boratory was established at Norris.

Foundation and embankment studies are being made at the Norris laboratory for the Chickamauga Dam near Chattanooga, Tennessee. These cover two earth dikes totalling approximately 4000 feet in length and about 50 feet in height.

Foundation studies are likewise being made of five sites in the lower Tennessee within 25 miles of Paducah, Kentucky. These cover four sites on the Ohio River above Paducah and one on the Tennessee near Gilbertsville, Kentucky. Their purpose is to aid in selecting the best of the four Ohio River Sites and to determine the strength and settlement characteristics of the soil at the Gilbertsville site.

Approximately 12 miles of highway fill in the Guntersville reservoir area are being studied.

No. A-15 REPORT ON WORK OF THE AMERICAN SOCIETY FOR TESTING MATERIALS FOR A.S.T.M.

C. A. Hogentogler and W. J. Housel, Delegates to this Conference

Its Purpose and Work. The American Society for Testing Materials was organized in 1898 and formally incorporated in 1902 as a national technical society. Its specific purpose is "the promotion of knowledge of the materials of engineering, and the standardization of specifications and the methods of testing." This work is accomplished in two ways: (1) through the presentation of scientific and technical data in the form of papers and discussions; and (2) through the activities of its technical committees appointed to study the properties of various materials.

Membership. The members, which include representatives of most of the important industries of the country, can be roughly classified into three groups: (1) producers of raw materials and semi-finished and finished products; (2) consumers of materials; and (3) a general interest group comprising engineers, scientists, educators, testing experts, research workers, and the like.

Standardization. Of special importance in A.S.T.M. work is standardization as applied to both methods of testing and specifications for materials of engineering. The development of standard specifications and methods of testing is handled by some 60 standing committees comprised of outstanding experts of the country in their technical fields. The A.S.T.M. committee organization is very well adapted to develop specifications, for each committee is made up of producers familiar with the limitations of the manufacturing processes and consumers fully acquainted with the requirements and the various uses to which the material is put.

Before a proposed standard is finally adopted by the A.S.T.M. it must receive a rigorous examination in the committees, in industry, and by the Society as a whole. Constructive criticism is stimulated by publishing all proposed standards for a year or more as tentative in the Proceedings of the Society, which are issued annually and aggregate 1800 to 2000 pages.

By means of overlapping of both special projects and personnel, and by official representation of other bodies upon A.S.T.M. committees, the work of the Society is well coordinated with that of other national American organizations, with a minimum of duplication of effort, since the aims of other organizations either are different from those of the Society or are not as comprehensive in scope as related to the subject of engineering materials.

Thus, with respect to soils, the following four American organizations are engaged in work on various aspects of the subject: Society for the Promotion of Engineering Education, American Society of Civil Engineers, American Association of State Highway Officials, and the Highway Research Board of the National Research Council. The Society for the Promotion of Engineering Education has to do primarily with the selection of the type of information to be included in college curricula. The American Society of Civil Engineers "was instituted in 1852, for the purpose of advancing engineering and architectural knowledge and practice, maintaining a high professional standard among its members, encouraging intercourse between men of practical science, and establishing a central point of reference and union for its members." While the purpose of the American Association of State Highway Officials is primarily for developing standards, they are limited to those required in the construction of highways. The Highway Research Board, organized as a project of the Division of Engineering and Industrial Research of the National Research Council, is distinctly a research organization whose purpose is to provide a national clearing house for highway research activities and information.

The work of the Society in engineering soils began in 1933 with the formation, in the A.S.T.M. Committee D-4 on Road and Paving Materials, of a Subcommittee on Soils for Highway Purposes. As a result of this committee's work, there was published in the Proceedings of the Society for 1935 tentative standard methods for (1) surveying and sampling soils for use in place as subgrade for highways, (2) preparing soil samples as received from the field for mechanical analysis and the determination of the subgrade soil constants, (3) mechanical analysis of soils, (4) test for liquid limit of soils, (5) test for plastic limit and plasticity index of soils, (6) test for centrifuge moisture equivalent of soils, (7) test for field moisture equivalent of soils, and (8) test for shrinkage factor of soils. (See Proceedings, American Society for Testing Materials, Vol. 35, Part I, pp. 940-982 (1935). Copies of these methods may be obtained by addressing American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa.)

