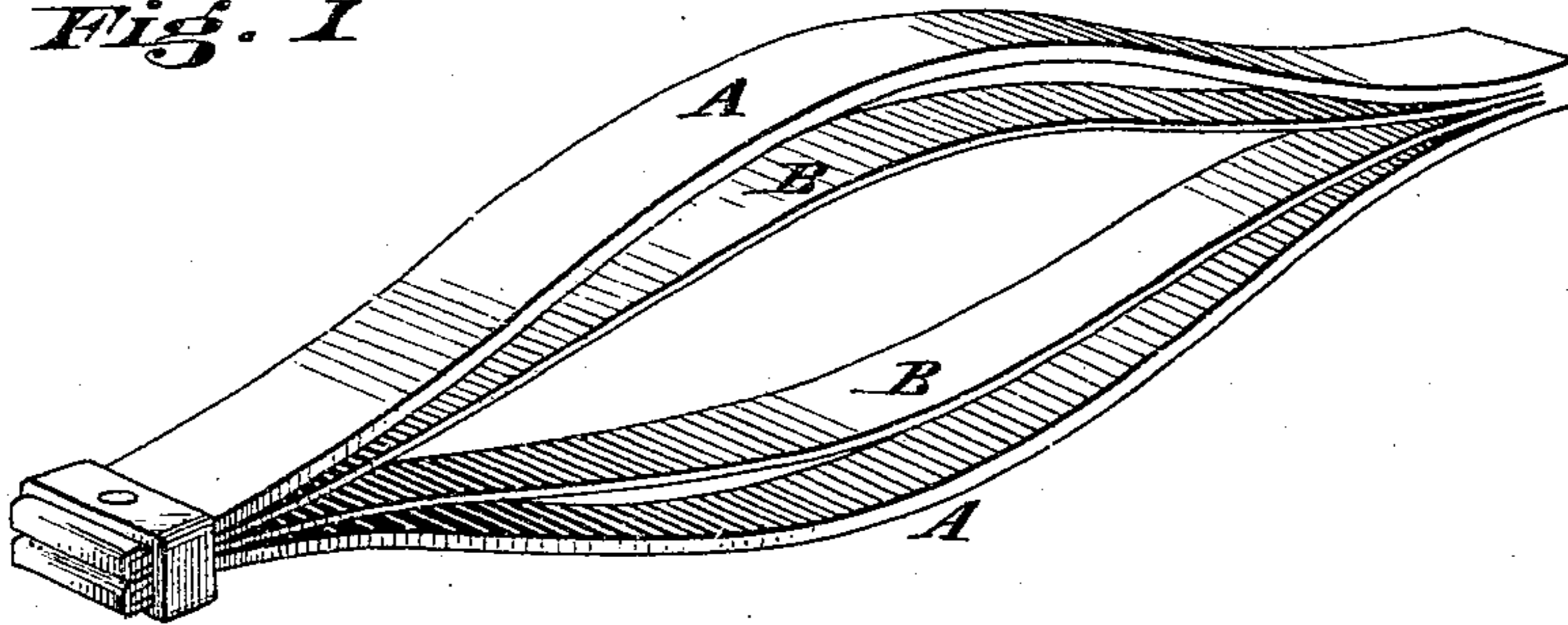


J. D. RICHARDSON.  
Vehicle-Springs.

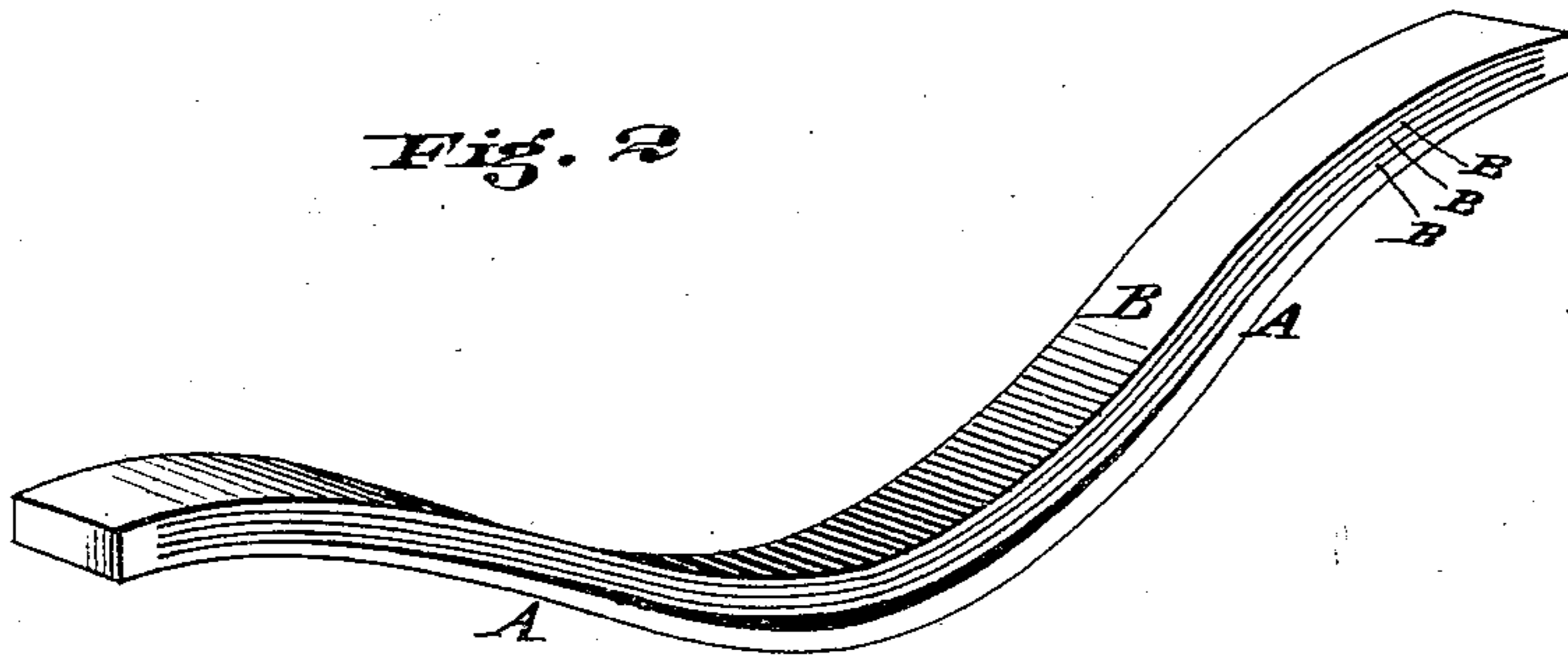
No. 153,612.

