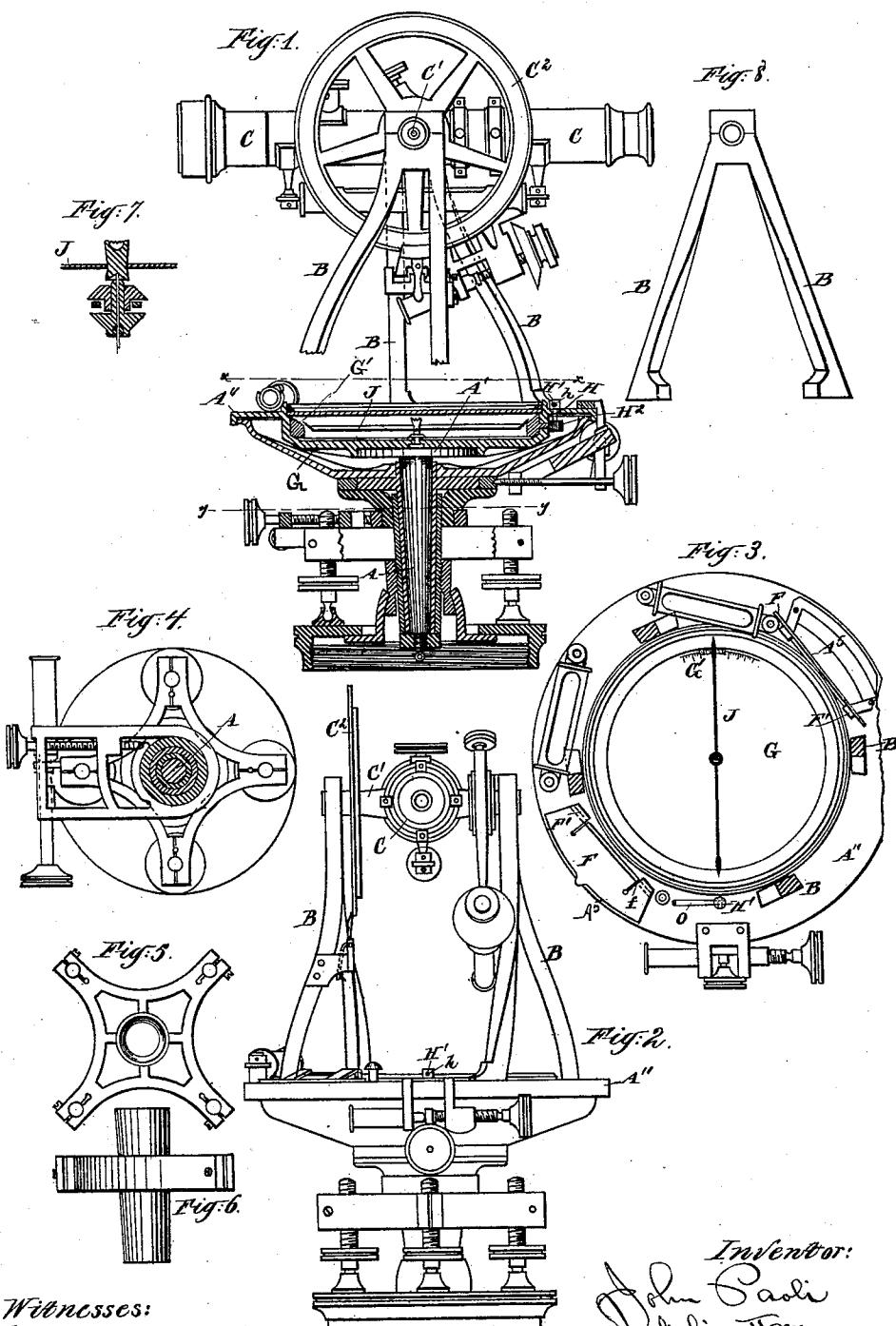


(No Model.)

J. PAOLI.
ENGINEER'S INSTRUMENT.

No. 453,159.

Patented May 26, 1891.



Witnesses:
Chas. S. Barber.
Charles S. Searle.

Inventor:
John Paoli
By his attorney
James Fred Stetson

UNITED STATES PATENT OFFICE.

JOHN PAOLI, OF HOBOKEN, NEW JERSEY, ASSIGNOR TO WILLIAM KUEFFEL
AND HERMANN ESSER, OF NEW YORK, N. Y.

ENGINEER'S INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 453,159, dated May 26, 1891.

Application filed September 20, 1890. Serial No. 365,610. (No model.)

To all whom it may concern:

Be it known that I, JOHN PAOLI, a subject of the King of Italy, residing in Hoboken, in the county of Hudson and State of New Jersey, have invented a certain new and useful Improvement in Engineers' Instruments, of which the following is a specification.

I will describe the invention as carried out in the elaborate instrument known as a "transit," embodying the capacities of several minor instruments.

