D. HOFFMAN.

Tripod-Head for Surveying Instruments.

No. 197,369. Patented Nov. 20, 1877.

Fig 1

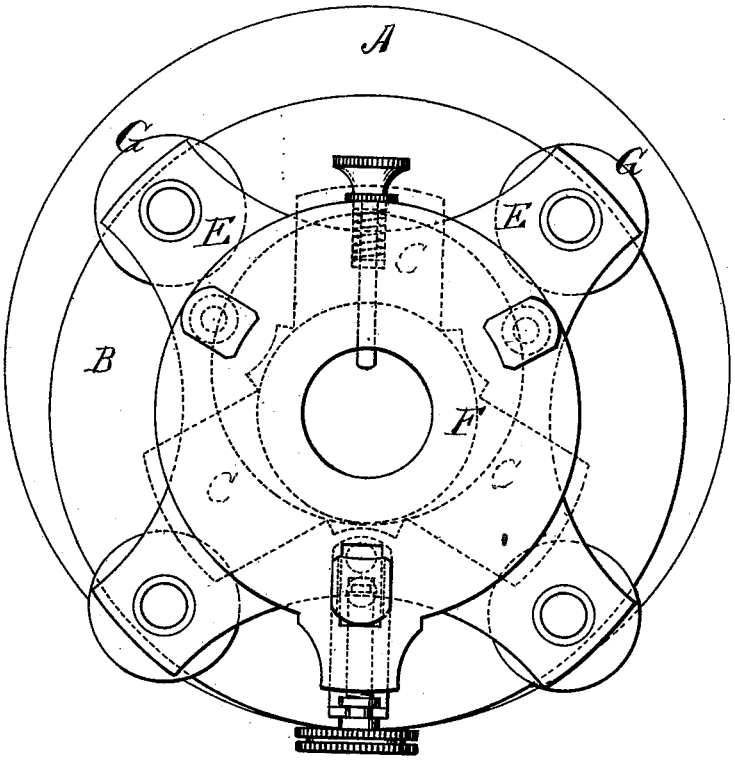
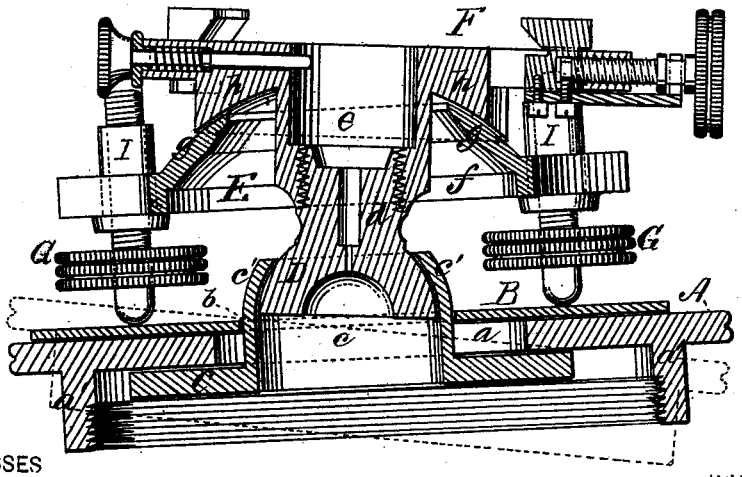



Fig 2




WITNESSES

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## IMPROVEMENT IN TRIPOD-HEADS FOR SURVEYING INSTRUMENTS.

Specification forming part of Letters Patent No. **197,369**, dated November 20, 1877; application filed October 20, 1877.

*To all whom it may concern:*

Be it known that I, DANIEL HOFFMAN, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and valuable Improvement in Tripod-Heads; 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 top view of my improved tripod-head, and Fig. 2 is a vertical central section of the same.

This invention has relation to improvements in tripod-heads for transits, levels, theodolites, and other instruments for surveying, engineering, and astronomical purposes.

The object of the invention is to devise a tripod-head of such a construction that it may be leveled with absolute accuracy and expedition, and may be adjusted horizontally for bringing the center of the instrument over a fixed point on the ground, whatever be the nature of the same or its inclination.

The nature of the invention will be readily perceived from the following description, and pointed out in the claims appended thereto.

