

(No Model.)

D. C. WOLFE.

DEVICE FOR ASCERTAINING GRADES, &c.

No. 478,491.

Patented July 5, 1892.

Fig. 1.



Fig. 2.

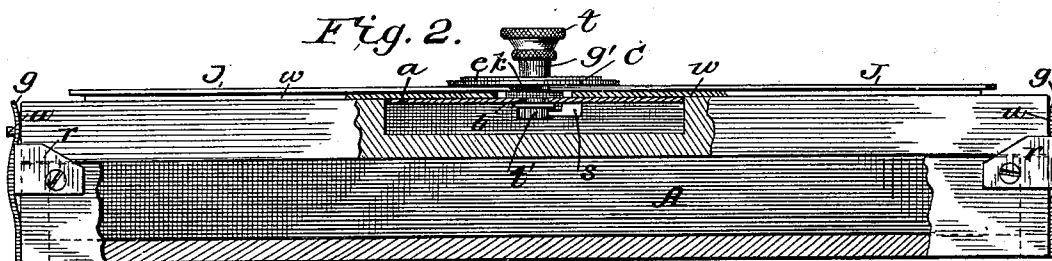


Fig. 4.

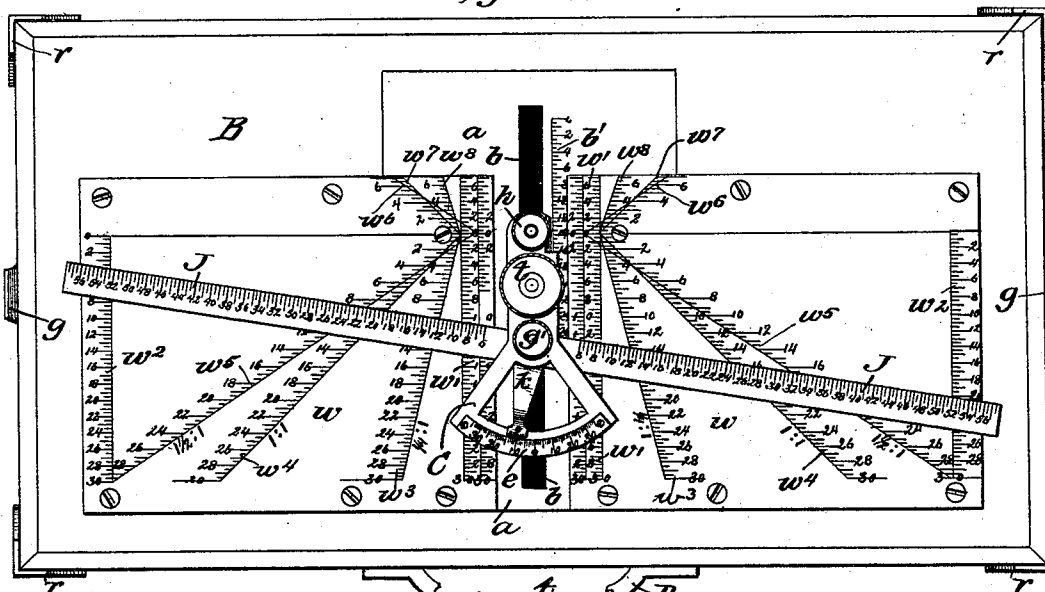
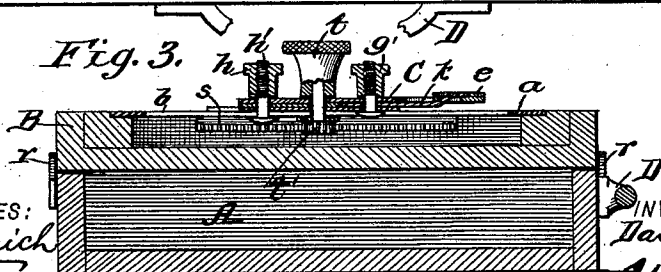


Fig. 3.



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DAVID C. WOLFE, OF LYONS, KANSAS.

DEVICE FOR ASCERTAINING GRADES, &c.

SPECIFICATION forming part of Letters Patent No. 478,491, dated July 5, 1892.

Application filed May 27, 1891. Serial No. 394,248. (No model.)

