J. McARDLE.

LEVEL.

APPLICATION FILED NOV. 14, 1917.

1,282,095. Patented Oct. 22, 1918.

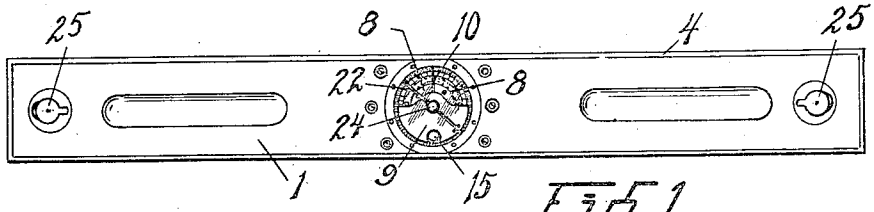


Fig. 1

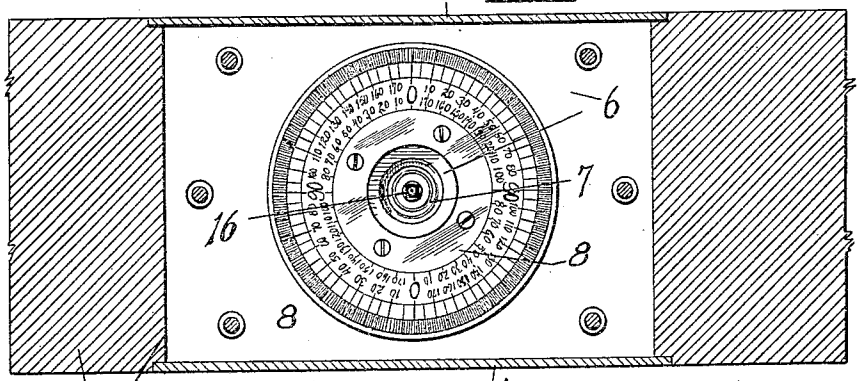


Fig. 2

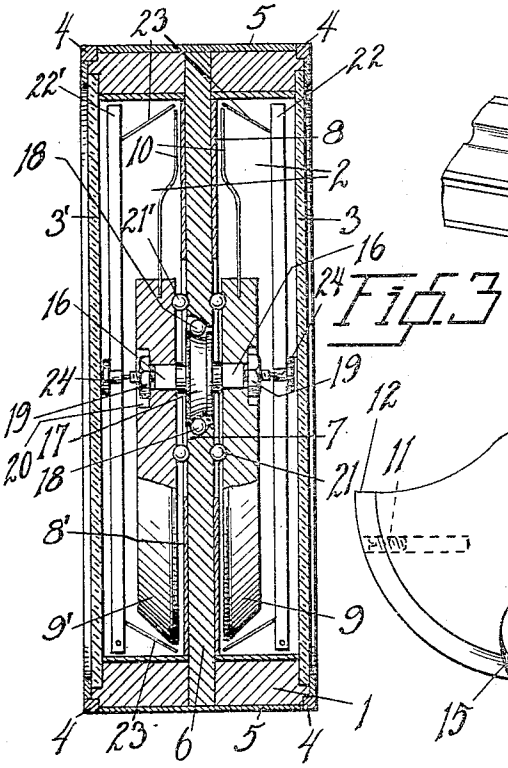


Fig. 3

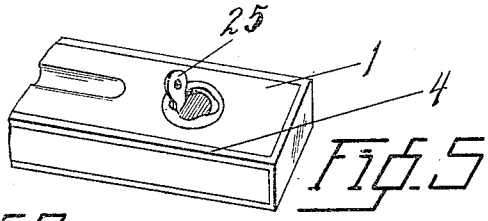


Fig. 5

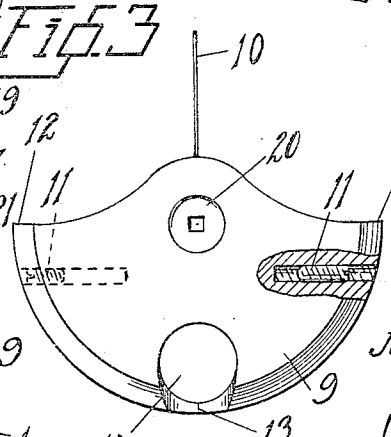


Fig. 4

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UNITED STATES PATENT OFFICE.

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LEVEL.

1,282,095. Specification of Letters Patent. Patented Oct. 22, 1918.

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To all whom it may concern:

Be it known that I, JOHN MCARDLE, a citizen of the United States, residing at Spokane, county of Spokane, and State of Washington, have invented certain new and useful Improvements in Levels, of which the following is a specification.

The present invention relates to improvements in levels in the broad class of geometrical instruments, and of the particular type known as pendulum levels. The device is designed for general work in building construction, and is also equipped with a magnetic needle so that simple or rudimentary surveying may be accomplished for the purpose of laying out building sites, etc.

