J. E. MUHLFELD.

SHOCK ABSORBER.

APPLICATION FILED MAR. 24, 1913.

1,093,642. Patented Apr. 21, 1914.

Fig. 1

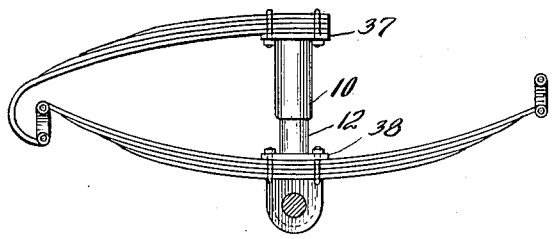


Fig. 2

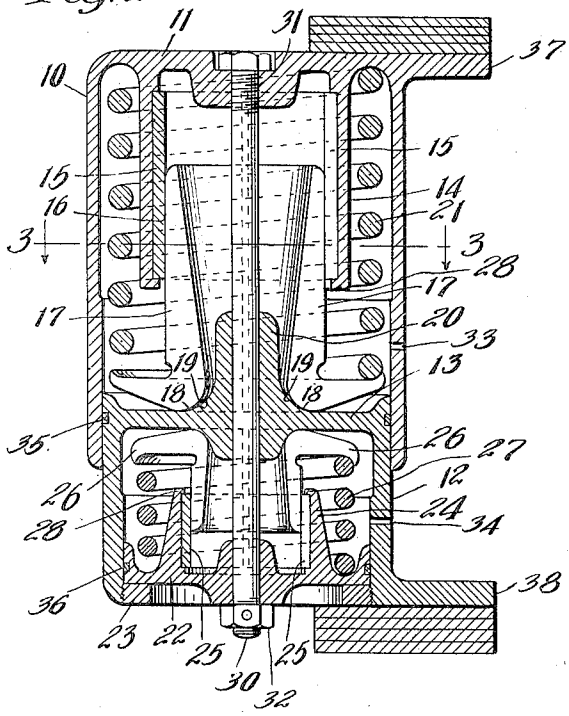


Fig. 3

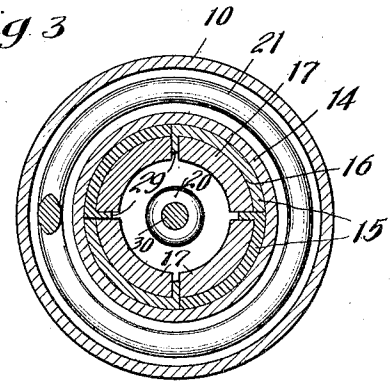


Fig. 4

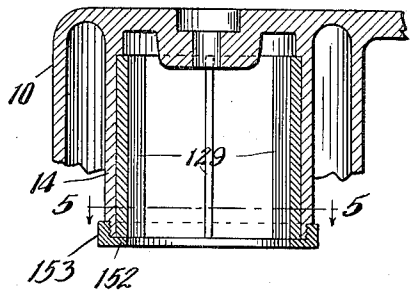
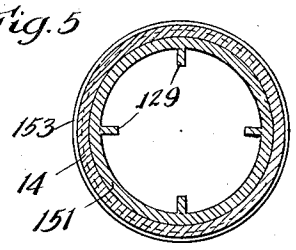


Fig. 5



Witnesses:

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UNITED STATES PATENT OFFICE.

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SHOCK-ABSORBER.

1,093,642. Specification of Letters Patent. Patented Apr. 21, 1914.

Application filed March 24, 1913. Serial No. 756,278.

To all whom it may concern:

Be it known that I, JOHN E. MUHLFELD, a citizen of the United States, residing in Kansas City, in the county of Jackson and State of Missouri, have invented a new and useful Improvement in Shock-Absorbers, of which the following is a specification.

This invention relates to a double acting, graduated, compound spring, friction, pneumatic shock absorber, equalizer and stop for the purpose of reducing both the compression and recoil of elliptical, spiral or other shaped springs used in connection with running or draft gear or other mechanisms of locomotives, cars, vehicles, machinery and other mechanically operated equipment, devices and appliances, the device being also adapted to limit the extreme movements of the parts to which it is attached.

