3 Sheets—Sheet 1.

W. KUEBLER.

SURVEYING INSTRUMENT.

No. 181,451. Patented Aug. 22, 1876.

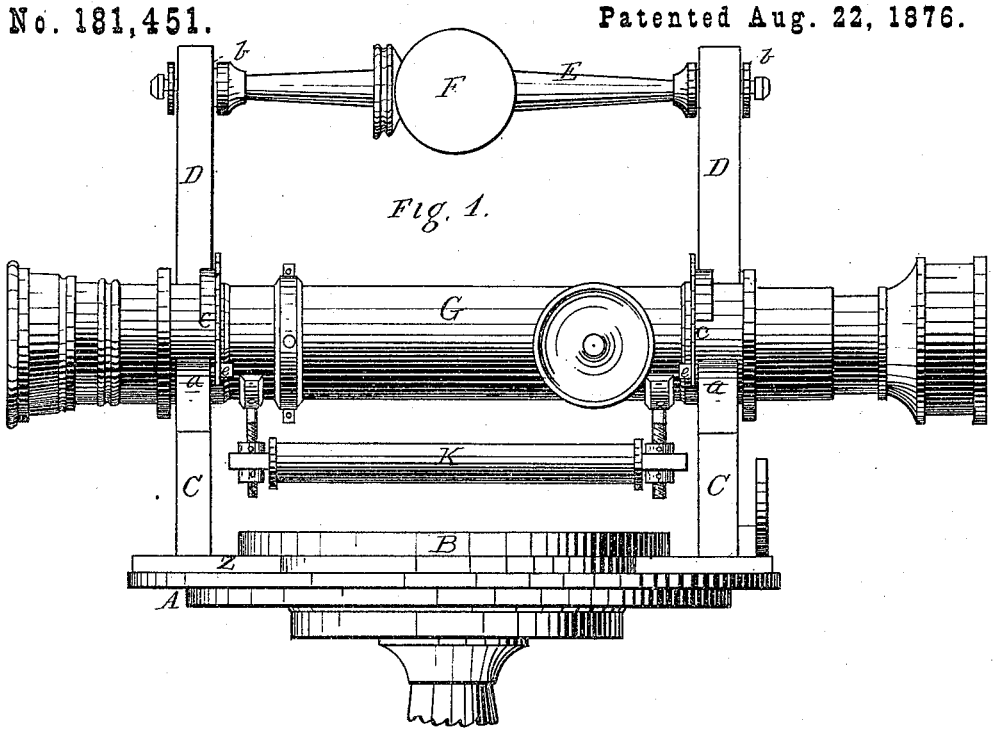

Fig. 1.

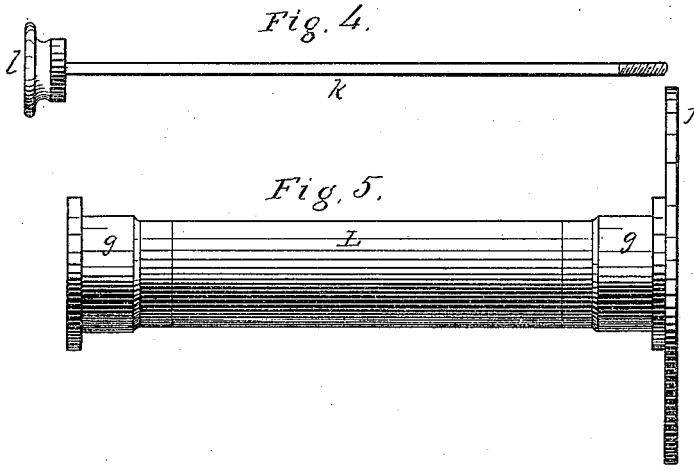

Fig. 4.

Fig. 5.

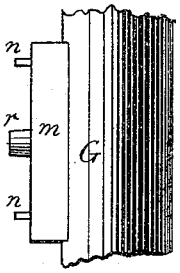

Fig. 6.

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Fig. 2.

