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DOUBLING THE CAPACITY OF AN 800,000-LB. TESTING MACHINE

by Inge Lyse\*

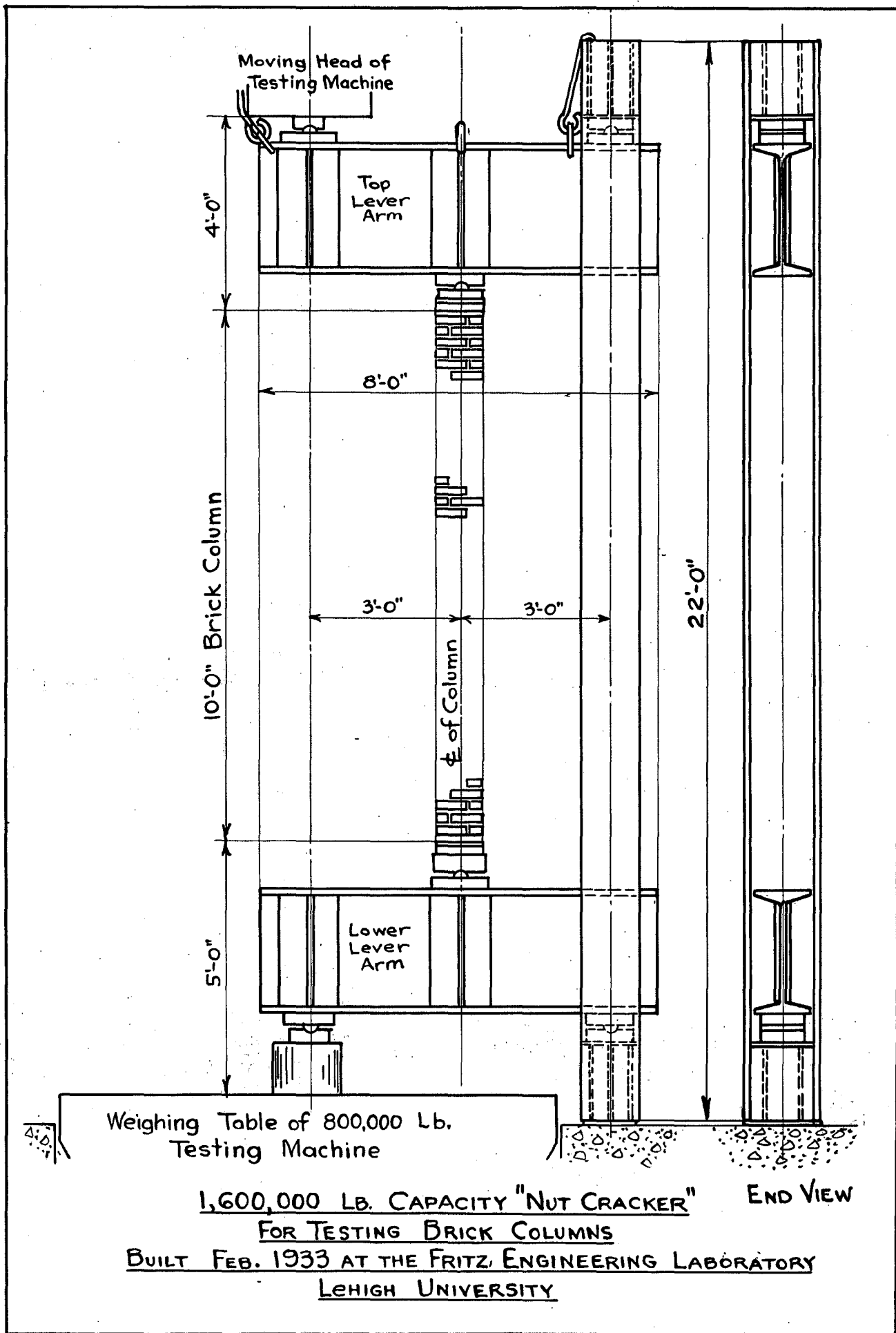
During the last few years the Fritz Engineering Laboratory of Lehigh University has frequently been requested to test specimens which exceeded the capacity of the 800,000-lb. machine. A recent investigation of reinforced brick columns made it necessary to find some way to apply loads of more than 800,000 lb., and a device was designed to double the compression capacity of the machine. A lever system working on the nut-cracker principle, by which the load on the test specimen is twice the load on the table of the testing machine, was built from two 30-in. Bethlehem I-beams 30 ft. long, which had been purchased several years before for other purposes. A tension member holds one end of the levers at a fixed distance apart and the movement of the head of the machine brings the other ends of the levers together, the test specimen being placed half way between the tension piece and the head of the testing machine. A sketch of the lever system is shown in Fig. 1. Roller bearings are provided in both directions at the top of the test columns and in one direction at the bottom. The tension member consists of the two flanges of a Bethlehem 30-in. beam from which the web has been cut. In order to give sufficient resistance to shearing stresses, the beam sections used as levers had to be reinforced with extra plates welded to the web. A photograph of the loading rig in place in the machine is shown in Fig. 2.

