All Steel Pullman Cars

THE PULLMAN COMPANY HAS PERFECTED A DESIGN FOR ALL STEEL SLEEPING, PARLOR, CLUB AND PRIVATE CARS, WHICH PERMITS THE USE OF A STANDARD UNDERFRAME COMPLETE AND MANY OTHER STANDARD PARTS FOR ALL CLASSES OF CARS. THE FOLLOWING DESCRIPTION APPLIES PRINCIPALLY TO THE SLEEPING CARS.

The Pullman Company now has in service on the Pennsylvania over 300 all-steel cars, representing about half the steel equipment required for operation on this system in connection with the New York terminal project. The cars are being placed in service as fast as they can be built and cover three varieties of sleeping cars, parlor cars, observation cars, club cars and private cars.

These cars are radically different from the first steel sleeper built and named for the Jamestown Exposition,* where it was exhibited. This car is remarkable for the almost imperceptible effects the subsequent continuous service has left upon it. However, its construction was so heavy as to cause doubts in the minds of railway motive power and operating officials as to its practicability. Realizing this, the Pullman Company endeavored to secure a lighter construction without any sacrifice in structural strength and built five club cars very similar to the present standard designs.

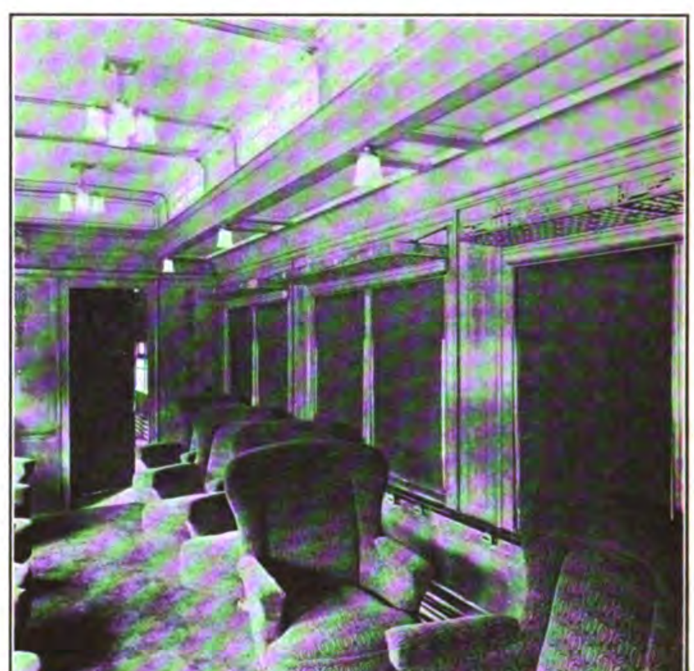
The cars now running and under construction as per the designs here reproduced probably exemplify the highest development of the steel car building art. In general characteristics, appearance and over-all dimensions all classes of these cars are identical. The outside elevation is square with pressed prism plate combination gothics and deck lights, continuous sash rest, round-top high windows of pressed prism plate glass, interlocking steel sheathing of 1½ in. face below the letter board, Pullman standard roof, hood and vestibule. The outside is painted Pennsylvania standard colors and striping so as to secure a uniform train appearance.

AN ALL STEEL PULLMAN SLEEPING CAR.

