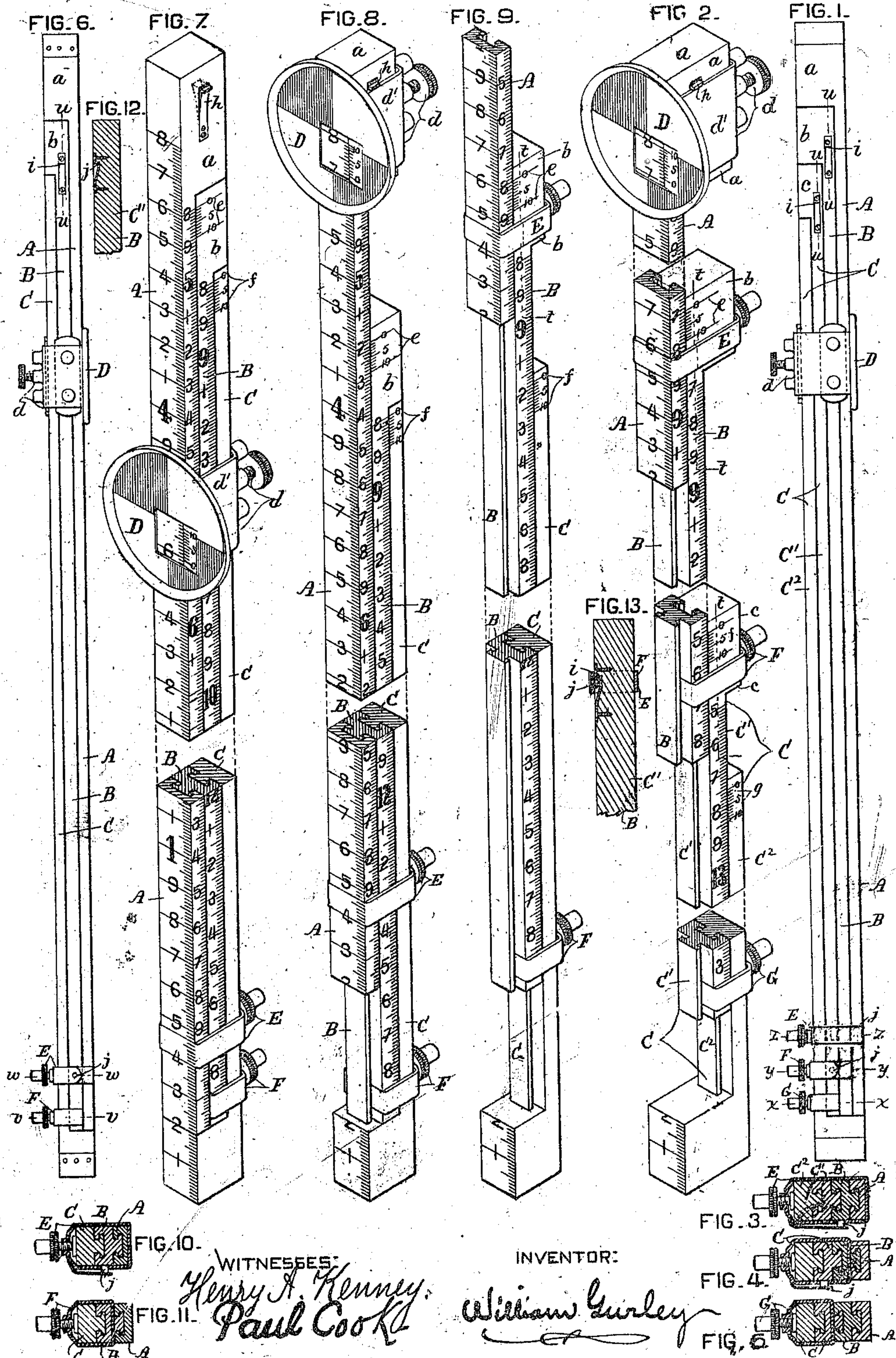


(No Model.)

W. GURLEY.  
LEVELING ROD.

No. 287,021.

Patented Oct. 23, 1883.





# UNITED STATES PATENT OFFICE.

WILLIAM GURLEY, OF TROY, NEW YORK, ASSIGNOR TO HIMSELF AND  
LEWIS E. GURLEY, OF SAME PLACE.

## LEVELING-ROD.

SPECIFICATION forming part of Letters Patent No. 287,021, dated October 23, 1883.

