M. E. COMSTOCK.

LEVEL.

APPLICATION FILED JULY 15, 1907.

986,909. Patented Mar. 14, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

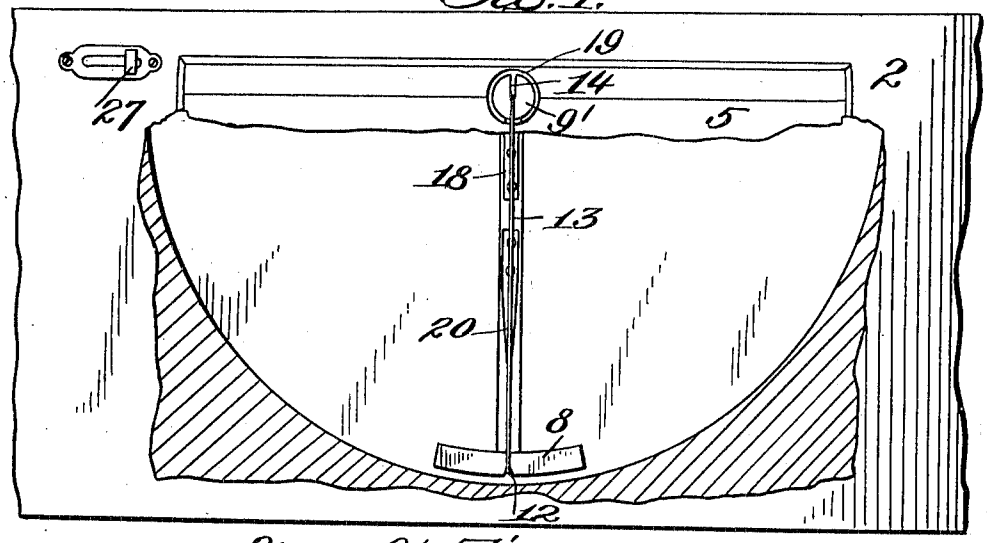


Fig. 2.

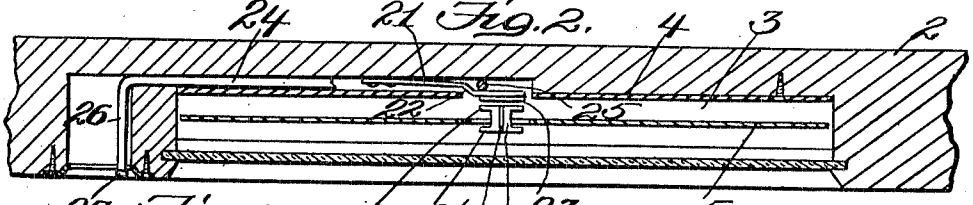
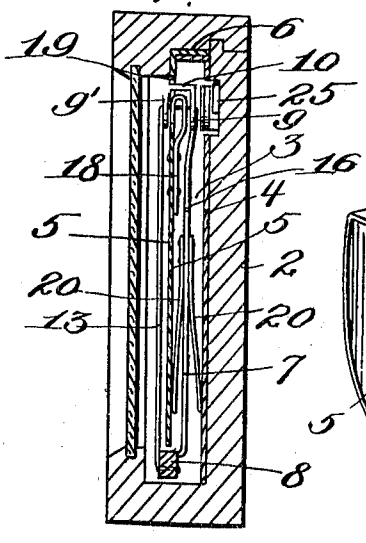
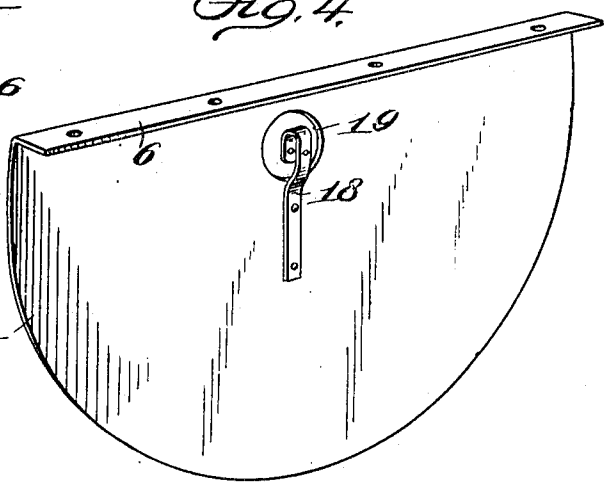


Fig. 3.





