April 4, 1944. W. A. BIERMAN ET AL 2,345,652

CAR CONSTRUCTION

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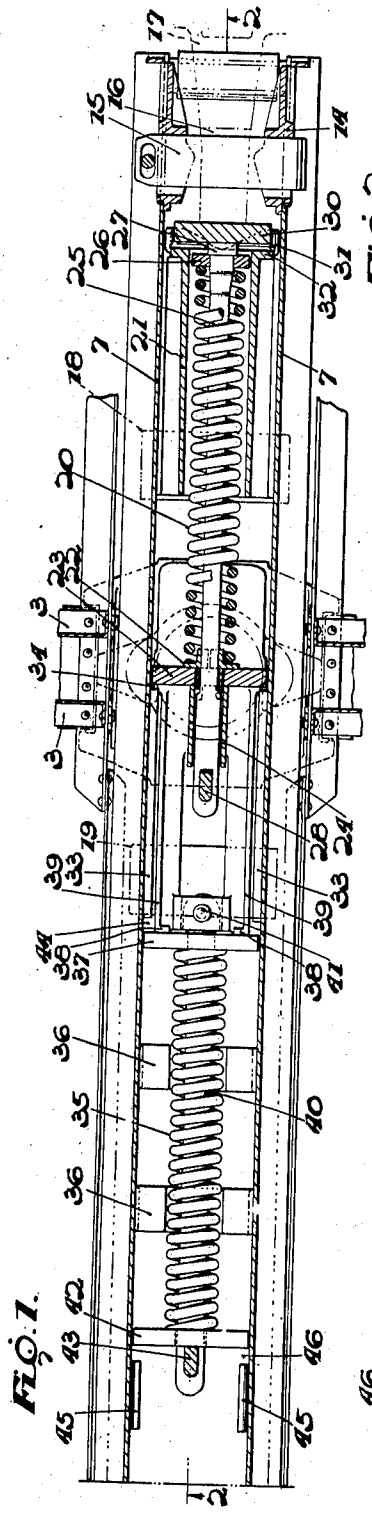


FIG. 1.

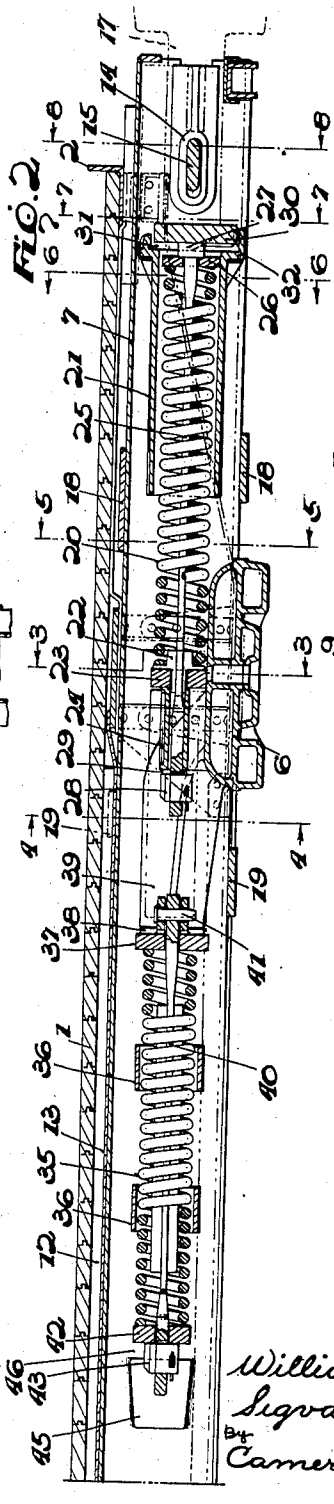


FIG. 2.

