

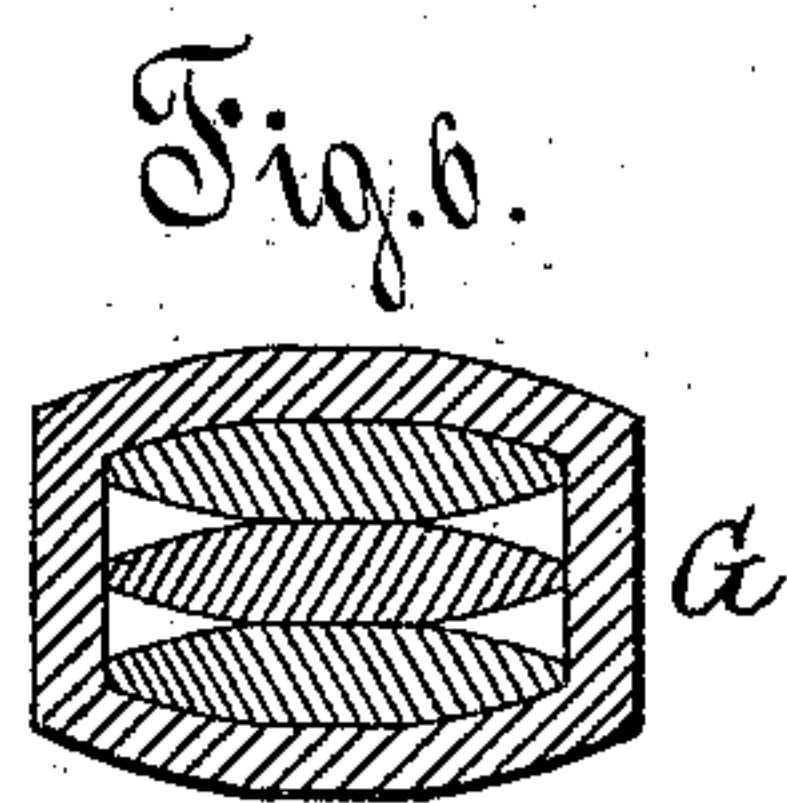
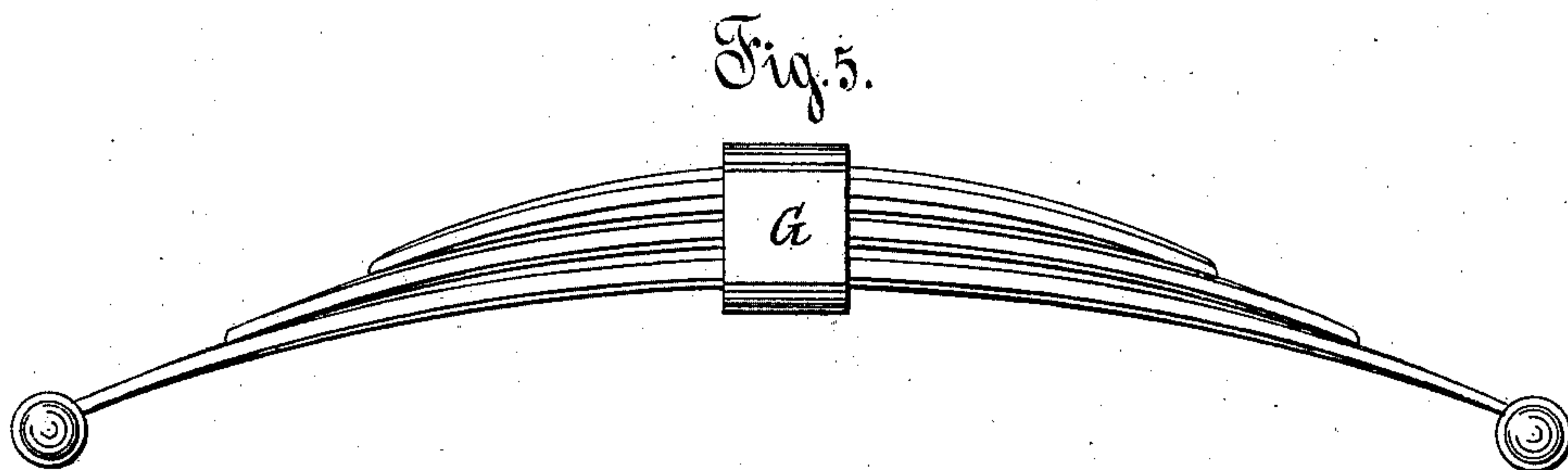
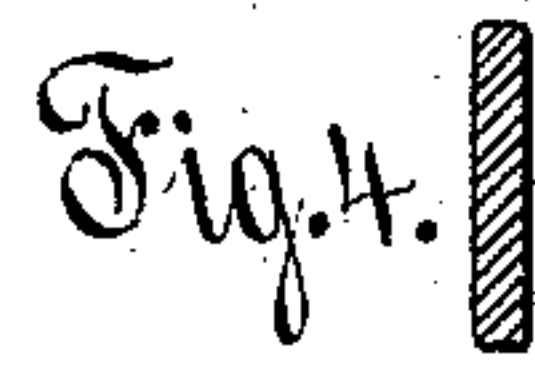
