July 26, 1949. R. F. SHROPSHIRE 2,477,094

UNDERWATER BOTTOM HARDNESS TESTER

Filed May 2, 1945

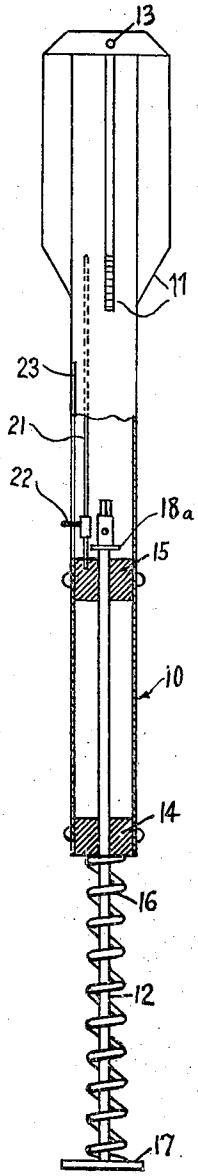


Fig 2

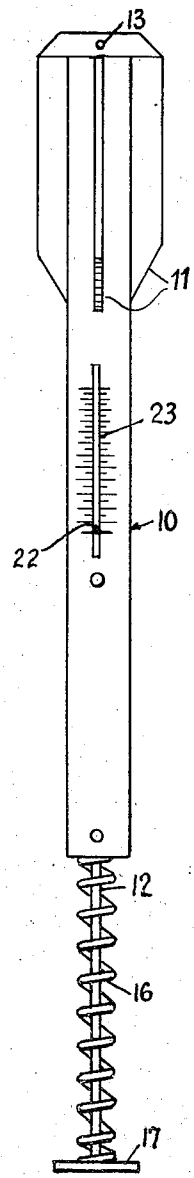


Fig. 1

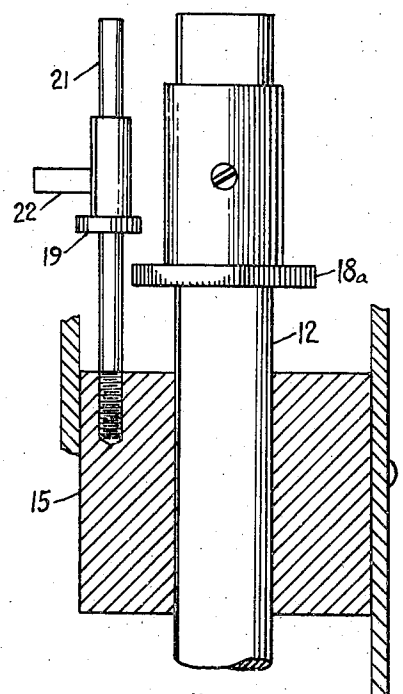


Fig. 3

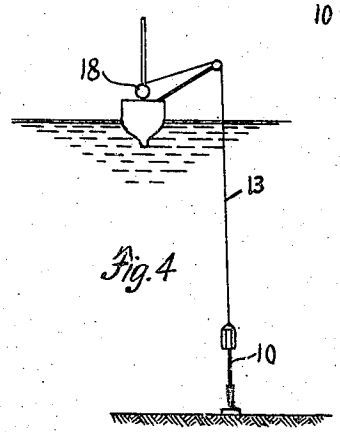


Fig. 4

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UNDERWATER BOTTOM HARDNESS TESTER

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3 Claims. (Cl. 73—84)

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This invention relates to hardness measuring devices and more particularly to a new and improved device for measuring the hardness of the ocean bottom.

It is of particular importance that geodetic surveying expeditions make an accurate topographical survey of the ocean bottom, and in making such survey, measuring devices are frequently employed for determining the depth of the ocean or other body of water surveyed by means of the timing required to reflect an echo from the ocean bottom. In determining depth by this method it is important to know the degree of hardness or compactness of the submarine soil. Also, it is desirable in submarine sounding and construction projects to know the extent to which an object placed upon the bottom will sink into it.

One embodiment of the present invention provides a device for measuring the compactness or hardness of a submarine bottom in terms of the degree to which a spring is compressed upon impact against the soil of a plunger operated in a free-falling device.