The primary object of the invention is the provision of an instrument of this class which is comparatively inexpensive in cost, simple in its construction and operation, accurate, and durable, and efficient in performing its functions. To this end the invention consists in certain novel features and combinations and arrangements of parts involving particularly the mounting of the duplicate pendulums and features of their construction, as will be hereinafter set forth and claimed.

In the accompanying drawings one complete example of the physical embodiment of the invention is illustrated constructed and arranged according to the best mode so far devised for the practical application of the principles of the invention.

Figure 1 is a side view or elevation of the level constructed according to the present invention.

Fig. 2 is an enlarged sectional view of a portion of the stock of the level showing the dial or scale plate or disk, at one side of the center plate of the level, the other side being a duplicate.

Fig. 3 is a transverse sectional view, on a still larger scale, at the longitudinal center of the level, showing the two pendulums and their ball bearings, together with other accompanying features.

Fig. 4 is a plan view of one of the pendulums, partly broken away to disclose one of the adjusting counterbalancing weights for the pendulum.

Fig. 5 is a perspective view at one end of the level illustrating a foldable sighting device in operative position.

In the preferred embodiment of the invention as depicted in the drawings, the usual wood stock 1 is utilized, and formed with a central pocket or opening 2 extending transversely therethrough and closed by the two glass panels 3, 3′ properly fitted into the walls of the pocket. The level is provided with the usual metal edge strips 4, and a pair of metal plates 5, 5, close the top and bottom openings of the pocket 2 and in addition perform the function of reinforcing plates for the stock where the pocket is located.

Extending longitudinally of the stock, and located centrally of the pocket, is a metallic supporting plate 6, rigidly fixed by suitable means within the stock of the level, and fashioned with an open center 7 forming a ball race, and encircling the central opening is a pair of circular scale plates or dials 8, 8′ one at each side of the center supporting plate and rigidly attached thereto. The dials are provided with two series of figures denoting degrees, and the two pendulums 9 and 9′ are used in connection with the scales on the plates as usual. There is a pair of pendulums, one at each side of the supporting plate, and each one is equipped with an index finger 10, and a pair of adjusting counterbalancing weights 11, in the form of threaded screws, movable laterally toward or away from the pivot center of the pendulum in order to increase or decrease the weight of material, and thus cause the index finger 10 to coincide with desired mark on the dial plate with which it coöperates. In addition to the index finger, each pendulum has three marking points as 12, 13, 14, and these points, together with the index finger, are spaced ninety degrees apart, or are at right angles to each other, or rather, diametrically arranged so that adjoining marks are at right angles to each other, adapting the pendulums for facile reading of angles.

The pendulums are pivotally supported at their centers, and the additional adjusting weight or disk 15 of usual type is in direct line with the trunnions 16 of the pendulums and the index finger 10, for shortening or lengthening the swing of the pendulums. The pendulums move in synchronism about the center axis of their trunnions which are located at the sides of the central circular hub 17 which is a grooved bearing disk rigid with the trunnions and provides a complementary race member with the open center supporting plate for the bearing balls 18,

and in this manner the pendulums are supported vertically so that they may rotate freely about their axis, and the clamp nuts 19, 19 hold the pendulums on their trunnions against lateral displacement. The outer faces of the pendulums or weights are countersunk at 20 to receive the nuts 19 and the trunnions project through openings in the pendulums so that the nuts retain the pendulums and also hold the pendulums against two sets of bearing balls 21, 21'. These latter bearings are provided to eliminate friction, and to furnish lateral supports for the pendulums so that they may swing freely even though the level is not held in upright position. Thus with the three sets of ball bearings, the pendulums are extremely sensitive to variations in position of the level, and swing with a minimum of friction, and yet are securely held and supported in the center plate.

In connection with the pendulums are arranged a pair of magnetic needles 22 and 22', each fashioned with end pointers 23 which project from the inner sides of the needles, near their ends, to close proximity with the dials so that the readings may be made with facility. These needles are supported on the trunnions as at 24, and of course are pivoted free of the pendulums so that the level, through the instrumentality of the magnetic needles, may be used as a compass.

Near the ends of the stock are located sighting devices 25, 25 to be used for surveying purposes in laying off sites, etc., the devices being hinged so that they may fold down out of the way when not in use. The level may be used in laying off sites, by bringing the magnetic needle coincident with the two sights for establishing lines to work from, and when required to find a required slope for a sidewalk or graded surface, the degree or level may readily be ascertained on the level dials from any one of the four diametrical points of the pendulums.

From the above description taken in connection with the drawings it is evident that a structure of this type is provided which will perform the required functions of this class of instruments with efficiency and accuracy, and withal furnish an instrument capable of many advantageous and meritorious uses.

What is claimed is:—

The combination with the supporting plate of a level having an open center which contains said plate, of a hub having a ball bearing in the open center of the plate, alined trunnions projecting from opposite sides of the hub, pendulums on the trunnions and securing means therefor, anti-friction devices between said plate and the pendulums, radially arranged indicating devices on the pendulums and index dials for said devices, and means for adjusting the centers of gravity of the pendulums to change the relation of the indicating devices to the index dials.

In testimony whereof I affix my signature.

JOHN McARDLE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."