

Dec. 21, 1937.

C. ROGGERO

2,103,184

LEVELING AND SQUARING DEVICE

Filed March 29, 1937

2 Sheets-Sheet 1

Fig. 1

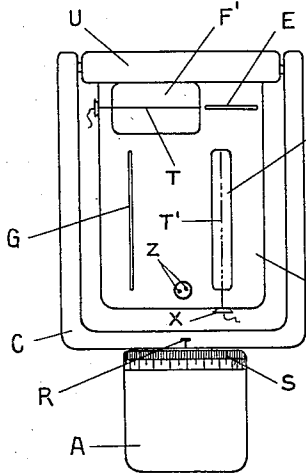


Fig. 2

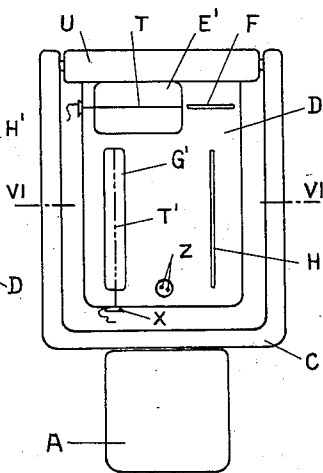


Fig. 3

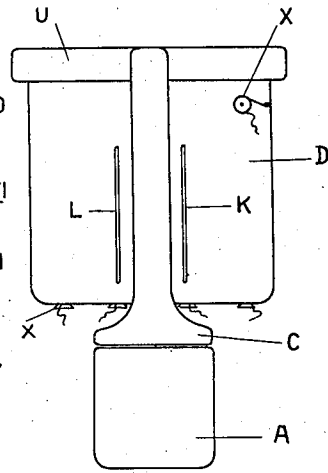


Fig. 4

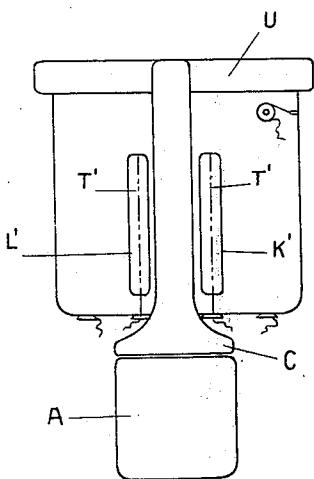


Fig. 5

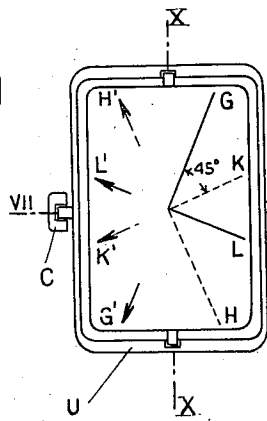
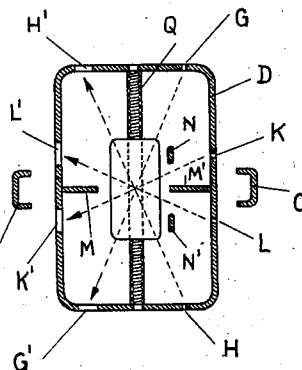


