

**Feb. 19, 1929.**

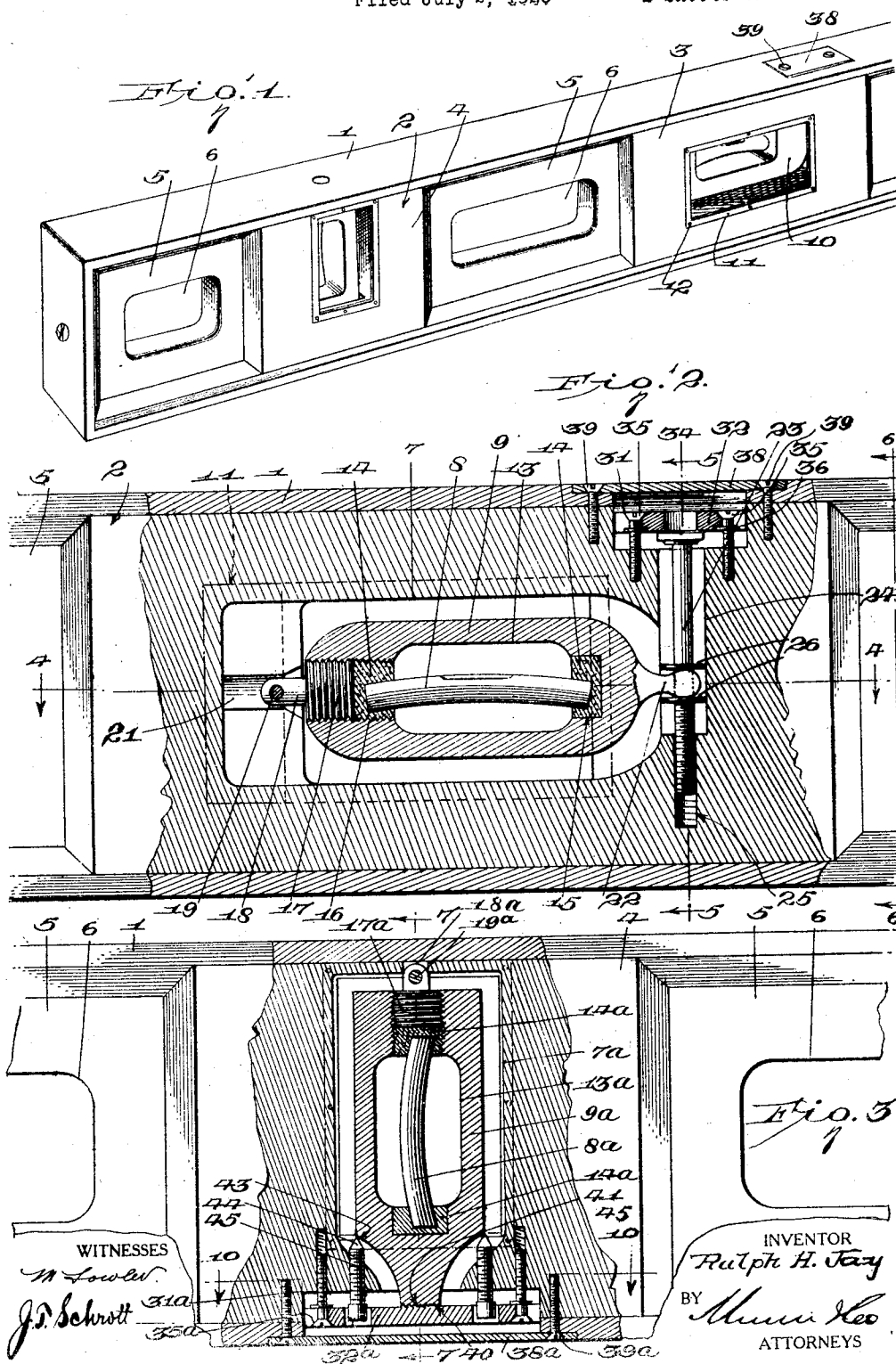
**1,703,006**

**R. H. JAY**

SPIRIT LEVEL

Filed July 2, 1926

2 Sheets-Sheet 1



Feb. 19, 1929.