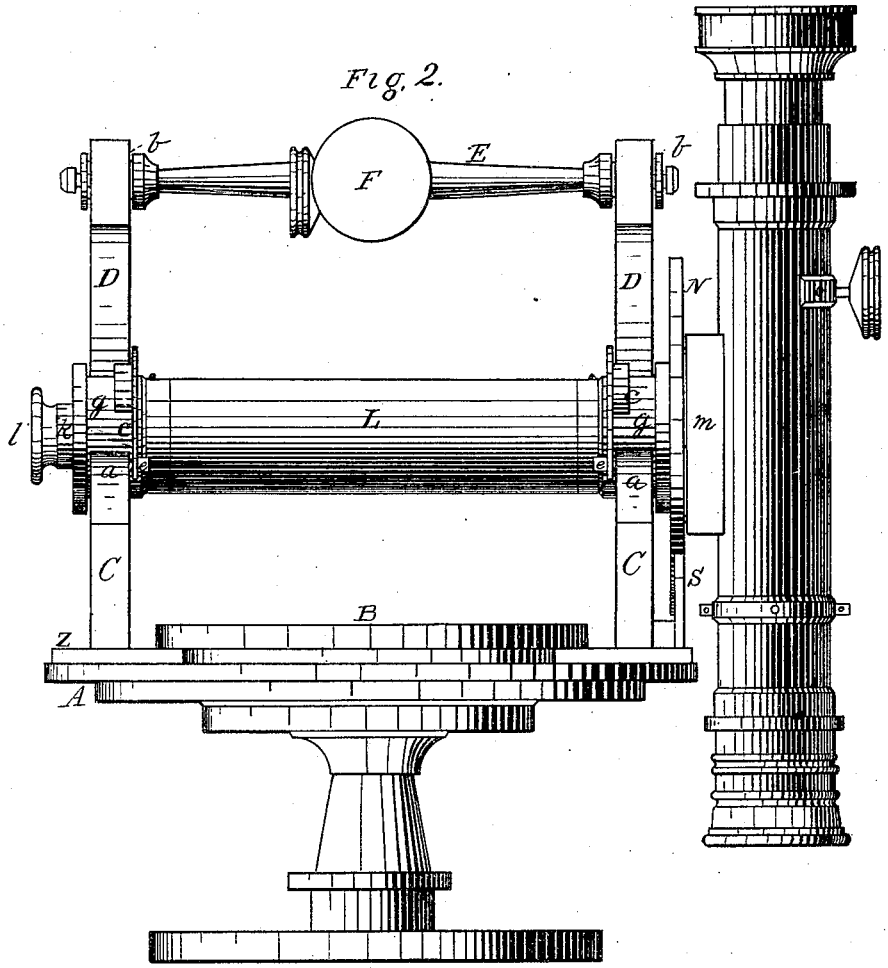

Fig. 7.

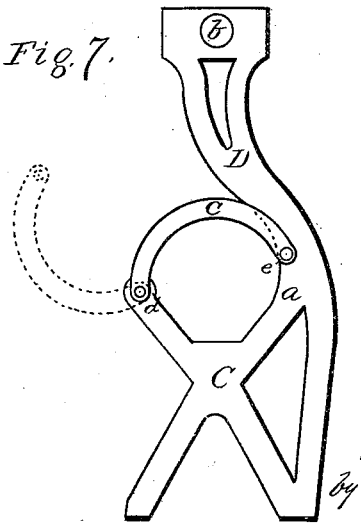

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Fig. 3.

