grain load transmitted to it by friction. This form of bin construction has been in use practically from the inception of the grain elevator system on this continent, and in many respects is admirably adapted for the purpose.

The defect from a structural point of view was its lack of vertical rigidity, by reason of the shrinkage of the wood and the compressing of the many horizontal joints during the first loading of the bins, which usually amounts to a settlement of 12 to 18 inches in 70 feet, thus necessitating very great care being taken to distribute the grain load when first filling the bins in order to prevent undue strain of the structure. When, however, the initial settlement has taken place, no further precautions are necessary .

The chief defect, however, of the wooden elevator is its liability to destruction by fire, involving heavy loss on the building and contents, and therefore high insurance premiums.

The increasing cost of Insurance and timber, combined with the great inconvenience and loss of business to transportation companies by the destruction of an important terminal elevator, created a sudden demand for fire-proof buildings ; and the consequent change in the materials of construction made it necessary that a more accurate knowledge of Grain Pressures under all working conditions should be obtained to permit of the intelligent design of bins of different materials or increased diameter and depth.

Notwithstanding that the modern elevator system had its inception, and has reached its highest development in America, there is no record of any systematic series of tests having been made on this Continent, with a view of obtaining a definite knowledge of the pressures produced by grain in deep bins. In fact, there is ample evidence that some who have undertaken the design and construction of bins for the storage of grain, coal, or other granular substances have been entirely lacking in knowledge of this subject ; and there have been very few of even those engineers making a specialty of grain elevator or coal bin construction who could calculate with any degree of confidence the pressures produced by granular materials in bins having a breadth and depth varying to any considerable extent from standard size or constructed of different materials.

The Author does not, however, wish to convey the impression that all grain elevator designers have been entirely groping in the dark on this subject, nor does he claim to have had a superior knowledge of grain pressures over other experienced elevator engineers, before undertaking the extensive and systematic series of tests which form the chief subject of this paper.

It has been well understood by experienced grain elevator engineers that grain stored in bins of standard dimensions (12 to 14 ft. square and 60 to 70 ft. deep) produced comparatively small ver-