TESTS OF CANADIAN TIMBER.

Strength of Douglas Fir, Red Pine, White Pine and Spruce.

An encouraging feature of the lumber trades is the consideration lumbermen are giving to forestry proposals, and the ascertaining, by scientific methods, of the enduring qualities of timber. It is not to have been expected, in a new country, such as this, that at the outset men who invested their capital in forest products, would have much thought outside of the commercial return that would come to them from the investments thus made. Immersed in the cares of business, material things have necessarily commanded a large share of attention. In Canada and the United States, however, we have reached a period when lumbermen have come to the conclusion that, rich as are these countries in timber resources, yet there can be an end to these riches. Consequently, more lumbermen to-day than at any other time, are thinking along the line of reforestation. We are free to admit that this interest grows slowly, but it is growing. So it is in the matter of testing the properties of timber grown in the woods. It is worth something to the lumber trade to know by scientific experiments just what is the degree of endurance and practical utility of the leading woods of the country. By knowledge of this kind, fresh markets can be opened up, and our own woods placed to uses that are not common to them to-day. The Forestry Department of Agriculture in the United States is giving considerable attention to this question, and during the present congress an appropriation of $40,000 was made that investigations in this direction might be made. Perhaps our Government has been too busy paying out money for sundry royal commissions to touch anything so material as lumber. But it is pleasing to know that within the educational institutions of the land, there are those who have given careful thought, and, out of their experience, made known to the public the strength of the leading woods of the Dominion.

Before us at the present writing is an exhaustive paper prepared by Mr. Henry T. Bovey, M. Inst. C. E., L. L. D., giving statements of results obtained in various experiments made to ascertain the strength of Canadian Douglas fir, red pine, white pine and spruce. Mr. Bovey is at the head of the technical department of McGill University, Montreal, Que., and the experiments made have extended over a period of two years.

DOUGLAS FIR.

Douglas fir of British Columbia is the first timber dealt with, and some of the experiments made were from beams sent to the Montreal Testing Laboratory by Mr. John Kennedy, chief engineer of the Montreal Harbor Works. It will be remembered by readers of the CANADA LUMBERMAN that within the past two or three years some of the finest Douglas fir timbers grown on the Pacific coast were shipped to Montreal to be used in harbor improvements. During the journey of these woods from Vancouver to Montreal, their immense length and size generally, as well as magnificent appearance, produced comment at many of the stations along the line, when en route. Other timbers of the same kind were forwarded to the Laboratory by the British Columbia Mills Timber and Trading Co., through its manager, Mr. C. M. Beecher. We shall not attempt in the present comments to give with any degree of detail the results recorded by Mr. Bovey, as this would mean much more space than we have at our disposal just now. Briefly summarized, however, the writer of the paper in question states that the following data may be adopted in practice. In the case of specially selected timber, free from knots, with sound, clear and straight grain, and cut out of the log at a distance from the heart:

Average weight in lbs. per cubic foot = 40.

Average co-efficient of elasticity in lbs. per sq. in. = 2,000,000.

Average maximum skin stress in lbs. per sq. in. = 9,000.

Safe working skin stress in lbs. per sq. in. = 3,000.

In the case of first quality timber, such as is ordinarily found in the market:

Average weight in lbs. per cubic ft. = 34.

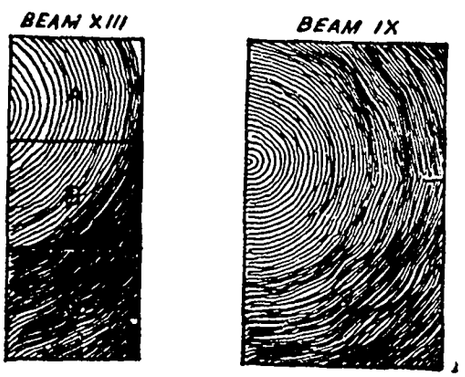
Average co-efficient of elasticity in lbs. per sq. in. = 1,430,000.

Average maximum skin stress in lbs. per sq. in. = 6,000.

Safe working skin stress in lbs. per sq. in. = 2,000.

Certain experiments were made from old Douglas fir, and it is remarked that the results obtained in the experiments with the old stringers show that the strength of the timber had been retained to a very large extent, and that the rotting had not extended to such a depth below the skin as to sensibly affect the efficiency of the sticks, which still possess ample strength for the work they were designed to do. The tensile shearing and compressive experiments upon specimens cut out of different parts of the same log all show that the timber near the heart possesses much less strength and stiffness than 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 outward, 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 3rd quality, the portion between the two circles as 2nd quality, and the outermost portion as 1st quality.

RED PINE.

Experiments made with red pine from timbers secured in the neighborhood of the Bonnechere River, Nipissing district, county Renfrew, are summarized as follows: The average weight in lbs. per cubic foot = 34.61; average co-efficient of elasticity in lbs. per sq. in. = 1,520,056; average maximum skin stress in lbs. per sq. in. = 5,370.

