No. 742,010. PATENTED OCT. 20, 1903.

G. L. DAVIS.

SPIRIT LEVEL.

APPLICATION FILED JULY 21, 1903.

NO MODEL.

Fig. 1.

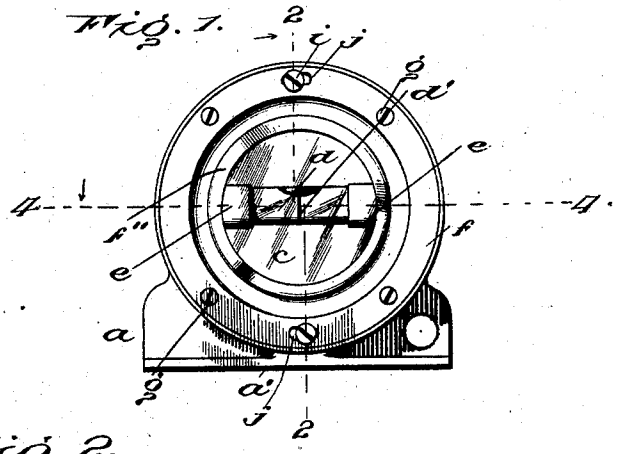


Fig. 2.

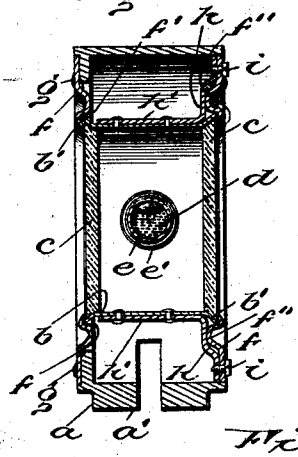


Fig. 4.

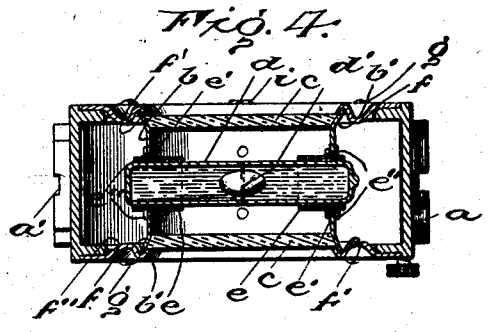
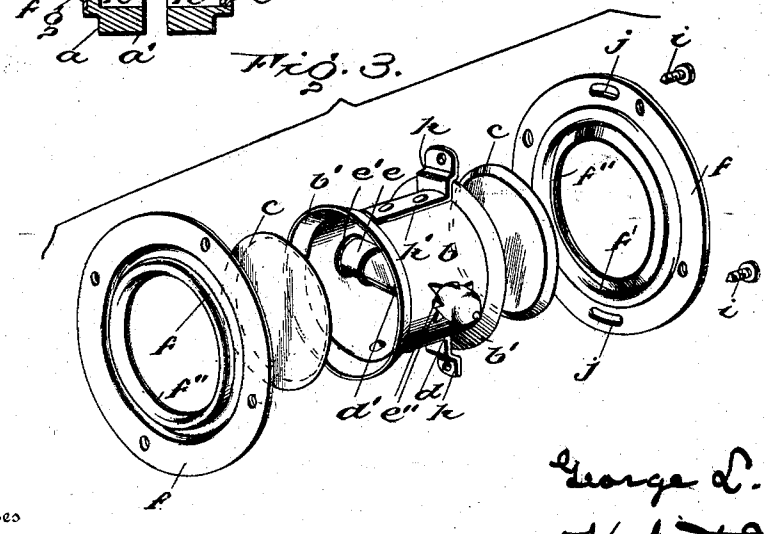


Fig. 3.



Witnesses

Jno. Imirie

Chas. P. Wright, Jr.

Inventor

George L. Davis

By Hubert Peck

Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 742,010. Patented October 20, 1903.

UNITED STATES PATENT OFFICE.

GEORGE L. DAVIS, OF WATERTOWN, NEW YORK.

SPIRIT-LEVEL.

SPECIFICATION forming part of Letters Patent No. 742,010, dated October 20, 1903.

Application filed July 21, 1903. Serial No. 166,427. (No model.)

To all whom it may concern:

Be it known that I, GEORGE L. DAVIS, a citizen of the United States, residing at Watertown, Jefferson county, State of New York, have invented certain new and useful Improvements in Spirit-Levels; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to certain improvements in levels, and more particularly to improvements in the class of "spirit-levels" comprising a bubble-tube mounted and adjustable in a suitable holder; and the objects and nature of my invention will be readily understood by those skilled in the art in the light of the following explanation of the construction illustrated in the accompanying drawings as an example of a construction within the spirit and scope of my invention.

