

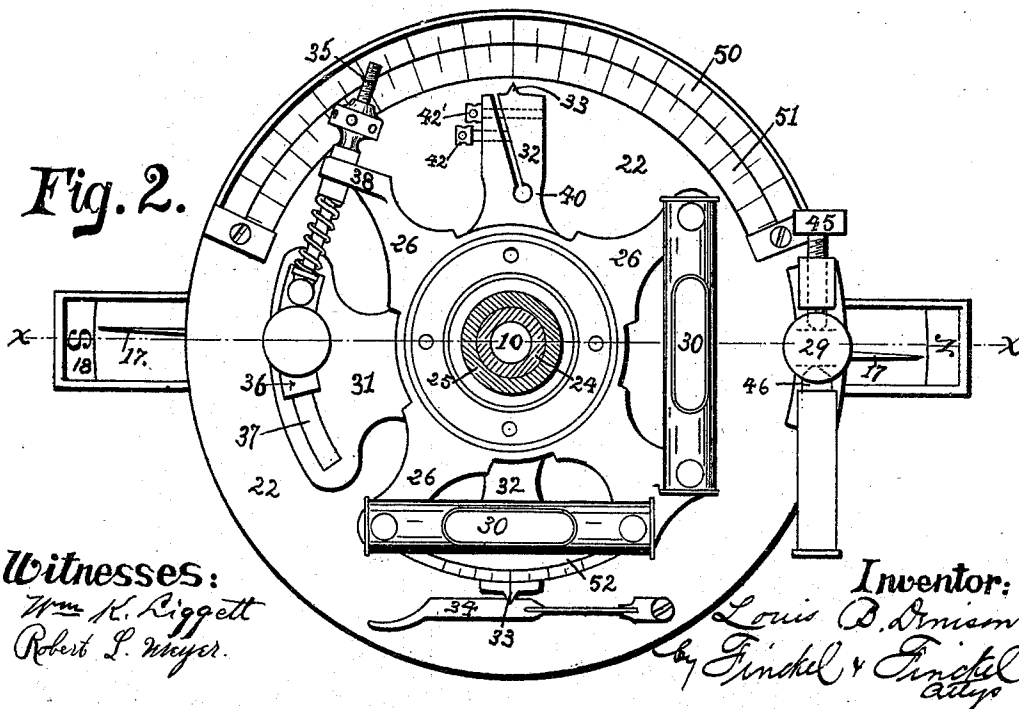
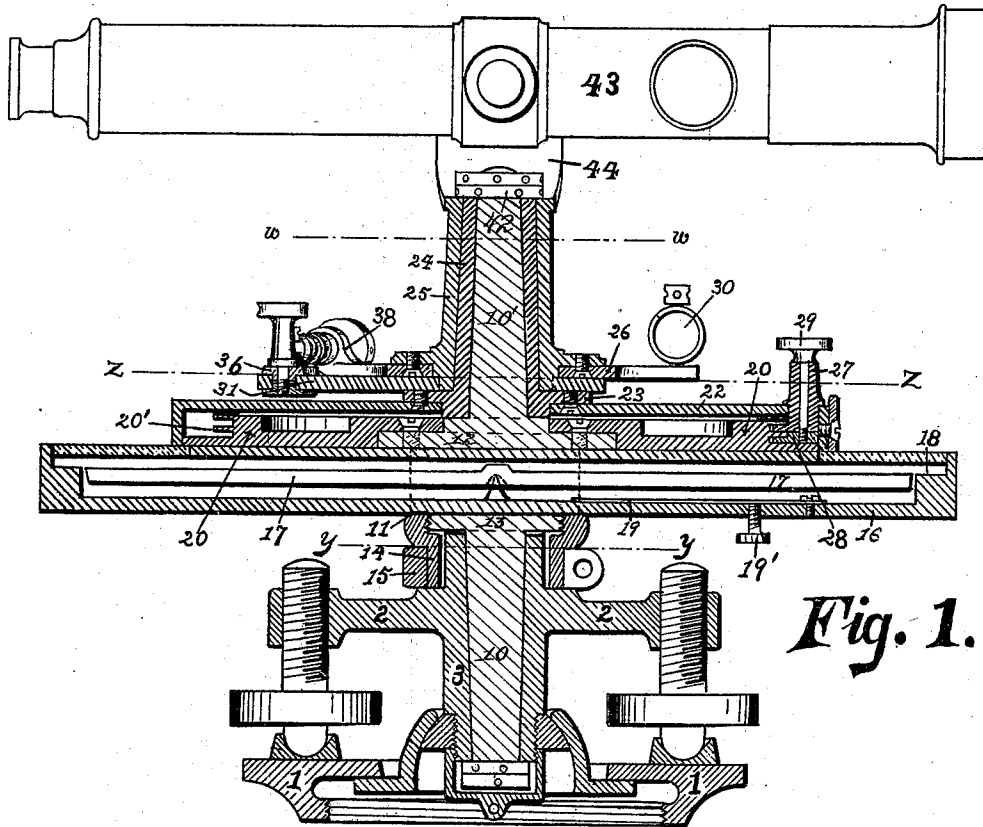
(No Model.)