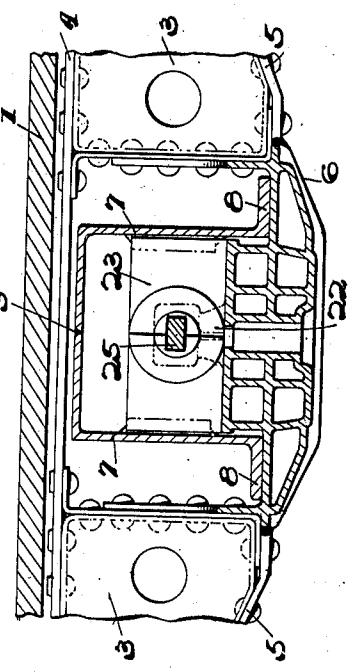


FIG. 3.

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FIG. 4.

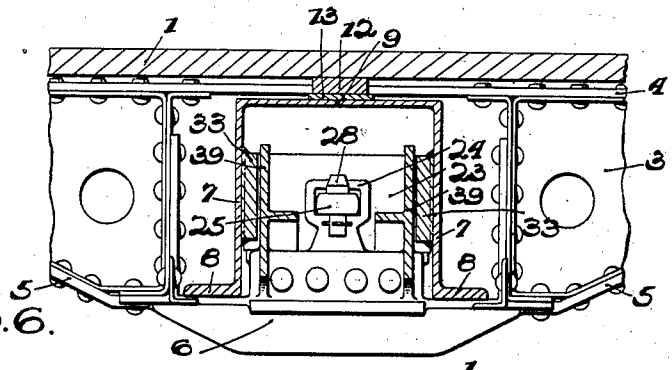


FIG. 6.

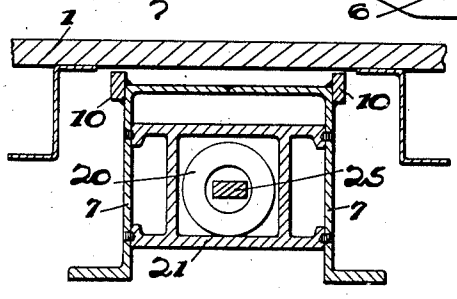


FIG. 7.

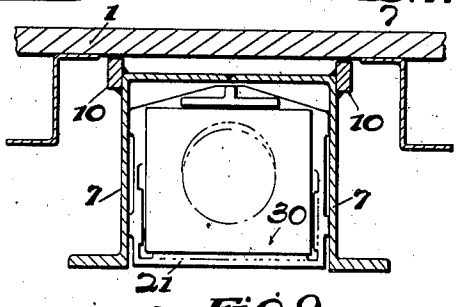


FIG. 8.

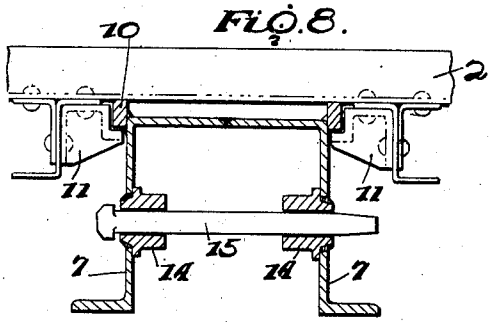


FIG. 9.

