

Fig. 2—Compressive Strengths of Test Cylinders: Consistency of Mix Tests

reproduced showing accumulations of water cavities underlying the particles of stone aggregate and the reinforcing steel tending to reduce the bearing capacity in the

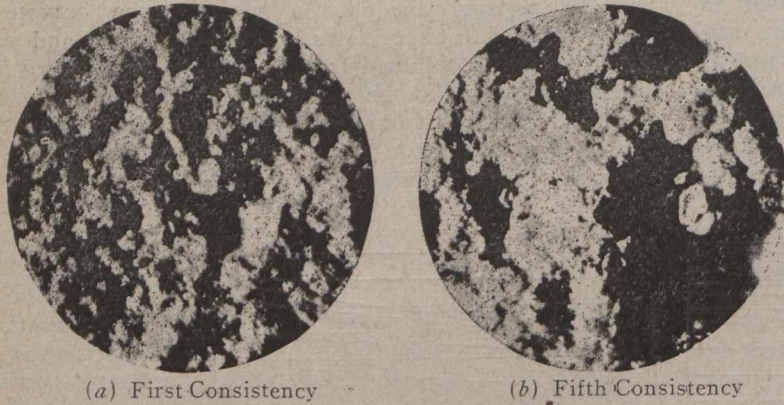


Fig. 3—Photomicrographs of Mortar Bedding of Stone Aggregate—Consistency of Mix Tests. ( $\times 75$ )

former case and the bond between the steel and the concrete in the latter case.

A microscopic examination of the mortar portions of the concretes of the five different consistencies discloses a marked change in the physical structure of the cement



Fig. 4—Test Specimens: Consistency-Abrasion Test

matrix. Doubtless the decrease in strength found in the tests of concrete cylinders and of reinforced concrete beams is in part due to this change in the matrix.

Fig. 3 shows photomicrographs ( $\times 75$ ) of the mortar bedding of stones in first and fifth consistency concretes. Under the microscope the cement matrix of the first consistency concrete appears gray in color and adheres closely to the surfaces of the aggregates in amorphous masses containing myriads of minute voids, but on the whole giving the impression of possessing strength, hardness and rigidity. In comparison, the cement matrix of fifth consistency concrete presents a marked difference, both in color and in physical structure. Its color is more nearly a milky white and its structure is generally loose and flaky, giving ample evidence of a lack of strength resulting from absence of cohesion between the cement particles and adhesion between these particles and the surfaces of the aggregates.

**Consistency-Abrasion Tests.**—This test was made with the object of obtaining information relating to the influence of the consistency of mix upon concrete in relation to its resistance to abrasion and shock. The mix used was a  $1:1\frac{1}{2}:3$ . Two sets of test cylinders were made. In the first set the stone aggregate was broken limestone of good quality and in the second set a good

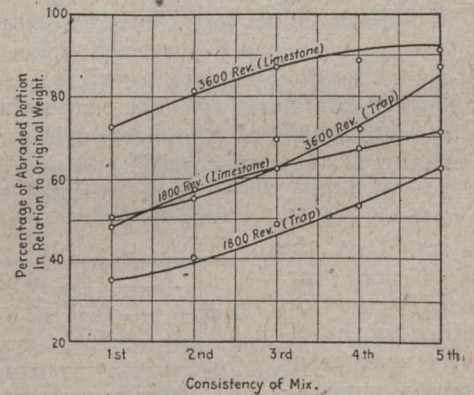


Fig. 5—Relative Reductions of Test Specimens: Consistency-Abrasion Test

quality of broken trap rock was used. In the first consistency mix the water content was 6.25 per cent. of the total weight of the cement and aggregates. The water

Table I.—Sand and Gravel Gradings

Sand Grading.		Gravel Grading.	
Sieve No.	Percentage Retained on Sieve.	Screen Size, in.	Percentage Retained on Screen.
4	0.0	2	0.0
8	14.0	$1\frac{1}{2}$	15.0
10	4.0	1	26.0
20	14.0	$\frac{3}{4}$	20.5
30	9.0	$\frac{1}{2}$	14.0
40	11.0	$\frac{1}{4}$	24.5
50	14.0		
80	20.0		
100	6.0		
200	6.0		
	2.0 (passing)		

content was increased by 10, 20, 35 and 50 per cent. for the four succeeding consistencies. The test specimens were cast in 6-in. cylinder forms by the insertion of a