To all whom it may concern:

Be it known that I, DAVID C. WOLFE, of Lyons, in the county of Rice and State of Kansas, have invented a new and useful Improvement in Devices for Ascertaining Grades, &c., of which the following is a specification.

The object of my invention is to provide a device for ascertaining the position and heights of grades and cuts and the position of stakes and number of them; and it consists in the peculiar construction and arrangement of the various parts of the device, which I will now proceed to fully describe.

Figure 1 is an edge view of the device closed or folded for transportation. Fig. 2 is a longitudinal section of the hollow part of the case with the other portion in position for use. Fig. 3 is a transverse section of the device, and Fig. 4 is a plan view.

In the drawings, A represents a shallow wooden case provided with a handle D for carrying the same. This case has four corner plates *r*, which are constructed as angle-irons that form seats to receive and retain the flat base B, which carries the working parts of the device. At the ends of the case A are spring-clasps *g*, that have perforations that lock over short pins *u* on the base B, and prevent it from falling away from the case. The base B is adapted to be fastened upon this case A, with either one of its faces uppermost. Thus, for instance, in Fig. 1, it has its bottom face outside, the working parts being housed within the case, while in Fig. 2 the working parts are upon the outside, and the case A acts as a supporting-frame to sustain the portion B, the spring-catches *g* acting to hold the portion B in place in either of these positions. This is rendered practicable by locating the pins *u* in the middle line of the base-board B, so that they come in proper position to register with the spring-catches *g*, no matter which side of the base B is outward.

The base B is hollowed out or recessed about its middle, and above this is placed a cross-plate *a*, having in the same a slot *b*, running transversely to the base B, and upon opposite sides of the plate and lapping over upon the same are the two side plates *w w*. The plate *a* is marked with graduations at *b'*,

and the plates *w* are marked with graduations at the inner and outer ends, as at *w' w''*, and at intermediate points with diagonal lines of graduations *w³ w⁴ w⁵ w⁶ w⁷ w⁸*.

C is a carrier-frame, which has a short vertical shaft, with a turning-knob *t* at its upper end and a pinion *t'* at its lower end, which latter engages with a rack or toothed bar *s*, fixed in the base B beside the slot *b*. By turning the knob and pinion the carrier C may be adjusted to any position on the slot *b*. To hold it to its adjustment, a screw-clamp *h* is provided, which turns upon a threaded stem *h'*, having a head which bears against the under side of the edges of the slot *b*. The carrier C is formed at one end with a sector of a circle *e*, reading to thirty-five degrees to right and left from a central zero-point.

J is a graduated lever or rule hung at the center to the carrier and provided at this point with a screw-clamp *g'*, by which its position may be fixed. This rule is graduated to represent feet from its center to each end, and it swings over the face of the plates *w w* with a sweep or arc of seventy degrees. This rule J has a limb or arc *k* within the sector *e*, which limb is provided with a vernier scale reading to five feet.

The object of this device for ascertaining grades is to enable the calculator by the use of the instrument and the aid of mathematical tables and plates now in existence to calculate speedily and without possibility of error the cubical contents of embankments, cuts, and fills in railroad construction and in all similar work.

In railroad work the surface of the ground is seldom level. In a cross-section the surface of the ground usually descends either to the right or to the left, causing a greater fill or cut upon one side than upon the other. What is claimed for the device is that it is an accurate and ready calculator of the position and height of bed and slope stakes and of the cubical contents of the cut or fill where the surface is level or where it regularly and evenly descends to the right or to the left. Where the cross-section is irregular the instrument calculates only the position and height of the bed and slope stakes.

In this device for ascertaining grades all scales showing heights read from the surface of the road-bed.