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In order to calibrate this loading rig a steel pipe 9 in. in diameter and 7/8-in. wall thickness, was borrowed from the Bethlehem Steel Company. This pipe was placed in the loading rig, load applied, and deformation readings taken on four 50-in. gage lines by means of 1/10,000-in. Ames dials. Both the pipe and the loading rig were then removed from the machine. The pipe was then placed directly in the 800,000-lb. machine, load again applied, and deformation readings taken. The load-deformation curves for both methods of tests are given in Fig. 3. It is noted that straight line deformation curves were obtained by both methods. The multiplication ratio between the load in the testing machine and that applied by the rig is found to be 2.02 and is constant within the range of the calibration. The multiplication factor aimed at was 2.00.

By means of this loading rig the capacity of the machine has been increased to 1,600,000 lb. in compression. The cost of this rig was very low as all construction work was done by the laboratory staff. The present set-up is convenient for the testing of sections 10 ft. long. By welding another support for the top lever at any desired height of the tension section, tests of shorter specimens may easily be made. The same type of lever system may readily be used to increase the compression capacity of any universal testing machine.

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Moving Head of Testing Machine

Top Lever Arm

4'-0"

8'-0"

10'-0" Brick Column

3'-0"

3'-0"

22'-0"

φ of Column

Lower Lever Arm

5'-0"

Weighing Table of 800,000 Lb. Testing Machine

1,600,000 LB. CAPACITY "NUT CRACKER"

END VIEW

FOR TESTING BRICK COLUMNS

BUILT FEB. 1933 AT THE FRITZ ENGINEERING LABORATORY

LEHIGH UNIVERSITY



MADE IN U.S.A.

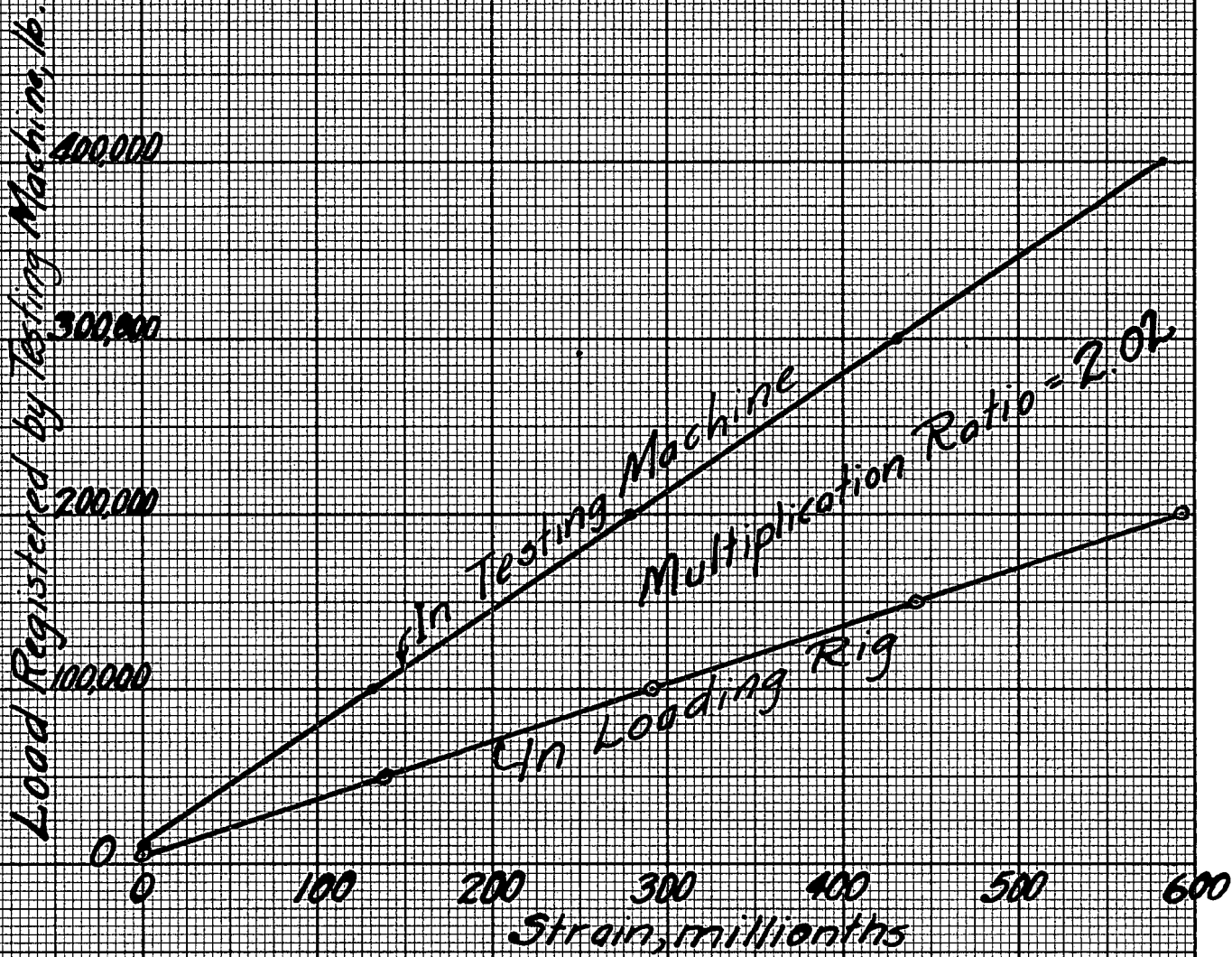


Fig. 3 - Calibration Diagram for Loading Rig.