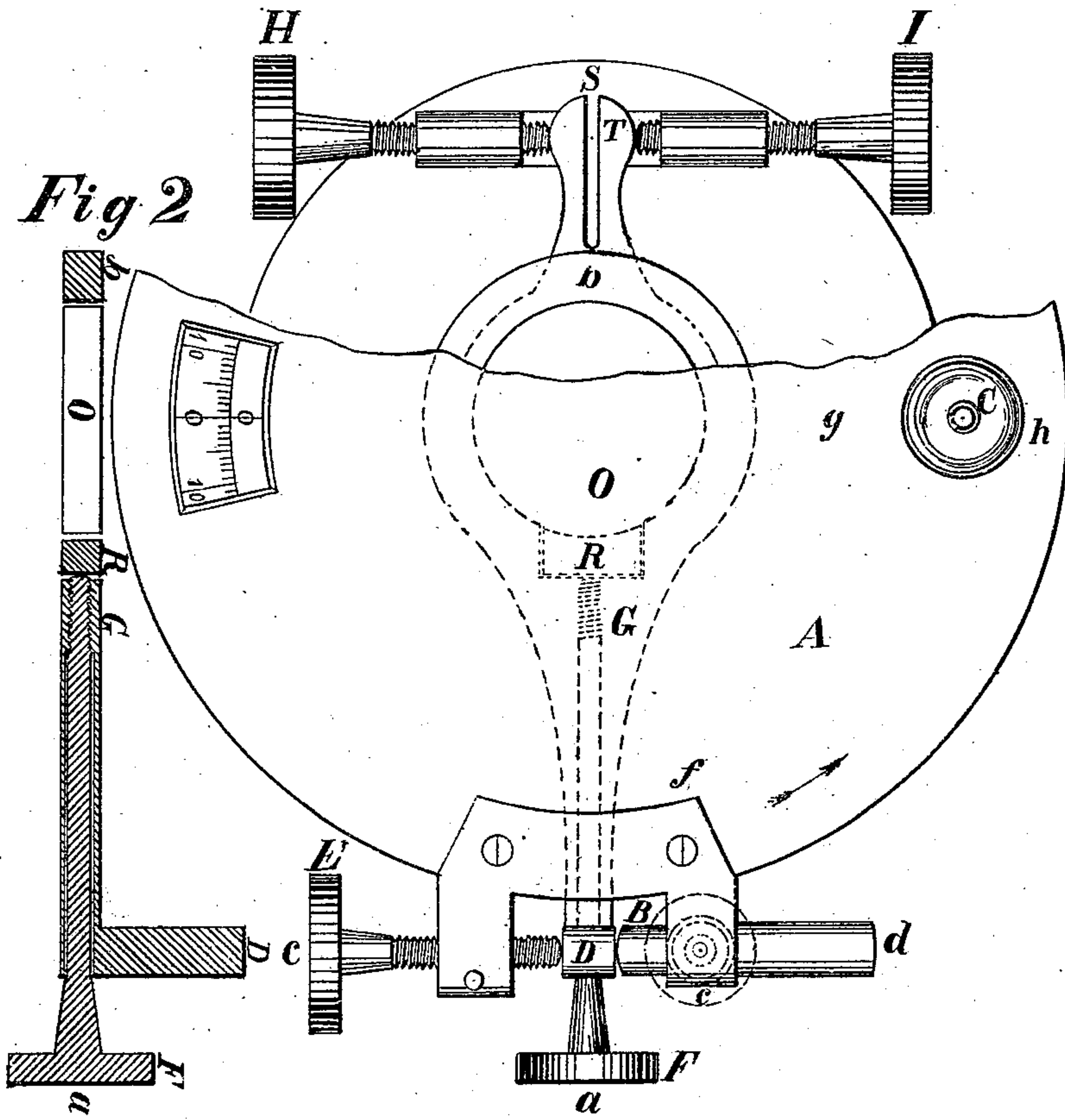


TRANSIT INSTRUMENT.

