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AN ALUMINUM TELESCOPING POLE FOR MEASURING TREE HEIGHTS

by

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Introduction

Accurate determination of the merchantable height of trees is one of the major problems confronting public forestry organizations and private companies who depend on periodic measurements of permanent inventory plots as a guide in forest management. The sampling technique popularly known as "continuous forest inventory," for example, requires accurate height measurement for thousands of trees. Use of an Abney Level for determining merchantable height is time-consuming; in northern hardwood forests, such devices may even be useless where leaves of a dense understory obscure the line of sight.

In order to provide an inexpensive means for estimating merchantable heights, poles of one sort or another have been employed. Bamboo poles have been most commonly used, although aluminum tubing has found favor with some. Rarely do these poles permit actual measurement to more than twenty or thirty feet; thus, sawlog merchantable height must usually be estimated, using the pole as a guide. In remeasurement, therefore, it becomes difficult to re-establish accurately the previous point of measurement for determination of height growth in the interval.

The aluminum telescoping pole described in this article was developed by the author for use at the Ford Forestry Center. It provides a convenient, easily manageable, and readily portable device for measuring heights up to 55 feet both rapidly and accurately. It has been used to measure merchantable height on more than 10,000 trees, and total height on an additional 1500. In use it has proven durable when given reasonable care and it requires minimum maintenance. Moreover, anyone can make the pole from materials readily available.

Description of the Telescoping Pole

The advantages of the telescoping pole are (1) light weight; (2) compactness; (3) rapid extension; (4) free movement of sections; (5) positive and easy locking and unlocking of sections; (6) ready adaptation to height of timber by removing or adding sections at either end; and (7) low cost. Construction details are presented in Figure 1.

A 12-section pole extends to 48 feet, yet weighs less than 14 pounds. Heights up to 55 feet can be measured with it, when the 7-foot reach of the average man is added. Cost of materials totals $29.78. Twelve-section poles are suitable for research work where production is not of such great importance and where great distances need not be traveled on foot. In practice, the merchantable length of less than 1% of the trees at the Ford Forestry Center exceeded heights which could be reached with the 12 section pole.

For most purpoees, however, the lower four sections of a pole can readily be removed. Weight then is reduced to only 5.2 pounds; however, heights up to 39 feet can be measured when a man's reach is included. This is adequate for most situations. Total cost of materials for the eight sections is $13.24.

The pole is constructed of nested sections of drawn aluminum tubing. Stock sizes, weight, and cost are given in Table 1. Since tolerance between sizes is not consistent for tubing available in stock sizes, a stop must be placed three inches from the bottom of the looser fitting sections. This prevents the sections from passing the locking spring (Fig. 1, A), which acts as a stopper in the closer fitting units. The problem could be eliminated through use of tubing made to specification. Although large quantities of any size tubing can be manufactured at the same cost as standard sizes, the cost for producing small amounts is prohibitive.

The locking pin (Fig. 1, A), made from a 1/4" brazing rod, can be shaped with a file while being rotated in a drill press or on a lathe. Locking pins for the smaller diameter sections can be reduced in length to about 1/4 of an inch.

A guide line groove (Fig. 1, C) should be scratched into the surface of each section and painted. The groove is necessary to prevent the paint from being rubbed off through repeated telescoping of the pole. The painted line serves as a guide for bringing the locking pin in the proper alignment with the hole in the preceding section, when the pole is being extended.

To make the measuring more rapid and accurate, the cumulative height should be marked at the top of each section (Fig. 1, D). A tape band (Fig. 1, E) to demarcate each section helps in determining the height of defective portions of the tree when the pole is extended to merchantable height. The bands also facilitate judgment of heights greater than the length of the pole and minimize the possibility that two sections will be extended together.

Procedure for Using the Pole

The procedure for measuring tree heights with the pole is as follows. The pole is set at the base of the tree. The second section is raised with one hand about six inches from within the third section so that the hole (Fig. 1, F) in which the locking pin must fit can be seen. Centering the guide line in with the hole, the first section is raised upward along the tree trunk until the spring (Fig. 1,A) locks the pin in position. Each section is raised in the same manner until the desired height is reached (Fig. 2). When measuring many trees the pole is lowered only far enough so it can be maneuvered readily around limbs when proceeding from tree to tree. When moving from one plot to the next, the sections of the pole are telescoped by depressing the locking pins, thus permitting each section to slide into the one below.

Table 1. Drawn aluminum tubing alloy 6061-T6 used in construction of a 12-section Telescoping pole.[1]

Length	Outside Dia. (Inches)	Wall Thickness (Inches)	Weight lbs.	Rate C. wt.	Cost
48"	2 1/4"	.083	2.62	$168.50	$4.42
54"	2"	.083	2.62	168.50	4.42
54"	1 3/4"	.083	2.25	163.60	3.68
54"	1 1/2"	.049	1.18	171.40	2.02
54"	1 3/8"	.035	.75	182.30	1.37
54"	1 1/4"	.049	.97	171.40	1.66
54"	1 1/8"	.035	.62	182.30	1.13
54"	1"	.049	.77	171.40	1.32
54"	7/8"	.049	.67	175.90	1.18
54"	3/4"	.049	.57	175.90	1.00
54"	5/8"	.049	.47	188.50	.88
54"	1/2"	.049	.37	188.50	.70
			13.86		23.78
		Cutting Charges (.50 per length)			6.00
					29.78

[1]The stock sizes listed are available through several distributors. Names of suppliers will be furnished on request. The four lower sections may be eliminated if a 32-foot pole will serve the purpose.

