June 10, 1930. E. G. GOODWIN 1,763,146

SPRING

Filed May 9, 1925 3 Sheets-Sheet 1

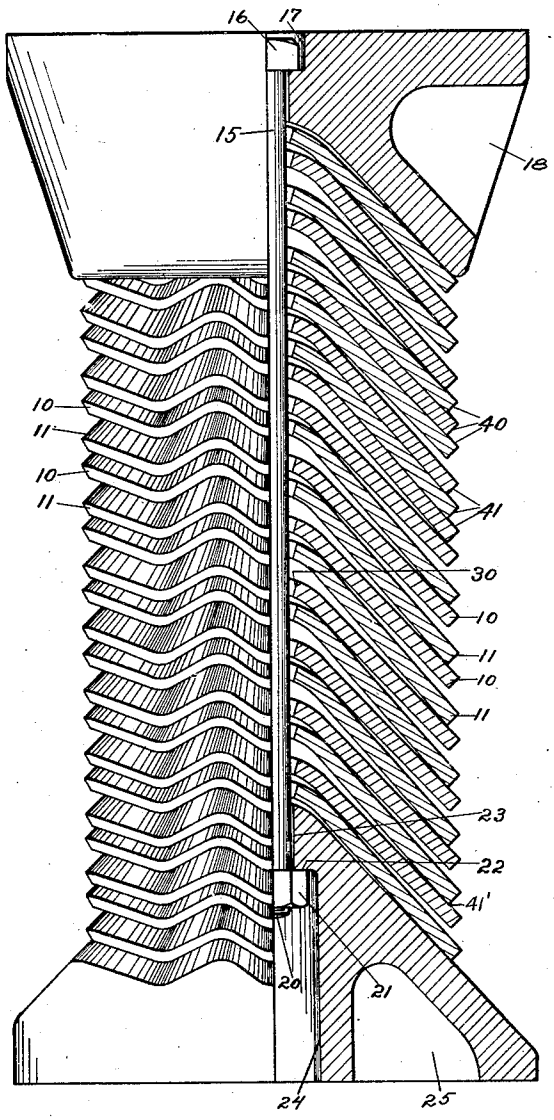


Fig. 1

INVENTOR
ERNEST G. GOODWIN
BY H. H. Snelling
HIS ATTORNEY

June 10, 1930. E. G. GOODWIN 1,763,146

SPRING

Filed May 9, 1925 3 Sheets-Sheet 2

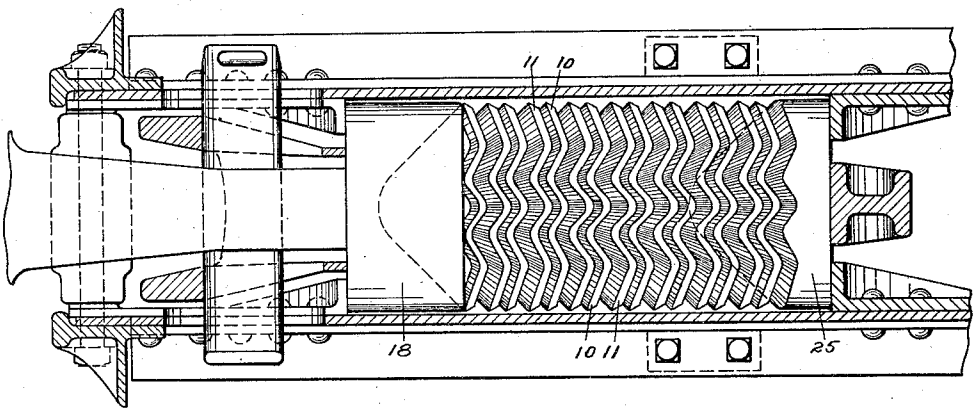


Fig. 2

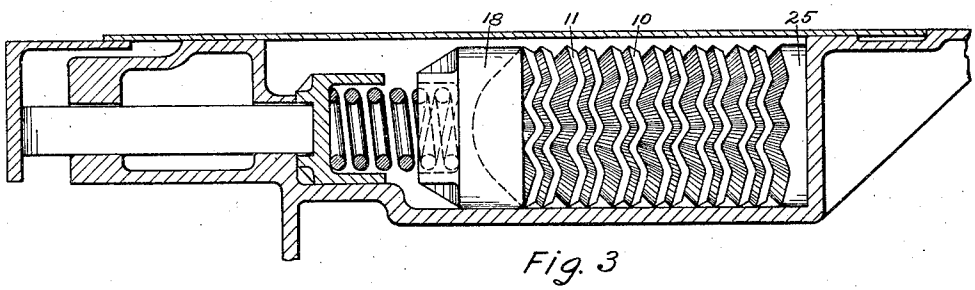


Fig. 3

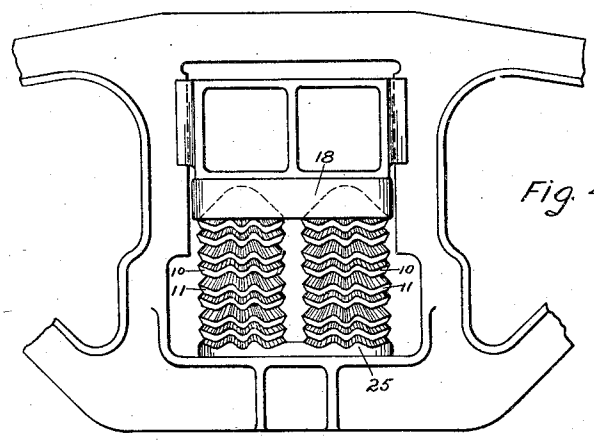


Fig. 4

INVENTOR.
ERNEST G. GOODWIN.
BY H. H. Snelling
HIS ATTORNEY.

June 10, 1930. E. G. GOODWIN 1,763,146

SPRING

Filed May 9, 1925 3 Sheets-Sheet 3

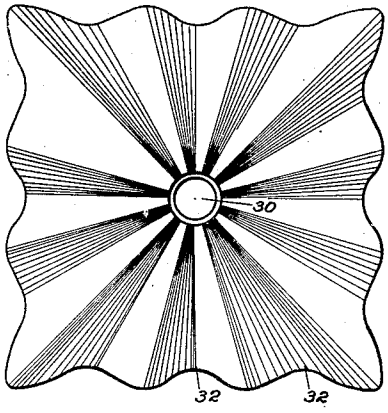


Fig. 5

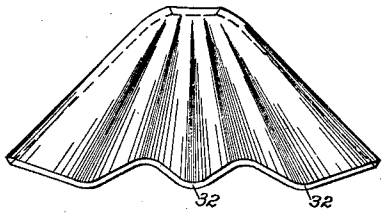


Fig. 6

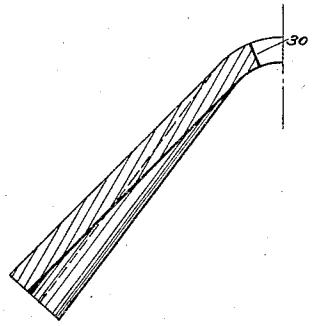


Fig. 7

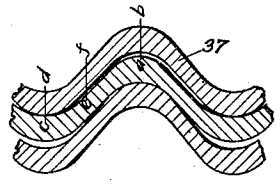


Fig. 8

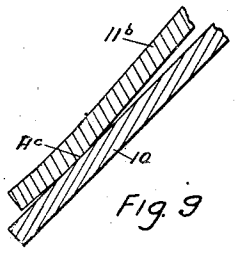


Fig. 9

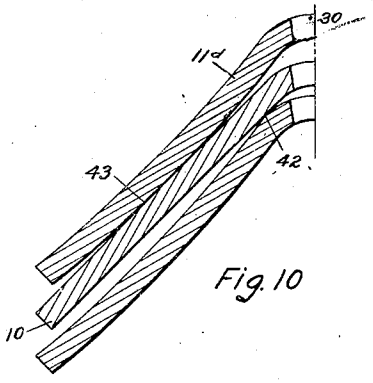


Fig. 10

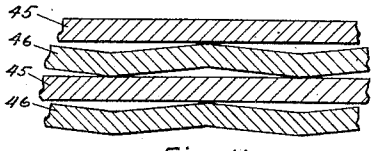


Fig. 11

INVENTOR.
ERNEST G. GOODWIN.
BY E. H. Snelling
HIS ATTORNEY

Patented June 10, 1930 1,763,146

UNITED STATES PATENT OFFICE

ERNEST G. GOODWIN, OF PELHAM, NEW YORK, ASSIGNOR TO STANDARD COUPLER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY

SPRING

Application filed May 9, 1925. Serial No. 29,194.

This invention relates to springs in general but particularly to springs of rather heavy capacity, and has for its principal object the provision of a spring suitable for use where a relatively great amount of travel is not required. A further object of the invention is to provide a spring particularly suited to use in railway draft gears.

In railway gears the problem is to dissipate a considerable amount of energy while at the same time avoiding too slight an amount of travel as this would be injurious to the car sills and also avoiding too great an amount of travel as this, since the length of the coupler bar is absolutely fixed, would result in allowing the coupler heads to droop after a rather short service.

