

Dec. 12, 1933.

S. SIMONSON

1,938,754

CAR CONSTRUCTION

Filed July 8, 1931

3 Sheets-Sheet 1

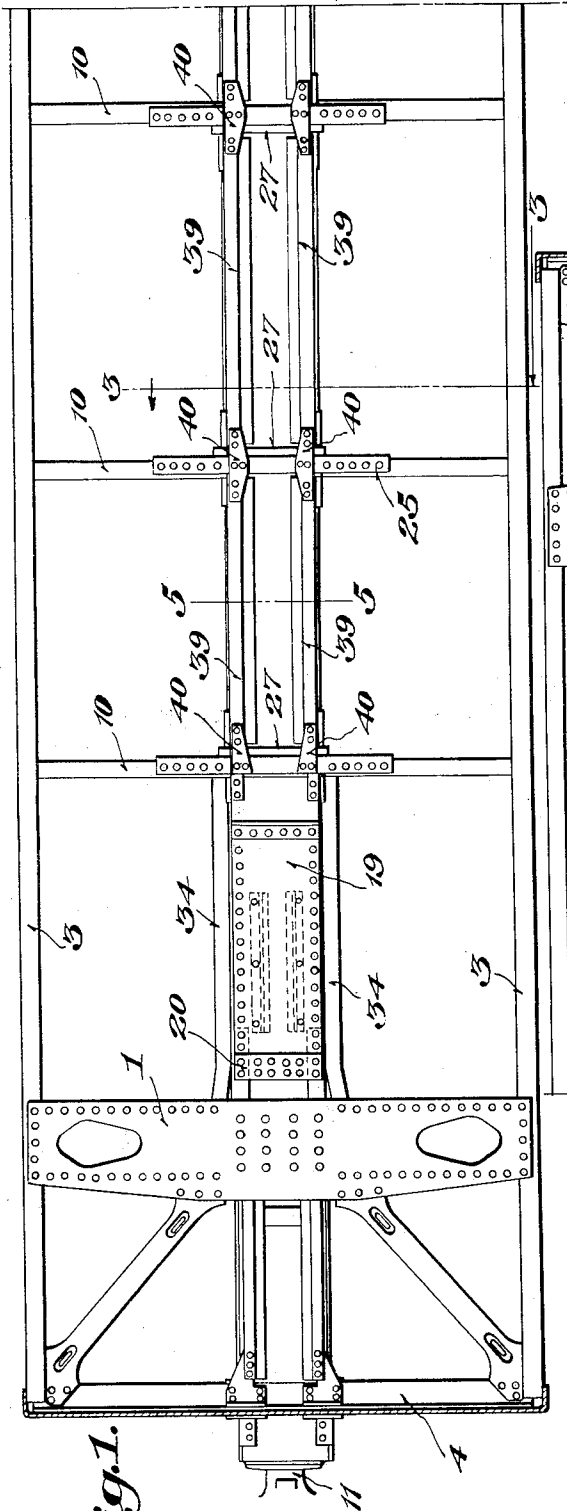


Fig. 1.

