2 Sheets--Sheet 1.

G. F. GODLEY.

Spring for Vehicles.

No. 162,165. Patented April 20, 1875.

Fig. 1.

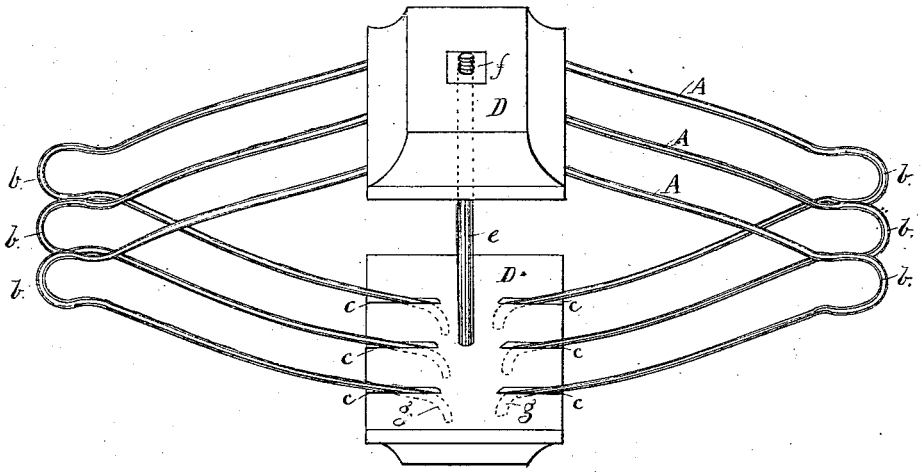


Fig. 2.

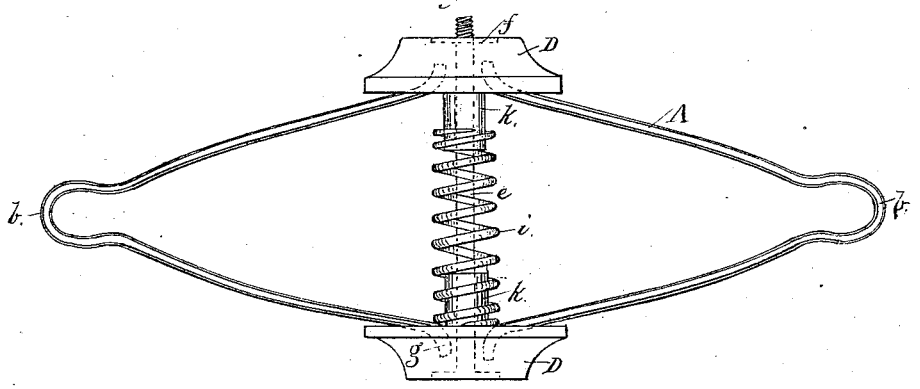
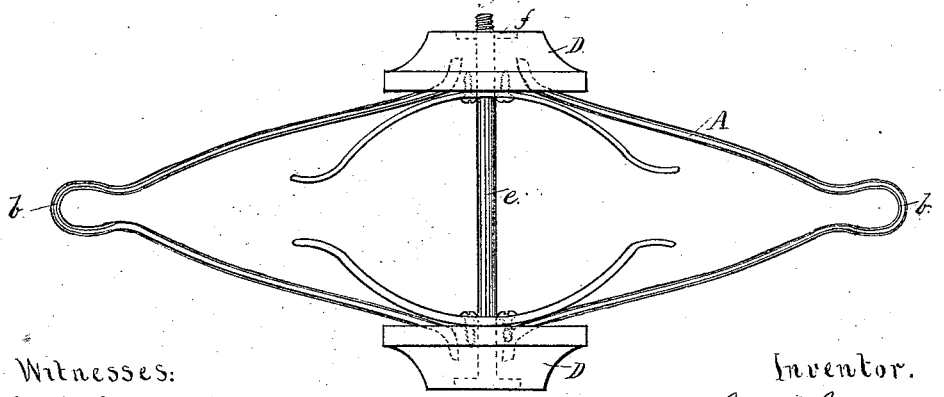


Fig. 3.



Witnesses:
Geo. T. Smallwood Jr.
John Roby Jr.

Inventor.
Geo. F. Godley.
By. John J. Halsted
atty.

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G. F. GODLEY.

