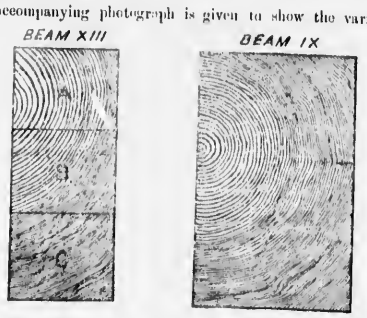
If 2 is adopted as the factor of safety, and in the opinion of the author, 2 is an ample factor for the great majority of cases, the rotting might extend without danger to a depth of 3.398 ins.

In the case of Beam XXV, which is the old stringer giving the least co-efficient of strength, namely, 4613 lbs. per square inch taking 2 as the factor of safety, the effective depth might be diminished by an amount of $\frac{15.85 \times 613}{2 \times 4613} = 1.04$ ins. and rot might safely extend to this depth.

Again, it will be observed that the skin stress and the elasticity are subject to a wide variation. This variation is due to many causes, of which the most important are the presence of knots, obliquity of grain, and, more than all, the locality in which the timber was grown, the original position of the stick in the log from which it was cut, and the proportion of hard to soft fibre, or of the summer to the spring growth. The tensile shearing and compressive experiments upon specimens cut out of different parts of the same log all shew that the timber near the heart possesses much less strength and stiffness than the timber at a distance from the heart.

The accompanying photograph is given to show the variation of



thickness in the growth rings from the heart outwards, and a careful study of the results obtained up to date would seem to indicate that the best classification defining the strength of the timber would be found by dividing the section of a log into three parts by means of two circles, with the heart as the centre, and by designating the central portion as third quality, the portion between the two circles as second quality, and the outermost portion as first quality.

A most interesting paper on the structural characteristics of Douglas Fir from a botanical standpoint was read by Professor Penhallow, F.R.S.C., at the meeting of the Royal Society of Canada in Ottawa, in 1894, in connection with a paper by the author on the strength of the timber.

RED PINE.

Beams XXVI to XXXIII were sent to the laboratory.

These beams were not specially selected, but were the ordinary scantlings in the market. They were cut from logs felled in February or March, 1893, in the neighbourhood of the Bonnechère River, Nipissing District, County Renfrew. The logs remained in the water from April until October, when they were sent to the mill, where they were sawn up and piled.

Beam XXVI. This beam was cut from the heart of the tree, and was tested March 13th, 1894, with the annular rings, as in Fig. 53.