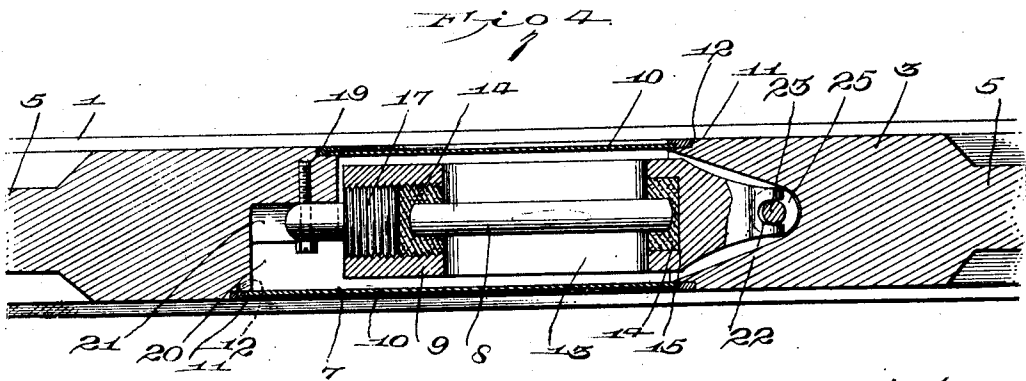
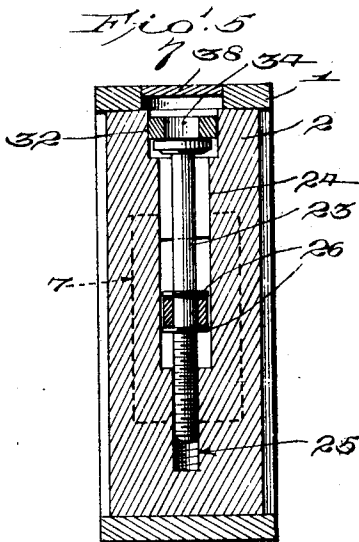
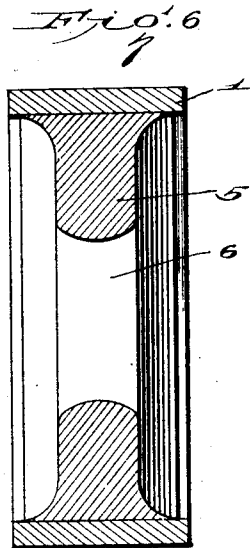
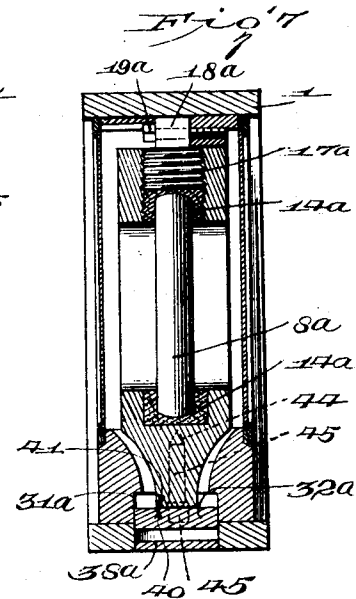
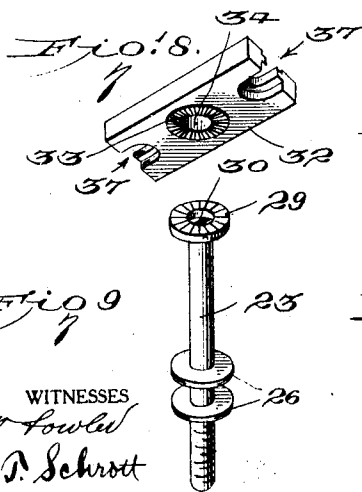
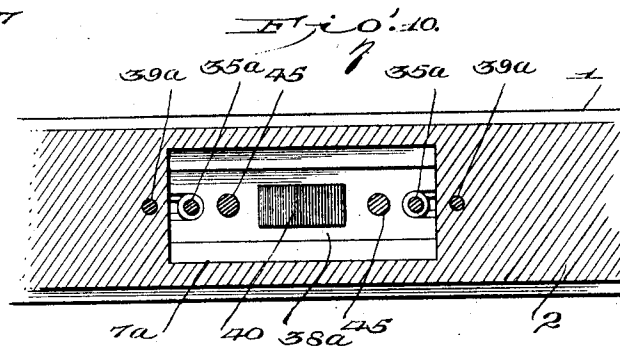
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R. H. JAY