An object of the invention is to provide an axially-adjustable inner or bubble tube carrying ring or sleeve with improved and very effective means for turning or rocking said ring on its center or axis and locking the same in the necessary position to maintain the bubble-tube in the desired adjustment.

Another object of the invention is to provide certain improvements in arrangements and constructions of parts and details, whereby a highly-efficient and advantageous spirit-level is produced.

The invention consists in certain novel features in construction and in combinations and arrangements of parts, as more fully and particularly pointed out and set forth hereinafter.

Referring to the accompanying drawings, Figure 1 is a side elevation of a spirit-level embodying my invention. Fig. 2 is a cross-sectional view, somewhat enlarged, taken in the plane of the line 2 2, Fig. 1. Fig. 3 is a detail perspective view of the two flanged securing-rings, the two glass disks, the inner or bubble tube carrying ring, and the two clamping-screws of the adjustment, said parts being shown separated. Fig. 4 is a horizontal cross-section on the line 4 4, Fig. 1, showing the means employed for mounting the bubble-tube in its carrying ring, sleeve, or frame.

In the drawings, *a* is the frame or holder of the level, having the straight-edge *a'*, with which the bubble-tube is maintained parallel. This holder has the opening or aperture extending completely therethrough and in which the bubble-tube and its supporting devices are arranged, so that the bubble-tube can be readily inspected from either end of the aperture and from either side of the holder. The holder and frame can be of any suitable form and construction—such, for instance, as the ordinary carpenter's level—and my invention is generally applicable to various forms and arrangements of frames or holders in which a bubble-tube can be employed.

b is the inner or bubble tube carrying sleeve or ring, which is usually arranged concentrically within the opening or aperture of the frame or holder. This ring *b* can be formed of a sheet-metal cylinder having open ends. The ends of the cylinder are preferably flared or beveled outwardly to form the ring *b*, with the inwardly-beveled ends or faces *b'* to receive the correspondingly-beveled edges of the transparent (preferably glass) plates or disks *c*, which close the ends of the ring and form the closed chamber within the ring containing the bubble-tube *d*. The transparent (usually glass) bubble-tube *d*, which can be of the ordinary construction, extends diametrically across the ring *b* at a point midway between the two glass plates *c* and is usually formed with any suitable indicating-mark—such, for instance, as central mark *d'*—by which the operator can determine when the bubble is at the central point. In the specific example illustrated the ring *b* is formed in one piece of metal with diametrically opposite holes or apertures for receiving the bubble-tube. I form these holes of a diameter greater than the external diameter of the bubble-tube. On the end portions of the tube elongated metal bushings or sleeves *e* are fitted, and, if desired, the bubble-tube can be secured therein by suitable cement. These sleeves *e* are formed with the annular exterior shoulders *e'* abutting against the inner surface of the ring *b* around the apertures through said ring, and the ends of the bubble-tube project through and beyond said apertures and through and beyond said sleeves. The sleeves also project through and beyond said

apertures and are formed with projections or fingers e'', bent down on the exterior surface of the ring b. The bubble-tube hence has an extended bearing in the sleeves, and the sleeves form a very effective means for accurately and fixedly securing the tube in the ring and maintaining the same therein against loosening play or movement. However, I do not wish to limit other features of my invention to the means just described for securing the bubble-tube in its ring. The beveled ends of the ring b center the glass disks in the ends of the ring and form tight joints therewith to keep dust and dirt from the chamber inclosing the bubble-tube. The beveled ends of the ring b preferably project outwardly beyond the planes of the outer faces of the glass disks, and said disks are held and the ring b is properly centered and maintained in position by the outer or end retaining rings or plates f, each of which has a central opening coinciding with the glass disk beneath the same. Each ring f fits the holder or frame around the opening therein containing the ring b and is secured to said holder by the screws g, passed through the retaining-rings into the holder, or other fastening means can be employed for this purpose to rigidly secure the retaining-plates to the holder. Each retaining-ring around its central opening and at its inner face is formed with an annular groove f', which receives an end of the ring b, and the inner wall of this groove is formed by the flanged inner annular edge f'' of the retaining-ring, which is beveled inwardly to correspond to the bevel of the end of ring b. These beveled flanges f'' of the retaining-rings fit into the beveled ends of the ring b and center said ring b within the retaining-rings and also engage the glass disks and properly hold and center the same in the ends of the ring b. The beveled or inclined engaging faces of the ring b and of the retaining-rings form bearing-surfaces, which while at all times maintaining the ring b properly centered yet permit axial movement or turning of the ring b on its longitudinal axis or center when necessary to properly adjust the position of the bubble-tube.

