

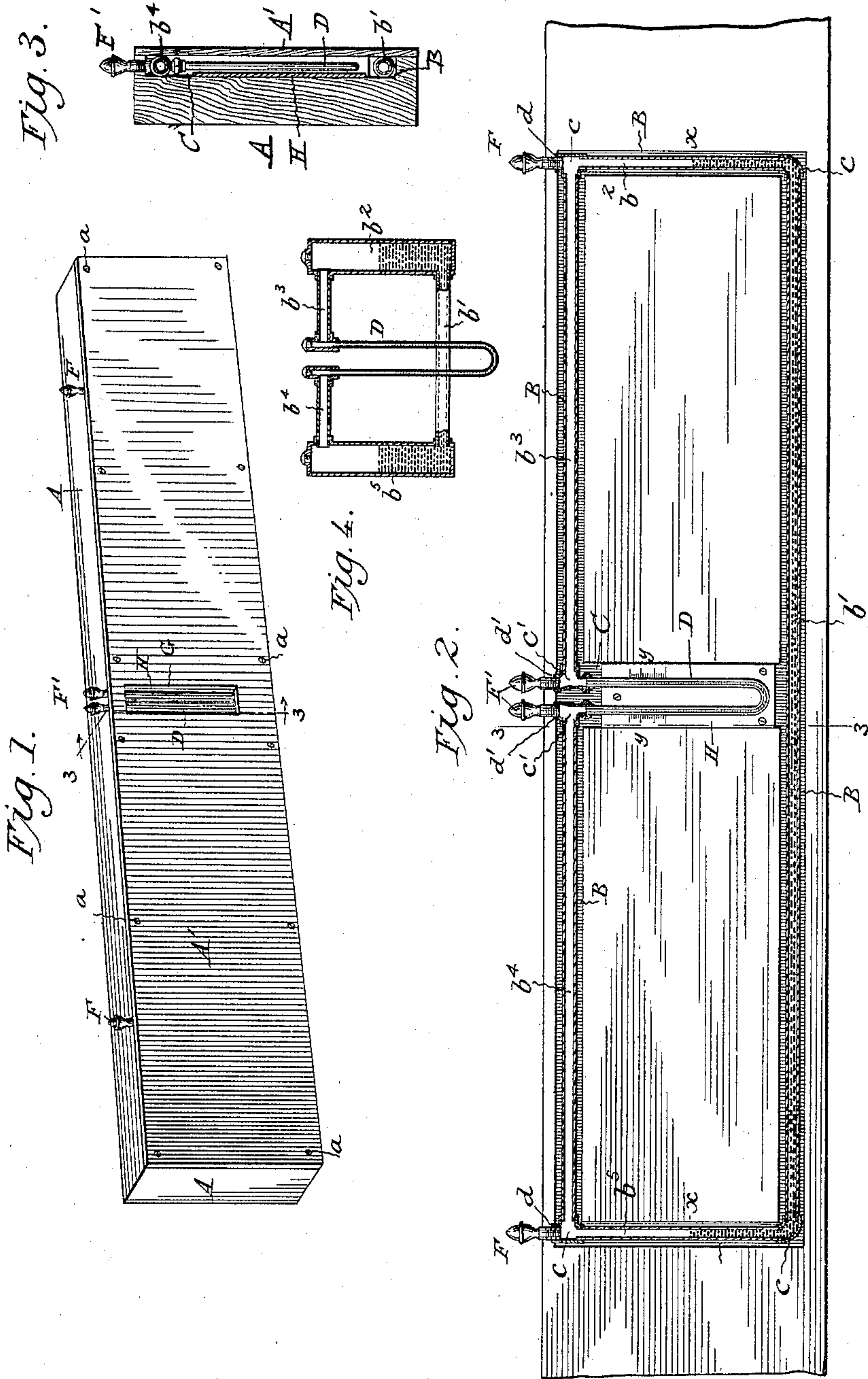
No. 652,078.

Patented June 19, 1900.

F. T. CABLE.
CLINOMETER.

(Application filed Mar. 28, 1900.)

(No Model.)



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UNITED STATES PATENT OFFICE.