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2 Sheets-Sheet 2



WITNESSES  
M. Fowler  
J. P. Schrott

INVENTOR  
Ralph H. Jay  
BY *Shun Hoo*  
ATTORNEYS

## UNITED STATES PATENT OFFICE.

RALPH H. JAY, OF EUGENE, OREGON, ASSIGNOR OF ONE-HALF TO FRANK J. GRAYUM,  
OF EUGENE, OREGON.

## SPIRIT LEVEL.

Application filed July 2, 1926. Serial No. 120,229.

This invention relates to improvements in spirit levels, one of the important objects being to simplify and improve the construction and mode of adjustment of the bubble tube or level glass holder, the construction being such that a broken bubble tube can readily be replaced, and the mode of adjustment being such that the jars of ordinary use will not render the level inaccurate.

Other objects and advantages appear in the following specification, reference being had to the accompanying drawings in which,

Figure 1 is a perspective view of approximately one-half of a level embodying the improvements,

Figure 2 is a longitudinal section of the central portion of the level,

Figure 3 is a longitudinal section of an adjacent end portion of the level which is employed as a plumb,

Figure 4 is a detail horizontal section taken on the line 4—4 of Figure 2,

Figure 5 is a detail cross section taken on the line 5—5 of Figure 2,

Figure 6 is a detail cross section taken on the line 6—6 of Figure 2,

Figure 7 is a detail cross section taken on the line 7—7 of Figure 3,

Figure 8 is a detail inverted perspective view of the locking plate hereinafter referred to,

Figure 9 is a detail perspective view of the associated adjusting screw,

Figure 10 is a detail horizontal section taken on the line 10—10 of Figure 3.

Briefly amplifying the foregoing introductory statement, it is the purpose of the invention to provide a spirit level, which when adjusted, will withstand the knocks and jars of ordinary use without getting out of order. It sometimes happens that the level glass or bubble tube becomes broken, and while this glass has ample protection in the improved level, provision is made nevertheless, for the replacement thereof. Furthermore, the mode of adjustment of the level glass holder is simplified to a considerable extent, and the adjustment is locked when made. Access to the adjusting elements is had only through a cover or surface plate, tampering with the adjusting elements being thereby discouraged.

Reference is made to the drawings which disclose the central structure and one end structure, the former being used for leveling,

the latter for plumbing. But inasmuch as the two plumb structures are alike (there being another at the remote end of the level, not shown), a description and illustration of one will suffice.

A rim 1 extends completely around the periphery of the metal stock 2, and for the purpose of increasing the protection that the metal rim affords the edges extend beyond the sides of the stock as clearly shown in Figures 1, 4, 5, 6 and 7. The level, when laid down, will rest upon the edges of the rim, and contact with more fragile parts is thus avoided. The stock has thickened portions 3 and 4, parts of the stock adjacent to said thickened portions being reduced at 5 and provided with openings 6 facilitating grasping the level in the hands.

