

No. 717,193.

Patented Dec. 30, 1902.

G. G. HEGHINIAN.
SURVEYOR'S ROD.

(Application filed June 17, 1902.)

(No Model.)

2 Sheets—Sheet 1.

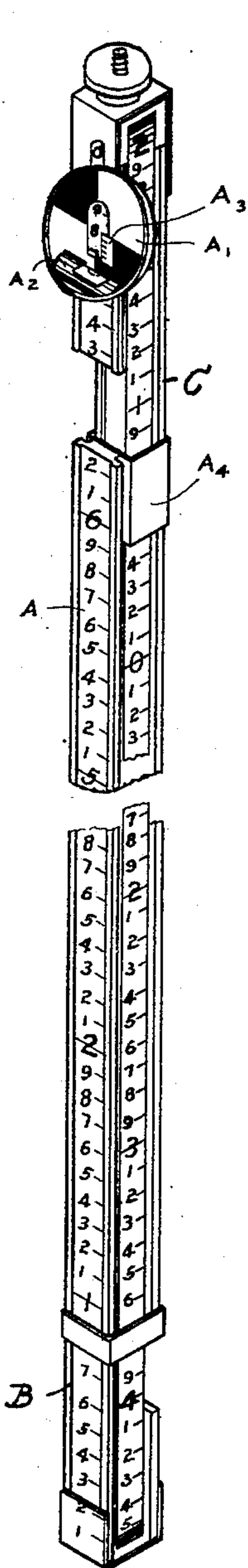


Fig. 1.

WITNESSES:

W. Cooley
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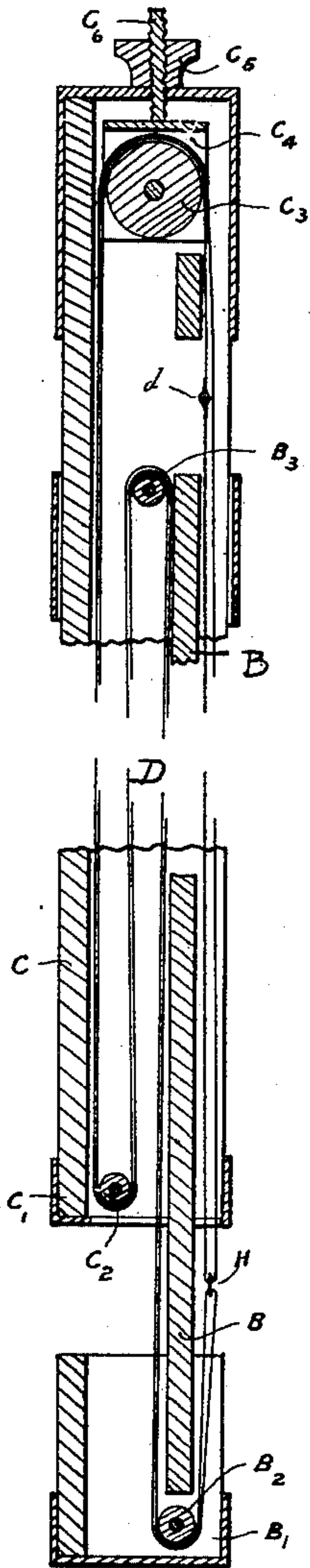


Fig. 2.