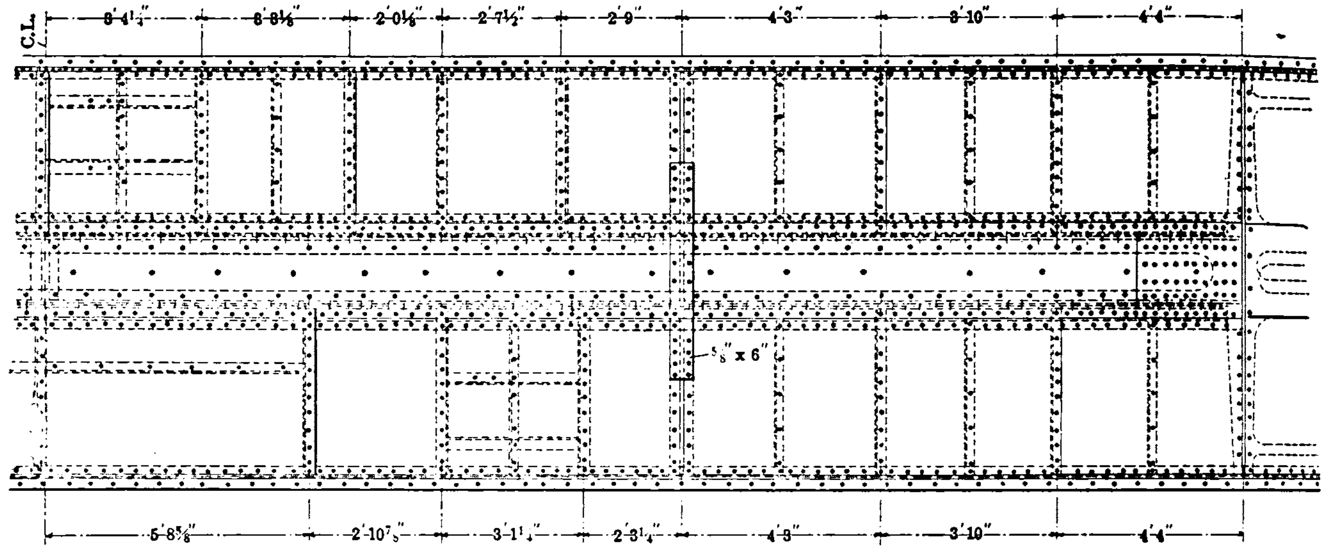
The body of these cars weighs on the average 100,000 pounds and the two trucks 43,500 pounds. This is a very creditable result, the total service weight being but from 12 to 15 per cent.

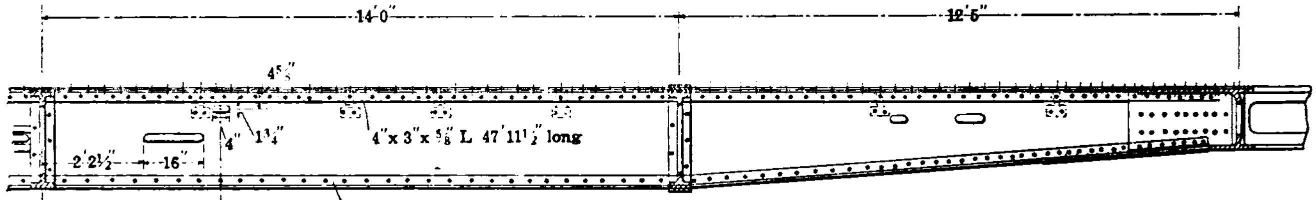
* See AMERICAN ENGINEER, April, 1907, p. 130.

INTERIOR VIEW OF SLEEPING CAR. THE CEILING IS FLAT.

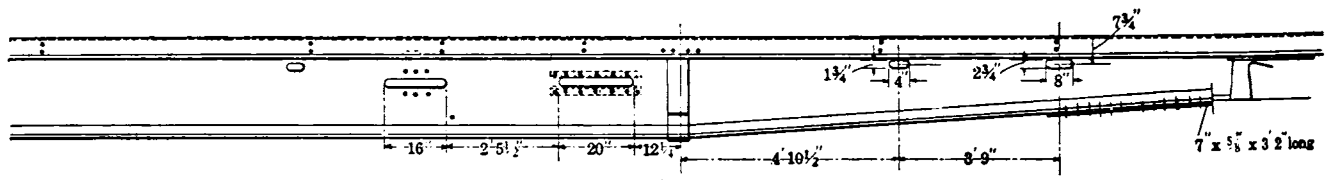


INTERIOR VIEW OF PARLOR CAR. A BEAMED CEILING IS USED.





Section at Center

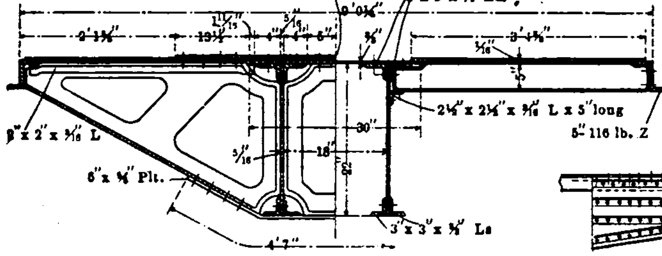


Side Elevation

greater than the standard wooden sleeping cars.