As is well known, with railway locomotive tenders, motor, passenger cars and automobiles, where semi or full elliptical springs are used between the running gear and body parts, there is a continued and repeated compression and recoil of these springs, due to the irregularities in the track or road bed, the amount of such compression and recoil depending upon the character of the irregularity and the speed of the vehicle. This continued vibration, rocking, jarring and bouncing, in addition to being an annoyance to passengers, is also destructive to all parts of the vehicle affected, and finally causes a permanent set or breakage of the springs.

An object of my invention is to provide a device which will counteract all the annoying and destructive effects above enumerated, by means of a combined shock-absorbing, equalizing braking, easing and cushioning device which is applied between the spring supported and the non-spring supported parts of the vehicle.

The invention furthermore consists in the improvements in the parts and devices as herein shown, described or claimed.

Broadly stated, my invention is a combined shock absorber and equalizer, in which the equalizing action is obtained through the instrumentalities of springs, the braking action is obtained through the instrumentalities of sliding friction surfaces, and the easing and cushioning action is obtained through a pneumatic arrangement.

In the drawing forming a part of this specification, Figure 1 is a side elevation of a portion of a spring, such as used on an automobile, showing my improvements attached thereto. Fig. 2 is an enlarged, central, vertical section of my improved, combined shock absorber, equalizer and stop. Fig. 3 is a transverse, sectional view, taken substantially on the line 3—3 of Fig. 2, and Figs. 4 and 5 are sectional views of a modified construction.

In said drawing, the shock absorber, equalizer and stop, as shown, comprises a main case 10, having a closed upper end 11, said case 10 telescoping with an auxiliary case 12, the latter having a closed inner end 13, and being slidable within the main case 10. Within the main case 10 is a main friction cylinder 14, having a plurality of quadrant shaped friction sleeves 15, each of said friction sleeves 15 having an inner friction surface 16 with which engages a friction bell-crank-shaped lever 17, the number of said friction levers corresponding to the number of the friction sleeves, and each friction lever 17 being pivotally mounted as at 18 on a rounded surface 19, formed by a central hub 20 rising from the upper surface of the top 13 of the auxiliary case 12. Encircling the friction cylinder or shell 14 is a main spring 21, the latter, at one end, engaging the top 11 of the main case, and at its other end, engaging the outwardly extended lower arms of the bell-crank friction levers 17.

Within the auxiliary case 12 is a combined spring and friction shock absorbing device similar to that above described for the main case 10, and in said auxiliary case 12 is slidably mounted a washer 22, the latter being held within the case 12 by means of a threaded retaining ring 23. As shown, said washer 22 is provided with an inwardly extending auxiliary friction shell or cylinder 24, provided on its interior with a plurality of auxiliary friction sleeves 25, the latter cooperating with a plurality of pivoted bell-crank-shaped auxiliary friction levers 26, said levers being engaged by an auxiliary spring 27.

In order to retain the friction sleeves 15 and 25 within their respective friction cylinders, each cylinder is provided with an inturned flange 28, and to properly space the friction levers 17 and 26, the friction sleeves 15 and 25 are each provided with radially and inwardly extended flanges 29 (see Fig. 3). An adjusting rod 30 is also provided to

hold all the parts under an initial compression, and thereby automatically take up wear in the friction levers and sleeves, and also to maintain the proper positioning of all the parts so that a certain and effective resistance is insured when the parts are operated. This rod 30 is threaded into the top 11 of the main case, as shown at 31, and extends through the top end 13 of the auxiliary case 12, and also through the washer 22, the two last named parts being slidable on the rod, and the length of the rod being adjustable by means of a nut 32.

As shown in Fig. 2, the main case 10 is provided with a main air vent 33, located a short distance above the upper edge of the auxiliary case 12 and the latter is also provided with an auxiliary air vent 34 located a short distance above the inner edge of the washer 22, so that under normal conditions the vents 33 and 34 will be open. In the periphery of the auxiliary case 12 is a main packing ring 35, and in the periphery of the washer 22 is an auxiliary packing ring 36, said packing rings being of any suitable and well known form, and adapted to prevent the escape of air past the same.

