Feb. 13, 1923.

C. A. McMORRIS.

LEVELING ROD.

FILED SEPT. 14, 1921.

1,445,526.

2 SHEETS—SHEET 1.

Fig. 1.

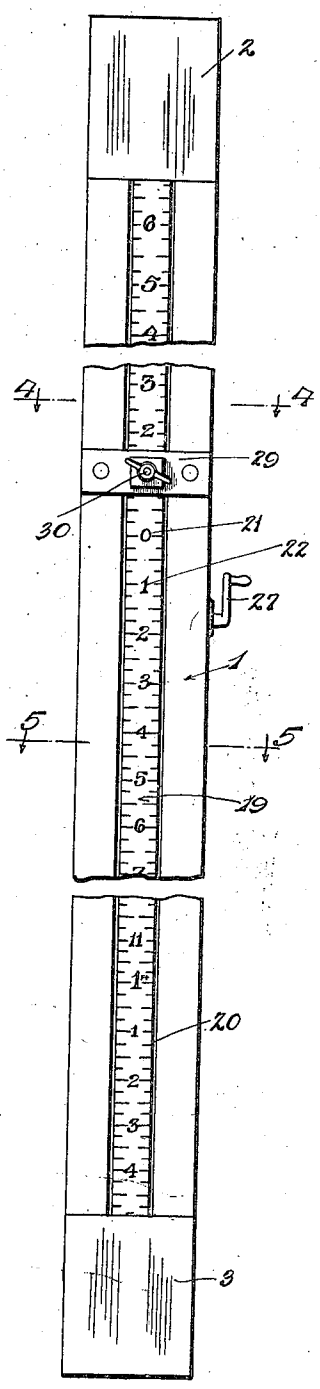


Fig. 2.

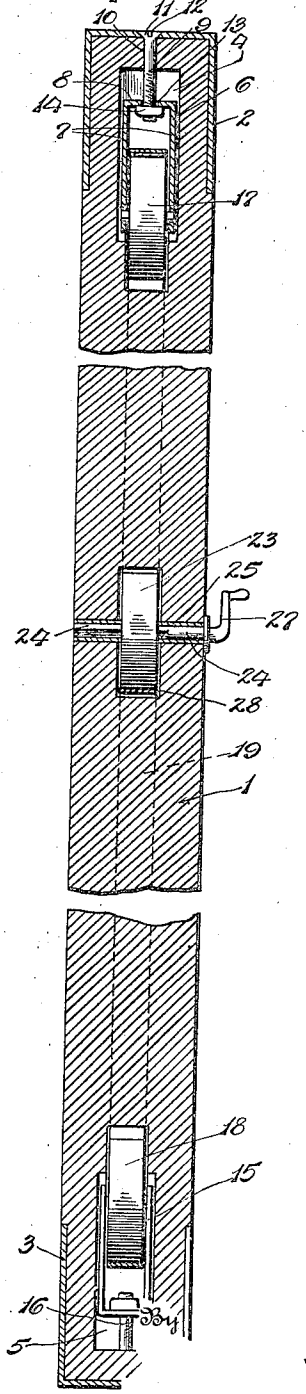
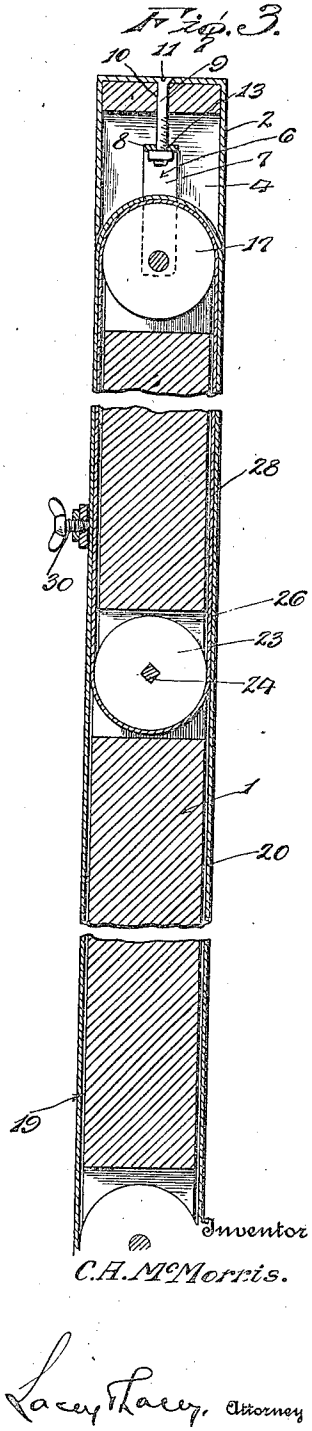