Framing.

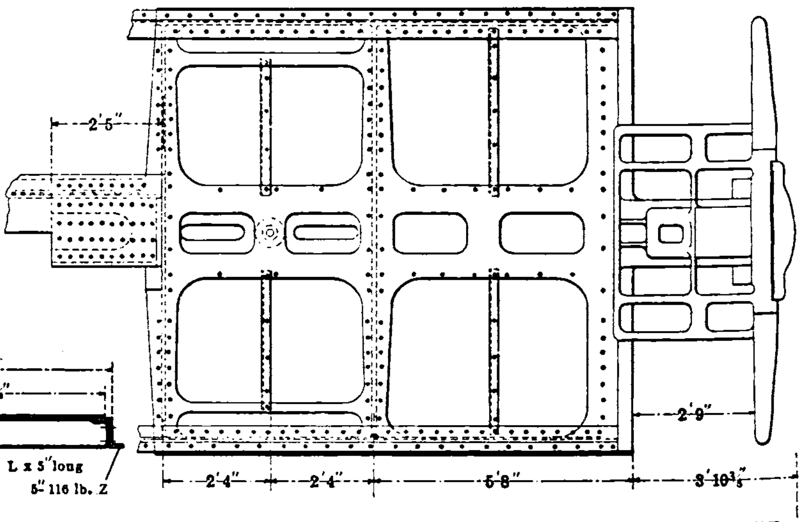
The car is framed to meet M. C. B. recommendations for steel passenger equipment, the same as the Pennsylvania all-steel equipment* with which these cars are to run. The center sills are designed to carry all of the load and resist the service end-shocks. The weight of superstructure and loading is transferred to the center girder at the ends, by the large combined platform and bolster casting and at two inter-

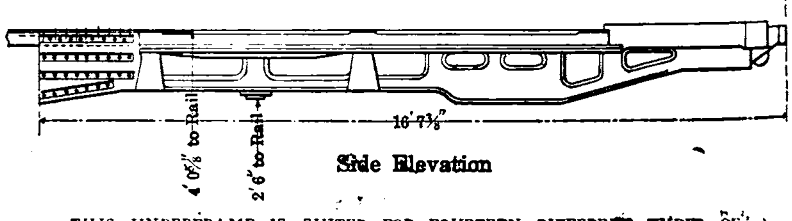


SECTIONS AT CANTILEVER AND CROSSTIE.

mediate points on each side, by cast steel cantilevers.

The center sills, spaced 18 in. apart, are fish-bellied, built up of a 30 x ⅜ in. top cover plate; 2 upper flange angles 4 x 3 x ⅞ in.; 2 web-plates 5/16 in. x 1 ft. 10 in. deep, continuous between end castings; and 2 bottom flange angles 3 x 3 x ⅜ in.. The whole section provides an area of 50 square inches at the center of the car. The use of heavier angles at the top of the web than at the bottom, together with the heavy cover plate, raises the neutral axis so that it is almost concentric with the line of action of the resultant end





Side Elevation

THIS UNDERFRAME IS SUITED FOR FOURTEEN DIFFERENT TYPES OF CARS.

* See American Engineer, June, 1907, p. 232; July, 1907, p. 260.

VIEW OF FRAMING FOR SLEEPING CAR.

