Discussion on Draft Gears on Railway Rolling Stock.

The paper on this subject, by L. E. Endsley, professor, University of Pittsburg, Pa., read before the Canadian Railway Club and published in Canadian Railway and Marine World for Dec., 1917, was discussed by several of the club's members. The following are the most important parts of the discussion:

T. H. Curtis: I would like Mr. Endsley to make plain to us the shearing of the 19/31 in. rivets. Does this mean that each lug has 9 rivets in it? If so, are they in the same channel? Or are there two lugs to shear 18 rivets; each lug bearing about half the load? Referring to fig. 2, the cut shows 18 rivets on the side. I think this should be explained.

L. E. Endsley: There are 18 rivets in the single shear and two lugs. Sometimes under a test both lugs would shear off. I meant to say that there are two lugs, 9 rivets in each and each rivet in single shear. As regards the 18 rivets in the channels, as shown in fig. 2, it only took 800,000 lb. to shear off 10 rivets and as this was not the strength of the sill, we added more rivets. We did not want to shear the lug off, but to obtain the strength of the sill.

Jas. Coleman, Superintendent Car Department, G.T.R.: Mr. Endsley has opened up a very interesting and broad subject—one that all railway companies are very much concerned in at present. It is the opinion of many operating men that in 70% of the claims paid by the claims departments for damage to freight in transit the cause for such damage cannot be traced; this high percentage is due to damage in switching and yard service, due to weak draft rigging. With the ordinary spring draft gear, that has not sufficient tension to absorb the shocks in switching and in road service, the gear becomes solid in switch movement and moves car under load. This means, it forces the load, or contents against the end of the car, scattering it over the floor of car, thereby causing unknown damage to contents, that cannot be determined until car has reached its destination. If the spring tension of draft gear was strong enough to absorb the shock before the spring went solid, it would prevent movement of contents or load in car, also stop movement of car under load and forcing load against ends of car. It is clearly demonstrated, on account of heavy train movement, increased tonnage in train service, and heavy switching service, due to increased tare weight of car and increased capacity of cars, that it has become necessary that a friction draft gear should be applied to all freight and passenger car equipment. It has been fully demonstrated that a spring tension draft gear is not sufficient to absorb the shocks ,and prevent them from being centralized in underframe and from of cars. In a discussion with some railway men, in connection with claims paid for damage to freight, the cause of which could not be traced, one company, I heard of $200,000 being paid out in 1916 for damage to freight in transit, cause of which could not be traced, or damage was not discovered until car reached its destination. This amount was only a portion of the total amount of damage, as usually it is pro-rated over the different lines over which the car may be routed. This is conclusive that the mechanical departments should do something to improve this condition, that will prevent the constant flow of expense for damage to freight, a large percentage of which can be saved and avoided by the introduction of a stronger and more efficient draft gear. Large numbers of equipments have been in service for a number of years, but at the time such equipment was originally constructed, it was not necessary for a heavy friction draft gear. In the last few years, or less than the average life of a great deal of equipment now in service in the countrly, it has become necessary, due to the increased tonnage of trains and increased draw bar pull on large and heavy locomotives to apply a reinforced steel underframe and a stronger draft gear to stand the service of present day operation, the same applies to improvements made in sorting yards and switching.

W. H. Yost, Mechanical Engineer, Hart-Otis Car Co.: As trains get bigger the draft gear must necessarily be made heavier. The modern friction gears give good service and much better than the spring gears. The heavier trains will require us to adopt something heavier.

