No. 879,545. PATENTED FEB. 18, 1908.

P. HIEN.

FRICTION SPRING.

APPLICATION FILED JULY 19, 1902. 3 SHEETS—SHEET 1.

Fig. 1.

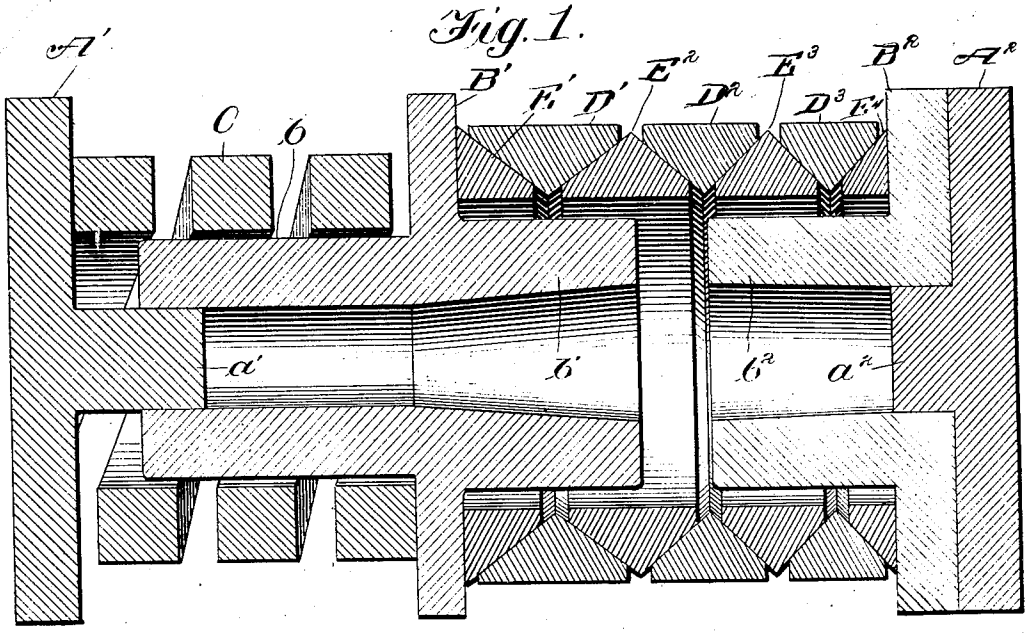
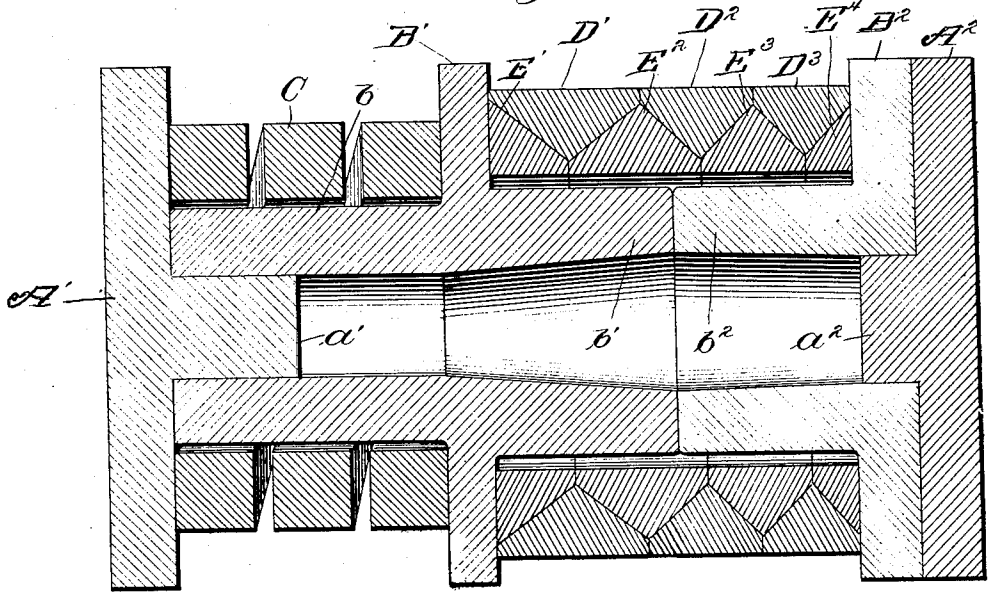


Fig. 2.