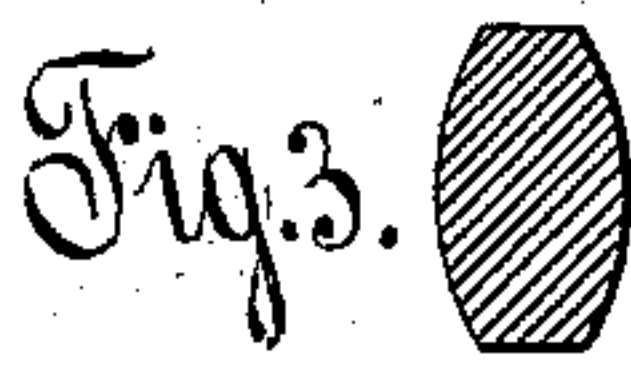
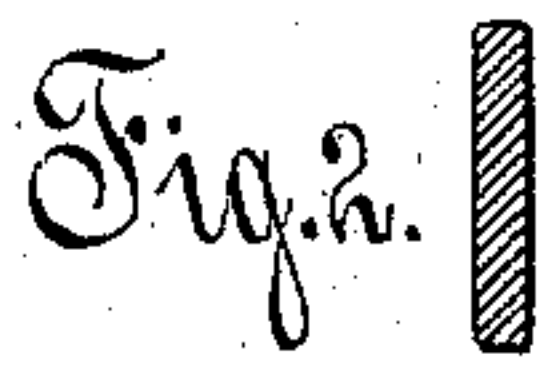
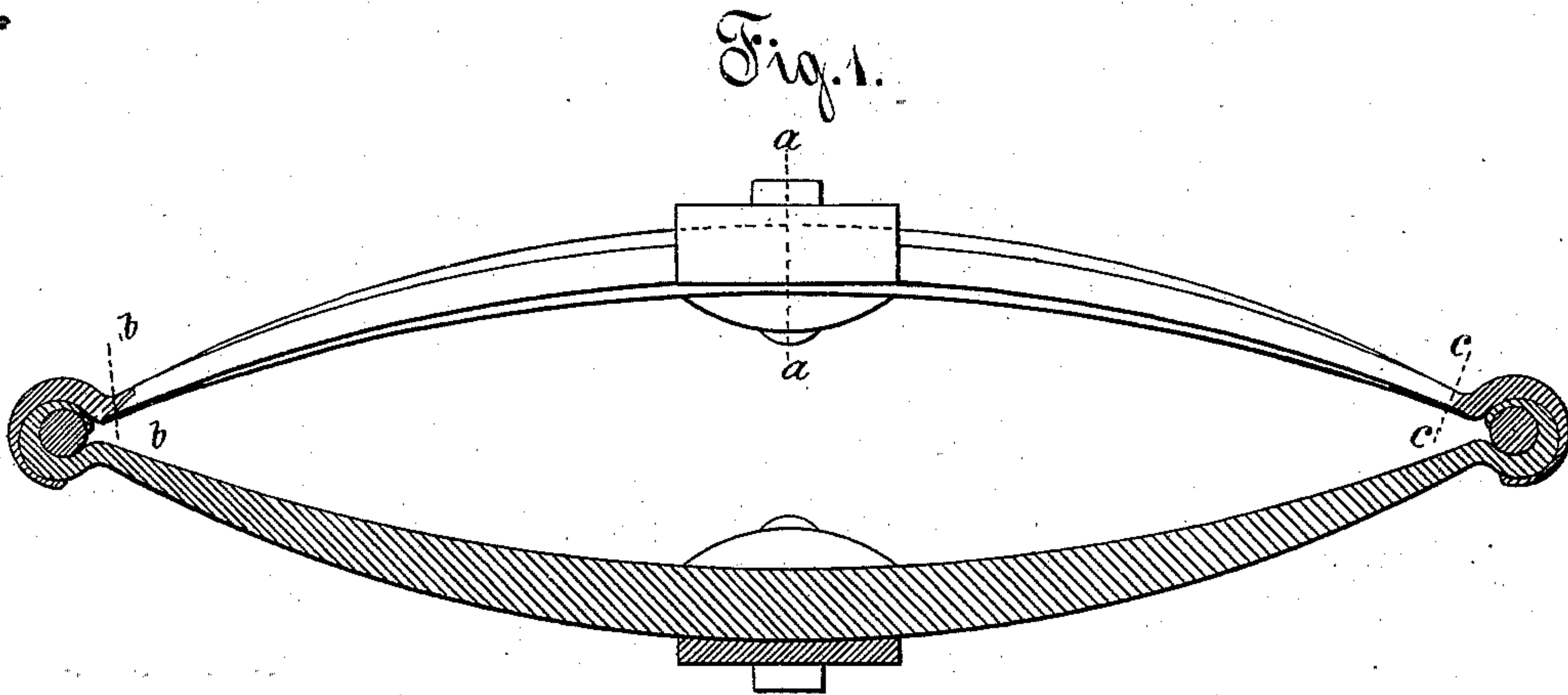
(No Model.)

