Main Line Steel Passenger Cars for the Erie

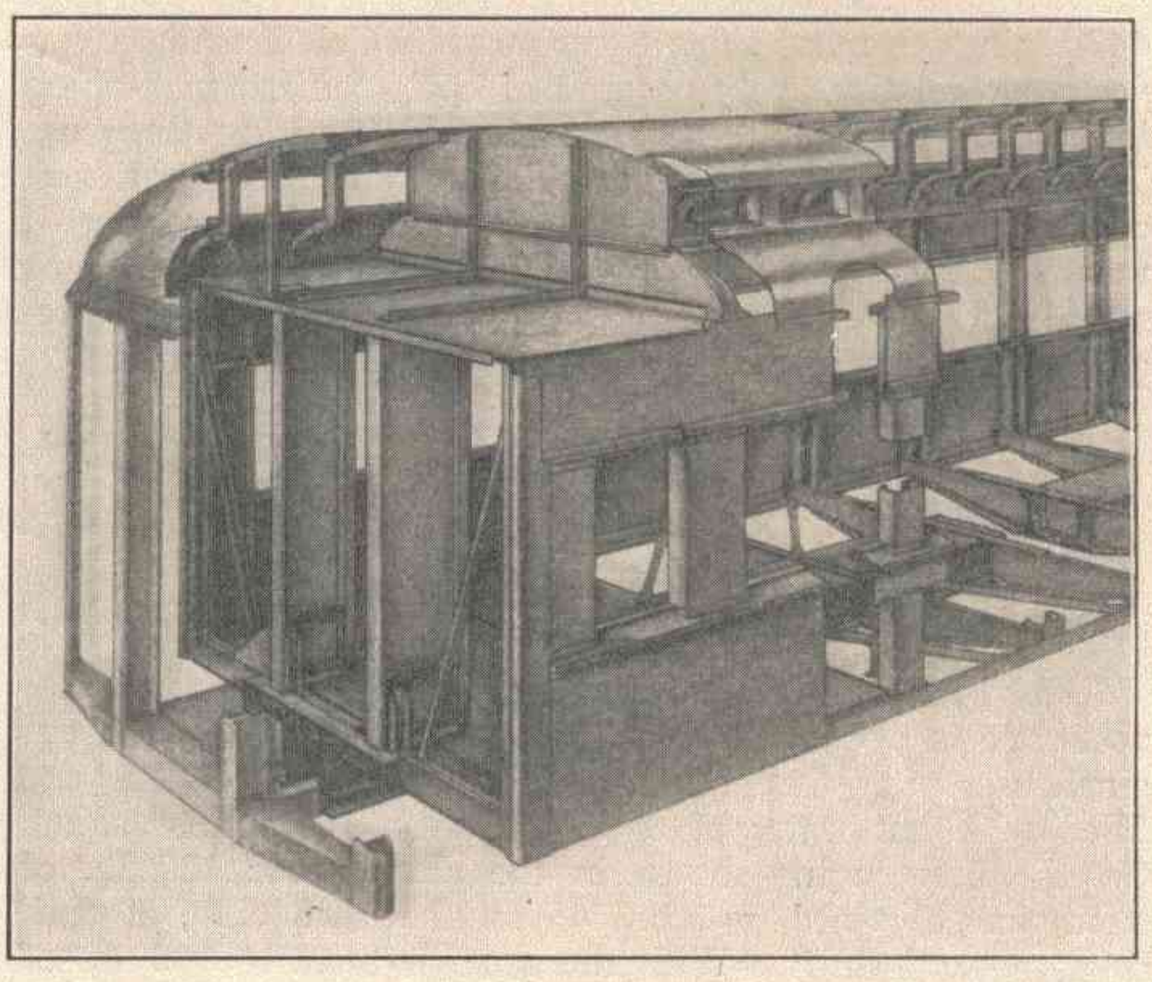
Design Marked for Its Light Weight and Strength; A Noteworthy Anti-Collision Bulkhead Construction

THE Erie Railroad has recently placed in service five all-steel coaches and one all-steel baggage car for through line service, which weigh materially less than the existing equipment with steel underframes and wood superstructures now used by that road in similar service. These cars were built by the Pressed Steel Car Company from designs prepared by L. B. Stillwell, consulting engineers of New York City, and are especially noteworthy because of the distribution of metal in the superstructure, which provides an unusually stiff construction throughout. The unusually light weight of the cars was made possible by following the same system of high truss side frame design, differing only in detail, that was used in the all-steel suburban cars built for the Erie about two years ago and described in the *Railway Age Gazette* for June 11, 1915, page 1243.