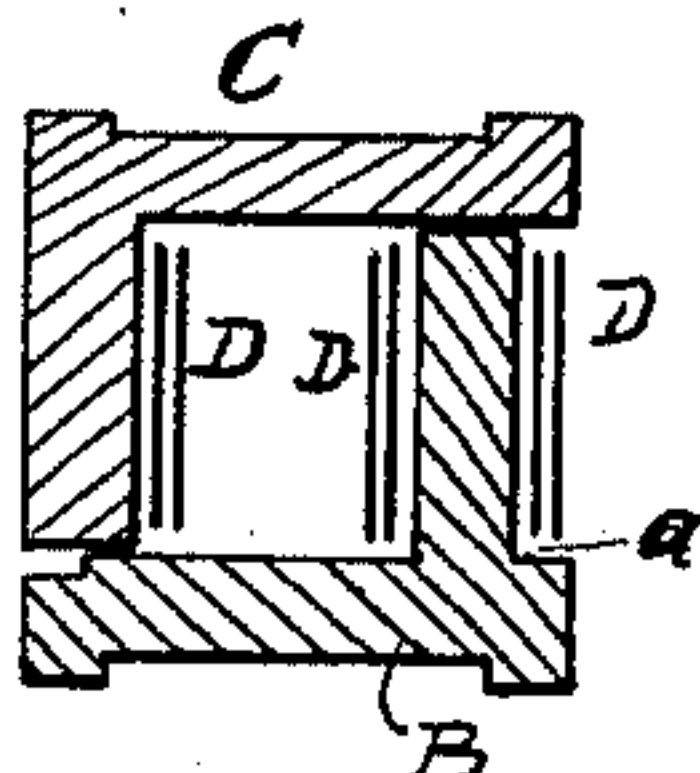


Fig. 3.

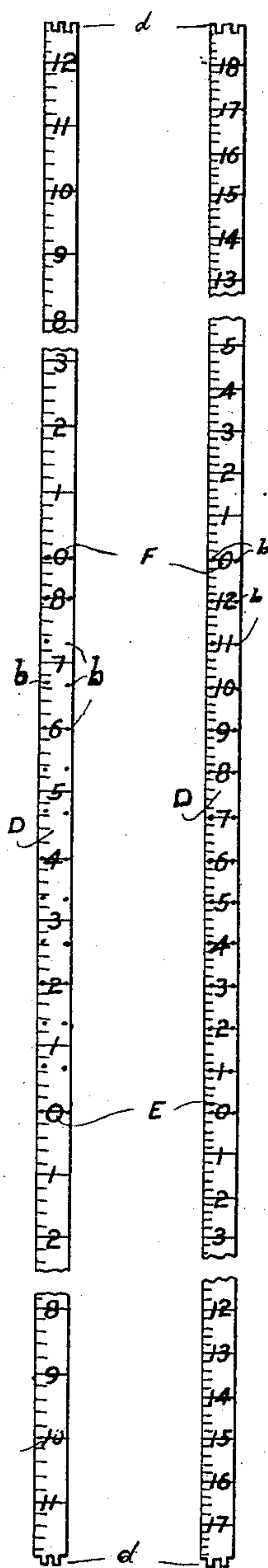


Fig. 4.

Fig. 5.

Fig. 6.

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2 Sheets—Sheet 2.

