H. GARDINER.
Vehicle-Spring.

No. 215,114. Patented May 6, 1879.

Fig. 1.

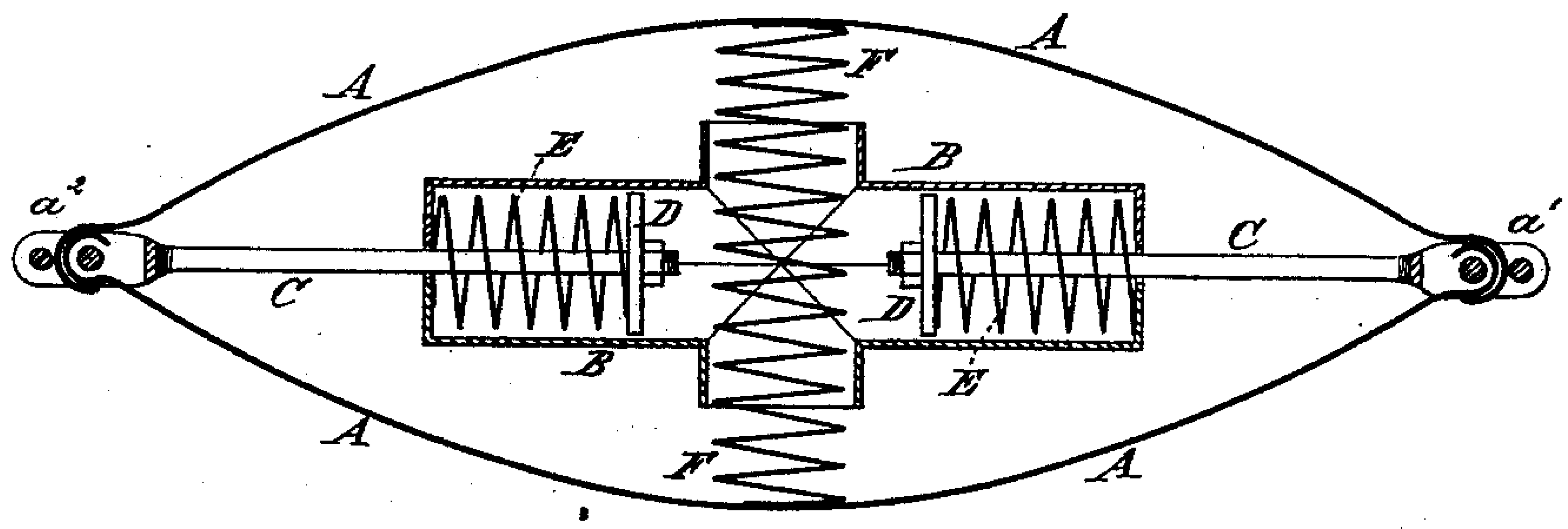


Fig. 2.

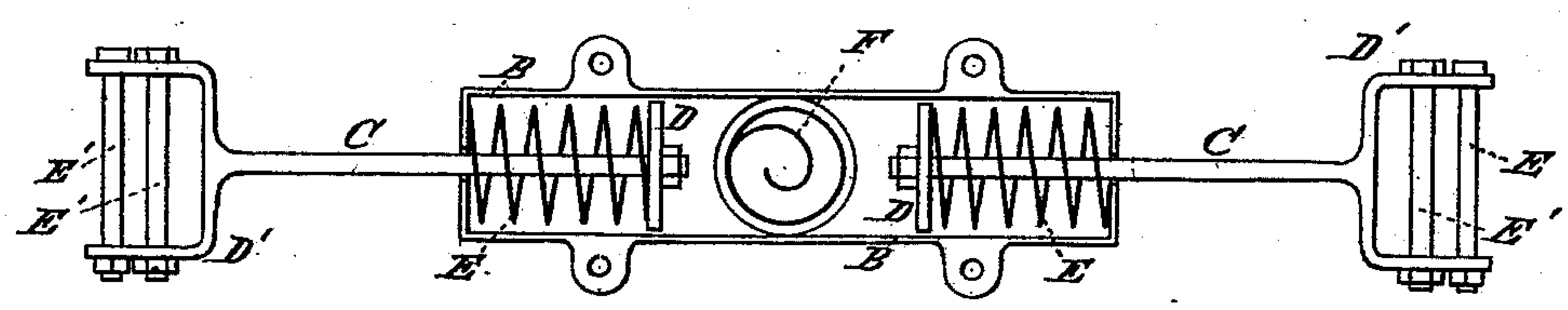


Fig. 3.