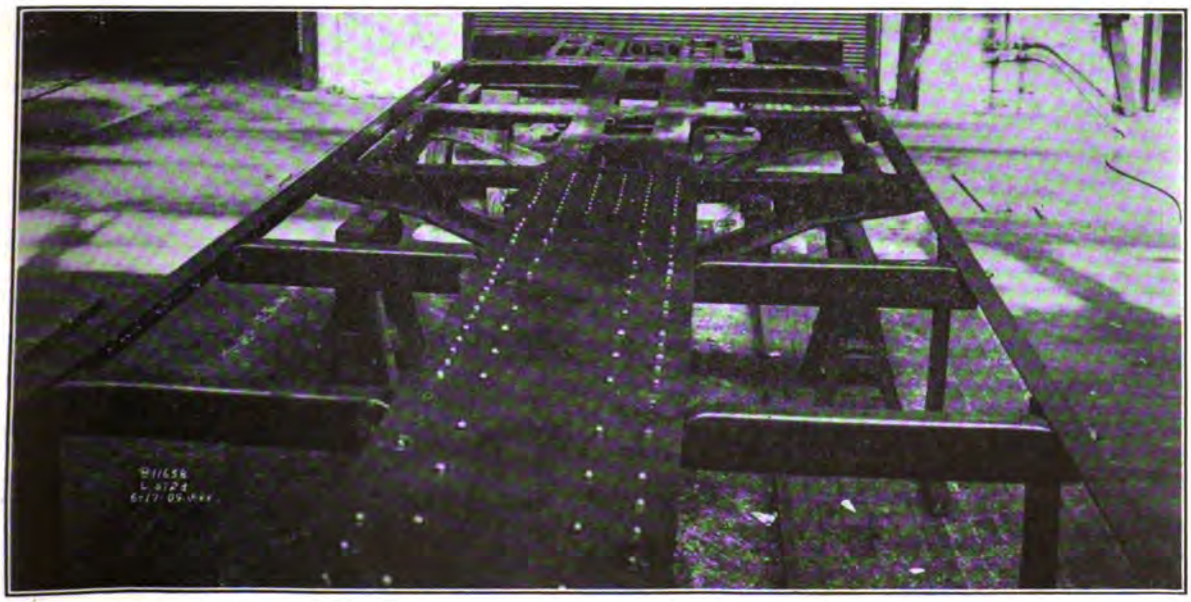
shock. The bending stresses due to eccentric end shock are thus almost eliminated and to the lading stresses but slightly more than the direct compressive end shock stresses need be added to obtain the total stress.

The careful disposition of the metal in the underframe members, thus permits the building of the whole underframe, with a complete covering of floor-plates, under 30,000 lbs. in weight.

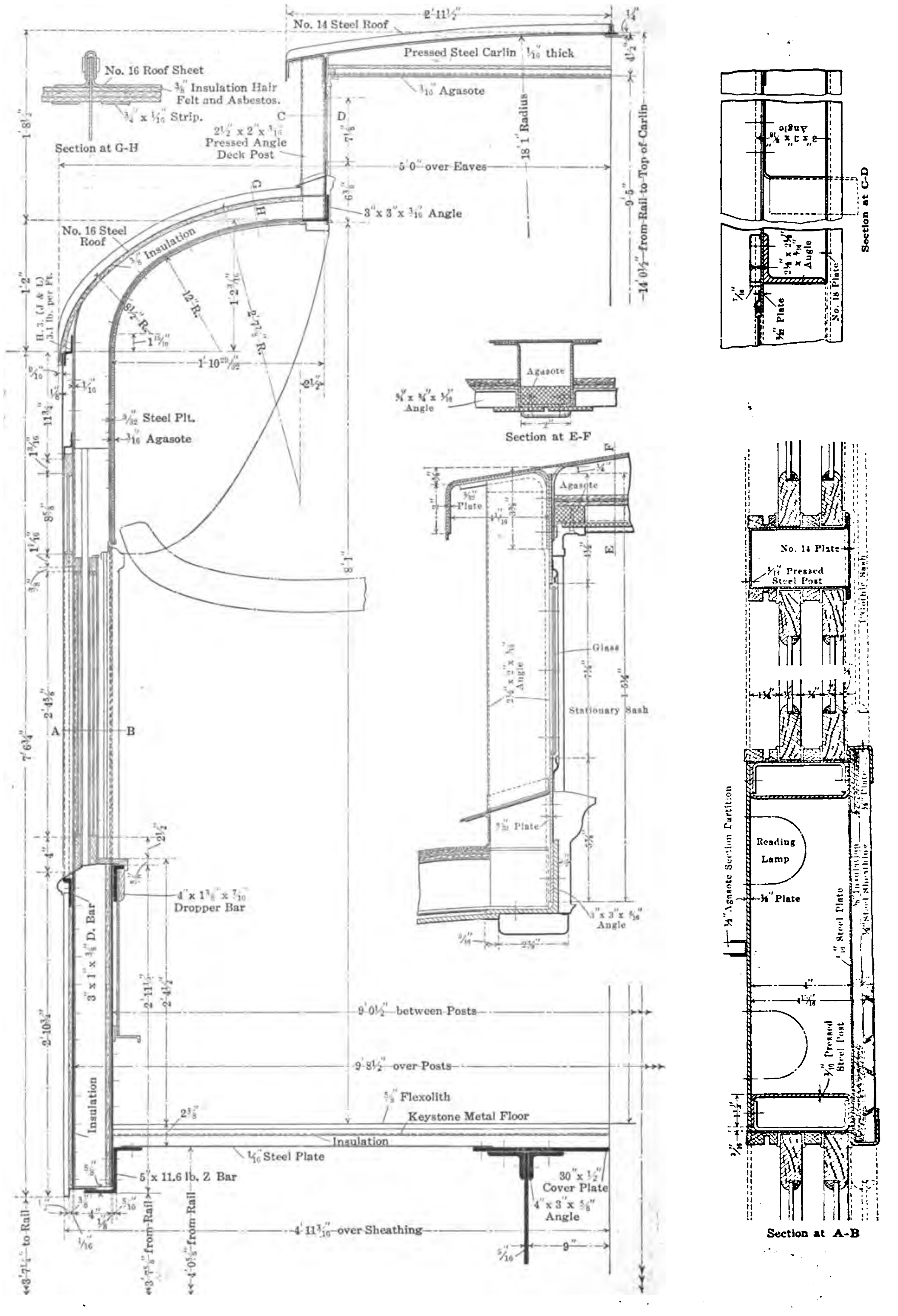
This design of underframe, shown in the illustration, will fit under 14 different types of cars without any modification whatever—a feat of interchangeability. The alignment of center and side-sills is permanently assured by the frequent use of pressed steel transverse cross-ties. The same cross-ties, together with floor stiffener angles placed between them, serve as web stiffeners and splices for the floor girder plates which extend from side-sill to center-sill and from end to end of car. This construction produces an admirable floor-girder well suited for resisting the tendency of buckling sidewise, as a whole.