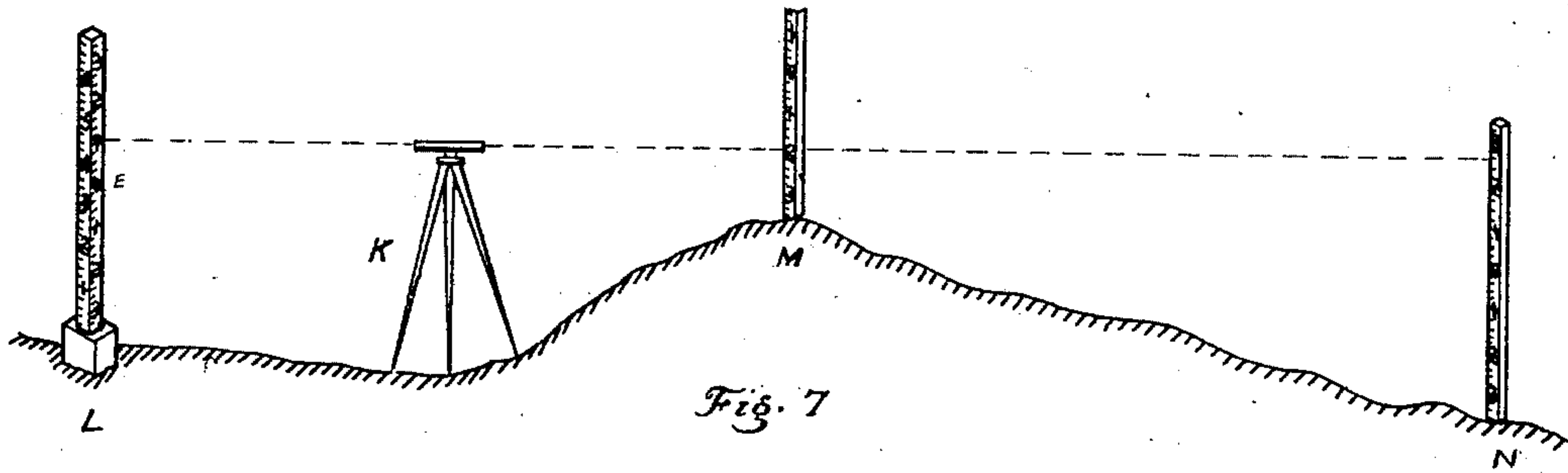


Fig. 7.

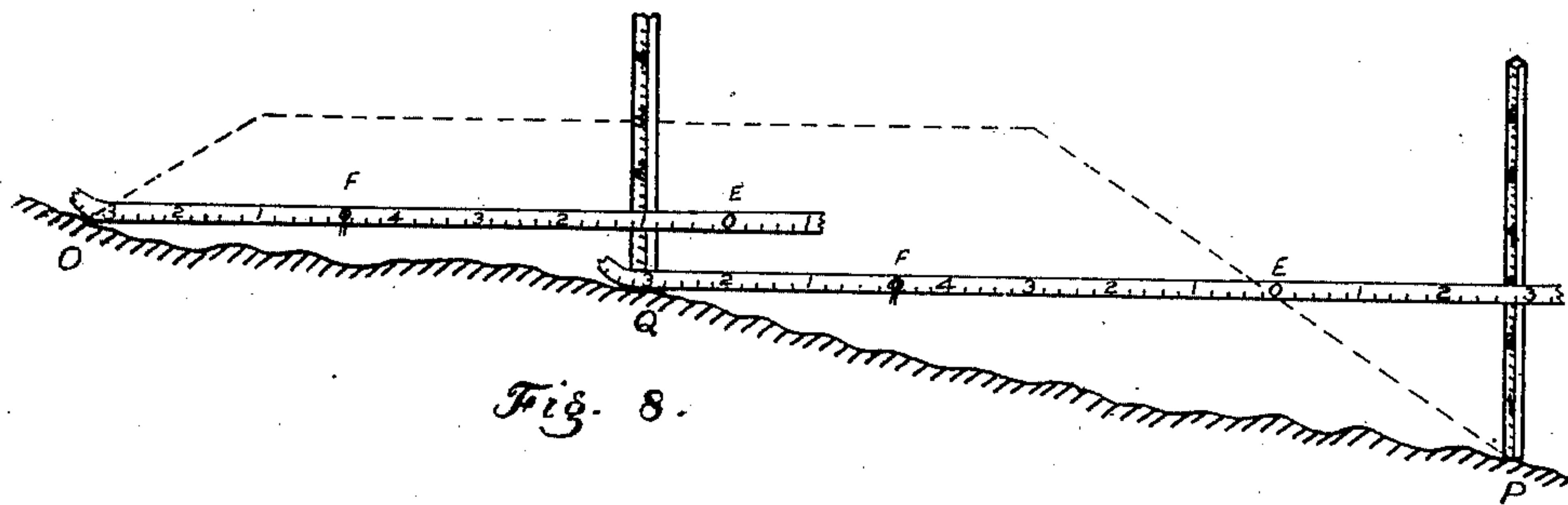


Fig. 8.

