

in their attempt to mount the rail, rode on a larger diameter, and that there was very little, if any, slipping of the smaller wheels.

Similar tests as to that taken with C.P.R. car 310,016 had been previously made with C.P.R. flat car 310,073. They confirmed exactly the results obtained with car 310,016, but the car got out of the yard before the wheels could be officially taped, and the results made of that car are not reported. Another test on a side track, laid parallel and on the outside of the 8° 10' curve, track laid with 56 lb. steel, C.P.R. car 310,016 loaded as in the experiment recorded, gave practically identical results with those recorded.

The writer's object, in giving this matter to the public, is to revive interest in this subject, bring out discussion, and if possible get more information on this important question. It is only when the actual causes of trouble are really understood that the proper remedies can be applied. The second reason is to call the attention of railway operating officials to the fact that it is a waste of fuel to haul over railways cars, the wheels of which are not running true. It is the writer's belief that over 75% of the wheels that are taken out of service, on account of

general any skidding that does take place is on the inner wheel of the rear axle.

The reader will naturally ask: "If there is very little skidding of wheels, wherein lies the considerable resistance offered by curves that we know from experience actually exists?" That is the problem the writer started out to try and solve, but as stated at the beginning, he cannot give any reasonable formulae. The writer had formulae for the case of flat wheels and vertical flanges, that worked out beautifully close to the accepted amount of resistance offered by curvature in these formulae; however, coefficients of friction were taken rather large for bodies actually moving on each other, and the horizontal pressure against the outside rail was assumed to be 1/2 in. below the top of the flat top and vertical side of rail, as shown at B, figs. 4 and 5, plate I—but what is the use of giving formulae for conditions that we know do not exist? The only thing the writer can offer is his opinion, which is that the major factor in the resistance offered by curvature is caused by the flanges of the outside wheels striking the outside rail at an angle, instead of rotating in lines parallel with the gauge side of the head of the rail. Any one who doubts the reasonable-

**Railway Maintenance of Way Employees Wages.**

Supplement 8 to the Director General of United States Railroads' general order 27, fixing rates of pay and rules for overtime and working conditions for railway maintenance of way employes, which became effective in the U.S. Sept. 1, is being considered by a committee representing Canadian railways collectively and a committee representing the Brotherhood of Maintenance of Way Employes, in order that an amicable understanding may be reached as to uniform application of the supplement's provisions on Canadian railways.

The members of the committee representing the railways is composed of M. S. Blaiklock, Engineer, Maintenance of Way, G.T.R.; A. E. Crilly, Assistant to General Manager, Eastern Lines, Canadian Government Railways, and G. Hodge, Assistant to Vice President, Eastern Lines, C.P.R.

The members of the committee representing the Brotherhood of Maintenance of Way Employes is composed of: A. McAndrew, acting General Chairman, C.P.R.; W. Robson, Secretary, Joint Protective Board, C.G.R.; W. Jewkes, Secretary, C.P.R. Joint Protective Board; P. Wood, General Chairman, Canadian Northern Ry.; W. Thompson, Assistant General Chairman, Canadian Northern Ry.; G. H. Cummings, General Chairman, G.T.R.; M. H. McCurdy, General Chairman, Dominion Atlantic Ry.; W. Aspinall, General Chairman, G.T.P.R.; G. W. Murray, General Chairman, Canadian Government Rys.; L. E. Moore, General Chairman, T. & N.O.R.; J. Sheppard, General Chairman, Q.M. & S.R.; W. Dorey, General Chairman, I.B. of M.W.E.

**Table 1.**  
Results of test to determine amount of slip C.P.R. flat car 310,016, loaded with steel rails, gross weight 129,100 lb.; 8° 10' curve; outer rail elevated 2 in.; speed about 4 miles an hour.