It is an object of the present invention to provide a compact portable device which may be employed in smooth or rough water to measure the degree of hardness of the ocean bottom.

A further object of the present invention is to provide in such a device suitable indicating and registering means for showing the degree of hardness of the ocean bottom and retaining such information until the device is withdrawn for examination.

A further object of the present invention is to provide a free-falling ocean bottom hardness indicator having means to normally retain the indicator oriented in a vertical position.

Other objects and advantages will appear from a consideration of the following detailed specification. For a more complete understanding of this invention reference may now be had to the drawings, in which:

Fig. 1 is a vertical side elevation of one embodiment of the present invention;

Fig. 2 is a view of the embodiment of Fig. 1 rotated 90° and with a portion broken away;

Fig. 3 is an enlarged detailed view of a portion of the embodiment illustrated in Fig. 2; and

Fig. 4 is a schematic view showing the manner in which the embodiment of Figs. 1, 2 and 3 is used.

Considering first Figs. 1 to 4, inclusive, the embodiment illustrated comprises an elongated tubular body 10 having guide vanes 11 located

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on the upper end and having a retractable plunger 12 projecting from the lower end. This device may be suspended from a drop line 13.

As shown particularly in Fig. 2, the plunger 12 is guided in its vertical reciprocation by means of guide blocks 14 and 15 secured within the tubular structure 10 in the manner shown and is normally biased to its extended position by means of the plunger encircling compression spring 16 located between the guide block 14 and a soil engaging head 17 secured to the lower end of the plunger 12.

It will be apparent that in operation this indicating device may be dropped overboard in the manner shown in Fig. 4 and, in use, it is preferably employed in conjuction with a free-running reel 18, whereby the line 13 is permitted freely to pay out until the device strikes the ocean bottom. The hardness of the ocean bottom determines the degree to which the plunger 12 will be forced upwardly against the resistance of the spring 16 and thereby is a measure of the hardness of the ocean bottom at that point.

In order to indicate the amount that the plunger 12 is displaced by the force of the impact, a radial collar 18a, Fig. 3, is mounted on the plunger stem and extends into the path of a rim 19 of an indicator slide 20. The slide 20 is mounted for vertical movement along an indicator guide rod 21 and is provided with an outwardly projecting indicator pin 22. The pin 22 projects through a slot 23 in the tubular member 10 and the amount of movement along the slot may be read directly from scale indicia located adjacent the slot 23.

From the foregoing description it will be apparent to those skilled in the art that various modifications thereof may be made without departing from the spirit and scope of this invention and it is desired, therefore, that the same be limited only by the scope of the prior art and the appended claims.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. A soil hardness measuring device for determining from a station on a vessel or the like in the water the hardness of an ocean bottom by impact comprising: a tester including a plunger support, a plunger movable in the support, an indicating scale fixed relative to the support, an indicator movable along the scale, and indicator moving means on the plunger; means for retrievably dropping the tester freely through the ocean from the station and means for orienting

the tester to maintain the plunger perpendicular to the ocean bottom during plunger impact therewith.

2. A soil hardness indicating device for determining from a station on a vessel or the like in the water the hardness of an ocean bottom by its resistance to impact comprising: a tester including a plunger support, a plunger movable in said support, an indicator bearing rod extending parallel to the plunger, an indicator slidable on the indicator bearing rod, indicator engaging means located on the plunger, and resilient means normally urging said plunger downwardly; means for retrievably dropping the tester freely through the ocean from the station; and means for orienting the tester to maintain the plunger perpendicular to the ocean bottom during plunger impact therewith.

3. A soil hardness measuring device for determining from a station on a vessel or the like in the water the hardness of an ocean bottom by impact comprising: a tester including a plunger support, a plunger movable in the support, an indicating scale fixed relative to the support, an indicator movable along the scale, and indicator moving means on the plunger; a free-running reel at said station, a line connected between the tester and the reel for retrievably dropping the tester freely through the ocean; and means for orienting the tester to maintain the plunger perpendicular to the ocean bottom during plunger impact therewith.

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