Letters to the Editor

EFFECT OF RODDING CONCRETE

Sir,—For some time the Engineering Division of the Bureau of Economic Geology and Technology of the University of Texas has been devoting considerable attention to an investigation relating to improvement in concrete construction and based on the following assumptions:—

(a) The strength of concrete is a function of the cement-concrete ratio, other factors remaining constant.

(b) For a given set of conditions there is a fairly definite water-concrete ratio which assures the greatest strength of the concrete.

(c) In practical concrete construction it is generally necessary, or at least often highly desirable, to use more mixing water than the optimum quantity, in order to produce a concrete which is sufficiently fluid to be handled advantageously and which will flow readily into the forms and between and around the reinforcing steel,—even though such concrete is weaker than it would be if less water had been used in its preparation.

During the course of our experiments we found that it was possible to prepare concrete with considerably more than the optimum quantity of water, deposit this concrete in the molds in a manner similar to that used in actual concrete construction, then "rod" the concrete, and finally secure a material which is fully as strong as it would have been had only the optimum quantity of water been used.

In other words, by this method of producing concrete it is possible to secure the advantage of economic handling and thorough filling of forms and coating of reinforcing steel, which is characteristic of concrete containing excess mixing water, and also the advantage of maximum strength, which is characteristic of concrete prepared with the optimum quantity of mixing water.

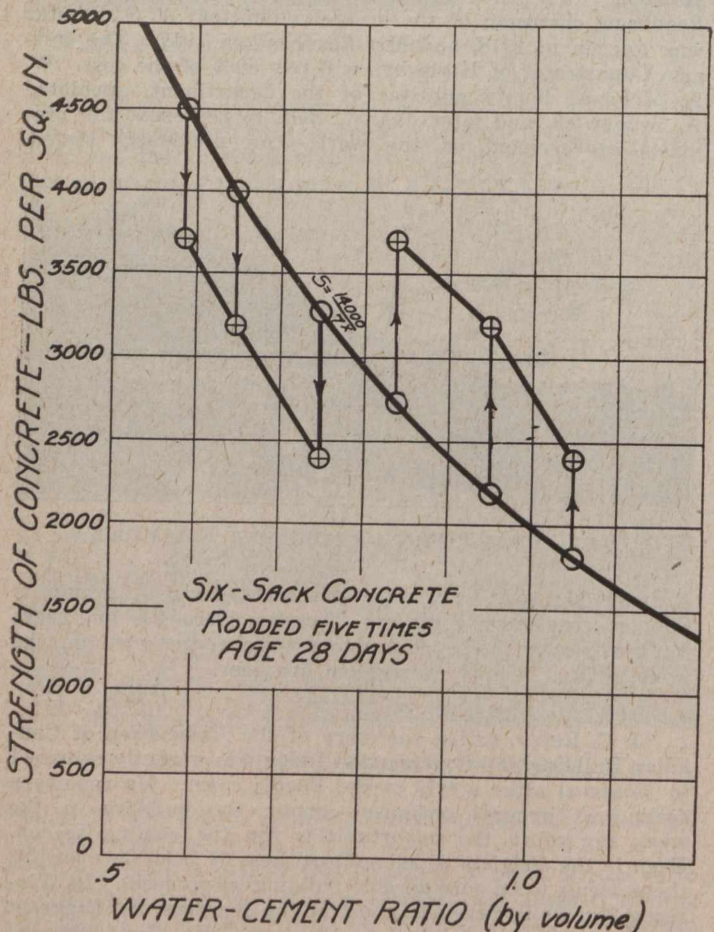

Fig. 1—Comparison of Prof. Abrams' Curve With Strengths of Rodded Concrete; Water-Cement Ratios Based on Quantity of Water in Concrete Before and After Rodding

We considered this discovery of such great practical value that we published our partial results in technical journals and before technical societies whenever we had sufficient information to warrant such publication.

During the course of our investigation Prof. Abrams published his discovery that the strength of concrete can be expressed as a function of the water-cement ratio; the compressive strength of a 28-day concrete, prepared of good materials, being approximately $14,000/7^x$ lbs. per sq. in.

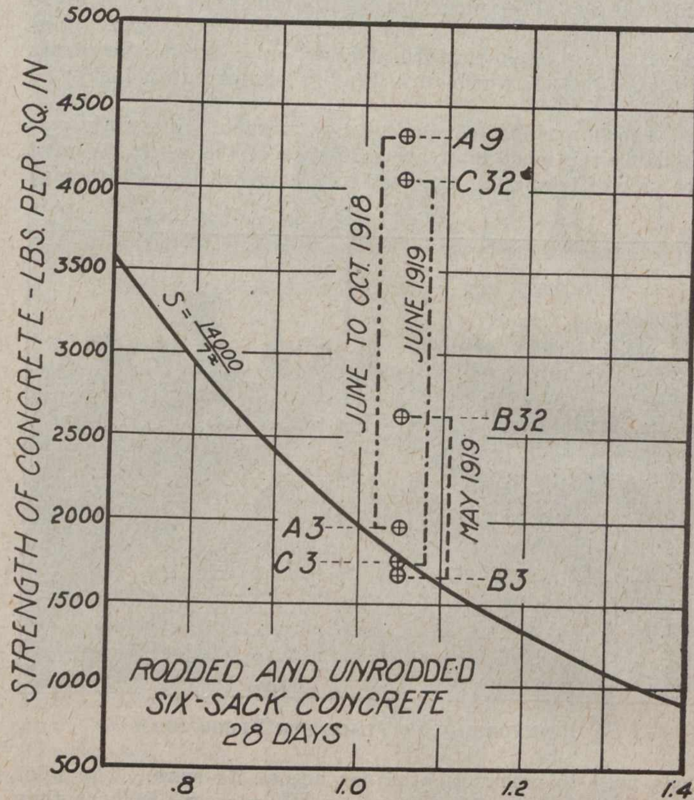

Fig. 2—Comparison of Strengths of Unrodded and Rodded Concrete With Each Other and With Prof. Abrams' Curve

We accepted Prof. Abrams' value as the best available basis for the comparison of the strength of rodded and unrodded concrete because Prof. Abrams had made a sufficient number of tests to convince us of the accuracy of his work, and because those of our tests which were made with unrodded concrete agreed well with Prof. Abrams' results.

Since the strengths of our rodded concrete were so much in excess of those shown by Prof. Abrams' curve, it was suggested that we repeat our tests and determine the quantity of water expelled from the concrete by the rodding, and to plot the strength against the water remaining in the concrete to see whether Prof. Abrams' expression would then agree with our results.

This was done in connection with a series of tests designed primarily to determine how the strength of "rodded" concrete varies with the cement-concrete ratio and with the maximum size of the coarse aggregate, other factors remaining constant.

We express the cement-concrete ratio in terms of the number of sacks of cement incorporated in a cubic yard of concrete; the six-sack concrete, for example, refers to concrete which, in its final condition, contains cement at the rate of six sacks of 94 lbs. of cement per cubic yard of concrete.

In the series referred to, we used three cement-concrete ratios, namely, 4-sack, 6-sack, and 8-sack; three maximum sizes of the coarse aggregate, namely, ½ in., 1¼ ins.