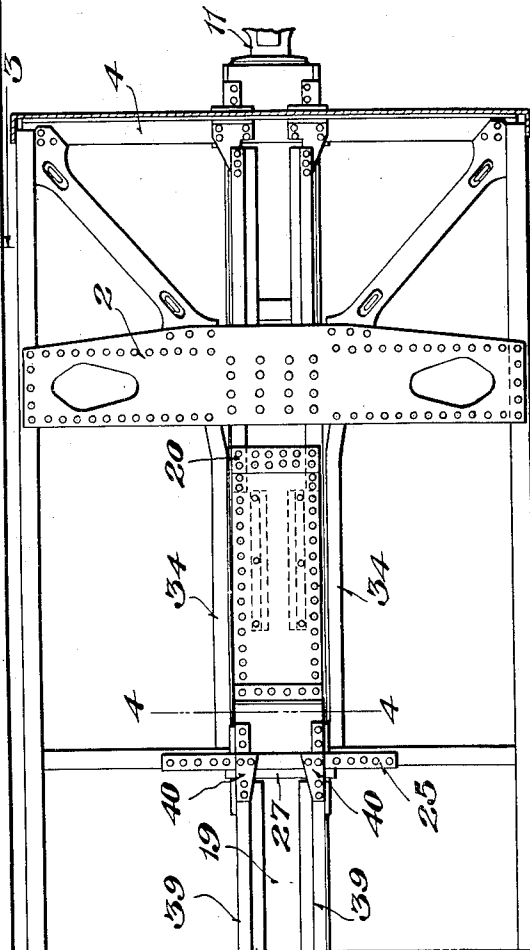


Fig. 1a.

INVENTOR

Sigvard Simonson.

BY

Cameron, Kirkham & Sutton.
ATTORNEYS.

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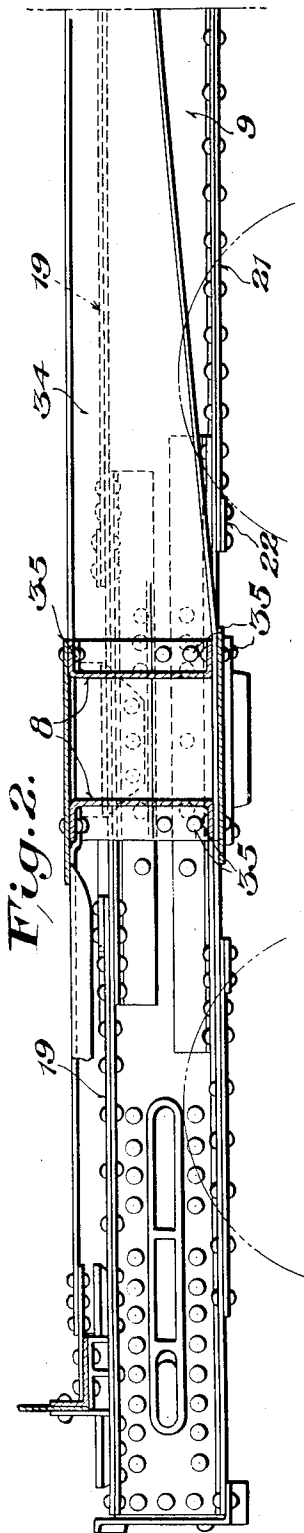


Fig. 2. a

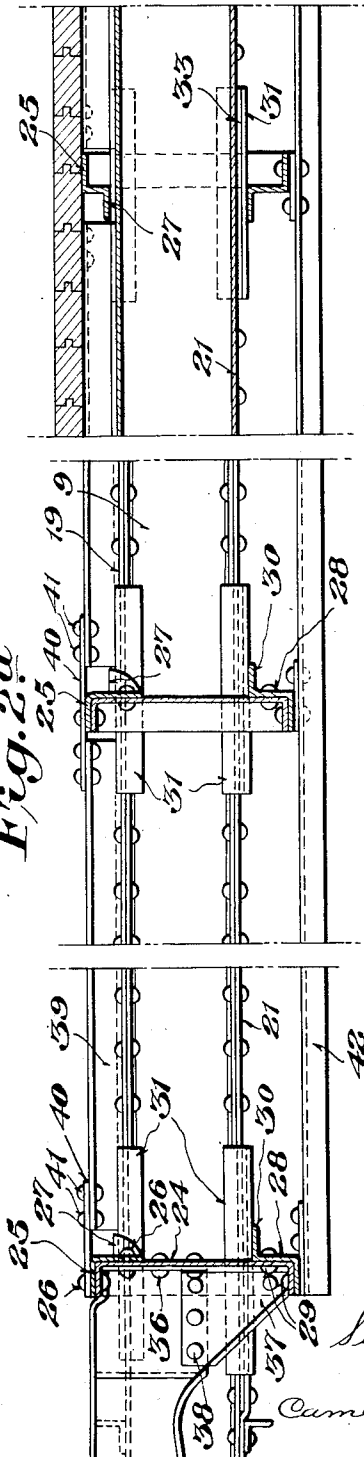
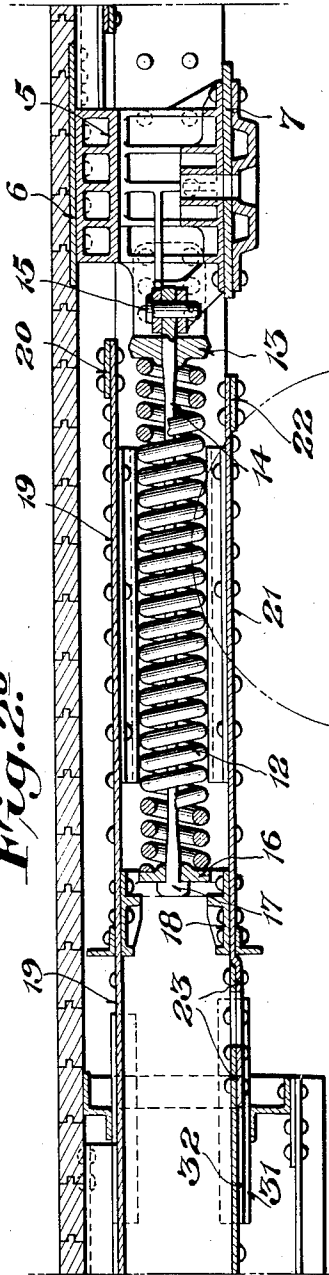


