1. Maximum heave observed was 7 3 inches
2 The nature of the underlying soil or subgrade does not appear to influence the amount of heave nearly so much as do the drainage conditions Large heaves were measured where subgrade conditions were sandy as well as clayey, and small heaves were also measured under these conditions

At test station No 6, Duluth, Minnesota, numerous springs exist beneath the surface of the road and although an attempt was made to take care of the free water by using drain tile, very marked heaving occurs here each winter in spite of the fact that the drain tiles are operating throughout almost the entire year A large amount of rock and gravel was put here before the pavement was laid

SAND-CLAY ROAD INVESTIGATIONS

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Reviewing the 1923 report of this Committee, it appears that the statement of principles and methods therein need not be repeated

Much thought during the current year has been given to the idea that road soils and other pavements made by the formation of slabs from loose aggregates owe much of their durability and traffic service to mass action and internal physical bond The effort has been made to devise a means of studying this action in some of its phases in the laboratory and in the field After considerable disappointment with trial apparatus, an appliance has been devised which promises well and which, if not already in satisfactory shape, may be modified further.

A brief description of the test follows

THE DISC SHEAR APPARATUS

1 Discs of relatively large diameter and thin vertical dimensions are prepared under uniform conditions of mixing, tamping, and final compression Present standard uses a disc 4 inches in diameter and 1 inch thick, mixed up in moist condition for soils, thoroughly tamped and finally compressed under a total load of 25,000 pounds, or very nearly 2,000 pounds per square inch
2. The discs are dried to constant weight
3 The test is made by centering the disc enclosed in a snug fitting steel ring over a circular die opening of ¾ inch diameter, above which a steel plunger, accurately aligned with the die and ⅝ inch in diameter, is made to force or punch a plug of the material through the die ring
4. On road soils, the test is made first on the dry discs, and is followed by tests of similar discs containing specific percentages of water
5 The water is added and diffused through the discs as follows The surface of the disc is covered with blotting paper, well

moistened On top of this, a Gooch crucible with asbestos filter is placed The dry weight of the disc being known, one-half of the water needed to give the desired per cent is placed in the crucible from which it gradually oozes out into the blotter and from the blotter is absorbed by the disc One surface having been treated thus, the disc is turned over and the other half of the water needed is similarly applied and absorbed During absorption, the disc is kept in a moist closet and left for at least 24 hours in order that uniform distribution of the moisture throughout the disc may be secured The moistened disc is weighed just before being tested, and the increase in weight measures the exact amount of water present

6 Successive tests with increasing moisture reveal the rate of diminishing shearing strength in the sample

7 For road soils, the hypothesis is

a That the plunger being small as compared with the mass of the disc, we are developing a stress distribution mainly of shear and partly of lateral displacement somewhat similar to what occurs on the road when a hard surface layer is pressed by a concentrated load into a weak or unsupported point of the subgrade

b That both the physical bond and adhesive values of the granular and fine ingredients are tested in a significant way

c That the influence of water in lubricating the movement and reducing the adhesiveness will be revealed slowly until enough water is present to cover with a hygroscopic film the surface of the particles, and thereafter its effect will be more rapid The absolute percentage of water thus becomes a function in part of the granular composition of the material and areas exposed

d. That probably a coarse-grained road soil will retain a larger percentage of its strength than a silty or highly-clayed soil, when account is taken of the comparative surface areas of the two materials

e. That the relation of the die opening to the test plunger should be such that a marginal distance equal to the diameter of the coarsest grain in the sample should be provided on each side of the plunger in order that such large particles may not become wedged in on entering the die

f That probably the supporting test ring instead of being rigid should be of thick rubber in order to permit a greater amount of lateral displacement and thus approximate the field condition of an extensive mass capable of lateral yield While this point is important, the test results with the existing rings show very consistent breaks on duplicate tests