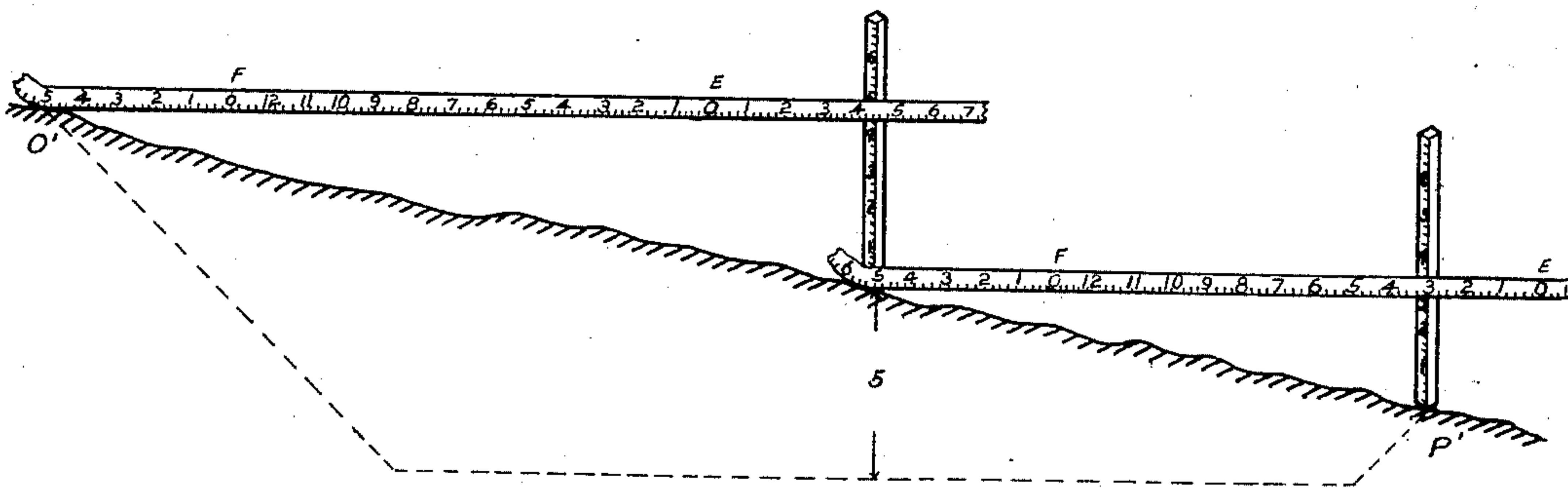


Fig. 9.