My improvement increases the perfection of the compass, facilitates the reading of the indications on the verniers, and provides more conveniently and reliably than usual for adjusting and holding the variation-plate. The compass is sunk below the uppersurface of the top plate, and the rim is beveled toward the center. The needle is bent upward at each extremity. This allows the point of the needle to read directly into the lines even when the instrument is not perfectly level or when the needle is not perfectly balanced. The needle is heavier near the points than in the center, which makes it unusually sensitive, while holding the magnetism better than the ordinary shape. I employ two verniers mounted on opposite sides of the horizontal circle, as usual, and provide each with a cover held by a spring. The cover is finished with a dead-white reflecting-surface, and is adapted to perform the three functions of throwing the light favorably on the graduations, shading the vernier when required under some conditions, and of being closed entirely down, so as to serve as a protection for the vernier-glass. I provide unusually long leverage and attain more accurate setting than usual for the variation-plate. The pinion which turns the compass a little, as required, relatively to this plate is set under the top plate, so as to aid in defending against dust and dirt getting into this part of the instrument.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a central vertical section partly in side elevation. Fig. 2 is an elevation quartering to the view in Fig. 1. Fig. 3 is a hori-

zontal section on the line xx in Fig. 1. Fig. 4 is a horizontal section on the line yy in Fig. 1. Figs. 5 and 6 represent a portion detached. Fig. 5 is a plan view, and Fig. 6 an elevation. Fig. 7 is a vertical section of a portion on a larger scale. Fig. 8 is a side elevation. It shows a modification.

Similar letters of reference indicate like parts in all the figures where they appear.

A is the inner center, and A' the extended top piece firmly fixed thereon, which I will term the "top plate," and which, like the center, is of the ordinary construction, except as hereinafter stated, and performs, as usual, the important functions of supporting the standards B, which carry the telescope C and its attachments.

C² is the vertical circle carried on the shaft C'.

The triangular standards B are sufficiently spread at the bottom to afford a reliable support. One side or leg is nearly vertical. The other branch or leg is inclined beyond the ordinary extent and is twisted, as shown. The form gives a clear space for each horizontal vernier A⁵ in a position at about forty-five degrees relatively to the telescope, where it can be easily inspected. The operator can examine the proper vernier A⁵ without changing his position but little, if at all, from that required to look through the telescope. There are, as usual, two verniers A⁵ on opposite sides of the instrument. Each vernier has a cover F turning on an axis f and provided with a friction-spring F' at each end formed integral therewith, which presses on the support of the axis, making sufficient friction to reliably hold the cover at any angle in which it may be set. The under face is of celluloid or analogous dead-white material. The cover thus equipped serves as a protection for the vernier when closed, as a shade, if such shall sometimes be required, and as a reflector to reflect a mild and clear light upon the vernier.

The compass is sunk in the top plate A' and has a beveled rim G', on which the divisions are engraved. The needle J is hung with the usual provisions for lifting and clamping when not in use. It is made light near the mid-length, heavy near each end, and again light at the extreme ends. The ends are

bent upward, so as to approximately coincide with the beveled rim G' and allow the position of the needle to be accurately read thereon. The variation-plate G is fixed to the top 5 plate A' and serves as the bottom for the compass. The rim G' is capable of being partially revolved on the plate G and is operated by a pinion H^2 , which is sunk below the upper surface of the top plate A' . The 10 shaft of this pinion extends above the plate, and its small head H' is provided with holes h , adapted to receive the removable lever O , (see Fig. 3,) by which it may be turned when required, the lever being then immediately 15 removed. The construction protects the pinion and the teeth with which it engages from dust and injury, and the small head H' , with the holes h , avoids a frequent source of error due to the accidental hitting and changing of 20 the large head or button necessary with the ordinary construction.

I have shown in Fig. 3 the rim G' as having a small graduated segment extended inward where the variation-plate G is graduated; but 25 this is not essential, because it is possible to make the same graduations and effect the same adjustments without such extension inward of the rim.

Modifications may be made without departing 30 from the principle or sacrificing the advantages of the invention. Parts of the invention may be used without the whole. One friction-spring F' may suffice.

I do not in this patent claim the peculiarities 35 of the standards and of the parts carried thereon in the upper part of the instrument, nor the novel features in the ball-joint,

false sleeve, and connected parts for supporting and adjusting the instrument at the base. Such are made the subjects of separate applications for patents, the first filed April 8, 1890, Serial No. 347,097, and the last filed herewith. 40

I claim as my invention—

1. In a transit or analogous instrument, in combination with the telescope C , supporting- 45 standards B , inclined and bent as shown, and top plate A' , with provisions for revolving and adjusting, a vernier A^5 , and vernier-cover F , the latter having a reflective under surface and mounted with liberty to turn on an axis 50 f , and a friction-spring F' , arranged for joint operation as herein specified.

2. In a transit or analogous instrument, the compass sunk in the top plate, in combination with the latter and with a telescope, and 55 provisions for adjusting the top plate as required, the compass having its graduations on a beveled rim, and with the compass-needle J having its ends bent upward to correspond approximately with the beveled rim, 60 all substantially as herein specified.

3. In a transit or analogous instrument, the variation-plate G , shaft H , pinion H^2 , and small operating-head H' , in combination with the top plate A' , standards B , and telescope 65 C , and with provisions for adjusting the whole, substantially as herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

JOHN PAOLL.

Witnesses:

CHAS. S. BARBER,
H. A. JOHNSTONE.