Fig. 2. b



INVENTOR
Sigvard Simonson.
BY
Cameron, Lerkam & Sutton.
ATTORNEYS

Dec. 12, 1933.

S. SIMONSON

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3 Sheets-Sheet 3

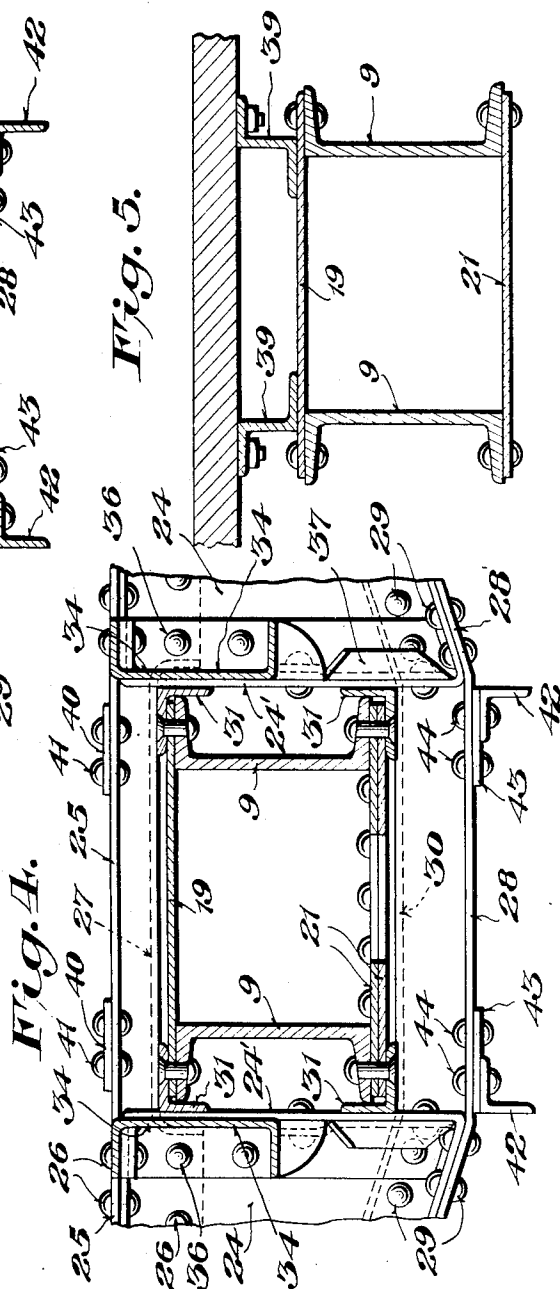
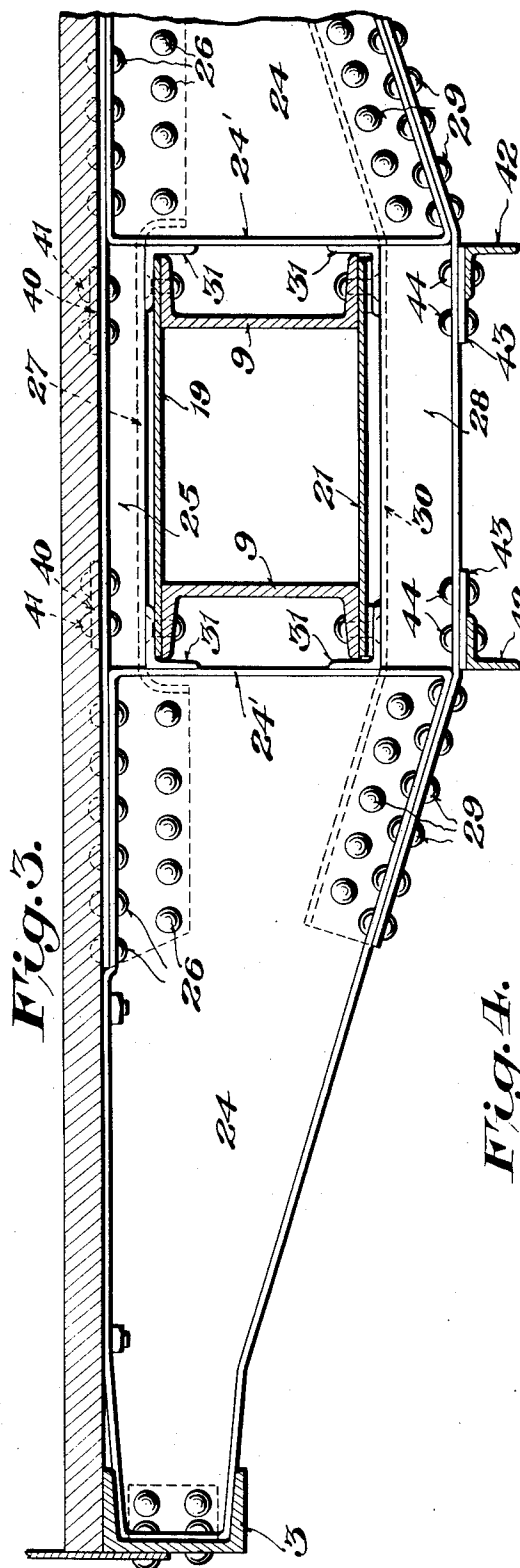
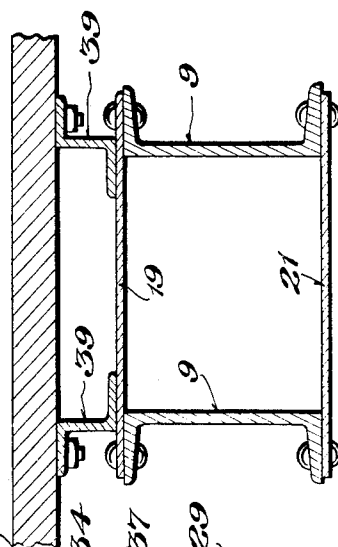


Fig. 5.



INVENTOR
Sigvard Simonson.
BY
Cameron, Kerkam & Sutton.
ATTORNEYS

UNITED STATES PATENT OFFICE

1,938,754

CAR CONSTRUCTION

Sigvard Simonson, Butler, Pa., assignor to O. C. Duryea Corporation, Wilmington, Del., a corporation of Delaware

Application July 8, 1931. Serial No. 549,473

8 Claims. (Cl. 213—8)

This invention relates to car constructions of the type embodying a continuous draft and buffing column or center member that extends substantially the length of the car structure and is mounted for longitudinal movement relative to the car structure and body bolsters.

