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D. W. BRUNTON.

UNIVERSAL TRANSIT INSTRUMENT.

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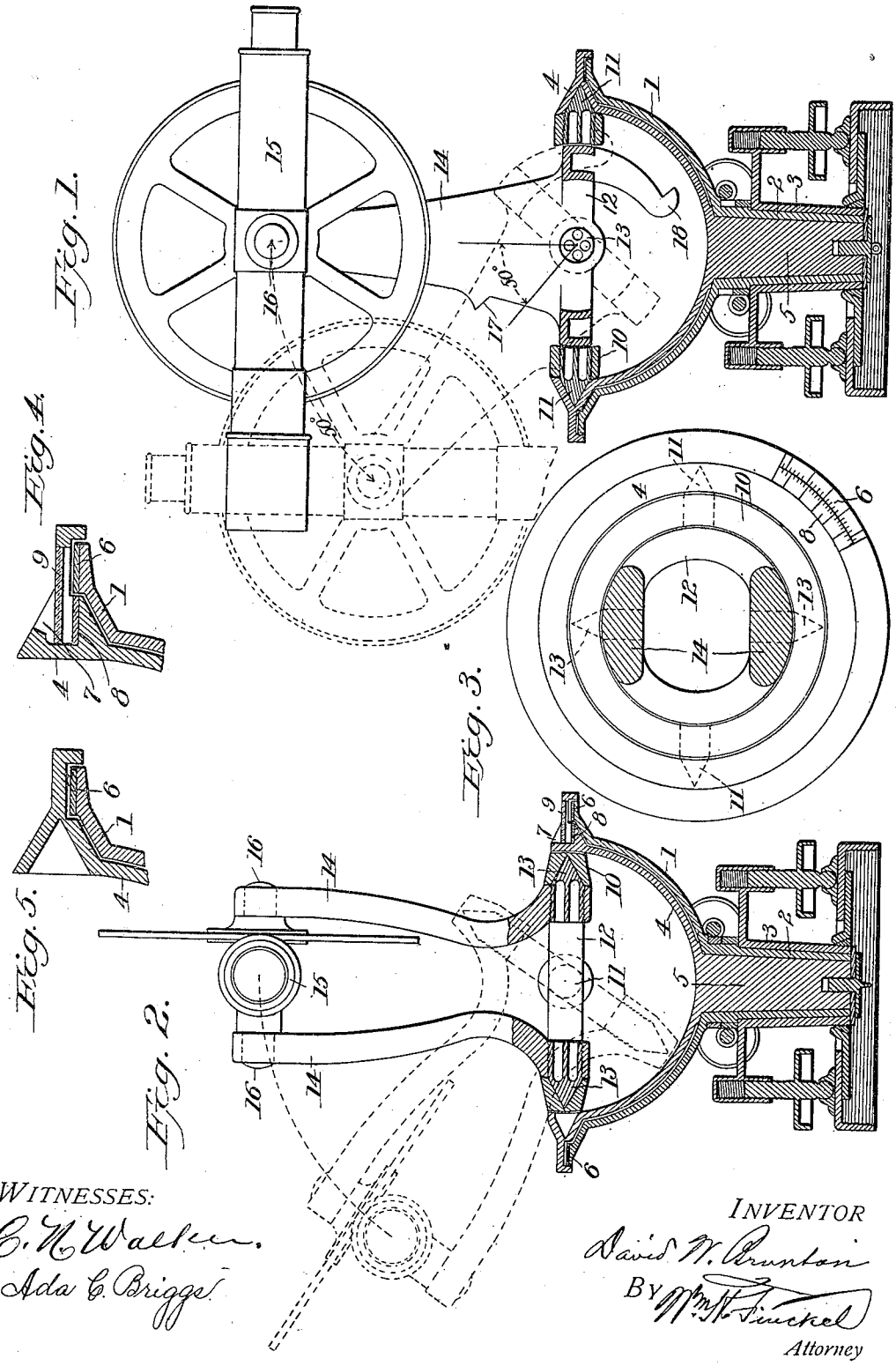


Fig. 1.

Fig. 4.

Fig. 3.

Fig. 5.

Fig. 2.

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UNIVERSAL TRANSIT INSTRUMENT.

No. 837,791. Specification of Letters Patent. Patented Dec. 4, 1906.

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To all whom it may concern:

Be it known that I, DAVID W. BRUNTON, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented a certain new and useful Improvement in Universal Transit Instruments, of which the following is a full, clear, and exact description.

The object of this invention is to provide a universal transit adapted for use in performing all of the different operations necessary in surface and mine surveying and capable of use in staking out slope-cuttings on railroad and canal work and the like.

The invention consists of a transit or surveying instrument having a telescope mounted upon a gimbal-joint supported in the adjusting-head, so that in its normal position a perpendicular plane drawn through the line of collimation will be coincident with the vertical axis of the instrument and at right angles to the horizontal axis of the base on which the telescope-standards are tilted forward to permit of high angle and zenith or nadir observations, whereby it is possible to carry surveys up or down vertical shafts or steep inclines and whereby also the telescope-standards may be inclined at right angles to the forward inclination to permit the telescope to be rotated in an inclined plane, thus enabling an operator without previous survey or calculation to stake out slope-cuttings or trace the outcrop of dipping veins across hilly or uneven ground.

While it is possible to accomplish the purposes of the invention by other means than the gimbal-joint, still by way of a concrete example I will describe the invention as utilizing a gimbal-joint.

