P. G. GARDINER.

Volute Springs.

No. 144,201. Patented Nov. 4, 1873.

Fig. 1.

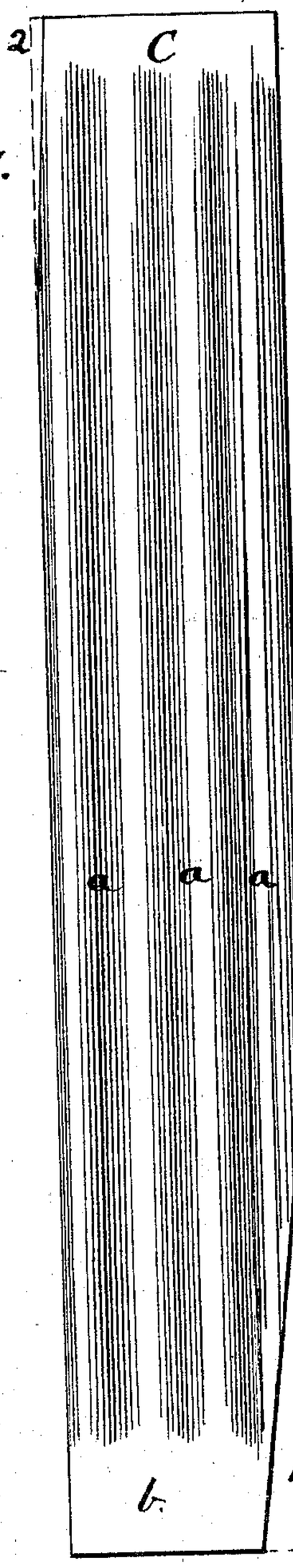


Fig. 2.

Fig. 4.

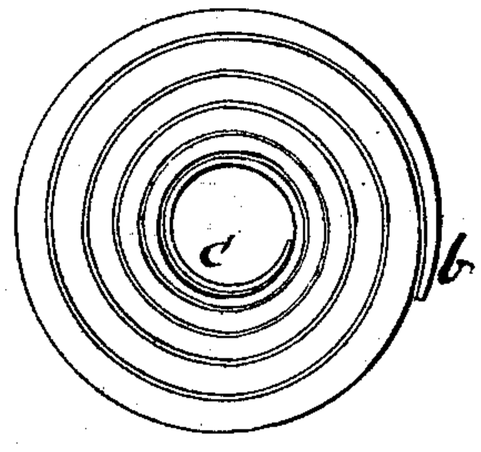
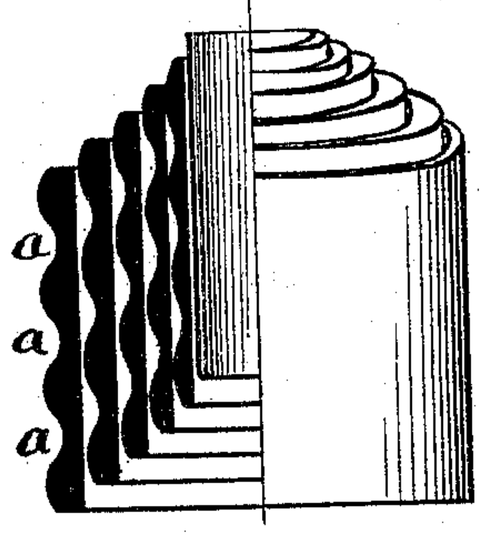


Fig. 3.



Witnesses.

H. H. Stoddard

J. B. Staples

Inventor.

P. G. Gardiner

UNITED STATES PATENT OFFICE.

PERRY G. GARDINER, OF NEW YORK, N. Y.

IMPROVEMENT IN VOLUTE SPRINGS.

Specification forming part of Letters Patent No. **144,201**, dated November 4, 1873; application filed October 13, 1873.