In car constructions embodying the usual type of draft gear, energy which is transferred from one car to another as in train service or in coupling cars together is transmitted through a draft gear mounted at the end of the car structure and rigidly connected to the center sills and car body. It is desirable to increase the travel of such draft gears in order that energy absorbing capacity may be increased without excessively high forces, but at the same time there are rigid limitations on the permissible amount of train slack. With the usual draft gear, the travel of the gear limits both the train slack and the energy absorbing travel so that a compromise is necessary between the desired long travel for cushioning purposes and the desired short travel for train slack purposes.

It has been proposed heretofore, as for example in the United States patent to Otho C. Duryea, No. 1,693,194, to provide a car underframe wherein train slack and energy absorption capacity are controlled separately each to provide the most desirable operating conditions and without the necessity of compromise. The Duryea underframe embodies a member movable relative to the car structure and body bolsters and adapted for long travel, that is, for travel materially greater than can be provided in the usual draft gear because of train slack limitations, and the car body is cushioned by suitable resilient or friction means interposed between the center member and the car structure. Train slack is controlled independently of cushioning by means including couplers mounted at the ends of the center member for limited movement of any desired extent with respect thereto whereby train slack can be reduced materially below that which can be provided by the usual draft gear because the travel must be kept as high as possible to provide for energy absorption.

The movable center member of a Duryea underframe comprises a pair of spaced channel members extending substantially the length of the car structure and suitably connected together so that they are movable as a unit with respect to the car body. To this end the car bolsters and cross bearers have heretofore each been provided with a pair of spaced openings through which the channel members extend slidably and the chan-

nel members have been connected by suitable tie and cover plates spaced along the length of the channel members. It is desirable to have the center member as strong as possible in order to increase the strength and rigidity of the underframe. The stresses in the material of the center member are dependent among other factors on the area of material included in a cross-section through the center member and also on the section modulus of the particular form of cross-section, but the desirable amount of material in the center member is limited by weight and cost considerations and the cross-sectional form of the center member is governed to a certain extent by the requirement that the center member be capable of longitudinal movement through and with respect to the bolsters and cross bearers. Heretofore the cross-section of a Duryea center member has comprised a section through two spaced channel members and the material of the tie and cover plates has not materially strengthened the center member because the strength is dependent on the weakest cross-section.

One of the objects of the present invention is to provide a novel center member for a Duryea underframe wherein the distribution of material is improved and made more efficient and the center member thereby strengthened.

Another object is to provide an underframe of the Duryea type embodying a center member in which spaced channels are connected by top and bottom cover plates which are continuous and extend substantially from one bolster to the other, passing slidably through the cross bearers.

Another object is to provide a Duryea underframe embodying improved cross bearer construction wherein the cross bearers are each provided with a single centrally disposed opening for the passage of the complete center member and with novel means for guiding the center member during its longitudinal movement relative to the cross bearers.

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

In the drawings,

Figs. 1 and 1a constitute a plan view of a Duryea underframe embodying the invention; Figs. 2, 2a and 2b constitute a side elevation, partly in section, of the underframe shown in Figs. 1 and 1a;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1a; and

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 1.

Referring now to the drawings, the car underframe comprises body bolsters indicated generally in Figs. 1 and 1a at 1 and 2, and interconnected side sills 3 and end sills 4. The body bolsters may be of any suitable type but preferably comprise as shown in Figs. 2 and 2b, a center brace casting 5, top and bottom cover plates 6 and 7 respectively and laterally extending diaphragms or webs 8 which extend from the center brace to the side sills of the car body. On both sides of the center brace casting, openings are provided for the passage of channel members 9 which are connected together as hereinafter described and constitute a movable center member. The side sills 3 are likewise connected by suitable cross bearers as indicated generally at 10 in Figs. 1 and 1a, these cross bearers being provided with openings for the passage of the center member.

Draft and buffing forces are transmitted to the center member through any suitable coupler gears mounted at the ends of the center member and including couplers 11 (Figs. 1 and 1a) which are mounted for limited movement with respect to the center member to provide reduced train slack of the order of one inch or less if desired. These coupler gears may be of any suitable type and their particular form constitutes no part per se of the invention. For example, the coupler gear disclosed in the co-pending application of Otho C. Duryea, Serial No. 460,505, filed June 11, 1930, may be employed.

