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M. KLEINBAUER.

SPIRIT LEVEL.

APPLICATION FILED NOV. 3, 1906.

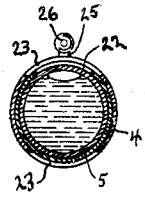
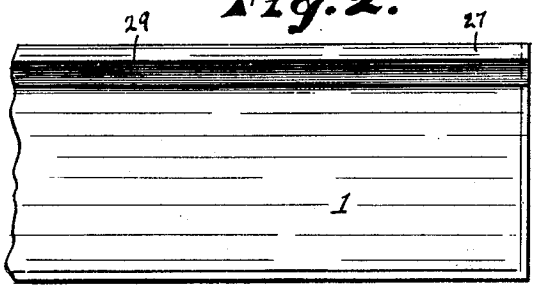


Fig. 6.

Fig. 2.



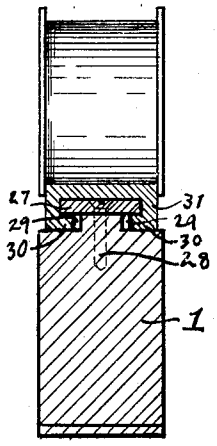


Fig. 3.

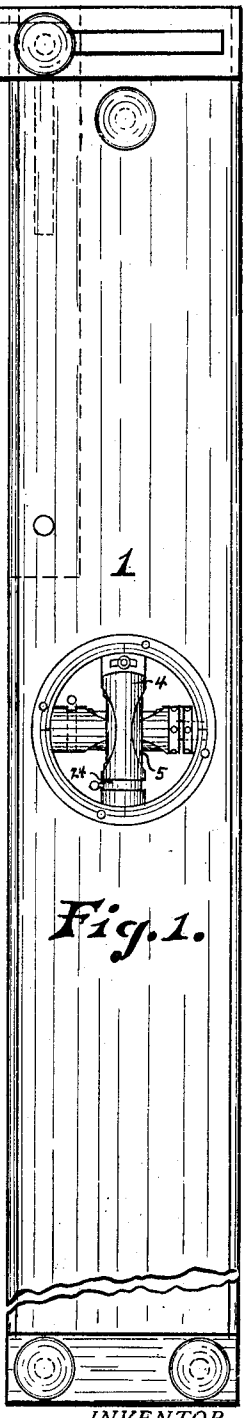


Fig. 1.

Fig. 5.

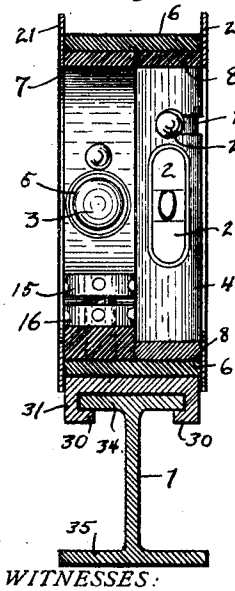
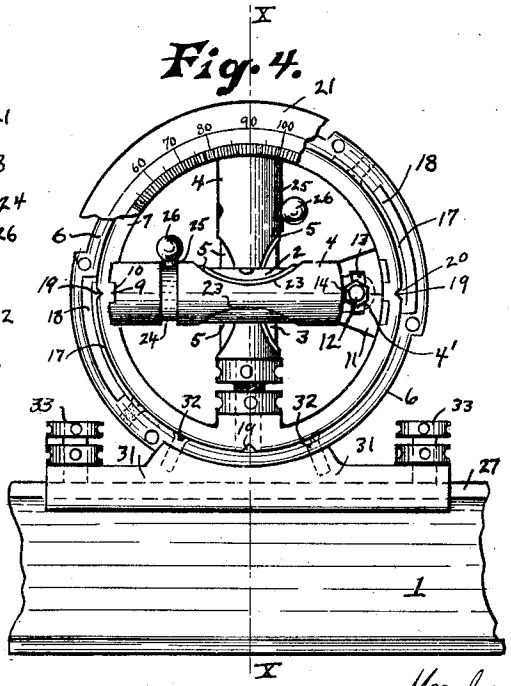


Fig. 4.



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SPIRIT-LEVEL.

No. 832,326. Specification of Letters Patent. Patented Oct. 2, 1906.

Application filed November 3, 1905. Serial No. 285,672.

To all whom it may concern:

Be it known that I, MATHIAS KLEINBAUER, a citizen of the United States, residing at the city of Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Spirit-Levels, of which the following is a specification.

My invention relates to improvements in spirit-levels.

