caps removed from flexible staybolts and bolts found to be o.k. A patch was applied on top flange of flue sheet, half side sheet seam in firebox in good condition. When locomotive is shopped again it will be necessary to renew back flue sheet on account of same being patched. This locomotive

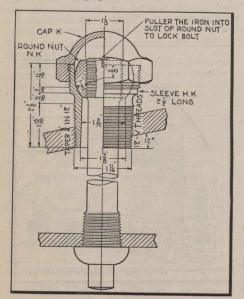


Fig. 25.-Flexible Staybolt Sling Stay.

made 319,567 miles to Nov., 1911, and lost no time due to broken staybolts.'

One member advises that they have equipped some fireboxes with full installation of flexible staybolts, but can see no advantage in doing this. In their opinion the flexible staybolts are only advantageous

## Suggestions and Deductions From Steel Passenger Cars.

By A. Copony, Chief Draughtsman, Car Department, G. T. R., Montreal.

It has always been the aim of railways to redesign and improve on existing passenger equipment, thus being in a position to take care of the ever increasing demands for safety, speed, and comfort of the trav-elling public whose wishes are becoming imperative in those sections of the country where competition amongst rival lines puts zest into the fight for supremacy in the passenger transportation business.

Several eastern and middle western roads have tried to keep up competition by means of increased speeds of trains run under a provisional guarantee, granting a refund of part of the fare in case trains are not run on time, whereas western and transcontinental lines, not able to perceptibly reduce their time of travel, on account of single tracks, are keeping up their bid for passenger traffic by means of safer cars, greater luxuries, and increased comforts, all of which items amount to astounding sums of expenses as well as profits to the railroads in question.

Since the advent of steel passenger cars the question of speed, comfort and safety become more accentuated and the construction of these cars has become a matter of great importance, not only of the car department but of the motive power, the transportation and the maintenance of way departments, and the public in general as well, besides which there is a rational limit set to the expenses incurred for equipment, by the definite returns expected from this investment.

În order to show the interest evinced in certain performances of the cars by the different departments of railroads the fol-

In the construction of steel passenger cars all the aforementioned points have to be carefully considered, besides which a host of other details have to be taken into consideration which depend on existing conditions under which a road is operating. For instance: It will be easier to build steel passenger cars operating in climates where the maximum and minimum temperatures of a year do not go to extremes, since the matter of insulation will not be so serious as in northern latitudes where the extremes are within a range of 120° or more. operating in a climate of great humidity will have to be treated differently in the selection of material as well as painting, compared to cars operating in a climate of low humidity. Cars operating in mountainous sections with small curves and heavy grades will receive closer attention as to running gear than cars operating in international or transcontinental service where the percentage of total run to run under the above mentioned conditions will be comparatively small.

In order to demonstrate the merits and demerits of constructions of different types, it should be only fair to judge a car not only in regard to the dead weight per passenger seated, but the consideration of comfort and safety must not be omitted, and last, but not least, the cost and main-tenance as well as draft resistance per car is of vital importance, if not to the passen-

ger, decidedly so to the railway.

Not taking steel underframe cars with wooden superstructure into consideration and omitting the type of inside finish, we can split existing constructions into two different types, as follows: The double deck or monitor type and the single deck or turtle back car type.

## THE DOUBLE DECK CAR TYPE.

This type follows in its main outlines the wooden car construction closely and has been adopted by the Pennsylvania, the New York Central, the Wabash, and the Dela-ware, Lackawanna & Western railroads, the Pullman Co., etc.

It consists in the main of a steel underframe composed of centre and side sills, intermediate sill being in most cases dispensed with and substituted by pressed or structural steel bridging. The centre sills are either of the fishbelly type built up of structural steel, or else consisting of heavy channels or I beams, as used by the Pennsylvania, the side sills are Z bar channel or I beams, or simple combinations of the aforementioned sections, the whole being well braced and connected with substantial steel-bolster castings, pressed or cast steel end sills and built up platforms, or designed to fit into the commonwealth type of end-framing casting, which is a combination of platform and bolster cast in one piece.

The superstructure consists of post of pressed steel or structural shapes, connected direct to the side sills, as well as indirect by means of the side sheets to the side sills. In some designs side plates are used for the top connection of the posts, but the Pennsylvania and the Pullman standard type of sleeping cars shows posts which connect in a clean sweep with the upper deck sills, thus eliminating lower deck carlins and side plates. In the first mentioned case either single, pressed steel, lower and upper deck carlins are used, but a number of constructions shows a combination of lower and upper deck carlins with deck posts, the whole being either pressed or of built up construction and applied while erecting the

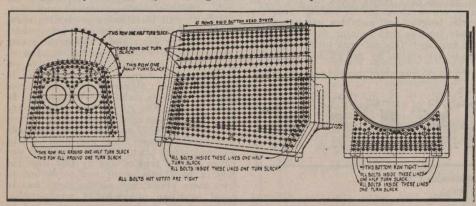


Fig. 26.—Slack Allowances and Location of Staybolts.

when applied in the breakage zone, and they have discontinued making full installation and are only applying them in-the breakage zone. However, a full installation of flex-ible staybolts in the throat sheet is being used by quite a few members with good results.

Three members advise that they allow a certain amount of slack when applying flexible staybolts. Fig. 26 shows the amount of slack and the location followed out by one of the members. It is the belief that an application of this kind will decrease the number of broken staybolts and allow for a greater expansion and contraction, which prevents the cracking of firebox sheets and increases the life of firebox correspondingly.

Your committee believes that this is a subject worthy of further consideration and would suggest that some more of the members carry on a further investigation and make a report at some future date to this Association.

(To be continued.)

lowing diagram will be of value in the more explicit treatment of details. The more explicit treatment of details. departments are indicated by following abbreviations set next to the details in question. [Editor's Note:—Owing to want of space the diagram has to be omitted.] department Motive power department Transportation department Maintenance of way department W Public Construction. C Constructional details. Maintenance oxydiza (Protection against C oxydization. C-M-W Weight. Draft resistance. C-M-W C-T-P Insulation. C-T-P Inside finish. C-T-P-M Heating. C-T-P C-T-P Lighting.

Ventilation.

Sanitation.

C-T-P