FRANK T. CABLE, OF NEW MILFORD, CONNECTICUT.

CLINOMETER.

SPECIFICATION forming part of Letters Patent No. 652,078, dated June 19, 1900.

Application filed March 28, 1900. Serial No. 10,532. (No model.)

To all whom it may concern:

Be it known that I, FRANK T. CABLE, a citizen of the United States, and a resident of New Milford, in the county of Litchfield and State of Connecticut, have invented certain new and useful Improvements in Clinometers, of which the following is a specification.

This invention relates to that class of instruments employed to determine the condition of a surface, whether level or inclined.

The object of my invention is to provide an instrument which, while simple in construction and easily used, may indicate with great accuracy and delicacy whether the surface to which it is applied is level or whether it is inclined and, if inclined, the exact degree of inclination.

In carrying out my invention I employ a continuous tube or passage, one part of which contains a comparatively-heavy liquid, such as mercury, another part a lighter liquid, such as water or alcohol, while the remaining portions of the tube between the lighter and the heavier liquids contain air. The continuous tubular passage is hermetically sealed and is arranged in a rectangular block or frame, like that employed in the ordinary carpenter's spirit-level. Preferably the lighter liquid is contained in a portion of the tubular passage of smaller caliber than that containing the heavier liquid, and that portion of the tube containing the lighter liquid is preferably U-shaped, arranged vertically, and of transparent material, a calibrated scale being arranged adjacent to the transparent tube.

In the accompanying drawings I have shown the best way now known to me of carrying out my invention; but of course my improvements may be embodied in instruments varying in details of construction from that shown.

Figure 1 is a perspective view of the instrument. Fig. 2 shows a front elevation of the instrument with the front plate removed. Fig. 3 shows a transverse section on the line 3-3 of Figs. 1 and 2, and Fig. 4 illustrates a modification.

The frame of the instrument consists of two parts, a main frame A and a front plate A', the latter being removably secured to the frame A by means of screws α or other suitable securing devices. The main frame A is formed with a recess or groove B for the re-

ception of the pipe-sections b' , b^2 , b^3 , b^4 , and b^5 . It is also formed with a wide vertical recess C for the U-shaped tube D. The tube-sections b^2 , &c., may be of metal, and they are joined together by couplings c . The inner ends of the tube-sections b^3 b^4 are connected by suitable couplings c' with the upper ends of the U-shaped glass tube D. When the tube-sections are thus connected, a continuous passage is formed around the edges of the frame. The tube-section b' and the tube-sections b^2 and b^3 up to the levels marked x are preferably filled with mercury or some such heavy liquid. The U-shaped tube-section D is preferably filled with alcohol or some other light liquid up to the level marked y . The liquids may be placed in the tubes before the parts are coupled; but I find it most convenient to provide filling-orifices d d' , closed by screw-plugs F F'. The mercury may be poured in through the openings d when the plugs F are removed, while the alcohol may be poured in through the openings d' when the plugs F' are removed. When the proper amount of liquid has been poured into the tubes, the plugs should be screwed home very tightly, so as to hermetically seal the tubular passage. The spaces in the tubes between the levels x and y will then be filled with air, and as the mercury rises and falls above or below the levels x on opposite sides the alcohol in the tube D will be correspondingly made to rise or fall on opposite sides of this tube.

The grooves B and C are of sufficient depth to receive the tube-sections, so that when the plate A' is attached to the main frame A it will lie flat against the front face of this portion of the frame. The plate A' is provided with an opening G, through which the U-shaped tube D may be inspected. The calibrated scale H is preferably attached to the frame A in rear of the tube D, and it projects from opposite sides thereof and may be inspected through the opening G in the plate A'.

By means of this instrument the condition of a surface, whether level or inclined, may be readily determined with great accuracy. The instrument is especially designed for use as a clinometer for boats or other sea-going vessels, but may be used, obviously, for other purposes. Preferably the portion D of the tube is of smaller caliber than the remainder

of the tube. The greater the difference in caliber the greater will be the delicacy of the instrument—that is to say, when the caliber of the portion D of the tube is much smaller than that of the remainder of the tube a small change in the condition of the heavier liquid will produce a relatively-great change in the level of the lighter liquid in the tube-section of smaller diameter.