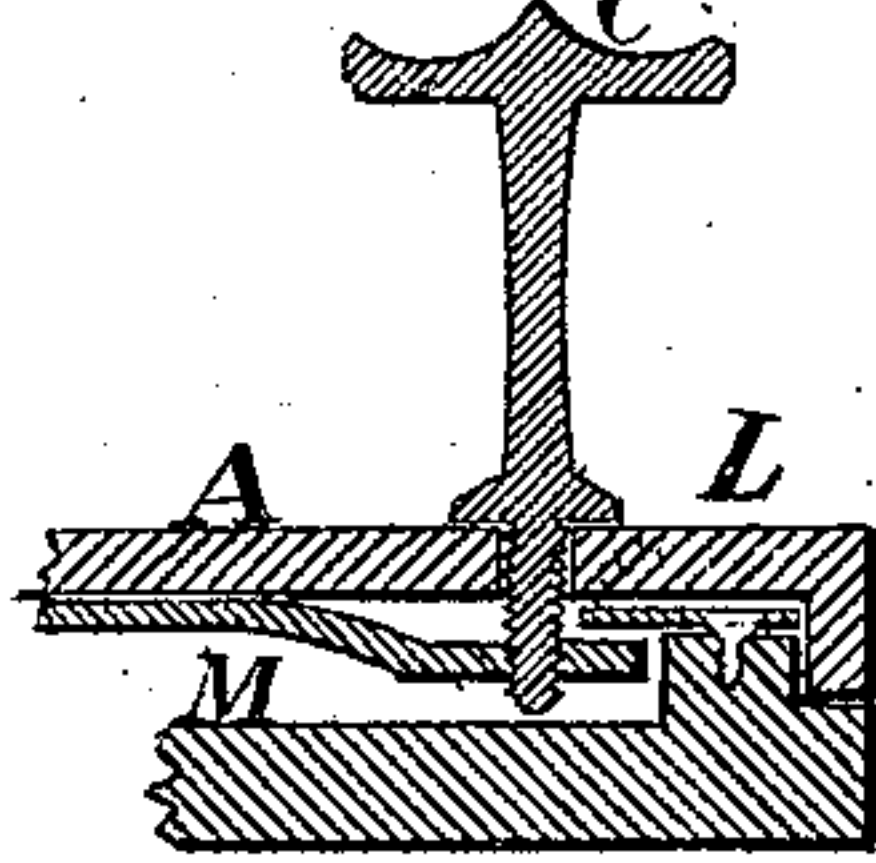
No. 184,922.

Patented Nov. 28, 1876.