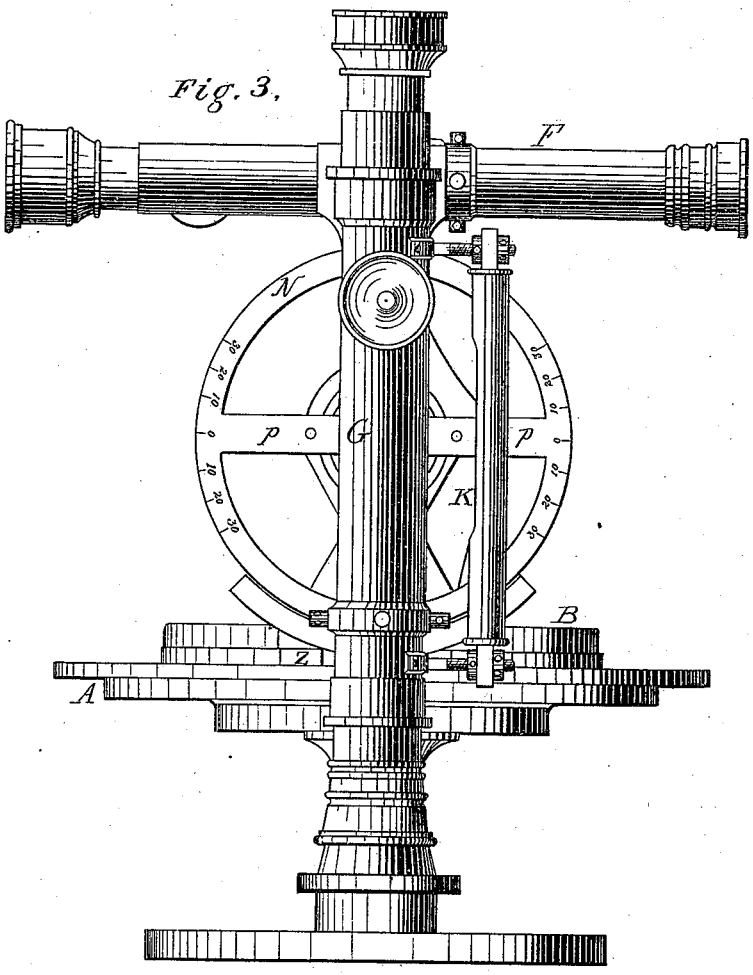
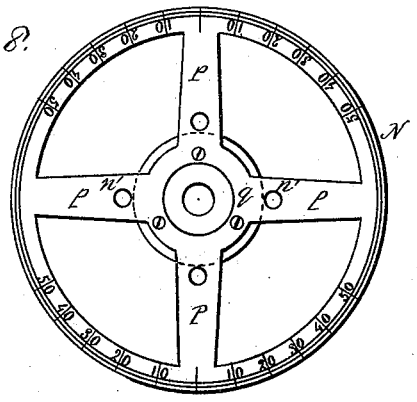


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM KUEBLER, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN SURVEYING-INSTRUMENTS.

Specification forming part of Letters Patent No. **181,451**, dated August 22, 1876; application filed June 24, 1876.

To all whom it may concern:

Be it known that I, WILLIAM KUEBLER, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and valuable Improvement in Surveying-Instruments; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a front view of this invention, with level-telescope in the wyes. Fig. 2 is a front view, with cylinder-axis in the wyes, and level-telescope vertically arranged. Fig. 3 is an end view, showing the graduated wheel. Figs. 4, 5, 6, 7, and 8 are details.

This invention has relation to surveying-instruments; and it consists in the construction and novel arrangement, in combination, of a transit and Y-level, forming a right-angular instrument; also, in the novel combination, with said instrument, of an axis-piece, whereby the level-telescope can be arranged to sweep in a vertical plane; and, finally, in the construction and novel arrangement of the frame and axis connection, as hereinafter fully shown and described.

The object of this invention is to provide a single instrument which will serve efficiently in place of two instruments—that is to say, the Y-level and transit, now separately used by surveyors—and to so arrange the same instrument that it will be especially adapted for work in mining districts, and other places where it is necessary at times to sight in the vertical direction.

In the accompanying drawings, the letter A designates the upper plate or limb, which carries the compass B and standards which support the telescopes. The standards may be made entire, or in two or more parts, one portion, C, extending upward from the plate, and terminating at its upper end in a circular bearing, *a*, being similar to the wye of an engineer's level, the other portion, D, extending above the wye-bearing, being usually about twice its height. It may form a portion of the wye-standard, being extended upward from one of its branches, as illustrated in the drawings; or it may be attached to the plate by an independent foot. It is preferred to make the entire standard in one piece.

At the upper end of the arms D are the journal-seats *b*, for the journals of the axis E of the transit-telescope F. These journal-seats may be made in the usual manner, to allow the transit-telescope to turn readily in the vertical plane.