Car moving north.	Distance on rail measured in feet travelled by wheels making 70 complete revolutions.		70 times circumference of wheels in feet taped in field close to flange.		Difference between distance measured on rail and 70 times circumference.		70 times circumference of wheels in feet as officially taped after test 1 in. from base of flange.		Difference between distance measured on rail and 70 times official taping of circumference.	
	Outer.	Inner.	Outer.	Inner.	Outer.	Inner.	Outer.	Inner.	Outer.	Inner.
No. 1	605.88	601.68	602.29	602.29	+ 3.58	- 0.61	601.01	600.83	+ 4.87	+ 0.85
No. 2	605.58	601.39	605.21	605.21	+ 0.37	- 3.82	604.11	604.11	+ 1.47	- 2.72
No. 3	605.92	601.73	602.29	602.29	+ 3.63	- 0.56	601.38	601.01	+ 4.54	+ 0.72
No. 4	605.46	601.27	603.02	603.02	+ 2.44	- 1.75	602.11	602.29	+ 3.35	- 1.02
Car moving south.										
No. 1	604.67	600.48	602.29	602.29	+ 2.38	- 1.81	601.01	600.83	+ 3.66	- 0.35
No. 2	608.88	604.68	605.21	605.21	+ 3.67	- 0.53	604.11	604.11	+ 4.77	+ 0.57
No. 3	604.63	600.43	602.29	602.29	+ 2.34	- 1.86	601.38	601.01	+ 3.25	- 0.58
No. 4	607.08	602.89	603.02	603.02	+ 4.06	- 0.13	602.11	602.29	+ 4.97	+ 0.60

sharp flanges, have only one wheel on an axle with a sharp flange. This is caused either by poorly mating the wheels, or by them being placed in trucks that are not properly squared. Whatever the cause, this matter should be given more attention by mechanical and operating officials.

The writer is convinced that the greater portion of curve resistance is caused by pressure of the flange against a single rail, therefore the mating of wheels or setting up of trucks not properly true, that causes the flange on one wheel of an axle to wear sharp, is not only shortening the life of the wheel, but is costing the company considerably more money to acquire this undesirable result.

The following is a summary of the writer's conclusions:

1. All outer wheels of railway equipment exert a pressure against the outer rail when rounding a curve.
2. The cause of this pressure is the tendency of a cylindrical body to rotate in a straight line at right angles to the axle of rotation.
3. That there is never any skidding of either wheels of the leading axle of a truck, unless it is a forward skidding of both wheels, caused by the resistance to rotation being great enough to cause a slight retardation to rotation, which results in an apparent forward skidding.
4. That there is no skidding of the outer wheel of a rear axle, and that in

ness of this opinion can ask an old timer what his experience was in the days before gasoline, in pumping a velocipede over the road, with the leading wheel not set true, and especially when it was set to hug the rail.

The writer wishes to acknowledge, with thanks, some valuable criticisms on this subject by I. P. Church, Professor Emeritus of Cornell University, Ithaca, N.Y., and would be very glad if Professor Church could be induced to write a criticism of this paper to be given to the public.

**Electric Welding in the War.**

Three hundred men from the Ordnance Department, U.S. Army, will be trained as electric welders in schools established by the electric welding section of the Industrial Relations Group. They will be used in the reclamation of millions of dollars worth of war materials gathered from the French battlefields. Ten men of the Expeditionary Forces already are in training at the Cleveland school, and the remainder will be sent to the schools in relays. It is estimated that millions of dollars will be saved to the War Department through this work.

Ship welders are being trained without charge in the electric welding section's schools at Schenectady, New York City, Cleveland and Philadelphia.

The Farmers Grain & Shipping Rd. runs from Devils Lake, N.D., where connection is made with the Great Northern and Minneapolis, St. Paul and Sault Ste. Marie Rys., to Starkweather, Crocus and Hansboro, 66 miles, and is operated under the U.S. Railroad Administration. The following appointments have been made: J. M. Gruber, General Manager; M. L. Countryman, General Solicitor; A. H. Hegeland, Chief Engineer; F. A. Bushnell, Purchasing Agent; F. A. Barnes, Federal Auditor; L. E. Katzenbach, Federal Treasurer, all of whom hold similar positions with the Great Northern Ry. under the U.S. Railroad Administration, with offices at St. Paul, Minn.

The Toronto Terminals Ry.'s application for permission to lay steam pipes from the Toronto Electric Light Co.'s plant at the foot of Scott St., along the Esplanade to the new Union Station, for the supply of heat for the premises, under a three year contract, came before the city's board of control Oct. 25, when the board decided to oppose the application, stating that the company should give preference to the city system. It was pointed out that the city hydro electric system could not supply steam for heating, and could not guarantee continuous lighting service, and the T.E.L. Co. would not supply the steam without the light.

D. O. Wood, Superintendent, Inland Transportation, British Ministry of Shipping (Canada), Montreal, in remitting his subscription to Canadian Railway and Marine World, which he has taken for many years, writes: "I like your paper very much and think it is the best of its kind."