

deductions therefrom, and will illustrate some of the weaknesses that have developed in different forms of construction. He will also endeavor to show the cause for certain failures, and describe the problems to be met in the safe and economical design of grain bins, and will in connection therewith, illustrate and describe a number of designs of grain bin constructions.

Before proceeding to describe these tests the Author will briefly outline such different tests, calculations and discussions on this subject as it has been possible to obtain from any hitherto published records.

In Great Britain in the year 1882, Isaac Roberts made a series of tests on both model and full-sized bins, which demonstrated that in a grain bin having a depth equal to  $4\frac{1}{2}$  times the diameter, the proportion of the grain weight resting on the bin bottom was very small, as also the lateral pressure. Mr. Roberts read a paper describing his tests before "The British Association for the Advancement of Science." The Author, however, regrets that he has been unable to obtain a full copy of this paper.

In 1895 H. A. Janssen, C.E., Bremen, Germany, made a number of experiments on small rectangular bins with a view to obtaining the proportion of weight of the grain contained in a bin that would rest on the bottom, and that would be carried by the bin walls.

His bins were all of approximately the same depth but of varying horizontal areas. Briefly, his system of tests consisted in supporting bin walls on 4 jackscrews while in the bottom of the bin was placed a loosely-fitting board resting on a platform scale. By filling the bin with grain the proportion of weight resting on the bottom was recorded on the scale. When the weights previously placed on the beam balanced the weight of grain resting on the bottom, a record was taken of both the weight of grain in the bin and the proportion of said weight that was resting on the bottom.

The bin was then slightly raised by means of the jackscrews, and owing to the friction of the grain on the bin sides this also relieved part of the bottom pressure and allowed the beam to drop; added weights were then placed on the beam and the filling of the bin proceeded with, the same procedure being followed until the bin was filled.

Janssen's tests were thus carried out in four different sizes of bins, but were to obtain the bottom pressure only, as he found that having obtained the bottom pressures, it was quite simple to calculate the lateral pressure. By conducting a series of tests to obtain the co-efficient of friction between grain and the bin wall materials, he was enabled with the information thus gained to calculate pressures in different sized bins.