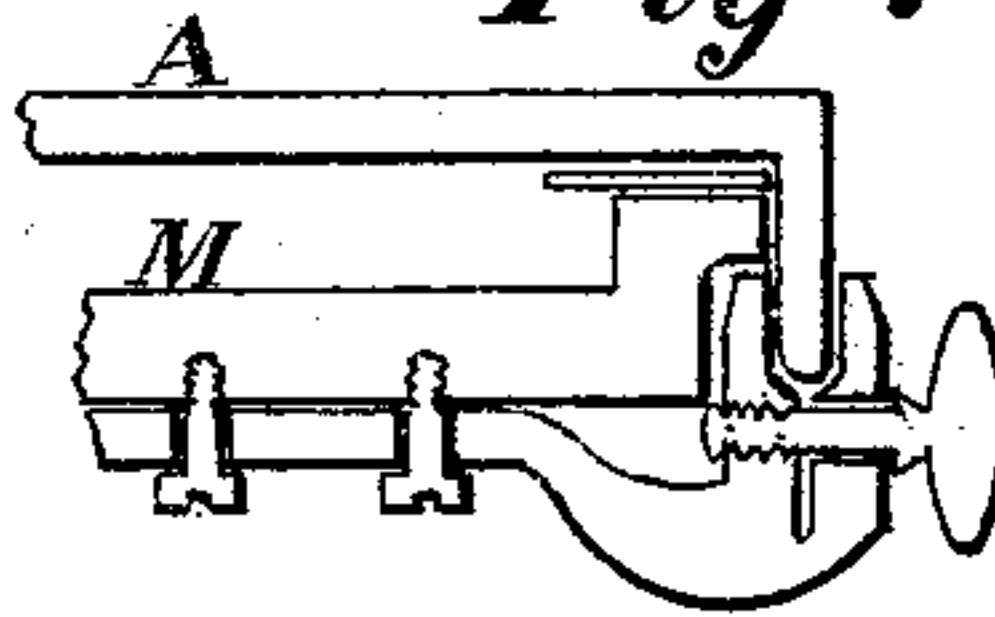
*Fig 1*



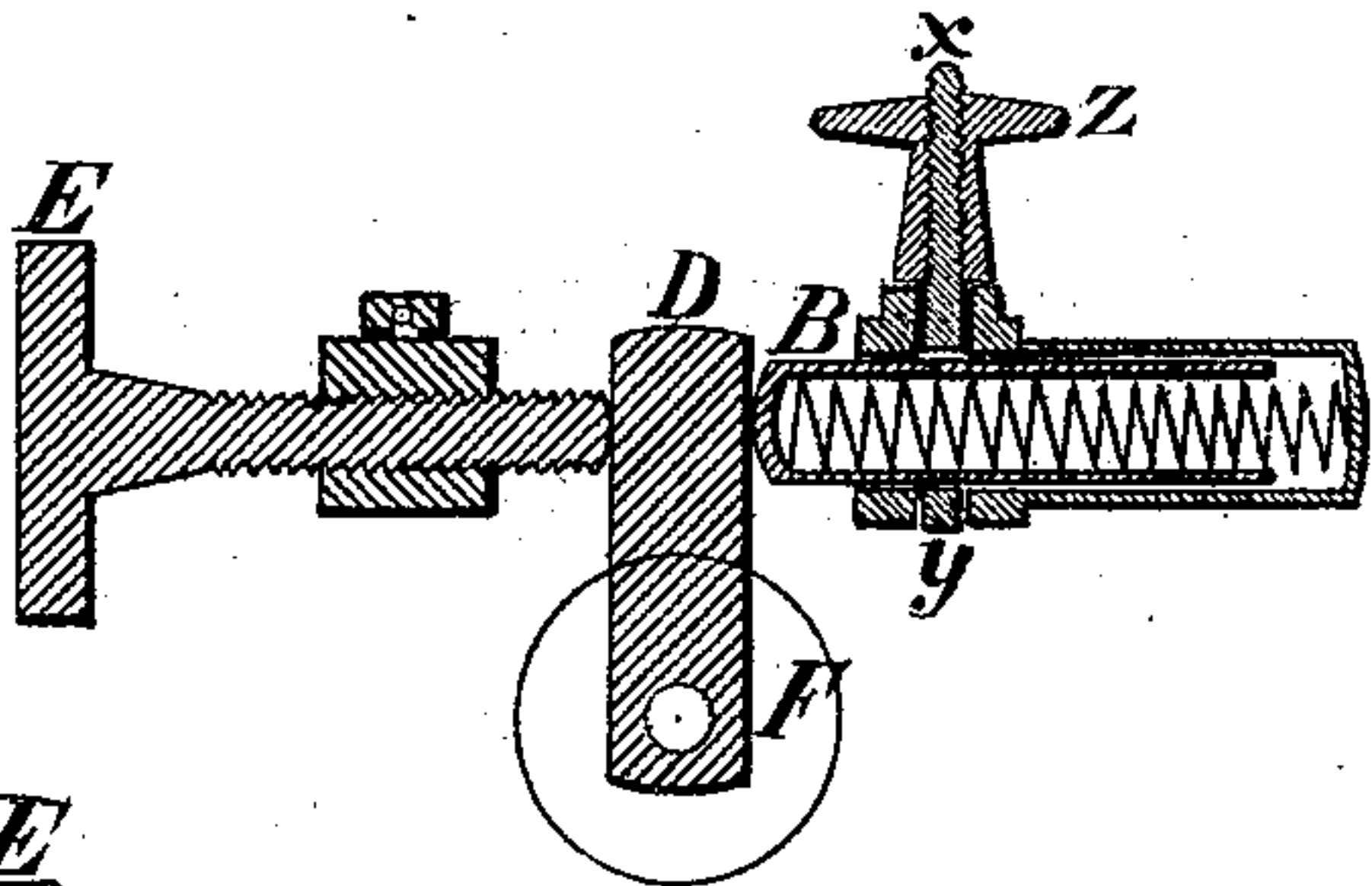
*Fig 6*



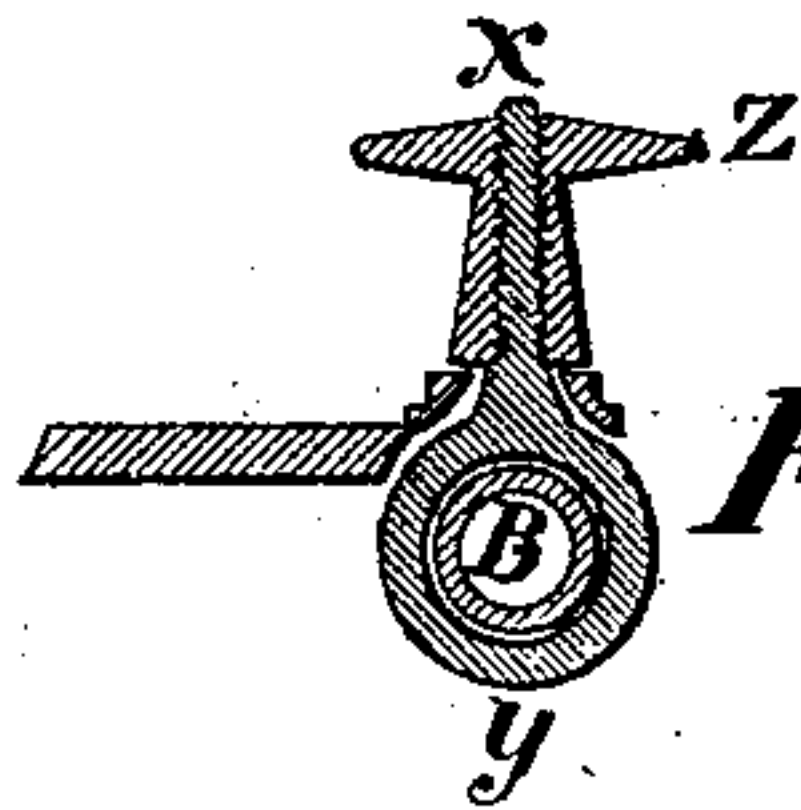
*Fig 7*



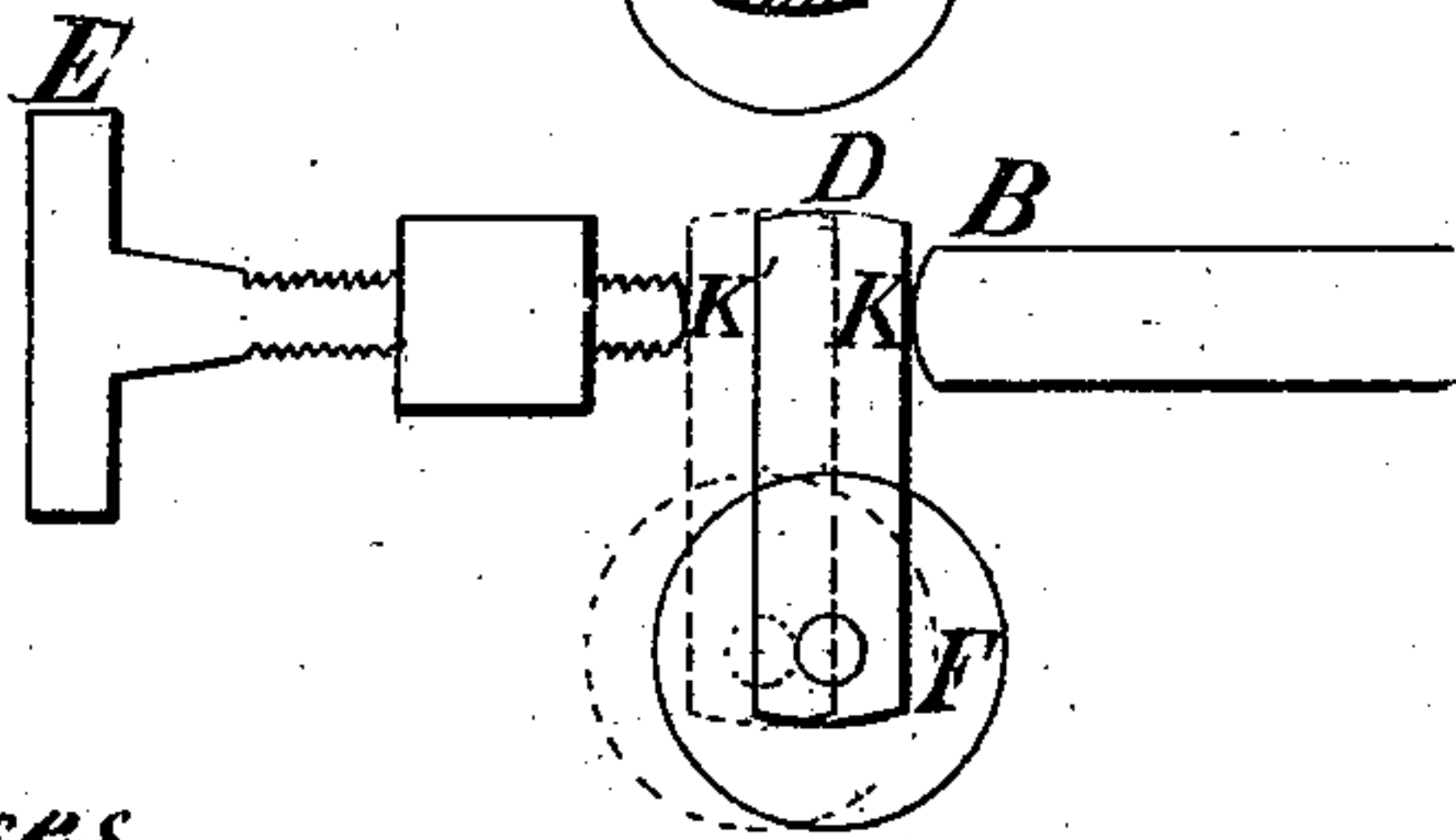
*Fig 3*



*Fig 4*



*Fig 5*



*Witnesses.*

John. S. Spofford  
William E. Blunt.

*Inventor*

Nelson Spofford.



# UNITED STATES PATENT OFFICE.

NELSON SPOFFORD, OF HAVERHILL, MASSACHUSETTS.

## IMPROVEMENT IN TRANSIT-INSTRUMENTS.

Specification forming part of Letters Patent No. 184,922, dated November 28, 1876; application filed May 13, 1876.

*To all whom it may concern:*

Be it known that I, NELSON SPOFFORD, of Haverhill, county of Essex, and State of Massachusetts, have invented certain Improvements in Engineers' Transit-Instruments, of which the following is a specification:

This invention relates to certain improvements in engineers' transit-instruments, its object being to facilitate the alignment depending upon the radial arm of the lower clamp and tangent device, and also to facilitate the laying out of railroad-curves, or the arcs of circles for any other purpose in which a transit-instrument is required.

Previous to my invention the said radial arm of the lower clamp, so far as I am aware, has always been made solid at the point where it is compressed between the ends of the tangent-screws, rendering it necessary, in order to communicate the proper lateral motion to said radial arm, to operate both tangent-screws at the same time, which is attended with great inconvenience.

The first part of my invention is intended to obviate this difficulty; and it consists in constructing the said radial arm with a vertical longitudinal slot at the end, which is clamped between the two tangent-screws, rendering that portion of said arm slightly compressible, so that one tangent-screw may be operated at a time to adjust the arm, the elasticity of the metal causing the parts to resume their normal position on releasing either tangent-screw, enabling the operator to bring the cross-hairs of the instrument to a final accurate alignment with ease and facility.

The second part of my invention consists in a combination of devices, more fully hereinafter set forth, whereby the laying off of railroad-curves, or the arcs of circles for any other purpose, is facilitated.