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3 SHEETS—SHEET 2.

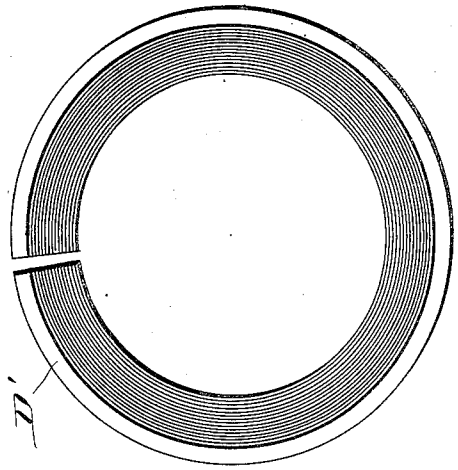

Fig. 5.

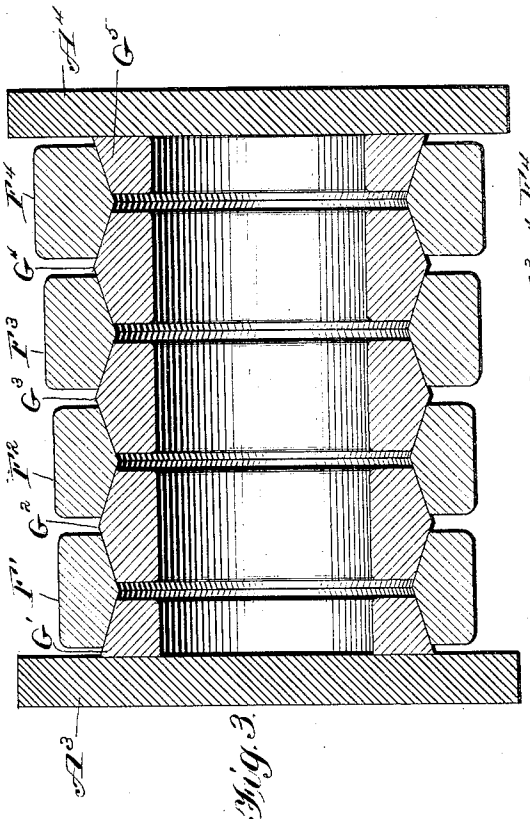

Fig. 3.

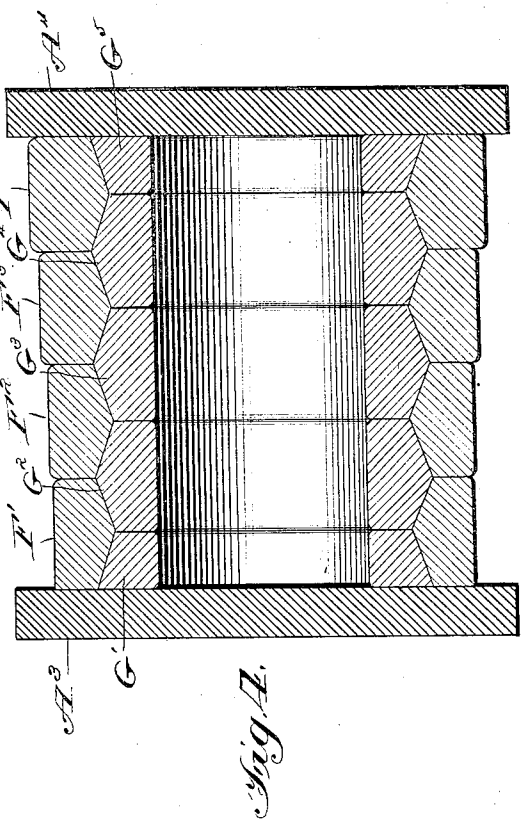

Fig. 4.

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APPLICATION FILED JULY 19, 1902.

3 SHEETS—SHEET 3.

Fig. 6.