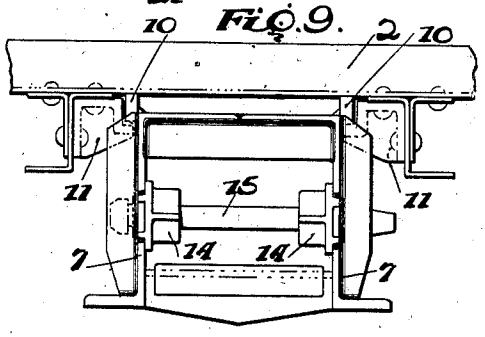
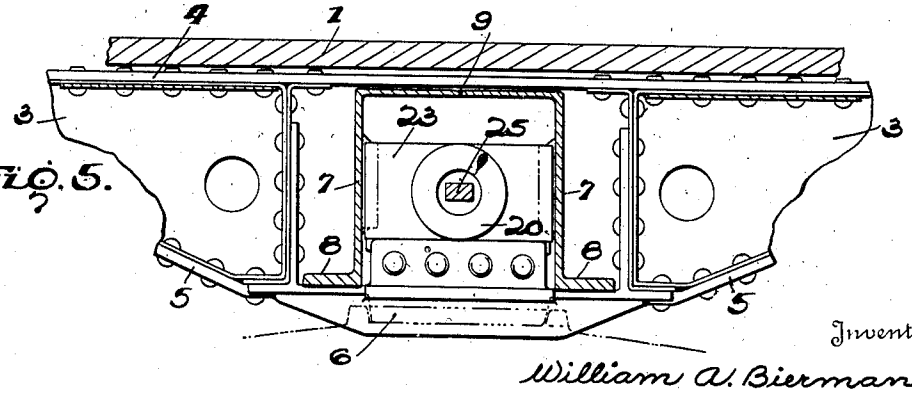


FIG. 5.



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UNITED STATES PATENT OFFICE

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CAR CONSTRUCTION

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Application June 30, 1941, Serial No. 400,466

10 Claims. (Cl. 213—8)

This invention relates to railway car underframes of the Duryea type which provide relatively long travel for resisting draft and buffing shocks together with a relatively short and predetermined amount of train slack.

In one form which has been extensively used in practice, the Duryea underframe comprises a draft and buffing column extending substantially the length of the car body and movable longitudinally relative thereto, the couplers being mounted at the ends of the column for movement of limited extent relative thereto to provide train slack, usually in buff only. Draft and buffing shocks are resisted by cushion gears interposed between the car body and the draft and buffing column, and since the travel of the column is independent of the train slack, the travel of the cushion gears may be made long with the result of providing the desired cushioning capacity while at the same time reducing the forces on the car body. Relatively light draft and buffing shocks are absorbed by the initial travel of the cushion gears, and their resistance increases gradually as the column continues to move so that the full cushioning capacity is available in the case of relatively heavy shocks. On the other hand, the train slack movement of the couplers relative to the column has been cushioned either by the initial travel of the cushion gears or by the provision of separate coupler cushion gears.

Underframes of the above type have given excellent results in service. However, in addition to the long cushioning travel made possible by such underframes, it is desirable to provide greater selectivity of cushioning capacity to meet varying service conditions. For example the weight to be cushioned in the case of an empty car is comparatively small. In this case it is desirable that the draft and buffing column or center sill be movable against a small cushioning resistance, and the amount of cushioning travel required is also small. Where the car is loaded to its cubic capacity, but the weight is light and the lading fragile, somewhat greater cushioning capacity and travel are required, but the full cushioning capacity should not be called into action, at least under ordinary conditions of handling of the car. On the other hand, when the car is loaded to its weight capacity, as with coal, steel, etc., the full cushioning capacity must be available but it is important at the same time that the initial impact be as soft as possible and that the forces increase gradually as cushioning travel increases.

One of the objects of the present invention is to provide novel cushioning means having a selective cushioning capacity whereby widely varying service conditions, such as those indicated above, are handled in a manner best suited to the requirements of each case, with sufficient cushioning capacity but at the same time minimum destructive forces.

Another object is to accomplish the above result without increasing the travel of the draft and buffing column or center sill beyond, for example, a maximum of seven or eight inches which has heretofore been found satisfactory in service.

A further object is to provide novel long travel cushioning means wherein cushioning devices are brought into action serially and the cushioning capacity is thereby successively augmented as the draft and buffing column moves away from its normal position.

A still further object is to coordinate a plurality of cushioning means including those at opposite ends of the car to provide a serial action thereof as the draft and buffing column moves away from its normal position in either direction, whereby the equipment required and the cost and weight of the underframe are kept within practicable limits.

