2 Sheets—Sheet 1.

J. HARGREAVES.

Elliptic Spring.

No. 208,171. Patented Sept. 17, 1878.

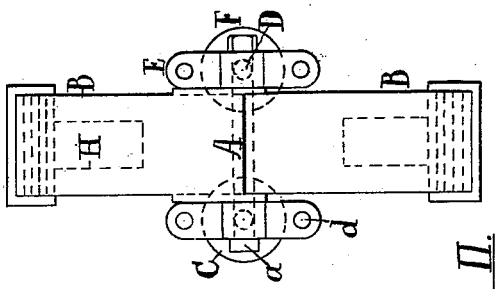


Fig. II.

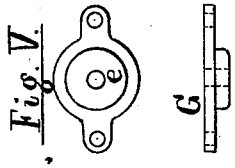


Fig. V.

Fig. VI.

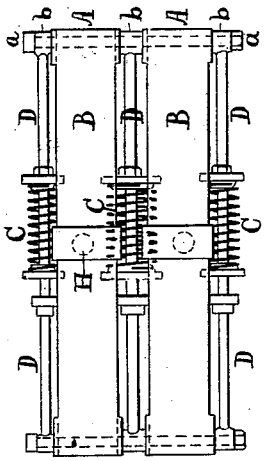


Fig. IV.

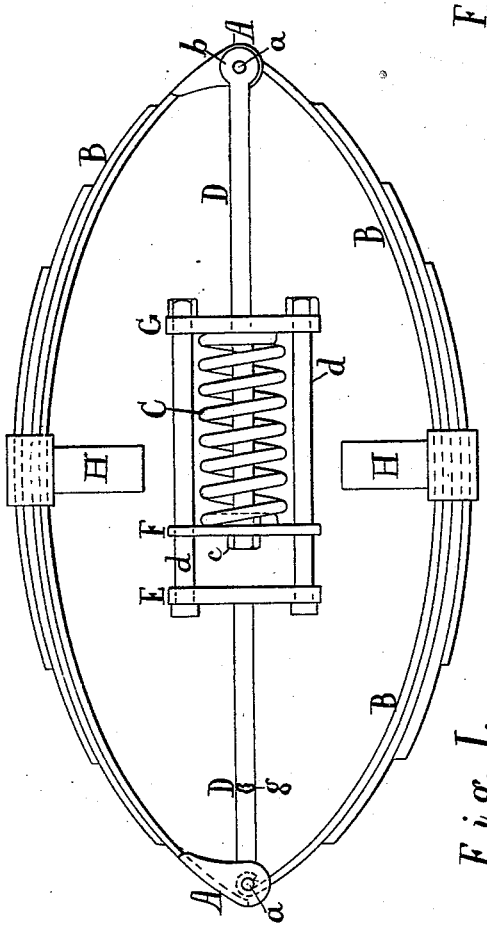


Fig. I.

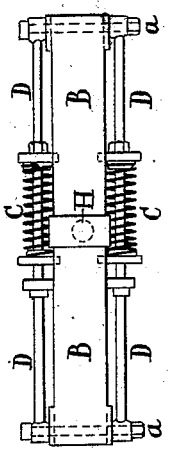


Fig. III

Attest:

Martin N. Jepson

Thos. L. Crane.

Inventor.

James Hargreaves

2 Sheets—Sheet 2.

J. HARGREAVES.
Elliptic Spring.

No. 208,171. **Patented Sept. 17, 1878.**

Fig. 7.

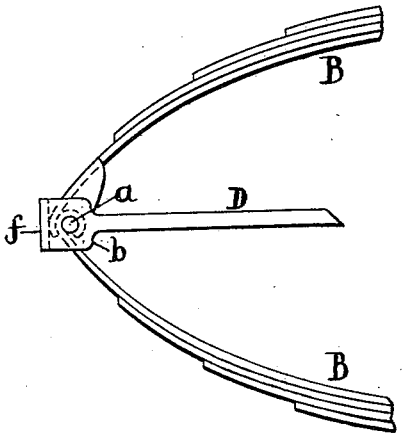


Fig. 8.