In the annexed drawings, the letter A designates the base-plate of my improved tripod-head, having a large central circular opening, *a*, and a flange, *a'*, upon its under side, provided with a coarse screw-thread upon its inner face, by means of which the whole head is secured to the tripod.

B represents the carrier-plate, upon which the upper part of the head is supported. This plate has a central opening, *b*, of circular form, of less diameter than the opening *a* of plate A. C represents a socket-plate having a short central neck, *c*, in which the concave bearing-surface *c'* of the lower ball-and-socket joint is formed. This plate is passed from below inside of the flange *a*, and its neck thrust through the openings *a b* of the base-plate and of the carrier-plate, respectively. The diameter of the neck *c* and of the orifice *b* of the plate B are the same, and the neck fits snugly in the said orifice. The ball D of the lower socket-joint is passed up through the neck, and its projecting screw-threaded end *d* through the leveling-screw plate E. It is then screwed into the lower end of the neck *c*, projecting downward from the plate F, to which the instrument is directly attached.

The leveling-screw plate E has a large central opening, *f*, and on its upper face is provided with a convex annulus, *g*, which is received in and accurately fits a concave socket, *h*, upon the under side of the plate F aforesaid. When the end *d* is screwed into the neck *c* aforesaid, the parts of the tripod-head are coupled together.

The convex annulus *g* and the socket *h* form the upper ball-and-socket joint of my improved head for tripods, and their curved surfaces and those of the lower ball-and-socket joint are concentric; consequently, while the leveling-screw plate is motionless, the instrument-plate F has free universal movement upon the lower ball-and-socket joint *c'* D, in the ball of which the centers of the curved surfaces of both the upper and lower joints are coincident. The neck *e* of the instrument-plate and that of the ball, as aforesaid, are connected together, and the axial line of the former, if extended, would pass through the center of the latter; consequently, when the said plate is level and the instrument properly secured thereon, the center of latter must be in line with the longitudinal axis of the neck and the center of the ball, and the plummet-line in the vertical prolongation of the said axis.

By sliding the carrier-plate A horizontally the plummet may be brought directly over the fixed point on the ground with great accuracy and expedition, thus bringing the center of the instrument and the said fixed point in the same vertical line.

By setting up the leveling-screws G the level thus obtained and the adjustment of the center of the instrument over the fixed point on the ground may be preserved for any length of time, whatever be the nature of the ground. These leveling-screws extend through long screw-threaded nuts I, rigidly secured to the plate E, exactly at right angles thereto, and their lower ends bear upon the plate B, as shown; consequently they are not liable to become jammed in their bearings, to lose their position with reference to plate E, nor to interfere with the base-plate.

I operate the head as follows to obtain a level position for the instrument and bring its center in the vertical line of the fixed point on the ground: I loosen any two of the leveling-screws which may be convenient, (about one half-turn will be sufficient,) thereby letting down plate C sufficiently to clear it from the base-plate, and permitting the carrier-plate B to be shifted in any direction horizontally, carrying the leveling-plate, the upper and lower ball-and-socket joints, and the instrument-plate with it, until the instrument on the head is centered over the fixed point on the ground. This being accomplished, I level the instrument approximately by hand, and exactly by setting up the two leveling-screws aforesaid, as may be requisite. This causes the ball and sockets to bind tightly upon each, and produces the desired result.

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

1. The combination, with the plate A, having central opening *a*, and the plate C, having the socket *c'* extending through said opening, of the ball D, having threaded neck *d*, the leveling-screw plate E, having ball *g*, and the instrument-plate F, having neck *c* and socket *h*, substantially as specified.

2. The combination, with the base-plate A, having central opening *a*, and the socket-plate C, having neck *c*, of the carrying-plate B, having aperture *b*, fitting said neck, and the leveling mechanism of a tripod-head, substantially as specified.

3. A tripod-head having a ball-and-socket joint for the base-plate, in combination with the instrument-plate F, having a spherical bearing, *g h*, concentric with said ball-and-socket joint, and leveling-plate E, substantially as specified.

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

DANIEL HOFFMAN.

Witnesses:
ALLEN H. GANGEWER,
H. C. BRICK.

1,250 words.