(No Model.) 3 Sheets—Sheet 1.

J. W. CLOUD.

SPRING.

No. 531,910. Patented Jan. 1, 1895.

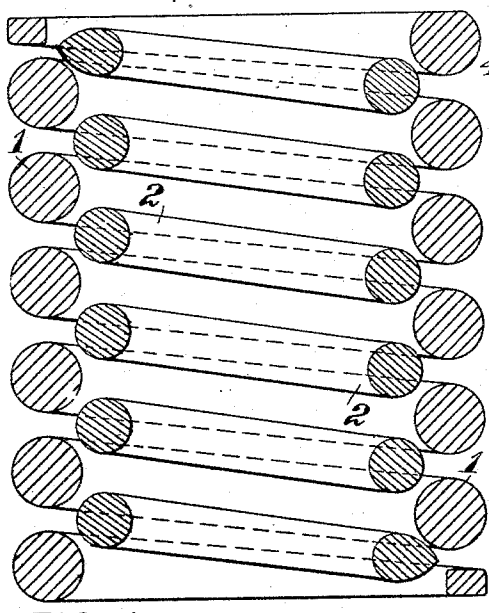

FIG. 1.

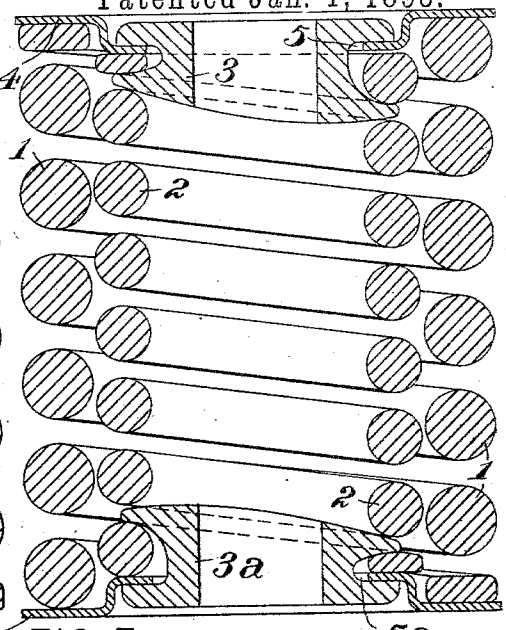

FIG. 5.

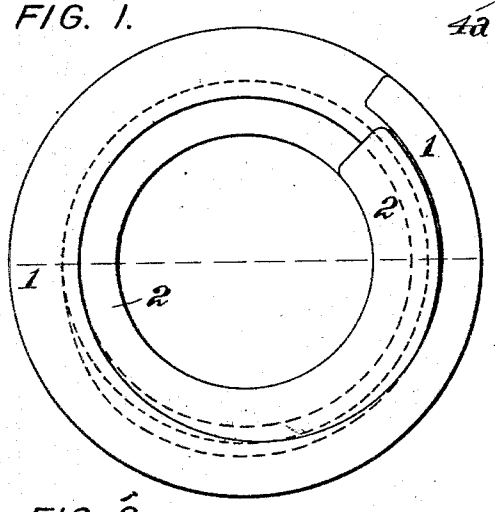

FIG. 2.

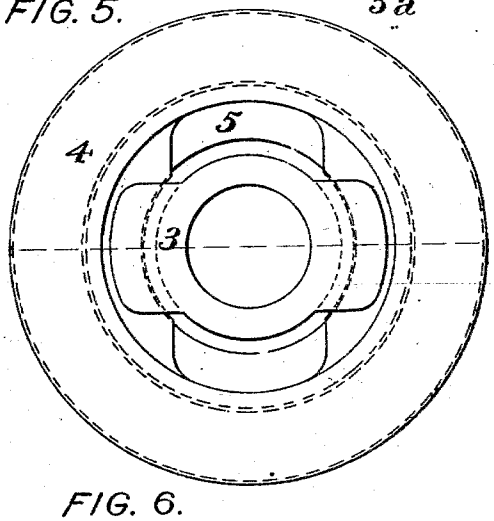

FIG. 6.

