

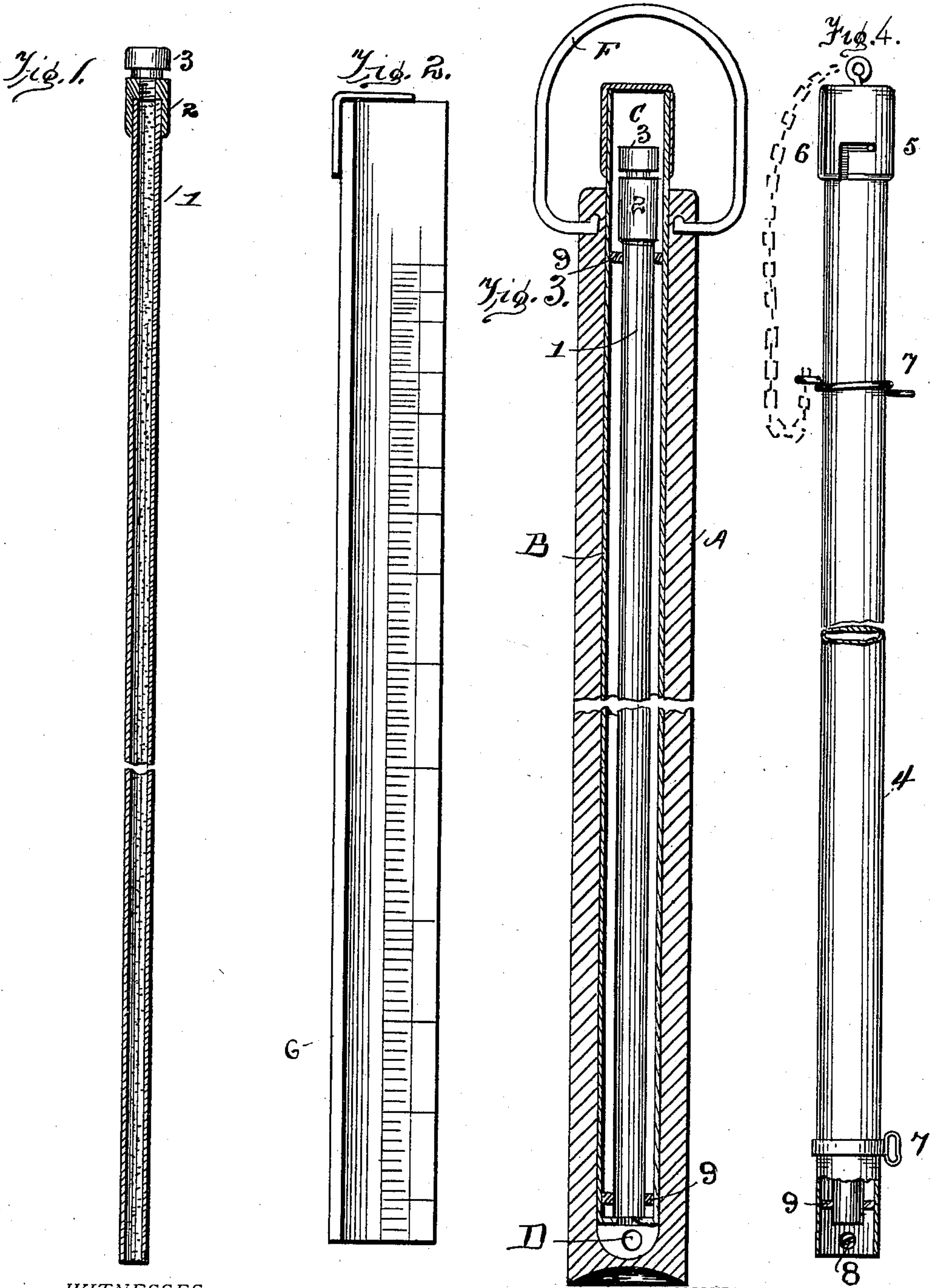
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Z. L. TANNER & J. B. BLISH.  
SOUNDING APPARATUS FOR NAVIGATORS' USE.

(Application filed Apr. 28, 1898.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

ZERA L. TANNER AND JOHN B. BLISH, OF THE UNITED STATES NAVY.

## SOUNDING APPARATUS FOR NAVIGATORS' USE.

SPECIFICATION forming part of Letters Patent No. 617,451, dated January 10, 1899.

Application filed April 28, 1898. Serial No. 679,099. (No model.)

*To all whom it may concern:*

Be it known that we, ZERA L. TANNER, retired, and JOHN B. BLISH, both of the United States Navy, have invented certain new and useful Improvements in Sounding Apparatus for Use in Navigation, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in devices for sounding the depth of water for purposes of navigation.

The object of the invention is to produce an apparatus which can be conveniently used to measure and determine depths of water up to, say, one hundred fathoms without stopping the forward movement of the ship.

A sounding-tube largely in use in navigation is known as the "Sir William Thompson sounding apparatus." In this a glass tube of small internal diameter, open at bottom and closed at top and internally coated with a chemical which is discolored by water, is attached to the sounding-line in such manner that water has free access to the open end of the tube. The water by its entrance compresses the air in the tube just in proportion to the immersion, and on taking the tube from the water the extreme depth to which the tube has descended can be readily ascertained by the discoloration of the tube-lining, a graduated scale being marked on or applied to the tube. The bore of the tube is so small that it acts as a capillary tube, and water will not enter nor air escape, although the tube may be inclined from the perpendicular, as is generally the case while sounding from a moving ship. An objection to the Thompson tube is that it can generally be used but once without recoating, and on ship-board there is little facility for chemical work of this character, so that a large number of coated glass tubes must be carried, and when the supply is exhausted by frequent soundings very serious mishaps may occur.

