C. A. LYFORD & E. L. KINMAN.

TREE MEASURING INSTRUMENT.

APPLICATION FILED AUG. 18, 1913.

1,105,149. Patented July 28, 1914.

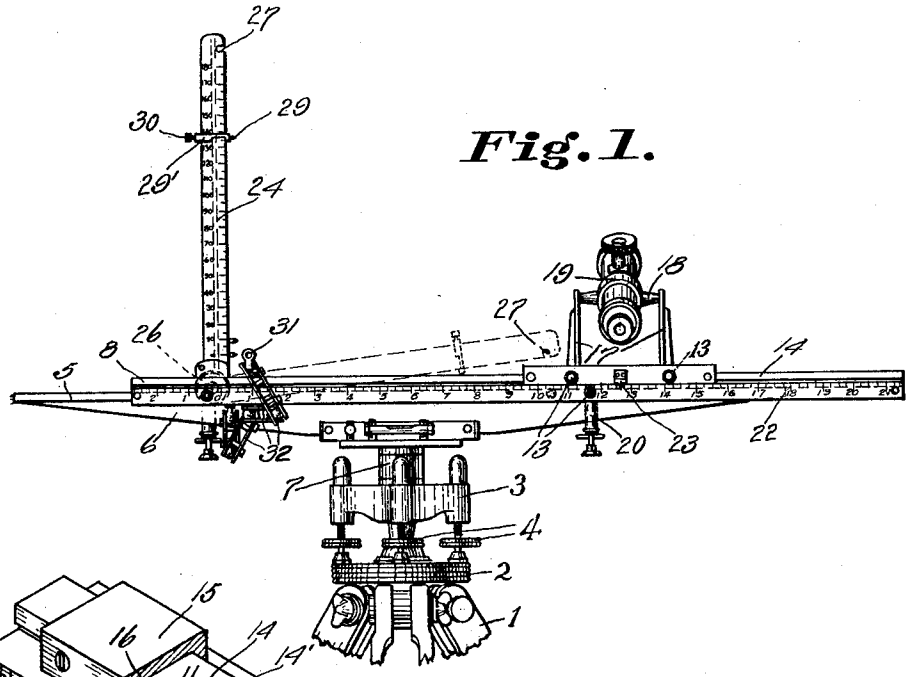

Fig. 1.

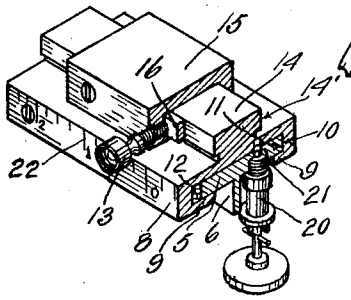

Fig. 3.

Fig. 2.

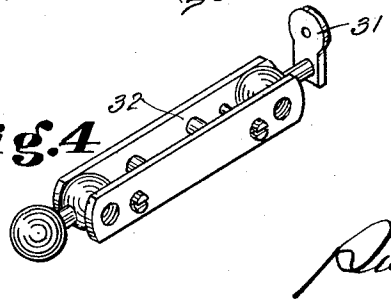

Fig. 4.

WITNESSES:

Horace Barnes

C. B. Gibbons.

INVENTORS

C. A. LYFORD

E. L. KINMAN

BY

Pierce Barnes

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CHARLES A. LYFORD AND EVERT L. KINMAN, OF VANCOUVER, BRITISH COLUMBIA, CANADA.

TREE-MEASURING INSTRUMENT.

1,105,149. Specification of Letters Patent. Patented July 28, 1914.

Application filed August 18, 1913. Serial No. 785,238.

To all whom it may concern:

Be it known that we, CHARLES A. LYFORD, a citizen of the United States, and EVERT L. KINMAN, a subject of the King of England, residing at Vancouver, in the Province of British Columbia, Dominion of Canada, have invented certain new and useful Improvements in Tree-Measuring Instruments, of which the following is a specification.

This invention relates to improvements in instruments for the measurement of standing trees for the calculation of the merchantable timber contained therein.

