

The Canadian Engineer

A weekly paper for Canadian civil engineers and contractors

Effect of Time of Mixing on the Strength of Concrete

Exhaustive Series of Tests on Machine-Mixed Materials Shows That Inferior Concrete is Produced By Undermixing, But Excess of Water is By Far the Greater Evil—
Paper Read Before the Atlantic City Convention of the American Concrete Institute

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MACHINE-MIXING has almost entirely replaced hand-mixing of concrete on work requiring the use of large quantities of material. While it is generally recognized that good results can be secured by hand-mixing, it is also well known that this result can be accomplished only at the cost of conscientious effort and much hard work. It has long been known that the thoroughness of mixing, whether by machine or hand, has an important influence on the quality of the finished concrete. Reference may be found in engineering literature to several series of tests in which the effect of duration of mixing was studied. So far as hand-mixing is concerned such studies have been generally confined to briquet tests made on cement mortars. The tests on machine-mixed concrete which have been reported, covered such a narrow range that no quantitative measure of the effect of continued mixing has been developed. No

two on the part of specification writers toward lengthening the time the batch should remain in the mixer.

There can be no question of the importance of thorough mixing of concrete. Undoubtedly much inferior

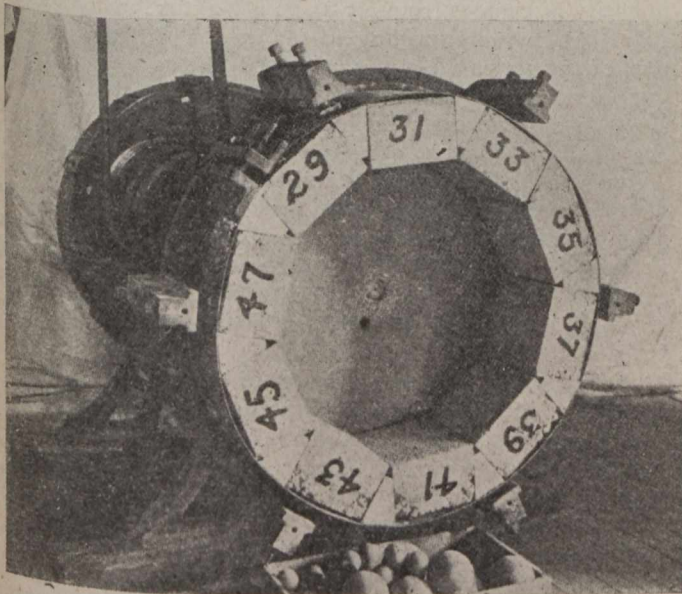


Fig. 1—Talbot-Jones Rattler with Concrete Wear Blocks in Place

Wear tests were made on blocks 8-in. square, 5-in. thick.

sustained effort has been made, so far as the writer is aware, to analyze the factors which enter into the beneficial effects of continued mixing. Due to a more or less vague impression of the value of longer mixing time, there has been a marked tendency during the past year or

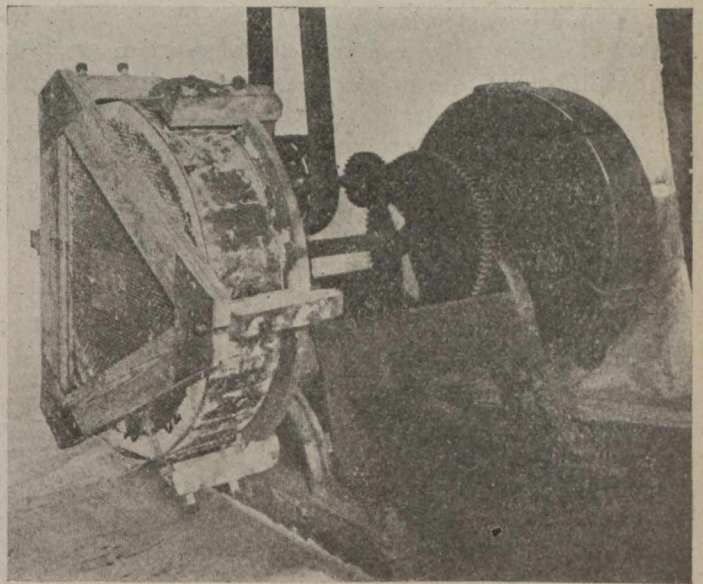


Fig. 2—Talbot-Jones Rattler with Head Closed Ready for Test

The machine was operated for 1,800 revolutions at 30 r.p.m.

concrete is produced by undermixing. Undermixing, coupled with the excess of mixing water which is too frequently used, forms a combination which is very conducive to defective concrete or concrete of low strength and wearing resistance. Of the two evils, excess water is by far the greater.

Due to the multiplicity of sizes and designs of batch mixers, the exact basis for the mixing period has not been clear. Should a minimum time limit be specified? Or should a minimum number of revolutions of the drum be required? If a minimum time limit for mixing is specified, what is a proper basis for mixers of different capacities, or mixers operating at different rates? Whatever basis is used for fixing the minimum amount of mixing which would be acceptable, several other questions of equal importance are immediately raised. What is the effect of the time of mixing if the proportions of the concrete are changed? The change of proportions would in-