Due to the absolute necessity of interchangeability of railway equipment, so many of dimensions, sizes and positions are fixed, it is becoming increasingly difficult to work within the said fixed confines and yet obtain the ever increasing capacity required of draft gears. Of course it would be very simple to make the capacity at any figure desired if it were not for the ever opposing requirement for a certain amount of travel, this figure usually being taken as 2¾ inches in the car. By using a draft gear made up of the spring elements of this invention with suitable end pieces, which are at the same time followers, I am able to provide a device of any desired capacity, by modifying slightly the arrangement or relative positioning of the individual spring elements; having them in straight pairs for maximum travel and therefore minimum capacity or by arranging similar elements together in series so that two or more of each type form with an equal number of the other type a pair I can increase the capacity to the extent desired, the greater the number of similar elements nested together, the greater the capacity, but naturally the less the travel. By a suitable arrangement of nesting and by a proper choice of thickness of the metal of each element it is possible to obtain accurately any desired travel and capacity within reason.

For convenience of illustration and to make clearer the description, I have illustrated the spring of my invention in a preferred form but the invention is a broad one capable of many dissimilar uses and hence the specific embodiment of the invention must not be considered as limiting the scope of the invention.

In the drawings:—

Figure 1 is a general elevation partly in longitudinal cross section of one form of draft gear embodying the present invention.

Figure 2 is a plan view of an application of the draft gear shown in Figure 1 to the draft sills of a railway car.

Figure 3 is a sectional elevation showing the invention used as a buffer for railway passenger cars.

Figure 4 is a view showing the invention as a bolster spring for car trucks.

Figure 5 is an axial view of one of the corrugated conical disks.

Figure 6 is an edge elevation of the disk shown in Figure 5.

Figure 7 is a radial section taken through the plate, disk or element.

Figure 8 is a developed cross section taken in a cylindrical plane.

Figures 9 to 11 show modifications.

The draft gear illustrated is composed of a plurality of spring plates 10 and 11 forming a plurality of pairs which are mounted on a bolt 15 having a non-circular, preferably square head 16 fitting in a corresponding recess 17 in the end section 18 and having a threaded end 20 receiving a hexagonal nut 21 resting on the shoulder 22 formed at the junction of the rather small bolt receiving bore 23 and the much larger, preferably cylindrical, core 24 in the end block 25.

Each spring plate 10 or 11 is in the form of a cone or pyramid, the vertex angle of the elements 10 being somewhat greater than the vertex angle of the elements 11 so that the theoretical circle line of contact between an element 11 and an element 10 on the left as seen in Figure 1 is at the periphery of the element 11 while the theoretical circle of contact between this element 11 and the proximate element 10 on the right is quite near to the axes of the elements or disks.

It might be well to describe these spring plates by the method of their manufacture. I preferably cut sheets of suitable steel into squares and punch in the center of each a hole 30 which in finished form receives somewhat loosely the bolt 15 but which has the quite important function of serving to guide one of the two dies between which each flat square plate or disk is pressed into the corrugated form best seen in Figures 5 and 6.

The smooth, rounded ridges as seen from the concave side of the disk and indicated diagrammatically by lines 32 are preferably twelve in number and are, as shown, radial, the amount of arch decreasing toward the center. It is particularly to be noted that in the dieing operation the metal is not caused to flow materially in order to make the ridges and therefore neither the crests nor the depressions are weakened. On the contrary as best seen in Figure 8 the crests and depressions are each slightly thickened at the expense of metal at a point such as 37 which is the neutral point of flexing when it is attempted, after the disk is complete, to push it in a manner to increase or decrease its vertex angle. The cross-section is such, as seen in Figure 8 that the disks are of exactly the same thickness measured in a line parallel to the axis at any given distance from the axis, that is, as shown in the figure the vertical distance from edge to edge of any cross section is similar; in other words the distance *ab* equals *cd* equals *ef* although the thickness at the center of *ef* measured normal to each surface is materially less than the distance *ab*. The advantage of this construction is that when the gear is closed the disks are in contact from end to end and from axis to periphery.

In Figure 1 in elevation I have shown the corrugated disks as consisting preferably of pairs.

The preferred form of head pieces 18 and 25 of Figure 1 call for their vertex angle to be substantially midway between the vertex angle of elements 10 and 11 since said head pieces are not flexible. In the longitudinal cross section in this figure however I have shown at 40 three consecutive disks each of which normally forms that which we will arbitrarily call the right hand member of the pair and at 41 adjacent to the three elements at 40, I have shown three consecutive elements each of which according to the same arbitrary standard may be called the left hand members of a pair.

By having every alternate disk alike we obtain maximum travel but by placing a number of disks 10 together and then following this by an equal number of consecutive disks 11 we increase in direct ratio to the number of single elements in each set, the capacity of the gear as a whole but obviously in increasing the capacity we necessarily limit the travel. I find that by having a number of pairs interspersed, regularly or not, with consecutive similar elements I can obtain for the gear a desired capacity and still have in the gear a sufficient amount of travel to make it a commercial success.