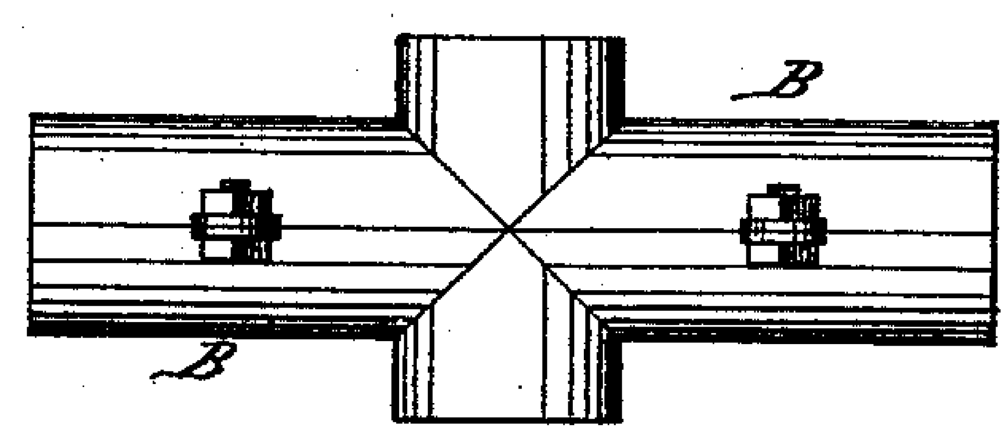
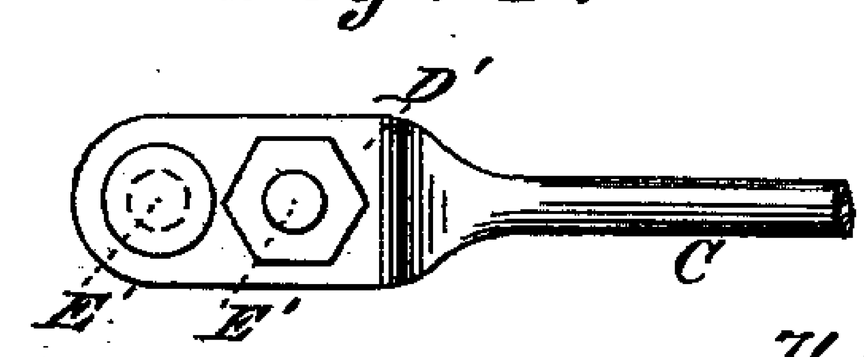


Fig. 4.



Witnesses:
H. Rydquist
John C. Dugan

Inventor:
H. Gardiner

UNITED STATES PATENT OFFICE.

HEMAN GARDINER, OF NEW YORK, N. Y.

IMPROVEMENT IN VEHICLE-SPRINGS.

Specification forming part of Letters Patent No. **215,114**, dated May 6, 1879; application filed September 30, 1878.

To all whom it may concern:

Be it known that I, HEMAN GARDINER, of the city, county, and State of New York, have invented new and useful Improvements in Springs Suitable for Railroad-Cars and other Vehicles, of which the following is a specification.

My invention has reference to that class of springs composed of steel plates which are combined with steel spiral springs, and commonly known as "elliptic springs."

My invention consists, first, in combining with the usually-formed elliptic spring a peculiar-shaped cylinder, made in the form of a cross, and so arranged that it will contain three separate steel spiral springs, one placed at right angles to the other two. By means of truss-rods connected with the two horizontal spiral springs and attached to the ends of the elliptic springs there will be formed an elastic truss, connecting the ends of the elliptic spring. The third cylinder and spiral spring will be at right angles to the other two, and stand in a vertical position between the plates forming the elliptic spring; and, secondly, in the combination of the parts as a whole, with reference especially to forming a railroad and carriage spring.

The usual method of making elliptic springs, especially for carrying heavy loads, is to form an eye on each end of the inner plate to receive a bolt and coiling the ends of the outer plate around the eye, consequently, by introducing a truss across the center of the spring, and fastened to each end by means of bolts through the eyes, holding the inner plate rigid, while the outer plate having no support, its tendency is to force itself off the eye of the inner plate and let the spring come apart.

There appear to be great defects in all the attempts to support an elliptic spring by means of a truss or bar placed longitudinally with the spring. They are too rigid, if only a bar across, causing the plate of the spring either to buckle or break; and if the truss is made rigid by being passed through the ends of the spring, the truss itself will break by the vibrations of the spring.

It is a well-known principle that the less rigid a spring is the easier it will carry the load, and is less liable to break—for instance, three separate springs will carry ten thousand pounds easier than one spring of sufficient strength to carry the same weight.

My invention consists in making a spring of its several parts so that they will all work in harmony one with the other, and at the same time carry the load with the least amount of metal.

In the accompanying drawings, Figure 1 represents a side sectional elevation of the spring; Fig. 2, a top view of the cruciform or compound cylinder cut through the center horizontally, also a top view of the compound bolted fork or jaw, which clasps the ends of the elliptic spring, and forming part of the elastic truss rods or bars.