One embodiment of the invention has been illustrated in the accompanying drawings, but it is to be expressly understood that said drawings are for purposes of illustration only and are not to be taken as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

In the drawings:

Fig. 1 is a plan view in section of one end of a car underframe embodying the invention;

Fig. 2 is a vertical longitudinal section on the center line of Fig. 1;

Fig. 3 is a vertical transverse section on the center line 3—3 of Fig. 2;

Fig. 4 is a section on the line 4—4 of Fig. 2;

Fig. 5 is a section on the line 5—5 of Fig. 2;

Fig. 6 is a section on the line 6—6 of Fig. 2;

Fig. 7 is a section on the line 7—7 of Fig. 2;

Fig. 8 is a section on the line 8—8 of Fig. 2; and

Fig. 9 is an end view of the underframe from which the car coupler has been omitted.

While only one end of the underframe has been illustrated in the drawings, it will be understood that the same or any equivalent construction may be employed at the other end of the car. The car body, the floor 1 and end sill 2 of which are shown in the drawings, is carried by body bolsters at opposite ends of the car which may be of the usual or any suitable construction. The draw-

ings illustrate a part of one bolster comprising vertical diaphragms 3 and top and bottom cover plates 4 and 5 respectively which make up a bolster structure extending laterally from the center of the car toward each side. The bolster structure at the center of the car may be suitably arranged to provide an opening for the passage of the draft and buffing column described hereinafter, said laterally extending structure being connected in the form shown by the top cover plate 5 and by a center brace casting 6 adapted to rest on the car trucks (not shown).

The draft and buffing column or center sill, which may be of any suitable construction, extends substantially the length of the car body and is mounted for longitudinal movement relative thereto through the openings in the body bolsters. In the form shown, said column comprises Z-sections 7, the lower flanges 8 of which are turned outwardly and rest slidably on the center brace casting 6 and the upper flanges of which are turned inwardly and welded together at 9. The column 7 may be supported and guided at the end of the car in any suitable way, as by bars 10 welded to its upper corners and slidably supported by carrier castings 11 which are suitably secured to the end sill 2 of the car body. Intermediate the bolsters the column supports the weight of the car floor 1 by means of a filler block 12 bearing on a plate 13 which is connected at its ends to the bolsters and frictionally engages the top of the column.

Couplers are mounted at the ends of the column 7 in any suitable manner so as to be capable of movement of limited extent relative thereto to provide a predetermined amount of train slack, preferably in buff only. In the form shown, cheek plates 14 are secured as by welding to the opposed inner faces of the draft and buffing column and are provided with ribs defining openings aligned with similar openings in the draft and buffing column, a coupler key 15 passing through these openings and through an opening 16 in the shank of the coupler 17. As shown in Fig. 1, the inner edge of the opening 16 normally engages the inner edge of the key 15 and the outer edge of said key normally engages the outer edges of the openings in the cheek plates 14, so that on draft said column is moved outwardly without train slack. However, the dimensions of the coupler key openings are greater than the dimensions of the key so that on buff the coupler can move inwardly relative to the key and thereafter the coupler and key can move inwardly together relative to the column to provide train slack, the extent of which is predetermined and limited as hereinafter described.

On draft or buffing shocks, the column 7 will move relative to the car body in the appropriate direction and away from the normal position illustrated. The maximum travel of the column may be suitably limited by the engagement of outer stop plates 18 with the outer face of the bolster structure or by the engagement of inner stop plates 19 with the inner face of the bolster structure, and may be assumed for purposes of example to be seven inches in either direction. In order to accomplish the ends stated above, this travel of the column is cushioned by a plurality of cushioning means or devices arranged to come into action serially as the column moves away from its normal position. Thus the total travel of the column is in effect divided into cushioning zones with additional cushioning capacity becoming operative in each successive zone. The construction may be arranged to provide the desired number and relative length of zones according to the service requirements to be encountered. By way of example, the drawings show an underframe having three cushioning zones; an initial zone of light cushioning capacity and very low forces which may be of the order of ¾"; a second zone of somewhat greater cushioning capacity which may be of the order of 1½"; and a third zone occupying the remainder of the total travel of the column wherein considerably greater cushioning capacity is available but wherein the forces, due to the length of this zone, are initially low and increase gradually as the column continues to move.