While I prefer to make the instrument in this way, my invention, so far as I am advised, comprehends also a continuous tube of uniform diameter, and so far as advised the invention is not limited to the use of liquids of different specific gravities, nor necessarily to the use of a U-shaped portion in the tube.

The portion D of the tube, which is of smaller caliber than the side portions b^2b^5 , may be also much longer than the said side portions, as illustrated in Fig. 4. When the side portions are of much greater caliber and the portion D of greater length, the liquid in the portion D will rise and fall to a proportionately greater extent, and thus render the instrument more delicate.

In the claims I have referred to the liquids as being contained in a "tube;" but I wish it understood that I mean by this expression any continuous tubular passage or receptacle performing the same function as the pipe or tube shown. I also wish it understood that where I refer in the claims to the liquids being separated by air I wish to include gas or other suitable equivalent of air.

I claim as my invention—

1. A clinometer, comprising a continuous tube, one portion of which contains a liquid, another portion of which contains a liquid out of contact with the first-mentioned liquid, while the space in the tube between the two liquids is filled with air.

2. A clinometer, comprising a continuous tube hermetically sealed, one portion of which contains a liquid and another portion of which contains a relatively-light liquid out of contact with the first-mentioned liquid while the spaces between the two liquids contain air.

3. A clinometer, comprising a continuous tube, one portion of which is U-shaped and contains a liquid, while another portion contains another liquid out of contact with the first-mentioned liquid.

4. A clinometer, comprising a tube of general rectangular form but having a U-shaped portion between its opposite ends, said U-shaped portion containing a relatively-light liquid, while the horizontal portion and parts of the vertical end portions contain a relatively-heavy liquid which is out of contact with the lighter liquid.

5. A clinometer, comprising a continuous tube, one portion of which is of smaller caliber than the other portion, said portion of said passage having a smaller caliber containing liquid while the other portion contains another liquid out of contact with the first-mentioned liquid.

6. A clinometer, comprising a continuous tube having vertical side portions of relatively-large caliber containing a liquid, and another vertical portion of relatively-small caliber but of greater length than said side portions and also containing a liquid which is out of contact with the first-mentioned liquid.

7. A clinometer, comprising a continuous tube, one portion of said tube being horizontal and having two vertical branches containing a liquid, and the other portion consisting of a vertically-arranged tube of smaller caliber than the two vertical branches, arranged in a different vertical plane connected therewith and containing another liquid.

8. A clinometer, comprising a continuous tube, one portion of which is horizontal and has two vertical branches, and the other portion of which is a vertically-arranged tube of smaller caliber than the two vertical branches, and is arranged between them in a different vertical plane, said horizontal portion and its two vertical branches containing a liquid, and said vertical portion between the two vertical branches containing a lighter liquid.

9. A clinometer, comprising a continuous tube, one portion of said tube being horizontal and having two vertical branches containing a liquid and the other portion consisting of a vertically-arranged U-shaped tube of smaller caliber than the two vertical branches arranged between them in a different vertical plane connected therewith and containing another liquid.

10. A clinometer, comprising a continuous tube, one portion of said tube being horizontal and having two vertical branches containing a liquid and the other portion consisting of a vertically-arranged tube of smaller caliber and of greater length than the vertical branches connected with said vertical branches and arranged between them in a different vertical plane and containing another liquid.

11. A clinometer, comprising a continuous tube, one portion of said tube being horizontal, and having two vertical branches containing a liquid, and the other portion consisting of a vertically-arranged U-shaped tube of smaller caliber but of greater length than the two vertical branches, arranged in a different vertical plane connected therewith and containing another liquid.

12. A clinometer, comprising a continuous tube, one portion of which contains a relatively-heavy liquid, while another portion consists of a U-shaped tube with its vertical arms placed close together, and containing a relatively-light liquid which is out of contact with the heavy liquid.

In testimony whereof I have hereunto subscribed my name.

FRANK T. CABLE.

Witnesses:

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