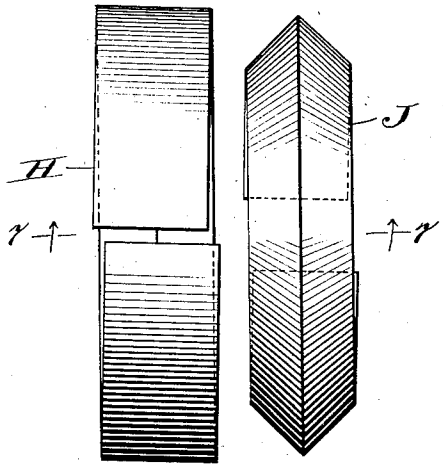


Fig. 7.

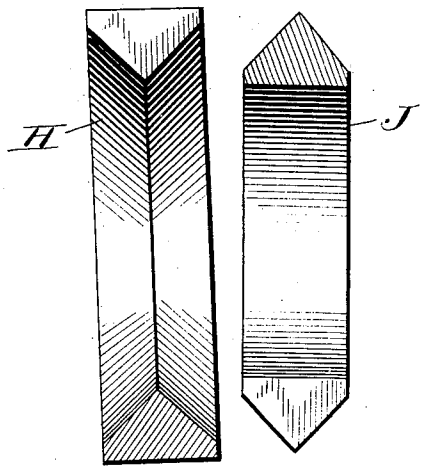


Fig. 8.

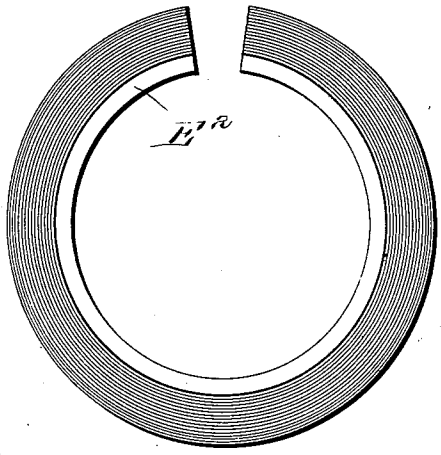
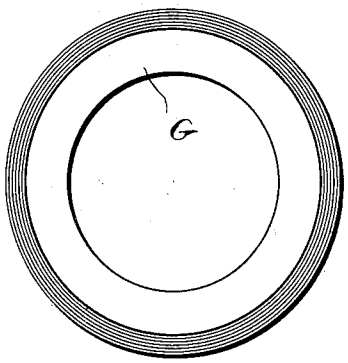


Fig. 9.



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UNITED STATES PATENT OFFICE.

PHILLIP HIEN, OF CHICAGO, ILLINOIS.

FRICTION-SPRING.

No. 879,545. Specification of Letters Patent. Patented Feb. 18, 1908.

Application filed July 19, 1902. Serial No. 116,187.

To all whom it may concern:

Be it known that I, PHILLIP HIEN, citizen of the United States, residing at Chicago, county of Cook, State of Illinois, have invented a certain new and useful Improvement in Friction-Springs, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates in general to apparatus for yieldingly resisting a strain or for gradually absorbing a shock due for instance to the pull or push exerted upon the draw bar of a car incident to the starting or stopping of a train.

A comparatively limited relative movement between the draw bar and draft timbers of a car is permitted and in order that the sudden shocks in pulling and buffing may be absorbed or gradually transmitted from the coupler to the car frame, it is necessary that the apparatus should be interposed between the draw bar and draft timbers of a car capable of exerting a great resistance while its members are being relatively moved the available longitudinal distance. Heretofore apparatus for the purpose mentioned has comprised springs, or friction surfaces or a combination of springs and friction surfaces, the arrangement being such that a sudden pull or push upon the draw bar is dissipated or gradually communicated to the draft timbers of a car through compressing interposed springs or relatively moving the friction devices. In order to secure a combined spring and frictional resistance it has previously been necessary so far as I am aware to employ frictional devices separate from and in addition to a spring or springs.