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3 SHEETS—SHEET 2.

Fig. 5.

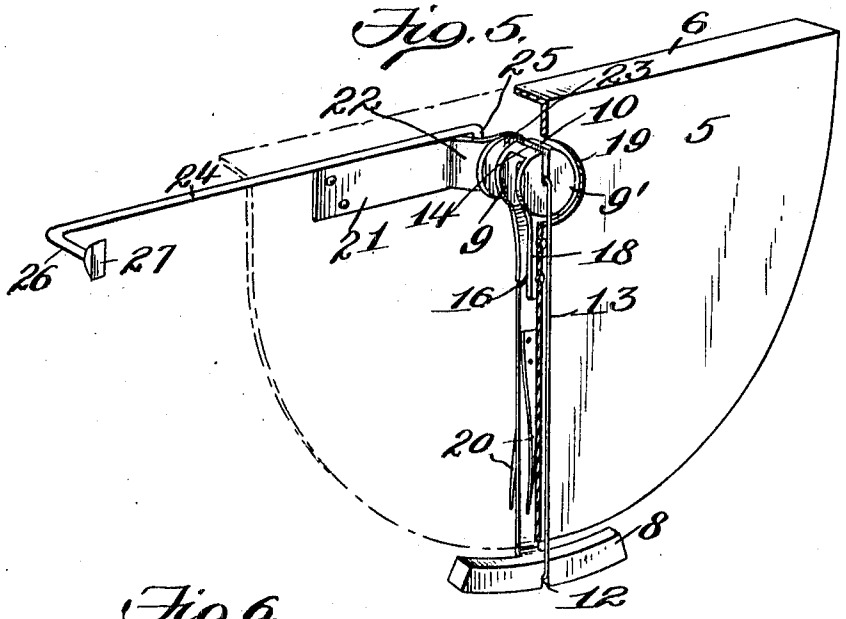


Fig. 6.

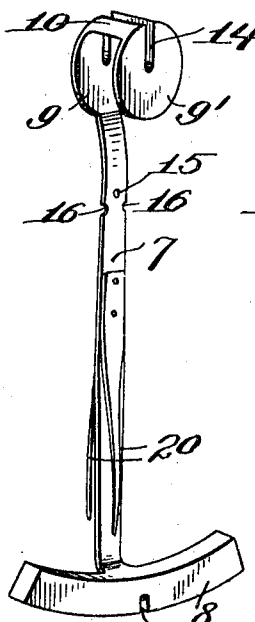


Fig. 7.

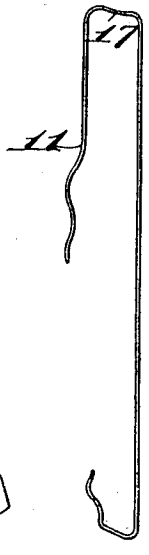


Fig. 8.

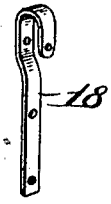
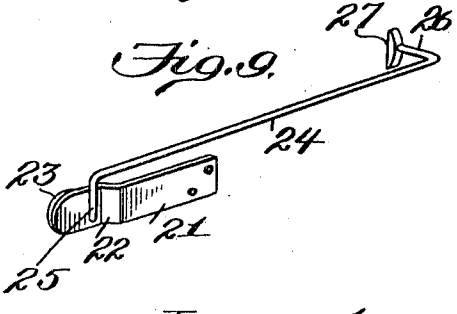


Fig. 9.



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3 SHEETS—SHEET 3.