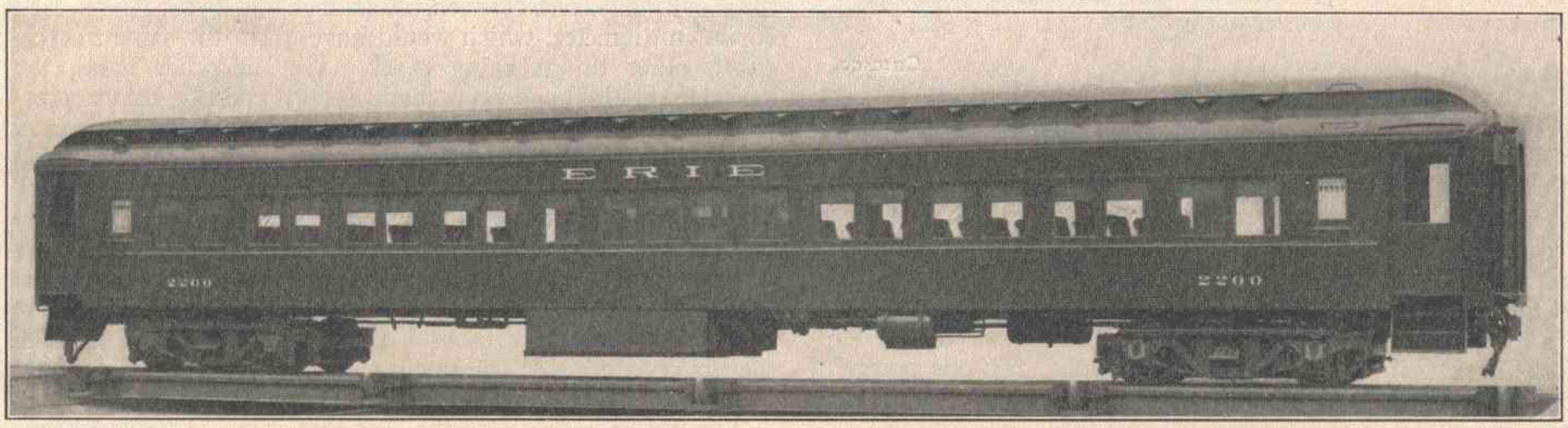
This saving of weight is of importance not only in effecting a reduction in the first cost through the elimination of unnecessary steel, but also because of the possibility of changing from wood cars to all-steel cars in main line service, without taxing the capacity of existing passenger motive power. In many cases the advent of all-steel equipment has necessitated an increase in the size of locomotives used in through passenger service. A third, and no less important economy, will result from the reduction in the amount of fuel used per car-mile because of the smaller net weight of the equipment.

Aside from the economic advantages accruing from the light weight, the design of the new cars is of interest because of the unusual strength of the car body which is designed especially with reference to its ability to resist destruction in collision or derailment. This is accomplished by the introduction of two new members in the body end: An anti-telescoping tie member of heavy plate, extending across the car from side wall to side wall for about 5 ft. 6 in. lengthwise of the car, forming a flat ceiling for the lavatory, passageway and saloons; and special door posts in the body end frame formed of vertical 21-in. pressed steel beams. These beams are framed into the center sills and to the anti-telescoping plate above with connections capable of developing the full strength of the beams.

The arrangement of the body door posts and the anti-telescoping tie member is clearly shown in the perspective drawing of the end construction of the car. It is evident that the heavy doorposts, together with the anti-telescoping plates which tie the side walls together at the roof line, and their rigid attachment to the underframe provide an anti-telescoping bulkhead of great strength. The vestibules are of the usual construction and obviously are less capable of resisting a severe shock than is the heavy body end construction. Consequently, if the car is subjected to a violent collision shock, the vestibule structure may be expected to close up against the body of the car and in doing so somewhat cushion the force of the blow. The further progress of the colliding body will be greatly checked, if not arrested by the heavy body end construction. This construction should greatly reduce, if not eliminate that most common and most destructive form of collision—the splitting open and telescoping of one car by one of its neighbors or by a locomotive.