FIG. 3.

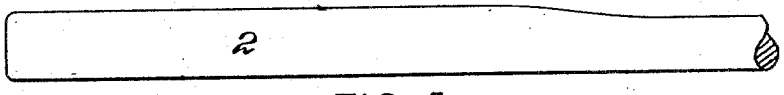

FIG. 4.

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SPRING.

No. 531,910. Patented Jan. 1, 1895.

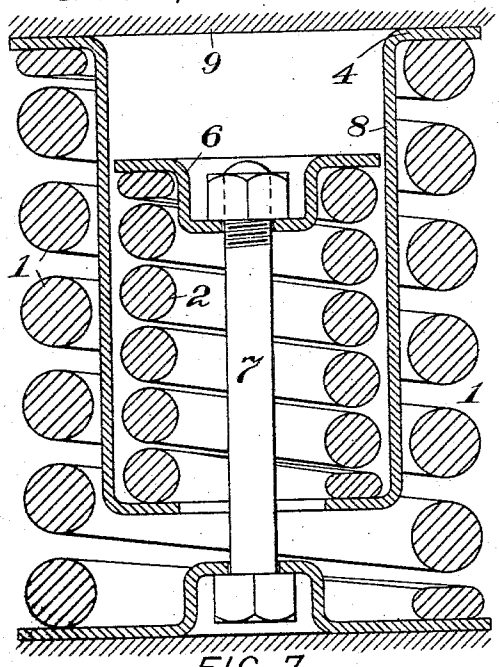

FIG. 7.

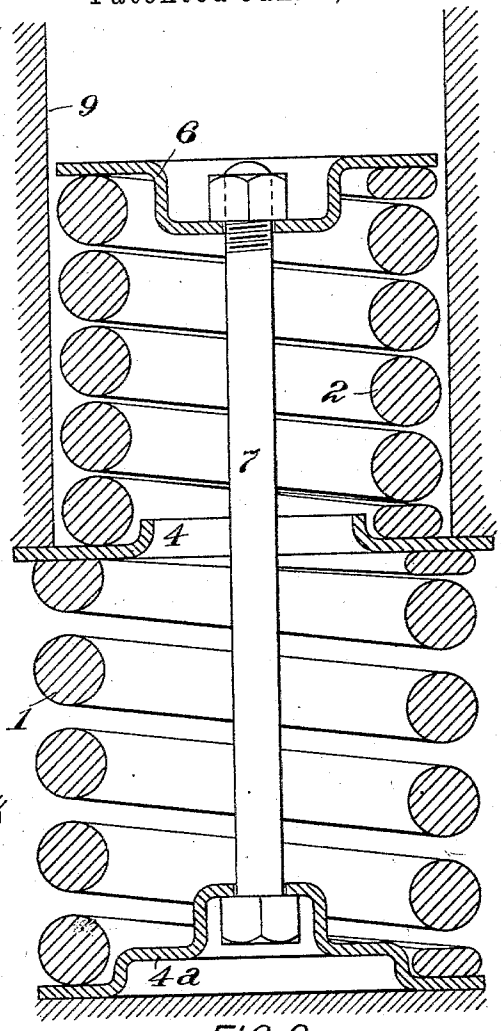

FIG. 9.

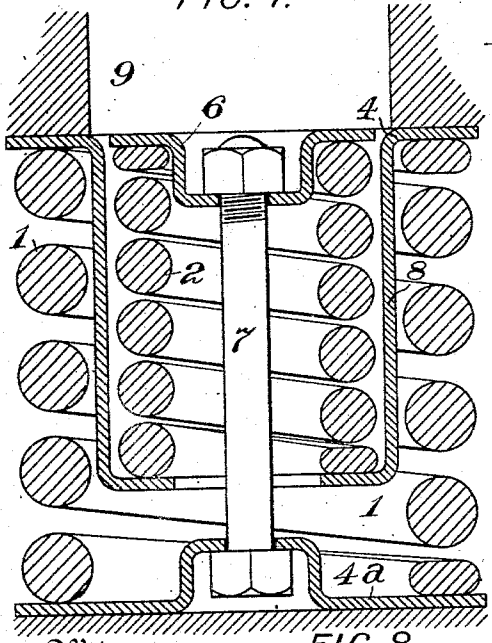

FIG. 8.