The large platform and bolster-casting is used for the whole structure and detail of the underframe from the buffer-beam to about 12 feet behind the body end-sill. This casting serves for buffer-beam, platform-sills, safety-chain and pipe-anchors, buffing-housing, trap-door and step-supports, body-end-sill, draft-housing, center-sills, double-body-bolsters, side-bearing-braces, center-plate-bearing, and center-sill-splice. It avoids a multiplicity of parts and riveting and withal weighs but 5,150 pounds. It was designed and built by the Commonwealth Steel Co. The center-sill-splice or the connection of the structural sills to the casting, comes approximately at the point of inflexion of the total bending moment on the center-sills, making it eminently safe.

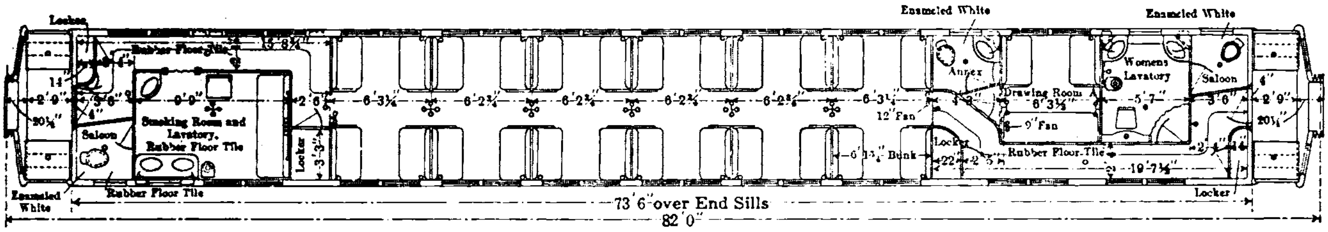
The transverse cantilevers are of cast steel with a center-sill separator between the web-plates, the whole being securely tied



VIEW OF UNDERFRAME. THE COMMONWEALTH STEEL COMPANY'S COMBINATION CASTING IS USED.