2 Sheets—Sheet 1

E. CLIFF.
Elliptic Spring.

No. 239,447.

Patented March 29, 1881.



Witnesses:
Phoebe Hoston
Charles J. Burke

Inventor:
Edward Cliff
by D. E. Clark
His Atty.

(No Model.)

2 Sheets—Sheet 2.

E. CLIFF.
Elliptic Spring.

No. 239,447.

Patented March 29, 1881.

Fig. 7.

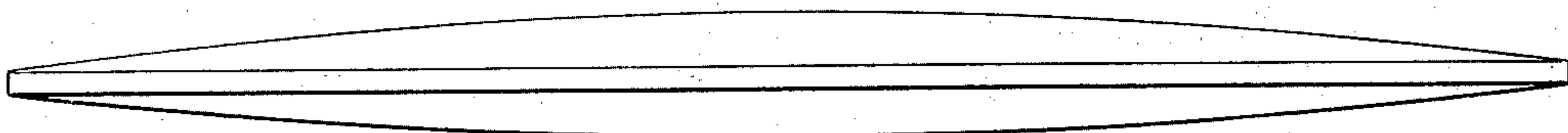
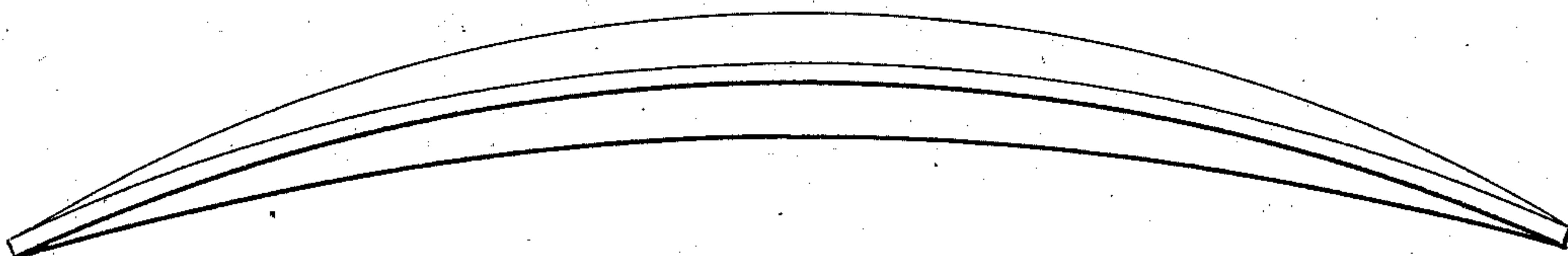