2 Sheets—Sheet 1.

L. B. DENISON.
SURVEYING INSTRUMENT.

No. 552,751.

Patented Jan. 7, 1896.



Witnesses:

Wm. K. Riggett
Robert L. Meyer.

Inventor:

Louis D. Ormiston
by Finckel & Finckel
Attys

(No Model.)

2 Sheets—Sheet 2.

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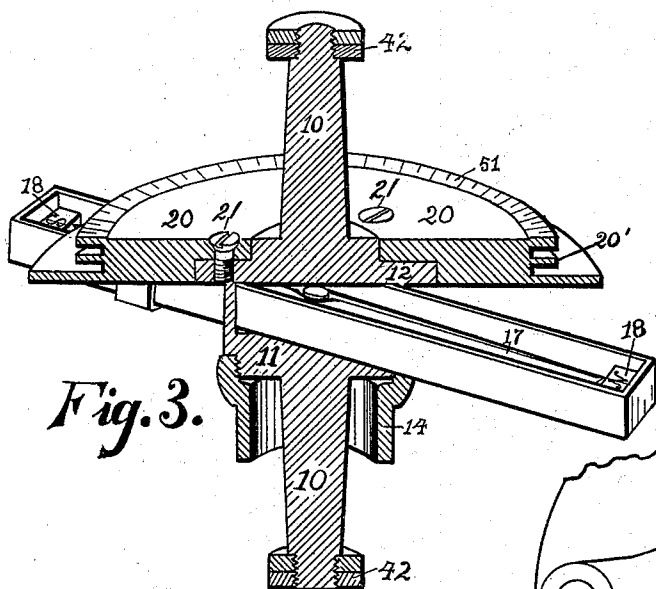


Fig. 3.

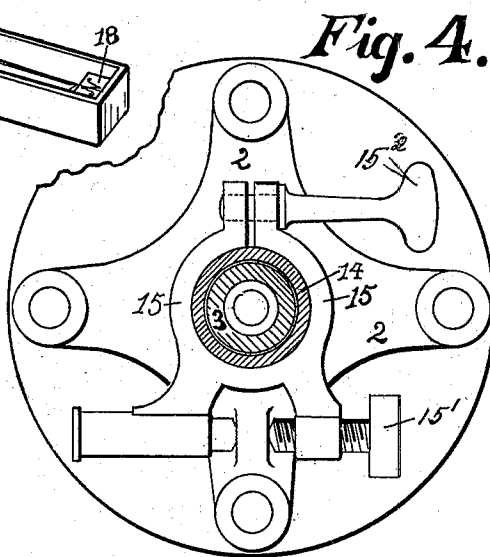


Fig. 4.