The operation described above can be simply and effectively attained by providing cushioning devices for each zone and arranging them to come into action in succession at appropriate points in the travel of the column 7. It is desirable in the interest of standardization of equipment to duplicate the cushioning means at opposite ends of the car, however, and in the preferred form of the invention shown herein, advantage is taken of such duplication by coordinating similar cushioning devices at opposite ends of the car so that they act in series as the column moves in either direction to provide the first two zones. Since movement of the column in either direction results in draft operation at one end and buff operation at the other end, this coordination can be accomplished by similarly delaying the action of the cushioning devices at opposite car ends either in draft or buff. Hence in both directions of movement of the column, the operation will be the same, one or the other of said similar devices coming into action immediately and the other becoming effective in the second cushioning zone. To increase the cushioning capacity in the third zone, one or more additional cushioning means are provided which become operative only after the draft and buffing column has moved through the first and second zones.

In the form shown, the action of the cushioning devices at opposite ends of the car is delayed in draft, or on outward movement of the column relative thereto, so that the initial travel of each gear on buff may be utilized to cushion the inward train slack movement of the coupler relative to the column as well as the further inward movement of the coupler and column together in the first cushioning zone, and the use of separate coupler cushion gears is avoided. Hence these cushioning devices, as illustrated at one end of the car, may suitably extend from the outer side of the bolster substantially to the inner end of the coupler. The specific construction of these gears may be varied to suit conditions. As shown herein for purposes of illustration, each gear comprises a coil spring 20, the outer part of which is housed in and supported by a casting 21 secured to the draft and buffing column in any suitable manner, preferably by welding. The inner end of the spring extends partially into the opening in the bolster and is seated on a two-part spring washer 22 supported by a follower plate 23 which engages an abutment 24 formed by the walls of the center brace casting 6. A spring link 25 extends longitudinally through the spring 20 and through aligned openings in the follower plate 23 and abutment 24 and through a similar opening in a follower plate 26 at the outer end of the spring 20. The outer end of the link 25 carries a head

27 which retains said follower plate 26 on the end of the spring 20, and the inner end of the link is provided with a key 28 adapted to engage the inner end of the bolster abutment 24 but normally spaced therefrom as shown at 29 for a purpose hereinafter described.

The spring 20 is thus held in compression between the outer face of the bolster abutment 24 and a follower plate 30 interposed between the link head 27 and coupler butt 17, the latter and the coupler key 15 being thereby maintained normally in their outermost position as shown in Fig. 1 and described above. Accordingly when the coupler moves inwardly relatively to the column under a buffing shock, the follower plate 30 moves the link 25 freely inwardly and compresses the spring 20 against the follower plate 23 and bolster abutment 24. Thus the inward train slack movement of the coupler relative to the draft and buffing column is cushioned by the initial compression of the spring 20 until the follower plate 30 has moved through a space 31 into engagement with abutment walls 32 at the outer end of the casting 21. The space 31 thus predetermines and limits the train slack, since thereafter the coupler and column move inwardly together.

Further inward movement of the coupler and column together results in further compression of the spring 20 throughout the first cushioning zone referred to above. Meanwhile the column is moving outwardly at the other end of the car so that the cushioning action at that end may be illustrated by the operation in draft at the end of the car shown in the drawings. As above pointed out, the column moves outwardly without train slack in the case of a draft force. Secured to the opposed inner faces of the column in any suitable manner, as by welding, are stop plates 33 the outer ends of which are arranged to engage and move the follower plate 23 on outward movement of the column. Hence said follower plate, the spring 20, the link 25, follower plate 30 and coupler 16 all tend to move outwardly as a unit with the column until the key 28 moves through the space 29 and is brought into engagement with the inner end of the bolster abutment 24. Thereafter the outer end of the spring 20 is held against movement by the link 25, follower plate 26 and link head 27, and continued outward movement of the column results in outward movement of the follower plate 23 and compression of the spring 20.