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Fig. 5

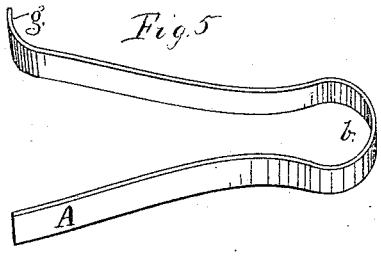


Fig. 6

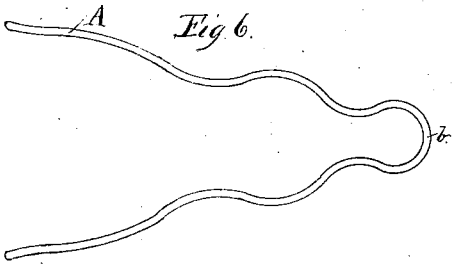


Fig. 8

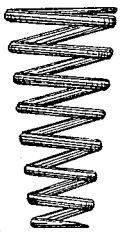


Fig. 9

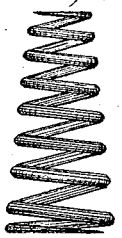


Fig. 7

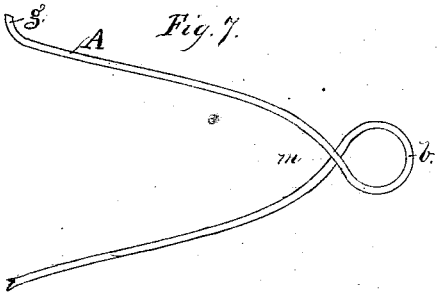
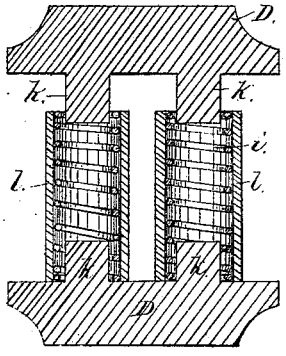


Fig. 4



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UNITED STATES PATENT OFFICE.

GEORGE F. GODLEY, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN SPRINGS FOR VEHICLES.

Specification forming part of Letters Patent No. **162,165**, dated April 20, 1875; application filed March 4, 1875.

To all whom it may concern:

Be it known that I, GEO. F. GODLEY, of the city and county of Philadelphia and State of Pennsylvania, have invented new and useful Improvements in Springs; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification is a description of my invention sufficient to enable those skilled in the art to practice it.

The object of my invention is the production of a light, economical, durable spring, having requisite strength, and but little dead weight, easily put together or repaired, and almost entirely free from frictional surfaces, and which I call the "anti-friction graduated elliptic spring."

My improvements consist in a peculiar construction of elliptic spring, in which the separate springs or leaves are placed at the side of but not touching each other, and not, as heretofore, lapping one upon another, the construction being such that the bars forming each separate spring may be of any desired form in cross-section—either round, flat, or otherwise—the ends of the bars being free from joints or bolts, and sustained in proper supporting-plates; auxiliary vertical central springs being employed in connection therewith, if desired; the construction permitting much latitude in the form of the spring in order to adapt them for different uses where different degrees of elasticity may be required, and so as to give a slow and easy or a quick, sharp motion, according to the formation of the circle.

In the drawings, Figure 1 is a perspective view of a spring made in accordance with my invention and without any central auxiliary relief-springs. Fig. 2 is an elevation with the auxiliary springs of a spiral form; Fig. 3, the same elevation, but with the auxiliary springs of a bow form; Fig. 4, a cross-section in detail, showing the blocks and the spirals surrounded by rubber tubes; and Figs. 5 to 9, different forms of bars and springs.

The leading principles of my invention are shown in Fig. 1, which will serve as an illustration of the same.