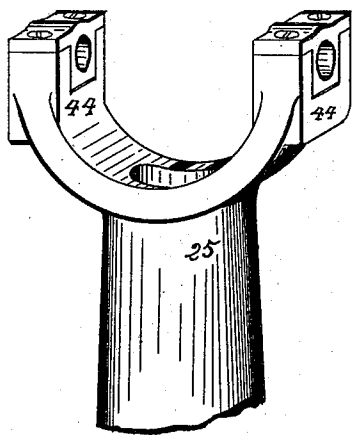


Fig. 6.

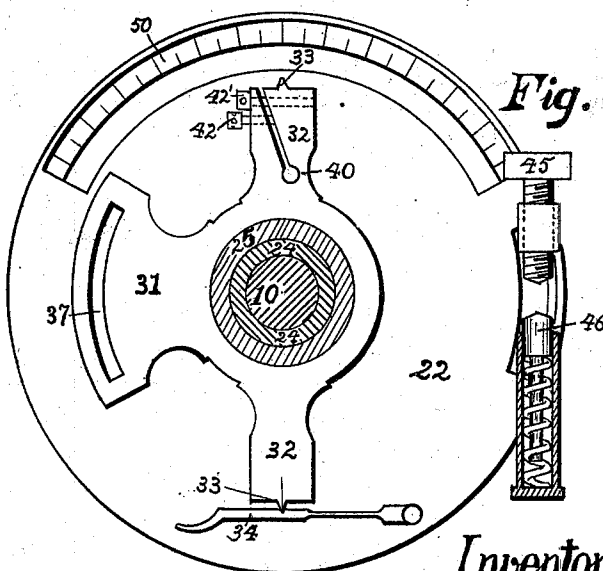


Fig. 5.

Witnesses:

Wm. H. Liggett
Robert L. Meyer

Inventor

Louis B. Denison
by Finkel & Finkel
attys.

UNITED STATES PATENT OFFICE.

LOUIS B. DENISON, OF DELAWARE, OHIO.

SURVEYING-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 552,751, dated January 7, 1896.

Application filed February 25, 1895. Serial No. 539,621. (No model.)

To all whom it may concern:

Be it known that I, LOUIS B. DENISON, a citizen of the United States, residing at Delaware, in the county of Delaware and State of Ohio, have invented certain new and useful Improvements in Surveying-Instruments; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Figure 1 represents a vertical sectional view taken on a plane indicated by the line $x x$ of Fig. 2. Fig. 2 is a sectional and top plan view taken on the line $w w$, Fig. 1, the telescope being omitted. Fig. 3 is a combined sectional and perspective view of the central hub and attached parts. Fig. 4 is a top plan view below the horizontal plane indicated by the line $y y$, Fig. 1. Fig. 5 is a horizontal sectional and plan view taken on the line $z z$, looking downward. Fig. 6 is a perspective view of the hollow post having a Y containing the bearings of the telescope.

Like characters of reference in the several views designate corresponding parts.

1 indicates the usual cap-plate that is screwed or otherwise fastened to the tripod.

A frame 2 provided with the usual or any suitable means for effecting a leveling adjustment of the same is supported upon the plate 1. Supported and turning in a tapering socket-bearing 3 in the frame 2 is the lower part of what, for the sake of brevity, I shall call a "double spindle." This spindle consists of two tapering spindles 10 and 10' placed with their bases toward each other, with an intermediate hub 11 having at its upper part a shoulder or flange 12 and at its lower part a thread 13 to receive a collar 14, which is engaged by a clamping device 15 of suitable construction.

The hub 11 of the central spindle has a central aperture to receive a long box 16 in which is pivotally supported the magnetic needle 17. In each end of the box is an offset 18, upon which are the north and south marks. Near one end of the bottom of the box there is secured, by means of a small screw, a spring 19, which has its free end raised by the end of a thumb-screw 19' to lift the needle when not in use off its pivot.

