C. D. WARD.

TAPE-MEASURES.

No. 194,317. Patented Aug. 21, 1877.

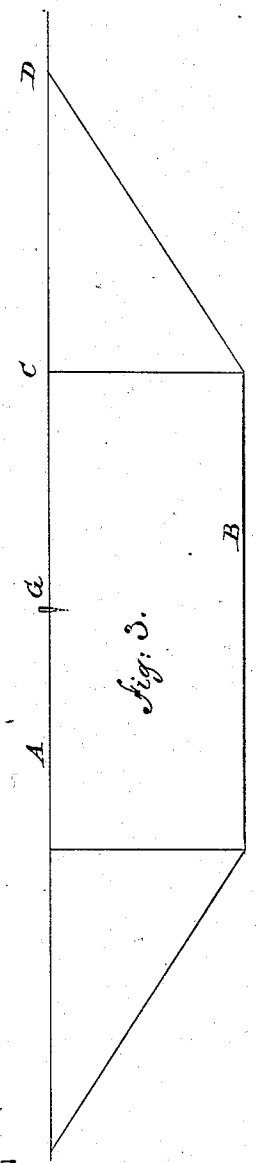

Fig: 3.

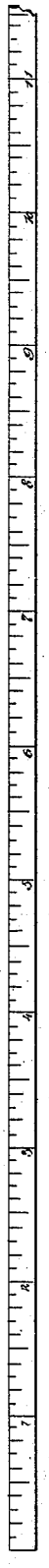

Fig: 2



Fig: 1

Witnesses:

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per [illegible]

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UNITED STATES PATENT OFFICE.

CHARLES D. WARD, OF JERSEY CITY, NEW JERSEY.

IMPROVEMENT IN TAPE-MEASURES.

Specification forming part of Letters Patent No. **194,317**, dated August 21, 1877; application filed January 2, 1877.

To all whom it may concern:

Be it known that I, CHARLES D. WARD, of Jersey City, in the county of Hudson and State of New Jersey, have invented a new and Improved Measuring-Tape; and that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon, making part of this specification.

This invention is in the nature of an improvement in measuring tapes; and the invention consists in a measuring-tape for road-cutting or other excavations, divided into subdivisions which bear a given relation to the vertical depth of the road bed or cutting, the subdivisions beginning at a given relative distance from the end of the tape, so that by the application of a measuring-tape so divided, the determination of the point for the commencement of the slope-cutting, and the location of the stakes to govern this feature is at once ascertained without the necessity of calculation.

In the accompanying sheet of drawings, Figure 1 represents my measuring-tape. Fig. 2 shows the ordinary foot-subdivisions on the opposite side of the tape, and Fig. 3 a diagram representing a cross-section of road-cutting, and showing the application of the tape.

Similar letters of reference indicate like parts in both figures.

In laying out a cutting for railroads and other purposes, of say eighteen feet width of road-bed, it is customary to first indicate the center of the road-bed by a stake, as at G, Fig. 3, the width of the road-bed being, of course, just nine feet on each side of this stake. Now, since the level of the road-bed is designed to be below the level of the natural surface of the ground, it is, of course, important to know the extent and inclination of the inclined sides of the cutting, and we will suppose that the best angle of inclination to prevent slides and other inconveniences is one and a half feet of slope to every foot of perpendicular, and it is customary with engineers in laying out cross-sections of cutting to arrive at this degree of slope by multiplying the vertical distance from the bed of the road to the surface of the ground by one and a half, which gives the distance from a vertical line erected from the outer edge of the bed of the road to the surface of the ground to a point at which the slope commences. Then, this distance being ascertained, it becomes necessary to add half the width of the road-bed, (which, in the case supposed, would be nine feet,) in order to arrive at the distance from the center of the road-bed to the extreme point of the cutting at which the slope begins; so that, in a cutting of any extent, as in laying out rail or common roads, a constant repetition of the calculation of multiplying the vertical distance into one and a half the degree of slope, and adding half the width of the road-bed, becomes necessary, and, of course, errrors are liable to occur in this repeated calculation, which tend to interfere with the correctness of the work, and add to the expenses.

By my invention, however, no calculation is necessary, and therefore the work is laid out with greater accuracy and much more expeditiously. To that end I construct a measuring-tape with subdivisions bearing a given relation to the vertical depth of cutting, which in the case supposed would be one foot and six inches to every foot of vertical depth, these subdivisions commencing at a given relative point from the end of the tape, or at a point equal to one-half the width of the road-bed, (which in the case supposed would be nine feet from the end of the tape).

Now, my tape being constructed as above, it is applied as follows: Referring to Fig. 3, A represents the natural surface of the ground, and B the surface of the road-bed it is desired to construct. The level having determined the depth at which it is necessary to place the surface of the road-bed, this vertical distance, which is represented by the line B C, Fig. 3, is known. To ascertain the point at which the cutting is to commence, it is simply necessary to apply the tape at the point where its subdivisions commence, to a stake, C, indicating the outer edge of one side of the road-bed, and extend the tape along the surface of the ground a distance equal to one subdivision (of one foot and six inches each in the case supposed) for every single foot of perpendicular depth of road-bed, when the point from which to commence the cutting or slope is at

once ascertained and fixed by a stake or otherwise without the aid of any calculation whatsoever. As an example, if the vertical line B C, Fig. 3, is six feet in length, (the subdivisions of the tape being one foot and six inches,) then the distance to the commencement of the slope-cutting would necessitate extending the tape six subdivisions from the stake at C, indicating the outer edge at one side of the road-bed.

The position of the stake marking the outer edge of the road-bed before referred to is promptly ascertained by causing the subdivisions on the tape-measure to commence at a distance from the end of the tape equal to one-half the width of the road, so that by simply applying the end of the tape to the stake marking the center of the road and extending it, the tape will give the position for the stake representing the outer edge of the road, as at C, Fig. 3, and also the position for the stake limiting the width of cutting at D. In this way, by one measurement, and without calculation of any kind, (the depth of cutting and position of center stake being determined,) the width of cutting is ascertained promptly and with accuracy.

Of course it is obvious that, by placing the zero-point or commencement of the subdivisions of the tape farther from or nearer to its end, it may be used for wider or narrower formation widths, and by using a different unit in graduating the tape it may be adapted to a different angle of slope, and there may be different graduations for two different slopes on opposite sides of the same tape—with differently-shaped figures and of different colors, however, to prevent confusion—or the ordinary division of feet and inches may occupy one side of the tape.

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

A measuring-tape or device for road-cutting or other excavations, provided with subdivisions commencing at a given relative distance from the end of the tape, and which bear a given relation to the perpendicular depth of the cutting, whereby the extent or slope of the cutting is determined by measurement alone, and without calculation, substantially as described.

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Witnesses:

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