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(No Model.) 3 Sheets—Sheet 3.

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No. 531,910. Patented Jan. 1, 1895.

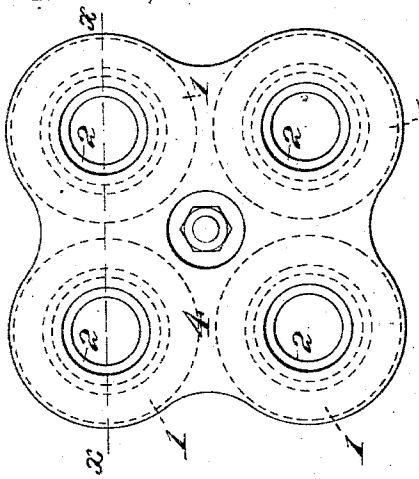

FIG. 12.

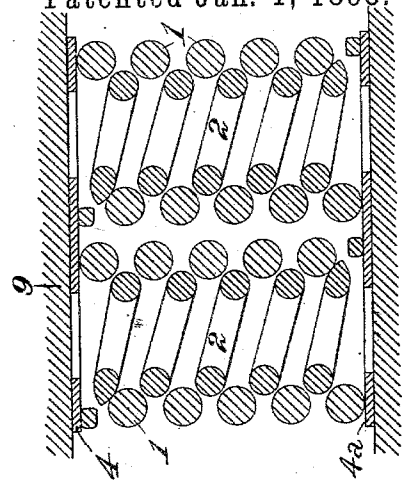

FIG. 13.

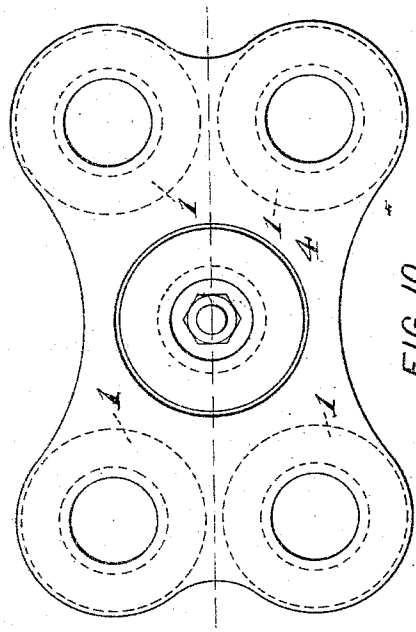

FIG. 10.

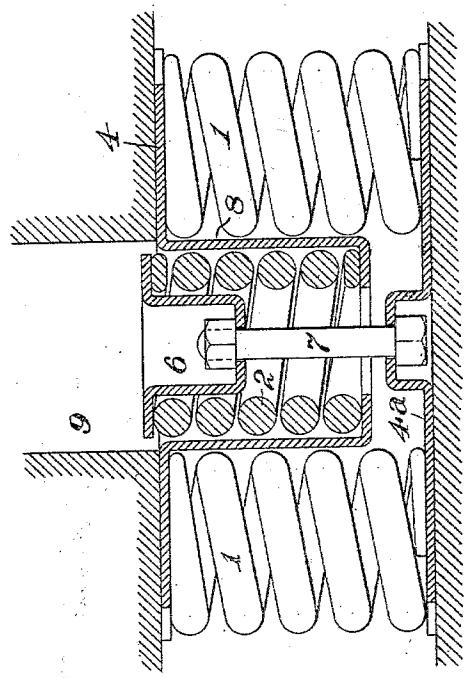

FIG. 11.

Witnesses
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UNITED STATES PATENT OFFICE.

JOHN WILLS CLOUD, OF CHICAGO, ILLINOIS.