Plate *a*, Fig. 4, is provided with a slot *b* to
 5 allow the traverse of carrier C up and down
 the plate *a* for the purpose of setting off the
 given heights of grades or cuts on scale *b'*.
 The initial point (zero) of carrier C is under
 thumb-nut *h*. Thumb-nut *h* is used for
 10 clamping rigidly carrier C until the cross-section
 is fully calculated. Rack and pinion *s*,
t, and *t'*, Fig. 3, are to produce the movement
 of carrier C up and down slot *b*. Thumb-nut
g' is for the purpose of clamping swinging
 15 scales J J and of clamping limb *k*, a part of
 J J, to the degree-circle *e*. Swinging scales
 J J are scales graduated from the center to
 the right and left for the purpose of ascer-
 taining distances from the center and for the
 20 purpose of reading numbers on the scales of
 vertical heights. Degree-circle *e* is for the
 purpose of indicating by the aid of swinging
 scale J J the angle of slope to the right or
 left. Scale $w^3 w^3$ is for the purpose of setting
 25 off by the top of scale J J the difference
 in perpendicular height between the surface
 of the ground at the center of the road-bed
 and the surface of the ground at a given distance
 therefrom. (This difference must be
 30 previously ascertained by a common Y-level
 and rod.) Scale $w^2 w^2$ is only for setting off
 the fall of the slope of ground in a given distance.
 Where the fall is taken on the right,
 it is set off on the right on scale w^2 , and on
 35 the left on scale w^2 if the fall is taken on the
 left. (The fall is taken by the use of a Y-
 level and rod.) The fall is added to the given
 height of center of road-bed, (given by civil
 engineer in charge.) The sum is read on scale
 40 w^2 . The top of scale J is moved till it intersects
 the sum or reading. In a fourteen-foot
 roadway (fill) (see Fig. 4) w^2 is fifty-two feet
 from center of roadway. In an eighteen-foot
 roadway (fill) w^2 is fifty-four feet from center
 45 of roadway. The fall is taken at the given
 distances according to width of road-bed used.
 By the position of swinging scale J J the position
 and height of both bed and slope stakes

are at once indicated. (See Fig. 4, $w' w' w^3 w^3$
 $w^4 w^4 w^5 w^5$.) The marking and scales on w^3 , 50
 w^4 , and w^5 indicate perpendicular distances
 from the surface of the road-bed. Scales w'
 $w' w' w'$ indicate the heights of cuts and fills
 at the side of the road-bed at the point where
 the top of scales J J cut such scales $w' w' w'$ 55
 w' . Scales w^3 , w^4 , and w^5 are read in the same
 way. Scale w^5 is for calculating fills one and
 one-half to one. Scale w^4 is for calculating
 cuts one to one. Scale w^3 is for calculating
 cuts one-fourth to one, (rock.) Scales w^6 , w^7 , 60
 and w^8 are used when the slope of the ground
 cuts the roadway, as will be seen by leaving
 swinging scale J J in its position and running
 carrier to 0 feet in plate *a*. The roadway is
 the horizontal surface of the top of a fill or 65
 the bottom of a cut. What is meant by the
 "slope of the ground cutting the roadway" is
 where the slope of the ground intersects the
 above-mentioned horizontal lines, causing a
 cut on the upper side, and a fill on the lower 70
 side of roadway $w^6 w^7 w^8$ is for cuts that fall
 above the horizontal line or for fills, if the
 operator was using the device upside down,
 as in cuts.

Having thus described my invention, what 75
 I claim as new, and desire to secure by Letters
 Patent, is—

1. In a device for ascertaining grades, the
 combination of the hollow case A, with pro- 80
 jecting angle-irons *r* at the corners and spring-
 clasps *g*, and a reversible base-board B, bearing
 upon one side a set of graduated plates
 and scales and having pins *u* projecting in
 central position from the ends, substantially 85
 as shown and described.

2. The combination of the plate *a*, provided
 with slot *b*, the side plates $w w$, graduated as
 described, the adjustable carrier C, having
 sector *e*, and the graduated lever or rule J,
 hung to the carrier and provided with limb *k*, 90
 substantially as shown and described.

DAVID C. WOLFE.

Witnesses:

W. A. RAWLINGS,
 LEE STANFORD.

It is hereby certified that Letters Patent No. 478,491, granted July 5, 1892, upon the application of David C. Wolfe, of Lyons, Kansas, for an improvement in "Devices for Ascertaining Grades, &c.," an error appears in the printed specification requiring the following correction, viz.: In line 80, page 1, the word "feet" should read *minutes*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 9th day of August, A. D. 1892.

[SEAL.]

CYRUS BUSSEY,

Assistant Secretary of the Interior.

Countersigned:

N. L. FROTHINGHAM,

Acting Commissioner of Patents.