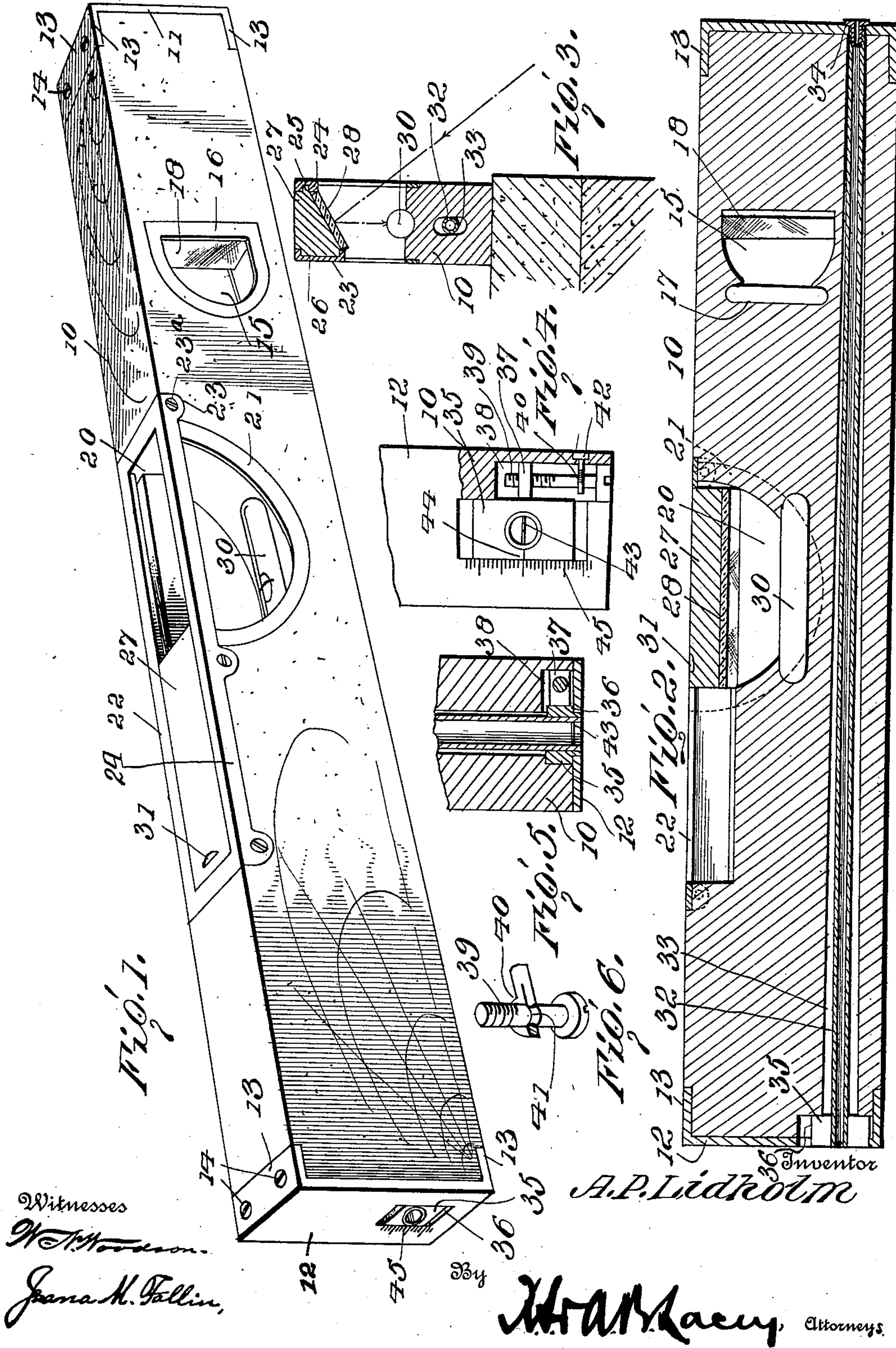


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LEVEL.

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UNITED STATES PATENT OFFICE.

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LEVEL.

999,573.

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To all whom it may concern:

Be it known that I, ALGOT P. LIDHOLM, citizen of the United States, residing at Hibbing, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Levels, of which the following is a specification.