In reference to the central structure there is an opening 7 extending from side to side of the thickened portion 3 so that the level glass or bubble tube 8 and holder 9 thereof are readily visible from either side of the level. The ends of the opening 7 are covered by glass panes 10 which are held in place by metallic frames or rims 11 secured by screws or other fastening means 12. The level glass is mounted lengthwise of the sight opening 13 of the holder 9. The extremities of the tube are imbedded in cement plugs 14 which occupy holes 15 and 16 in the holder. The latter is threaded to receive the threaded metallic plug 17. This plug has a projection 18 through which a screw 19 passes giving the holder pivotal support. Compound lateral and longitudinal recesses 20 and 21 in the level stock receive the projection 18 as clearly shown in Figure 4. The lateral portion of the recess is necessary for permitting sidewise movement of the holder in abstracting it from the opening 7, the longitudinal recess 21 being necessary to permit longitudinal movement of the holder in releasing the stirrup 22 from the adjusting screw 23. The latter occupies a bore which is of two diameters, the smooth part 24 being larger than the threaded part 25. The threaded part of the screw turns in the threaded bore 25. Turning of the screw 23 to the left produces an unscrewing motion in respect to the bore 25 and a raising of the nearest end of the holder 9, the stirrup end being situated between a pair of integral flanges 26 upon the screw shank. The upper surface of the flanged screw head is radially serrated at 29 (Fig. 9)

but the center of the screw head is slotted at 30 so that a screw driver may be applied for turning the screw.

A recess 31 both in the stock 2 and rim 1 5 receives the locking plate 32 which has serrations 33 extending radially from the central hole 34 for the purpose of engaging the serrations 29 and holding the screw 23 locked in position when the screws 35 (Fig. 2) are 10 turned down. These screws have flanges 36 which engage on the underside of the locking plate. Recesses or notches 37 (Fig. 8) are cut into the transverse edges of the locking plate and suitably shaped to receive the 15 flanges and the heads of the screws. The arrangement provides a swivel mounting the function of which is to raise and lower the locking plate when the screws are turned.

It is thus clear that the screw 23 can be 20 locked in its various adjustments. The serrations or teeth 29 and 33 (Figs. 9 and 8) are fine enough to hold the screw at fractional adjustments. The integral flanges 26 fit the 25 bore 24 rather closely and serve to guide the adjusting screw. They will hold the adjusting screw true to the bore 24 even should the screw head be stationed so high as to be entirely out of the bore. A surface plate 38 30 covers the recess 31, it being held in position by screws or other means 39.

The end structure is much on the order of the foregoing central structure. Reference is had to Figures 3 and 10 for the former. The thickened portion 4 of the stock has an 35 opening 7<sup>a</sup> containing the holder 9<sup>a</sup> in which the level glass 8<sup>a</sup> (or in this case the plumb glass) is held by cement plugs 14<sup>a</sup> as before. The glass occupies the sight opening 13<sup>a</sup>. A screw 19<sup>a</sup> provides the pivotal mounting for 40 the holder. It passes through the projection 18<sup>a</sup> of a metallic plug 17<sup>a</sup>.

A locking plate 32<sup>a</sup> performs the same function as before, but in this case the serrations 40 (Fig. 10) are parallel and extend 45 crosswise of the locking plate in order to match the similar serrations 41 on the free extremity of the holder 9<sup>a</sup>. The holder is adjustable on the arc of a circle and the various serrations are intended to hold the adjustment at whatever position it might be. 50

The foregoing free extremity of the holder 9<sup>a</sup> is cut-away at the corners, producing what might be called a heel but also producing a pair of shoulders 43. It is with these shoulders 55 that the conical ends 44 of set screws 45 engage. These set screws are carried by adjacent metallic parts of the level. The locking plate is movable in the recess 31<sup>a</sup> by screws 35<sup>a</sup> which have heads and flanges as do 60 the screws 35 in Figure 2. The surface plate 38<sup>a</sup> is held in place by screws 39<sup>a</sup> thereby to conceal and protect the adjusting mechanism.

The operation may be readily understood. The use of the spirit level requires no explanation as this is well known to those engaged

in particular building arts. It is with the adjustments of the central and end structures that the operation is concerned.