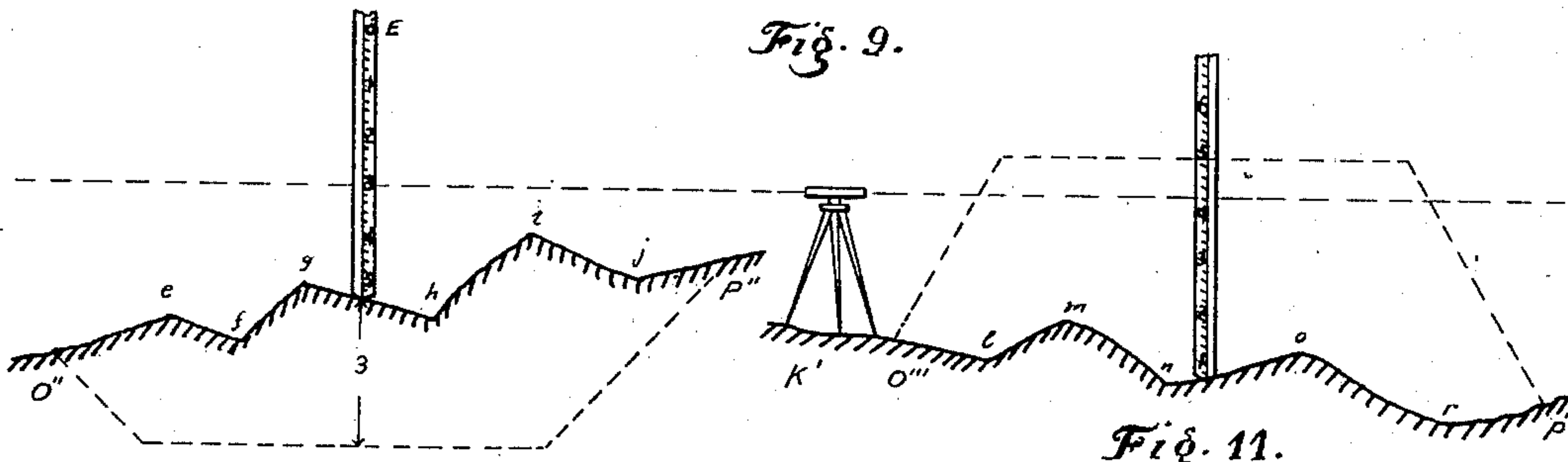


Fig. 10.

Fig. 11.

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UNITED STATES PATENT OFFICE.

GARABED GEO. HEGHINIAN, OF WEST HOBOKEN, NEW JERSEY.

SURVEYOR'S ROD.

SPECIFICATION forming part of Letters Patent No. 717,193, dated December 30, 1902.

Application filed June 17, 1902. Serial No. 112,024. (No model.)

To all whom it may concern:

Be it known that I, GARABED GEORGE HEGHINIAN, a citizen of the United States, residing at West Hoboken, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Surveyors' Rods, of which the following is a specification.

This invention relates to improvements in surveyors' rods; and the object of my invention is to provide a new and improved surveying-rod which is especially adapted for use in grading, contour-work, slope-stake setting, cross-section work, and the like on the field and greatly facilitates such work.

In the accompanying drawings, in which like letters of reference indicate like parts in all the views, Figure 1 is an isometric perspective view of my improved surveyor's rod, parts being broken away. Fig. 2 is a vertical longitudinal sectional view of the same, parts being broken away. Fig. 3 is a transverse horizontal sectional view. Fig. 4 is a face view of one side of the tape or band, parts being broken away. Fig. 5 is a face view of the other side of the tape, parts being broken away. Fig. 6 is a face view of the tape, showing the manner of shortening the same, parts being broken away. Fig. 7 is a diagrammatic view showing how my improved surveyor's rod is used for grading and contour-work on the field. Fig. 8 is a diagrammatic view showing how my improved rod is used on the field for establishing the slope-stakes of a fill. Fig. 9 is a similar view showing the establishing of the slope-stakes of a cut. Fig. 10 is a diagrammatic view showing how my improved rod is used on the field in cross-sectioning earthwork for a cut. Fig. 11 is a similar view showing the same for a fill.

The surveyor's rod A is telescopic and in general is of the conventional construction. It is composed of two L-shaped pieces mounted to slide on each other and is provided with suitable guides A⁴ and means for clamping the L-shaped pieces after adjustment, and it is provided on its front and back with graduated scales of feet and fractions thereof. It is provided with a target A', carrying a small level A² and a vernier A³. This hollow and telescopic rod can be lengthened, more or less, in the conventional manner. In the