G indicates the level-telescope, which is designed to be seated in the bearings *a*, being confined therein by means of clips *c*, which are journaled usually to the branches of the wye-bearings, opposite the transit-arms D, as indicated at *d* in the drawings, and may be secured to said transit-arms by suitable pins *e;* or the clips may be secured to the opposite branches of the wye-bearings in the usual manner, when these are made separate. When seated in the wye-bearings, the level telescope is designed to have a direction at right angles with that of the transit-telescope, said directions being referred to a horizontal plane.

B designates the compass, and K represents the level, which is attached to the under side of the telescope G in the ordinary manner, having the usual adjusting devices at the ends.

This instrument is designed to serve every purpose for which two instruments—the engineer's level and the engineer's transit—are now commonly employed, and possesses further advantages with reference to right-angular measurements, derived from the position of the two telescopes and their common relation to the compass.

It is evident that the transit-telescope may also be provided with a level, if desired, in the usual manner.

For certain astronomical observations and mining operations a different adjustment of the level-telescope is provided for, by means of the axis-cylinder L. This piece is designed to be sufficiently long to be seated in the bearings *a* of the wyes, its ends being provided with journals *g*, so that it may be readily revolved in said bearings.

At one end there is attached to the cylinder a graduated circle or wheel, N, the edge of which, when the cylinder is turned, moves upon an arc-scale, S, or vernier, which is attached to the frame or one of the standards,

in a position exterior to the latter, as shown in the drawings. A screw-rod, *k*, extends through the hollow center of the axis-cylinder, being provided with a milled head, *l*, at one end thereof.

At the other end of the cylinder the level-telescope is designed to be attached in the vertical plane. The attachment or connection may be made in several modes.

In the drawings, the telescope is represented as being provided with a side block, *m*, having end studs *n* and a projecting female screw or nut, *r*, at its middle portion, designed to enter corresponding apertures in the wheel and cylinder-head, to fix the position of the telescope with relation thereto.

In the construction illustrated, the graduated wheel is provided with four radial arms, *p*, and the apertures *n'*, for the end studs of side block, are made therein. The central portion *q* of the wheel fits around a projecting neck of the cylinder-head, into the central opening of which the nut *r* is received, and the telescope secured in position by screwing the end of the axis-rod *k* into said nut. This arrangement is designed to enable the telescope to sweep a vertical plane when turned around on the journals of the axis-cylinder, and to serve an important purpose in sighting perpendicularly up or down. It also enables the surveyor to read off any angle of elevation or depression on the divided circle S.

In order to strengthen the limb or plate A, in order to make it sufficiently strong to bear the double weight of the telescopes, a bar, Z, may be extended diametrically across the same from standard to standard, and may support the latter.

I am aware that the mode of building this instrument may be varied in some particulars by persons skilled in the art, and, therefore, the invention is not limited to the precise construction herein shown and described.

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

1. The combined Y-level and transit, having two telescopes centrally and diametrically arranged above the compass, at right angles to each other, and the Y-bearings below the extended journal-seat arms, which carry the transit-telescope, substantially as specified.

2. The combination, with a surveying-transit, of a side telescope, sweeping in a vertical plane parallel with that of the transit-telescope, for perpendicular sighting and measuring angles of depression and elevation, substantially as specified.

3. The telescope-standards, consisting of the portions C, extending upward from the base-plate, and terminating at their upper ends in bearings *a*, and the portions D, extending above said bearings, to receive the journals of the transit-telescope, substantially as specified.

4. The axis-piece adapted to revolve in the wyes, forming the journal of the level-telescope, when arranged in the vertical plane, substantially as specified.

5. The combination, with a wye axis-piece having a graduated end wheel, of the level-telescope and the divided arc, substantially as specified.

6. The level-telescope, provided with a side attachment, *m*, in combination with the axis-piece and fastening-rod, substantially as specified.

7. A surveying-instrument having double-seated standards diametrically opposite each other, on each side of, and extending above, the transit-compass, for mounting the level and transit telescopes, substantially as specified.

8. A Y-level having an axis attachment, L, to form a journal for the level-telescope, at right angles with the cylinder-case of said telescope, substantially as specified.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

WILLIAM KUEBLER.

Witnesses:

EMILE L. PERDRIAUX,

ALLEN H. GANGEWER.