A plate 20, upon the outer edge of which is

a scale 51 of three hundred and sixty degrees, has its zero-mark exactly at right angles to the north and south marks of the needle-box. This plate is secured by means of screws 21 to the flange or collar 12 on the upper part of the hub 11, and above this is a disk or plate 22 secured by means of screws to a flange 23 on the lower part of a hollow post or sleeve 24 on the upper part of the spindle 10. The outer edge of the plate 22 bears a scale 50, which in connection with the scale 51 forms a vernier.

The outer perimeter of the disk or plate 20 is made with a circumferential flange 20', and to this is adjustably attached a post 27 passing through an arc slot in the plate 22. The means for attaching this post to the flange 20' consists of a screw 29 passing longitudinally and disengagedly through the post 27 and threading into a small block 28 having a tongue projecting under the flange which by means of the screw is drawn against a tongue on the post projecting over the upper side of the flange, so clamping the post to the flange.

The plates 20 and 22 are adjustable with respect to each other by means of an adjusting-screw 45 and a spring-actuated follower 46 supported in bearings fixed upon the plate 22. By this means the scale 50 may be adjusted to the scale 51, and so perform the function of a vernier.

Surrounding and turning on the hollow post or sleeve 24 is another hollow post or sleeve 25, to a flange on the lower part of which is secured by means of screws another disk or plate 26. The spirit-levels 30 are secured to this plate 26. Immediately below the plate 26 on the hollow post or sleeve 25 is another plate 31, which has arms 32 having diametrically-opposite V-shaped points 33, which engage a V-shaped notch in a spring-keeper 34. The plates 26 and 31 have a fast and slow adjustment with respect to each other by means of a small screw-threaded pin 35 passing through an arm 38 on plate 26 and connected with a block 36 that is adjustable and fixable in an arc slot 37 in an arm of the plate 31. One of the points 33 is made adjustable, so that the two may be placed exactly one hundred and eighty degrees apart. The method shown of accomplishing this consists in making that part of the arm 32 bearing the V-shaped point with an elastic shank 40

and passing through the fixed part of said arm 32 two set-screws 42 and 42', one for moving the movable point in one direction and the other for moving it in the opposite direction.

The telescope 43 is supported in bearings of the arms 44 of the Y projecting upward from the hollow pillar 25. Both the hollow pillars 24 and 25 are secured from vertical movement on the upper part of the spindle 10 by means of a nut 42.

The plate 26 has attached to it a small graduated plate 52, which, in connection with a mark on the point 33, enables the engineer to determine and adjust the telescope for the variation of the magnetic needle from the true north.

From the foregoing description of the construction of my instrument engineers and persons acquainted with the art or science of surveying will be able to understand its uses and appreciate its advantages. The construction is greatly simplified and compacted.

Devices for measuring angles in vertical planes can of course be readily added to the instrument.

The instrument is used as follows: In laying off or tracing a straight line which is to have a certain direction with respect to the direction of the magnetic needle the instrument is first leveled in the usual way by means of the screws in the frame 2. The whole instrument is then turned upon the lower part of the double spindle until the needle-box 16 is in an approximate north and south direction. The needle is now lowered upon its pivot by the screw 19' and the instrument turned upon the lower part of the spindle by the slow-motion screw 15' until the needle coincides with the north and south marks in either end of the box. In this position the instrument is clamped to the lower part of the central spindle by means of the clamp-screw 15². The post 27 upon the plate 20 is now released, and the upper plate 22, with all the parts above it, is turned horizontally upon the upper part of the double spindle until the telescope points in approximately the desired direction. After this the post 27 is secured to the plate 20 by the screw 29, and an accurate adjusting by means of tangent screw 45 of the plate 22 and the telescope is effected. During this last operation the needle-box, the lower plate 20, and the double spindle (being rigidly connected) of course remain stationary. The extent of the horizontal movement thus effected is shown by the vernier 50 on the upper plate 22 in connection with the graduations 51 on the lower plate and the angle which the vertical plane passing through the longitudinal axis of the needle makes with the vertical plane passing through the longitudinal axis of the telescope indicated. When the zero-marks on the variation-arc 52 and on the arm 32 coincide, and the zeros of the vernier 50 and degree-plate 51 coincide, the north and south marks of the