The ring b is normally rigidly clamped or otherwise secured or fixed to one of the retaining-rings by adjustable means readily accessible at the exterior of said retaining-ring. For this purpose in the specific example illustrated I show two (although as at present advised I do not wish to so limit myself) radial rigid metal lugs or arms h, projecting outwardly from one end of the ring b and at the inner face of the retaining-ring at that end of ring b. These lugs are arranged diametrically opposite each other and each is formed with a base h', arranged longitudinally on the exterior surface of the ring b and riveted or otherwise rigidly fastened thereto. Each lug h is formed with a transverse tapped or screw-threaded perforation receiving a machine or clamping screw i, passed transversely through the adjacent face-plate or retaining-ring and having a head at the exterior surface of said plate. Said exposed heads of the screws i are formed to receive a tool or implement by which they can be turned to tightly clamp the lugs h to the retaining-ring or to loosen the screws, so that the ring b can be moved axially, the lugs sliding along the inner face of the said retaining-ring. The ring b is moved by the fingers of the operator engaging the heads of the two or more clamping-screws i. The said retaining-ring is formed with elongated segmental slots j for the clamping-screws i to permit the movement thereof when the ring b is being adjusted axially. Advantages are attained by providing opposite lugs or other means of attachment between the ring b and one of the face-plates or retaining-rings, as the ring b is thereby efficiently held and turned without liability of loosening and without wedging or locking while being adjusted.

I do not wish to limit myself to the forms of the bubble-tube ring b and the retaining-rings shown nor to the specific constructions of lugs h, as shown, nor in all instances to the employment of glass disks.

Having thus described my invention, what I claim is—

1. In a spirit-level, in combination, a holder, a bubble-tube ring, means for retaining the same, the bubble-tube extending diametrically through said ring, and the bushings secured on end portions of said tube, each bushing having an exterior shoulder abutting against the inner surface of said ring and fingers bent down on the exterior surface of said ring.

2. In a spirit-level, in combination, a holder, a bubble-tube ring having an outwardly-beveled end, a bubble-tube carried by said ring, a transparent disk having a correspondingly-beveled edge fitting said beveled end of the ring, and a retaining-ring having a correspondingly-beveled edge centering said bubble-tube ring and holding and centering said disk in said beveled end.

3. In a spirit-level, in combination, a holder, a bubble-tube ring having outwardly flared or beveled ends, a bubble-tube carried by said ring, and retaining-rings having annular grooves at their inner faces receiving the ends of said bubble-tube ring and centering the same, said grooves having beveled or flared walls corresponding to and fitting in said beveled ends of the bubble-tube ring.

4. A spirit-level comprising a bubble-tube ring provided with the bubble-tube and having outwardly flared or beveled ends and retaining-rings having annular correspondingly-beveled surfaces fitting in the ends of said bubble-tube ring.

5. A spirit-level comprising an axially-adjustable bubble-tube ring provided with the bubble-tube, fixed end retaining-rings fitting the ends of said bubble-tube ring and centering and forming the end bearings for the

same, and clamping and adjusting means normally locking the bubble-tube ring to one of said retaining-rings and accessible at the exterior of said retaining-ring.

6. A spirit-level comprising a holder, an axially-movable bubble-tube ring provided with the bubble-tube, fixed end retaining-rings supporting and centering said bubble-tube ring and on which the same turns, and clamping and adjusting screws passing from the exterior thereof through one of said retaining-rings and into parts rigid with said bubble-tube ring.

7. A spirit-level comprising a holder, an axially-adjustable bubble-tube ring provided with a diametrically-arranged bubble-tube, exterior fixed end retaining-rings supporting and centering said bubble-tube ring, said bubble-tube ring provided with several radial projections rigid therewith and located at the inner face of a retaining-ring, said retaining-ring formed with slots, and clamping and adjusting screws passed through said slots and into said projections.

8. A spirit-level comprising a holder, an axially-adjustable bubble-tube ring provided with a bubble-tube, said ring provided with opposite radial projections rigid therewith, and clamping and adjusting screws extending from the exterior of the holder into said projections and normally locking said ring against movement.

9. A spirit-level comprising an axially-adjustable bubble-tube ring provided with a bubble-tube, opposite radial lugs at an end of said ring and having bases rigidly secured to the ring, means retaining the ring and on which the same turns, and clamping and adjusting screws passing through said means into said lugs and having exterior accessible heads, substantially as described.

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

GEORGE L. DAVIS.

Witnesses:
L. J. DAVIS,
OMAR A. HINE.