H. L. BREVOOR.

Pressure Gage.

No. 39,114. Patented July 7, 1863.

Fig. 1

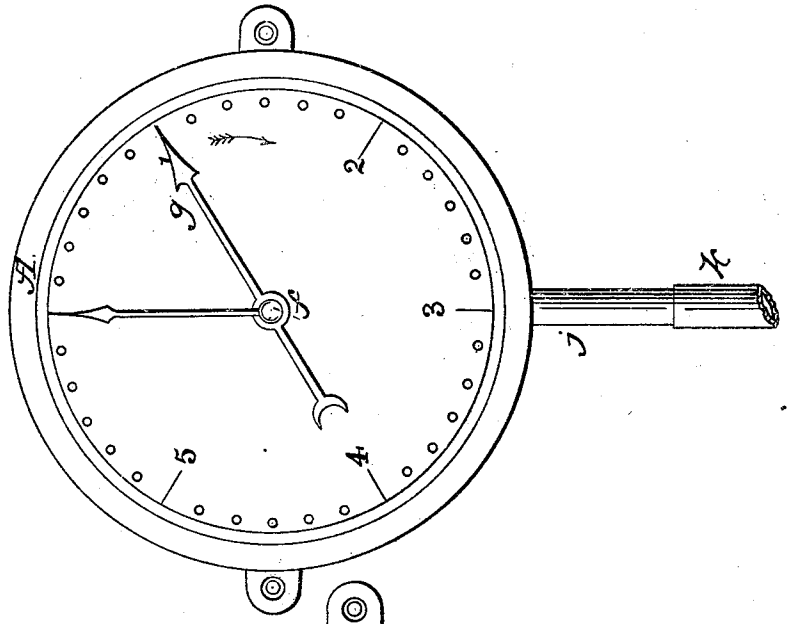
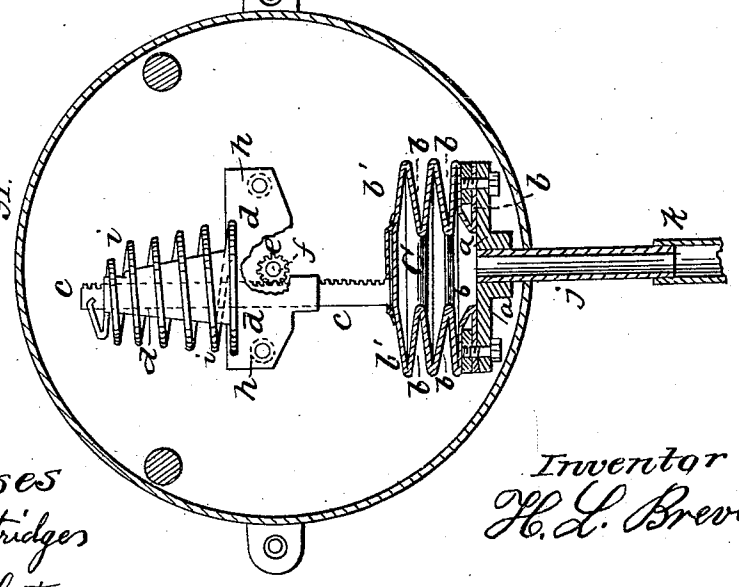


Fig. 2



Witnesses
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UNITED STATES PATENT OFFICE.

H. L. BREVOOR, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN INSTRUMENTS FOR INDICATING THE DEPTH OF WATER IN CISTERNS.

Specification forming part of Letters Patent No. **39,114**, dated July 7, 1863.

To all whom it may concern:

Be it known that I, HENRY L. BREVOOR, of the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Instruments for Indicating the Depth of Water in Ships and other Vessels; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front view of an instrument with my improvement. Fig. 2 is a vertical section of the same parallel with Fig. 1.

Similar letters of reference indicate corresponding parts in the several figures.