In the spring of this year (1936) the Executive Committee of the Society approved the expanding of the Society's activities in soils by authorizing the formation of a separate Standing Committee on Soils

for Engineering Purposes. Included in the scope of the work of the new committee will be (1) standardization of all methods of undersoil exploration, sampling, and tests of soils to be used for engineering purposes; (2) testing apparatus; (3) nomenclature, symbols and presentation of data; and (4) the formulation of specifications for engineering soils exclusive of those used for road purposes, which will logically continue under the jurisdiction of Committee D-4 on Road and Paving Materials.

The program of this year's annual meeting of the Society to be held in Atlantic City, June 29--July 3 includes three papers dealing with the subjects of (a) internal stability of granular materials, (b) testing and design of stabilized soil mixtures, and (c) the sampling and testing of foundation soils. At the same time committee action for tentative standards of method of test is being started on procedures for (a) sampling of foundation soils, (b) performing the compression tests on soils, (c) performing the Proctor tests on compacted soils in the field, and (d) performing the stability tests on compacted soils in the laboratory.

The present coordination in the field of soils between the various national American societies and representatives of the teaching profession, the engineer, the research worker, and industry is indicated by the attached list of memberships in various Soils Committees and their professional connections (Appendix I).

The problems indicative of the work of the various committees of these organizations is indicated by the accompanying list of projects of the American Association of State Highway Officials and the Highway Research Board (Appendix II).

APPENDIX I
Memberships of Committees on Soils Investigations

Name	Official Connection	Technical Organization				
		1	2	3	4	5
Henry Aaron	Bureau of Public Roads	*				
H. Allen	Kansas Highway Commission	*	*	*		
L. L. Allen	Minnesota Highway Department	*				
A. A. Anderson	Portland Cement Association	*				
Geo. E. Beggs	Princeton University				*	
Louis Bendel	Consulting Engineer, Lucerne, Switzerland	*				
A. C. Benkelman	Bureau of Public Roads	*				
D. S. Berry	University of Michigan	*				
J. E. Boyd	Georgia State Highway Board			*		
S. J. Buchanan	U.S. Waterways Experiment Station, Vicksburg, Mississippi	*				
Fred Burggraf	Calcium Chloride Association	*				
Donald Burmister	Columbia University					*
Arthur Casagrande	Harvard University	*				**
B. Clemmer	Bureau of Mines, Rolla, Missouri	*				
H. F. Clemmer	D. C. Highway Department	*	*	*		
L. C. Campbell	New Mexico Highway Department			*		
C. A. Downing	St. Louis Municipal Testing Laboratory		*			
M. L. Enger	University of Illinois				*	
F. H. Eno	Ohio State University	*				
R. J. Fogg	Construction Engineer, Bethlehem, Penn.				*	
Josue Gallan	University of the Litoral, Santa Fe, Argentine	*				
A. L. Gemeny	Bureau of Public Roads	*				
Glennon Gilboy	Massachusetts Institute of Technology				*	
A. F. Gill	Canadian National Research Council	*				
Frank Gilmore	The Asphalt Institute	*				
L. E. Grinter	Texas A. and M. College					*
H. H. Hatch	Springfield Massachusetts Water Works	*				
W. B. Hicks	Solvay Process Company	*				
C. A. Hogentogler	Bureau of Public Roads	**	**	**		
C. A. Hogentogler, Jr.	George Washington University	*				
W. S. Housel	University of Michigan	*	*			
Fred Hubbard	National Slag Association		*			
F. N. Hveem	California Highway Commission	*				
H. T. Immerman	Spencer, White and Prentis, N.Y.				*	
H. T. Jenkins	Cornell University	*				
J. V. Keily	Rhode Island Department of Public Works			*		
W. P. Kimball	Dartmouth University	*				
D. P. Krynine	Yale University	*			*	*
J. W. Kushing	Michigan Highway Department	*				
F. C. Lang	Minnesota Department of Highways			*		
L. M. Law	Shell Petroleum Corporation	*				
R. R. Litehiser	Ohio Department of Highways			*		
C. D. Looker	International Salt Co.	*				
Anson Marston	Iowa State College				*	