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

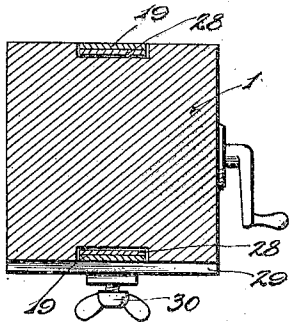


Fig. 5.

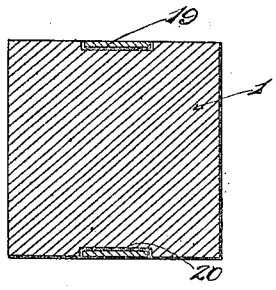


Fig. 6.

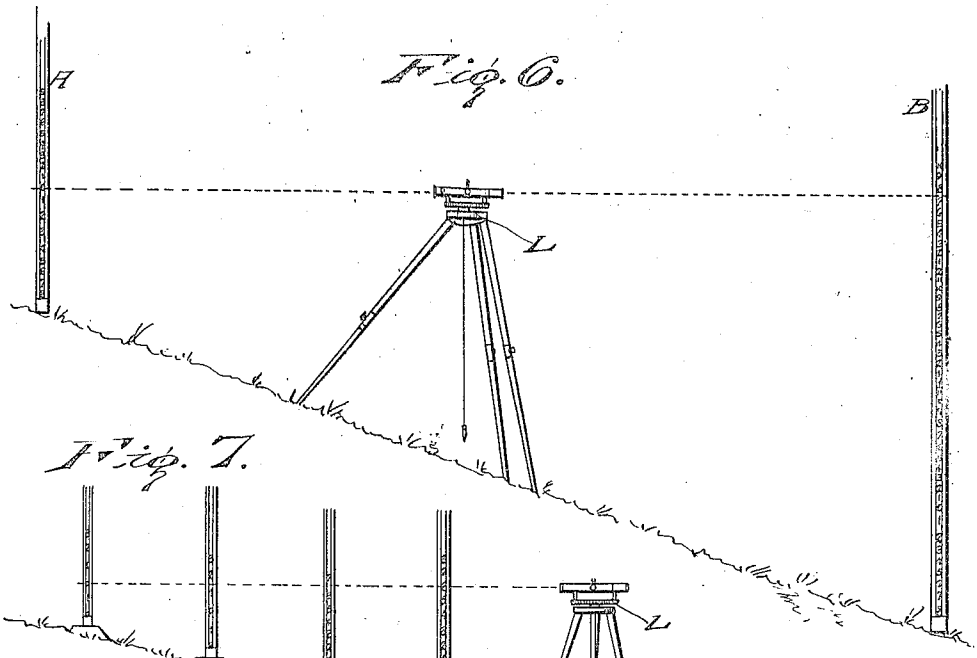


Fig. 7.

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Patented Feb. 13, 1923. 1,445,526

UNITED STATES PATENT OFFICE.

CHARLES A. McMORRIS, OF NORTH BEND, OREGON.

LEVELING ROD.

Application filed September 14, 1921. Serial No. 500,597.

To all whom it may concern:

Be it known that I, CHARLES A. McMORRIS, a citizen of the United States, residing at North Bend, in the county of Coos and State of Oregon, have invented certain new and useful Improvements in Leveling Rods, of which the following is a specification.

This invention relates to surveyor's leveling rods and has as one of its objects to provide a rod by the use of which differences in elevation between two points may be determined without calculation, thus eliminating possibility of error and effecting a saving in time.

The rod embodying the present invention is provided with a movable tape from which the readings are to be taken, and another object of the invention is to provide novel means whereby the tape may be adjusted in the use of the rod.