It will be seen that the distance through which the column moves in draft before the spring 20 comes into operation may be adjusted by regulating the space 29 and also, if desired, by providing a further space 34 between the outer ends of the stop plates 33 and the follower plate 23 when the parts are in normal position. The extent of spaces 29 or 34, or the sum thereof, thus determines the distance through which the draft and buffing column must move inwardly before the cushioning spring 20 at the other end of the car comes into action, and hence likewise determines the length of the first cushioning zone and the point at which the second cushioning zone begins.

To provide additional cushioning capacity in the third zone, one or more additional cushioning devices may be arranged to become operative when the draft and buffing column has moved through the first and second cushioning zones. The number and arrangement of these additional cushioning devices will depend to a large extent on the amount of additional cushioning capacity desired as well as on considerations such as weight and cost. For example, two additional simultaneously acting springs may be employed, one disposed at the inner side of each bolster in tandem relation with the spring 20 as illustrated by the spring 35 at the end of the car shown in the drawings. The spring is supported in any suitable way as by means of supports 36 secured to the draft and buffing column. The outer end of said spring engages a follower plate 37 which rests against abutments 38 formed at the ends of walls 39, the latter extending inwardly from the bolster structure and being formed as part of the casting 6. A link 40 extends through the spring 35 and its outer end passes through an opening in the follower 37 and is pinned at 41 to the inwardly extending bolster structure 39. The inner end of the spring 35 bears against a follower plate 42 and the inner end of the link 40 passes through an opening in said follower plate and carries a key 43 whereby the spring is held under compression between the follower plates 37 and 42.

On movement of the draft and buffing column, the spring 35 is brought into action after the column has traveled the desired distance by means of suitable stops secured to the column and adapted to engage the follower plates 37 or 42 depending on whether the column moves inwardly or outwardly. In the form shown, the follower plate 37 is engaged on inward movement of the column by the inner ends of the stop plates 33 which in normal position are spaced from the follower plate as indicated at 44. The spring 35 is then compressed against the follower plate 42 which is held against movement by the link 40 and key 43. On outward movement of the column, the follower plate 42 is engaged by suitable stops 45 which in normal position are spaced from the follower plate as indicated at 46. The spring 35 is then compressed against the follower plate 37 and the abutment 38. Depending on conditions, the spaces 44 and 46 may be different or, as here shown, equal in extent. In the latter case the two springs 35 adjacent the two bolsters act simultaneously and come into action after the same extent of movement of the draft and buffing column in either direction to provide the desired additional cushioning capacity in the third cushioning zone.

The operation will be clear from the foregoing description and may be briefly summarized as follows. In case of a buffing force at either end of the car, the coupler 17 first moves inwardly relatively to the draft and buffing column to provide train slack, the extent of which is predetermined and limited by the space 31, this movement being cushioned by the initial compression of the spring 20. Thereafter the coupler and column move inwardly as a unit to an extent depending upon the severity of the buffing shock, the maximum amount of such inward movement being limited by the engagement of the stop plates 18 with the bolsters. In the case of an empty car, for example, where the energy to be absorbed is ordinarily comparatively small, the inward movement of the draft and buffing column may be limited to the first zone in which it is cushioned only by continued compression of the spring 20 and with correspondingly low forces. In the case of a loaded car where the weight is relatively light, the buffing shock under the same conditions may be sufficient to move the draft

and buffing column into the second cushioning zone, or the same result might follow in the case of very severe handling of an empty car. In this cushioning zone the cushioning capacity is increased by the spring 20 at the other end of the car which operates as in draft. Where the buffing shock is heavy, as in the case of a heavily loaded car, the draft and buffing column may be moved into the third cushioning zone in which event the cushioning capacity of the two springs 35 is added to that of the two springs 20 and the resistance gradually increases as the inward movement of the column continues toward its maximum.