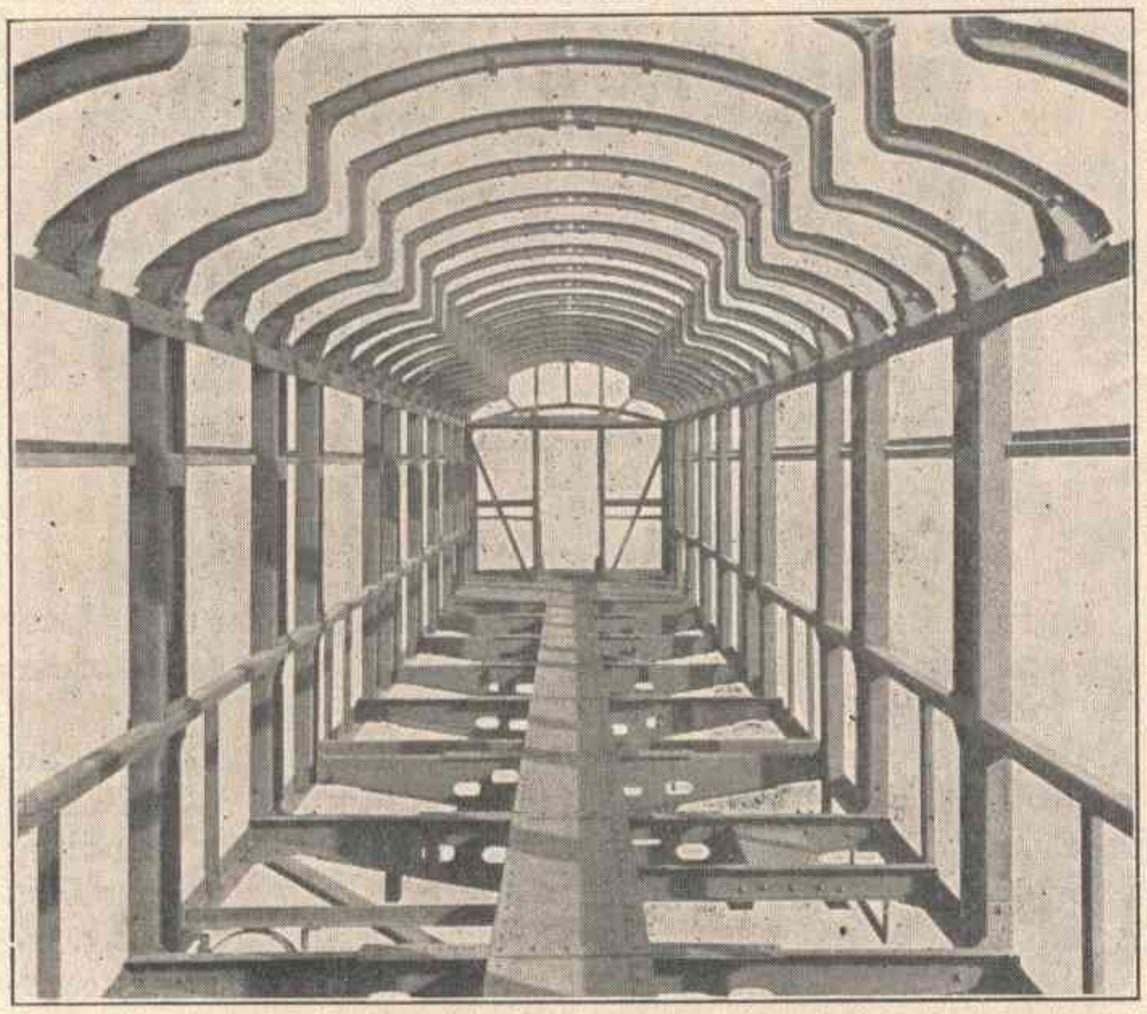
A Perspective View of the Anti-Collision Bulkhead Construction