The object of my invention is, among other things, first, to provide a spirit-level which may without adjustment be used upon both vertical and horizontal surfaces and which may also be readily adjusted so as to be used upon surfaces which are formed at any desired angle to the vertical or horizontal; second, to provide a spirit-level by which the indicating medium may be seen equally well when the instrument is located above or below the horizontal line of vision of the user, whereby the necessity of a ladder when using the instrument above a person's head is avoided and also whereby the necessity of bending over when using the instrument at or below a person's feet is avoided.

The construction of invention is explained by reference to the accompanying drawings, in which—

Figure 1 represents a front view thereof. Fig. 2 is a modified form of bar upon the edge of which the spirit-retaining tubes are adapted to be used. Fig. 3 is a transverse section of the bar shown in Fig. 2, showing a side view of the tube-retaining sleeve. Fig. 4 represents a front view of the spirit-retaining tubes and tube-supporting sleeves attached to the edge of a supporting-bar. Fig. 5 represents a vertical section drawn on line $x\,x$ of Fig. 4, showing a side view of the tubes in which the spirit is located; and Fig. 6 represents a transverse section of one set of the tubes shown in Fig. 5.

Like parts are identified by the same reference characters throughout the several views.

My device comprises, among other things, the bar 1, two glass tubes 2 and 3, two sets of metallic tubes 4 and 5, which inclose said glass tubes, an exterior annular sleeve 6, rigidly affixed to the center of the bar 1, as indicated in Fig. 1, in an aperture provided therefor, or is rigidly affixed to the edge of the bar, as shown in Figs. 4 and 5, and two movable annular sleeves 7 and 8, both of which are slidably supported within said exterior sleeve 6.

The horizontal tubes are supported from the annular sleeve 7, while the vertical tubes are supported from the annular sleeve 8, whereby said tubes may be adjusted independently of each other in said stationary sleeve 6. The exterior tubes 4 are preferably pivotally connected at one end of their supporting-sleeves 7 and 8 by the shoulder 9, operating in the recess 10, while the opposite end of said tubes are connected with the opposite side of said annular sleeves through a bracket 11 and transversely-arranged bolts 12. The brackets 11 are rigidly affixed at their outer ends to their inclosing sleeves and are respectively provided with a transverse slot 13 for the reception of said bolt 12. The bolt 12 is rigidly connected with the end of the tube 4 by the bracket 4′, whereby when the nut 14 is loosened on said bolt the contiguous end of said tube 4 may be adjusted slightly upwardly and downwardly a distance corresponding with the length of slot 13, whereby the tube which contains the spirit may be nicely adjusted in its proper relative position to the supporting-sleeve.

It will be understood that the respective tubes 4 with their inclosures are normally adjusted at right angles to each other for using the level upon horizontal and vertical surfaces. When, however, it is desirous to use the level upon surfaces which are at an angle to either the horizontal or vertical, either one of said tubes may be adjusted at any desired angle between the horizontal and vertical without interfering with the adjustment of the other. When the collars 7 and 8 have been adjusted at the desired position, they may be locked at such point of adjustment by turning down a hand-screw 15 against the exterior sleeve 6. 16 is a locknut by which the hand-screw may be locked when adjusted.

17 17 are springs which are rigidly affixed at one end to the annular sleeve 6 within the recesses 18 18, and the other end of said springs 17 are adapted to engage in the V-shaped recesses 19, formed in the periphery of the inner sleeves 7 and 8, said spring 17 being provided with a V-shape projection 20, which engages said recess 19 and serves to hold said sleeves 7 and 8 at the four several points of adjustment corresponding with the distance between said recesses 19, by means of which a quick adjustment at said four several points is attained, while said

sleeves 7 and 8 are adapted to be adjusted at any intermediate point between said recesses 19 by the fastening-screw 15.

21 21 are dial-plates which serve to retain said annular sleeves 7 and 8 within the inclosing sleeve 6, while they also serve to facilitate in the proper adjustment of said tubes at points corresponding with the figures and index-marks thereon.

It will be understood that the glass tubes 2 and 3, in which the spirit is contained, are located within the inclosing tubes 5 and that one side of the inclosing tube 5 furnishes a white or light-colored background for the liquid, whereby the bubble in the spirit may be readily seen, while the opposite side of the tube 5 is provided with an elongated aperture 22, through which the bubble in the spirit may be readily observed. To facilitate viewing the bubble in the horizontal tubes when the level is being used above the horizontal line of vision, the inner tube 5, in which the glass is located, is turned a partial revolution within stationary tube 4, so that the aperture through which the bubble is seen is brought to its lower side, whereby the bubble may be observed from the lower side of the stationary tube 4 and the necessity of climbing a ladder to make such observation is avoided.