base B' of the bottom section B a roller or pulley B² is mounted, and a like roller or pulley B³ is mounted in the upper end of this bottom section. A roller or pulley C² is mounted in the lower end of the upper section C and a larger pulley C³ is mounted in the upper end of the upper section C, said pulley C³ being mounted in a yoke C⁴, adapted to slide up and down in the upper end of said upper section C, and which yoke can be adjusted by means of a nut C⁵, screwed on a threaded stem C⁶, projecting from said yoke beyond the upper end of the upper section C. An endless band or tape D is passed around the several pulleys B² B³ C² C³ in the manner shown in Fig. 2, the ends of said band being provided with eyes d, resembling the eyes on a door-hinge, so that one set can pass into the other and a pin passed through them for the purpose of uniting the ends of the tape, and thus making it endless. The tape can easily be removed from the rod or reapplied on the same, as necessity may require. On one face this tape is provided with a graduated scale of feet and fractions thereof, the graduations beginning at two points E and F, at each of which points "zero" is located, and said graduated scale of feet and fractions thereof extends from the said two zeros in opposite directions. Between the two zeros at E and F, which are separated a distance of thirteen feet, representing one-half of the largest normal railroad-bed, the graduations are numbered successively from one zero to the other. On the opposite face of the tape or band D the two zeros are provided coincident with those mentioned previously; but the subdivisions are not equal to one foot, but to one and a half feet, and these subdivisions are marked successively "1," "2," "3," "4," &c., the numbers extending from the two zeros in opposite directions and the space between the zeros being subdivided in like manner and numbered successively "1," "2," "3," "4" up to "8 $\frac{2}{3}$."

One side of the rod A is provided with a recess a, in which the two strands of the tape D appear which rest on the outer surface of the rod.

In slope-stake setting for railroad-beds, reservoir-dams, canal-work, and cuts or embankments of all kinds it becomes necessary to re-

duce the distance between the two zeros at E and F, and for this purpose the tape or band is looped U-shaped, as shown at G in Fig. 6, and slipped through a flattened ring H, and a spring-key J is passed through two holes b in the tape or band D in the space between the two zeros of each graduation. After the tape or band has been passed around the pulleys, with the foot-scale side visible and its ends united in the manner described, it is drawn taut by the drawing up of the pulley C³ by means of the nut C⁵. The band or tape can be shifted on the rollers so as to show any desired number on the tape at the side of the rod.

The rod is used in the following manner: For grading an instrument or level K, Fig. 7, is set, the tape is moved up and down until the zero at E would appear in the line of sight of the instrument if the rod was held vertically in a place where no cut or fill is required, and then the numerals below the zero at E indicate the necessary cut and those above indicate the necessary fill. If the grade is forty-five feet and the elevation at the point L, which is a bench-mark, is 43.8 feet, the line of sight will be at "1.2" above the zero at E, which indicates that a fill of 1.2 feet must be made. At M the line of sight of the instrument will meet the tape on the rod at "2" below the zero at E, which indicates that a cut of two feet is required. At N the line of sight will meet the tape on the rod at 2.6 feet above the zero at E, and this indicates that a fill of 2.6 feet is necessary. In the same manner the appliance can be used for further grading.

If the difference between the grade and the bench-mark is greater than the length of the rod when extended to its extreme, then the difference is assumed to be ten or twenty feet less than it actually is, and the rod is set for this difference after the above deduction has been made, and afterward this sum of ten or twenty feet is added or subtracted from the rod-readings. In a similar manner the rod can also be used for contour-work.

Fig. 8 also shows the use of the rod for establishing slope-stakes of fills on the field without the use of a level instrument. It is assumed that the base of the fill is fourteen feet and the slope as one and one-half to one and that the fill at the center is three feet. The object to be obtained is to find the points O and P on the ground. The operator first detaches the tape from the rod and then connects the zero at F with that number on the tape on the foot-scale side between the two zeros E and F, representing one-half of the base of the bed—in this case seven feet, as the bed is fourteen feet—and it is intended to make the distance between E and F equal to one-half the base of the bed. Fig. 6 shows clearly how the band is looped to decrease the effective distance between the zeros to seven feet. The tape D of my improved surveyor's rod is then placed on the ground, so that the nu-

meral "3" above F on that side of the tape having one and half foot graduations is at the center stake of the fill—that is, at the point Q, Fig. 8, and one man holds the tape in this position. Another man takes the rod in one hand, holding it vertically by aid of the level on the target and also vertically to the tape, which is held horizontally with the other hand, and this man moves the vertical rod toward and from the point Q until the numbers on the tape below E on the side having the one and one-half foot graduations and on the vertical rod agree at the point of intersection. This determines the point P. To find the point O, the entire party shifts positions, so that the man with the rod is at the center point Q, Fig. 8. The other man holds the subdivision "3" above F on the ground and moves toward and from the point Q until the man at the center point Q reads the same number on the tape between E and F and on the face having the foot and a half graduations and on the rod at the point of intersection. When the same numbers appear at the intersection, the man at the left is holding the tape on the ground at the point O. Both points O and P are thus established and located.

