quote from the report of the Committee on Maintenance of Superheater Locomotives for 1912, as follows: "Replies to the circular of inquiry indicate that Hunt-Spiller gun iron has been used on many railways with excellent results. This is said to be an air furnace charcoal iron, and the process of manufacture, combined with the proper chemical composition, seems to result in a metal which is well adapted for use with highly superheated steam." Upon further investigation the committee ascertains that Hunt-Spiller gun iron is not a new product, but in fact is a very old one. It seems that as far back as about 1810 the late Cyrus Alger made many improvements in the metallurgy of iron, and by the process suggested and manipulated by himself was enabled to increase the strength of certain kinds of pig iron from its nominal strength to that of some 35,000 lbs. per sq. in. This iron was produced for the purpose of fabrication of ordnance and it was because of the use to which it was put that it derived its name, "gun iron." The analysis of this iron is practically as shown in the report of the committee of 1912. The physical structure, however, was not referred to, and, although exceedingly important, your committee also has made no attempt to determine and explain, due to the short time remaining in which to make the report. That Hunt-Spiller gun iron is generally considered to be efficient, economical, and for these reasons desirable, cannot be doubted, considering the fact that 80% of the roads reporting are using this product in their superheater locomotives for some of the parts mentioned; therefore the committee does not hesitate to recommend its use for piston valve bushings, piston valve packing rings, piston valve bull rings, cylinder bushings, piston packing rings, and pistons or piston bull rings.

Extended Piston Rods.—The committee included in its circular of inquiry a list of questions on the use of extended piston rods. Eighteen roads report experience with extended piston rods. A great diversity of experience and opinion has been expressed. Three roads out of the 18 have entirely discontinued the use of extended piston rods as a result of their experience, and several others find them to be of no advantage. On the other hand, several roads state that a saving is effected by the use of the extended piston rods. For comparison it may be noted that the report of the Committee on the Maintenance of Superheater Locomotives for 1912 shows that 18 out of 36 roads replying to the circular had locomotives equipped with extended piston rods, but 3 of these were eliminating them. It is seen, therefore, that there has apparently been no increase in the use of extended piston rods since that time. It is the contention of some that the use of extended piston rods reduces the wear of cylinder bushings and packing rings, due to the fact that they are relieved of the weight of the piston, with a consequent reduction of friction inside the cylinder. On the other hand, there is the increased first cost and the cost of maintenance of the extended rod and its cross-head, cross-head guide and extra set of rod packing, if this arrangement is used.

The question arises as to what extent extended piston rods are used on saturated locomotives. Only one road reports the use of extended rods on saturated locomotives. This road uses extended rods upon the low-pressure cylinders of both superheater and saturated Mallet locomotives. The committee finds that most of the roads using extended piston rods are using a small cross-head on the front end of the extended rod; in fact, only one road reports the use of any other device. This road uses an arrangement in which the extended piston rod slides in a brass sleeve. The Cole type of piston rod extension is in most general use. This arrangement is described as consisting of a miniature cross-head at the front of the extended rod, which slides on a cylindrical surface, rigidly supported and easily located on the cylinder head. The wear of the extension cross-head on the guide is taken care of by lining up between the small cross-head shoe and its body. The packing on the extended rod is easy of access and can be repaired without difficulty. The extension guide is self-centered on a circular flange of the cylinder head, and requires no adjustment in service, as it cannot get out of position. The guide is made with an open top, so that when it is necessary to remove the guide it can be dropped from the rod.

Twelve roads have reported the minimum size of cylinders used in connection with extension piston rods. The minimum diameter of high-pressure cylinders varies from 20½ in. to 29 in., the average being over 24½ in. With regard to the tendency of the extended piston rod to spring, reports show that 5 roads find this tendency. Nine roads sate that there is no increase in expense of maintaining rod packing with extended piston rods, and 3 roads state that the expense is increased. One road states that the expense of maintaining piston rod packing is doubled by the use of the extended piston rod. Lubrication by oil cups is almost universal, only one road using the splash system for extended piston rods. Open-hearth steel is very generally used for extended piston rods. Experiments with vanadium steel or other special alloy steels have not developed to a point where the committee can recommend them for this purpose.