The primary object of my invention is to provide in an apparatus for transforming a sudden to a gradual relative movement between adjacent parts, a plurality of elements capable when subjected to compression of individually exerting a gradually yielding spring resistance and simultaneously generating a frictional resistance.

A further object of my invention is to provide in an apparatus of the character referred to, a series of resilient elements capable of first exerting a torsional resistance when subjected to compression and subsequently exerting a combined frictional and spring resistance by the relative movement between adjacent elements.

A further object of my invention is to provide an apparatus for resisting or absorbing a sudden blow or shock which will be simple in construction, inexpensive in manufacture and efficient in operation.

My invention will be more fully described hereinafter with reference to the accompanying drawings in which the same is illustrated as embodied in several convenient and practical forms, and in which—

Figure 1 is a longitudinal sectional view through an embodiment of my invention, the parts being shown in their distended condition; Fig. 2 a view similar to Fig. 1, the parts being shown as compressed; Fig. 3 a view similar to Fig. 1 of a modified embodiment of my invention; Fig. 4 a view of the modification shown in Fig. 3, the parts being shown compressed; Fig. 5 a detail elevational view of one of the expansible rings shown in Fig. 1; Fig. 6 an elevational view of a pair of spirally disposed spring rings; Fig. 7 a sectional view on lines 7—7, Fig. 6; Fig. 8 an elevational view of one of the compressible rings shown in Figs. 1 and 2; and Fig. 9 an elevational view of one of the inner rings shown in Figs. 3 and 4.

Similar reference characters are used to designate similar parts in the several figures of the drawings.

Referring more particularly to Figs. 1 and 2 reference characters A′ and A² designate followers such for instance as are located within the yoke of a draw bar and engage stops on the draft timbers of a car. The illustration of the draw bar and draft timbers of a car is unnecessary as they form no part of my invention.

The follower A′ is shown as provided with a cylindrical projection a' which fits within a tubular portion b projecting from a transverse plate B′. The follower A² is provided with a projection a^2 which extends within an opening formed in a transverse plate B². The plates B′ and B² are provided with tubular projections b', b^2, which serve as stops to limit the movement of the plates towards each other.

A spring C is interposed between the follower A′ and the plate B′ which tends to separate or force apart the follower A′ and the plate B′.

A series of resilient elements which are shown in the form of open spring rings D′,

D^2, and D^3, are located between the plates B′, and B^2, and surround the tubular projections b' and b^2. The springs are provided with inclined surfaces so that the cross section of the rings is V-shaped, as shown in Fig. 1. Interposed between the spring rings D′, D^2 and D^3 are surfaces inclined complementally to the inclination of the adjacent surfaces of the rings D′, D^2 and D^3. The interposed inclined surfaces may be in the form of compressible rings E^2 and E^3, shown in detail in Fig. 8. Inclined surfaces E′ and E^4 are interposed between the plates B′ and B^2 and the adjacent surfaces of the rings D′ and D^3.

The series of rings D′, D^2 and D^3 preferably vary in expansibility, such variance being effected by the inclination of their surfaces, in Figs. 1 and 2 for instance the inclined surface E′ forms a more acute angle with a horizontal line than does the inclined surface E^2 which engages the adjacent surface of the ring D′. The angle of inclination of the engaged surfaces E^2 and D^2 is still less acute but is more acute than the angle of inclination between the surface of the ring D^2 which engages the inclined surface E^3. The angle of inclination between the ring D^3 and the surface E^3 is less acute than that between the ring D^3 and the surface E^4.

The operation of the embodiment of my invention shown in Figs. 1 and 2 is as follows; When the followers A′ and A^2 are moved together, due for instance to the relative movement between a draw bar and the draft timbers of a car, the spring C is first compressed permitting the follower A′ to engage the tubular projection b' on the plate B′. Further movement of the followers A′ and A^2 towards each other expands the rings D′, D^2 and D^3 through the engagement of the inclined surfaces E′, E^2, E^3 and E^4. If the inclined surfaces E′, etc. are open spring rings such as is shown in Fig. 8, they will be compressed through their engagement with the inclined surfaces on the expansible rings D′ etc. The relative movement of the adjacent surfaces of the members E′ etc. and the spring rings D′, etc. produces friction which resists the movement of the followers towards each other, such movement of the followers being also resisted by the expansion of the spring rings D′, etc. and the compression of the members E′, etc. when they are in the form of compressible spring rings.