Fig. 6



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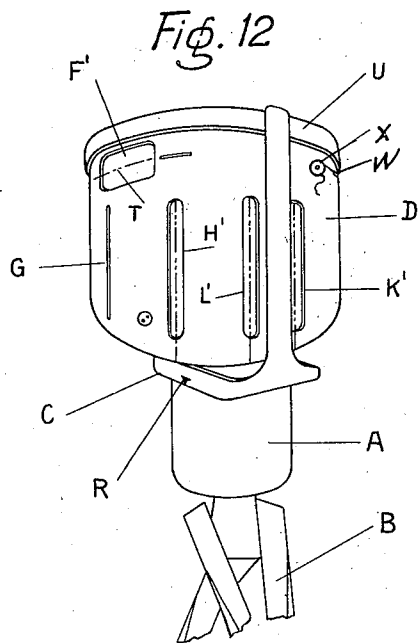
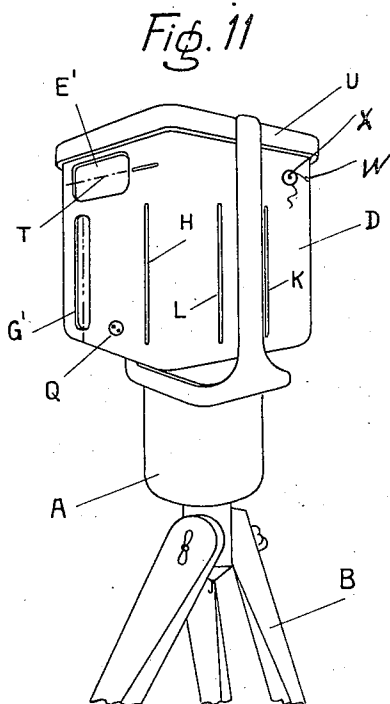
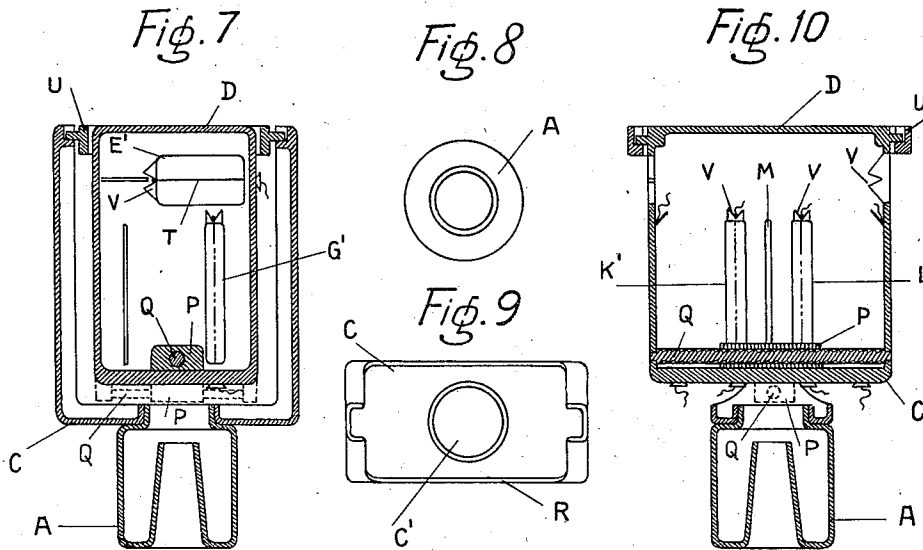
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LEVELING AND SQUARING DEVICE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,103,184

LEVELING AND SQUARING DEVICE

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Application March 29, 1937, Serial No. 133,742
In Germany April 6, 1936

7 Claims. (Cl. 33-72)

This invention relates to a combined level and square or goniometer, especially suitable for surveyors and by which it is possible to do all usual level and angle measuring work.

The object of the invention is to provide a device of the above kind, which is very simple in construction and very reliable in use.

The invention is based on the combination of a gravity level with an optical square, and is constituted by a freely hanging box, suspended on a Cardanical joint and provided with horizontal and vertical narrow slits, faced by wider slots or apertures traversed by cross hairs. In one embodiment of the invention screens are further fitted to the interior of the box in such a manner as to avoid that from one of the slits more than one of opposite apertures can be seen.

The invention will be better understood by the following specification with reference to the accompanying drawings in which:

Figures 1 and 2 are front elevations seen from opposite sides of the apparatus;

Figures 3 and 4 are side elevations from opposite sides;

Figures 5 and 6 are respectively a plan view and a horizontal section on line VI—VI of Figure 2;

Figure 7 is a vertical section on line VII—VII of Figure 5;

Figures 8 and 9 are respectively a plan of the supporting block and of the stirrup of the device;

Figure 10 is a vertical section on line X—X of Figure 5, and

Figures 11 and 12 are two perspective views showing respectively a parallelepipedal and a cylindrical box mounted on their respective feet, seen from opposite sides.

As shown, the instrument comprises a box D which may be of parallelepipedal, cylindrical or other suitable form, suspended on a pair of aligned pivots to a frame U which in its turn is suspended on another pair of pivots at right angles to the former ones to the end of the wings of stirrup C, the whole so as to have a cardanic suspension. The yoke of the stirrup C may be rotatably mounted on a vertical pivot on a supporting block A, mounted on a tripod or stand B.

The vertical walls of box D are provided with a number of vertical and horizontal slits, namely in the upper part of the two sides lying opposite to one another and parallel to the plane of stirrup C a narrow slit E, F is cut and in front of each of these slits a larger opening or slot E', F' traversed by a cross hair T (Figures

1, 2, 7, 11, 12) is provided. The instrument is adjusted in such a way that when the box D hangs freely on its Cardanic support U, looking through one of slits E, F, so as to centre cross hair T of opposite slots E', F', the vision extends through a horizontal plane and therefore the instrument acts as a level.

Below these horizontal apertures vertical slits G, H, K, L, are cut through which oppositely lying slots G', H', K', L' may be looked at.

It is to be noted that from each slit only one of the opposite lying slots shall be visible and namely the slot the center line of which lies on the vertical plane drawn through the center of the slit and the intersection line of the vertical planes passing through the suspension pivots of the box, the said intersection line being the center axis of the device. Furthermore the slits come to be at the intersection points of a number of equally spaced vertical planes radially drawn from the said center axis towards one vertical half of the box, while the larger apertures are cut on the other half of the box symmetrically of said slits (see Figure 6). For the usual purposes the slits G—K—L—H and apertures G'—K'—L'—H' are spaced 45° apart from one another.

