claimed that plates made in the 90's by the acid process are still in use and giving good service, manufacturers claiming they are fully as good. It is important that the mixture covers the iron and adheres to every point; otherwise, there are liable to be what are known to the trade as pinholes, which are injurious and permit corrosion to start. Terne plates, like the other grades, are packed in boxes which show the style of finish, the grade of the plate and the amount of coating. The process of manufacturing does not produce all perfect sheets, which are designated by the mill as prime plates. A small percentage of the manufactured plates contain pinholes or other defects, and are called wasters.

The report terminated with a series of drawings and descriptions of 20 standardized parts, including the following, in some cases in different sizes; Engineer's torch, oil cans of different kinds, card case and buckets.

Report of Committee on Superheater Locomotives.

The American Railway Master Mechanics' Committee, H. H. Vaughan, Assistant to Vice President, C.P.R., reported as follows:

The committee has made an investigation in connection with packing rings, etc., in view of the widely varying results which are reported in locomotives using superheated steam, and have also the privilege of presenting to the Association the results of the experiments made by the Pennsylvania Rd. on their testing plant at Altoona, on the tests of a class K 2, s a locomotive and on the effect of various changes in the form, length and extent of heating surface of a Schmidt superheater.

The test on a class K 2, s a locomotive has been printed and issued as Bulletin 18, by the Pennsylvania Rd., and the committee recommends that it be reprinted in the Proceedings of the A. R. M. M. A., in the same way that the report on the test of a class E 6 s locomotive was reproduced in the 1913 Proceedings.

The tests on a Schmidt fire tube superheater showing the effect of various changes in its form, length and extent of heating surface are presented as part of this report. This test is valuable as indicating the effect of changing the length of the superheating pipes, and the possibility of obtaining results with the return loop shortened which are equal to those with a full length return loop. The tests have been carried out in the thorough manner usual on the Pennsylvania Rd., and this Association is indebted to their general superintendent of motive power, Mr. Wallis, for permission to present them.

In connection with packing rings, 20 roads were written operating about 5,500 superheater locomotives, and the replies may be summarized as follows:—There is a large variation in the life obtained from piston packing rings, the replies giving from two or three monts of 6,000 miles, to as high as 50,000 miles or two years. Roads representing about 25% of the locomotives use a special mixture for piston packing rings, but while most of those who do so report from 50 to 100% longer service from special irons than from ordinary gray iron, the latter is used by those roads reporting the longest life in service. In several cases cylinder iron is used with 1.20 to 1.50% of silicon—the prosphorus also being kept low, not over 0.5%, and with apparently good success. There is, however, considerable variation between different classes of engines, in some cases the life reported in passenger service being double that in freight, while in other cases the reverse occurs. The longest life reported is with the plain ¾ in. square ring which is used by the majority of the roads; but one road using ⅜ in. by ⅝ in. rings reports a decided improvement as against the ¾ in. wide ring, and exceedingly good results are reported by the Leighton balanced ring, which is a special design and used by the Illinois Central.

The great variation in the life is peculiar, as there does not appear to be any explanation of the wide differences reported. The average life for all locomotives represented is five months, and this figure compares very closely with results reported by several roads that have gone into the matter carefully. It is generally suggested that ample lubrication and the use of the drifting throttle are the requirements for long life, but apart from these suggestions there is nothing to explain the variations.

The majority of the roads have used extended piston rods to some extent with improved results in most cases, especially on large cylinders, 23 in. diameter and over. Replies would indicate that if of proper design this attachment is undoubtedly an advantage, the only question being one of maintenance.

The life of piston valve rings also shows a wide variation from as low as two months to as high as two and even three years. There is no correspondence between the life reported for piston packing rings and valve rings, in many cases roads reporting a long life for piston rings, reporting a short life for valve rings and vice versa. The average life reported is slightly over 13 months. It is apparently but slightly affected by the material used, but several roads refer to the necessity of boring out the bushing in position to obtain good results. Very little trouble is experienced in the case of piston valve bushings and there is evidently no serious difficulty in the maintenance of these parts.