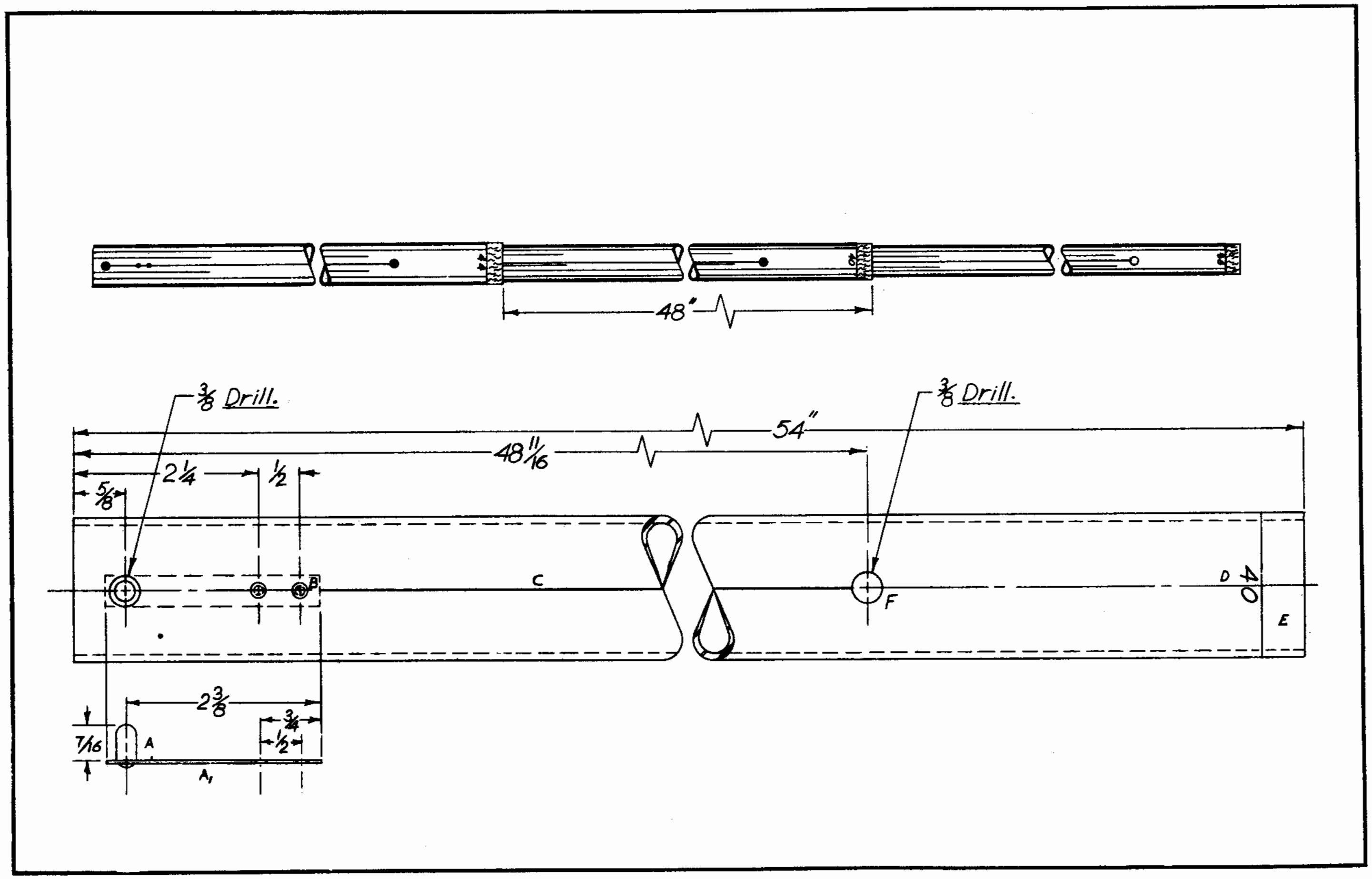

Figure 1. Drawing showing details of construction

A. Locking pin is 1/4" brazing rod riveted to spring.

A1. Spring steel locking spring, width 3/8" thickness 1/32".

B. 1/8" tin rivets used to attach spring.

C. Grooved painted line to guide locking pin to the hole in preceding section when section is being extended.

D. Cumulative height is scratched into each section.

E. Band of tape demarcates each section.

F. Hole in which locking pin locks when section within is raised.

Figure 2. Aluminum Telescoping Pole in use. Each section is raised until the desired height is reached.