

tests that the sample for the tests could be made more practical and useful if one-half were 1/2 to 1 in. in size and one-half were 1 to 2 ins. in size. The standardized test, as operated at the present time, is as follows:

The sample of stone or gravel or other road material consists of 2,500 g., of which 1,250 g. are from 1/2 to 1 in. and 1,250 g. are from 1 to 2 ins. in size. The abrasive agent consists of six cast-iron spheres 1 7/8 ins.

Table II.—Tests of 12 Typical Indiana Limestones with the Standard Deval and New Abrasion Test Apparatus

SAMPLES 5000 G. EACH. TOTAL NUMBER OF REVOLUTIONS, 10,000; 30.5 R. P. M.

| Sample No. | Wear, per cent. | | Ratio of New to Deval Test. |
|------------|-----------------|-----------|-----------------------------|
| | Deval Test. | New Test. | |
| 1..... | 3.5 | 8.1 | 2.3 |
| 2..... | 4.15 | 9.1 | 2.19 |
| 3..... | 3.9 | 9.6 | 2.46 |
| 4..... | 3.76 | 9.7 | 2.58 |
| 5..... | 3.6 | 10.3 | 2.86 (one test only) |
| 6..... | 3.0 | 10.5 | 3.5 (" " ") |
| 7..... | 4.1 | 11.8 | 2.9 (" " ") |
| 8..... | 5.56 | 14.1 | 2.54 |
| 9..... | 6.0 | 14.7 | 2.45 |
| 10..... | 6.05 | 16.3 | 2.70 |
| 11..... | 6.00 | 20.2 | 3.36 |
| 12..... | 10.3 | 35.2 | 3.42 |

in diameter as used in the rattler test for paving brick. The charge is given 2,000 revolutions in the case of broken stone and 4,000 revolutions in the case of gravel, at the rate of 30 revolutions per minute. The losses for

Table III.—Tests of Broken Stone with the New Apparatus Under Varying Conditions as to Charge and Number of Revolutions

| Sample. | Abrasive Charge. | Number of Revolutions. | Wear, per cent. | |
|-------------------------------|------------------|------------------------|-----------------|------------|
| | | | Medium Stone. | Soft Stone |
| DEVAL TEST. | | | | |
| 50 pieces, 5 kg..... | None | 10 000 | 5.28 | 10.3 |
| NEW TEST. | | | | |
| 50 pieces, 5 kg..... | None | 10 000 | 12.3 | 35.2 |
| 25 " 2.5 "..... | None | 2 000 | 5.3 | 14.9 |
| 25 " 2.5 "..... | 6 1/8-in. Shot | 2 000 | 6.0 | 17.1 |
| 25 " 2.5 "..... | " " " | 4 000 | 10.0 | 27.1 |
| 25 " 2.5 "..... | " " " | 6 000 | 13.4 | 35.1 |
| 25 " 2.5 "..... | " " " | 8 000 | 16.6 | 42.5 |
| 25 " 2.5 "..... | " " " | 10 000 | 19.3 | 48.2 |
| 1 to 2-in. sizes, 2.5 kg..... | " " " | 2 000 | 7.3 | 19.3 |
| 1 to 2 " " 1.25 "..... | " " " | 2 000 | 9.7 | 24.6 |
| 1/2 to 1 " " 1.25 "..... | " " " | | | |
| 1/2 to 1 " " 2.5 "..... | " " " | 2 000 | 9.9 | 23.0 |

both stone and gravel for this shortened test are approximately the same as for a full 5,000 g. sample for 10,000 revolutions, without an abrasive charge.

Results of Tests

Table III. gives the results of tests upon broken stone under different conditions as to charge and number of revolutions. The next to the last item gives the results

of the standardized test with the new apparatus as arranged at present.

Table IV. shows the results of the standardized test with the new apparatus upon gravels. For the purpose of comparison and study, the gravels were selected particles from the local gravel deposits synthetically grouped as shown. Except where otherwise stated the results are the average of at least three tests.

The apparatus here described has been devised at the Laboratory for Testing Materials, Purdue University, to fill the need of a rapid and practical abrasion test for road materials of all kinds. The machine is simple in con-

Table IV.—Results of the Standardized Test with the New Apparatus on Various Gravels

| Trap. | Gravel Content, percentage by Weight. | | | | Wear, per cent. | |
|-------|---------------------------------------|---------|------------|------------|-------------------|-------------------|
| | Granite. | Quartz. | Limestone. | Sandstone. | 2000 Revolutions. | 4000 Revolutions. |
| 100 | 0 | 0 | 0 | 0 | 0.4 | 1.08 |
| 0 | 100 | 0 | 0 | 0 | 1.48 | 2.60 |
| 0 | 0 | 100 | 0 | 0 | 2.04 | 3.48 |
| 0 | 0 | 0 | 100 | 0 | 2.24 | 4.52 |
| 0 | 0 | 0 | 0 | 100 | 15.52 | 23.04 |
| 50 | 5 | 5 | 40 | 0 | 1.5 | 2.5 |
| 50 | 5 | 5 | 35 | 5 | 3.2 | 4.5 |
| 50 | 5 | 5 | 30 | 10 | 4.0 | 5.9 |
| 50 | 5 | 5 | 20 | 20 | 5.2 | 9.0 |
| 50 | 5 | 5 | 10 | 30 | 7.0 | 10.5 |
| 50 | 5 | 5 | 0 | 40 | 10.0 | 14.0 |
| 40 | 5 | 5 | 50 | 0 | 1.5 | 2.9 |
| 35 | 5 | 5 | 50 | 5 | 3.0 | 5.5 |
| 30 | 5 | 5 | 50 | 10 | 4.5 | 7.5 |
| 20 | 5 | 5 | 50 | 20 | 6.0 | 9.7 |
| 10 | 5 | 5 | 50 | 30 | 9.4 | 14.0 |
| 0 | 5 | 5 | 50 | 40 | 12.0 | 17.2 |
| 15 | 5 | 5 | 75 | 0 | 2.1 | 3.8 |
| 10 | 5 | 5 | 75 | 5 | 3.3 | 5.6 |
| 5 | 5 | 5 | 75 | 10 | 5.0 | 8.4 |
| 0 | 5 | 5 | 75 | 15 | 6.0 | 9.3 |
| 2 | 2 | 2 | 75 | 19 | 8.0 | 10.8 |

struction and acts upon the right principle by allowing the dust of abrasion to escape.

The tests of stone and gravel reported are given as representing certain local conditions. It is hoped that others will continue abrasion tests with this or a similar apparatus, especially in the field of gravels where very little testing has as yet been done.

"Progressive men on both sides of the Niagara frontier are agreed that even before the war a greater diversion of water from the Niagara River was justifiable, and that the present emergency merely changes the word justifiable into obligatory," says "The Engineer," of London, Eng., in a recent issue. "In round numbers, according to the 'Electrical World,' the flow of water and the head at Niagara Falls represent 5,000,000 continuous horsepower. Even at the low price of \$10 a horsepower year, the spectacle has a potential value of \$50,000,000 per annum. Can any nature lover contend that the view is worth any such sum, and would any government be justified in appropriating \$50,000,000 yearly to reproduce the attraction? With these self-evident facts in mind, it is difficult to understand why this profrigacy continues, especially when there is such urgent need of the power, a willingness to use more water on both sides of the border, and apparently nothing to stop it except the inertia of governmental bodies."