needle-box and the longitudinal axis of the telescope are in the same vertical plane; but when the nature of the work to be performed requires that a variation of the needle from the true north and south be provided for and set off in the instrument it is accomplished by changing, with the screw 35, the relative horizontal position of the plate 31 to that of the telescope 25. The amount of this variation is shown on the graduated arc 52 and the mark on the arm 32.

For determining or laying off a straight line irrespective of any direction indicated by the needle, two points on the line being given, the instrument is set up over the second point and turned horizontally upon the lower part of the double spindle until the telescope is directed to a staff set on the first point, where it is clamped. The point 33 is then released from the notch in the spring 34 and the telescope revolved horizontally through a half-circle, or until the point 33 on the opposite arm engages the notch in the spring 34. A third point is thus determined in the direction indicated by the telescope. By moving the instrument to this third point a fourth may be determined in the same way, and others as far as desired. If in laying off a line it be found that any three points are not in the same straight line, it is an indication that the teeth or dogs 33 on the arms 32 are not diametrically opposite, and this may be corrected by means of the screws 42 or 42', the tooth or dog being moved in one direction or the other until the points are exactly opposite.

What I claim, and desire to secure by Letters Patent, is—

1. In an instrument of the kind described, the combination of the double spindle consisting of two tapering spindles 10 and 10' placed with their bases toward each other, a central hub between said bases having an aperture, a needle box supported in said aperture, a graduated plate secured to said spindle, and a telescope and graduated plate supported and turning on the upper part of said spindle, substantially as described.

2. In an instrument of the kind described, the combination of the double spindle consisting of two tapering spindles 10 and 10' placed with their bases toward each other, a central hub between said bases having an aperture, a graduated plate 20 secured to said spindle and a graduated plate 22 supported and turning on the upper part of said spindle, a plate 31 with means substantially as described for locking the same in diametrically opposite positions upon the plate 22, a telescope revolvable horizontally about the upper spindle with means substantially as described for adjusting and fixing the telescope with respect to the plate 31, as set forth.

3. In an instrument of the kind described, the combination of the double spindle consisting of two tapering spindles 10 10' placed with their bases toward each other, a central

hub between said bases having an aperture, a graduated plate secured to said spindle, a graduated plate supported and turning on the upper part of said spindle, a plate 31 with means substantially as described for locking the same in diametrically opposite positions upon the plate 22, a telescope revoluble horizontally about the upper spindle, means for adjusting and fixing the telescope with respect to the plate 31, and a graduated plate 52 for determining the position of the telescope with respect to the plate 31, substantially as described.

4. In an instrument of the kind described, a double spindle having a central hub, a degree plate secured to said hub, a hollow pillar or post 24 turning on the upper part of the double spindle having a plate 22 secured to said post or pillar, with means for fixing the plates 20 and 22 with respect to each other, the telescope-bearing pillar or post 25 turning on the sleeve or pillar 24, with a catch

substantially as described for fixing said post in either of two diametrically opposite directions.

5. In an instrument of the kind described, the combination of the frame 2, the double spindle consisting of two tapering spindles 10 and 10' placed with their bases toward each other, a central hub between said bases having an aperture containing a magnetic needle, the lower of said spindles being supported and rotatable in said frame, means for clamping said spindle in said frame, a graduated plate secured to said spindle, and a telescope and graduated plate supported and turning on the upper part of said spindle, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

LOUIS B. DENISON.

Witnesses:

GEORGE M. FINCKEL,
A. J. SMART.