Each bar A is, as shown, made in a double or retroverted form, the bight or bend *b*, which is the fulcrum, being at its outer part and free from bolts or joints. Two opposite series of such bars are used, the two ends of each bar being, as shown, inserted or lodged in recesses *c c* in blocks D D, and these blocks are held by a bolt or bolts, *e*, a nut, *f*, on which limits the distance to which the blocks may separate, and also serves, when so separated, to compress the springs sufficiently to hold them jointly in their place against accidental displacement. The extreme tips of each spring-bar may, if preferred, be bent at an angle or short curve, so as to lodge in holes in the blocks, as shown at *g*. The bar A may be of any preferred form in cross-section. I have shown it as round in most of the Figs. 1, and flat in Fig. 5; and I also make it of any of the forms in cross-section shown or described in my car-spring patent No. 155,578, or in my application for patent filed February 15, 1875. It will now be seen that a spring made as above described has perfect freedom of movement, and no friction of any one spring bar or leaf, one upon another; that there is no clumsy or heavy part adding largely to its dead weight while contributing nothing to its resiliency; that no eyebolt is needed, the bight or bend dispensing with all necessity for it; that no screws or fastenings are employed to secure each bent bar to the blocks; that the bars themselves may be made as light as the special use to which a given spring is to be put will permit; that if a bar by any accident should become broken it can be replaced with another by simply compressing its two ends toward each other and lodging them in the recesses in the blocks, the resilience of the bar serving to lock it to its place; and that the spring will without detriment yield to an uneven pressure or strain which would tend to force the blocks in any direction out of parallelism with each other, inasmuch as any pair of opposite or fellow bars is at liberty to yield more or less than, or independently of, its neighboring pair or pairs. The form or figure of the doubled bars A, when doubled or bent, may be varied to suit circumstances, to adapt them to the character of the vehicle, and to meet the amount of weight it is expected to carry; thus, if made longer and larger, they will yield more, and

have a softer and slower motion; if shorter, they will be more rigid and act quickly; when the blocks are farther apart there will be more range of springing motion. The bars may also be bent zigzag or irregularly, as shown in Fig. 6, by way of example.

As an auxiliary to the spring a central yielding device may be placed between the blocks D D, as shown in Figs. 2 and 4, or a pair of bowed springs, as shown in Fig. 3, either of which is arranged to come into action only under the weight or pressure of a load, and after the spring has been somewhat compressed, but not when the vehicle is empty.

In Fig. 2 vertical coiled springs *i* are used, but shorter than the distance between the blocks, bosses or projections, *k*, on which enter the coil and steady it. The coils of these springs may be uniform, or of tapering or cone-shaped spiral. (See Figs. 8 and 9.)

No metal clamps are needed to hold the rods or bars A to the plates D D, and the weight and inconvenience of such clamps are therefore dispensed with; and no separate parts are required for the purpose of providing the bosses *k* for the central springs, (when these are used,) for the manifest reason that in my construction the plates or blocks directly hold to place the bars, and the bars directly hold to place the blocks, while the bosses project from or form part of these blocks.

Rubber tubular springs *l* surrounding the spiral central springs may be used, as desired. They serve to contribute to the resiliency when a car is loaded, and assist in sustaining in position and protecting the spirals. These rubber tubes are shown in Fig. 4.

The bars may be made, as shown in Fig. 7, with a crossing bend, as seen at *m;* and any of the bars may be made from cold-rolled or drawn steel made by the Bessemer process. Although the ends of the bars are some of them shown as having a short bend to enter holes in the plates D, yet this is not absolutely necessary, and such bends and holes may be dispensed with, if preferred, for the reason that the recesses *c c*, in conjunction with the diverging arms of the bar, serve to hold the bar in place when it is compressed, as it must be to be inserted, the ends of the bars always adjusting themselves and finding their proper positions in and relatively to the plates. The bent tips and holes, however, afford an additional security of hold.

By my construction I avoid all friction incident to the rubbing of one leaf against another, as in ordinary elliptic springs, and also that loss of resilience incident to most springs, due to their being capable of receiving a very considerable blow or pressure before they will yield at all; and also that other peculiar disadvantage attending leaf elliptic springs—namely, that the greater the weight imposed upon them the greater is the friction of the leaves upon each other. It is also well known that when the leaf-springs are compressed by a considerable load several hundred pounds of the load may be removed before they will commence to act, the friction acting as a preventive, and needing first to be overcome. This, also, I avoid completely.

For railways, I can save, in each spring made according to my present invention, more than half the usual weight, thus lessening the weight of a car by many hundreds of pounds, and proportionately lessening the expense of transportation, and the power required to run a train, and the consequent wear and tear.

I claim—

1. A spring for cars and other vehicles, composed of a series of doubled or retroverted rods or bars, A, the ends of which are lodged in grooves or recesses *c c* in the plates D D, the latter being held by a bolt or bolts, *e e*, as set forth.

2. In combination with the retroverted rods or bars A, recessed plates D D, and bolt or bolts *e*, the central auxiliary springs, substantially as shown and described.

GEORGE F. GODLEY.

Witnesses:

EDWIN F. GLENN,

THEODORE JORDAN.