are lost with the brake beam. Labor and material may be charged for key bolts, cotters and brake pins when lost independently of above items."

Rule 105. Adding to rule: "Manufactured articles are those that are not subject to competitive prices, and which can only be obtained from one manufacturer or concern."

Rule 112. To read: "When the body or trucks of a foreign car are destroyed or badly damaged, the owner shall, upon request, furnish depreciated value of body and trucks separately (the same to be figured from the date the car was originally built), and the party damaging shall have the option of rebuilding or settling under the depreciated value. If it is decided not to rebuild, the owner must be immediately advised."

Rule 115. Change end of last paragraph: "Except the second hand value will be allowed for all metal brake beams good for further service and the average credit price for wheels." Abolish reference to damaged steel and steel underframe cars.

Rule 120. To read: "A car unsafe to load on account of general worn-out condition due to age, decay or corrosion, shall be jointly inspected by the handling line and a representative of the owner of or a disinterested line, whichever can be most conveniently obtained by handling line. If inspectors agree that the car is unsafe to load on account of general worn-out condition due to age, decay or corrosion, the result of such joint inspection, entered on a form, shall be sent to the car owner, showing in detail all defects found on car, also an estimate of the cost to rebuild the car. Upon receipt of this information the owner must either authorize the destruction of the car, or authorize the handling company to rebuild it. In the latter case the owner must forward to the handling company complete plans and specifications necessary for the rebuilding of the car. If the owner elects to have the car destroyed, the handling line shall allow credit for all material at M.C.B. scrap prices, less labor cost of destruction."

Rule 121. Be made vacant.

PASSENGER CAR RULES.

Rule 3. To read: "Equipment and tools missing from the inside of baggage, mail and express cars are at owner's responsibility."

Rule 17. To read: "All inside or concealed parts of passenger equipment cars are at owner's risk."

Report of Committee on Brake Shoe and Brake Beam Equipment.

The Master Car Builders' Committee, C. H. Benjamin, Professor of Railway Engineering, Purdue University, Lafayette, Ind., reported in part as follows:—

BRAKE SHOES.—Tests were conducted upon the M.C.B. brake shoe testing machine. The shoes tested were of 6 different kinds. selected from the 7 kinds reported in 1911, each as follows:—

Two plain cast iron, received from the Pennsylvania Rd., length on arc, 14 ins.; width, 3⅜ ins.; thickness, 1½ in.; no insert; reinforced with steel back. Two Spear-Miller, received from the Chicago, Burlington and Quincy Rd., length on arc, 13½ ins.; width, 3⅜ ins.; thickness, 1¾ in.; two V-shaped inserts; reinforced with a steel back. Two National, received from Chicago, Milwaukee and St. Paul Ry., length on arc, 14 ins.; width, 3⅜ ins.; thickness, 1⅝ in.; chilled ends, and reinforced with a steel back. Two Diamond S Christie, also known as a half-flange type, having a flange of 2½ ins. at each end of the shoe, received from the Southern Pacific Rd., length on arc, 14 ins.; width, 4 ins.; thickness, 1½ in.; insert composed of a bundle of expanded metal, covering the entire face; reinforced with a steel back. Two U shoes, received from the New York Central Lines, length on arc, 15¾ ins.; width, 3⅜ ins.; thickness, 1⅝ in.; ends tapered and chilled; reinforced with a steel back. Two Pittsburg, from Pennsylvania Rd., length on arc, 14 ins.; width, 3⅜ ins.; thickness, 1⅜ in.; made up of a pressed back, ⅛ in. thick, completely filled with a composition filler.

Each shoe was tested upon a steel-tired wheel under the following brake shoe pressures:—12,000, 14,000, 16,000 and 18,000 lbs., the initial speed of the machine being in each case 65 m.p.h. At each of the above pressures nine stops were made.

In anticipation of a test the shoe was given a number of applications until a full bearing surface was obtained, after which it was accurately weighed upon a pair of scales. The shoes were first tested at a pressure of 12,000 lbs., after which the pressure was increased by increments of 2,000 lbs. until a pressure of 18,000 lbs. was reached, or until the shoe broke or became unserviceable. The loss in weight of the shoe was obtained by weighing the shoe after each three applications, thus giving a check upon the loss for each pressure. Between each application the shoe was cooled by a blast of air until the temperature was reduced to such an extent that the observer could bear his hand upon the shoe.

