Feb. 27, 1934. O. M. CARLETON 1,948,508

LEVELING DEVICE

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Fig. 1.

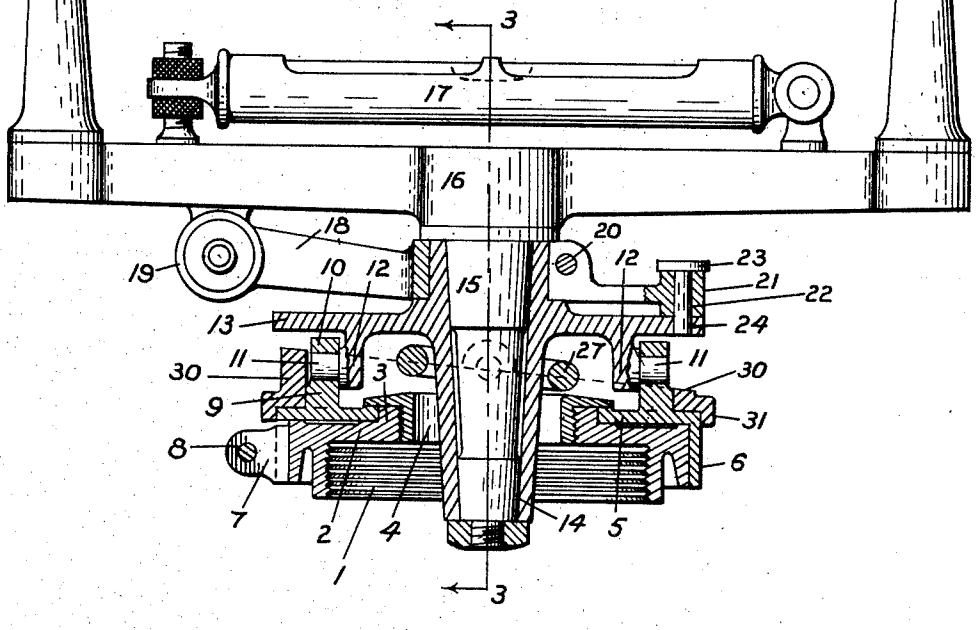
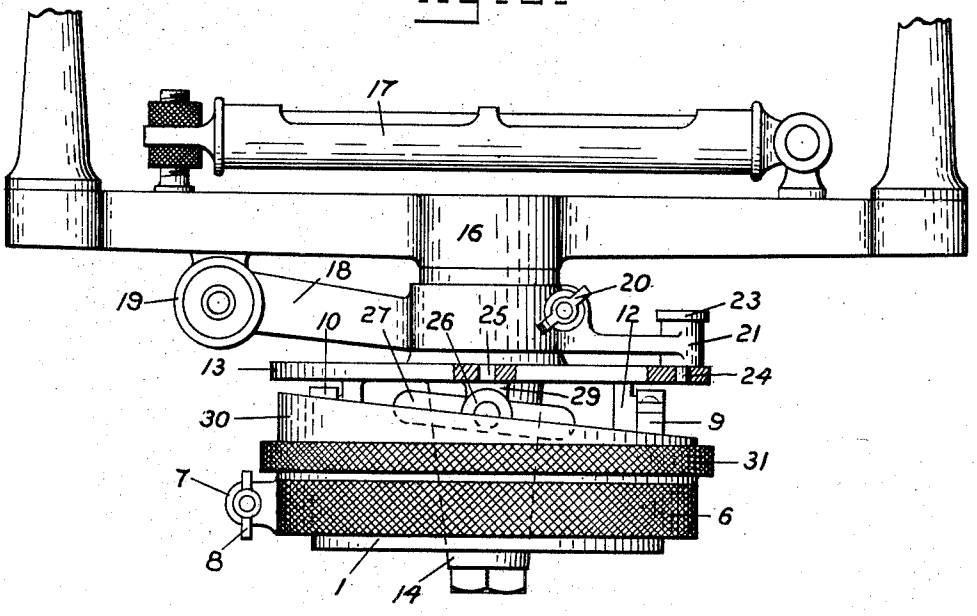


Fig. 2.



