

No. 626,659.

Patented June 6, 1899.

J. BEAL & F. C. BROWN

LUNG TESTER.

(Application filed Aug. 23, 1898.)

(No Model.)

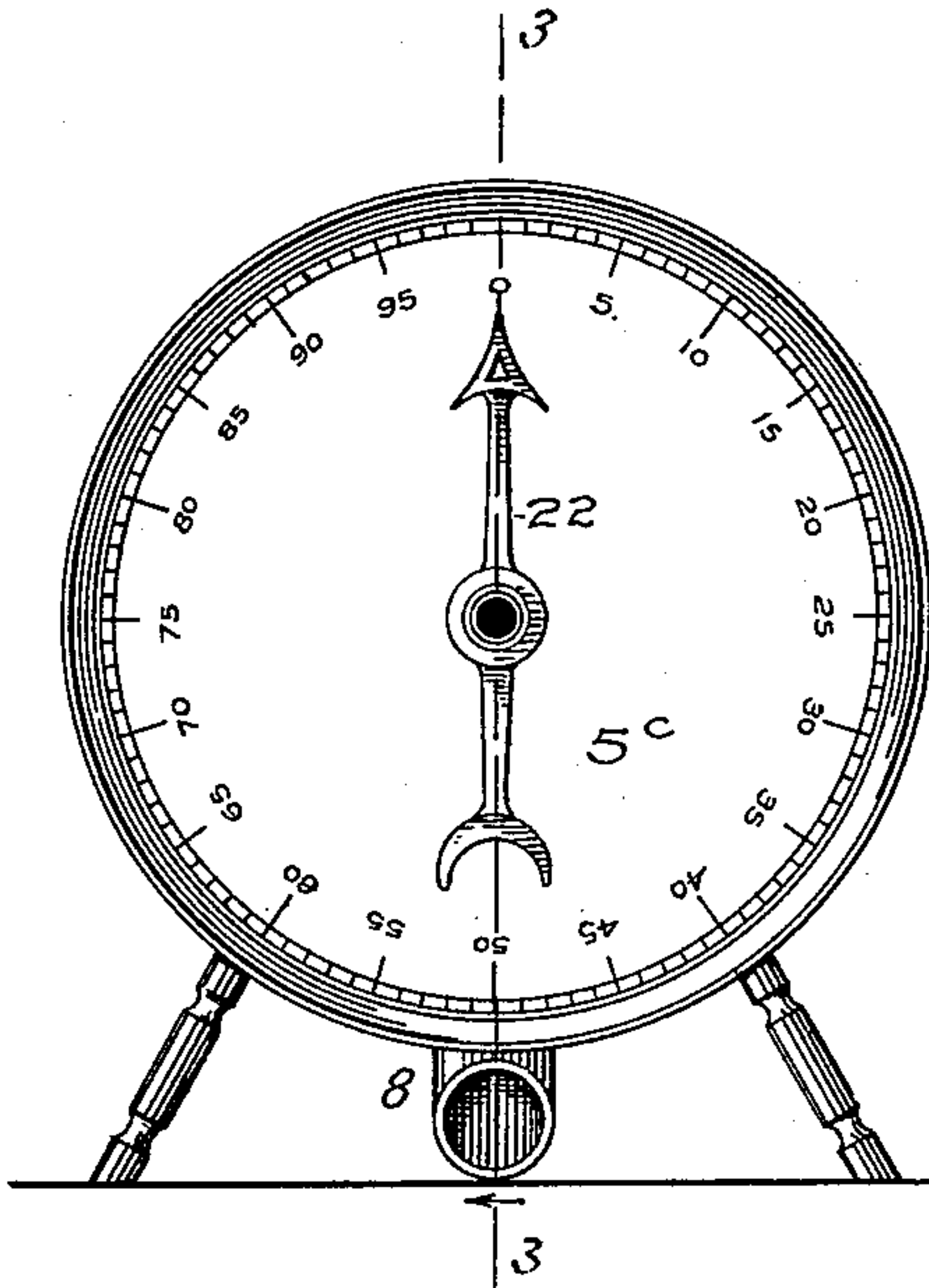


FIG. 1

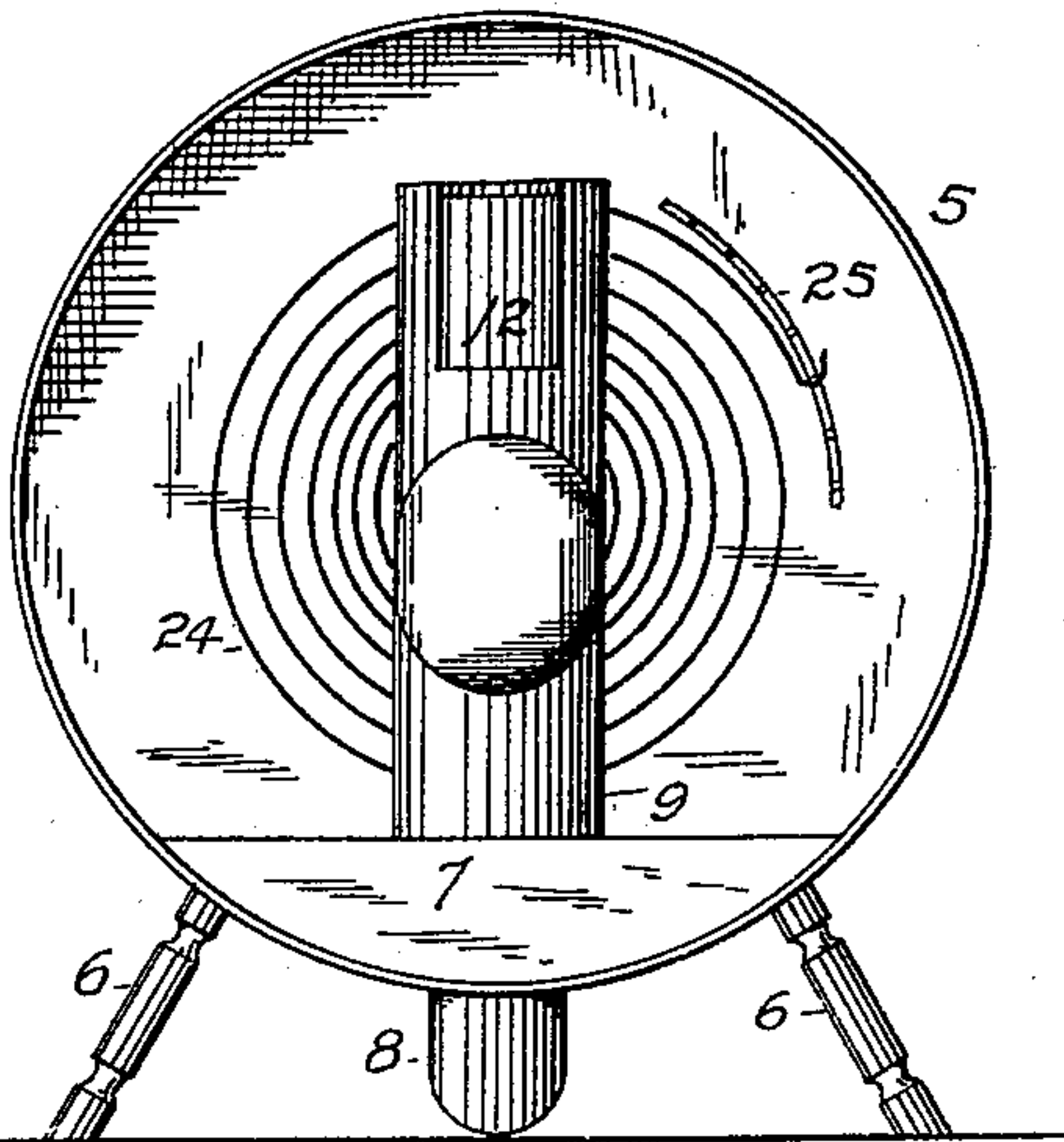


FIG. 2

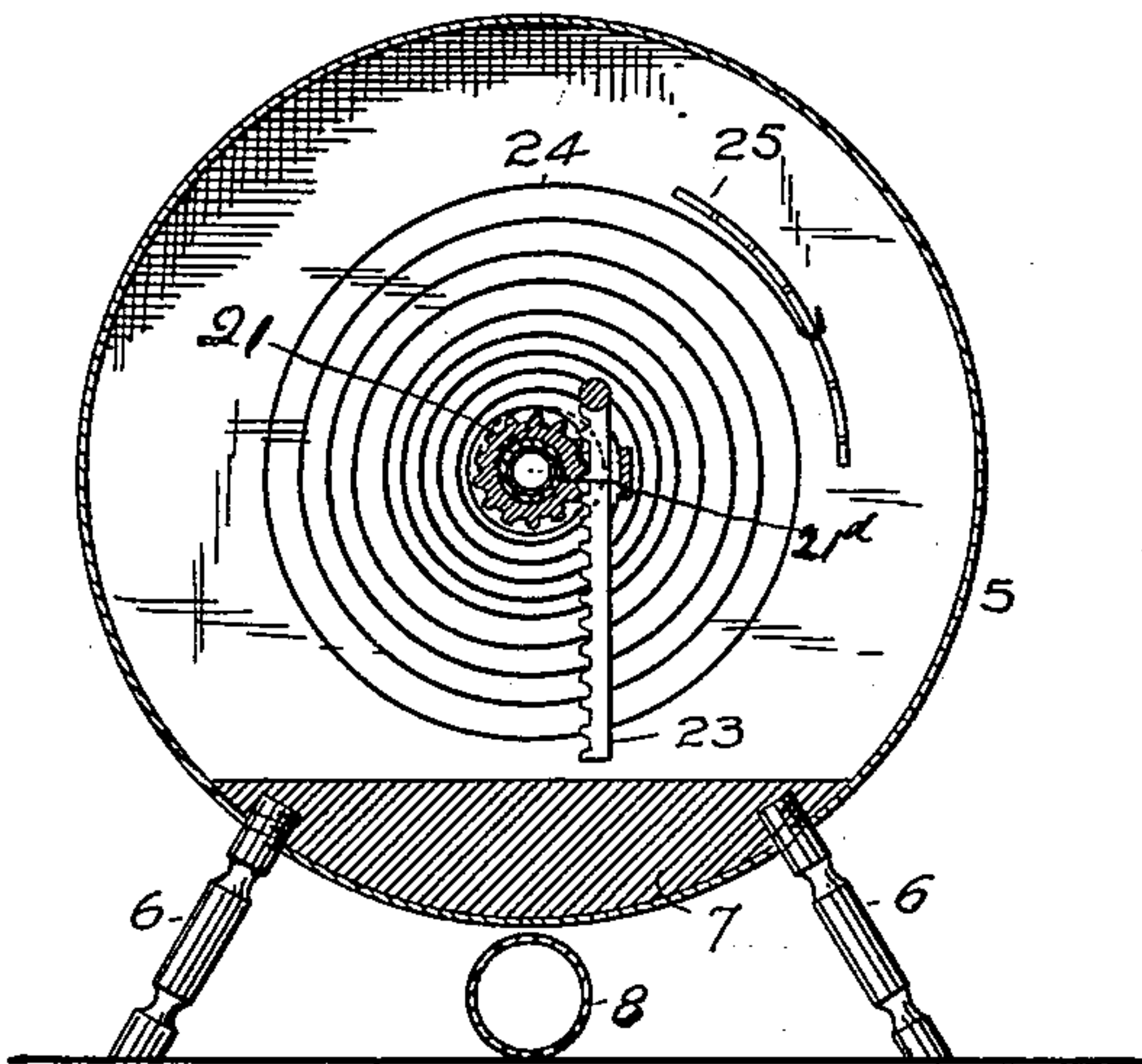


FIG. 4

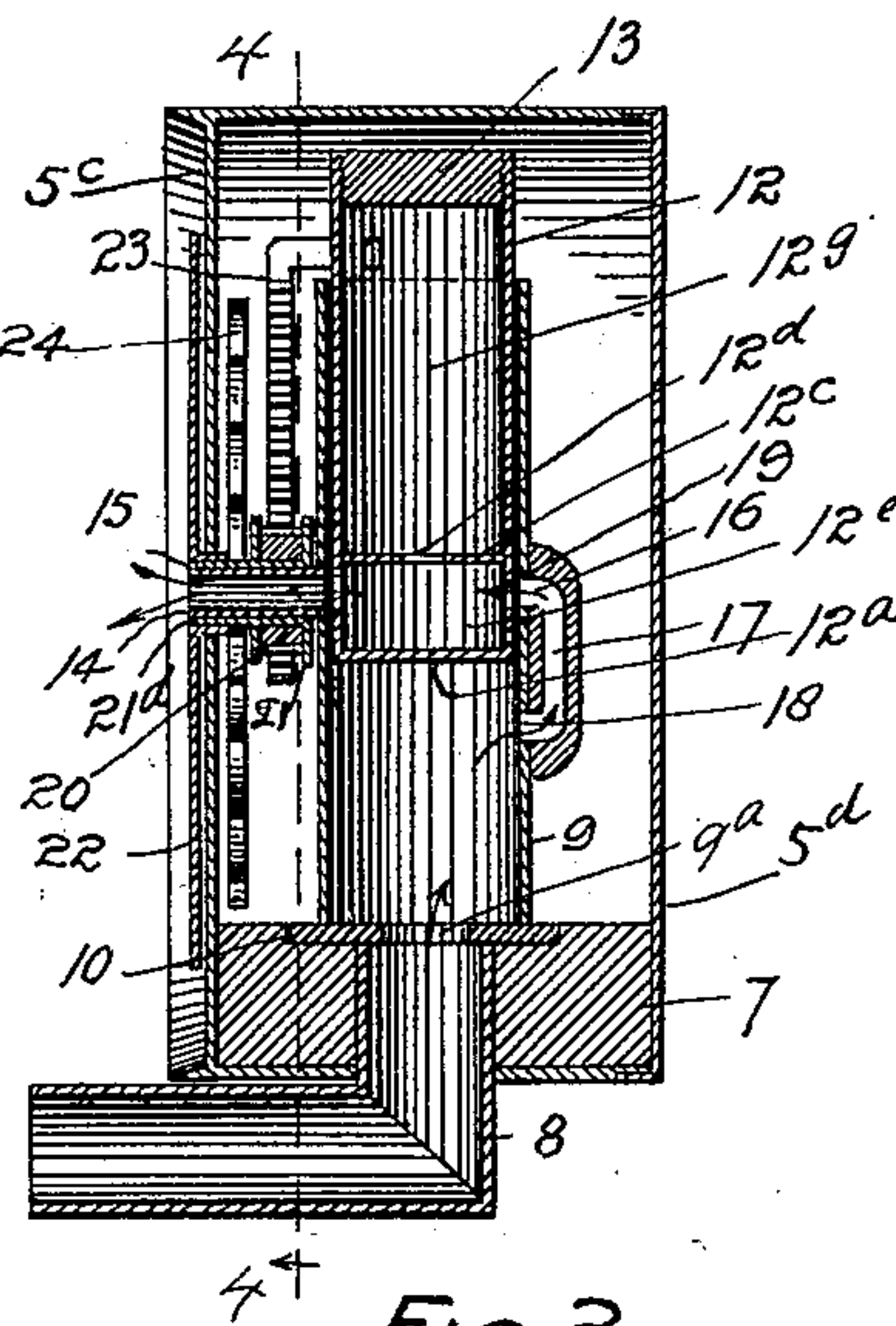


FIG. 3.

Witnesses  
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# UNITED STATES PATENT OFFICE.

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## LUNG-TESTER.

SPECIFICATION forming part of Letters Patent No. 626,659, dated June 6, 1899.

Application filed August 23, 1898. Serial No. 689,354. (No model.)

*To all whom it may concern:*