Steel Coach for Through Line Service—Erie Railroad

This design is the result of a careful study of the effects of collisions and derailments upon cars, particularly those of all-steel construction, which has covered a period of six years. This study has been based upon personal inspection and examination of the photographic records of many accidents involving passenger equipment. As a result it is the conclusion of the designers that the heavy underframes so

generally used in steel passenger train equipment not only afford little protection against damage to cars in derailment or collision, but in themselves not infrequently increase the destruction of life and property because of the effect of their excessive weight. In case of collision the underframe of at least one car in a train is usually raised at one end above



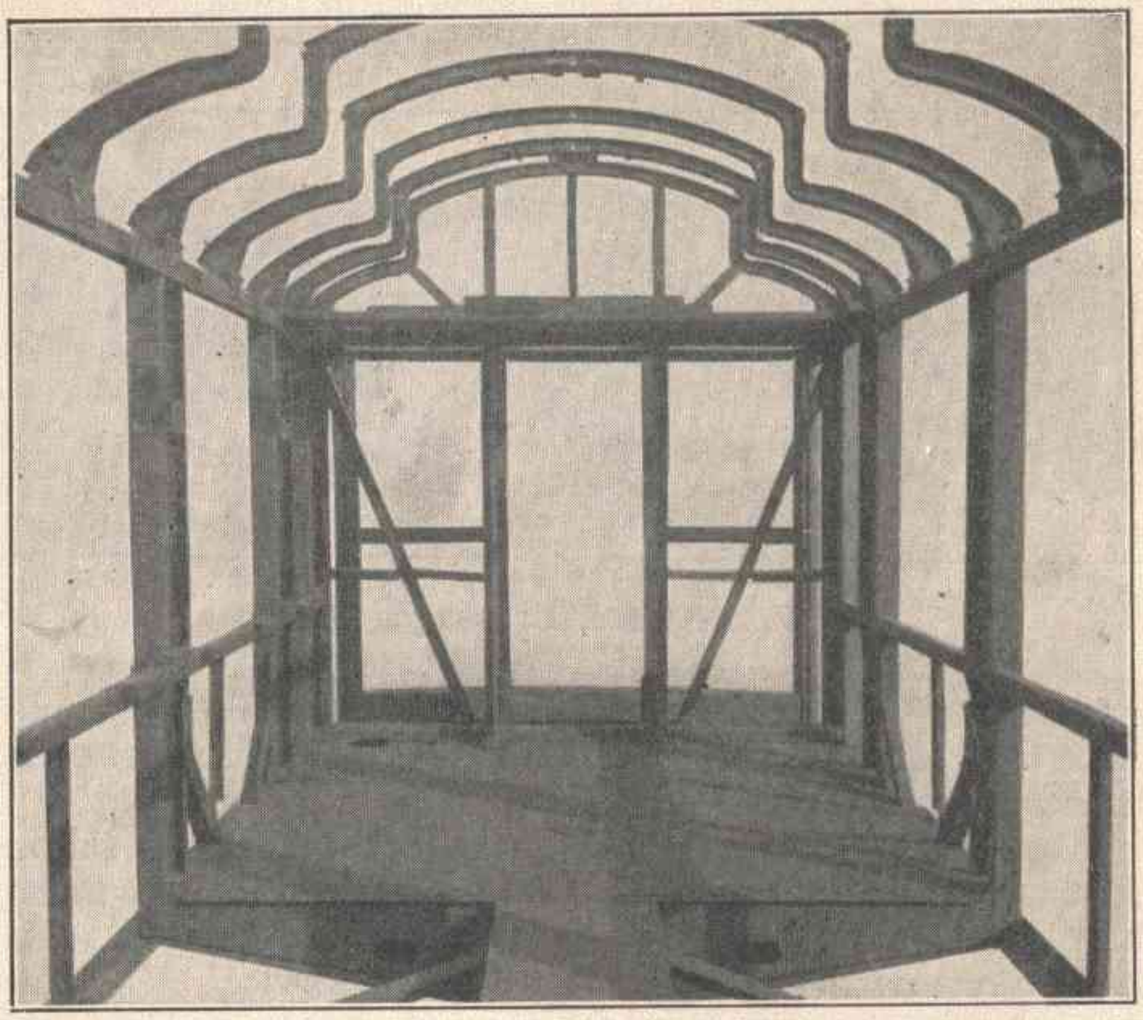
Interior View Showing the Details of the Frame Construction

that of the adjoining car. When this occurs, the greater the weight and strength of the underframe as compared with that of the superstructure of the neighboring car, the more effective it becomes in destroying that superstructure.