When a buffing blow is imparted to the center member at either end of the car body, the center member tends to move inwardly with respect to the car bolsters and when a draft force is imparted to said center member at either end of the car body, the center member tends to be pulled outwardly relative to the car bolster. This relative movement between the center member and the car bolsters is resisted and the car body is cushioned against draft and buffing forces by means of a suitable cushioning gear which may have, for example, the form shown in Fig. 2b. Referring to this figure, a coil spring or springs 12 are positioned in the center member adjacent the bolster, said spring 12 bearing at one end against a follower plate 13 which normally abuts against the center brace casting 5. A link 14, which is pinned at 15 to the center brace 5, extends through the coil spring 12 and through a follower plate 16, said link being provided with an enlarged head 17. When a draft force is applied to the center member at the end of the car shown in Fig. 2b, the center member moves from left to right as seen in Fig. 2b and suitable stops 18 that are secured to the center member in any suitable manner engage the follower plate 16 and compress the spring 12 against the center brace casting 5. When a buffing force is applied to the center member at this end of the car, the center member moves from right to left as seen in Fig. 2b and suitable stops (not shown) on the center member engage the follower plate 13 and compress the spring 12 against the follower plate 16 which is now held stationary by virtue of the link 14. Thus movement of the center member in either direction relative to the car body and bolsters is cushioned by the resilient cushioning

gear. It will be understood that the same or a similar cushioning gear is employed at the opposite end of the car structure and that the particular form of these cushioning gears constitutes no part per se of the present invention.

Referring now to Figs. 2, 2a and 2b, the channels 9 are connected together by means of a top cover plate 19 which is preferably continuous and extends substantially the entire distance between the car bolsters, the ends of this cover plate being preferably spaced from the adjacent center braces 5 by a predetermined amount as shown in Fig. 2b and being preferably reinforced by means of tie plates 20. The predetermined distance between the ends of the cover plate and the center braces defines the maximum amount of movement of the center member relative to the car body and bolsters, which may be of the order of seven inches or more in either direction to provide long cushioning travel. In a similar way the channels 9 are connected by a bottom cover plate 21 which extends substantially the entire distance between the car bolsters, the ends of said bottom cover plate being spaced from the adjacent center braces 5 by the aforesaid predetermined distance and being preferably reinforced by tie plates 22. The top and bottom cover plates 19 and 21 may be made in one piece or may comprise a plurality of inter-connected sections, said cover plates and channels constituting a box-like center member which has the same cross-sectional form throughout its length between the car bolsters. In the drawings, the top cover plate 19 comprises a single sheet of material, whereas the bottom cover plate 21 comprises a plurality of inter-connected sections which are overlapped and connected together by suitable rivets as shown at 23 in Fig. 2b. This permits of removing one section of the bottom cover plate in order to provide access to the cushioning units. It will be understood, however, that the sections may be welded together instead of riveted.

A cross-section through the center member is shown in Fig. 5. Owing to the use of the continuous top and bottom cover plates, the section modulus is increased and at the same time the area of effective material in the cross-section is increased without adding greatly to the weight of the center member, so that stresses in the material are reduced.

Novel cross bearer construction is required in order to permit the passage therethrough of a center member having a cross-sectional form shown in Fig. 5, and one form of cross bearer construction is shown in Figs. 3 and 4, these figures illustrating separate cross bearers of the underframe which are, however, the same in all essential respects. Referring to Fig. 4, which illustrates the cross bearers at opposite ends of the car structure which are immediately adjacent the body bolsters, each of these cross bearers comprises a pair of flanged plates or webs 24 which extend from the side sills of the car to opposite sides of the center member as shown in Figs. 1 and 1a, said plates terminating in spaced vertical flanges 24'. The plates 24 are connected together at the center of the car by means of a top tie bar 25 which as shown is an angle having both of its faces riveted to the plates 24 by means of rivets 26. Intermediate the plates 24, the vertical flange of the angle 25 is bent into the horizontal plane as shown at 27 in Figs. 2a and 4, the horizontal flange 27 defining the top of the opening in the cross