Assume that it is required to replace the level glass or bubble tube 8 in the central 70 structure in Figure 2. One of the cover glasses 10 and metallic frame or rim 11 (Fig. 1) is removed so that access may be had to the opening 7. Upon removal of the screw 19 the holder 9 can be moved back into the longitudinal recess 21 sufficiently far to disengage 75 the stirrup 22 from the adjusting screw 23. The projection 18 is then drawn forwardly through the lateral portion 20 of the compound recess and the holder 9 is withdrawn 80 from the opening. The metallic screw plug 17 is removed, and the cement plugs 14 are dug out. A new glass tube is put in place and cemented, whereupon the plug 17 is 85 screwed back in place, and the holder 9 again put in position on an order reverse to the foregoing.

The holder 9 is subject to considerable adjustment, and it is therefore not necessary 90 to take unusual pains in placing the level glass 8 in position. Any slight inaccuracy in the position of the glass 8 can be compensated for by the adjusting screw 23. The screw 23 may be held in various adjusted positions by a locking plate 32 which has radial 95 teeth or serrations 33 on the underside (Fig. 8) to engage similar teeth or serrations 29 on the flange head of the screw. Upon turning the screw in reference to the fixed thread 25 the flanges 26 swing the holder 9 on its fulcrum 19 by means of the stirrup 22. The adjustment of the holder is in the arc of a circle. 100

The adjustment of the end structure in Figure 3 is slightly different. The locking plate 32<sup>a</sup> is first backed away so that the serrations 105 or teeth 40 and 41 disengage. One or the other of the set screws 45 is moved inwardly so that the holder 9<sup>a</sup> is shifted to the right or left depending on which one of the conical ends 44 is brought to bear against 110 the shoulders 43. After the adjustment is made the locking plate 32<sup>a</sup> is moved back into position, whereupon the remaining and otherwise idle set screw 45 is turned inwardly until it too engages the adjacent shoulder of the 115 holder 9<sup>a</sup>. The range of adjustment of the holder 9<sup>a</sup> in the two directions in which it it can swing is limited to one-half the diameter of the set screws 45, and obviously the screws 45 may be made as large as desired in 120 order that the range of adjustment may be increased.

Tampering with the adjusting elements in both the central and end structures is discouraged by the presence of the surface plates 125 38 and 38<sup>a</sup>. It is evident in Figs. 2 and 3 that the adjustment of the holder 9 or 9<sup>a</sup> can be made in either of two directions there being sufficient room for such adjustments as will dispose the bubble tube 8 or 8<sup>a</sup> in a position 130

suitable for laying tile or pipe. While the construction and arrangement of the improved spirit level is that of a generally preferred form, obviously modifications and adaptations may be made without departing from the spirit of the invention or the scope of the claims.

I claim:—

1. A device of the character described comprising a stock having an opening with a communicating bore, said bore having a communicating recess, a level glass having a holder situated in the opening and having a stirrup extending into the bore, means at the end opposite to the stirrup providing a pivotal mounting for the holder upon the stock, a screw having a pair of flanges receiving the stirrup therebetween and having a head with a serrated flange adjacent to the recess, means in fixed position in the bore in which the screw can be turned thereby to rock the holder upon its pivotal mounting, a locking plate situated in the recess having a hole through which the screw head is accessible and having corresponding serrations ad-

jacent to the screw flange, and screws swivelly carrying the locking plate for moving the locking plate in the direction of the screw head thereby to engage the various serrations and hold the screw in adjustment.

2. A device of the character described comprising a stock having an opening with a compound lateral and longitudinal recess at one extremity and a bore at the opposite extremity, a level glass and holder therefor situated in the opening having a bifurcated stirrup at one extremity extending into the bore, a screw adjustable in the bore having a pair of flanges receiving the bifurcated stirrup therebetween, pivot means at the opposite extremity of the holder, and a projection upon said end of the holder receiving said pivot means, said projection being movable into the longitudinal recess then laterally in the lateral recess for disengagement of the bifurcated stirrup from the screw and removal of the holder from said opening after removal of said pivot means from the projection.

RALPH H. JAY.