We have discovered that capillary tubes of glass, with the interior of the tube ground to show a translucent surface, become transparent when wet internally, and therefore act as well as the chemically-prepared tubes referred to, and these ground-glass tubes when dried again become translucent, so that the same tube may be used repeatedly, and

as the capillary tube of small diameter will not dry quickly under ordinary conditions we have devised means by which the moisture can be withdrawn from the tube with facility, and we have further devised apparatus to protect such tubes while in use in sounding and to conveniently apply, remove, and dry the tubes.

Figure 1 is a broken section intended to represent a ground-glass tube with a cap and closing-plug. Fig. 2 is an elevation of a scale by which the immersion of the tube is measured. Fig. 3 is a section of a sounding-lead, with the shield or cover and tube therein. Fig. 4 is an elevation of a shield or protector for attachment to a sounding-line and not directly to the lead.

The drawings are merely illustrative and are not intended to show proportions of parts.

The transparent glass tube 1 is generally made about two feet in length, one-fourth inch external diameter, and one-eighth inch in internal diameter. These proportions are not essential; but the bore of the tube must be small and uniform to prevent liquid from having too free movement therein and for accuracy. The interior of the tube is "ground" or abraded in usual manner of grinding glass, as by passing a wire or cord covered with sand or other abradant through the tube repeatedly or by fluoric-acid treatment.

A close-fitting cap 2, preferably of brass, is cemented to one end of the tube. In this cap there is a screw-plug 3, the threaded part fitting a threaded aperture in the cap 2. As the top or covered end of the tube is generally applied to the scale G with the end of plug 3 against the bar g of the gage, it is desirable that the caps and plugs of all sounding-tubes should be alike.

When used in sounding, the plug 3 is screwed home, making an air-tight joint. No air escape must be permitted while the instrument is in use, and on occasion any usual packing may be used to insure a tight joint. When withdrawn from the water, the distance to which the water has entered the tube will be clearly indicated on the tube. Then by withdrawing plug 3 dry air may be forced through the tube to expel the moisture therefrom. We find in actual use that the suction of the lungs will be sufficient to draw air



through the tube and dry it in a minute. If air is blown through the tube, it will take a longer time to dry, and if the plug is not removed from the tube moisture will remain in the tube indefinitely.

By drying the tube it may be at once re-used, and as there is not much danger of breakage a few tubes will be all that are needed on a ship.

To protect the tube in use, it may be inclosed in a shield or protector 4. This shield is usually a small brass tube a little longer than the glass tube 1 and large enough to easily contain the glass tube. The shield 4 has a cover 5, connected by a bayonet-joint when applied and held against loss by a chain 6. Rings or loops 7 7 are applied to the shield, so that the same may be attached to the sounding-line, usually above the lead. Casing 4 has a cross-bar 8 near the bottom to support the glass tube, and the glass tube is held by washers 9, of rubber, cork, cotton, or other material, so as to be protected against accident.

When the glass tube 1 is used in the sounding-lead a special construction of lead is necessary, and a lead so made is known as a "combination-lead." We have devised the apparatus shown in Fig. 3 for this purpose. In this device, A indicates the lead proper, of about usual size and length to give the necessary weight, but having an interior tube B, preferably of galvanized iron, brass, or steel to give stiffness to the lead. The lead may be cast about tube B, so as to be firmly connected thereto. Tube B projects a little above the top of lead A, so as to receive cap C, which is held by a bayonet-catch or in any other usual manner. A hole D in the lead permits water to enter tube B. The glass tube 1 is inclosed in tube B in the same manner as has been described for casing 4 and packed by light rings 9. The sounding-lead A has a bail F, of strong wire, which can be turned to one side to permit access to the cap C and the insertion of the glass tube into or its removal from the tube or casing B in the lead.

From the foregoing it will, we think, be understood that the main part of our invention lies in the construction of the glass tube 1 with ground interior surface and with a close-fitting stopper at one end, which stopper is

removable to dry the tube, and that we have adapted mechanism to the protection of this tube when in use.

We are aware that bottles and tubes for chemical purposes have been ground on their inner surfaces for a little distance from the open end for the purpose of securing a ground-glass stopper therein. Such a device is not a capillary tube and would not be available for the purpose of sounding in deep water in the way we have described, and such we do not claim as our invention.

What we claim is—

1. A capillary tube for sounding purposes, composed of glass having the inner surface ground or etched throughout its length as described, said tube provided with means for tightly closing one end the other end remaining open for use, substantially as described.

2. The glass sounding-tube described, having a "ground" interior surface, and having one open end and a closing-cap at the other end, and a removable plug by which one end may be tightly closed, substantially as described.

3. In a sounding apparatus, the sounding-lead having means for attachment to a sounding-line, the lead having a rigid interior tube open through its length and having an opening at the bottom through which water may enter the tube, and a removable cover at top, whereby a registering-tube of glass or the like, may be entered into the top of and confined in the rigid tube, and water admitted to the rigid tube from below, all combined substantially as described.

4. In a sounding apparatus, the sounding-lead A having interior rigid tube B and cap C, and a bail F, connected to the lead, so as to turn out of the way of cap C, said lead having a passage for water into the interior tube of the lead, substantially as described.

In testimony whereof we affix our signatures in presence of witnesses.

Z. L. TANNER.

JOHN B. BLISH.

Witnesses to the signature of Z. L. Tanner:

W. A. BARTLETT,

WALLACE MURDOCK.

Witnesses to the signature of John B. Blish:

F. C. MILLER,

P. A. AGELASTO.