In order to avoid that the wrong slot may also be seen through each slit, two pairs of screens M, M' and N, N' are fitted within the box D so as to avoid the vision at right angles or parallel to any one of these planes.

The vertical slots are also provided with cross hairs T' as collimators for determining vertical planes when seen at the centre of the opposite slits. In Figures 5 and 6 the different directions of vision are indicated, which as it is apparent, form with one another angles of 45° or multiples thereof. In practice these angular directions are sufficient for the usual measuring operations.

The instrument can be adjusted in the workshop and to this purpose on the bottom of the box a shiftable counterweight P is fitted, which is constituted preferably by a suitable weighty block P, having a screw-threaded bore which is screwed on a threaded spindle Q as shown in Figures 6, 7 and 10.

Spindle Q can be turned from the exterior of the box, for instance by means of a suitable key to be inserted in keyholes Z provided at one end of the spindle Q. A like shiftable counter-weight can be fitted at right angles to the above described, for instance at the underside of the bottom wall of the box, as shown in Figures 7 and 10, and this counterweight may be also closed in

a suitable casing. However, these balancing weights are not absolutely necessary and the adjustment of the box may be effected by any other suitable known means, as for instance those usually adopted by scale makers and consisting in eliminating the unbalancing by means of suitable small fixed additional weights, as drops of tin.

Having to set ranging pegs at angles other than 45° or multiples thereof (which happens not very frequently), a mark R may be provided on a part integral of stirrup C pointing on a graduated circle S (Figure 1) on block A.

From the foregoing the advantages of the new and useful instrument are apparent. In fact, this instrument can replace two instruments adopted until now by surveyors, viz. a level and an optical square. It may be mentioned that the new construction permits of a simple and economical fastening of the cross collimator hairs T, T' (Figures 1, 2, 4, 7, 12) which are fitted in their operating position by inserting a knot at one end in a narrow notch between suitable wings V fitted at one end of the apertures E', F', G' and by winding the opposite end of hair on a buttonlike projection X under the bottom of the box, the hairs being maintained in their right position by suitable notches W.

As it is apparent, the box may be of parallelepipedal (Figure 11), as well as cylindrical (Figure 12) or eventually polygonal form.

I claim:

1. In a combined leveling and squaring device, a box, a Cardanic suspension for said box, a forked supporting member or stirrup for supporting the said box through the said Cardanic suspension, narrow horizontal slits in the upper part of the box and wider apertures or slots opposite of each of the said slits, narrow vertical slits below said horizontal slits and apertures and wider vertical apertures or slots opposite of said vertical slits and vertical cross hairs on said apertures, whereby the vertical slits come to lie all on one vertical half of the box and the wider apertures or slots are provided on the other half of the box, the said vertical slits and apertures being spaced from one another of equal angles about the centre of the device.

2. In a combined leveling and squaring device according to claim 1, the arrangement of means for avoiding that through each vertical slit more than one vertical slot may be seen.

3. In a combined leveling and squaring device according to claim 1, the arrangement on the bottom of the box of adjustable weights for main-

taining the box vertical when freely hung on its supports.

4. In a combined leveling and squaring device according to claim 1, a stand for supporting the forked support, a block on said stand, pivotal connections between this block and the said forked support of said frame to which the box is suspended, a graduated circle on said box adjacent to the lower part of said forked support and a mark on this part of the forked support pointing to the graduations of said graduated circle.

5. In a combined leveling and squaring device, a box, a pair of oppositely lying pivots on said box, a frame encircling the upper part of said box, seats on said frame for the projecting pivots of the box, a pair of oppositely lying pivots fastened to and projecting to the exterior of the said frame at right angles to the said seats for the box pivots, a forked supporting member or stirrup, seats on said stirrup for supporting the projecting pivots of the frame, means for pivotally supporting said stirrup, narrow horizontal slits in the upper section of said box and larger horizontal apertures provided with cross hairs in front of said horizontal slits, four adjacent narrow vertical slits spaced apart 45° from one another with regards to the center axis of the device, four adjacent longitudinal apertures or slots each traversed by a vertical cross hair, the said cross hairs being spaced 45° apart from one another with regards to the center axis of the device and the outer longitudinal slots being spaced 45° apart from the outer adjacent slits and means for avoiding that from each slit more than one longitudinal slot may be looked at, the slot visible through each slit being so situated that the vertical center axis of the device comes to lie on all planes passing through the center of each vertical slit and the cross hair of the corresponding slot and means for supporting said box so that it hangs vertically.

6. In a leveling and squaring device according to claim 5, a mark on the base of the forked support, a hole in the center of said base, a supporting block for said forked support, a pivotlike projection on said block fitting in the hole of the forked support, a graduated circle on the upper part of said block, in front of said mark of the forked support and a stand for adjustably supporting said forked support.

7. In a leveling and squaring device according to claim 5, the provision of screens in front of each vertical slit to control the line of vision through each vertical slit.

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