One of the objects of the invention is the provision of relatively simple and direct means for ascertaining the height of a tree or any portion thereof; such means employing the principle of proportional intersections of parallel lines, one of which is the tree to be measured and the other a vertical scale having fixed and movable sighting points.

Another object of the invention is the provision of simple mechanical devices for obtaining the diameter of a tree at any predetermined height, such as the point upon the tree selected as the upper termination of the merchantable timber contained in the tree.

The method employed utilizes a series of bars slidable relatively in longitudinal directions with a telescope mounted thereon to obtain the diameter of a tree by the projection of two parallel lines of sight with the result readable directly upon the apparatus. Thus with finding the length of a selected portion of a tree, the diameter of the tree at the upper extremity of said portion, and with the girth of the tree at the base or stump known which may be found by actual measurements, the cubic contents of the merchantable part of a tree may be calculated with celerity and sufficient exactness.

With the above objects in view, the invention consists in the novel construction, adaptation and combination of parts of tree measuring apparatus, as will be fully described in the following specification, illustrated in the accompanying drawings, and finally set forth in the appended claim.

In said drawings, Figure 1 is a view in front elevation of apparatus embodying our invention. Fig. 2 is a view of the same in side elevation. Fig. 3 is a fragmentary perspective view showing certain details of construction. Fig. 4 is a detached perspective view of the eye-piece for the height-measuring apparatus and a link of the adjustable supporting devices.

Referring to said views, the reference numeral 1 designates a tripod support, 2 and 3 the upper and lower leveling plates, and 4 the leveling screws. A horizontally disposed rail 5 having a longitudinal rib 6 is rigidly supported intermediate its length by a spindle 7 mounted for horizontal turning movements in plate 3 which are controlled by clamping and tangent screws (not shown) such as are usually employed upon surveyors' instruments. An extension bar 8 is slidably mounted upon said rail having inwardly directed flanges 9 upon opposite sides, engaging the underside of the rail. A lateral edge 10 of the rail is carefully trued to a straight edge and the adjacent opposing wall 11 of the bar is correspondingly finished upon its inner vertical face. Between the opposite lateral edge of the rail and the opposing wall of the bar is interposed a gib 12 extending the entire length of the bar, and secured at its ends thereto.

13 indicate thumb-screws threaded in the side wall of the bar and impinging upon said gib intermediate its ends adapted to impel the straight edge 10 of the rail against the corresponding straight edge 11 of the bar to insure accuracy of alinement.

An integral T-shaped longitudinal ridge 14 formed upon the upper side of the bar 8 is provided with a straight edge 14^1 upon the same side and corresponding with the edge 10. A block 15 having an interior slot adapted to receive said ridge is slidably mounted upon said ridge and provided with a straight edge upon its inner surface opposing the edge 14^1. A gib 16 with thumb-screws 13 is likewise provided upon the opposite side of said ridge between the latter and the block for an analogous purpose as explained for the gib 12. Rigidly positioned upon said block are spaced standards 17 in which are mounted trunnions 18 of a telescope 19 arranged at right angles to said bar 8. Said rail 5 and bar 8 are desirably of equal lengths and the latter is capable of and adapted for extension beyond the end of the rail in either longitudinal direction for a distance approximating three-fourths of its length. A latch 20 is provided near each end of said rail having a spring-pressed pin 21 adapted to project into one of a series of

holes in the underside of the bar 8. The outer lateral face of said bar is graduated in inches and fifths or tenths of an inch beginning at zero at or near an end of the bar to form a scale 22. The block 15 is provided with a pointer 23 indicating the respective graduation mark in vertical alinement with the longitudinal axis of the telescope.

