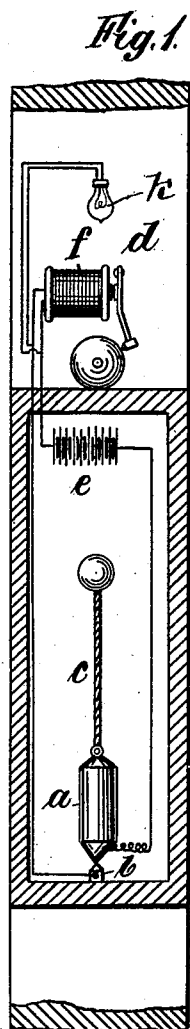
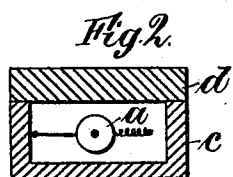
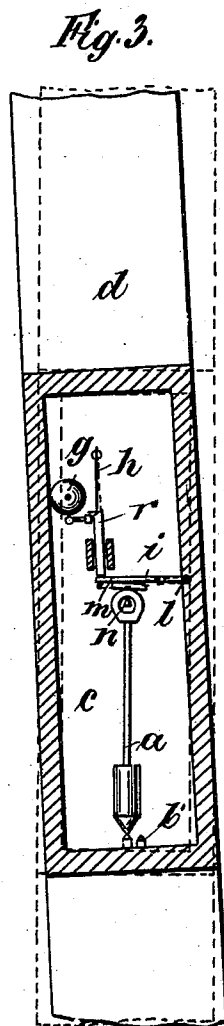


K. HEIN.
LEVELING STAFF.

APPLICATION FILED APR. 14, 1902.

NO MODEL.



WITNESSES

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UNITED STATES PATENT OFFICE.

KARL HEIN, OF HANOVER, GERMANY.

LEVELING-STAFF.

SPECIFICATION forming part of Letters Patent No. 723,526, dated March 24, 1903.

Application filed April 14, 1902. Serial No. 102,800. (No model.)

To all whom it may concern:

Be it known that I, KARL HEIN, a subject of the King of Prussia, German Emperor, residing in Hanover, Germany, have invented an Improved Leveling-Staff, of which the following is a specification.

My invention relates more specifically to the measuring instruments known as "leveling staffs or rods" for surveyors' use; and the object of my invention is to so construct such a staff that the surveyor can assure himself at the moment of reading the staff that the said staff does actually stand in a perpendicular position and that consequently incorrect results cannot follow from an inclination of the staff. This object I attain by providing the leveling-staff with an audible or visible signal, operated either by electrical or mechanical means, to indicate to the surveyor at a distance when the staff is in a perpendicular position.

In the accompanying drawings, Figure 1 is a vertical section illustrating one form in which my invention may be carried into effect. Fig. 2 is a horizontal section of Fig. 1, and Fig. 3 is a vertical section of a modification.

In Fig. 1 I have shown the signaling devices as electrical, and preferably as inclosed or partly inclosed within a protective box *c*, affixed to the leveling-staff *d* in any suitable manner. There is a pendulum *a* forming part of an electrical circuit which is closed by a suitable part of the pendulum coming into contact with a contact-piece *b* when the leveling-staff is perpendicular. The wires of this circuit include a battery *e* and the electromagnet *f* of an electromagnetic bell or other audible signal and an incandescent lamp *k*, or either, whereby there may be transmitted to the surveyor standing at a distance an audible or visible signal, or both, at the moment when the leveling instrument is put in a truly perpendicular position and while it is so maintained. I have diagrammatically indicated the battery and the signal as if mounted upon the staff; but these parts may be actually located in or on a separate support near by. The pendulum and contact must of course be upon the staff *d* and preferably inclosed within a box *c*.

In Fig. 3 I have shown by way of example

a signaling device to be actuated mechanically when the staff *d* is put in its perpendicular position. For this purpose I provide (preferably within a protecting-box *c*, as before) a spring-actuated ringing device *g*—such as used in alarm-clocks, for instance. Normally the hammer of the bell is locked by a spring-finger *h*, which is maintained in the locking position (shown by full lines in Fig. 3) by means of the inclined upper edge of a vertically-guided rod *r*. The lower end of this rod *r* rests upon and is supported by a lever *i*, pivoted at *l* to the box, and in turn this lever lies in contact with a plate *m* on the pendulum *a'*, which can swing upon the point *n*. When the staff *d* stands obliquely—as indicated, for example, by full lines in Fig. 3—the plate *m* will be tipped up and keep the lever *i*, and consequently the rod *r*, in their elevated positions, as shown in full lines, and consequently the locking-finger *h* will prevent the signal-bell from ringing. As soon, however, as the leveling-staff is placed in its perpendicular position (indicated by dotted lines in the figure) and the pendulum stands over the mark *b'* the plate *m* will come to a level position and the lever *i* and rod *r* will drop and release the spring locking-finger *h*, which will move back to the dotted position, and the ringing mechanism will then operate and give an audible signal indicating to the surveyor at a distance that the leveling instrument is in the desired perpendicular position. In the same manner the horizontal position of an instrument can be indicated.

I claim as my invention—

1. A leveling-staff, a signaling means mounted on the staff and adapted to convey a signal to a distance, and means for automatically operating the signaling means upon the staff assuming a perpendicular position, substantially as described.

2. A leveling-staff, a signaling means mounted thereon, a pendulum adapted to operate the signaling means upon the staff assuming a perpendicular position, substantially as described.

3. A leveling-staff provided with a pendulum and an audible signal controlled by the pendulum to indicate to the surveyor at a distance when the staff stands perpendicularly.

4. A leveling-staff, provided with a pendulum and a ringing signaling mechanism with connections between the pendulum and the ringing mechanism, whereby the latter is put
5 in action only when the staff is set in a perpendicular position.

5. A leveling-staff provided with a pendulum and an inclosing box therefor, in combination with a signaling device controlled by
10 the pendulum to indicate to the surveyor at a

distance when the staff stands perpendicularly.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

KARL HEIN.

Witnesses:

LOUISE KNOKE,
EMMA G. WHITE.