The additional weight of material incorporated in the heavy body end structure is more than offset by the reduction in weight effected elsewhere in the design. The complete weight of the coaches, including the four-wheel trucks, but excluding the lighting equipment, is 111,000 lb. each. The weight of the car body is such that it may be carried on four-wheel trucks with journal loads well within the limits prescribed by good operating practice.

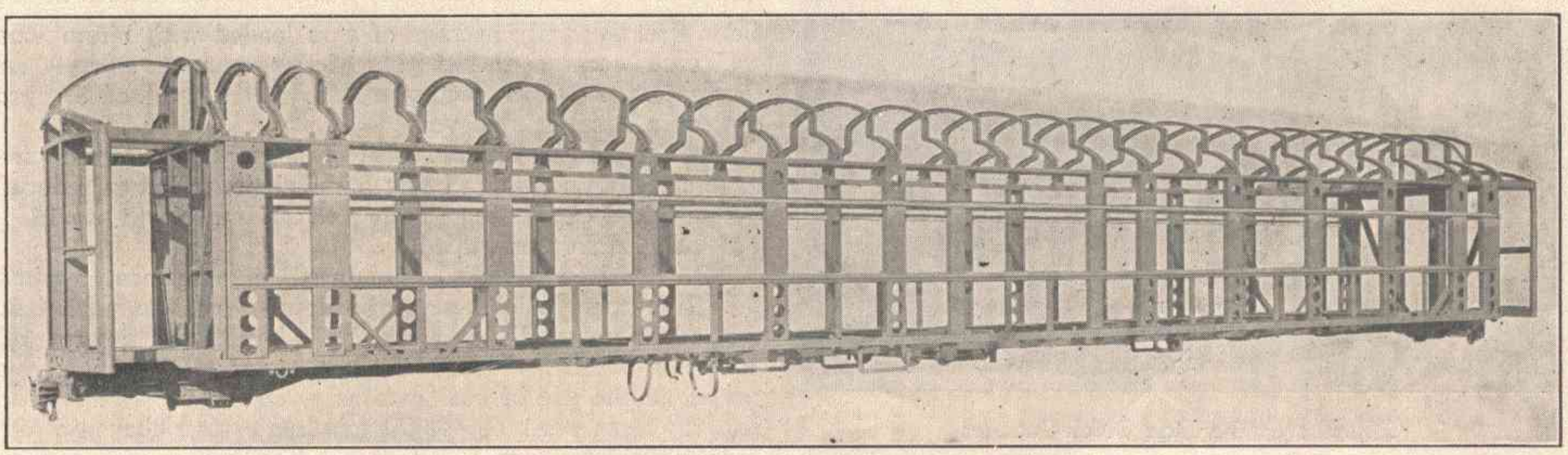
The framing system of the through line cars is similar to that employed in the Erie suburban cars with the exception that the windows are rectangular, whereas those of the suburban cars were of the Gothic form. In each case the vertical members are framed together into a girder, the depth of which is equal to the full height of the side walls, and which acts as a load carrying member. This not only produces a car structure free from appreciable deflection, but greatly increases the safety of the passenger space in case of accident.

The bottom member of the side frame girder is the angle side sill of 4-in. by 3½-in. by ⅜-in. section. The main piers are approximately 5 ft. 11 in. between centers and are C-shaped pressings 12 in. wide by 4⅞ in. deep. The upper member of this high girder is a pressed channel of 5¼-in. by 3/16-in. section. The bracing of the piers is accomplished by the side sheathing and the belt rail below the windows, and by the letterboard and upper belt rail above the windows. The load carrying girder is thus 7 ft. 7 in. in height by 70 ft. long as compared with the usual construction having a girder about 3 ft. ½ in. in height and 70 ft. long, below the window sills.