In the case of a draft force at the end of the car shown in the drawings, the draft and buffing column moves outwardly immediately and without train slack but the spring 20 does not immediately come into action. At the other end of the car, however, the column moves as in buff and the movement is cushioned initially by the spring 20 at that end of the car. As the outward movement of the column continues, the cushioning capacity is increased when the spring 20 at the end shown in the drawings is brought into action, and if the draft force is heavy, the column may move outwardly far enough to bring the two springs 35 into action. The maximum outward movement of the column is limited by the engagement of the stop plates 19 with the bolster.

It will be understood that whatever the direction of movement of the column, the resistance of the springs is supplemented by the friction between the plate 13 and the top of the draft and buffing column. Further when the energy of the draft or buffing shock has been either absorbed or dissipated, the springs restore the parts to the normal position shown in the drawings and the return movement is snubbed by the friction between the plate 13 and the top of the draft and buffing column.

The invention thus combines the advantages of long cushioning travel, which are inherent in underframes of the Duryea type, with a selective cushioning capacity. The resistance to movement of the draft and buffing column is proportioned relative to the extent of movement thereof to provide cushioning capacity and low forces best suited to the widely varying requirements of service. The maximum cushioning capacity desired in the case of heavy shocks is made fully available, while at the same time the initial impact in such cases is relatively low. For lesser shocks, a graduated cushioning capacity is available and the destructive forces are correspondingly reduced. Moreover by coordinating the cushioning devices at the opposite ends of the car in the manner described the desired graduated cushioning capacity may be provided without duplication of parts while at the same time the cushioning springs at the opposite ends of the car may be made to serve the additional function of cushioning the train slack movement of the couplers relative to the draft and buffing column.

While only one embodiment of the invention has been described and illustrated in the drawings it is to be expressly understood that the invention is not limited to this embodiment and that various changes may be made in the form, details of construction and arrangement of the parts without departing from the spirit of the invention. Reference is therefore to be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. In a railway car, the combination with the car body and bolsters of a draft and buffing column extending substantially the length of the car body and longitudinally movable relative thereto, couplers mounted at the ends of said column for movement of limited extent relative thereto, cushioning means at each end of the car, means operative on inward movement of one of said couplers relative to said column and on further inward movement of said coupler and column together for actuating the cushioning means adjacent to said one coupler, means for actuating the other of said cushioning means after said column has moved outwardly relative thereto by a predetermined amount, additional cushioning means, and means for actuating said additional cushioning means on movement of said column in either direction, said last-named means becoming operative after said column has moved through a distance greater than said predetermined amount.

2. In a railway car, the combination with the car body and bolsters of a draft and buffing column extending substantially the length of the car body and longitudinally movable relative thereto, couplers mounted at the end of said column for movement of limited extent relative thereto, cushioning means at each end of the car, means operative on inward movement of one of said couplers relative to said column and on further inward movement of said coupler and column together for actuating the cushioning means adjacent to said one coupler, cooperating stop and follower means for actuating the other of said cushioning means and arranged for engagement after said column has moved outwardly relative thereto by a predetermined amount, additional cushioning means operative in either direction of movement of said column, and cooperating stop and follower means for actuating said additional cushioning means and arranged for engagement after said column has moved in either direction through a distance greater than said predetermined amount.

3. In a railway car, in combination with the car body and bolsters, a draft and buffing column extending substantially the length of the car body and movable longitudinally relative thereto, means at each end of the car for cushioning said relative movement, each of said means being operative during inward movement of said column relative thereto and each becoming operative on outward movement of said column relative thereto only after said column has moved through a predetermined distance, and additional cushioning means arranged to become operative after said column has moved in either direction by an amount greater than said predetermined distance.