Another object of the invention is to provide means whereby, after the tape has been adjusted, it may be secured in its position of adjustment and subsequently readily released for further adjustment preliminary to taking a further reading.

A further object of the invention is to provide novel means whereby any slack in the tape may be taken up or tension relieved, to thus compensate for expansion and contraction of the tape.

In the accompanying drawings:

Figure 1 is a front elevation of the leveling rod embodying the invention;

Figure 2 is a vertical transverse sectional view through the rod;

Figure 3 is a vertical front to rear sectional view through the rod;

Figure 4 is a horizontal sectional view on the line 4—4 of Figure 1;

Figure 5 is a similar view on the line 5—5 of Figure 1;

Figure 6 is a semi-diagrammatic view illustrating one manner of using the rod;

Figure 7 is a similar view illustrating another manner of using the rod.

In the drawings the rod is indicated in general by the numeral 1 and the same may be made in any length desired and is preferably rectangular in horizontal cross section. At its upper end the rod has fitted thereto a cap indicated by the numeral 2, and a similar cap 3 is fitted to the lower end of the rod, the rod being recessed near its upper and lower ends as indicated respectively by the numerals 4 and 5. The numeral 6 indicates a yoke which is arranged within the recess 4 and which includes spaced side members 7 and a connecting portion 8. A threaded adjusting screw 9 is rotatably mounted within an opening 10 formed in the upper wall of the recess 4 or in other words in the end of the rod, and is provided with a head 11 preferably countersunk in the top of the cap 2 and provided with the usual slot 12 to receive the bit of a screw driver whereby the screw may be rotated. The lower end portion of the screw fits loosely through an opening 13 formed in the connecting portion 8 of the yoke 6, and a nut 14 is fitted into this end of the screw within the yoke and in position engaging the under side of the connecting portion 8 of the said yoke. A similar yoke 15 is arranged within the recess 5 at the lower end of the rod and has associated with it an adjusting screw 16 arranged in the same manner as the screw 9. Pulleys 17 and 18 are rotatably mounted respectively within the yokes 6 and 15, and the adjustable tape heretofore referred to and indicated by the numeral 19, is trained over these pulleys. The tape 19 is endless and in its adjustment it travels in shallow channels 20 formed in the front and rear sides of the rod 1 as illustrated in Figures 1, 3 and 5 of the drawings. Thus the outer side of the tape 19 is brought substantially within the planes of the front and rear sides of the rod so that there is little likelihood of the tape being engaged and torn loose through contact with other objects. At this point it will be evident that should the tape become tensioned through contraction or should it become slack through expansion, the tension may be relieved or the slack may be taken up by adjusting either or both of the screws 9 and 16. Obviously this adjustment may be effected in a convenient manner and without displacing the tape. At one point in its length the tape is provided with a target 21 preferably consisting of a zero character printed upon the outer face of the tape, and from this mark the tape is scaled in opposite directions in feet and inches as indicated by the numeral 22.

For the purpose of adjusting the tape 19, there is preferably provided the friction means best illustrated in Figures 2, 3 and 4 of the drawings. This means includes a pulley 23 fixed for rotation with a spindle 24 mounted in suitable bearings 25 in the

rod, the pulley being housed within a recess 26 opening through the front and rear faces of the rod and being located immediately below and suitably spaced from the pulley 17. A crank handle 27 which may if desired be of a foldable nature, is provided at one end of the spindle 24 so that the spindle may be conveniently rotated by hand. The pulley 23 occupies a position in vertical alignment with the pulley 17, and an endless belt 28 of any suitable friction material is trained over the pulleys 17 and 23 and with its stretches traveling in the channels 20 above the recess 26, the channels in these portions of their lengths being preferably deepened sufficiently to accommodate the thickness of the belt 28. It will be observed by reference to Figures 2 and 3 of the drawings that the friction belt 28 travels in direct contact with the pulleys 17 and 23 and that the tape 19 passes in contact with the two stretches of the belt and the portion of the belt which extends over the pulley 17. It will now be evident that inasmuch as the belt 28 is of friction material, rotation of the pulley 23 through the medium of the crank handle 27 will result in travel of the belt and in motion being imparted to the tape 19 so as to cause its forward stretch to move upwardly or downwardly depending upon the direction of rotation of the crank handle. At this point it will be evident that by adjusting the screw 9, the belt 28 as well as the tape 19 may be suitably tensioned, and by providing, in addition to the screw 9, the adjusting screw 16 at the lower end of the rod, the tape 19 may be suitably tensioned independently of the belt 28.