Application filed September 17, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM GURLEY, a citizen of the United States, residing in the city of Troy, in the county of Rensselaer and State of New York, have invented certain new and useful Improvements in Leveling-Rods, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to improvements in extension leveling-rods for use by civil engineers and surveyors. Such extension-rods are generally composed of two rods fitted to slide lengthwise one upon the other, and furnished with a sliding target, and graduated to about twelve or thirteen feet when fully extended and to about six or seven feet when closed, and with one index and vernier on the target and another on the upper part of the lower section, for indicating the height of the target when fastened on the more or less extended upper section of the rod. On such rods the index and vernier on the upper part of the lower section are so high above the eyes of the rodman that to accurately inspect and read the graduations by the index and vernier when the rod is extended he must first turn down or greatly incline the whole extended rod. The general object of my improvements is to avoid that great practical defect and produce a more compact and portable and easily-operated leveling-rod, which shall have the generally required capability of being extended to about twelve or thirteen feet, and which will allow a rodman of low or common height to read with ease and accuracy the graduations and the indications of the verniers on the upper parts of the lower sections of the rod while the rod is extended and remains in the upright or perpendicular position in which it is used. I accomplish that object by making a leveling-rod in three or more sections adapted to be slid lengthwise upon one another, and with heads or lateral projections on the upper end parts of two or more of the sections, and graduated and furnished with a sliding target and with clamping devices, substantially as hereinafter described, and

represented in the aforesaid drawings, in which—

Figure 1 is a side elevation of a leveling-rod having four slides, (shown closed,) and embodying one form of all the parts of my invention. Fig. 2 is an isometrical view of the same rod on a larger scale, showing the upper and lower end parts of all the slides when fully or partly extended, but not showing long intervening portions. Figs. 3, 4, and 5 are enlarged sections of the closed rod shown in Fig. 1, the sections being taken at the lines *z z*, *y y*, and *x x*, respectively. Fig. 6 is a side elevation of a leveling-rod having three slides, (shown closed,) and embodying one form of the principal parts of my invention. Fig. 7 is an isometrical drawing, on a larger scale, of the leveling-rod shown in Fig. 6, with all the slides closed and the middle parts of the slides removed. Fig. 8 is an isometrical view of the top and bottom parts of the same leveling-rod, with the target fastened to the head of a somewhat extended slide and the other slides closed. Fig. 9 is an isometrical view of parts of the same rod extended, the target and main upper portion of one fully-extended slide and the middle parts of the other slides being all removed. Figs. 10 and 11 are enlarged sections of the closed rod shown in Fig. 6, the sections being at the lines *w w* and *v v*. Fig. 12 is a lengthwise section of the upper end part of some of the slides of the same rods, the section being at the line *u u* in Figs. 1 and 6. Fig. 13 is a lengthwise section of parts of the same leveling-rods, taken at the lines *t t* in Figs. 2 and 9.

A, B, and C are three slides or rods connected together by dovetail tongues and grooves, as represented in the drawings, so that the part A can be slid to and fro lengthwise on the part B, and that the part B can be slid to and fro along the part C; but as regards my invention the rods A B C can be connected to slide along one another by means of any suitable known equivalents for the dovetail tongues and grooves. The sliding rod B has a head or part, *b*, above and extending over the top of the rod C, and the sliding rod A



has a head or part, *a*, extending over the top of the rod B and its head *b*, as clearly shown in the drawings.

In the leveling-rod represented by Figs. 1, 2, 3, 4, and 5 the rod or slide C is composed of two rods, *C' C''*, connected by a dovetail or recessed tongue and groove, so that the rod *C'* can be slid lengthwise on the rod *C''*, and the rod *C'* has a head or part, *c*, extending over the top of the rod *C''*, as clearly shown in Figs. 1 and 2.

D is a target furnished with a clamp, *d*, and adapted to be slid along and clamped at various heights upon the rod when its parts A, B, and C are closed together, as shown in Figs. 1, 6, and 7, and to be clamped fast to the head *a* on the rod A, above the rods B and C, as shown in Figs. 2 and 8.

The slide A is furnished with a clamp, E, constructed and arranged to fasten that slide at various heights along the slide B and to the head *b* of that slide, as indicated by Figs. 1, 2, 3, 6, 7, 8, 9, 10, and I furnish the slide B with a clamp, F, for fastening that slide at different heights along the part C, as shown by Figs. 1, 2, 4, 6, 7, 8, 9, 11.