4. In a railway car, in combination with the car body and bolsters, a draft and buffing column extending substantially the length of the car body and movable longitudinally relative thereto, means at each end of the car for cushioning said relative movement, each of said means being operative during inward movement of said column relative thereto and each becoming operative on outward movement of said column relative thereto only after said column has moved through a predetermined distance, and additional cushioning means at each end of the car and each arranged to become operative, on movement of said column inwardly relative thereto and out-

wardly at the other end of the car, after said column has moved an amount greater than said predetermined distance.

5. In a railway car, in combination with the car body and bolsters, a draft and buffing column extending substantially the length of the car body and movable longitudinally relative thereto, means at each end of the car for cushioning said relative movement, each of said means being operative during inward movement of said column relative thereto and each becoming operative on outward movement of said column relative thereto only after said column has moved through a predetermined distance, and additional cushioning means at each end of the car and each arranged to become operative, on outward movement of said column relative thereto, after said column has moved an amount greater than said predetermined distance.

6. In a railway car, in combination with the car body and bolsters, a draft and buffing column extending substantially the length of the car body and movable longitudinally relative thereto, means at each end of the car for cushioning said relative movement, said column in either direction of travel moving relative to one of said means in an inward direction and relative to the other means in an outward direction, each of said means cushioning the movement of said column in one of said relative directions from its normal position and each being arranged to cushion the movement of said column in the other of said relative directions from its normal position only after said column has moved a predetermined amount in said other direction, and additional cushioning means operative in either direction of movement of said column relative thereto after said column has moved a distance greater than said predetermined amount.

7. In a railway car, in combination with the car body bolster, a draft and buffing column movable longitudinally of the car relative to said bolster, and a plurality of cushioning means for resisting movement of said column in either direction relative to said bolster, one of said means resisting inward movement of said column and also being constructed and arranged to resist its outward movement after an initial outward travel of predetermined extent, and another of said means being constructed and arranged to resist movement of said column in either direction after an initial travel greater than said predetermined extent.

8. In a railway car, in combination with the car body bolster, a draft and buffing column movable longitudinally of the car relative to said bolster, a plurality of cushioning means for resisting said relative movement, one of said means being actuated by inward movement of said column, cooperating stop and follower means normally spaced apart a predetermined distance and adapted to engage to actuate said one means on outward movement of said column, and cooperating stop and follower means normally spaced apart a predetermined distance greater than the aforesaid predetermined distance and adapted to engage to actuate another of said cushioning means on movement of said column in either direction.

9. In a railway car, in combination with the car body bolster, a draft and buffing column movable longitudinally of the car relative to said bolster, a coupler mounted at the end of said column for movement of limited extent relative thereto, a plurality of cushioning means one disposed outwardly and another inwardly of said bolster for resisting said relative movement, said outer cushioning means being engaged at its outer end and actuated on inward movement of said coupler, means on said column adapted to engage the inner end of and actuate said outer cushioning means after said column has moved outwardly a predetermined amount, and means on said column adapted to engage the outer or inner end of said inner cushioning means after said column has moved inwardly or outwardly, respectively, by a predetermined amount greater than the aforesaid predetermined amount.

10. In a railway car, in combination with the car body bolster, a draft and buffing column movable longitudinally of the car relative to said bolster, a coupler mounted at the end of said column for movement of limited extent relative thereto, cushioning means disposed outwardly of the bolster, follower means between the outer end of said cushioning means and said coupler for actuating said cushioning means on inward movement of said coupler and column, cooperating stop means on said column and follower means for the inner end of said cushioning means, said cooperating means being normally spaced apart a predetermined amount and being adapted to engage and actuate said cushioning means on outward movement of said column, cushioning means disposed inwardly of said bolster having follower means for its inner and outer ends, and cooperating stop means on said column for the inner and outer ends of said inner cushioning means but normally spaced from their respective follower means by a predetermined amount greater than the aforesaid predetermined amount.

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