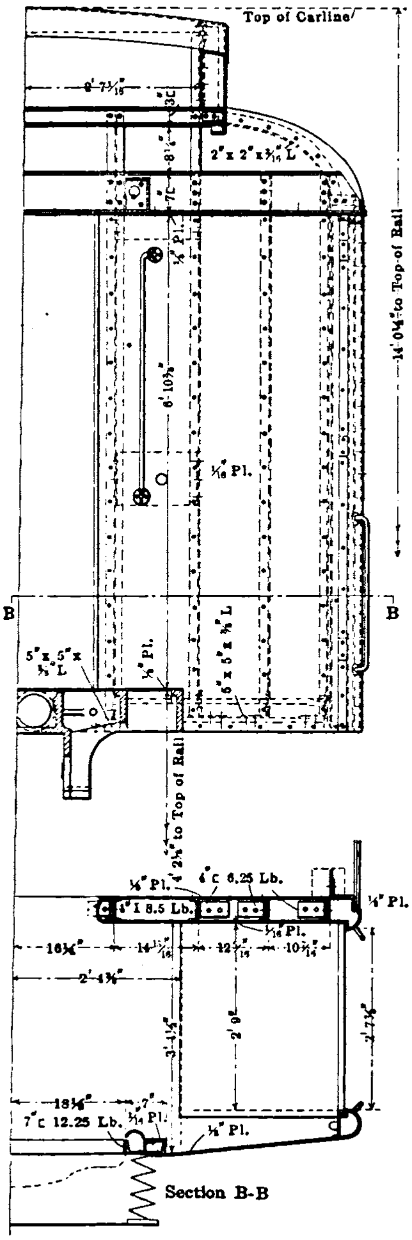
VARIOUS SECTIONS AND DETAILS OF SIDE FRAMING FOR STEEL PULLMAN CARS.

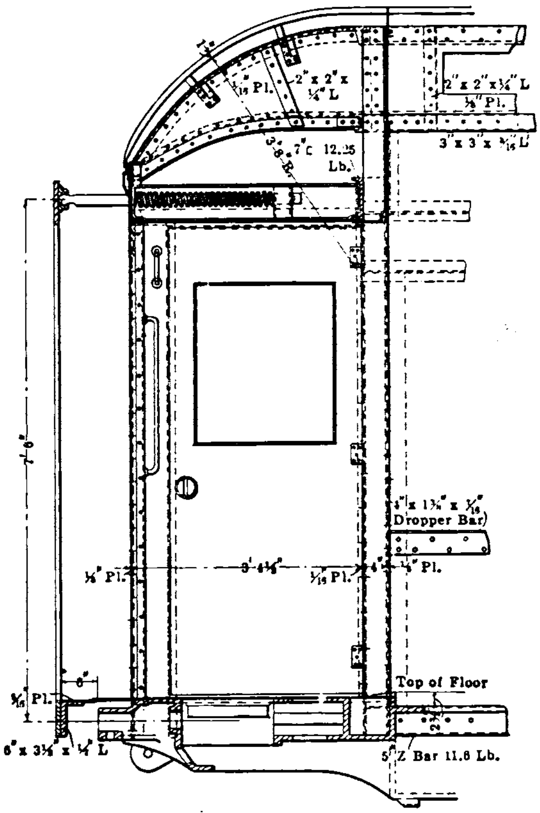


PLAN OF TWELVE-SECTION ALL STEEL SLEEPING CAR—THE PULLMAN COMPANY.

together top and bottom by a 6 x 5/8 in. cover plate, besides being riveted directly through.

The underframe is used for the floor framing direct; above the 1/16 in. floor girder plate is placed a 1 in. layer of magnesia insulation, separated by longitudinal furring strips, to rigidly support the 1/2 in. keystone flooring. Over the keystone metallic





DETAILS OF VESTIBULE.

flooring is spread a 5/8 in. layer of flexolith. This floor weighs about 45 pounds per square foot.

On the platform, the floor is simply a 1/8 in. plate covering the casting with 1/4 in. rubber tiling on top. The floor of the car is not subject to any noticeable vibration and is a good non-conductor of sound.

The Side Girder.