In order that the tape 19 may be held in positions to which it is adjusted, a bridge plate 29 is fixed upon the rear face of the rod and extends transversely thereof and across the respective channel 20, and a binding screw 30 is threaded through the bridge plate and may be adjusted so as to bind at its inner end against the tape 19 to grip the tape and the belt 28 between it and the bottom of the channel.

Figure 6 of the drawings illustrates fully the manner in which the rod is to be employed in determining the difference in elevation between two points. In this figure the reference letter L indicates a surveyor's level which is disposed between the points the difference in elevation of which is to be determined, and after the leveling instrument has been set up in position, the rod 1 is placed for example in the position A and the tape 19 is adjusted to bring the target or zero 21 to the sight line of the instrument. The binding screw 30 may then be tightened so as to secure the tape in this position of adjustment, whereupon the rod is carried and set up in the position B and the reading then taken from the rod will disclose the difference in elevation between the two points A and B.

Under conditions where it is desired to erect a number of posts upon bases, piers, or the like, placed at various elevations, and it is desired to determine the required length of each post in order to bring the structure to be supported thereby to grade level, the instrument "L" will be sighted for grade level in a line with the bases, and the rod will be successively disposed in upright position upon the said bases and the several readings taken.

Having thus described the invention what is claimed as new is:

1. In a leveling rod, two spaced pulleys, a pulley spaced with relation to one of the first mentioned pulleys, a friction belt trained over the two last mentioned pulleys, an endless tape trained over the two first mentioned pulleys and in frictional contact with the said belt and having a stretch extending longitudinally of the front of the rod, the said tape having a target point indicated thereon and having scaled units of measurement from said point, and means for rotating the third mentioned pulley.

2. In a leveling rod, upper and lower pulleys located near the upper and lower ends of the rod, an intermediate pulley located in spaced relation to one of the first mentioned pulleys, a friction belt trained over the intermediate pulley and the associated one of the first mentioned pulleys, an endless tape trained over the first mentioned pulleys and in frictional contact with the stretches of the said belt and the portion of the belt passing over the related one of the first mentioned pulleys, the said tape having a stretch extending longitudinally of the front of the rod and bearing a target point and scaled in units of measurement from said point, and means for rotating the intermediate pulley.

3. In a leveling rod, upper and lower pulleys located near the upper and lower ends of the rod, an intermediate pulley located in spaced relation to one of the first mentioned pulleys, a friction belt trained over the intermediate pulley and the associated one of the first mentioned pulleys, an endless tape trained over the first mentioned pulleys and in frictional contact with the stretches of the said belt and the portion of the belt passing over the related one of the first mentioned pulleys, the said tape having a stretch extending longitudinally of the front of the rod and bearing a target point and scaled in units of measurement from said point, means for rotating the intermediate pulley, and means operable to adjust one of the first mentioned pulleys over which the friction belt is passed in relation to the intermediate pulley.

4. In a leveling rod, upper and lower pul-

leys located near the upper and lower ends of the rod, an intermediate pulley located in spaced relation to one of the first mentioned pulleys, a friction belt trained over the intermediate pulley and the associated one of the first mentioned pulleys, an endless tape trained over the first mentioned pulleys and in frictional contact with the stretches of the said belt and the portion of the belt passing over the related one of the first mentioned pulleys, the said tape having a stretch extending longitudinally of the front of the rod and bearing a target point and scaled in units of measurement from said point, means for rotating the intermediate pulley, means operable to adjust one of the first mentioned pulleys over which the friction belt is passed in relation to the intermediate pulley, and means operable to adjust the other one of the first mentioned pulleys with relation to the other pulleys.

In testimony whereof I affix my signature.

CHARLES A. McMORRIS. [L. S.]