The function of the spring C is to absorb the usual strain incident to the running of a train so that the resilient elements are only brought into action by a sudden or violent pulling or buffing shock occurring when the train is started or stopped. By graduating the expansibility of the resilient rings D′, D^2, and D^3, they will be brought into action serially commencing from the left in Fig. 1 and proceeding towards the right, inasmuch as the more acute the angle of inclination between the engaged surfaces the greater will be the wedging action and the quicker will the ring be expanded. When the inner members E′ are compressible springs they will of course be compressed serially owing to the different angular inclination of their surfaces.

It is not necessary that the spring C should be employed inasmuch as the entire resistance to the movement of the followers together may be afforded entirely by the resilient elements. In Figs. 3 and 4 for instance I have illustrated another embodiment of my invention in which the resilient elements are interposed directly between plates A^3 and A^4 upon which the force which is to be resisted is exerted. The resilient elements F′, F^2, F^3, and F^4 are of graduated expansibility owing to their being composed of different quantities of metal. In other words the thickness of the metal of the rings varies. In this embodiment of my invention when the followers A^3 and A^4 are forced together the resilient ring F′ will first be expanded and the rings F^2, F^3 and F^4 subsequently expanded in order. The inner elements G′, G^2, G^3, G^4 and G^5 may if desired also be in the form of compressible springs and of different thicknesses, or they may be in the form of solid rings as shown at G in Fig. 9. In Figs. 3 and 4 the inclination between the engaged surfaces is the same, the serial action of the resilient elements being affected as above described by graduating their thickness.

In Figs. 6 and 7 I have illustrated still another form of resilient elements which may be employed in carrying out my invention. The expansible ring H is slightly spirally disposed as is also the coöperating inner ring J. In the use of such rings when they are subjected to compression they are first flattened, thereby exerting a torsional resistance and are subsequently expanded and contracted through their engaged inclined surfaces, producing a combined frictional and spring resistance. When a series of such spirally disposed resilient rings are employed for a friction buffer it is unnecessary to employ a spring such as C in Figs. 1 and 2 to assume the usual strain incident to the running of a train, as such strain is absorbed by the torsional resistance produced in flattening the several resilient rings. The rings are only expanded and contracted by a sudden or violent pulling or buffing shock occurring when the train is started or stopped.

It is of course obvious that in carrying out my invention a series of expansible rings may be employed in connection with non-compressible members, such for instance as the ring G in Fig. 9 or a series of compressible springs may be used in connection with interposed non-expansible members. It is also

obvious that the tension of the rings may be varied either by graduating the inclination of their friction surfaces or by varying the thickness of the rings. It is further evident that either or both of the expansible and compressible springs may be spirally disposed and at the same time graduated as to tension either by varying the inclination of their frictional surfaces or by graduating the thickness of the several rings.

It is apparent that my invention is adapted for a variety of uses in addition to that of serving as a draw bar and buffing apparatus. My invention may in fact be used wherever it is desired to absorb a violent shock or blow, or to transform a sudden or violent relative movement between the coöperating parts to a gradual relative movement, or to sustain a heavy load.

From the foregoing description it will be observed that I have invented an apparatus for resisting a strain or for dissipating a shock composed of a series of elements capable of affording frictional as well as spring resistance, thereby avoiding the employment of friction devices separate from springs in order to attain a combined frictional and spring resistance.

While I have described more or less precisely the details of construction I do not wish to be understood as limiting myself thereto, as I contemplate changes in form, the proportion of parts, and the substitution of equivalents, as circumstances may suggest or render expedient, without departing from the spirit of my invention.

Having now fully described my invention what I claim as new, and desire to secure by Letters Patent, is—

1. A device of the character described comprising a series of resilient elements having inclined frictional surfaces the surfaces on adjacent elements adapted when said series of elements are subjected to compression to be relatively moved through engagement with each other thereby placing said resilient elements under tension.