Fig. 9 illustrates how slope-stakes of a cut are located on the ground for a railway road-bed without the use of a level instrument. Assume the base to be twenty-six feet and the slope one to one and the cut at the center stake five feet. The points O' and P' are to be found. As the distance between E and F on the tape is equal to thirteen feet, which is one-half of the base, no shortening of the tape between E and F is required. One man holds the subdivision "5" above F of the tape on the side having foot graduations over the center stake, and another man holds the rod vertical in one hand across the tape, which is held horizontally in the other and moves the vertical rod toward and from the center stake until the numeral on the rod and the numeral of the tape on the face of foot graduations and between E and F are the same at the intersection. The base of the vertical rod shows the location of the point P'. To find the point O', the party moves. The man with the rod comes and holds the rod on the center stake. The other man holding the same numeral "5" on the ground moves toward and from the center stake until the man at the center reads the same number on the tape, on the face of foot graduations and below E, and on the rod at their intersection. Then the numeral "5," held on the ground, indicates the location of the point O' on the ground.

Fig. 10 shows how the rod with the tape on is used for cross-sectioning for a cut. An instrument K is set. Then the rod is held at the center stake, and the tape on it is moved up and down until the numeral below E and corresponding to the center cut is in the line of sight. Then the rod is held at the other points

e f g h i j and also at *O'' P''*, which were formed and staked as described in Fig. 9, and the distances from the center to those points are measured with the rod by laying
5 it on the ground.

Fig. 11 shows the use of the rod for a fill, and in this case the numeral above *E* must be brought to the line of sight of the instrument instead of the numeral below *E*, the rest of
10 the steps being the same as described for Fig. 10.

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

15 1. The combination with a hollow telescopic surveyor's rod formed of two sliding sections, of a small pulley at the top and bottom of one section, a small pulley at the bottom of the other section, and a large pulley
20 at the top of this second section, and an endless graduated tape passed over said pulleys, substantially as set forth.

2. The combination with a surveyor's rod, of a tape-measure, having two "zeros" separated a greater or less distance from each
25 other, the space between the "zeros" being divided into equal parts and the remainder of the tape divided, from each "zero" in opposite direction, also in equal parts, substantially
30 as set forth.

3. The combination with a surveyor's rod, of a tape-measure having two "zeros" a certain distance apart on two opposite faces of

said tape, the positions of the "zeros" being coincident on the two faces of the tape, the
35 space between the "zeros" on one face being divided into equal parts and the rest of the tape being divided into like equal parts numbered in opposite direction from the two
40 "zeros" and the space between the two "zeros" on the other face of the tape being divided into equal parts each greater than the parts on the first-mentioned face and also extending from each "zero" in opposite directions,
45 substantially as set forth.

4. The combination with a surveyor's rod, of a tape-measure having two "zeros" separated a certain distance, the space between the "zeros" being divided into equal parts
50 and two holes formed at each subdivision, substantially as set forth.

5. The combination with a surveyor's rod, of a tape having two "zeros" separated a certain distance, the space between the "zeros" being divided into equal parts, the balance
55 of the tape being divided into like parts extending in opposite directions from the two "zeros," substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of
60 two subscribing witnesses, this 4th day of June, 1902.

GARABED GEO. HEGHINIAN.

Witnesses:

C. W. COOLEY,
ROBT. A. STRONG.