Be it known that we, JOHN BEAL, residing at Berthoud, and FRANK C. BROWN, residing at Loveland, in the county of Larimer and State of Colorado, citizens of the United States of America, have invented certain new and useful Improvements in Lung-Testers; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

Our invention relates to improvements in lung-testers, our object being to provide a device of this class which shall be simple in construction, economical in cost, reliable, durable, and efficient in use; and to these ends the invention consists of the features hereinafter described and claimed, all of which will be fully understood by reference to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a front elevation of the device. Fig. 2 is a rear view of the same with the back plate of the casing removed. Fig. 3 is a section taken on the line 3 3, Fig. 1. Fig. 4 is a section taken on the line 4 4, Fig. 3.

Similar reference characters indicating corresponding parts in the views, let the numeral 5 designate a case mounted on legs 6, which are screwed into a solid segmental plate 7, located within the case. The legs pass through openings formed in the case and enter coinciding threaded apertures formed in the plate 7, thus fastening the latter in place. In the bottom of the case 5 is formed an opening, which registers with a threaded opening formed through the segmental plate, into which is screwed the elbow-shaped tube 8. Made fast to the upper surface of the plate 7, which is formed flat for the purpose, is a tube or piston-chamber 9, which is provided at the bottom with an opening 9<sup>a</sup>, communicating with the tube 8. This opening is surrounded by a rubber washer 10, which forms the bottom of the tube. In this tube is located a hollow piston 12, provided with a closed bottom

12<sup>a</sup> and a diaphragm 12<sup>c</sup>, located above the bottom and provided with an opening 12<sup>d</sup>. Above this diaphragm is a chamber 12<sup>e</sup> of suitable capacity. The top of the hollow piston is closed by a plug 13.

