The Spring-scale cone does not apply to pure sand, and the poor results obtained in sandy soil with only a small content of clay scarcely correspond to the actual bearing power of the soil.

The average relation of the Spring-scale index "S" to the Danish Fall-cone firmness index "K" (Konsistenstal) is, for Moraine clay, by Mr. A. Bretting (Chief Engineer of Christiani and Nielsen, Copenhagen) found to be

$$S \ (Kg/10 \ mm) = 1.4 \ K \ (kg/10 \ mm)$$

This corresponds fairly well to the findings of the author.

The length of the spring-scale cone is 215/mm and the maximum diameter of the cone 25 mm, so that the apparatus is easily carried in a pocket.

The weight is 0.20 kilogramme, including the leather case 0.25 kilogramme.

No. A-12 RECENT PROGRESS OF RESEARCH WORKS ON SOIL MECHANICS IN JAPAN, ESPECIALLY ABOUT SOME SOIL MECHANICS LABORATORIES

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Research in Soil Mechanics in Japan substantially started after the Great Earthquake in 1923. At present almost all universities and Higher Technical Schools which have Civil Engineering Departments give instruction on this subject and some of them have special laboratories for this purpose. A few years ago the Government Railway appointed the Geotechnical Committee to investigate the matter on this subject relating to the Government Railway. The equipment of the laboratory attached to the Committee is listed in the following table:

EQUIPMENT OF THE SOIL MECHANICS LABORATORY, JAPANESE GOVERNMENT RAILWAY

Name of Equipment	Size and Capacity		Number
Shear Test Machine	Max. Compression	30 tons	
	Max. Shearing force	60 tons	1
	Shearing area	20 x 20 cm	
	Sensitivity	100 kg	
" " "	Max. Compression	1000 kg	
	Max. Shearing force	1500 kg	6
	Shearing area	20 x 20 cm	
	Sensitivity	1 kg	
" " "	Max. Compression	500 kg	
	Max. Shearing force	1000 kg	2
	Shearing area	10 x 10 cm	
" " "	Max. Compression	5 kg	
	Max. Shearing force	10 kg	2
	Shearing area	4 x 4 cm	

Apparatus for mechanical analysis			25 sets
Consolidation Testing apparatus (Terzaghi's Type)	Max. Compression	2500 kg	2
Testing machine for Direct Compression	Max.	1000 kg	1
	Sensitivity	5 gr	
Testing apparatus for Direct Compression with variable speed		3 kg	1
Permeability Tester			1
Testing apparatus for consistency of soil (Atterberg's Type)			4 sets
Testing apparatus of model piles			3
Core Boring apparatus			3
Boxes for transportation of soil samples			100
Foundation prospecting apparatus by seismograph			1 set
Photoelastic instrument			1
Total area of laboratory			500 m^2

The subjects at present studied are as follows:

(1) Determination of economical slopes of embankment and out, measuring the internal friction and cohesion of soils by the shear test machines.

(2) Determination of economical forms and thickness of the lining of tunnels.

(3) Studies about economical design of the foundations of various structures, especially on the weak strata.

(4) Studies about the physical and mechanical properties of soils.
(5) Studies on the geophysical prospecting by electrical and seismic methods.
(6) Studies on the pressure distribution under the foundation of various structures.

The Soil Mechanics Laboratory of the Tokyo Imperial University is not yet completed. It has only one special room for the mechanical analysis of soil and the other instrument such as shear test machines are installed in the laboratory room of the testing of materials in general. The equipment which has been installed up to the present time is as follows:

EQUIPMENT OF SOIL MECHANICS LABORATORY TOKYO IMPERIAL UNIVERSITY

Name of Equipment	Size and Capacity		Number
Shear Test Machine	Max. Compression	1000 kg	
	Max. Shearing force	1000 kg	
	Shearing area	20 x 20 cm	1
	Sensitivity	1 kg	
	Electrically driven		
" " "	Max. Shearing force	10 tons	
	Shearing area, changeable		
	Hydraulic, mounted on the ordinary 100 tons testing machine.		
" " "	Small Shear test machine which is put in the ordinary testing machine.		1
	Shear area	4 x 4 cm	
Apparatus for mechanical analysis			5 sets
Consolidation testing machine			1
Small universal testing machine, especially designed for investigation of the mechanical properties of soils.	Max. Compression	500 kg	1
	Max. Tension	500 kg	
Testing apparatus for consistency of soil			1
A permeability tester and a curing box with constant temperature and humidity are going to be prepared in this year.			
Some 40 students are taught yearly in this laboratory about the soil mechanics.			

The new Japanese University at Tokyo has the following equipment:

EQUIPMENT OF THE JAPANESE UNIVERSITY, TOKYO

Name of Equipment	Size and Capacity		Number
Shear Test Machine	Max. Compression	1000 kg	
	Max. Shearing force	1500 kg	1
	Shearing area	20 x 20 cm	
" " "	Max. Compression	5 kg	
	Max. Shearing force	10 kg	2
	Shearing area	4 x 4 cm	
Consolidation testing machine			1
Compression testing machine			2
Permeability tester			2
Apparatus for mechanical analysis			1 set
Apparatus for consistency measurement			1 set
Total area of laboratory			200 m^2
Some 30 students are taught yearly in this laboratory			

Almost all the apparatus of the above mentioned laboratories are the machines and tools usually used in every soil mechanics laboratory. A single exception is the shear test machine which was designed by the author. A few remarks about this machine will be given. It is a double shear type. il is put in the Box A in Fig. 1. A is a square box of which the central part C is pushed by lever

F under vertical load P made variable with weight B. As the support G is made to slide horizontally we can determine force F for any amount of shear displacement. The force F is automatically described on a paper put on the drum H which moves with G and whose rotation gives the shear displacement of the part C. A typical diagram thus described for sand and clay is shown in Fig. 3 and 4 resp., the horizontal axis is shear displacement and the vertical is shearing force. It is remarkable that the two diagrams have entirely different features. Sand gives upper and lower yield points just the same as with the ordinary tension test of mild steel, whereas clay gives no "drop of beam" phenomenon.