I have shown my combined shock absorber and equalizer as employed on an automobile, and for this purpose the main case 10 will be provided with a bracket 37, which will be secured to the spring supported parts of the vehicle and the auxiliary case 12 is provided with a similar attaching bracket 38, which will be secured to the non-spring supported parts of the vehicle, but, as will be understood, the means for securing the device in position will be varied to suit the places where it is used.

When the combined shock absorber, equalizer and stop is employed on an automobile, as shown in the drawing, the operation is as follows: When the parts receive an impact, the elliptical spring will be compressed, thereby causing the main case 10 to move downwardly with the spring supported parts of the vehicle, and as this movement takes place, the main spring 21 will offer a certain amount of resistance which, in turn, is augmented by the frictional resistance between the levers 17 and the friction sleeves 15. As the main case 10 continues to move farther over the auxiliary case 12, the air is exhausted from the main case 10 through the vent 33, thereby causing a pneumatic resistance to the movements of the parts, which pneumatic resistance is increased when the vent 33 is finally closed by the auxiliary case 12 sliding over the same, the vent 33 in actual practice being preferably closed when half of the total possible movement of the main case 10 has taken place.

From the preceding description, it will be seen that the spring, frictional and pneumatic resistance and cushioning effect are all graduated and increased from the commencement, to the end of the movement of the main case over the auxiliary case, the maximum resistance, cushioning and equalizing effect being obtained at the end of movement of the case 10. The rebound or recoil of the vehicle spring is controlled and graduated by the main case friction levers and friction surface until the main case and the auxiliary case come to normal position, after which any further rebound or recoil movement brings into play the auxiliary case, friction levers, friction sleeves and auxiliary air vent 34 through the adjusting bolt 30 which lifts the washer 22, thereby compressing the auxiliary spring 27 and increasing the frictional contact between the levers 26 and friction sleeve 25 and finally closing the air vent 34.

From the preceding description, it will be seen that the device provides a combination spring, frictional and pneumatic stop for the downward movement of the spring supported parts of the vehicle, thereby eliminating the necessity for rubber stops or blocks which are now generally found on automobiles, cars, other vehicles and other apparatus for the purpose of stopping excessive movements, and which cause severe impact and shock. It will also be noted that the device herein shown, described and claimed is adapted to absorb, resist and reduce longitudinal, lateral, vertical and other impact, shock, vibration, jar, recoil, oscillation or compression between the truck or running gear and the body or superstructure, as well as between the individual parts of the truck or running gear, or of the body or superstructure of the vehicle or other apparatus to which it is applied.

The adjusting rod 30, in addition to holding the parts in assembled condition, also serves to keep the two cases 10 and 12 and the washer 22 in proper alinement, especially when the auxiliary cylinder is withdrawn from the main cylinder upon the recoil.

In Figs. 4 and 5, a slightly modified construction of the friction sleeves which are used in the main and auxiliary cases is shown, and in said figures the sleeve 151 is shown as made of a single piece, having a plurality of radially and inwardly extended separating flanges 129, to keep the friction levers properly spaced in a manner similar to the construction shown in Figs. 2 and 3, and in this construction, the sleeve 151 will be held in position against a shoulder 152 by means of a collar nut or retaining ring 153, the latter taking the place of the inturned flanges 28 of the construction shown in Figs. 2 and 3.

Although I have herein shown and described what I now consider the preferred embodiment of my improvements, yet it will be understood that various changes and

modifications may be made in the details of construction and arrangement of parts without departing from the spirit of the invention, and all such changes and modifications are contemplated as fall within the scope of the claims appended hereto.

I claim:—

1. A compound, graduated shock absorber, equalizer and stop of the character described including, in combination: a main case; an auxiliary case telescoped and movable with respect to the main case; a set of combined spring and frictional shock absorbing devices in each of said cases; and means for causing pneumatic resistance to the relative movement of said cases coöperating with said shock absorbing devices, substantially as specified.

