No. 431,250, dated July 1, 1890.

Application filed November 23, 1889. Serial No. 331,279. (No model.)

To all whom it may concern:

Be it known that I, EDWARD CLIFF, of Nyack, in the county of Rockland, in the State of New York, have invented new and useful Improvements in Graduated Spiral Springs, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

The object of this invention is to provide a spiral spring adapted for use on cars and other vehicles, and which shall be formed of a bar of uniform dimensions in cross-section, and thus easily manufactured, and shall at the same time be graduated so as to bring the helices of the spring successively into action as the load on the spring is increased; and to that end my invention consists in the novel construction of the spiral spring hereinafter described, and specifically set forth in the claims.

In the annexed drawings, Figure 1 is a side view of a spiral spring embodying my invention, and Fig. 2 is a longitudinal section of the same.

This spring I form of a bar of spring-steel of any suitable shape in cross-section, but of uniform dimensions throughout its main portion, the ends *a a* thereof being merely tapered and flattened to form bearings for the spring. In forming said spring I wind the bar on a tapering or conical mandrel, and in passing it from the large end of the mandrel to the small end thereof I move the feed of the bar parallel to the axis of the mandrel with sufficiently-accelerated speed to gradually increase the distance between the successive coils of the bar, and thus form a spiral spring of conical shape or with the convolutions gradually diminishing in diameter and with the pitch of the successive helices gradually increasing from the large end of the spiral to the small end thereof, as illustrated in the annexed drawings.

The aforesaid mandrel is of such a taper and the movement of the feed of the bar lengthwise of the mandrel is so gaged in speed as to make the external diameter of each succeeding convolution of the spring greater than the internal diameter of the preceding larger convolution.

A conical spring thus constructed possesses greater power of resistance at its small end than at its large end or base, and when subjected to a load the large coils yield first, and as the load is increased the smaller coils become successively compressed and brought to bear upon each other, in accordance with the ratio of the increase of the load.

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

1. A graduated spiral spring formed with gradually diametrically-diminishing convolutions and with gradually-increasing pitch from the largest to the smallest convolution and with the external diameter of each succeeding smaller convolution greater than the internal diameter of the preceding larger convolution, as set forth.

2. A graduated spiral spring formed with gradually diametrically-diminishing convolutions from end to end of the spiral and with a gradually-increasing pitch from the large end to the small end thereof and with the external diameter of each succeeding smaller convolution greater than the internal diameter of the preceding larger convolution, as set forth and shown.

3. A graduated spiral spring formed of a bar of uniform dimensions in cross-section throughout its main portion and having its convolutions gradually diminished in diameter from end to end of the spiral and the pitch of the helices gradually increased from the large end to the small end of the spiral and with the external diameter of each succeeding smaller convolution greater than the internal diameter of the preceding larger convolution, substantially as described and shown.

In testimony whereof I have hereunto signed my name this 20th day of November, 1889.

EDWARD CLIFF. [L. S.]

Witnesses:
WM. J. GREEN,
MELVILLE GREEN.