This invention relates to measuring instruments and refers particularly to an improvement in the construction of that class of such devices which are known as levels.

A salient feature of this invention is to form a level, by means of which readings may be taken when the instrument is positioned above the head of workmen, or in such other position wherein is hindered the observing of the spirit tube in levels of common construction.

The invention further contemplates the provision of a level with means whereby the level may be positioned accurately in various and predetermined planes, so that beams or the like, upon which the level is positioned, may be disposed at the desired angle.

The invention has for a still further object to provide a level with a mirror which is so mounted therein that it can be adjusted above the spirit tube for overhead work, or can be moved to one side when it is desired to employ the level in the usual manner.

For a full understanding of the invention reference is to be had to the following description and accompanying drawing, in which:—

Figure 1 is a perspective view of the improved level. Fig. 2 is a longitudinal and central section through the same. Fig. 3 is a transverse and central section through the level. Fig. 4 is a forward end view of the level partly in section. Fig. 5 is a horizontal section through the forward end of the level, and Fig. 6 is a detail view of the set-screw and split collar in connection with the same.

Corresponding and like parts are referred to in the following description and indicated in all the views of the accompanying drawing by the same reference characters.

Referring to the drawing, 10 designates the stock of the improved level which is formed, preferably, from a piece of wood carrying end plates 11 and 12 having flanges 13 overlapping the edges of the stock 10 and

being countersunk therein. Screws 14 are employed for securing the flanges 13 upon the stock 10 to hold the plates 11 and 12 in position.

The stock 10 is provided at its rear end with a transverse opening terminating through the sides of the stock and providing a chamber 15. Plates 16 engage against the sides of the stock 10 about the chamber 15, and have apertures registering therewith. A vertical, inwardly facing spirit tube 17 is seated in the stock 10 at one side of the chamber 15. A mirror 18 is seated in the opposite side of the chamber 15 at an angle of approximately 30 degrees to the wall thereof, and faces toward one side of the stock 10 to reflect the image of the spirit tube 17 from one of the plates 16.

The stock 10 is recessed in its upper edge midway of its ends to provide a central, circular chamber 20. Arcuate reinforcing rims 21 are disposed upon the stock 10 about the edges of the recesses 20. A guide plate 22 is seated in the upper edge of the stock 10 and carries depending flanges 23 and 24 at its opposite longitudinal edges, the latter seating in the opposite sides of the stock 10. The guide plate 22 is held in position by screws 23^a, or the like, which engage through the flanges 23 and 24 into the body of the stock. The inner faces of the flanges 23 and 24 are longitudinally grooved, as is disclosed to advantage in Fig. 3, for the reception of beads 25 and 26 formed upon the opposite longitudinal sides of a slide 27. The slide 27 comprises a block provided with a lower inclined face, such form being effected by the enlargement or thickening of one side of the slide, to support a mirror 28 at an angle within the recess 20. A spirit tube 30 is arranged horizontally within the bottom of the recess 20 in such position that the air bubble therein rests normally at the central portion of the recess or chamber 20. The stock 10 is hollowed out or recessed beneath the guide plate 22 at one end of the recess 20 to receive the slide 27 and the mirror 28 when the same are not in use. A finger receiving notch 31 is provided in the end of the slide 27 by means of which the same is moved longitudinally in the plate 22.

The lower portion of the stock 10 is provided with a tube 32 disposed within the longitudinal opening 33 in the stock 10 extending the entire length thereof. The