To all whom it may concern:

Be it known that I, PERRY G. GARDINER, of the city, county, and State of New York, have invented new and useful Improvements in Steel Springs, suitable for railroad-cars, of which the following is a specification:

My improvements relate to that class of springs known as spiral volute springs; and the object of my improvements is to render more equable the action of the coils throughout the spring when under pressure, and at the same time to preserve its capacity for being tempered, and, also, to economize the construction by a saving in the material, which, also, has the advantage of diminishing the weight of the spring without weakening its efficiency.

To construct my improved spring, the steel plate of which it is composed is rolled out, with alternate grooves or channels upon the face of the plate in the direction of its length, the opposite face being left entirely flat or plain. These grooves are largest toward the end or butt of the spring, which is to form the base, and they gradually taper and fall away toward the opposite end of the plate, where, at last, they flatten out and leave the face of the plate flat and smooth a sufficient distance to form a part of the smaller or innermost coil. The plate is also rolled so as to have a gradual diminution of thickness outward at the base or larger end. From the line where the plate is thus gradually reduced in thickness at the base, the plate gradually diminishes in thickness to the opposite end of the plate.

The grooved face of the plate is shown in the drawing at Figure 1, in which the grooves are shown at *a a a*. The smooth thick end of the plate, tapered, is shown at *b*, and the opposite end at *c*. The form of this plate at the edge (at right angles to Fig. 1) is shown in Fig. 2. This plate, when coiled in the form of a spiral volute, is shown in side elevation in part, and in part in vertical cross-section through the center in Fig. 3. A top view of the spring is shown at Fig. 4. The plate is coiled so as that its flat surface constitutes the inner face of the coils.

In the spirally-coiled volute springs, when constructed of a steel plate of uniform thickness, or tapered or flattened off only at the end, when under pressure or use on railroad-cars, the elastic action or movement of the spring is confined to a space of about half or three-quarters of an inch on or near the middle coil, the larger part of the coils toward the base, owing to their greater leverage, having the elastic action exhausted by the weight, the smaller coils, from their stiffness and their small leverage, not exercising any or only very slight elastic action; and thus the action or elastic movement of the spring is confined to a very small space on the intermediate coil, and this leads to a tendency to rupture of the spring in that part, the strain and movement being almost entirely within this small space.

In almost all cases of fracture of the spiral volute spring by use, the injury takes place within a small space on the intermediate coil, where the action or movement of the spring is constantly going on. At first a very slight crack or opening appears in the edge of this coil, and this soon enlarges and extends so as to destroy the efficiency of the spring, though the other parts of the spring are entirely sound.

This defect is remedied in the spring constructed as herein described. By the gradual thinning of the plate, and by the tapering or flattening of the grooves, as described, the coils toward the apex are less stiff and rigid, and the elastic action or movement of the spring is extended or spread throughout a greater distance of the coils, and there is an approximation to an equable action throughout all the coils, excepting those constituting the base and apex. In order that the base and apex may have a flat and parallel surface, the plate is cut off on the sides at opposite ends, so as to leave a bevel of suitable length to constitute the flat base and top, as shown at the dotted lines 1 2, Fig. 1. The grooves also have the effect, by their gradual shallowing toward the apex, to admit the tempering fluid into the coils, when the spring is plunged into the tempering-bath, to a degree in proportion to the thickness of the plate—a greater amount of tempering being thus provided for in the thicker parts, where it is required, than in the thinner parts; otherwise the thinner parts might be made brittle or too hard.

Having thus described my improvements in

the spiral volute spring, and the manner of constructing the same, what I claim therein as my invention, and for which I desire Letters Patent, is—

1. A spiral volute spring constructed from a plate having a gradual taper or thinning from near one end toward the other end, and with the grooves upon one face of the plate gradually diminishing from end to end, substantially in the manner described.

2. The tapering plate and grooves, as described, having the smooth and gradually-thinning end *b* of the butt, and the smooth face *c* at the opposite end of the plate, beyond the grooves, substantially in the manner and for the purposes set forth.

P. G. GARDINER.

Witnesses:
J. B. STAPLES,
S. A. STODDER.