In the leveling-rod represented by Figs. 1, 2, 3, 4, 5 the slide *C'* is furnished with a clamp, G, formed and arranged to fasten the slide *C'* at various heights along and upon the part *C''*, as indicated by Figs. 1, 2, and 5. The graduations start on the face of the rod, at its lower end, and I commonly make them in feet, tenths, and hundredths, and have verniers to read thousandths, as illustrated in the drawings, or in meters, decimeters, and centimeters, with verniers to read millimeters, or in feet, inches, and sixteenths. When the slides are all closed and the target D is slid along the rod, as in Figs. 1, 6, and 7, the height of the target is shown on the face of the rod by the target-index and vernier, which in Fig. 7 indicates 3.685 feet.

When the rod is closed, as in Fig. 7, and the target D is clamped to the slide A at the end of the divisions on the face of the rod, as at 4.8 in Fig. 7, the index and vernier at *e* on the side of slide B indicate the same height by the graduations on the side of slide A as in Fig. 7, and while only the slide A, with the target D thus fast thereon, is extended as in Fig. 8, the height of the target is shown on the graduations on the side of the slide A by the index and vernier *e*, which in Fig. 8 indicate 5.200 feet. When the slide A, with the target D clamped to its head, as in Figs. 2 and 8, is extended and fastened by its clamp E to the head of slide B, as in Figs. 2 and 9, and the slide B is partially extended, as in Fig. 9, the height of the target is shown on the graduations on the side of the slide B by the index and vernier *f* on the part C, which index and vernier indicate 9.185 feet in Fig. 9. When I construct the part C of the two rods *C' C''* as shown in Figs. 1, 2, 3, 4, 5, and the target D is clamped

to the head on slide A, as in Fig. 2, and the slide A is fully extended and fastened by its clamp E to the head *b* of slide B, and the latter slide is fully extended and fastened by its clamp F to the head *c* on the slide *C'*, and the slide *C'* is partially extended, all as illustrated in Fig. 2, the height of the target is then shown on the graduations on the side of the rod *C'* by the index and vernier *g* on the part *C''*, which index and vernier indicate, in Fig. 2, 12.756 feet.

In Fig. 7, *h* is a spring-catch fastened to the part *a*, over a recess therein, and constructed and arranged to engage with the side *d'* of the target-slide, as shown in Figs. 2 and 8, when the target is at the end of the graduations on the face of the rod, and so that the catch *h* can be depressed by hand to permit the target to be removed from and replaced upon the rod whenever necessary.

In Figs. 1, 6, 12, and 13, *i* is a stop in the upper end part of the slide B and of slide *C'* in Fig. 1, and *j* is a spring-catch secured to the lower end part of the slide A and of slide B in Figs. 1 and 4, and constructed and arranged, in respect to the graduations and index-lines on the slides, so that the target D can be freely slid over the stop or stops *i*, and that the catch *j* engages with the corresponding stop, *i*, as indicated in Fig. 13, when the slide A is extended to the right degree to be fastened by the clasp E to the head of the slide B, as in Figs. 2 and 9, and when the slide B is extended to the proper point to be fastened by its clamp F to the head of slide *C'*, as in Fig. 2.

What I claim as my invention is—

1. An extension leveling-rod composed of the slides A, B, and C, graduated, and having the head *a* and clamp E on slide A, the head *b* and clamp F on slide B, and the target D, furnished with a clamp, *d*, and fitted to be fastened to the head of slide A and at various heights on the rod when all the slides are closed together, substantially as described.

2. A leveling-rod composed of the slides A, B, and C, graduated, and having the head *a* and clamp E on slide A, the head *b* and clamp F on slide B, the part C composed of the graduated slides *C' C''*, with a head, *c*, and clamp G on slide *C'*, and a target, D, furnished with a clamp, *d*, and fitted to be fastened to the head of slide A and at various points along the rod when all the slides are closed, substantially as set forth.

3. A leveling-rod composed of the slides A, B, and C, graduated substantially as described, and having the head *a*, clamp E, and catch *j* on slide A, the head *b*, clamp F, and stop *i* on slide B, and the target D, furnished with a clamp, *d*, and fitted to be fastened to the head of slide A and at various places along the rod when all the slides are closed, substantially as set forth.

4. A leveling-rod composed of slides, grad-



uated substantially as described, and having  
the head *a*, furnished with the spring-catch *h*  
on the extension-slide A, and the target D,  
furnished with the clamping-slide *d d'*, and  
5 fitted to be fastened to the head *a* on slide A  
and at various places along the rod when its  
slides are closed, substantially as set forth.

In testimony whereof I hereunto set my  
hand, in the presence of two subscribing wit-  
nesses, this 12th day of September, 1883.

WILLIAM GURLEY.

Witnesses:

HENRY A. KENNEY,  
PAUL COOK.