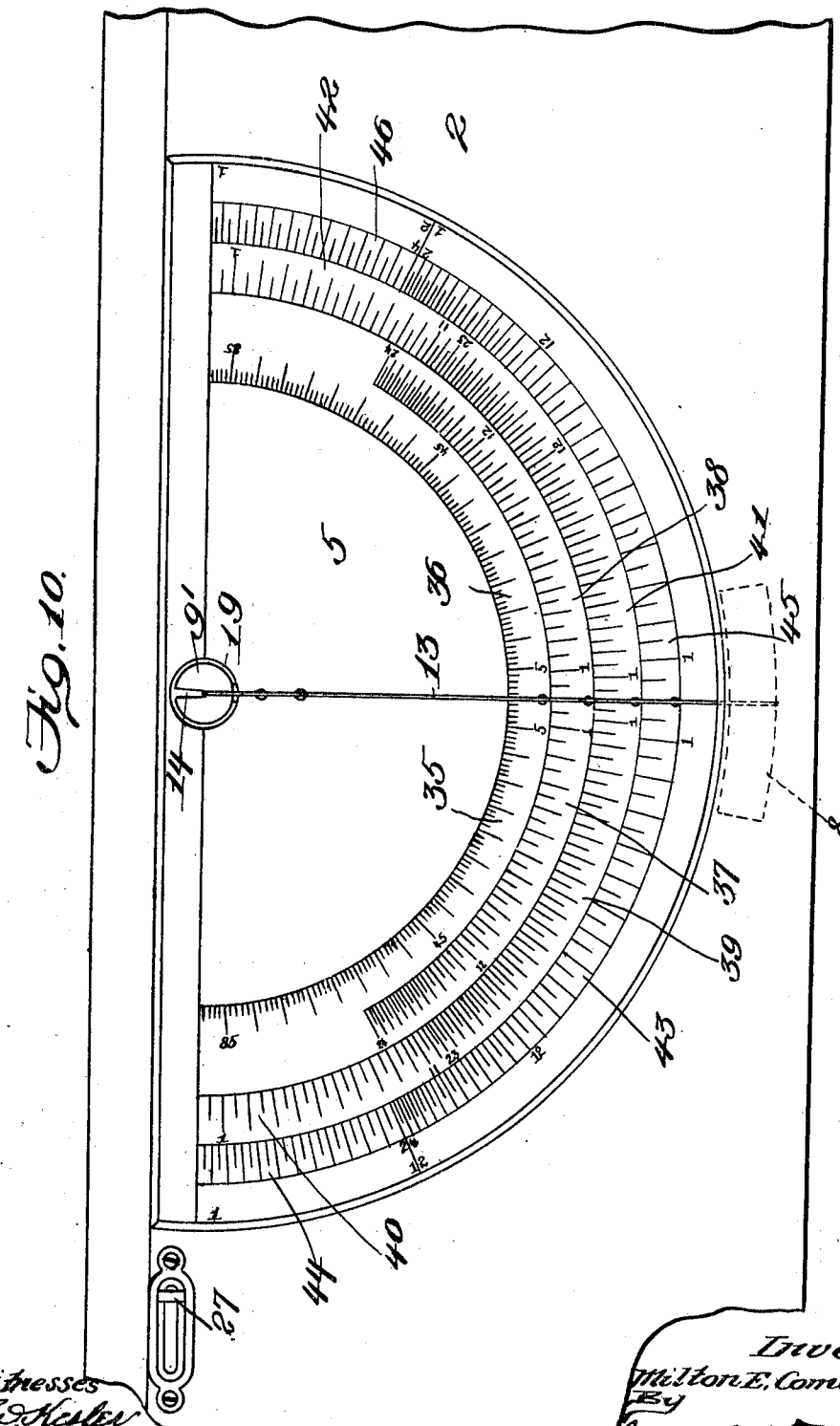

Fig. 10.

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UNITED STATES PATENT OFFICE.

MILTON E. COMSTOCK, OF BURLINGTON, IOWA.

LEVEL.

986,909. Specification of Letters Patent. Patented Mar. 14, 1911.

Application filed July 15, 1907. Serial No. 383,832.

To all whom it may concern:

Be it known that I, MILTON E. COMSTOCK, a citizen of the United States, residing at Burlington, in the county of Des Moines and State of Iowa, have invented new and useful Improvements in Levels, of which the following is a specification.

This invention relates to levels of that type involving a swinging pendulum, the object being to provide a simple article of this character which is effective in operation and which has means for preventing unnecessary vibration of the pendulum and for also momentarily positively holding the same in a desired relation.

The device includes other advantages which with the foregoing will be hereinafter set forth.

In the drawings accompanying and forming a part of this specification I illustrate one form of embodiment of the invention which to enable those skilled in the art to practice the same will be clearly explained in the following description, while the novelty of the invention will be included in the claims succeeding said description.

Referring to said drawings, Figure 1 is a sectional front elevation of a level including my invention with the ends removed. Fig. 2 is a horizontal section and Fig. 3 a transverse section of said level. Fig. 4 is an inside perspective view of a dial plate and a bracket carried thereby. Fig. 5 is a similar view of a pendulum, brake devices, a portion of the dial, and certain coöperative parts as viewed from the front. Fig. 6 is a perspective view from the rear of the pendulum with the pointer thereof removed. Fig. 7 is a like view of the pointer separated from the pendulum. Fig. 8 is a similar view of the bracket to which I have hereinbefore referred, and Fig. 9 is a like view of a brake and operating means therefor. Fig. 10 is an enlarged view in elevation of the central portion of the level showing particularly the graduated dial thereof.