Due to the use of interlocking steel sheathing, the side girder is placed inside of the car. The lower chord or side sill is a continuous 5 in., 11.6 lb. Z-bar, which section provides the readiest methods of fastening the floor to the side girder, of closing the bottom of the side wall and attaching the sheathing. The upper chord is a 4 x 7/16 x 1 3/8 in. continuous dropper bar (Jones and Laughlin) and the web is formed of 1/8 in. steel plates 2 ft. 11 1/4 in. deep in three lengths per side. The side girder, theoretically, is a continuous beam of three spans, the ends being in a condition somewhere between fixed and freely supported, due to the constraining influence of the steel end casing. The stesses in the side girder do not equal one-third of the permissible amount, the extra metal being required to prevent unsightly deflection in the long central span. This provides for a large degree of elastic deflection, due to overload or service damage, before the car could take a permanent set.

The side girder is stiffened to provide against lateral bending by the strength of the side posts and the two dropper bars, a 3 x 3/8 x 1 in. dropper bar being used outside, where it also serves as the upper attachment for the sheathing and the face connection of the drawn steel sash rest.

Between these two dropper bars and securely riveted to them, pass the pressed steel side posts. The main post is channel shaped, of 1/8 in. steel and continuous from side-sill to deck-sill, so that they form the lower deck carlines. The window posts are U-shaped of 1/16 in. in. steel and extend from side-sill to lower deck eave. From this point to the deck-sill extends a special 1/8 in. pressed carline, forming the lower deck roof joint and the attachment of roof to body of car.

The Deck Girder.

A continuous 3/32 in. steel plate punched out for ventilators, screens and deck lights forms the deck plate. Securely riveted to it at the bottom is a 3 x 3 x 3/16 in. angle forming the deck-sill and at the top a drawn steel chord forming the eave and water table. The girder is stiffened by upper-deck posts of 2 x 3 x 3/16 in. angles.

The Roof.

Three varieties of carlines are used in the upper deck, all made of 1/8 in. pressed steel. The main carline is of U-shaped section and upon it is made the joint of the inside finish. The carline is furred with agasote and drilled for the finish to screw to it. The intermediate carline is of Z-shaped section and is simply one-half of the main carline, which is used to save weight and for the fastening of transoms. The roof joint carline is of 1/8 in. pressed L-shaped steel and is used to attach the roof to the car.

All three types are riveted to the deck-plate through pressed end flanges, the rivets taking both the deck-plate and upper-deck chord.

Running longitudinally from end of car to end of car, in the center of the roof is a 1 x 1 x ⅛ in. T-bar securely riveted to each carline, preserving their alignment and forming the attachment for the longitudinal roof sheet flanges and the joint cover.

In the roof there are no rivets whatever extending from the outside to the inside to work loose and leak; even the connection of the lower-deck roof sheets to the deck-plate is outside. The sheets being split in the center are of a size easy to secure, and the flexible joint allows for temperature changes.

INSIDE FINISH.

Inside finish of steel and agasote, in a very unobtrusive design, with conventional stencil decoration is employed. Fireproof agasote is used for upper-deck ceilings, lining of upper berth, section partitions, and section wainscoting.

Vermilion inside sashes, sash rests, window and curtain stops, and seat back mouldings are used. The bunks are all-steel construction, as are the seats; they are painted a burnt red and mottled in finish, which destroys the effect of the flat color, but does not endeavor to imitate wood graining. The upper-deck in all cars is flat, the lower in the parlor cars is likewise flat with ceiling beams.

INSULATION.

The whole car is in reality a double insulated air space, due to the use of "resisto" insulation inside of the cellular sheathing and outside of the steel lining. This insulation is ⅜ in. hair felt sandwiched between sheets of asbestos. Besides the above, the section wainscoting and berth lining still further separate the passenger from the cold outside walls.

LIGHTING.

Provision for electric light only is made and the cars are wired so that either train line or axle device can be used. The great majority of the cars have not had axle devices applied to them as yet.

TRUCKS.

The trucks are of the newest cast steel type, using Lappin steel backed brake shoes, Creco beams, McCord boxes and lids, M. C. B. 5 x 9 in. axle, 36 in. Paige wheels, Woods' roller side bearings and Commonwealth Steel Company's castings. The bolster springs are 5-ply 4 x 7/16 in. steel 36 in. long and the equalizer springs of three-coil 9 x 13 in. of 1½, 1 1/16, 11/16 in. rod.

Westinghouse high speed brake is employed using two cylinders and braking trucks independently to 90 per cent. of the light weight of car.

SPECIALTIES.