In the drawing, Figure 1 represents a plan view of my invention, the telescope, as well as portions of both main plate and vernier-plate, being removed, in order to show the lower tangent-screws and my improved radial arm. Fig. 2 represents a vertical longitudinal section through the center of radial arm and its clamp-screw and brake, on the line *a b* of Fig. 1. Fig. 3 represents a vertical cross-section on line *c d* of Fig. 2; Fig. 4, a vertical section

on line *e f* of Fig. 1; Fig. 5, a detached view of tangent-screw and spring-bolt and their supports; Fig. 6, a sectional view of the clamping device of the vernier-plate; and Fig. 7, a modification thereof.

In the drawing, the letter A represents a vernier-plate, and T the radial arm of the lower clamp or tangent device secured upon the vertical axis O, and through the end of which is formed a vertical longitudinal slot, S, rendering that portion of the arm which falls between the tangent-screws H and I slightly compressible, the metal being sufficiently elastic to cause the parts to assume their normal position immediately after releasing either of the tangent-screws, thus enabling the operator to bring the cross-hairs of the instrument to an accurate final alignment by turning only one of the tangent-screws at a time. The letter G represents a radial arm secured upon the vertical axis O, and located immediately below the main plate A, and provided with a brake, R, operated by means of a clamp-screw, F, extending through the center of the radial arm G, by means of which said arm may be firmly clamped to the vertical axis O of the main plate. The letter E represents a tangent-screw passing through one arm of a bracket secured to the vernier-plate, and B a spring-bolt mounted in a sleeve secured in the opposite end of said bracket, and provided with a clamp-screw, Z, connected with and operating a screw-eyebolt, *x y*. (Clearly represented in Fig. 4.) The letter D represents a detent formed on the rear end of the radial arm G, and setting between the ends of the tangent screw E and spring-bolt B. The letter C represents a clamp-screw, passing through the vernier-plate, for the purpose of clamping the same in position.

The operation of my invention is as follows: The instrument being set over the tangent point of the curve, with vernier-plate A clamped at zero, the telescope is reversed and accurately aligned upon the back-staff by operating either of the tangent-screws H or I, as previously described. The spring-bolt B is then clamped by operating the clamp-screw Z, drawing up the eyebolt *x y* against said spring-bolt, and holding it securely. The tangent-screw E is then turned back, the detent being pressed



back in contact with its point, and, as the spring-bolt is clamped and cannot follow it, a space,  $k$ , will be left between the spring-bolt and the detent D, the position of which is shown in dotted lines in Fig. 5. By this operation the vernier-plate is turned on its center, and any small angle may be set off as required, while the space  $k$  will be the exact arc measure of any angle set off. The vernier-plate is then clamped by means of the secondary clamp-screw C, and, supposing the curve to turn to the left, the telescope is in position to align the chainman for the first stake of the curve. To set the second stake the clamp-screw F is released, after which the radial arm G may be moved to the right until the detent D comes in contact with the spring-bolt B, leaving the space  $k'$  between the end of the tangent-screw E and said detent. The clamp-screw C is then released, after which the telescope and vernier-plate are turned to the right, carrying with them the tangent-screw E until its point comes in contact with the detent D, thus turning the telescope through an arc equal to the angle first set off. The parts are clamped in this position, and the chainman is then aligned and the second stake set, and the operation is thus continued to the end of the work.

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

1. The combination of the eyebolts  $x y$  and the headed female screw Z, forming a clamp for holding the bolt B in its adjusted position, substantially as and for the purpose described.
2. The combination of the bolt B, a suitable clamping device for holding it in its adjusted position, and tangent-screw bolt E, for the purpose of forming one side of the limiting space between the holes B and E of the detent D, substantially as described, and for the object specified.
3. The combination of bolt or abutment B with the detent D and the tangent-screw E, for the purpose of forming a limiting space between the abutment B and the said screw, substantially as described, for the object hereinbefore set forth.
4. The combination, in a transit-instrument, of the slotted radial arm T and tangent-screws H I, all arranged to operate substantially as described.

NELSON SPOFFORD.

Witnesses:

JOHN S. SPOFFORD,  
WILLIAM E. BLUNT.