The diameter of a tree at a predetermined point above the ground is obtained by setting up the instrument at a distance from the tree where a clear sight of said point may be had. The rail 5 and bar 8 may be arranged so that their extremities coincide and the block may be positioned in proximity of one end of the same preferably with its pointer 23 at zero of said scale and the telescope sighted upon one edge of the tree at the selected height until the vertical cross-hair within the telescope is in line with the respective edge of the tree. The tangent screw upon the upper leveling plate 3 may be usefully employed in securing accuracy and speed in obtaining such sight. The block 15 is then moved along ridge 14 until said cross-hair coincides with the opposite edge of the tree. The lineal distance as indicated by the pointer 23 upon the scale 22 between the positions of said sights, denotes the diameter of the tree at the height selected. The line of collimation or projection of the optical axis of the telescope in both sighting positions is parallel to the other; hence, if the instrument is accurate the distance between said lines of collimation at the tree may be read directly from the scale on the instrument. It is to insure this accuracy of alinement that the meeting edges and surfaces upon one side of the sliding parts are carefully straight-edged, as described, and the opposing sides are provided with gibs and thumb-screws to draw the parts closely together upon the straightened side. Should the diameter of the tree at the height selected be greater than the capacity of the scale in the fixed relation of the bar upon said rail, the bar may be extended in one direction or the other after the first reading and the extended distance added to the number of inches as read on the scale, as will be readily understood. Furthermore, the bar may be extended in both directions in a similar manner and thus greatly increase the scope of the instrument to include trees of the largest diameters at their tops.

Referring again to said drawings, the reference numeral 24 designates a flat strip of metal having a stiffening rib 25 upon its rear side. Said strip is pivoted at one end to bar 8 and may be secured in its perpendicular operative position or in its recumbent position by the thumb-nut 26. When not in use, the strip may be turned on its pivot parallel to the axis of said bar in which position a notch 27 of the strip engages with a pin 27^1 projecting from the bar. When thus positioned, and secured by the nut 26, the strip is not in danger of accident and is removed from the path of the telescope when the block 15 is moved along the bar. A graduated scale is inscribed on the front face of said strip having graduations preferably twenty to an inch, every tenth division numbered and intermediate fifths indicated. The strip may be graduated for ten inches including two hundred divisions, each of the latter indicating a foot in height upon the tree to be measured, as will be seen. Two fixed pins, denoted by 28, and 28^1, project from the side edge of the strip one-half inch apart, at the zero and "10" mark, respectively. A pin 29 is mounted upon a slide 29^1 exactly in line with said fixed pins and is movable with said slide longitudinally of the strip and may be secured in any position by thumb-screw 30. A peep-sight 31 is mounted upon one extremity of a series of universal-jointed links 32 which is fixedly secured at its other end to the bar 8 in proximity to said strip 24. The required attributes of said chain of links are adjustability of the peep-sight to various distances from the instrument and sufficient rigidity to hold itself in set position.

The height of a tree or a selected portion of said tree is obtained as follows: An assistant is stationed at the base of the tree with a rod, indicated at R in Fig. 2, having two targets (not shown) ten feet apart. Said rod is held perpendicularly against the tree with its lower target at about the height at which the tree will be cut; that is to say, at the stump. The peep-sight is moved to bring the two fixed points 28, 28^1 in line with the lower and upper targets of the rod, respectively. Then with the peep-sight in this position the slide 29^1 is moved until the pin 29 comes into line with peep-sight and point on tree to which elevation is to be measured. The position of the slide 29^1 on the vertical scale upon said strip 24 will give in feet the height of the point sighted above the lower height at the base of the tree. When the peep-sight is set so that the pins 28 and 28^1, which are one-half inch apart, subtend 10 feet vertical distance on the tree, each division on the vertical scale which is one-tenth of the distance between the two fixed points 28 and 28^1 will subtend one foot vertical distance on the tree.

With the height of the tree to a selected point obtained and also the diameter at that point and the diameter at the base, the calculation of the contents of a tree is a relatively simple matter.

The invention is extremely simple and its operation is devoid of complications either

mechanical or mathematical. It is relatively inexpensive to manufacture, is not liable to get out of order, and is relatively light and convenient to transport.

Having described our invention, what we claim, is—

A tree measuring instrument consisting in a support, a horizontally directed rail mounted on said support, a bar slidable longitudinally on said rail, a block slidable longitudinally of the bar, and a telescope mounted upon said block to be swung in a vertical plane at right angles to the longitudinal axis of said rail.

CHARLES A. LYFORD.
EVERT L. KINMAN.

Witnesses:
E. A. GILLETT,
H. FORREST.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."