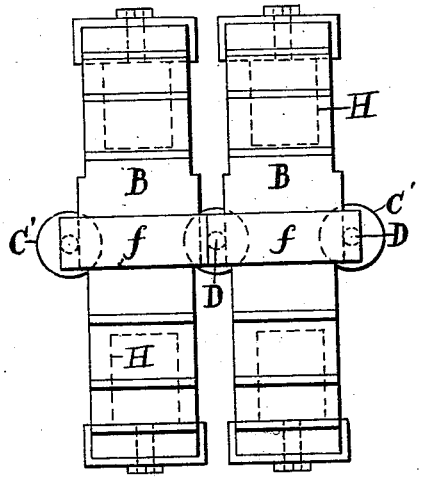
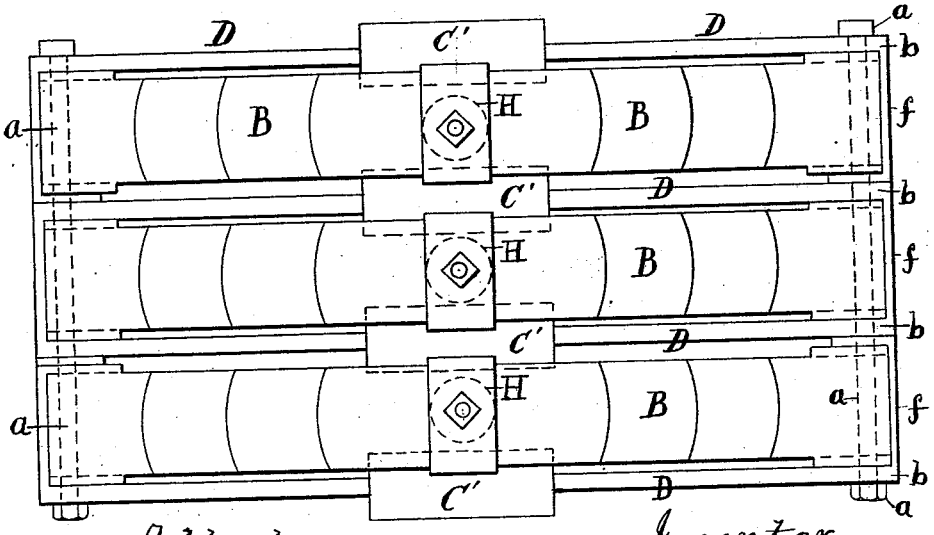


Fig. 9.



Attest:

Edward C. Roberts

Albert Behring

Inventor.

James Hargreaves per

Thos. S. Crane, atty.

UNITED STATES PATENT OFFICE.

JAMES HARGREAVES, OF NEWARK, NEW JERSEY.

IMPROVEMENT IN ELLIPTIC SPRINGS.

Specification forming part of Letters Patent No. **208,171**, dated September 17, 1878; application filed June 24, 1878.

To all whom it may concern:

Be it known that I, JAMES HARGREAVES, of Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Elliptic Springs, which improvement is fully described in the following specification.

My invention is designed as an improvement upon that class of elliptic vehicle-springs which are re-enforced or strengthened by the addition of a coiled spring; and consists in arranging the coiled spring and its connections at each side of the elliptic spring, instead of between the two halves of the spring, as heretofore, and in combining two or more of such elliptic springs together, for use in steam-car trucks.

Figure 1 of the drawings shows a side view of an elliptic spring, B, provided with a coiled spring, C, at each side, each spring C being clamped between washers F and G, and secured by a cross-bar, E, and two bolts, *d*, passing through the pieces E, F, and G to tie-rods D, by which they are connected to the joints A of the spring B, and unite their resistance to that of the spring B. One of the rods D is broken off at *g* to show the joint of the elliptic spring plainly and the joint-bolt *a*, which is made long enough to pass through the holes formed in the rods D at their head or eye *b*.