bearer through which the center member extends. Plates 24 are also connected together by means of a bottom tie bar 28 which as shown is a Z-bar having its vertical and lower horizontal faces riveted to the plates 24 by means of rivets 29. The upper horizontal flange 30 of Z-bar 28 defines the bottom edge of the opening in the cross bearer through which the center member extends, and the sides of this opening are defined by the inner vertical flanges of the plates 24. Substantially the same construction is embodied in the cross bearers at the central portion of the car structure, as clearly shown in Fig. 3, and the same reference characters are employed to designate the corresponding parts.

Suitable means are provided for guiding the center member and for taking the wear at the corners of the center member as it moves through the openings in the cross bearers. As shown in Figs. 3 and 4, angles 31 are provided in each corner of the openings in the cross bearers, these angles being secured to the center member in any suitable manner as by rivets which are countersunk on the faces of the angles which slidably engage the cross bearers. As shown in Fig. 2b, the lower angles 31 are secured to the overlapped portion of the plates 21, one section of the cover plate terminating between the ends of the angles so that spacers or fillers 32 are preferably employed at the end of this section. As shown in 2a, spacers or fillers 33 may be employed at the lower angles 31 at the intermediate cross bearers.

Preferably longitudinal strengthening members or torque arms 34 extend on each side of the center member from each bolster to the next adjacent cross bearer, these members strengthening the underframe and serving as additional supports for the car floor. Preferably the outer ends of the members 34 comprise parts of the bolster construction, the vertical inner faces of the webs of these members constituting the outer sides of the bolster openings through which the channels 9 pass while the laterally extending plates 8 and the top and bottom cover plates 6 and 7 are suitably connected to these members as by rivets 35. The inner ends of members 34 are suitably secured to the plates 24 as by means of the rivets 26 above referred to and by additional rivets 36. Preferably the connection of members 34 to the plates 24 is strengthened by the provision of gusset plates 37 which are secured to the members 34 and to the plates 24 in any suitable way as by rivets 38.

Preferably the several cross bearers are also connected together by longitudinally extending members. In the form shown, Z-bars 39 extend between each two cross bearers, said Z-bars being connected at their ends to the cross bearers by means of plates 40 and rivets 41. As shown in Fig. 5, these Z-bars serve to support the flooring of the car and also to guide the center member by virtue of their engagement with the top cover plate 19. The several cross bearers may likewise be connected by additional longitudinally extending angles 42 which as shown are secured to the bottom tie bars 28 by suitable means such as plates 43 and rivets 44. While the Z-bars 39 preferably extend only between adjacent cross bearers, the angles 42 may extend continuously between the two end cross bearers.

By virtue of the cross-sectional form of the center member, including the top and bottom cover plates extending continuously between the bolsters, the distribution of material is more

efficient and the strength of the center member is materially greater than in prior Duryea underframes because the section modulus for the cross-sectional form of the center member is increased and because the area of material in the cross section is likewise increased, resulting in a decrease in stress in the material. The use of a center member of this improved type has been made possible by new and improved cross bearer construction in which the cross bearers have been built up of a plurality of separate elements rigidly tied together in such a way as to constitute a strong rigid transverse member of the car underframe while at the same time providing the large opening required for the center member and efficiently guiding the same during its movement relative to the car body.

It will be understood that the invention is not limited to the form described and illustrated in the drawings and that 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 car body of the type embodying cross bearers and bolsters and a center member extending substantially the length of the car structure and mounted for movement relative thereto, the combination with said bolsters and cross bearers of a center member comprising a pair of spaced channels and continuous top and bottom cover plates connecting said channels intermediate said bolsters and forming a closed hollow column, said bottom cover plate comprising a plurality of overlapping interconnected sections, said center member extending slidably through said cross bearers and the ends of said cover plate being adapted to engage the bolsters to limit positively the extent of movement of the center member, the length of said cover plates being less than the distance between said bolsters by a predetermined amount.