Among the specialties are the following: Garland ventilators, exposed Durer hoppers, Knapp sash locks (inside sash), flush sash lifts and post springs (outside sash), Perfection sash balances, Brown metallic weather stripping, Forsyth ring offset shade fixtures, Pitt drawbars, Westinghouse draft gear, Acme diaphragms, vestibule roller curtains and fixtures, National steel trap doors and Pantosote Company's Agasote for inside finish.

CO-OPERATIVE PLAN OF ENGINEERING INSTRUCTION.

The scheme of instructing students in engineering and similar subjects on the co-operative principle, whereby a certain amount of practical work under regular every-day working conditions is combined with the theoretical instruction in the school, which was originated by Professor Schneider and installed by him in the University of Cincinnati, has attracted widespread attention and is being received with so much favor that other schools and colleges are taking up the idea and devising variations of the original plan to suit the special conditions in each case.

Among the latest of these is the University of Pittsburgh, which has originated a new idea whereby the students get the usual amount of instruction in the college and at the same time get three months each year of practical work in one of the industries around Pittsburgh. In the latest bullettin of the University this plan is described as follows:

"It has been a matter of common observation in connection with the educating of young men who enter the engineering activities that those who spent their vacations while at school in engineering offices and industrial establishments have been better prepared for entrance upon their life's work than their fellow students of otherwise equal abilities who devoted their time exclusively to school work. The contact with the engineering activities, even in this subordinate way, gives the student of engineering an insight into practical affairs which not only makes him of more immediate use to his employer upon graduation from school, but also fits him to pursue his studies to better advantage while in school.

"If the student of engineering is thus benefited by such chance work as he may be able to get during vacation periods, then it is evident that he will be benefited still more by pursuing a systematic course in which the instruction in school is interspersed with suitable outside practical work.

"The technical graduate who has taken school work only has no adequate knowledge of the organization which makes it possible for many men of diverse employment to work together as a single unit in the accomplishment of a desired result, or the system that is necessary for tying together interrelated departments for the attainment of economic production; nor does he even know as a beginner how to apply the knowledge at school in a manner altogether satisfactory to his employer.

"Because of this unpreparedness of the average technical graduate, a number of large corporations have established student apprenticeship courses for the benefit of such graduates as seek employment with them.

"The engineering schools and the companies who employ their graduates are thus working independently in their efforts to prepare young men for entrance upon their life's work. Since both school and future employer have the common aim to fit the young man for efficient service at the minimum of cost in time and money, it is evident that the best results cannot be had by independent action but by co-operation.

"The University of Pittsburgh because of its splendid industrial environment is most favorably situated to apply this co-operative principle to the education of young men who are preparing to enter the engineering industries. Instead of keeping the young man away from the actualities of his life's work for a period of four or more years prior to graduation, as is the general custom of engineering schools, the Committee on the School of Engineering have matured a co-operative plan whereby the student, while spending in school the amount of time usually devoted to instruction in our best engineering institutions, will work four terms of three months each, in the engineering industries of the Pittsburgh District. By this plan the student gets the usual theoretical course and in addition twelve months of practical work, all in the space of four years, the school work being arranged so that successive groups of students will furnish continuous service to the employer."

The schedule of work on this co-operative plan is as follows:

During the first three terms (of from 11 to 12 weeks each) the class is together at the college. In the fourth term of that year it is divided, one-half taking the college work and one-half the practical work. The first term of the following year these halves are alternated and the college work is repeated for the half of the class which was working in the shop during the previous three months. During the next term the sections change places again, as do they also in the third term. In the fourth term of this year the class is united in the college work. During the four terms of the next year the sections alternate regularly and at the end of this year their shop work is completed and the three terms in the following year are devoted entirely to the work in the college. This gives the classes the regular 12 terms in the college work and in addition four terms of practical work in the shops during which time they are earning sufficient to largely reduce the net cost of their education.

TAKE THE SCHOOL TO THE SHOP.—The fundamental principle underlying this work is the thing I want to try to impress upon you; that is, that the prime feature of apprentice training is in the shop and not in the school. In order to get successful mechanics and successful engineers, you have to take the school to the shop and not attempt to take the shop to the school.—*Prof. Schneider at the General Foremen's Convention.*