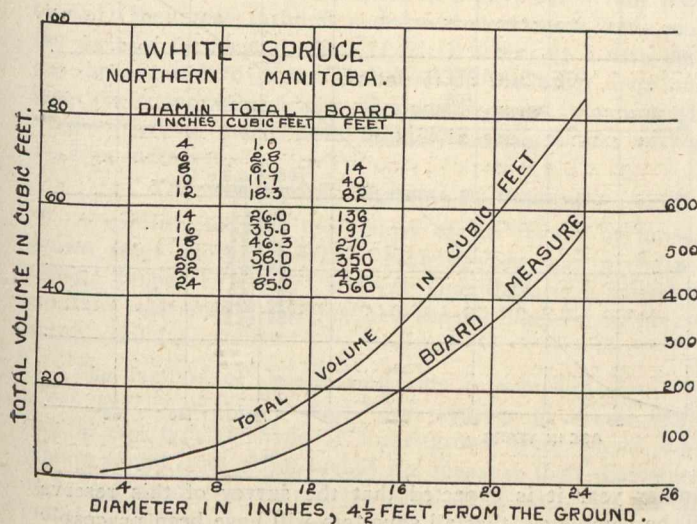


not counted, and on strong slopes discount is made. On very steep ground, indeed, steps taken are not a guide to distance, and judgment has to be resorted to in order to fill in the count. The count tells us when a line is approached, and enables us to pick it up with certainty, though it may be blind. But this means location may be made with considerable accuracy along the whole line. Having traversed the lines of a lot, noted the crossings of brooks and divides, taken the heights of essential points and noted and sketched whatever topography can be seen, we may then start from the middle of one side to run a line across the lot. In doing so it is best to use a pocket compass with a needle less than two inches in length, because a man climbing over the debris left, by cutting or shoving his way, head down through dense thickets of young fir will lose his direction in the course of a few rods. Now, if he has a compass in hand, he will stop and look at it, but he would do so less often if he had to set a staff, level a three-inch compass with folding sights and wait for the needle to come to a stand. From what has been said it is evident that a pedometer is of little use in this kind of work. For smooth going it answers very well, and does away with the necessity of counting, but on rough land its readings are no guide for distance.

On simple ground it is generally found that pacing once across each forty acre lot gives sufficient data to map the topography with sufficient accuracy for all ordinary purposes. Elsewhere there may be roads and streams to locate and divides that should be carefully put in. Here the compass and pacing method is still used, tying to the lines as often as may be. Travel in parallel straight lines is better, however, provided it is sufficient for the immediate



purpose in hand. The reasons for this are, first, that it gives more accurate results; and second, that systematic travel of this kind enables the timber land topographer to see a fair sample of all the timber on the land. In times past, one of the principal reasons for the notoriously inaccurate estimates given by many timber cruisers was that they did not get a fair average of all the timber, which they would have been able to get by travelling along evenly spaced and parallel straight lines running across the tract.

#### Is it Practical?

To those who say it is not practical to prepare a reliable topographic map by the methods just described, or that the cost is prohibitive, I would reply that in the autumn of 1896, Mr. Austin Cary, a practical timber cruiser, a graduate of the Yale Forest School and now Professor of Forestry at Harvard University, prepared such a map of Township 3, Range 5, in Franklin County, Maine. This township is six miles square, heavily timbered with spruce, and was gone over from four camps in a little over six weeks' time. Two weeks were then required in the office to work up the data collected in the field and prepare the map, which proved so valuable to the firm of Hollingsworth & Whitney, of Waterville, Maine, that other concerns were led to desire similar maps. The result was that, during the next few years, Mr Cary's services were greatly in demand for work of this nature, and that he has prepared maps of

this description for 200,000 acres of timber lands. Most of them are drawn to a scale of four inches to the mile, and have 50-foot contour lines representing the topography. As some woodsmen cannot easily read such maps, it was found advisable, in a few cases, to prepare cardboard or veneer models, which represent the land in miniature and show its main features just as clearly as if the men were on the land.

Taking the stumpage price of spruce at \$3.50 per M., and assuming that a township, containing thirty-six square miles, will average 5,000 board feet per acre, it is seen that we are dealing with a property worth \$403,200 in its present wild state, and easily worth \$500,000 by the time it can be got under proper management. From this it will be seen that an outlay of less than \$2 for every \$1,000 worth of property, or four cents per acre, will secure to the owners a first-class map of the topography of the entire township, which will enable them to sit in the office and discuss plans or let contracts with the same clearness as to details as if the men were on the land.

#### The Estimation of Timber.

Where the supply of timber is both plentiful and cheap, timber cruisers or "timber lookers" are generally employed to make ocular estimates of the contents of stands, but where it commands a better price it is now customary to constantly check the judgment of the estimators by means of measurements on sample areas properly distributed over the whole tract.

At the outset it should be clearly understood that ability to estimate the merchantable contents of a stand of timber can be acquired only through practice and experience in the woods. The estimator must be able to recognize the external signs of defect and have some knowledge of the local conditions of lumbering and be able to judge the cost of logging and milling before he can place a value on the stumpage. All this information is a matter of field training, and cannot be learned in a purely theoretical manner. It is a matter of good judgment and experience, and not a matter of mere method. This does not mean that there should not be any method in the procedure of making such an estimate, nor does it mean that one method is just as good as another. It does mean, however, that an estimator who is familiar with several methods of cruising is in a position to apply the method most suitable for the particular locality in which he happens to be working, and that his returns will be much more reliable than mere guesses.

In the case of ocular estimates, each cruiser does his work in his own way. Some multiply the **estimated** number of trees by the contents of the **average tree**, making due allowance for defects; others count the trees and multiply by the **estimated** contents of average trees, allowing for defects; and still others estimate the contents of each tree separately, making deductions for unsoundness and other imperfections. In the case of irregular hardwood stands, this latter is the only reliable method of estimating, because many of the older trees are almost worthless for saw timber, and would not pay for the cost of removing them.

The more defective the trees are, the more preferable is the judgment of estimators who have had long experience in the mill and in the woods to the methods of mere measuring. In sound timber, however, the method of measuring the trees on a known percentage of the total area is much preferable to the ocular estimate of a timber cruiser—no matter how experienced. Furthermore, a cruiser may be able to estimate pretty closely in the locality in which he has had long experience, and in a new region find himself very much "at sea." Possibly this fact explains the origin of the term "cruiser." Be that as it may, the cruiser finds it necessary to establish a new standard which will enable him to estimate correctly the contents of stands in the new region in which he finds himself. The quickest and surest way to establish such a standard is by a careful selection and exact measurement of representative trees in the stand. Having established his new standard of reference he is then in a position to correctly estimate the volume of the timber in the new locality in which he finds himself. When the timber is fairly uniform in size and evenly distributed over