Like characters refer to like parts throughout the several figures.

The level includes in its construction a body or stock as 2 which may be of wood, metal, or a combination of these materials as deemed desirable. The body or stock, as shown clearly in Figs. 2 and 3, has a chamber or cavity as 3 to receive the working parts of the level, said chamber being ordinarily made of segmental form and to the rear wall thereof I have shown as fastened in some suitable way as by screws a back plate 4 of substantially semi-circular form. The dial is designated by 5 and may be of any suitable shape or material. For example, it may consist of a segmental plate having along its upper edge a horizontally disposed flange as 6 fastened in some suitable way as by screws to the upper wall of the chamber 3. The outer face of this dial may have one or a series of graduations as shown in Fig. 10. These graduations may be of any desirable character the same depending upon the class of work in connection with which the level is employed. It will be understood that the dial 5 is separated from the back plate 4, this relation being clearly shown in Figs. 2 and 3 and in this space a pendulum as 7 is vibratory, said pendulum being shown as having a weight 8 of curved form at its lower end which tends to bring the pendulum to a perpendicular position.

The head of the pendulum 6 is shown as comprising the two substantially similar disk-like sections or flanges 9 and 9′ connected by the transverse piece 10, the flange or section 9 being in the present case directly united with the shank or body of the pendulum, and the flange or disk 9′ being in parallelism therewith. Between these sections 9 and 9′ as will hereinafter appear is situated the journal or pivot of the pendulum which is a portion of a wire as 11. It will be understood that I employ the designation wire in a broad sense to include not only the article so known but equivalent devices. The wire near one end thereof is set into a notch as 12 formed in the weight 8 of the pendulum and is coiled or otherwise suitably formed on the rear side of said weight. The wire is then carried up the front side of the weight as shown clearly in Fig. 3 to form a pointer or index 13. The upper portion of the wire is then placed in a slot as 14 formed in the head of the pendulum, then passed downward on the rear side of the pendulum through a perforation 15 in the shank thereof and around said pendulum in opposite notches 16 as shown best in Fig. 6. The wire is stretched very tight so as to provide an index or pointer 13 that is immovable with respect to the pendulum. The pendulum itself as will be understood

is on one side of the dial 5, while the pointer 13 is on the opposite side of said dial. The wire 11 crosses the head of the pendulum, the crossing portion of said wire being designated by 17 and constituting the pivot of the pendulum. This pivot portion 17 is supported by the hook-shaped head of a bracket as 18 fastened suitably to the inner face of the dial 5, the head of the said bracket 18 being surrounded by the wall of an aperture 19 in said dial in which aperture the head of the pendulum works, as clearly shown in Figs. 2 and 3. While I have stated that the pendulum is at one side of the dial and that the pointer 13 is at the opposite side it should be understood that the weight of the pendulum is in neither of these relations as will be seen on reference to Fig. 3. This, however, is an immaterial point for the invention does not lie in any particular disposition of parts, but in certain other features as will be found on reference to my claims. By employing a wire substantially in the manner indicated I can secure thereby a pointer and an effective pivot for the pendulum, in that I can employ very fine wire which is advantageous for thereby I can obtain accurate readings and a support wherein a minimum amount of friction is present.

In connection with the pendulum I provide means for checking or retarding undue oscillation thereof and this means may be of any desirable character, for example, it may consist of two bowed springs each designated by 20 (see, for example, Fig. 3), the upper ends of which are attached by rivets or in any other suitable manner to the pendulum, while the lower or free ends thereof engage against or substantially engage against the adjacent back plate 4 and dial 5. These springs do not prevent normal movement of the pendulum, but do check undue oscillation or vibration thereof when the level is brought to a state of rest so that at such point it is not necessary to wait until the pendulum has stopped vibrating which would be the case were the springs not present.

I prefer to provide means of a positive character for holding the pendulum in an angular relation with the stock or body 2 when said pendulum is in a determined position or is in a relation defining a certain pitch, and while said means may be of any desirable character I will now set forth the means shown in the drawings for accomplishing this result.