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Fig. 3.

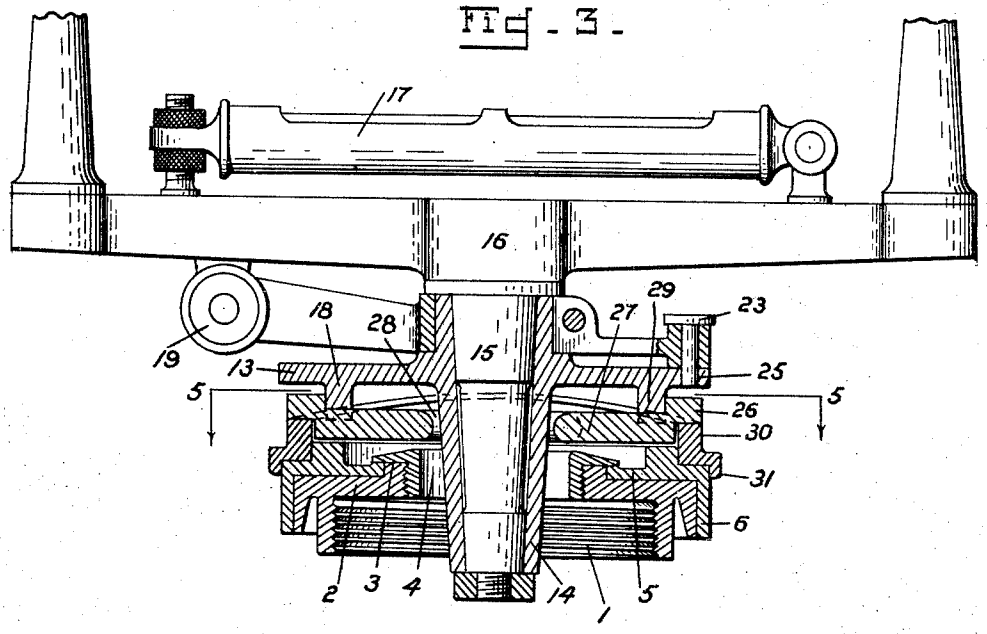


Fig. 4.

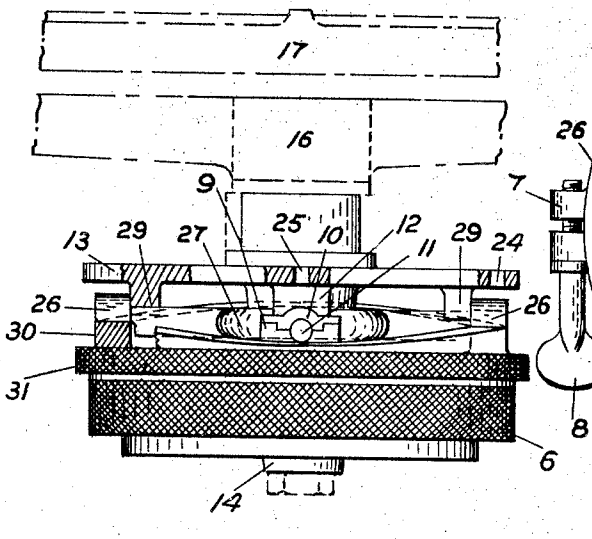
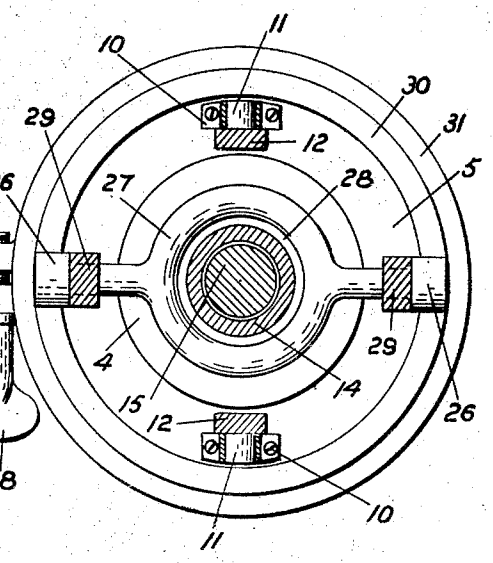