In all the figures similar letters represent similar parts.

A A, Fig. 1, represent the elliptic spring. B B, Fig. 1, represent the vertical section of the cruciform or compound cylinder. C C, Fig. 1, represent truss-rods with their connections to the ends of the elliptic spring. a^1 and a^2, Fig. 1, represent the connection of the jaws to the ends of the elliptic spring with the double or compound bolts, one passing through the eye made on the inner plate, and the other passing on the outside of the outer plate of the elliptic spring for the purpose of holding it on the eye of the inner plate.

D D, Fig. 1, represent the inner ends of the truss-rods passing through the spiral springs inclosed in the longitudinal cylinders, with screw and nut on their inner ends, and a washer between nut and spiral spring, for the purpose of holding or drawing against the ends of the spiral springs when the load compresses the plates of the elliptic spring, also for the purpose of tightening or lengthening the truss-rods.

E E, Fig. 1, represent sections of spiral springs in longitudinal cylinders.

E represents a section of spiral spring placed in the vertical or upright portion of the cruciform or compound cylinder. This spring is made longer than the cylinder in which it is placed, and may be termed a "graduating spring." As it is not long enough to fill the entire space between the elliptic plates, the other parts of the spring will carry a light load without operating on this spring. As the load is increased it will depress the plates of the elliptic spring, and will bring them in contact with this vertical or upright spring, and thereby giving increased resistance or force to the whole spring.

Fig. 2 represents a longitudinal cross-section of the cruciform compound cylinder, with truss-rods and clamps, having double or compound bolts to secure them to the ends of the elliptic spring. These cylinders are made in the form of a cross, as shown in Fig. 1 and Fig. 3, with two horizontal cylinders attached to the vertical cylinder on opposite sides and at right angles with it. These cylinders are all formed or cast together, so as to form one cruciform compound cylinder; but it is made in two halves by being cut through the center of the horizontal cylinders longitudinally, as shown in Fig. 2 and Fig. 3, bolted together by means of a lip or flange cast or made on the outer sides, near the ends of each longitudinal cylinder. These longitudinal cylinders have their outer ends cast or made solid with the cylinder, so that when the two halves of the cylinder are bolted together they will form a solid end, except a hole or opening large enough to allow the truss-rods to pass through. The horizontal cylinders open into the vertical or upright cylinder, giving ready access to the screw and nut on the ends of the truss-rods, as will be seen in Fig. 2.

D′ D′, Fig. 2, show a top view of the clamp or jaw. E′ E′, Fig. 2, represent the two bolts passing through the jaw or clamp. One passes through the eyes formed on one of the main elliptic plates and the other passes through the outer end of the clamp and on the outside of the outer plate formed around the eye of the inner plate. This outer bolt or pin holds the outer plate of the elliptic spring from being pressed off the eye of the inner plate. As the inner plate is held by the truss-rods it will not yield to the pressure as readily as the outer plate, which is not held directly by the truss-rods.

Fig. 3 represents an exterior view of the cruciform compound cylinder, showing where it is divided or cut through, so as to form two halves, making it more convenient to be adjusted to the other parts of the spring, as well as making it more substantial by having the ends of the cylinders which the spiral springs press against made solid with the cylinders, so that they cannot give way, as they are liable to do when they are tapped or screwed in.

Fig. 4 represents a side view of the jaw or clamp having double or compound bolts, one passing through the eye formed on one of the main plates of the elliptic spring and the other passing on the outer side of the outer plate around the eye.

By this method of making a spring there are three vital points obtained: first, by greatly reducing the amount of steel required to make a spring of the same capacity as the ordinary spring; second, by retaining all the ease and elasticity of any elliptic spring now made; and, third, by so distributing the amount of metal required in their several parts they are a great deal less liable to fracture than they would be were they in larger parts or pieces, while at the same time all the parts are brought in harmonious action together.

Having thus described my improved spring and the manner of constructing the same, what I claim therein as my invention, and desire to secure by Letters Patent, is—

1. A spring composed of the compound cruciform cylindrical case B and the spiral springs E, rods C, and spring F, and the elliptical plates A, constructed, arranged, and operating in the manner and for the purposes set forth.

2. The compound or double bolts, one in the eye of the elliptic plate, the other exterior to it, in combination with truss-rods C C, the screw and nut on their inner ends, all for the purposes described and set forth.

3. The compound cylinder B, made in halves, with solid heads, on one end of each horizontal cylinder, in combination with the elliptical plates A, truss-rods C, the inner and outer bolts of the jaws, and the spiral springs E, constructed, arranged, and operating in the manner and for the purposes set forth.

HEMAN GARDINER.

Witnesses:
JOHN E. DUGAN,
H. L. WATTENBERG.