My invention relates to instruments for indicating the depth of the bilge-water in a ship or other vessel, or of the water in a tank or other reservoir, by the agency of the pressure of the column of such water acting through the medium of air.

In carrying out my invention I use a series of flexible sectional or annular diaphragms, such as are used in the bilge and leakage indicator which constitutes the subject-matter of Letters Patent No. 15,624, granted to R. Shaler and since assigned to myself and L. G. Singleton. In that indicator the diaphragms are arranged in a chamber outside of the box which contains the mechanism for operating the index.

My invention consists in the arrangement of the diaphragms within the said box and in combination with a spring, whereby the instrument is made of more compact form and more certain in its operation.

To enable others skilled in the art to make and use my invention, I will proceed to describe it with reference to the drawings.

A is a cylindrical box containing all the moving parts of the indicator, and having in front a circular scale or dial graduated to represent feet and inches, or other measurements. *a* is a stationary horizontal plate arranged near the bottom of the box A, and secured within or forming part of the said box, and serving as the foundation for the series of flexible diaphragms *b b b'*, of india-rubber or other suitable material, which is impervious to air. These diaphragms, with the exception of the top one, are all of annular form. The lowest of the said diaphragms is secured closely to the plate *a*, and the others are cemented or otherwise secured together by their inner and outer edges alternately, as shown in Fig. 2, in such manner as to make their joints perfectly tight, and the top diaphragm is made without an opening. The diaphragms are thus made to form an expanding air-chamber, C, substantially like a circular bellows. The top diaphragm, *b'*, has secured to it the upright toothed rack *c*, which works in a guide attached to a fixed upright plate, *d*, and gears with a pinion, *e*, on the spindle *f*, which carries the index *g*. The plate *d*, which is secured to the back of the box by two studs, *h h*, serves also to contain one of the bearings of the index-spindle and for the attachment of a spiral spring, *i*, which is coiled around and connected with the upper part of the rack *c*, for the purpose of pressing down the said rack and thereby turning back the index toward the zero-point of the circular scale.

j is a short metal pipe screwed tightly into the plate *a* and protruding through the bottom of the box A for the attachment of a piece of india-rubber or other flexible tubing, *k*, to lead to the hold of the vessel or other place in which the depth of water is to be indicated. This piece of tubing may be loaded or otherwise secured at its lower end to keep its mouth as close as possible to the bottom of the vessel or other place which contains the water.

The instrument, when used as a bilge or leakage indicator for ships or other vessels, may be placed in the captain's cabin, the engine-room, or any other convenient place where it may be in view of a proper officer, and when used for any other purpose may be arranged in any place that may be most suitable, irrespective of its distance from the water whose depth is to be indicated. Its operation is as follows: The pressure of the column of water outside of the tube *k* acting upon the air within the said tube and within the pipe *j* and chamber C causes the expansion of the said chamber and the rising of the diaphragm *b'*, and thereby causes the rack *c* to be pushed upward and to produce, by its action on the pinion, the movement of the index in the direction of the arrow shown in Fig. 1, and by a proper graduation of the scale the index is caused to show the depth of water upon it. As the water rises or its depth increases the pressure of its column increases and by its above-described

action produces a further movement of the index in the same direction; but as the water falls or its depth diminishes its pressure becomes less and the spring *i* overcomes the pressure of the air in the diaphragm and depresses the rack *c*, and so produces a movement of the index in the opposite direction. This spring is found in practice to be very necessary, as it is found impracticable to make the diaphragms *b b b'* constitute springs, as was the intention in Shaler's apparatus. Instead of the spiral spring *i*, a volute spring arranged in an upright position may be applied.

What I claim as my invention, and desire to secure by Letters Patent, is—

The arrangement of the flexible diaphragms *b b b'* to form an expanding chamber within the box A, and in combination with a spring, *i*, substantially as herein specified.

Witnesses: H. L. BREVOOR.
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