2. A compound, graduated shock absorber, equalizer and stop of the character described including, in combination: a main and auxiliary case slidably telescoped one within the other, said cases having their axes in alinement; and a set of combined spring and frictional shock absorbing devices located within each of said cases, substantially as specified.

3. A compound, graduated shock absorber, equalizer and stop of the character described including, in combination: a main case; an auxiliary case, said cases having their axes in alinement; and a set of devices within each of said cases for absorbing shock, each set including a spring, a friction cylinder, and pivoted friction levers, said levers being pressed by the spring into engagement with the friction cylinder, substantially as specified.

4. A compound, graduated shock absorber, equalizer and stop of the character described including, in combination: a main case; an auxiliary case; a set of devices within each of said cases for absorbing shock, each set including a spring, a friction cylinder, and pivoted friction levers, said levers being pressed by the spring into engagement with the friction cylinder; and an adjusting rod extending through both cases for holding all the parts under an initial compression, substantially as specified.

5. A compound, graduated shock absorber, equalizer and stop of the character described including, in combination: a main case having a normally open air vent; an auxiliary case having a normally open air vent, said cases being telescoped one within the other; a washer slidable within the auxiliary case; and expansible cushioning means located within each of said cases, the cushioning means in the main case normally pressing the auxiliary case outwardly and the cushioning means in the auxiliary case normally pressing the washer outwardly to thereby keep the air vents open, substantially as specified.

6. A compound, graduated shock absorber, equalizer and stop of the character described including, in combination: a main case having a normally open air vent; an auxiliary case having a normally open air vent, said cases being telescoped one within the other; a washer slidable within the auxiliary case; expansible cushioning means located within each of said cases, the cushioning means in the main case normally pressing the auxiliary case outwardly and the cushioning means in the auxiliary case normally pressing the washer outwardly to thereby keep the air vents open, and packing rings in the peripheries of both the auxiliary case and said washer, substantially as specified.

7. A shock absorber of the character described including, in combination: a main case; an auxiliary case slidable within said main case; a friction cylinder within the main case; a plurality of friction levers cooperating with said friction cylinder, said levers being pivotally mounted on the top face of the auxiliary cylinder; a spring within the main case and operating to press said levers into engagement with the friction cylinder; a washer slidable within the auxiliary case; a friction cylinder within the auxiliary case; a plurality of friction levers within the auxiliary case and coöperating with the auxiliary friction cylinder; a spring within the auxiliary case operating to press the auxiliary friction levers into engagement with the auxiliary friction cylinder; and a rod extending through the main and auxiliary cases for holding the parts in assembled relation, substantially as specified.

8. A shock absorber of the character described including, in combination: a main case having a closed end and provided with an air vent in the side wall thereof; an auxiliary case having a closed upper end and slidable within the main case and adapted to close the air vent in the latter, said auxiliary case having also an air vent in the side wall thereof; a washer slidable within the auxiliary case and adapted to close the air vent in the latter; cushioning means in each of the cases; and means connecting the washer in the auxiliary case with the main case and adapted to move the washer, the air vent in the main case being closed when the auxiliary case slides within the main case, and the air vent in the auxiliary case being closed when the washer therein is moved by the main case, substantially as specified.

9. A device of the character described including, in combination: two cases telescoped one within the other; independent sets of braking and cushioning devices in each of said cases, one set of devices being operated when the cases are telescoped more than normal, and the other set of devices being operated when the cases are separated

more than normal; and pneumatic means cooperating with the cushioning and braking devices to resist relative movements between the cases, substantially as specified.

10. A compound, graduated shock absorber, equalizer and stop of the character described including, in combination: a main case; an auxiliary case; a set of devices within each of said cases for absorbing shock, each set including a spring, a friction cylinder and pivoted friction levers; and an adjusting rod extending through both cases for holding all the parts under an initial compression and the main and auxiliary cases in proper alinement, substantially as specified.

JOHN E. MUHLFELD.

Witnesses:
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SEBASTIAN SOMMER, Jr.