It will of course be understood that the stationary tubes 4 are both provided with two elongated slots or apertures 23 23, through which the bubble in the glass tube may be seen from two opposite sides. Thus when using the instrument at or below a person's feet the metallic tube 5, together with the glass tube therein, is again turned a half-revolution, whereby the bubble in the spirits may be observed from the upper side of the horizontal tube 4.

It will be understood that both sets of tubes are alike in construction and the revoluble tubes in both sets are adapted in like manner to be turned within the stationary tubes to facilitate viewing the bubble from either side of the stationary tubes. To facilitate turning said glass tubes within the exterior tubes 4, I have provided the exterior tubes 4 with annular slots 24 for the reception of the operating-arm 25. The inner end of arm 25 is connected with the inner metallic tubes 5, while the outer ends of said arms are provided with an operating-knob 26, whereby either one of said glass tubes, together with the inclosing inner tubes 5, are readily turned on their longitudinal axis, so as to be seen from either of the opposing sides of said stationary tubes, as stated.

When desirous to use the spirit-tubes in connection with the side of the bar, as shown in Figs. 3 and 4, I provide the edge of the bar 1 with a longitudinal plate 27, which is secured thereto at intervals by screws 28, and the respective sides of the bar 1 are cut away beneath said plate 27, forming channels 29 29 for the reception of the retaining-flanges 30 30, which retaining-flanges are formed in connection with the bracket 31. Bracket 31 is connected with the exterior collar 6 by screws 32 32. Thus it is obvious that by this arrangement the spirit-tubes may be adjusted at any point between the respective ends of the bar 1, and they may be locked at any desired point of adjustment by the clamping-screws 33 33, which have screw-threaded bearings in the bracket 31 and are adapted to impinge against the upper side of the plate 27.

It will also be obvious that the spirit-level may when thus provided with the bracket 31 be readily attached in like manner to the edge of an ordinary metallic bar 1, like that shown in Fig. 5, comprising a vertical central portion and two transverse portions 34 and 35.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a spirit-level the combination of a leveling-bar, an exterior tube-supporting sleeve slidably connected with the edge of said bar, means for locking said sleeve at any desired point of adjustment upon said bar, two independently-adjustable sleeves located within and slidably connected at their peripheries with said exterior sleeve, means for locking said last-named sleeves at any desirable point of adjustment within said exterior sleeve, two metallic tubes, one located in each of said adjustable sleeves at an angle to the other, and a glass spirit-tube located in each of said metallic tubes.

2. In a spirit-level the combination of an exterior tube-supporting sleeve rigidly affixed to a leveling-bar, two independently-adjustable sleeves located within and slidably connected at their peripheries with said exterior sleeve, a stationary metallic tube located in each of said adjustable sleeves, each of which stationary tubes is provided at opposite sides with longitudinal apertures, a revoluble metallic tube provided upon one side with a longitudinal aperture, a glass spirit-tube located within said revoluble tube, means for turning said revoluble metallic tube and glass spirit-tube on their longitudinal centers, whereby the aperture in the revoluble metallic tube through which the bubble may be seen in the glass spirit-tube may be caused to register with either of the apertures of the exterior stationary tube, all substantially as and for the purpose specified.

3. In a spirit-level the combination of a leveling-bar; an exterior tube-supporting sleeve connected with said bar; two independently-adjustable sleeves located within and slidably secured to said exterior sleeve; means for locking said last-named sleeves at

any desirable point of adjustment within said exterior sleeve; two glass spirit-retaining tubes one located in each of said adjustable sleeves at an angle to the other; metallic tubes inclosing each of said glass tubes adapted to be turned on their longitudinal axis therewith within an exterior stationary tube; an exterior stationary tube for each of said glass inclosing tubes provided with an elongated aperture through which to view the bubble in the spirit-tube and an annular slot for the reception of an operating-arm; an operating-arm rigidly affixed at its inner end to said interior metallic tube its protruding end serving as an operating bearing-knob, by which said glass tube and inclosing metal tube may be turned on their longitudinal axis within said stationary tube, and means for connecting the respective ends of said stationary tubes within and to their respective supporting-sleeves, all substantially as and for the purpose specified.

In testimony whereof I affix my signature in the presence of two witnesses.

MATHIAS KLEINBAUER.

Witnesses:
JAS. B. ERWIN,
O. R. ERWIN.