increased rigidity, and thus exerts a continually increasing resistance, so that there is produced a more or less perfect equalization of stress throughout the portion of the beam under compression, and this equalization will doubtless materially affect both the elasticity and the strength.

An interesting paper on the surface-loading of beams was presented by Prof. C. A. Carus-Wilson to the Physical Society of London, (Eng.), and an abstract of this Paper is to be found in the author's treatise on the Theory of Structures.

The co-efficient of elasticity, as determined by the tranverse loading, is deduced from the formula

$$E = \frac{1}{4} \frac{\Delta W}{\Delta D} \frac{l^3}{bd^3}$$

W being the increment of weight corresponding to the increment ΔD of the deflection.

Here again an error Δd in the estimated depth will produce an error ΔE in the calculated co-efficient of elasticity measured by

$$\Delta E = -3 \frac{E}{d} \Delta d.$$

DOUGLAS FIR.

Beams I to III were sent to the Testing Laboratory by Mr. John Kennedy, Chief Engineer of the Montreal Harbour Works.

Beams I and II were of good average quality.

Beam I was tested on March 1st, 1893, with the annular rings as in Fig. 3. The load was gradually increased until it amounted to 45,000 lbs., when the beam failed by the tearing apart of the fibres on the tension face.

The maximum skin stress corresponding to the breaking weight of 45,000 lbs. is 4897 lbs. per square inch.

The co-efficient of elasticity, as deduced from an increment in the deflection of .23-in. between the loads of 3500 and 22,500-lbs., is 1,138,900 lbs.

Table A shows the several readings.

Beam II was tested on March 2nd, 1893, with the annular rings running as in Fig. 4.

The load was gradually increased until it amounted to 36,575 lbs., when the beam failed by shearing longitudinally.

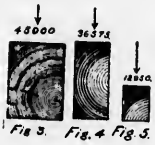

Fig 3. Fig. 4 Fig 5.

The maximum skin stress corresponding to this breaking weight is 4378 lbs. per square inch.

In connection with this experiment it is of interest to note that the timber, although it had failed by longitudinal shear, still possessed a very large amount of transverse strength, and similar facts will be subsequently referred to in the case of other beams. After the fracture, the load upon the beam was again gradually increased to 34,000 lbs. before a second failure occurred.

The co-efficient of elasticity, as determined by the increment in the deflection of .1 in. between the loads 2000 and 18,000-lbs., is 1,146,900 lbs.

Table B shows the several readings.

Beam III was tested on March 2nd, 1893, with the annular rings as in Fig. 5.

This Beam was of especially excellent quality, with clear, close, parallel grain, perfectly sound and free from knots.