In Fig. 2 is shown an end view of the spring B with the springs C and their connections. Fig. 3 is a plan of the same, and Fig. 4 a plan of a double or combination of two elliptic springs with three coiled springs, C. Figs. 5 and 6 are details of the spring-washers F and G. Figs. 7 and 8 are enlarged views of the head *b* used on the double springs, and Fig. 9 a plan of a triplet.

In Fig. 9 the four auxiliary springs C are represented as inclosed in tubular spring-sockets C′.

The special advantage of strengthening the spring B in the manner shown above consists in its leaving an open space within the elliptic spring, between the springs C, for the introduction of a buffer, the auxiliary springs hitherto used with the spring B having prevented the insertion of a buffer of elastic material, attached to the inside leaf of spring B, as is often done with the plain elliptic spring.

In Fig. 1 the head of rod D is shown at *b* as formed into a plain round eye, through which the joint-bolt *a* is passed to secure the rod to the side of the joint. By this mode of construction the bolt *a* is subjected to a severe cross-strain, and I therefore construct the head *b* in a different manner for car-truck springs, especially for those used in the doublets, which, by my mode of construction, are enabled to take the place of the triplet or group of three elliptic springs often used under palace-cars. For such springs I construct the head as shown in Figs. 7 and 8, forming the heads on opposite sides of the spring-joint A with a hook or extension, *f*, and uniting the two hooks together, so that the two rods D are joined at *f* and pull directly upon the outside of the joint. The bolt *a* in this case simply serves to keep the rods in place, and is relieved of all strain by the hooks on the heads *b*.

In Fig. 9 is shown the plan of a triple spring consisting of three elliptic springs, four coiled springs, and eight rods, D.

In the plan of the doublet in Fig. 4 the heads of the rods *b* are shown as in Fig. 1; but in Fig. 9 the heads *b* are shown hooked, as described, the central spring B having its rods D united, as just stated above, and the outer rods D being formed with heads *b*, which extend entirely around the end of the joint A and grasp the bolt *a* on the inner side of the spring B, to keep them securely in place. By this mode of construction the bolts *a* are fully relieved and the entire combination fitted to stand the severest strain.

The washers F and G are shown in Figs. 5 and 6 as formed with a boss, *e*, to center the coiled steel spring; but I am fully aware that such washers have already been used, as well as tubular sockets and other devices for holding and tightening the springs C, and I do not therefore claim any such arrangements as my own.

As shown in Fig. 1, the rods D may be tightened by the nut *c* on one of the rods or by the nuts on the bolts *d*.

I am also aware that clevises have been used to secure a single spring of rubber inside of the spring B; but my invention is expressly intended to leave a space in the middle of

each spring B for an elastic buffer, H, which is absolutely essential, in practice, to preserve the springs B from overstrain and the cracking of the leaves of which it is usually composed. My invention therefore enables me to use the buffer in all cases, and, by the use of the buffer and coiled springs together, in combination with a doublet or triplet of elliptic springs, enables me to produce a more powerful and durable combined spring than any known hitherto.

I therefore claim, and desire to secure by Letters Patent, as follows:

1. The combination described, consisting of the two coiled springs C, with the rods D, arranged and secured upon the outside of the elliptic spring B, and the separate buffers H H, arranged and secured inside of the spring B, as and for the purpose herein set forth.

2. The double or triple car-spring herein described, consisting of the elliptic springs B, coiled springs C C, washers or sockets for compressing the same, rods D, formed with hooks *f*, and secured to the joints of the springs B by a through-bolt, *a*, at each end, and buffers H H, secured to the inside of each elliptic spring, as and for the purpose set forth.

In testimony that I claim the foregoing as my own I hereto subscribe my name in the presence of two witnesses.

JAMES HARGREAVES.

Witnesses:

MARTIN N. JEPSEN,

THOS. S. CRANE.