In Figure 9 the element 10 is exactly similar to the other elements 10 of the preferred form of Figure 1 but the element 11 is replaced by a disk 11^b which has been slightly curved near its periphery as at 11^c so that instead of a theoretical line contact between the disks as in the preferred form we have with pressure of assembly a zone contact the area of which depends on the amount of curving or flatening of the disk 11^b.

In Figure 10 I have carried the idea still further and have altered the disks 11 by bending them so as to contact at the point 43 as well as at the point 42 as in the preferred type. By diminishing the radial distance between the points 42 and 43 or what is the same thing, between 42 and 41′, we increase the capacity or decrease the travel so that in addition to the different methods of stacking the disks I can alter the capacity or travel by using some elements 11^d in combination with the regular pairs of disks 10 and 11.

In Figure 11 each alternate disk such as 45 is a true cone, that is, it is uncorrugated and these cooperate with alternate disks 46 which are of type generally similar to either 10 or 11. Obviously in this form the disk 45 flex upon closing of the gear while the disks 46 tend to become conical but in this case exactly as in every other case the amount of flexing of any one disk is exactly compensated by the flexing of the next adjacent disk; in other words, for each degree of flattening of the corrugated disk 46 the disk 45 adjacent it takes up a degree of flex so that when the gear is completely closed to form solid metal, the disks 45 and 46 would be of exactly the same form and all the disks, as in the other modifications, would be in contact throughout their entire proximate areas.

An advantage of the device having considerable commercial value is the elimination of the necessity of scrapping parts, this flowing from the fact that as soon as the gear has been reduced in over-all effective length due to the actual wearing away of the surfaces of the disks, the capacity and length of the gear may be restored by the simple expedient of adding one or more of the spring elements, preferably a pair at a time in order to avoid as far as possible, uneven wear on the end pieces, the vertex angles of which, since these pieces are not flexible, are the same as the vertex angle of any one piece when the gear is under maximum load.

What I claim is:—

1. A spring consisting of a plurality of nested dished elements, each unconnected to but frictionally engaging the adjacent ele-

ments on each side, said elements contacting in increasing area as the load is applied.

2. A spring consisting of a plurality of nested sheet metal plates each dished by the provision of radial corrugations decreasing in size toward the center, the radial corrugations of each plate frictionally engaging the radial corrugations of the two proximate plates.

3. The spring of claim 2 in which a plurality of the plates are dished to a greater extent than are the remaining plates.

4. The spring of claim 2 in which all of the plates conform to one or the other of two configurations, and in which, at regular intervals a plate of one configuration is paired with a plate of the other configuration.

5. A spring element consisting of a centrally perforated rectangular sheet of metal dished by the provision of corrugations forming radial ridges on the convex side extending to each of the four corners.

6. The device of claim 5 in which the corrugations are each radial and certain of the corrugations forming ridges on the concave side extending to the midpoint of each edge.

7. In a spring, a front block and a rear block and a series of nested, frusto-conical plates between them, said plates nesting with the blocks.

8. The device of claim 7 in which each plate touches the adjacent plate on one side near its edge and touches the plate on the other side near its center.

9. A spring composed of a plurality of corrugated dished plates, said plates being of the same thickness thruout measured in a line parallel to the axis of the plate at any given distance from said axis, whereby when the spring is closed the plates are in contact from end to end and from axis to periphery.

10. A spring composed of a plurality of circumferentially corrugated dished elements in which the angle between the axis of the element and the average flare is approximately half a right angle and a plurality of generally similar elements in which the corresponding angle varies from the angle of the first mentioned plurality of elements by less than a fourth of the angle of either.

11. The spring of claim 10 in which the difference between the angles of the elements is approximately three degrees.

12. In a spring, a convex end piece, a concave end piece, and a plurality of corrugated spring elements between said end pieces.

13. In a spring, a block having a conical projection, a block having a conical depression therein, and a plurality of corrugated nested cones between said projection and said depression and adapted to be brought into firm contact with each other and with the blocks upon closing of the spring.

14. In a spring, a block having a conical projection, a block having a conical depression therein, and a plurality of corrugated nested cones arranged in pairs between said projection and said depression and adapted to be brought into firm contact with each other and with the blocks upon closing of the spring.

15. A spring consisting of a pair of blocks, a series of nested dished elements between the blocks, and retaining means passing loosely thru both blocks and all of the dished elements, said retaining means being less in length than the spring when under full load.

In testimony whereof I affix my signature.

ERNEST G. GOODWIN.