To the main tube 9 is attached a short horizontal open-ended conduit 14, which communicates with the interior of the main tube by way of an opening 15, formed therein directly opposite another opening 16, which forms the outlet of a byway 17, whose inlet is an opening 18, formed in the tube 9. The hollow piston 12 is provided with two openings 19 and 20, located on opposite sides and adapted to register with the openings 15 and 16 of the tube 9 when the piston is raised to the position shown in Fig. 3, the air in that event taking the course indicated by the arrows. In the chamber 12<sup>e</sup> of the piston any suitable powdered substance may be placed, which will be drawn through the opening in the diaphragm 12<sup>c</sup> and ejected through the tube 14.

Mounted on the conduit 14, which forms an arbor therefor, is a pinion 21, whose hub 21<sup>a</sup> projects beyond the dial or graduated face 5<sup>c</sup> of the case 5. To this pinion-hub is attached a hand or pointer 22, which moves around the graduated face of the case as the pinion turns on its hollow arbor. To the piston 12 is attached a toothed or cogged arm 23, forming a rack which engages and actuates the pinion 21 as the piston moves back and forth in its tube 9, the latter being vertically slotted to permit the movement of the toothed arm or rack-bar. To the hub of the pinion is attached one extremity of a coil-spring 24, whose opposite extremity terminates in a hook adapted to catch in open slots formed in a tension-flange 25, attached to the inner surface of the front plate. The tension of the spring is regulated by changing the hooked extremity of the spring from one slot to another of the tension-flange. The coil-spring is so arranged that as the piston moves upward in the tube 9 the spring is wound or placed under tension. Hence the normal position of the piston is in the bottom of the tube or chamber 9.

In using the device the person whose lungs are to be tested places the elbow-shaped tube to his mouth and blows thereinto. The air



passing through the tube engages the bottom of closed head of the hollow piston and raises the same in its chamber until its openings 19 and 20 register with the openings 15 and 16 of the piston-chamber. In this event the air passes through the opening 18, the by-passage 17, the openings 16 19 20 15, and the conduit 14 to the outer air. Hence as the air escapes from the conduit 14 the piston has been raised to its limit of movement. It is evident that the tension of the spring may be so regulated as to make the feat of raising the piston, so as to let the air escape, more or less difficult, as may be desired.

The object of the chamber 12<sup>s</sup> in the piston is to make the instrument at the same time both a lung-tester and an amusement apparatus. For instance, assuming that the chamber 12<sup>s</sup> contains some powdered material, as soon as the air passes through the lower part of the piston between its bottom and the diaphragm, as above described, this powdered substance will be forcibly ejected through the conduit 14 to the surprise of the person blowing on the instrument in the event that he is not aware the device contains a powdered material. If the elbow-shaped tube is located as shown in the drawings, the conduit 14 will point directly at the face of the person using the instrument. Hence the powdered material will be ejected into the face of the user. This, however, may be avoided by giving the elbow-shaped tube a right-angular turn. It is intended, however, that the person using the instrument shall be in position to watch the movement of the hand or pointer. Hence the position of the elbow-shaped tube shown in the drawings is the preferred one.

The back 5<sup>d</sup> of the case is detachable to expose the operating parts located therein. A rubber tube of any desired length may be attached to the elbow-shaped tube.

Having thus described our invention, what we claim is—

1. The combination of a case having a cham-

ber located therein, an exterior pipe communicating with said chamber, a hollow piston located in the chamber and having a closed top and bottom, the piston being provided with openings on opposite sides and adapted to register with openings formed in the piston-chamber when the piston is properly actuated, a hollow arbor leading from one opening in the piston-chamber to the external air, a spring-held pinion mounted on said arbor and having a hub provided with an external hand or index adapted to move around the graduated face formed on the case, and a rack-bar attached to the piston and engaging the pinion, the piston-chamber being provided with a by-passage communicating with the registering openings in the piston and piston-chamber.

2. The combination of a case having a chamber located therein, an exterior pipe or conduit communicating with the said chamber, a hollow piston located in the chamber and having a closed bottom, an apertured diaphragm above the bottom, and a plug closing the chamber above the diaphragm, the piston being provided with openings on opposite sides and adapted to register with openings formed in the piston-chamber when the piston is properly actuated, a hollow arbor leading from one opening in the piston-chamber to the external air, a spring-held pinion mounted on said arbor and having a hub provided with an external hand or index adapted to move around a graduated face or dial formed on the case, a rack-bar attached to the piston and engaging the pinion, the piston-chamber being provided with a by-passage communicating with the registering openings in the piston and piston-chamber.

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

JOHN BEAL.

FRANK C. BROWN.

Witnesses:

SARAH BEAL,  
B. C. MILLS.