C. W. Van Buren, General Master Car Builder, C.P.R.: There is one feature which Mr. Endsley did not bring out very strongly, although it has no doubt occurred to nearly all car department men here, that is that defects which develop in the draft gear and attachments cannot always be attributed to inferior draft gear. Many cars have been built and remodelled in recent years, with sills too weak to stand up under the severe service to which they are subjected. This is usually called rough switching, and in many cases it is, but we must remember that the traffic conditions which now prevail do not always permit of slow and careful movements of freight cars, and that it is at times extremely difficult to prevent damage to sills, couplers or draft gears without higher capacity gears, heavier couplers and stronger sills, draft arms and other attachments. I am not speaking of spring gear only. It is brought out quite clearly in the paper that friction draft gears frequently do go solid before any other parts of the car are damaged. Perhaps we might say that none of the draft gear manufacturers are keeping pace with the requirements. It has been my opinion for some time that the draft gear usually goes solid before the coupler breaks, and it would appear that the coupler should be the weakest link in the chain. We should design our sills, draft arms and lugs strong enough to stand a shock sufficient to break the coupler, and, if it is possible, the draft gear should be designed with at least as great a capacity as the coupler, and I believe that at least four inches travel is desirable. Officers in charge of the management of railways usually come up through the traffic or operating department, and it has been part of their training to keep the tare weights of cars and trains down to the minimum. Quite frequently, strength, durability and efficiency have been sacrificed in order to reduce the tare weight. Perhaps this condition is to some extent responsible for many of the comparatively weak draft gears in service today. There is one other point I would like to refer to on behalf of friction gear. When we were using nothing but spring gears, we expected to have couplers, followers, lugs, springs, and other parts broken. These failures were seldom criticized; we usually called it rough handling and let it go at that, but when we got the friction gear and it began to fail, we sometimes said it was no good. We thonght it did not stand up in service as it should, and we were sometimes inclined to condemn it because some parts had to be renewed, for we forgot that friction meant wear. I believe that it is impossible to build any friction draft gear which will not at some time during the life of the car require some repairs, and its efficiency, like wheels, brake shoes, couplers, brasses and other parts of cars, depends largely upon the inspection and repairs which it receives. This is something which we should endeavor to impress upon our managements. I believe all car men who have had any experience with friction draft gear are in favor of it as compared to spring gear. Most of our operating men who don't should visit the various laboratories and become familiar with the results of the tests.

R. W. Burnett, Master Car Builder, Delaware and Hudson Co.: I feel confident that up to recently 80 or 90% draft gear troubles have been the failure of attachments; that is. couplers, yokes, yoke rivets or attachments to wooden draft timbers. The couplers are now being made stronger, modern cast steel yokes do away with the rivets and distribute the metal so that breakages are greatly reduced and the use of steel centre sills or metal draft timbers is greatly reducing the draft timber attachment failures. The things I have mentioned may seem minor details, but they have constituted the greater part of the failures that have made the draft gear problem so prominent. With modern appliances these troubles will in time be reduced to a minimum which will leave us free to realize to the full on the wonderful developments that the friction draft gear people have made. With the increased weight of the cars and trains, and power of the locomotives, the full capacity that has been developed in the gears will be needed. We must not lose sight of the fact that the great capacity developed in the limited space will mean wear, and we must expect some cost in repairs and renewal, but, I feel that every dollar spent for improved modern draft gears will be saved many times over in repairs to other parts of the cars and in loss and damage to lading.

K. F. Nystrom, Chief Draftsman, Car Department, G.T.R.: There is one thing brought out very clearly by Mr. Endsley, viz., the wear of the friction draft gears. The great fault with certain friction draft gears is that the parts become worn and produce a slack in the gear. If this slack is not taken care of either by manual or automatic adjustment the gear will lose in capacity and soon be hammered to pieces. It is my opinion that in the ideal draft gear the wear should be reduced to a minimum and the slack or wear taken up automatically, so the gear will be in a good efficient condition during its entire life, the same as, for instance, a brake shoe. I should like to ask Mr. Endsley as to the relation between the draft gear and the centre sill. The draft gear will take care of a portion of the energy, or end shocks, the centre sill has to take care of the balance. How strong should we design the centre sills behind the draft gear to take care of reasonable load, say, in so many pounds static load?

L. E. Endsley: It would depend entirely upon the strength of the coupler. If I