2. A device of the character described comprising a series of resilient elements of graduated resisting capacity having inclined frictional surfaces adapted when said series of elements are subjected to compression to be relatively moved thereby placing said resilient elements under tension.

3. A device of the character described comprising a series of resilient rings having inclined frictional surfaces adapted when said series of rings are compressed to be relatively moved thereby placing said rings under tension.

4. A device of the character described comprising an expansible resilient ring and a compressible resilient ring, said rings having complemental inclined engaging frictional surfaces.

5. A device of the character described comprising a series of expansible resilient rings having inclined frictional surfaces and a compressible resilient ring interposed between adjacent expansible rings and having complemental inclined frictional surfaces.

6. A device of the character described comprising a series of spirally disposed expansible resilient rings having inclined frictional surfaces and a spirally disposed compressible resilient ring interposed between adjacent expansible rings and having complemental inclined frictional surfaces.

7. A device of the character described comprising a series of spirally disposed expansible resilient rings of graduated resisting capacity having inclined frictional surfaces and a spirally disposed compressible resilient ring interposed between adjacent expansible rings having complemental inclined frictional surfaces.

8. A device of the character described comprising a series of expansible resilient rings of graduated resisting capacity having inclined frictional surfaces and a series of compressible resilient rings of graduated resisting capacity having complemental inclined engaging frictional surfaces.

9. A device of the character described comprising a series of resilient elements having inclined frictional surfaces the angle of inclination of the surfaces being graduated whereby when said series of elements are subjected to compression the engagement between the graduated inclined frictional surfaces serially places said elements under tension.

10. A device of the character described comprising a series of resilient rings having inclined frictional surfaces, a member interposed between adjacent rings having inclined frictional surfaces complemental to the surfaces of the rings, the angle of inclination of said frictional surfaces being graduated whereby when said series of rings are subjected to compression the engagement between the graduated inclined frictional surfaces on said rings and members serially places rings under tension.

11. A device of the character described comprising a series of open spring rings having inclined frictional surfaces and a series of members having inclined frictional surfaces interposed between said rings and engaging the inclined surfaces of the adjacent rings, whereby when said series of rings are subjected to compression they are placed under tension through the engagement of the inclined surfaces thereof with the inclined surfaces of the interposed members.

12. A device of the character described, comprising a series of spirally disposed resilient open rings having inclined surfaces and a series of members interposed between said rings and having frictional surfaces inclined

complementally to the adjacent surfaces of the rings whereby when said series of rings are subjected to compression they are first flattened and thereby have torsional resistance imposed upon them and are subsequently placed under tension through the engagement and relative movement between their inclined surfaces and the inclined surfaces of the interposed members.

13. In an apparatus of the character described, an open spring ring having an inclined frictional surface adapted to be engaged by a similarly inclined surface to impart tension to the ring.

14. In a device of the character described, a spirally disposed open spring ring having inclined frictional surfaces adapted to be engaged by similarly disposed inclined surfaces.

15. A friction spring device comprising an outer and an inner series of resilient elements, the elements in each series having inclined frictional surfaces engaging corresponding inclined frictional surfaces on the elements in the other series whereby when the device is subjected to compression the elements in the outer series will be expanded and the elements in the inner series be contracted.

16. A friction spring device comprising an outer series and an inner series of spirally disposed resilient elements, the elements in each series having inclined frictional surfaces engaging corresponding inclined frictional surfaces on the elements in the other series, whereby when the device is subjected to compression the elements of the outer series will be expanded and the elements of the inner series will be contracted.

17. A friction spring device comprising an outer series of spirally disposed expansible elements, each element having inclined frictional surfaces on the opposite sides thereof, and an inner series of spirally disposed compressible elements, each element having inclined frictional surfaces on the opposite sides thereof, the elements in the inner series being interposed between and engaging the inclined frictional surfaces on the adjacent elements in the outer series, whereby when the device is subjected to compression the elements in the outer series will be expanded and the elements in the inner series contracted through the engagement and relative movement of the inclined frictional surfaces.

In testimony whereof, I sign this specification in the presence of two witnesses.

PHILLIP HIEN.

Witnesses:
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C. C. CUNNINGHAM.