From a careful consideration of the replies, the committee concludes that there is no particular necessity for the use of extended piston rods, except where railways traverse hilly country where long stretches of drifting is usual. However, where its use is desired, we advise the necessity of such a diameter of extended rod as to prevent springing, and are of the opinion that in no event is the extended rod necessary on cylinders of 20 in. diameter and less.

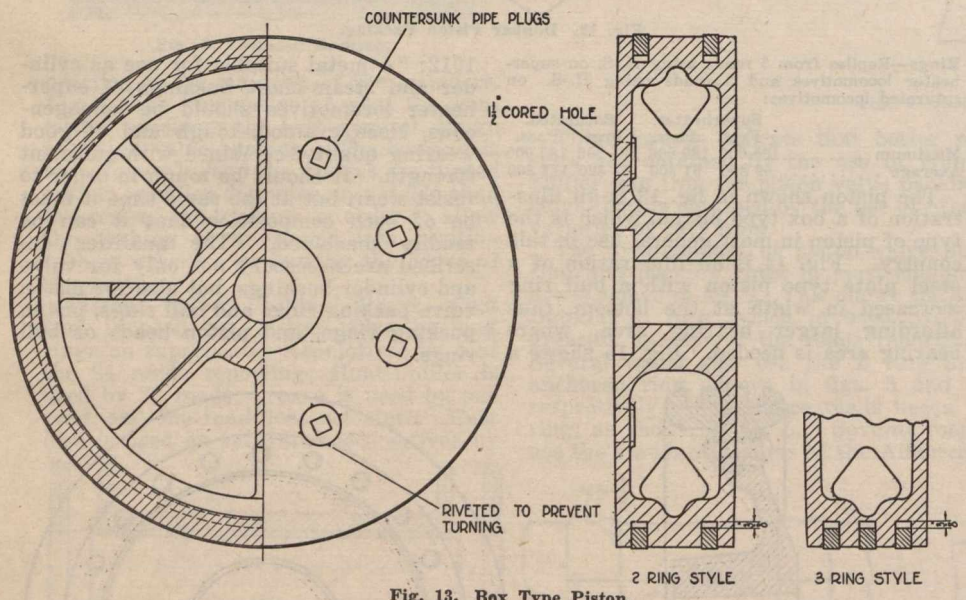

Fig. 13. Box Type Piston.

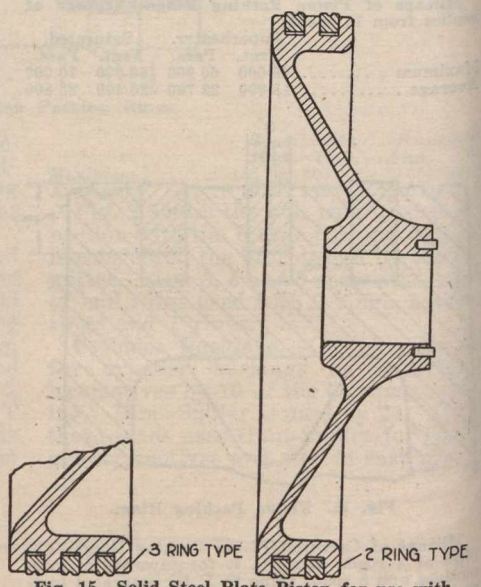

Fig. 15. Solid Steel Plate Piston for use with extended piston rod.

International Railway Fuel Association.—At the annual convention at Chicago, Ill., recently, it was announced that there was a total membership of 636. During the meetings 68 new members were enrolled. The officers for the current year are: President, W. H. Averell, Baltimore and Ohio; Vice Presidents, E. W. Pratt, Chicago and North Western; L. R. Pyle, Minneapolis, St. Paul and Sault Ste. Marie; W. L. Robinson, Baltimore and Ohio. The convention for 1917 will be held at Chicago.

Railway Storekeepers' Association.—The officers for the current year, elected at the recent annual convention, are: President, W. A. Summerhayes, Illinois Central; First Vice President, H. S. Burr, Erie; Second Vice President, E. J. Roth, Chicago, Indianapolis and Louisville; Third Vice President, J. N. Shaw, Delaware, Lackawanna and Western; Treasurer, J. P. Murphy, New York Central.

In machining operations the speed and the feed are settled upon in the works planning department, and are based on the power of the machine and the character of the metal to be machined. These have been worked out after careful study, and for efficiency displace the old method of relying on the workman's judgment.