A View of the Framing at the End of the Car, Also Showing the Body Bolster and Underframe Stiffening Plate

The center sills are composed of 12-in., 25-lb. channels provided with a top cover plate and bottom flange angles, and having a total sectional area of 27.915 sq. in. They are supported and alined by the side frame girders through the body end sills, bolsters and crossbearers placed at every main pier, approximately 5 ft. 11 in. between centers. This in effect, produces a compression member stiffened by flanges over 7 ft. in depth and eliminates all possibility of deflection of the center sills in a vertical plane. As a means of bracing the center sills against horizontal deflection, 12 diagonal braces are incorporated in the underframe, each extending from the center sill to a main pier at one of the crossbearers. These diagonal braces, with the side sills and cross-



Side Elevation of the Steel Frame of the Erie Coaches

bearers, form a horizontal truss for alining the center sills which is 9 ft. 9½ in. wide.

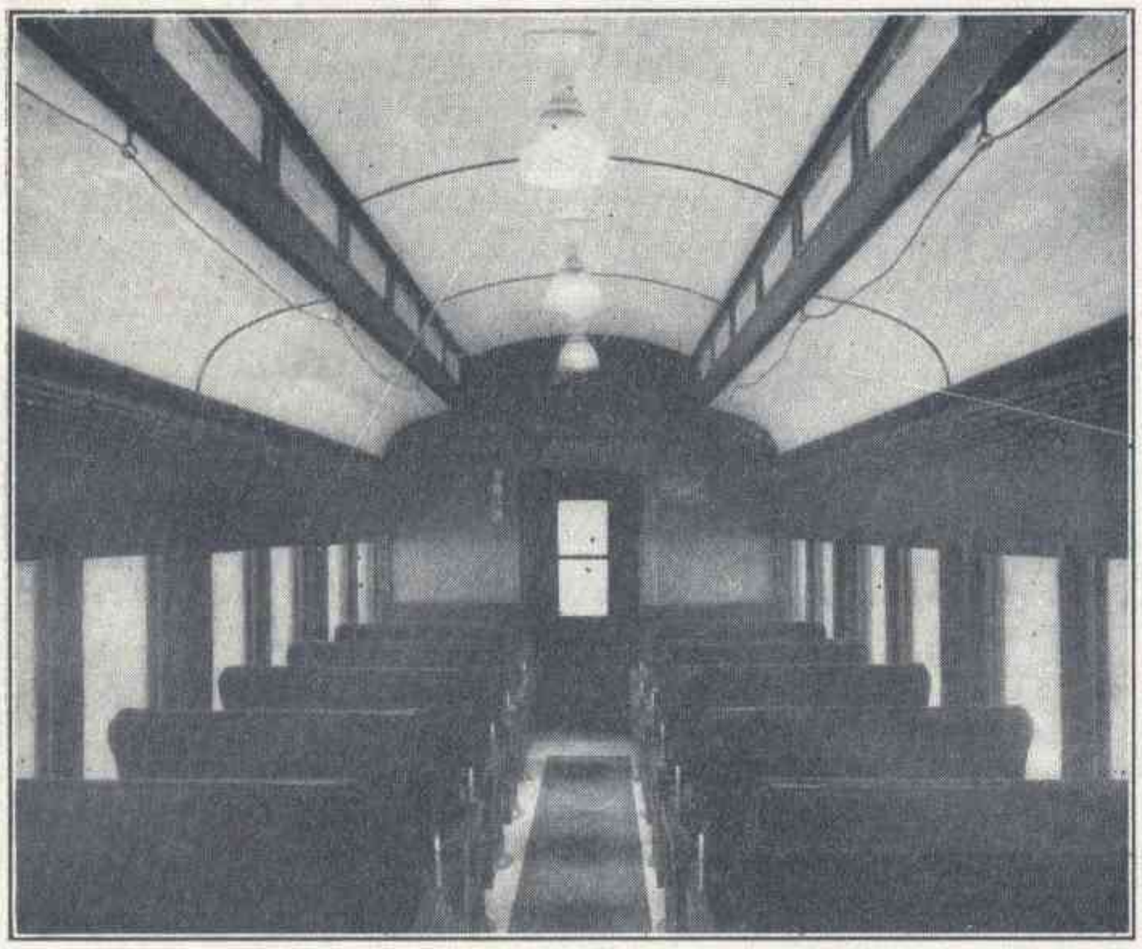
The underframe is provided with a double body bolster the upper member of which consists of a plate ¼ in. thick. As shown in one of the photographs, in front of this cover plate is a floor plate extending to the outer end of the body end sill. This plate securely ties together the side sills, end sills and center sills, and together with the diagonal braces prevents any possible horizontal deflection of the underframe.