In the accompanying drawings, illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is a sectional elevation showing in full lines the instrument for use in normal position and showing in dotted lines the instrument tilted forward for zenith and nadir observations. Fig. 2 is a view at right angles to Fig. 1 and showing in dotted lines the instrument tilted laterally for use in staking out slope-cuttings and the like. Fig. 3 is a sectional top plan view. Fig. 4 is a transverse section, on a larger scale, through the outer and inner circles in the plane of the vernier. Fig. 5 is a similar view at any other point than the vernier.

The horizontal plate 1 has the female center 2, supported in the leveling-center 3 on any approved form of head, and the vernier-plate carrier 4 has the male center 5, seated within the female center 2 in any approved manner and to provide for the usual rotary adjustments. The horizontal plate 1 carries the graduated arc 6, and the vernier-plate carrier 4 is recessed at 7, and in the bottom of this recess is provided the vernier-plate 8.

9 is a glass plate inclosing the vernier-plate.

The vernier-plate carrier 4 has pivoted to it the tilting circle 10 by diametrically opposite pivot-pins 11, which in order to make efficient bearings are preferably large and to reduce weight are hollowed out, the hollowed-out portion at the same time providing wrench or spanner holes. These pivot-pins, as shown, are screw-threaded to engage screw-threaded holes in the tilting circle 10, and their points are made conical to engage corresponding seats in the vernier-plate carrier 4. The innermost tilting circle 12 is similarly pivoted by diametrically-arranged pivots 13, of like construction to the pivots 11 and arranged at right angles to said pivots 11, and this tilting circle 12 supports the telescope-standards 14, which rise therefrom vertically and rotate with the pivoted tilting circles and the inner and outer horizontal plates. The telescope 15 is mounted in the top of these standards upon a horizontal axis in the nature of trunnions 16, and this axis is parallel with the other pivots hereinbefore mentioned.

Any suitable or approved catches may be used for clamping the several plates and tilting circles in the desired positions; but the inner tilting circle does not require to be held in any intermediate position between the vertical and its extreme tilt at fifty degrees, where it is supported by the shoulders 17 and 18.

As indicated in dotted lines in Fig. 1, the innermost tilting circle 12 may be turned upon its pivots 13 within the tilting circle 10, so as to tilt forward the standards and the telescope, and thereby admit of taking vertical sights with the telescope. Also, as indicated in Fig. 2, the circle 10 may be turned upon its pivots 11 within the vernier-plate carrier 4 so as to tilt the standards, and consequently the circle 12, laterally at right angles to the inclination shown in Fig. 1.

When tilted as in dotted lines, Fig. 1, the weight of the instrument may be distributed by the engagement of the shoulders 17 on

the circle 10 or by the engagement of the depending hook-shaped shoulder 18, and either or both of these devices may be employed. These stop devices, (shoulders 17 and 18,) as already indicated, serve to distribute the strain around the circle, and thus prevent any possibility of springing.

When the telescope-standards are tilted forward, as in Fig. 1, through an arc of fifty degrees, it is possible to take zenith and nadir observations without the use of an auxiliary side or top telescope, and by the sidewise tilting represented in Fig. 2 it is possible to rotate the telescope in the plane of the dip and strike of a vein, so that it is possible by setting up at any point on the outcrop where the dip and strike have been determined to stake out the curving lines of outcrop produced by the intersection of a tabular ore body dipping into the earth at any angle with the hills and ravines forming the usually hilly surface of the earth where veins are found. The same arrangement also makes it possible to stake out slope-cuttings on railroad, ditch, or canal work directly with the instrument instead of by cross-sectioning, as is the usual method. Both of these results are obtained without the use of an eccentrically-placed telescope, but, on the contrary, with a telescope wherein the line of collimation in each instance passes through the rotating center of the instrument. In those instruments where an eccentrically-arranged telescope is employed it is necessary to calculate on elevations from readings taken on the vertical circle, and this is a complicated operation and involves the introduction of many sources of error.

I have thus described the principle of my invention without including the many mechanical and other details that will be supplied in the full equipment of the instrument, and hence wish not to be understood as limiting the invention as herein claimed to the use of the single illustration given.

What I claim is—

1. A universal transit or surveying instrument, comprising a telescope, standards upon which it is journaled, a base for said standards pivotally mounted and movable to tilt the standards back and forth, and a support for said base pivotally mounted at right angles to the base-mounting and adapted to permit the lateral tilting of the standards and telescope, and a head containing the base and its support, and all arranged so that in normal position a perpendicular plane drawn through the line of collimation will be coincident with the vertical axis of the instrument and at right angles to the horizontal axis of the base on which the telescope-standards are tilted forward to permit of high angle and zenith or nadir observations.

2. A universal transit or surveying instrument, comprising a telescope, standards upon which it is journaled, a base for said standards, a support for said base in which the base is pivotally mounted, and a rotating head in which said support is diametrically pivoted at right angles to the pivots of the base, these several parts arranged directly one above the other, whereby the standards may be tilted forwardly or laterally, and the telescope rotated in an inclined plane to permit, without previous survey or calculation, the staking out of slope-cuttings and tracing of the outcrop of dipping veins across hilly or uneven ground.

3. A universal transit or surveying instrument, comprising a head, an outer tilting circle diametrically pivoted within said head, an inner tilting circle pivoted within said outer circle diametrically and at right angles to the pivots of the first-mentioned circle, standards rising from said inner circle, and a telescope journaled in said standards, all arranged to permit the telescope-standards to be tilted forward in a vertical plane parallel to the line of collimation, or tilted laterally to any desired extent at right angles to said plane.

In testimony whereof I have hereunto set my hand this 18th day of January, A. D. 1905.

DAVID W. BRUNTON.

Witnesses:
WM. H. FINCKEL,
ADA C. BRIGGS.