Fig. 5.



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UNITED STATES PATENT OFFICE

1,948,508

LEVELING DEVICE

Oscar M. Carleton, Watertown, Mass.

Application October 10, 1933. Serial No. 692,996

12 Claims. (Cl. 248—47)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to a leveling device intended primarily for leveling artillery, machine guns, surveying instruments and the like.

The invention consists broadly in so mounting a member to be leveled that it may be rotated to bring a given line on the surface of said member, or a line parallel thereto into a horizontal position and then tilting the member to bring a line perpendicular to the aforesaid line into horizontal position.

Specifically the invention consists in trunnioning the member in a rotatable element and providing a cam surface movable to tilt the member about its trunnion.

With the foregoing and other objects in view, the invention resides in the novel arrangement and combination of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

A simple form of the device designed for use with surveying instruments is shown by way of illustration in the accompanying drawings wherein:

Fig. 1 is a longitudinal sectional view with parts in elevation of a leveling device constructed in accordance with the invention.

Fig. 2 is a view in side elevation of Fig. 1.

Fig. 3 is a sectional view on the line 3—3 of Fig. 1, the spirit level being turned ninety degrees.

Fig. 4 is a view in side elevation of Fig. 3.

Fig. 5 is a detail sectional view taken on the line 5—5 of Fig. 3.

Referring to the drawings by numerals of reference:

There is provided a base of any suitable form herein shown as a ring 1, preferably internally threaded, formed at its upper edge with an inwardly projecting flange 2 having an upturned inner periphery 3 which threadedly receives a retaining ring 4, the outwardly projecting annular flange of which overlies a trunnion ring which is mounted for rotation on the base ring 1. The trunnion ring is preferably a flat annular plate 5 from the outer edge of which depends an apron 6 which may be knurled on its outer face to facilitate rotating the ring, and means is provided for locking the trunnion ring to the base ring, herein shown as a clamp (Fig. 5) formed by splitting the apron and providing on the split ends apertured lugs 7 one of which is threaded to engage with the threads of a clamping screw 8. At diametrically opposite positions on the annular plate 5 and located between the inner and outer edge thereof are bearing pillars 9 topped by the bearing caps 10.

The bearings 9—10 receive a pair of diametrically opposite trunnions 11—11 (Fig. 1) projecting radially outward from hangers 12—12 on the under side of a leveling head which is in the form of a disk 13. The disk is formed centrally with a tapered socket 14 for receiving the pintle 15 of a member 16 that is to be leveled and that carries a conventional spirit level 17.

An arm 18 fixed to the member 16 as indicated at 19 has a split bearing 20 intermediate its ends whereby it is journaled on the socket member. The free end 21 of the arm is provided with an aperture 22 for receiving a headed stop pin 23 whose lower end is adapted to enter either one or two apertures 24—25 provided in the marginal portion of the disk 13 and spaced 90 degrees apart. The aperture 24 is in line with the trunnions 11—11 while the aperture 25 is in line with a pair of shoes 26—26 carried by the disk 13 on an axis at right angles to the axis of the trunnions.