Fig. 8.



Fig. 9.



Witnesses:

Theo. G. Hostetler

Chas. R. Clarke

Inventor:

Edward Cliff

by

B. E. Clarke

his Atty.

UNITED STATES PATENT OFFICE.

EDWARD CLIFF, OF NEWARK, NEW JERSEY.

ELLIPTIC SPRING.

SPECIFICATION forming part of Letters Patent No. 239,447, dated March 29, 1881.

Application filed December 20, 1880. (No model.)

To all whom it may concern:

Be it known that I, EDWARD CLIFF, of Newark, State of New Jersey, am the inventor of an Improved Elliptic Spring for Cars and other purposes, of which the following is a specification, reference being had to the drawings accompanying the same.

My invention consists in an improved elliptical spring constructed of an elliptical bar of steel, which, when bent into the required form or shape, has at all times the greatest amount of steel in the center, both lengthwise and endwise, and the sides or edges of which are of the same thickness from end to end of the entire bar.

In the drawings, Sheet 1, Figure 1 is a side view of my improved spring, the lower half being in section and the upper half a side view. Fig. 2 is a section on line *b b*, Fig. 1. Fig. 3 is a like view on line *a a*, Fig. 1. Fig. 4 is a like view on line *c c*, Fig. 1. Fig. 5 is a side view of one-half of my spring having strengthening-leaves added thereto, and Fig. 6 is a cross-section on line *x x*, Fig. 5. Sheet 2, Fig. 7, is a side view of the bar. Fig. 8 is an end view of the bar; and Fig. 9, a side of the bar when bent into the form of a spring.

My elliptical spring consists in the construction of the bar of which said spring is made of such a form that the greatest amount of metal lies in the center of the bar, from end to end, graduated from the middle to either end, always having the most metal above and below the straight line through the center of said bar, and the sides or edges are of an equal width and plane surface from end to end even, retaining this even plane surface after the said bar is formed in its elliptical or bent shape, and thus the point of fracture so commonly found in elliptical bar-springs is removed, for it will be seen that as the sides of the bar have the

same thickness from end to end there is no decrease in the massing of metal, and no crack or fracture or point of weakness is formed, and where the point of fracture is usually found the greatest mass of metal is found. This is plainly seen by reference to Sheet 2, Fig. 7 being a side view of the bar of steel drawn out, showing the greatest amount of metal above and below the center, and its sides *d d* of an even depth from end to end. Fig. 8, same sheet, is an end view of said bar; and Fig. 9 a side view of said bar drawn out in the shape of an ellipse. The elliptical bars thus formed are joined together or attached to eyes at their ends, as commonly used.

Leaves forming such spring may be duplicated, as shown in Fig. 5, by placing a shorter on the long leaf or bar, no medium intervening, thus acting as a strengthening-leaf. These leaves, when two or more are used, are held together by the use of the clamping-band *G*.

What I claim, and desire to secure by Letters Patent, is—

1. An elliptical spring constructed of a bar of steel whose thickness is greatest through its middle from end to end crosswise and lengthwise, and whose sides *d d* are of the same thickness from end to end, thus obviating the point of fracture, for the purpose specified, and substantially as described.

2. The grouping of two or more leaves of varying length, together forming an elliptical spring constructed of an elliptical bar, as above described, the said leaves resting directly on each other with no intervening medium, for the purpose specified, and substantially as described.

EDWARD CLIFF.

Witnesses:

B. S. CLARK,

THEODORE G. HOSTER.