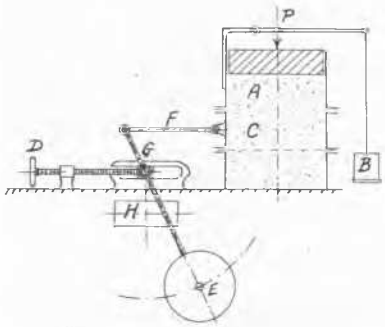

Fig. 1

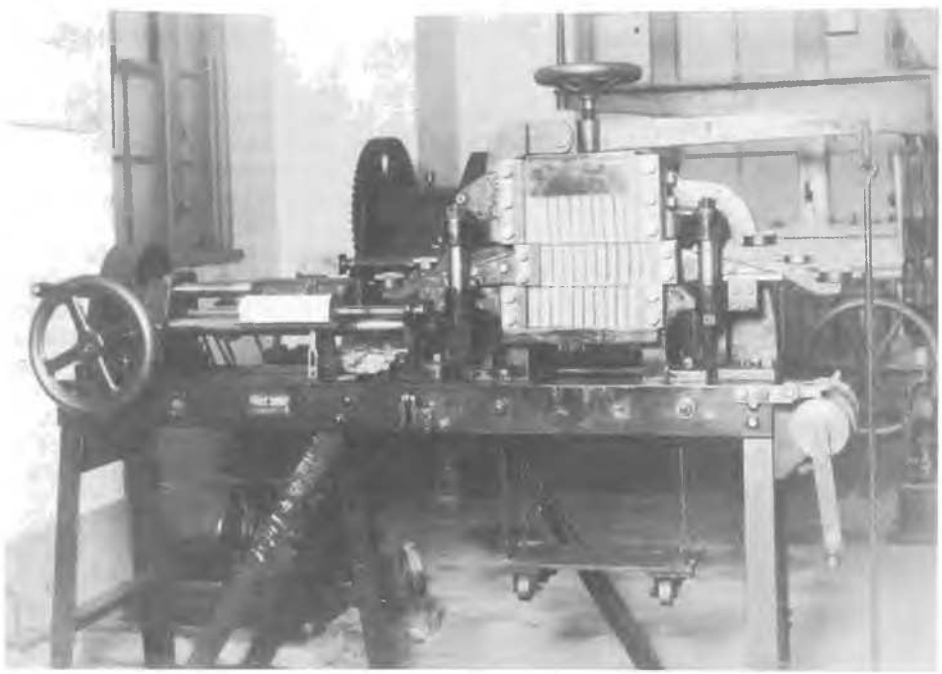

Fig. 2

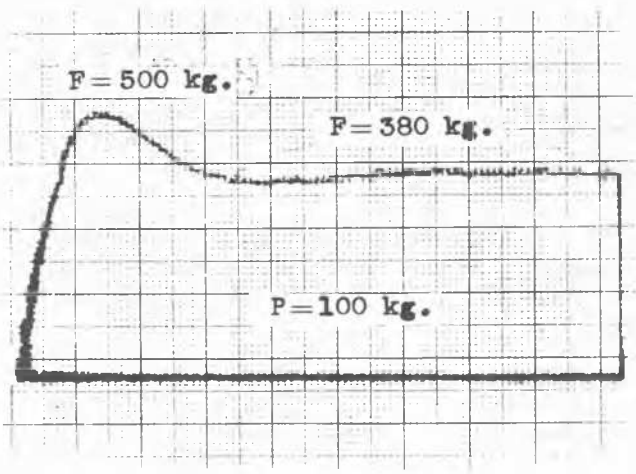

Fig. 3

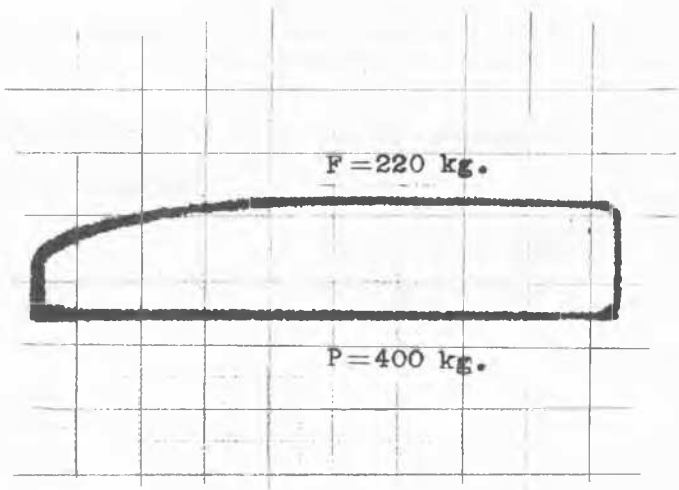

Fig. 4