A preferred manner of associating the shoes 26 with the disk 13 is shown in Figs. 3 and 4 and consists in forming the shoes on opposite ends of a connecting member 27 which is enlarged centrally and apertured as at 28 to permit passage therethrough of the socket 14. A pair of half bearings 29—29 on the under side of the disk 13 at right angles to the hangers 12 and trunnions 11 engage the connecting member on the inner side of the shoes 26 and hold it against upward movement while constraining it to be rotated in unison with the disk. The shoes are enlarged and offset so that their inner faces preferably engage the outer faces of the half bearings to prevent axial displacement of the connecting member.

The shoes ride on a cam ring 30 which is seated on the margin of the trunnion ring 5 and which is held in place by means of an apron 31 and also by engagement with the bearing pillars 9. The wearing surfaces of the shoes are in the same plane as the axis of the trunnions 11 and also in the plane containing the axis of tilting of the connecting member 27.

Assuming the base 1 to be out of level the operation of leveling the head 13 consists in first

placing the parts in the position shown in Fig. 1 with the stop pin 23 engaged in the aperture 24 which is in line with the trunnions 11 and with the spirit level 17 parallel to the trunnions. The trunnion ring 5 is then rotated, until the bubble of the spirit level is centered. The trunnion ring is then fixed to the base 1 by acting on the clamping screw 8.

The stop pin 23 is next withdrawn from the aperture 24 in the head 13, the member 16 is rotated 90 degrees and the stop pin is inserted in the aperture 25. The spirit level 17 carried by the member 16 is now positioned perpendicular to the trunnions 11 (Fig. 3) and parallel to the shoes 26.

The cam ring 30 is now rotated and since the shoes 26 riding on the cam ring are in effect carried by the head 13, the head will be tilted about the trunnions 11. The cam ring is rotated until the bubble of the spirit level is centered. The head 13 and the member 16 mounted thereon are now level.

I claim.

1. A leveling device comprising a base, a ring rotatably mounted on the base and having diametrically opposite bearings on its upper side, means for securing the ring to the base, a head overlying the ring and having a centrally disposed socket, trunnions on the under side of the head and receivable in the bearings, diametrically opposite half-bearings on the under side of the head and at right angles to the trunnions, a cam ring rotatably mounted on the ring, a connecting member engaged by the half-bearings, a shoe on each end of the connecting member and riding on the cam ring, the wearing surfaces of the shoes being in the plane of the axis of the trunnions and in the plane containing the axis of tilting of the connecting member, the inner faces of the shoes engaging the outer faces of the half-bearings, a member having a pintle receivable in the socket of the head, an arm secured to said member and journaled intermediate its ends on the socket, a stop pin passing through the free end of the arm and engageable with the head.

2. A leveling device comprising a base, a ring rotatably mounted on the base and having diametrically opposite bearings on its upper side, means for securing the ring to the base, a head overlying the ring, trunnions on the under side of the head and receivable in the bearings, diametrically opposite half-bearings on the under side of the head and at right angles to the trunnions, a cam ring rotatably mounted on the ring, a connecting member engaged by the half-bearings, a shoe on each end of the connecting member and riding on the cam ring, the wearing surfaces of the shoes being in the plane of the axis of the trunnions and in the plane containing the axis of tilting of the connecting member, the inner faces of the shoes engaging the outer faces of the half-bearings, a member rotatably mounted on the head, and means for fixing said member to the head in two positions at right angles to one another.

3. A leveling device comprising a base, a ring rotatably mounted on the base and having diametrically opposite bearings on its upper side, means for securing the ring to the base, a head overlying the ring, trunnions on the under side of the head and receivable in the bearings, diametrically opposite half-bearings on the under side of the head and at right angles to the trunnions, a cam ring rotatably mounted on the ring, a connecting member engaged by the half-bearings, a shoe on each end of the connecting member and riding on the cam ring, the wearing surfaces of the shoes being in the plane of the axis of the trunnions and in the plane containing the axis of tilting of the connecting member, the inner faces of the shoes engaging the outer faces of the half-bearings.