Memberships of Committees on Soils Investigations

Name	Official Connection	Technical Organization 1	2	3	4	5
H. S. Mattimore	Pennsylvania Highway Department	*	*	*		
C. W. McClain	Indiana Highway Department	*				
James McCormick	New Hampshire Highway Department			*		
W. H. Mills, Jr.	South Carolina Highway Department	*				
E. McD. Moore	U.S. Engineer Corps	*				
Levi Muir, Jr.	Utah State Road Commission			*		
N. M. Newmark	University of Illinois	*				
George Paaswell	Corson Construction Corporation, N.Y.				**	
L. A. Palmer	Bureau of Public Roads	*				
R. R. Philippe	U.S. Engineer Corps	*				*
F. L. Plummer	Case School of Applied Science					*
H. C. Porter	Texas Highway Department	*				
R. R. Proctor	Los Angeles Department Water and Power	*			*	
L. F. Rader	Brooklyn Polytechnic Institute		*			
G. A. Rahn	Pennsylvania Highway Department	*				
Paul Rapp	Bureau of Public Roads	*				
F. V. Reagel	Missouri Highway Commission	*		*		
E. O. Rhodes	Koppers Products Co.	*				
H. Ries	Cornell University	*				
R. M. Rowat	Canadian Industries, Ltd.	*				
P. C. Rutledge	Harvard University	*				
R. C. Schappler	Missouri Highway Department	*				
W. J. Schlick	Iowa State College	*				
E. R. Shepard	Bureau of Public Roads	*				
A. R. Smith	Indiana Highway Commission	*				
M. G. Spangler	Iowa State College	*				
T. E. Stanton	California Highway Commission			*		
O. L. Stokstad	Michigan Highway Department	*				
D. W. Taylor	Massachusetts Institute of Technology	*				
Charles Terzaghi	Technische Hochschule, Vienna	*			*	
R. B. Travers	Onondaga Co., New York Highway Department	*				
Leroy Tucker	Ohio State University					*
Warner Tufts	Office of Federal Coordinator of Transportation	*				
H. C. Weathers	Florida State Road Department			*		
Lazarus White	Spencer, White and Prentis, New York				*	
S. T. Whitmer	University of Pennsylvania					*
E. A. Willis	Bureau of Public Roads	*				
H. F. Winterkorn	University of Missouri	*				
K. B. Woods	Ohio Department of Highways	*				
Joseph Zapata	Wisconsin Highway Department	*				

The following are the committees referred to in the columns headed by the numerals 1 to 5 inclusive:

1. Highway Research Board: Department of Soils Investigations.
2. American Society for Testing Materials, Committee D-4 on Road and Paving Materials: Subcommittee D-5 on Soils for Highway Construction.
3. American Association of State Highway Officials, Committee on Materials: Division I on Subgrades, Foundations and Soil-Bound Roads.
4. American Society of Civil Engineers: Committee on Earths and Foundations.
5. Society for the Promotion of Engineering Education: Committee on Foundations and Soil Mechanics.

**designates chairman.

APPENDIX II
Soil Investigation Projects
Committee on Materials, A.A.S.H.O.

DIVISION I. Subgrades, Foundations and Soil Bound Roads.

I-1. Definitions and terms.
I-2. Soil testing equipment and Apparatus.
I-3. Surveying, sampling and testing subgrade soils.
I-4. Specifications for graded soil road materials, limerocks, caliches and cherts.
I-5. Specifications for sub-base material.
I-6. Tests for foundation soils.

I-7. Tests and specifications for fill materials.
I-8. Tests for adsorptive adhesion.