Patented July 28, 1874.

*Fig. 1*



*Fig. 2*



*Attest*

*Wm. Hunter*  
*Charles Street*

*Inventor*

*John D. Richardson*  
*By Y. Millward*  
*Attorney*

# UNITED STATES PATENT OFFICE.

JOHN D. RICHARDSON, OF HOUSTON, TEXAS, ASSIGNOR TO HIMSELF AND  
JOSEPH RICHARDSON, OF CINCINNATI, OHIO.

## IMPROVEMENT IN VEHICLE-SPRINGS.

Specification forming part of Letters Patent No. **153,612**, dated July 28, 1874; application filed  
February 10, 1874.

*To all whom it may concern:*

Be it known that I, JOHN D. RICHARDSON, of Houston, Harris county, State of Texas, have invented a certain new and useful Improvement in Springs for Carriages or other uses, of which the following is a specification:

My invention relates to the construction of metallic springs, and has for its object such a construction as will provide for great flexibility and diminished friction of the parts.

It is well known that in metallic springs composed of separate leaves, joined in the usual way at the center, with freedom necessary for end play of the leaves, a certain amount of rubbing action between the leaves is inevitable and deleterious to a free flexibility of the spring. My invention is designed to remedy these evils; and it consists of a spring formed by two or more leaves joined firmly together at both ends, and left free for independent action or motion at the center, the inner and outer leaves being of such formation relatively, that in operation the outer leaf is under compression lengthwise, and the inner leaf or leaves under tensile strain.

Figure 1 is a perspective view of an elliptical spring embodying my invention. Fig. 2 is a perspective view of a spring specially designed for locomotive or car use.

The spring is composed of outer leaf or leaves A and inner leaf or leaves B. The leaves are joined together at the ends either by welding, as shown at one end of Fig. 1, or by banding, as shown at the other end of Fig. 1, in the latter case it being desirable to lap the ends of the inner leaf over the ends of the outer leaf, as shown, so that they may have no motion at the ends. The outer leaf or leaves may be secured to the vehicle in any preferred manner, and the inner leaves must at the center be unattached to the outer ones, so as

to have free independent action. The outer leaves may be of any preferred form or construction so long as they are adapted under the weight to which they are subjected to impart a tensile strain to the inner leaves, and the inner leaves are preferably of cyma-reversa curvature, as shown. A form best adapted for elongation under tensile strain I have found to be the one shown. Under heavy strains the inner leaves are permitted to elongate so far as to form chords to the arc of the outer leaves, which is the limit inward to the flexibility of the spring.

It will be seen in the motion of the spring that the inner leaves have a motion whose extent is different and independent of the motion of the outer leaves, and that there is no rubbing contact between them.

If preferred, the leaves may be curled over each other at the ends to form the end junction, and the parts of the vehicle may be attached to the eyes thus formed by the curling of the ends, as in ordinary vehicle connections.

I claim—

1. A spring the inner leaves B of which are rigidly secured to the outer leaves A at the ends only, so that the inner leaves may act as flexible tensile braces, substantially as specified.

2. A spring the inner leaves B of which are rigidly secured to the outer leaves A, the inner leaves being of cyma-reversa form, substantially as shown, and for the purpose specified.

In testimony of which invention I hereunto set my hand.

JOHN DUNN RICHARDSON.

Witnesses:

J. C. LORD,  
SARAH N. LORD.