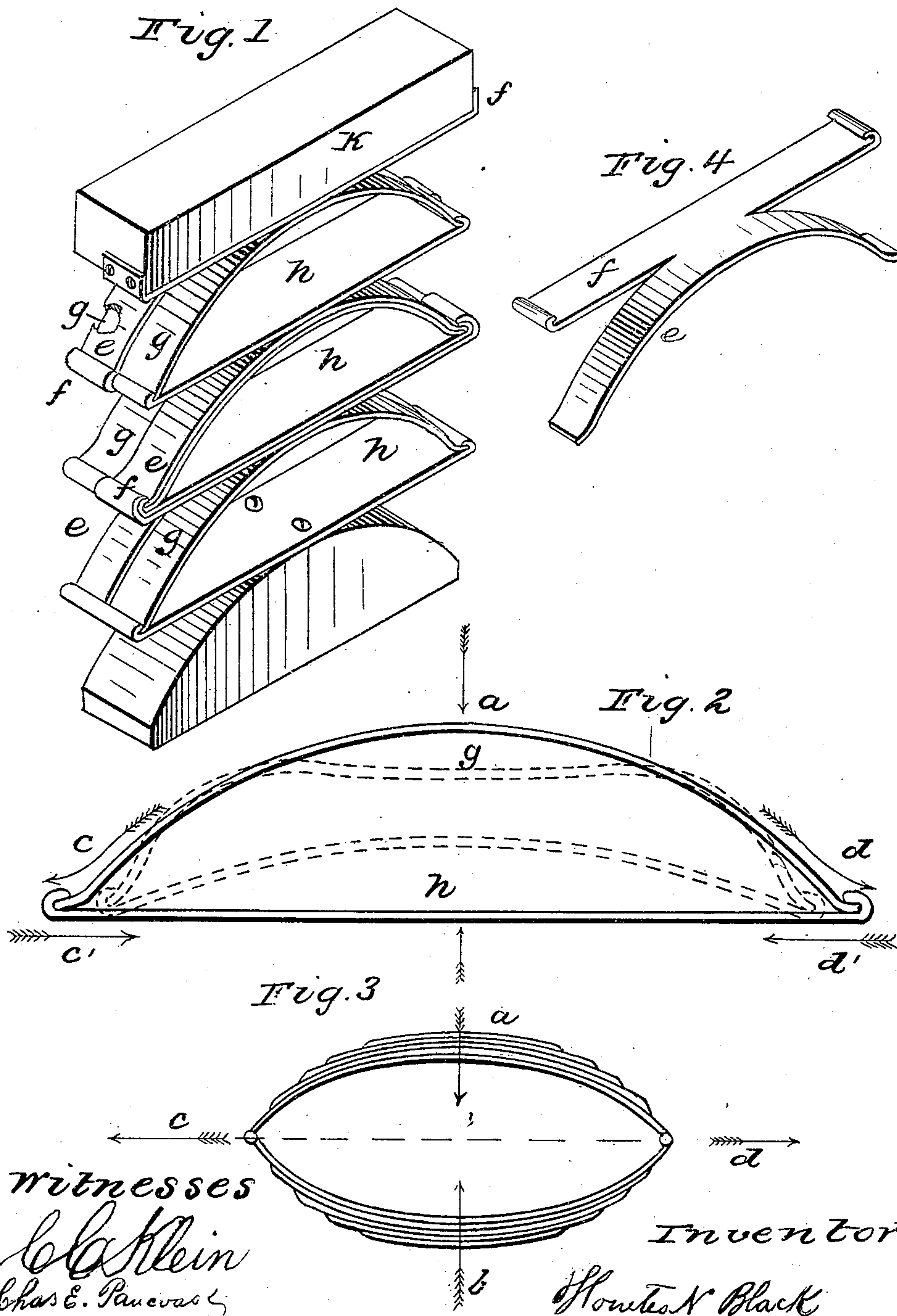


H. N. BLACK.
Carriage Spring.

No. 89,621.

Patented May 4, 1869.



United States Patent Office.

HORATIO N. BLACK, OF PHILADELPHIA, PENNSYLVANIA.

Letters Patent No. 89,621, dated May 4, 1869.

IMPROVEMENT IN SPRINGS.

The Schedule referred to in these Letters Patent and making part of the same.

Be it known that I, HORATIO N. BLACK, of Philadelphia, in the county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Springs; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making part of this specification, in which—

Figure 1 is a perspective view;

Figure 2 is a front view of a single spring;

Figure 3 is a front view of an old-style spring; and

Figure 4 is a perspective view of the spring used for connecting a series.

In that class of springs in which two arches are combined, as in fig. 3, the forces indicated by the arrows *a* and *b* have a tendency to move the ends of each spring in the direction of the arrows *c* and *d*, and as there is nothing but the elasticity of the materials to counteract this tendency, a considerable number of plates is needed for each arch, to make a spring of the required stiffness.

In order to obviate this difficulty, I have devised the spring shown in fig. 2, which consists of an arc, *g*, and chord *h*, fastened together at the ends by any well-known means.

The arrows *a* and *b* show the acting forces, and *c* *d*, *c'* *d'* indicate the effect of these forces upon the ends of the spring.

It will be noticed that the arrows point in opposite directions, showing that the tendency of the force *a* to increase the distance between the ends of *g* is counteracted by *b*, which tends to diminish the distance between the ends of *h*.

The motion of the ends of the spring being thus restrained, a greater resistance is offered to the forces *a* and *b*, hence a spring composed of single plates com-

bined, as in fig. 2, will sustain as much as a spring of several plates, arranged as in fig. 3, and thus a large amount of labor and material is saved.

The approximate shape of the spring, when compressed, is shown by dotted lines in fig. 2.

When only a small amount of elasticity is required, only one section, like that shown in fig. 2, is required, but where the amount of motion and pressure is considerable, two or more sections, as shown in fig. 1, should be employed.

In figs. 1 and 2 is represented my improved method of connecting the sections, dispensing entirely with the use of bolts, clamps, rivets, &c.

A rectangular plate, similar to those which form the arcs and chords of the improved spring, is split longitudinally, to within a short distance of its centre, as in fig. 4, one half, *e*, being bent to conform to the arc of the spring on which it is intended to rest. The other half, *f*, is left straight, but shaped at the ends to form a connection with the chord of the succeeding spring, or with the object, *k*, fig. 1, which the spring supports.

I do not claim, as my invention, a spring made of curved plates, when the ends thereof are rigidly fastened, or when said ends have a tendency to move in the same direction; but

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

The relative arrangement and combination of the series of springs or sections, substantially as described herein.

HORATIO N. BLACK.

Witnesses:

O. C. KLEIN,

CHAS. E. PANCOAST.