Referring more particularly to Figs. 5 and 9 the numeral 21 denotes a friction brake which is represented as consisting of a spring fastened in some suitable way in a recess formed in the back wall of the cavity 3, the spring between its ends having a bend or deflected portion 22 beyond which is an operative portion as 23 to coact with the head of the pendulum 7. The operative portion 23 of the brake may consist of a disk of felt, rubber or other suitable material held in place to the brake device in any suitable way. Under normal conditions the working or operative portion 23 of the brake device 21 is out of contact with the head of the pendulum, this result being assured by the resiliency of the spring. Upon the proper operation of the spring, however, the effective portion of the brake device can be put into engagement with the pendulum to hold the latter in a certain or desired relation.

The actuator for the brake device is designated by 24 and it may consist of an elongated bar or piece of wire having at its inner end a down-turned portion as 25 to directly coöperate with the brake device and at its outer end an outwardly extending portion 26 which projects through an elongated slot in the face of the level, said outwardly extending portion 26 having a thumb portion 27 to provide for the ready manipulation of the actuator. The actuator is supported suitably in the body or stock of the level and when in its inoperative relation occupies the position shown in Fig. 2 with the finger or projection 25 substantially opposite the disk 23. When it is desired to set the brake device the actuator 24 is moved longitudinally to the left in Fig. 2 by pressing against the thumb piece 27 which operation causes the finger or projection 26 to ride against the deflected portion 22 to carry the disk 23 against the head of the pendulum to prevent vibration of the latter. On the movement of the actuator toward the right from its shifted position the spring brake device automatically resumes its inoperative relation.

While any suitable form of graduated dial may be employed, I prefer to employ a dial such as 5 to which I have hereinbefore briefly referred, and the graduated surface of this dial is shown clearly in Fig. 10. This dial 5 has provision for assuring an accurate cut, pitch, or degree of rafters, such as plain, hip, valley and octagon; also reversed pitch, plain, valleys and hips. The index or pointer 13, as will be understood, is adapted to traverse in use the graduated surface of said dial 5 and, when said pointer 13 is on the common zero mark of the similar but opposite arcs 35 and 36, this will indicate that the level is perfectly horizontal, that is to say, the same is level. When the said pointer 13 is in register with the 90 degree mark on either of said arcs 35 and 36, this will indicate that the level is perpendicular or plumb. If the index or pointer 13 be on the 45 degree mark of either of said arcs, this will indicate that the slant of the level is 45 degrees. The two arcs 35

and 36 are laid off in degrees commencing with zero in the center of the scale or at the junction of the two arcs 35 and 36. From this common zero mark the two arcs or scales 35 and 36 run up to 90 right and left or outwardly. The arcs 35 and 36 are bordered below the same by arcs or scales as 37 and 38 of greater radii and which are numbered from the center of the scale in opposite directions or toward the right and left respectively from a common zero mark which is immediately below the other zero mark, 1, 2, 3, 4, etc., up to 24. Said numbers 24 substantially register with the 61¾ degree mark in the arcs 35 and 36. The numbers 1 on the arcs 37 and 38 are coincident substantially with the 4½ degree mark on the arcs 35 and 36 respectively, and the graduations on said arcs 37 and 38 decrease in width as they run from 1 to 24 respectively, making the two arcs 37 and 38 the octagon scales. The arcs 37 and 38 are in turn bordered by other arcs or scales as 39 and 41 and 40 and 42 respectively. The scales or arcs 39 and 41 commence to number from the center of the scale 5, the same as arcs or scales 37 and 38. The graduation 1 in the said scales 39 and 41 is about coincident with the 3 degree mark on the scales 35 and 36, and the graduations in said scales 39 and 41 decrease in width as they run from 1 to 24, the 24th space of said scales 39 and 41 being about coincident with the 54½ degree mark in the arcs 35 and 36 respectively. The arcs or scales 39 and 41 are for hip and valley rafters, and any figure on these scales at which the index or pointer 13 may stop will indicate the rise per run of one foot for plain rafters to match hip and valley rafters on which the level is placed. The hip rafters or valleys on a building are not as steep as the plain rafters, but the rise is the same with a different run from the plain rafters. The run of hips and valleys will be the hypotenuse of twelve and twelve inches or practically seventeen inches, if the plain rafters and the jack rafters are the same on either side of the hips or valleys. An octagon run is about thirteen inches. In other words, octagon and hip and valley rafters have a longer span with a correspondingly greater run, but the rise is the same. The reversed scales number toward the scales for plain rafters and plain hips and valleys. The plain scales number from the center each way up to twenty-four inch rise and run into reversed pitch scales 44, 46, 40 and 42. A twenty-four inch rise is the full pitch and zero is the absence of pitch or the basis of plain reckoning. In plain pitch twenty-four inch rise by twelve inch run is the steepest pitch and from this maximum runs down to zero or the horizontal. In reversed pitch twenty-four inch rise by twelve inch run is the starting point or the absence of pitch under this particular calculation and from this point runs up to the perpendicular. It was therefore necessary to make each scale complete in itself and involving five scales without counting the scale of regular degrees. The marks on the scales are of different lengths to correspond with the figures or divisions on the square as ordinarily used in carpenter work. The arcs 39 and 41 are bordered in turn by arcs or scales 43 and 45 and 44 and 46 respectively. The arcs 43 and 45 have twenty-four graduations respectively which decrease in width from 1 up to 24, the mark 1 being about even with the 4½ degree mark in the arcs 35 and 36 respectively, and the mark 24 thereof being about even with the 63½ degree mark on the arcs 35 and 36.