2. In a car structure of the type embodying a center member extending substantially the length of the car structure and mounted for movement relative to the car body cross bearer structure having an opening therein, a center member extending slidably through said opening and comprising a pair of spaced channels and top and bottom cover plates connecting said channels and extending on either side of said cross bearer structure, said channels and cover plates forming a closed hollow column and guide and wear members secured to the edges of said center member adjacent each cross bearer and having sliding engagement with said cross bearer structure.

3. In a car body of the type having cross bearers each provided with an opening for the passage of a movable draft and buffing column, a built-up cross bearer structure comprising a pair of vertical transverse plates the inner ends of which are spaced apart and provided with vertical flanges, a tie bar connecting the upper portions of said plates and having a horizontal flange, and a tie bar connecting the lower portions of said plates and having a horizontal flange, said vertical and horizontal flanges defining said opening for the passage of the center member and guiding and supporting the same during its movement.

4. In a car structure, a cross bearer comprising a pair of transverse plates the inner ends of which are spaced apart and provided with vertical flanges, a tie bar connecting the upper portions

of said plates and having a horizontal flange, a tie bar connecting the lower portions of said plates and having a horizontal flange, a draft and buffing column mounted for movement relative to the car structure and having a substantially rectangular cross section, said column extending movably through the opening in the cross bearer defined by said vertical and horizontal flanges, said flanges guiding and supporting said column during its movement, and angles secured to the edges of said center member adjacent said cross bearer and having sliding engagement with said flanges.

5. In a car structure of the type embodying a continuous draft and buffing column extending substantially the length of the car structure and mounted for movement relative thereto, a pair of body bolsters, a built-up cross bearer structure intermediate said bolsters comprising a pair of transverse members having their inner ends spaced apart, a tie bar connecting the upper portions of said members, and a tie bar connecting the lower portions of said members, the inner ends of said members and said tie bars defining a single substantially rectangular closed opening in said cross bearer structures and a draft and buffing column having a substantially rectangular cross section and extending movably through said opening, said column comprising a pair of spaced parallel vertical members and a pair of spaced parallel horizontal members inter-connected to form a closed hollow column extending substantially continuously between the body bolsters, said horizontal members terminating at predetermined distances from said bolsters and being adapted to engage the latter to positively limit the extent of movement of said column through said opening and relative to the car body.

6. In a car structure of the type embodying a continuous draft and buffing column extending substantially the length of the car structure and mounted for movement relative thereto, a pair of body bolsters, a plurality of cross bearers intermediate said bolsters each having a single closed substantially rectangular opening therein, a draft and buffing column of substantially rectangular cross section extending slidably through said

openings, said column comprising a pair of spaced parallel vertical members and a pair of spaced parallel horizontal members interconnected to form a closed hollow column, and longitudinally extending members connecting said cross bearers and so constructed and arranged as to guide said column in its sliding movement.

7. In a car structure of the type embodying a continuous draft and buffing column extending substantially the length of the car structure and mounted for movement relative thereto, a pair of body bolsters, a plurality of cross bearers intermediate said bolsters each having a single closed substantially rectangular opening therein, a draft and buffing column of substantially rectangular cross section extending slidably through said openings, said column comprising a pair of spaced parallel vertical members and a pair of spaced parallel horizontal members interconnected to form a closed hollow column, and longitudinally extending members connecting said cross bearers and having horizontal flanges in contact with one of the horizontal members of said column for guiding the latter in its sliding movement.

8. In a car structure of the type embodying a continuous draft and buffing column extending substantially the length of the car structure and mounted for movement relative thereto, a pair of body bolsters, a plurality of cross bearers intermediate said bolsters each having a single closed substantially rectangular opening therein, a draft and buffing column of substantially rectangular cross section extending slidably through said openings, said column comprising a pair of spaced parallel vertical members and a pair of spaced parallel horizontal members interconnected to form a closed hollow column, and longitudinally extending members connecting said cross bearers and each having an upper and a lower horizontal flange, said lower flanges being in contact with the upper horizontal member of said column for guiding the latter in its sliding movement, and said upper flanges serving to support the flooring of the car structure.

SIGVARD SIMONSON. 120

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