In general, the following data may be adopted in practice. Average weight in lbs. per cubic foot = 34.6; average co-efficient of elasticity in lbs. per sq. in. = 1,430,000; average maximum skin stress in lbs. per sq. in. = 5,100; average safe working skin stress in lbs. per sq. in. = 1,700, 3 being a factor of safety.

WHITE PINE.

The beams used as tests in white pine were cut out of one large piece of square pine made and taken out in the Gatineau Valley, Ottawa county. The timber was brought down via the Gatineau and Ottawa rivers to Montreal, and remained in the water until late in the fall of 1892, when it was piled on the land for winter sawing. Three old white pine stringers were also sent to the Laboratory. These had been in service since 1885, for about eight years. The summary of the results obtained for white pine is as follows: For new timber, the average weight in lbs. per cubic foot = 37.88; average co-efficient of elasticity in lbs. per sq. in. = 754,265; average maximum skin stress in lbs. per sq. in. = 3,388.

The following data are suggested for practice: The average weight in lbs. per cubic foot = 37.8; average co-efficient of elasticity in lbs. per sq. in. = 754,000; average maximum skin stress in lbs. per sq. in. = 3,300; average safe working skin stress in lbs. per sq. in., 3 being a factor of safety, = 1,100.

SPRUCE.

The stick of spruce sent to the Laboratory for experiment was cut out of a tree felled near the Skeena River B. C., about 600 miles north of Victoria. It is remarked as a possible item of interest that the freight for this beam from Claxton to Victoria was $4.; from Victoria to Vancouver, $2; from Vancouver to Montreal, $46., and the cartage to the University, $4, making a total cost for freight of $56. It is said that spruce from the Skeena district is of specially fine quality, having a clear straight grain, and possessing a large amount of toughness. The old spruce used for tests came from the Sherbrooke district, and had been used in the construction of a bridge near Lennoxville in the winter of 1886-87, and had been in service until the summer of 1894, or for a period of about 8 years. The experiments with spruce have not been as complete as Mr. Bovey would have liked, but he says the old spruce stringers were found to possess ample strength and stiffness for the work they were designed to do. The experiment gave: 29.15 lbs. as the average weight per cubic foot; 1,189,800 lbs. as the average co-efficient of elasticity; 3,875 lbs. as the average maximum skin stress per sq. in.

COMPRESSIVE STRENGTH.

The experiments to determine the compressive strength of the various timbers have been chiefly made with columns cut out of the sticks already tested transversely. These columns were in the first place carefully examined, to see that they had suffered no injury. The following inferences may be drawn:

(1). The compressive strength of Douglas fir and of other soft timbers is much less near the heart than at a distance from the heart. The compressed strength of the timber increased with the density of the annular rings.

(2). When knots are present in a timber column, the column will almost invariably fail at a knot, or in consequence of the proximity of a knot.

(3). Any imperfection, as, for example, a small hole made by an ordinary cant-hook, tends to induce an incipient bending or crippling.

(4.) When the failures of average specimens commence at an initial bending the compressive strength of columns of about 10 to 25 diameters in length agree very well and the results obtained by Gordon's formula, the co-efficient of direct compressive strength per sq. in. being 6,000 lbs. for Douglas fir and 5,000 lbs. for white pine.

(5.) The greatest care should be observed in avoiding obliqueness of grain in columns, as the effective bearing area, and therefore also the strength, are considerably diminished.

(6.) If the end bearings are not perfectly flat and parallel, the columns will in all probability fall by bending concave to the longest side.

(7.) The average strength per sq. in., indifferent of the ratio of length to diameter is: 5,974 lbs. for new Douglas fir; 6,265 lbs. for old Douglas fir; 4,067 lbs. for new red pine; 3,843 lbs. for new white pine, 2,772 lbs. for old white pine, 3,617 lbs. for new spruce, (B. C.); 5,136 lbs. for old spruce. It should be pointed out that none of the old Douglas fir columns exceeded 4.4 diameters in length, while the great majority of the new Douglas fir columns were from 4 to 25 diameter in length. This explains the reason of the greater average compressive strength of the old Douglas fir, and similar remarks apply to the new and old spruce.

Interesting experiments were also made directed to the comparison of the tensile strength and stiffness of portions of the same stick, in different positions relatively to the heart.

PROFIT IN LITTLE THINGS.

It is a well known business fact that many large buyers reclassify and reselect car load lots of lumber and find a profit in so doing. But there are many of the smaller mills that would find a large profit in doing the same. The small country mill can discover from his stock some as fine quality of extra quarter-sawed oak as can be turned out by the best and most improved methods of cutting. There is no possible way in which an oak log can be sawed without producing some quartered pieces. If the mill man will carefully select these and pile them by themselves he will in time have on hand a supply of first-class stock of dry quartered oak that will bring him in some extra money without having impaired the grade of the general stock. It is worth trying, at least.

The Savanne Lumber Co., Penetanguishene, Ont., are applying for incorporation with a capital stock of $48,000, for the purpose of building and operating mills for the manufacture of lumber, etc.