The arcs 43 and 45 are for plain rafter scales and any figure thereon at which the index or pointer 13 may stop will indicate the rise to the foot on a plain rafter or any other stick of timber, steel beams, etc., or for getting the grade on terrace and other work. The arcs 44 and 46 are reversed pitch on the outer arc and begin to count from 1 to 12 beginning on a line coincident with the 90 degree mark on the scales 35 and 36 and counting downward or inward toward the scales 43 and 45 respectively, and the graduations thereon decrease in width as they go down or inward. Any figure on the scales or arcs 44 and 46 at which the index or pointer 13 may stop will indicate the run to 24 inch rise. With reversed pitch on this level it is always 24 inches rise to whatever figure the index or pointer 13 may stop at in the scale said figure indicating the run by twenty-four inches rise. The arcs or scales 40 and 42 are for hip and valley for reversed pitch and number 1 to 12 beginning at 1 substantially even with the 90 degree mark on the respective scales 35 and 36 and progressing inward or downward to the scales 39 and 41 respectively, the graduations decreasing in width as they extend downward or inward. The arc or scale 43 is used for getting the pitch of plain rafter where it has no mate and the top end hits the comb board or stands alone, while the arc 39 is used likewise on the hips and valleys. These scales correspond.

What I claim is:

1. A level having a vibratory pendulum, a wire associated therewith and constituting a pointer and a pivot for the pendulum, and a dial between the pointer and the pendulum.

2. A level having a vibratory pendulum provided with a weight at the lower end thereof, a wire associated with the pendulum and constituting a pointer and a pivot for the pendulum and movable with the latter, and a dial mounted between the pen-

dulum and the pointer, the stock of the level being chambered to receive the pendulum.

3. A level having a vibratory pendulum, a wire associated with the pendulum constituting a pointer and a pivot for said pendulum, and a dial between the pointer and the pendulum.

4. A level having a vibratory pendulum, a wire associated with and constituting a pointer for the pendulum, said wire being continuous and its continuation serving as a pivot for the pendulum, and a dial means also operatively associated with the pendulum and pointer.

5. A pendulum having a head composed of two sections and a transverse piece uniting said sections, said head being slotted, and a wire set in the slot to present a pivot for the pendulum said wire being continued downward along the pendulum to serve as a pointer for said pendulum.

6. A level having a vibratory pendulum, and spring means secured to and movable with the pendulum to prevent abnormal vibration of the latter.

7. A level having a vibratory pendulum, and springs fastened to the opposite sides of the pendulum to prevent abnormal vibration of said pendulum.

8. A pendulum having a head and a weight, a taut wire connected with the head and weight and having a portion thereof serving as a pivot means for the pendulum, said wire constituting a pointer for the pendulum.

9. A pendulum having a taut wire associated therewith and constituting a pointer and a pivot means for the pendulum, the wire being connected to the pendulum at longitudinally separated points.

10. A level having a vibratory pendulum and a pointer connected therewith and consisting of a taut wire, the pointer swinging with the pendulum, a dial located between the pendulum and the pointer, and yieldable means carried by the pendulum for limiting undue oscillation thereof.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

MILTON E. COMSTOCK.

Witnesses:
CARL W. RADTKE,
E. M. FLYNN.