SPRING.

SPECIFICATION forming part of Letters Patent No. 531,910, dated January 1, 1895.

Application filed June 7, 1894. Serial No. 513,742. (No model.)

To all whom it may concern:

Be it known that I, JOHN WILLS CLOUD, of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Springs, of which improvement the following is a specification.

The object of my invention is to provide a spring, the action of which shall be approximately the same under a light as under a heavy load, and the recoil of which shall be less sudden or violent than that of the ordinary helical spring.

To this end, my invention, generally stated, consists in the combination of a main spring, and an auxiliary or controlling spring, connected with, and having an initial strain acting in opposite direction to, the main spring.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a vertical, longitudinal, central section through a spring embodying my invention; Fig. 2, a bottom plan view of the same; Fig. 3, a face view of the lower end of the rod or bar of which the auxiliary spring is formed; Fig. 4, a side view of the lower end portion of said rod or bar; Fig. 5, a vertical, longitudinal, central section through a spring illustrating another form of my improved spring; Fig. 6, a top plan view of the same; Figs. 7, 8 and 9, vertical, longitudinal, central sections through other forms of springs embodying my invention; Fig. 10, a plan view of a construction in which a single auxiliary or controlling spring is combined with a nest or group of four main springs; Fig. 11, a vertical longitudinal central section through the same; Fig. 12, a plan of a construction in which four main and four auxiliary springs, of the character of those shown in Figs. 1 to 4 are employed, and Fig. 13, a vertical section through the same at the line x, x, of Fig. 12.

In the practice of my invention, referring first to Figs. 1 to 4 inclusive, I provide a compound spring, consisting of a main helical spring 1, and an auxiliary or controlling spring 2, which is originally coiled to the same pitch as that of the main spring, when the coils of said main spring are brought together or closed down one upon the other under compression, and is connected with the main spring by being screwed into the coils thereof, when said coils are closed to a degree greater than that due to the normal tension of the main spring, and, preferably, to or near the limit of compression of the main spring. Upon the release of the main spring 1, from the compression by which its coils have been closed down, it returns to an operative position, in which its height is less than when originally coiled, by reason of the resistance of the auxiliary or controlling spring 2, which is put under initial tensional strain by the opening or separation of the coils of the released main spring, and which, therefore, acts in opposition to the expansion or opening tension of the main spring. Under such construction, it will be seen that the initial strain, in this case tensional, imparted to the spring 2, acts in opposite direction to the tension of the spring 1, that is to say, proportionately to the loading, and compression under load, of the spring 1, the tension of the spring 2 is reduced, and said spring 2, therefore, acts, in conjunction with the load, to compress the spring 1. Conversely, the tension of the spring 2 is increased, proportionately to the unloading, and expansion under release of load, of the spring 1, and the spring 2, therefore, acts, in conjunction with the load, to oppose the expansion or recoil of the spring 1. By proper relative proportions of the rods or bars of the main and the auxiliary or controlling spring, which may be determined in the discretion of the constructor, under different conditions of service, the action of the compound spring is rendered easy, uniform, and free from suddenness or violence in recoil, and the spring is made specially desirable for use on electric and other street railroad cars, or for passenger car equalizing springs or freight car bolster springs.

As shown in Figs. 3 and 4, the rod or bar forming the auxiliary or controlling spring 2, may, if desired, be brought to a flattened or taper form in cross section at and toward its ends, to increase the bearing near the ends of the spring 2 on the coils of the main spring 1. The main spring 1 should also be tapered toward its adjacent ends, as indicated in Fig. 2, to facilitate screwing in the spring 2.

Figs. 5 and 6 illustrate another form of my improved spring, in which, while the same relation and the same action of the springs 1 and 2 are presented and attained as in the instance first described, the structural connection of the two springs differs therefrom, in the particular that the spring 2 is not screwed into the coils of the spring 1, as in the former case, but goes freely inside of said spring, and is given its initial strain by being elongated and connected by caps 3, 3^a, to the end plates 4, 4^a, of said spring 1. The caps 3, 3^a, are grooved circumferentially, to engage the ends of the springs 2, and pass freely through openings 5, 5^a, in the end plates 4, 4^a. The spring 2 is elongated until its upper cap 3 is raised above the upper end plate 4, when by giving the cap a quarter turn, the spring 2 is held under initial tension, and acts, in connection with the spring 1, in the manner above described.