The framing of the roof is shown in the two views of the interior of the car frame and is designed to co-ordinate with the upper portion of the side walls in combination with the

Erie Four-Wheel Passenger Truck

anti-telescoping tie plate to resist compression stresses and also to protect the passenger space in case the car is overturned through derailment.

The general features of the design of the truck are shown in one of the illustrations. It is similar to that used under the Erie all-steel suburban cars previously referred to, this design having proved very successful in service. The riding qualities are considered fully equal to those of the usual type of six-wheel truck. The trucks are equipped with the American Brake Company's clasp brake which not only contributes greatly to the comfort of the passengers when brake



Interior of the Erie Steel Coaches

applications are being made, but adds materially to the safety and economy of operation.

The seating arrangement of the new cars conforms to that of other cars now in Erie through line service, a smoking compartment seating 12 passengers being placed in the middle of the car. The walls of this compartment are fitted with leaded glass windows and the seats are upholstered in leather. The seats in the rest of the car are upholstered in plush. Each end of the car is fitted with a saloon and lavatory. The seating capacity of the cars is 76, including the 12 seats in the smoking compartment.

The illumination of each car is obtained from ten incandescent lamps set on the center line of the ceiling. The power for lighting is furnished by a straight storage battery installation, consisting of an 800-ampere hour Wilson battery with lead lined cells. The capacity of this equipment is sufficient to furnish light for the round trip between Jersey City and Chicago without recharging.

The general dimensions of the cars are given in the following table:

Length over vestibule end sills	78 ft.
Length over vestibule body end sills	70 ft.
Wheel base of trucks	8 ft.
Height of car over-all	14 ft. 3 in.
Height of car over sheathing	9 ft. 9¾ in.
Weight of car body	80,660 lb.
Weight of two trucks, complete	30,240 lb.
Weight of car without storage batteries	110,900 lb.
Storage batteries, boxes and hangers	8,700 lb.

THE RAILROADS' WAR BOARD

Fairfax Harrison, president of the Southern Railway System and chairman of the Railroads' War Board, authorizes the following:

"In response to the patriotic demands made upon the railroads of the United States by the Railroads' War Board. they have so increased their efforts that they are handling a far heavier tonnage today than ever in their history. This is indicated in reports which the War Board is receiving.

"Increasingly satisfactory reports regarding the grain transportation situation, together with official government figures just at hand on the amount of bituminous coal hauled from the mines by the railroads in the month of May, lead to the belief that through the co-operation of railroads and shippers, real progress is being made in the campaign inaugurated by the Railroads' War Board two months ago, with a view to securing the maximum of national transportation efficiency.

"According to the government figures now compiled, the 82 principal bituminous coal carrying railroads in May, 1917, hauled 142,157 more carloads of coal—approximately 7,100,000 tons—than they did in May, 1916. This was an increase of 23.8 per cent. The railroads hauled 739,674 carloads of bituminous coal in May of this year, compared with 597,517 cars in May, 1916.

"That real headway is being made in the effort to save the time of freight cars by quick and prompt loading and unloading is brought out in the government figures which show that the daily average of cars loaded with bituminous coal each working day in May of this year was 28,449, an increase of 23.8 per cent over May, 1916, and of 8.1 per cent over April of this year.

"In the month of May, while this greatly increased tonnage of bituminous was being handled the railroads reduced the so-called car shortage from 148,627 on May 1, to 105,-127 cars, almost one third."

Mr. Harrison has also announced an agreement reached by all shippers of tide-water bituminous coal to pool their coal at the ports of New York, Philadelphia, Baltimore, and Hampton Roads, which will, it is estimated, effect such a saving in the use of coal cars as to enable the railroads to haul to these ports 6,640,000 tons more than they did last year when they hauled 31,000,000 tons. This arrangement was brought about through the co-operative efforts of the Committee on Coal Production of the Advisory Commission, Council of National Defense, and the Railroads' War Board.

Under the new plan, instead of shippers sending 1,156 kinds of coal to the Atlantic seaboard, they will reduce the number to 41; when coal of a certain grade is wanted for a steamer, the coal of that kind of any and all shippers will be used to fill the order. Coal men have sacrificed long