The results are plotted in figs. 1 to 3. It will be seen from fig. 1 that the co-efficient of friction of most of the shoes decreased as the pressure increased, the two exceptions to this being the plain cast iron and the National. The plain cast iron gave almost the same coefficient at all pressures, while the National gave almost the same coefficient at the three lower pressures and then made a sudden drop at 18,000 lbs. The loss in weight, due to wear, fig. 2, shows that in the case of four of the different types of shoe tested, the loss increased as the pressure increased up to 16,000 lbs. With two of the kinds of shoes tested the loss reduced at 18,000 lbs. This seemingly inconsistent result may be accounted for by the fact that two of the shoes, National and Spear-Miller, broke during the tests at 16,000 lbs., increasing the wear for a time at least, and possibly decreasing the wear when the broken shoes had again been worn to a new fit before the 18,000 lbs. pressure. Two of the types, the Diamond S and the Pittsburg, showed a tendency to reduce the wear as the pressure was increased up to 16,000 lbs., but increased at 18,000 lbs. pressure. No doubt this reduction in loss was due to a change in the per cent. of insert in contact or a change in the physical makeup of the shoe.

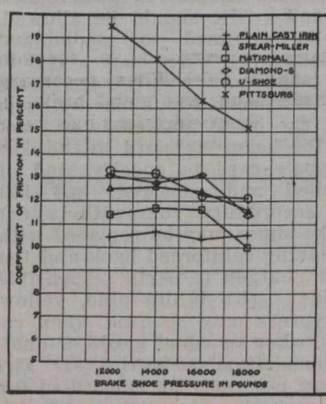

Fig. 1.—Average Co-efficient of Friction of Each Kind of Shoe.

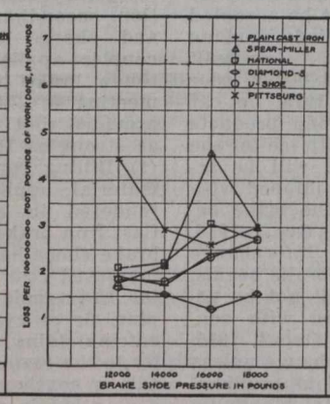

Fig. 2.—Average Loss per 100,000,000 ft.-lbs. of Work Done for Each Kind of Shoe.

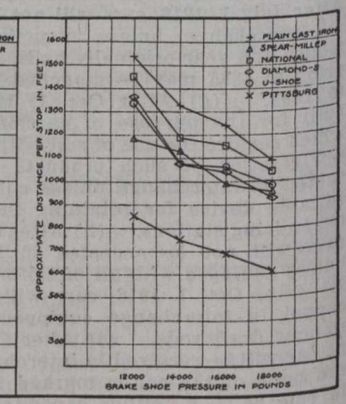

Fig. 3.—Approximate Distance per Stop in Feet for Each Kind of Shoe.

The results given in fig. 3 show that the approximate distance per stop was inversely proportional to the coefficient of friction, all of the metallic shoes varying about the same as for coefficient of friction, and this variation is greater at 65 m.p.h. than at 80 m.p.h., as in 1911. The Pittsburg made stops at approximately half of the distance required by the poorest metallic shoe.

It will be seen from a study of fig. 1 that the coefficients of friction of five of the different types of shoes tested fall somewhat close together, but not nearly so close as they did in the tests conducted at 80 m.p.h., reported in 1911. In 1911 the variation was less than 2 in the value of the co-efficient of friction in per cent. at any pressure for all shoes tested, with the exception of the Pittsburg. From the results reported this year at 65 m.p.h., it will be seen that this variation is considerably more, being as much as three or over at the different pressures. The coefficient of friction in 1911 was never over 10% nor under 7%, an average for all shoes with the exception of the Pittsburg being approximately 8.4, while in the tests this year at 65 m.p.h. the maximum was 13.3 and the minimum 10% for all but the Pittsburg. The average coefficient of friction at 65 m.p.h. was 12.2, thus making it greater by 3.8 than it was at 80 m.p.h. The Pittsburg in 1911 at 80 m.p.h. varied in a straight line from 19.75% at 12,000 lbs. to 17.1% at 18,000 lbs. It will be seen from the tests made this year that the coefficient of friction of this shoe was less at 65 m.p.h. than at 80 m.p.h. It will also be noted that the loss of weight in the Pittsburg was more at 65 m.p.h. than at 80 m.p.h. In 1911, the average loss at 80 m.p.h. was 2.8, while this year the results at 65 m.p.h. showed a loss of 3.2. This apparent inconsistency in the coefficient of friction and loss in wear of the Pittsburg may be accounted for by the fact that the shoe is made of a composition filler, and as the shoes have been lying in the laboratory for three years where the temperature was 70 degs. or more, the binder which holds the filler together may have dried out, thus reducing the coefficient of friction and increasing the wear.

BRAKE BEAMS.—The following change in specifications for no. 2 brake beams is recommended: Apply an initial load of 12,000 lbs., then reduce to 500 lbs.; reset the deflection instrument to zero. Apply a