Department of Soil Investigations, Highway Research Board

1. Standardization of nomenclature and definitions.
2. What information is desired by a practicing engineer.
3. Methods of exploring, surveying and sampling soils for highway purposes.
4. Methods of determining in place the physical characteristics of foundation and subgrade soils.
5. Methods of testing disturbed soils and the application of the test results in practice.
6. Laboratory determinations of the properties of foundation soils in their natural state and the application of test data in practice.
7. Methods of compaction for control and construction and their effect upon the properties of soils for highway purposes.
8. Practical design of drainage for highways and airports exclusive of bridges and culverts.
9. The effect of disturbing the natural structure of a soil on its supporting power.
10. Committee on testing equipment and apparatus.
11. Stress distribution in earth masses
    a. Load due to own weight
    b. Load through pavements
    c. External loads on foundations.
12. Physico-chemical testing of soils and the application of the results in practice.
13. Stabilized soil road surfaces.

No. A-16 SOIL MECHANICS LABORATORY AT THE THAYER SCHOOL OF CIVIL ENGINEERING

Wm. P. Kimball, Assistant Professor of Civil Engineering, Thayer School of Civil Engineering, Hanover, N.H.

The Soil Mechanics laboratory at the Thayer School of Civil Engineering was established by the author in 1933, primarily for the purpose of instructing civil engineering students in the elements and fundamentals of soil characteristics and soil tests; secondarily, to enable the author to pursue such research as time might permit. The laboratory is contained in a single room having a floor area 20' x 22'. An adjoining room 6' x 10' in size is in the process of being converted into a humid room.

Equipment.

Grain size determination: Standard Tyler sieves and an Eimer and Amend hydrometer reading from 0.995 to 1.030.

Moisture Content Determination: Watch glasses and electric drying oven.

Organic matter is determined by heating the sample in a graphite crucible held over a "Pyrofax" gas Bunsen burner flame.

The specific gravity of the soil particles is determined with ordinary Pyrex 500 cc pycnometers calibrated for temperatures between 16°C and 30°C.

The plate used for immersing Shrinkage Limit test specimens in a dish of mercury has three nail heads, each about $\frac{1}{4}$" long attached to one side by means of liquid solder.

The Liquid Limit device (Fig. 1 and 2) is built in accordance with the specifications published in Public Roads, October, 1932. For economy, the cup consists of the bowl of a soup ladle which may be bought for ten cents at any five-and-ten cent store. The ladle happens to correspond almost identically with the specifications except that it is metal-plated and lighter in weight. The discrepancy in weight has been compensated for by fastening strip lead to the edges of the cup. The groover was made from steel and case hardened, the size and shape conforming to the specifications referred to.

The consolidation device (Fig. 3 and 4) for $2\frac{1}{2}$ inch specimens, together with the special loading machine, (Fig. 5) accommodating four tests simultaneously, have been described in Engineering News-Record, February 27, 1936, page 324. Undisturbed specimens are introduced into the removable testing ring as described in the Proceedings of the American Society of Civil Engineers, August, 1933, page 1063. The form used for reporting test results is shown in Fig. 6.

Permeability tests are made with an ordinary 2" x 8" glass capillarity tube and a variable head permeameter, illustrated in Fig. 7. The capillarity tubes have been used also as variable-head permeameters.

The laboratory is equipped with a sampling tube similar to the one shown in Fig. 2 of the author's paper No. F-4, Vol. I. A special cap is used for driving the sampler with a mall when surface samples are to be taken for testing in the laboratory course. Samples 3" in diameter and about 18" long are obtained, immediately removed from the split liner tube, painted with paraffin and then immersed in paraffin which fills to overflowing the cardboard containers in which they are preserved. These cardboard containers are the standard one-quart ice-cream containers, $3\frac{1}{4}$" inside diameter, 7" long. The paraffin is melted in a pot over a "sterno" flame, and the only tools required are stillson wrenches or chain tongs for opening the sampling tube.

The lever loading device shown in Fig. 8 was built for experimental model tests. It has a capacity of 2000 lbs. and is equipped with an Ames dial for reading the deflection of the loading lever directly