opening 33 flares toward its outer end to admit of a slight vertical adjustment of the tube 32. The inner end of the tube 32 is internally threaded and receives an eye piece 34. The eye piece 34 is in the form of a hollow tubular member having an annular flange at its outer end seating within the outer face of the rear plate 11. The forward end of the tube 32 terminates within a block 35 arranged in an opening formed in the forward end of the stock 10 and through a registering opening in the plate 12, the marginal edges of which extend in from the side walls of the opening in the stock 10. The block 35 is reduced at its outer end to project through the plate 12, and has its outer face flush with the outer face of the plate 12. This peculiar form of the block 35 provides lateral projections 36 thereon engaging against the inner face of the plate 12 to hold the block from outward movement through the plate. An ear 37 projects from one side of the block 35 into an opening 38 in the stock, the ear 37 receiving the outer end of a set screw 39. The set screw 39 is held from longitudinal movement by a split collar 40. The collar 40 comprises a length of flat metal looped at its outer end to engage in an annular groove 41 formed in the screw 39 and adjacent to its head. The extremities of the split collar 40 are brought together and turned out for engagement through the side of the stock 10 to receive in threaded engagement a retaining nut 42. The tube 32 is secured in the block 35 by a transverse rod or wire 43 forming the objective sight of the instrument. The block 35 is provided upon its outer face with an indicating line 44 registering with the objective sight 43 to determine the adjustment of the block 35 relative to graduations 45 disposed upon the outer face of the plate 12 at one of the longitudinal edges of the slot 36.

In using the level, the slide 27 is moved toward the forward end of the stock within the guide plate 22 so as to dispose the mirror 28 within the recessed or hollowed portion of the stock. This position of the slide 27 opens the upper end of the recess 20 through the guide plate 22 and the spirit tube 30 may now be observed in the usual manner when the level is employed in connection with objects which are not higher than the eye of the observer.

When it is desired to apply the level to a piece of work disposed above the head of the observer, the guide 22 is moved over the upper end of the recess 20. The stock 10 is now positioned upon the work and the image of the spirit tube 30 is reflected out and down from the mirror 28 through one side of the recess 20 to admit of the reading of the spirit tube 30. The mirror 18 acts in a similar manner, as when the stock 10 is posi-

tioned on end against the side of a piece of work, and it is desired to take a reading of the instrument when the stock is above the head of the operator, the operator is enabled to take such reading by the reflection of the image of the spirit tube 17 from the mirror 18 and through the side of the stock.

In using the sight tube 32 it is adjusted vertically at its outer end by turning the set screw 39 through the fixed split collar 40 to move the ear 37, sliding the block 35 within the slot 36 in the plate 12. The angle, or height of the tube 32 within the stock 10 is determined by the position of the line 44 with respect to the graduations 45.

In use, suppose a beam is to be arranged in a predetermined inclined plane, the tube 32 is adjusted to dispose the same at an angle to the base of the stock 10 corresponding to the angle of inclination of the plane but in an opposite direction thereto. The operator now positions the stock 10 upon the beam to be set, and raises and lowers the beam until the required adjustment is had. The adjustment is determined by the registration of the objective sight 43 with a fixed object when looking through the eye-piece 34 from the rear end of the stock 10. The objective sight is designed to determine the horizontal position of the tube 32, while the position of the base determines the inclination of the plane desired.

Having thus described the invention what is claimed as new is:—

1. A level including a stock having a central chamber formed in its upper edge and opening through the sides thereof, a guide plate carried upon the upper edge of the stock over the chamber and having flanges at its opposite longitudinal edges, a slide fitted in the guide plate and having beads engaging against the flanges to support the slide, a mirror carried against the under side of the slide and disposed at an angle to reflect through one side of the chamber, and a spirit tube seated in the lower side of the chamber beneath the mirror, the stock being recessed at one side of the chamber and beneath the guide plate to receive the mirror when not in use.

2. A level including a stock provided with a recess in its upper edge midway of its ends, a guide plate carried upon the upper edge of the stock and extending over the recess, the stock being hollowed out beneath the guide plate at one end of the recess, a slide mounted in the guide plate for movement over the recess and into the hollowed portion of the stock, a spirit tube mounted in the lower end of the recess in the stock, and a mirror carried by the slide for registration over the spirit tube and for engagement in the hollowed portion of the stock.

3. A level including a stock having a recess in its upper edge and terminating in its

sides, the stock having a hollowed portion communicating with one end of the recess, a guide plate carried upon the upper edge of the stock over the hollowed portion and the
5 recess, a slide mounted in the guide plate for movement into the hollowed portion and the recess, a mirror carried at an angle against the under side of the slide, and a spirit tube

seated in the stock in the lower end of the recess. 10

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

ALGOT P. LIDHOLM. [L. s.]

Witnesses:

H. P. REED,

AUGUST JOHNSON.

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