Most roads use special types of rod packing, and with a good design there seems to be no difficulty in obtaining a life of 10,000 miles or over, with the 80% lead, 20% antimony mixture. Where this has given trouble on account of severe service and on the high pressure cylinders of Mallet engines, a mixture of 50% copper, 50% lead has been used to advantage. One road reports improved results on Mallet engines from a mixture of 33% copper, 67% lead, but the 80-20 mixture is the one most used and is evidently satisfactory in the majority of instances.

W. H. FLYNN, Superintendent of Motive Power, Michigan Central Rd., in the course of the discussion, said:—We have been safe ending the superheater tubes and getting excellent results from them. We build in one locality safe ending in the front end and in another the rear end, but for economic and other reasons we decided to weld only on the front end. On one division where we have continuous, high speed service we have been endeavoring to find something that will improve the service obtained from our cylinder packing. At the present time we are experimenting with graphite lubrication in conjunction with oil lubrication, and our results so far have been very gratifying.

E. R. WEBB, Master Mechanic, Michigan Central Rd., St. Thomas, Ont., said:—With superheater locomotives, and in that heavy, high speed service, we found it was necessary to inspect the packing every 30 days, and one of the amusing things that was found was that the cylinders did not wear; the wear seemed to all come on the packing and pistons. We use a 1¼ in. packing, 15-16 or 31-32 in. wide. It was found also, in the use of the Dunbar packing, with both the square and the other section, that the wearing surfaces would be of the same dimensions. I believe that it will be found that where the packing runs ordinarily more than 15,000 or 16,000 miles the temperature of the superheater is not very good for it. As regards the cylinder lubrication, we believe it to be necessary on superheater engines. With the graphite lubrication, we found that cracked piston rods have practically disappeared. The examinations which the superheaters receive in the roundhouse are what determine whether they shall be successful or not. It has been found that it is quite necessary to keep the flues open to inspect the front ends and to keep the boiler tight. The superheater has made it possible to operate our service with a 22 in. by 26 in. engine, that otherwise could not possibly handle the business. The man who cleans the flues and the man who calks the flues—the men who take care of these things are really the important and vital fellows.

H. H. Vaughan on the Car Construction Committee's Report.

In the discussion of the report of the committee on car construction (see pg. 294 of this issue), H. H. Vaughan, Assistant to Vice President, C.P.R., said:—

I advised the chairman, Mr. Kiesel, that I realized it was unfair at the time the report was written to interpose objections, but in some respects I did not consider the report satisfactory. My objections are as follows: I cannot subscribe to the recommendation on centre sills for new cars. I am inclined to agree that the two standards I recommend would not be practical, and therefore consider that the decision must be left to each road individually. From experience gained with 30,000 cars, having 19.8 sq. ins. of centre sill area, I do not consider results would warrant this area being increased for the class of traffic in which these cars are usually employed, while roads on which exceedingly heavy trains are handled may find it desirable to employ heavier construction at the expense of heavier dead weight. Until the time arrives at which interchange requirements demand a minimum strength of centre sill, it therefore appears useless to specify the dimensions for new cars.

End construction for new cars with two vertical 4 in. Z bars and 1¾ in. wood end lining has proved satisfactory, and is ample as a minimum requirement. I would therefore recommend the report be amended to read "New steel cars should have steel plate ends 1¼ in. thick, or wood lined ends 1¾ in. thick," etc., and that the statement regarding alternative arrangement be omitted. Bending strength of the braces should be specified at a definite height above floor line. It is unnecessary to provide end fastenings which are equal to the shearing strength of the braces.

I do not consider it desirable to specify patended type of ends, as these could better be provided for by saying that special design of ends should be equal in strength.

Under the heading of Car Doors and Fastenings, angles should be located not over 12 ins. from top and bottom of door to provide for construction in which these angles or their equivalent is used as part of door frames. They should be used with ⅜ in. carriage bolts, or ¼ in. rivets.

The recommendations on draft gears should permit cars to be transhipped at option of receiving road in place of forbid-