Figs. 7, 8, and 9 show further modifications of form, all embodying the same essential operative feature of my invention. The auxiliary or controlling spring 2 is, in these instances, normally compressed, instead of extended as in the cases previously described, but in service, inversely varying stresses are produced in the two springs, as in the prior cases. Initial strain, in this case compressive, is imparted to the spring 2, by means of a cap 6 and bolt 7, through which the spring 2, after having been compressed to the desired degree, is connected with the lower end plate 4^a of the main spring 1. The spring 2 bears, at its upper end, on its cap 6, and, at its lower end, on the upper end plate 4 of the main spring 1, which may, in order to enable the height of the compound spring to be reduced as far as practicable, be formed with a downwardly extending cylindrical body or frame 8, having at its lower end a bearing for the spring 2.

As shown in Fig. 7, the spring 2 does not project above the end of the spring 1, but does so project, in operation, in the constructions of Figs. 8 and 9, so that an opening must be provided for it, in the bolster or other member 9, supported by the spring.

Fig. 9 shows the spring 2 as located entirely above the spring 1, thus enabling a more powerful auxiliary or controlling spring to be employed than can be placed inside an ordinary coil.

Figs. 10 and 11 illustrate a construction in which a single auxiliary or controlling spring 2 is employed in combination with a nest or group of four main springs, 1, 1, 1, 1. As in the springs of Figs. 7, 8, and 9, initial compressive strain, inducing tensional action in opposition to the tension of the main springs, is imparted to the spring 2, and is transmitted therefrom to the springs 1, 1, 1, 1, through a cap 6, bolt 7, lower end plate 4^a, and upper end plate 4, having a downwardly extending body or frame 8 with a bearing for the spring 2 at its lower end, as in Figs. 7 and 8.

Figs. 12 and 13 show a nest or group of four compound springs, each composed of a main spring 1 and an auxiliary or controlling spring 2, screwed into the main spring and normally under initial tension, as in the case of the spring shown by Figs. 1 to 4, inclusive.

It will be obvious that other structural applications, involving the essential feature and operative principle of my invention, may be made by those skilled in the art without involving any departure from the spirit of my invention, and I do not therefore desire to limit myself to the specific exemplifications selected for illustration herein.

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

1. The combination of a main spring, and an auxiliary or controlling spring connected to the main spring under an initial strain acting in opposition to the main spring, substantially as set forth.

2. The combination of a main spring, and an auxiliary or controlling spring which is initially strained by connection with the main spring, so as to act in opposition thereto, substantially as set forth.

3. The combination of a main spring, and an auxiliary or controlling spring connected to the main spring under an initial strain acting in oppisition to the main spring with a varying resistance, substantially as set forth.

4. The combination of a main spring, and an auxiliary or controlling spring connected to the main spring under an initial strain which increases or decreases coincidently with the decrease or increase, respectively, of strain on the main spring substantially as set forth.

5. The combination of a main spring, an auxiliary or controlling spring which is initially strained by connection with the main spring so as to act in opposition thereto, and a bolster or other member through which a resistance is applied to the main spring, substantially as set forth.

6. The combination, in a compound spring, of a series of main springs, and an auxiliary or controlling spring which is initially strained by connection with each of the series of main springs, so as to act in opposition thereto, substantially as set forth.

7. The combination of a main spring and an auxiliary or controlling spring which is screwed into the coils of the main spring when said coils are closed to a degree greater than that due to the normal tension of the main spring, so that the auxiliary or controlling spring shall be under an initial strain acting in opposition to the main spring, substantially as set forth.

JOHN WILLS CLOUD.

Witnesses:
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A. J. SCHEVERS.