4. A leveling device comprising a base, a ring rotatably mounted on the base and having diametrically opposite bearings on its upper side, means for securing the ring to the base, a head overlying the ring, trunnions on the under side of the head and receivable in the bearings, diametrically opposite half-bearings on the under side of the head and at right angles to the trunnions, a cam ring rotatably mounted on the ring, a connecting member engaged by the half-bearings, a shoe on each end of the connecting member and riding on the cam ring, the wearing surfaces of the shoes being in the plane of the axis of the trunnions and in the plane containing the axis of tilting of the connecting member.

5. A leveling device comprising a base, a ring rotatably mounted on the base and having diametrically opposite bearings on its upper side, means for securing the ring to the base, a head overlying the ring, trunnions on the under side of the head and receivable in the bearings, diametrically opposite half-bearings on the under side of the head and at right angles to the trunnions, a cam ring rotatably mounted on the ring, a connecting member engaged by the half-bearings, a shoe on each end of the connecting member and riding on the cam ring, the wearing surfaces of the shoes being in the plane of the axis of the trunnions and in the plane containing the axis of tilting of the connecting member.

6. A leveling device comprising a base, a ring rotatably mounted on the base and having diametrically opposite bearings on its upper side, means for securing the ring to the base, a head overlying the ring, trunnions on the under side of the head and receivable in the bearings, diametrically opposite half-bearings on the under side of the head and at right angles to the trunnions, a cam ring rotatably mounted on the ring, a connecting member engaged by the half-bearings, a shoe on each end of the connecting member and riding on the cam ring, the wearing surfaces of the shoes being in the plane of the axis of the trunnions.

7. A leveling device comprising a base, a ring rotatably mounted on the base and having diametrically opposite bearings on its upper side, means for securing the ring to the base, a head overlying the ring, trunnions on the under side of the head and receivable in the bearings, diametrically opposite half-bearings on the under side of the head and at right angles to the trunnions, a cam ring rotatably mounted on the ring, a connecting member engaged by the half-bearings, a shoe on each end of the connecting member and riding on the cam ring, the inner faces of the shoes engaging the outer faces of the half-bearings.

8. A leveling device comprising a base, a ring rotatably mounted on the base and having diametrically opposite bearings on its upper side, means for securing the ring to the base, a head overlying the ring, trunnions on the under side of the head and receivable in the bearings, diametrically opposite half-bearings on the under side of the head and at right angles to the trunnions, a cam ring rotatably mounted on the ring, a connecting member engaged by the half-

bearings, a shoe on each end of the connecting member and riding on the cam ring.

9. A leveling device comprising a base, a ring rotatably mounted on the base and having diametrically opposite bearings on its upper side, a head having trunnions in the bearings of the ring, a pair of shoes carried by the head on an axis at right angles to the trunnions and turning on their axis, the wearing surfaces of the shoes being in the plane of the axis of the trunnions, and a cam ring rotatably mounted on the ring and engaged by the shoes.

10. A leveling device comprising a base, a ring rotatably mounted on the base and having diametrically opposite bearings on its upper side, a head having trunnions in the bearings of the ring, a pair of shoes carried by the head on an axis at right angles to the trunnions, the wearing surfaces of the shoes being in the plane of the axis of the trunnions, and a cam ring rotatably mounted on the ring and engaged by the shoes.

11. A leveling device comprising a base, a ring rotatably mounted on the base and having diametrically opposite bearings on its upper side, a head having trunnions in the bearings of the ring, a pair of shoes carried by the head on an axis at right angles to the trunnions and turning on their axis, and a cam ring rotatably mounted on the ring and engaged by the shoes.

12. A leveling device comprising a base, a ring rotatably mounted on the base and having diametrically opposite bearings on its upper side, a head having trunnions in the bearings of the ring, a pair of shoes carried by the head on an axis at right angles to the trunnions, and a cam ring rotatably mounted on the ring and engaged by the shoes.

OSCAR M. CARLETON.