content on the wear can be expressed by an equation of the form,

$$W = a\,b^{x} \quad - \quad - \quad - \quad - \quad (10)$$

where W = depth of wear in inches;
x = water ratio; and
a and b are constants whose values depend on age and other conditions of the test.

It is seen that this relation is of the same form as the equation for strength, except that the exponent which

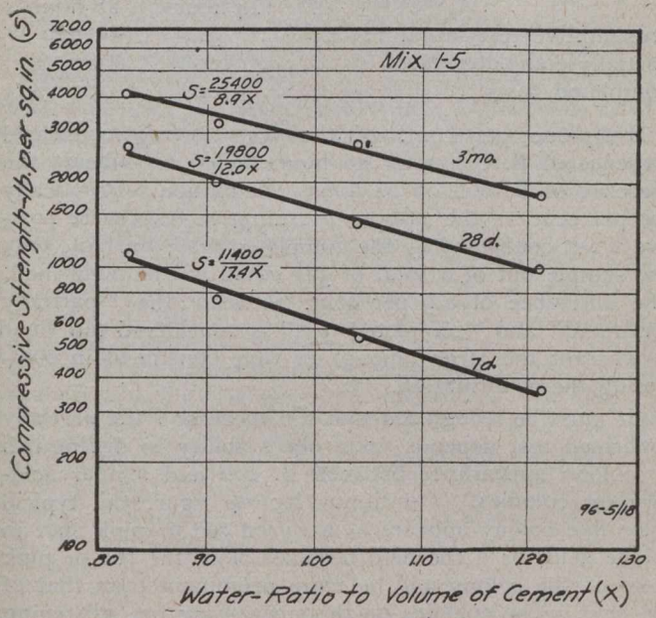

Fig. 45—Influence of Water on the Strength of Concrete

Series 96—Same data as in Fig. 44, except strength is platted to logarithmic scale. Compare Figs. 8, 10, 32, 34 and 53.

expresses the water ratio now appears in the numerator instead of in the denominator; in other words, increase in the ratio (within the range of plastic mixes) increases the wear and decreases the strength.

For the conditions of these tests, equation (10) becomes

$$W = 0.21\ (4.3)^{x} \quad - \quad - \quad - \quad (11)$$

Small changes in the water ratio exert an important influence on the wear. The wear increases at a more and more pronounced rate as the water is increased.

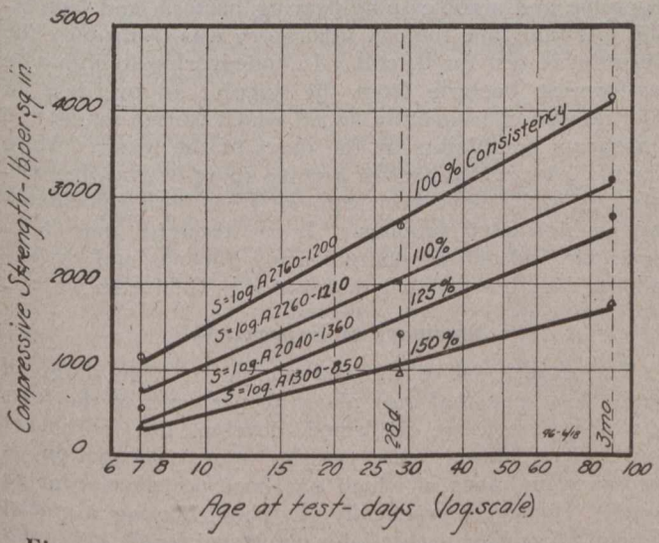

Fig. 46—Effect of Age on the Strength of Concrete

Series 96—Each point is the average of all rates of rotation for each consistency. Age platted to logarithmic scale. Compare Figs. 20, 36, 37 and 39.

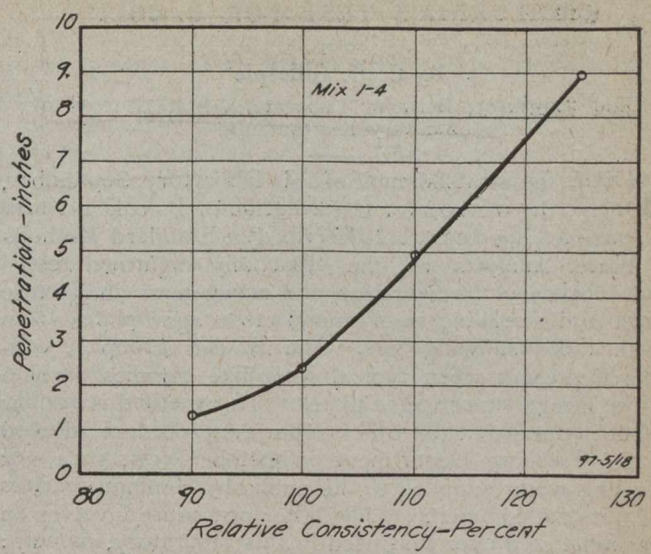

Fig. 47—Penetration Test for Consistency of Concrete

Series 96.

We have sufficient data for a study of the relation between the wear and compressive strength of concrete for a given age. This relation is shown in Fig. 14. Here each consistency is platted separately. The results of an earlier series of tests made in the same machine on 1:5 hand-mixed concrete, at the age of 4 months from Series 75 (details not given in this article) are shown in Fig. 16. The relation between strength and wear of concrete may be found by considering equations (1) and (10) simultaneously. If this is done and the values of the constants

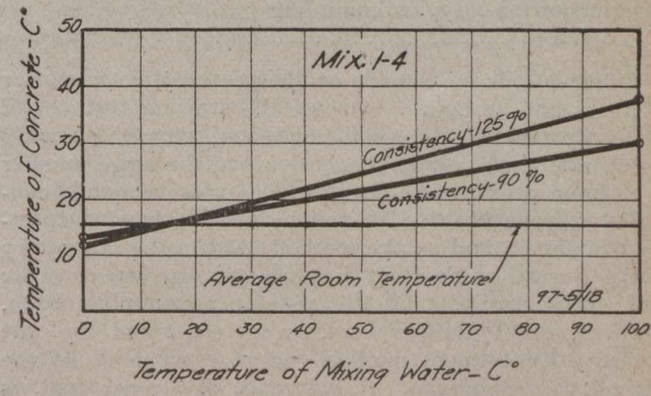

Fig. 48—Temperature of Concrete Produced by Mixing Water at Different Temperatures

Series 97—Consistencies between 90 and 125% are omitted.

found in these series substituted in the equation, we shall have:—

$$\text{For Series 89} \quad S = \frac{1{,}800}{W^{1.3}} \quad - \quad - \quad (12)$$

$$\text{For Series 75} \quad S = \frac{2{,}230}{W^{1.07}} \quad - \quad - \quad (13)$$

where S = compressive strength in lbs. per sq. in.; and
W = depth of wear in inches.

These relations are shown in Figs. 15 and 17. It will be noted that this form of equation gives a straight line if both variables (S and W) are platted to logarithmic scales.

These equations are most useful in estimating the probable wearing resistance of a concrete of known strength.

(Concluded in the next issue. For Figures 49 to 53, inclusive, see next issue)