

No. 895,606.

PATENTED AUG. 11, 1908.

A. G. WARDE.  
RESPIROMETER.  
APPLICATION FILED JULY 15, 1907.

Fig. 1

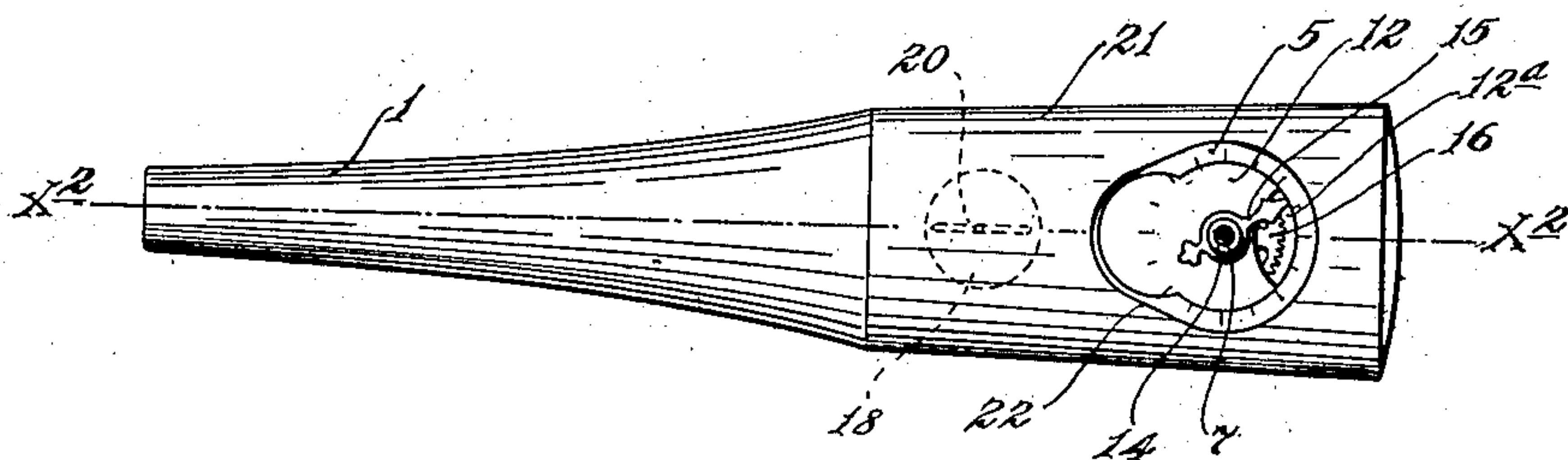


Fig. 2

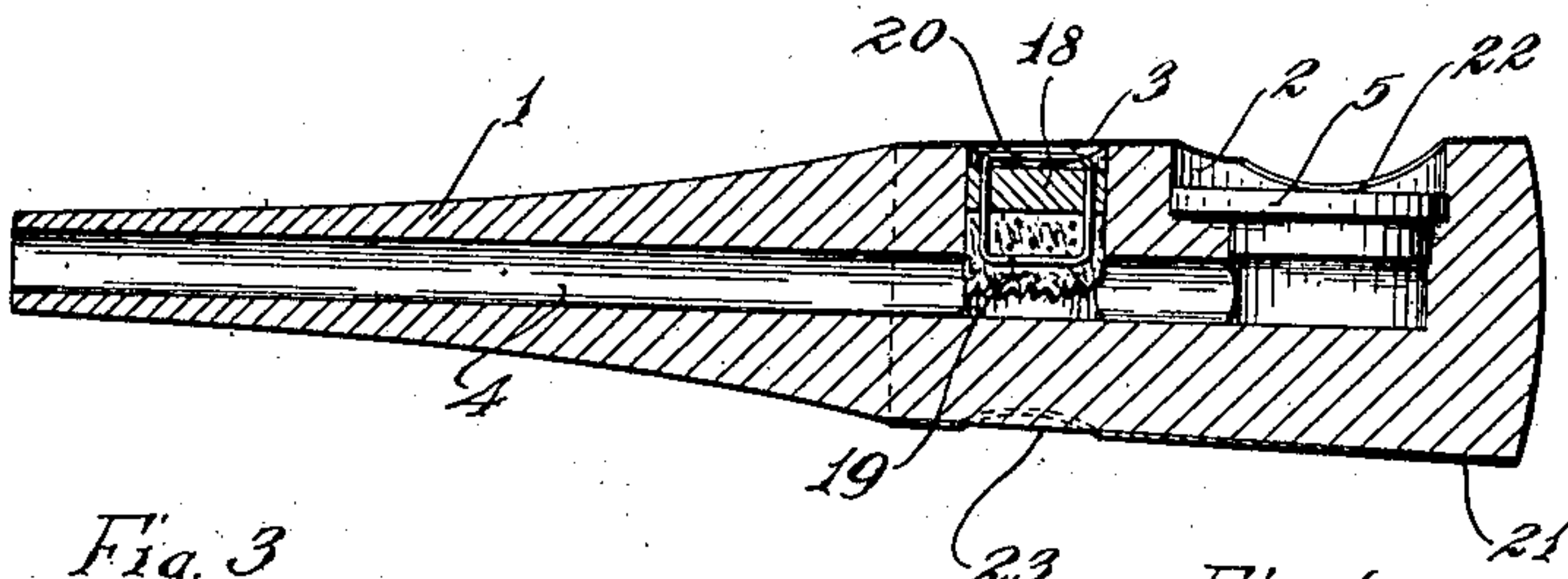


Fig. 3

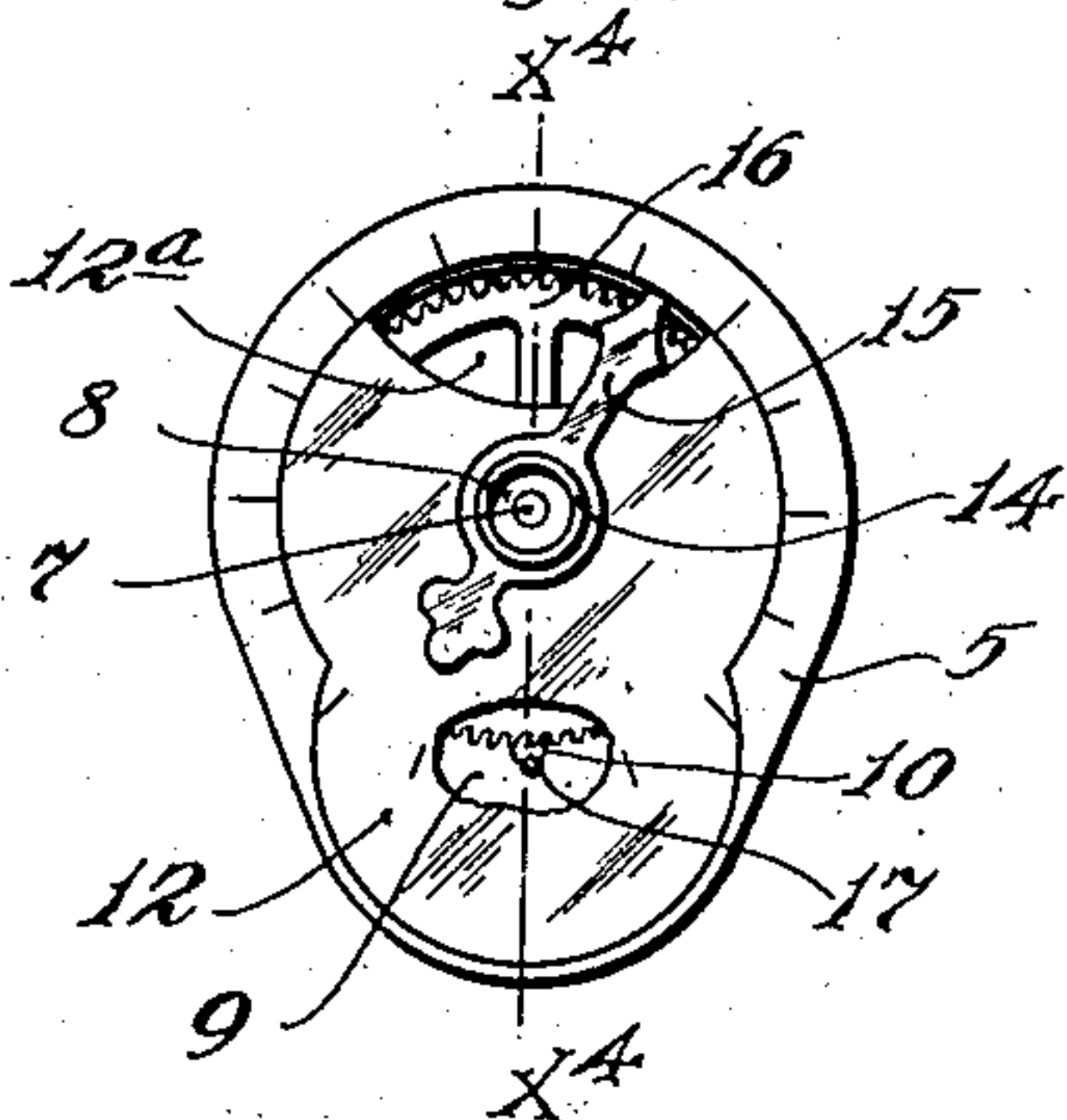


Fig. 4

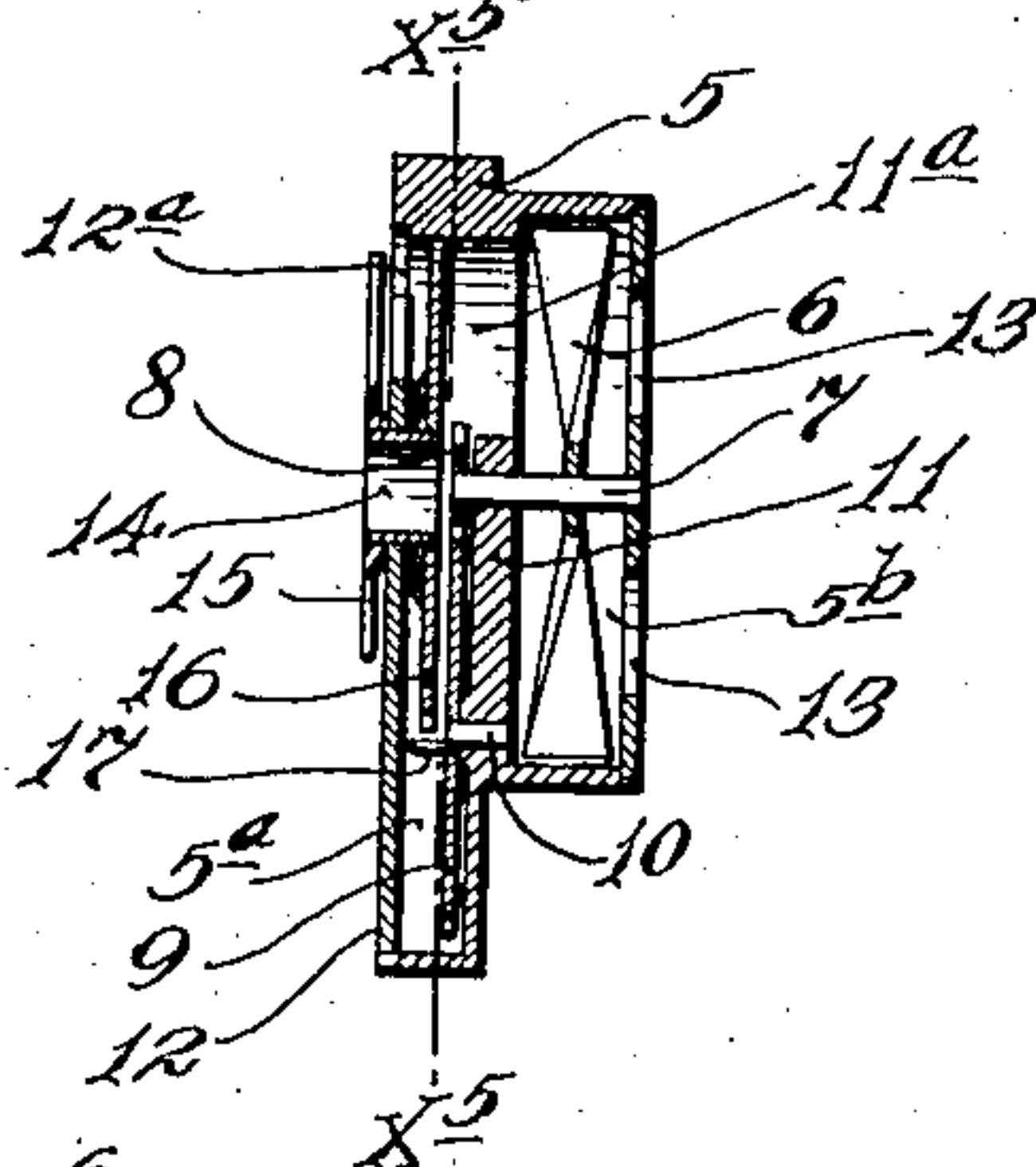
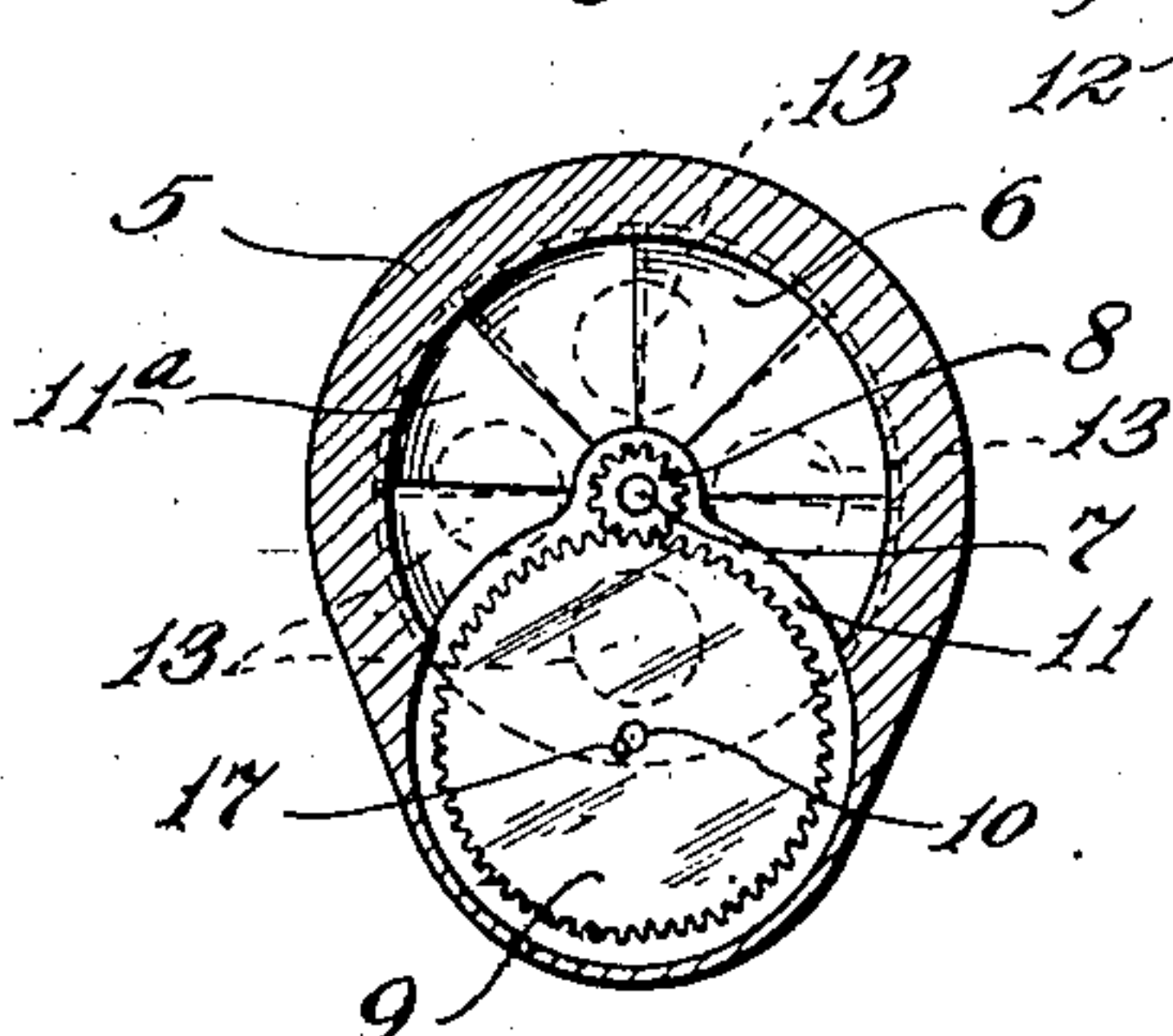


Fig. 5



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# UNITED STATES PATENT OFFICE.

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## RESPIROMETER.

No. 895,606.

Specification of Letters Patent.

Patented Aug. 11, 1908.

Application filed July 15, 1907. Serial No. 383,781.

*To all whom it may concern:*

Be it known that I, AMPLIAS G. WARDE, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Respirometers; and I do hereby 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.

My invention has for its object to provide an improved respirometer of simple construction and small cost which may be conveniently carried in the pocket and which is adapted for use to measure the inhaling capacity of the lungs.

The device also preferably comprises means for supplying a medicated vapor to be inhaled into the lungs, thereby adapting the device for use as a therapeutic instrument for the treatment of lung and throat diseases.

To the above ends the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a plan view of the improved respirometer. Fig. 2 is a vertical section taken through the device on the line  $x^2 x^2$  of Fig. 1. Fig. 3 is a plan view of the indicator mechanism and co-operating dial. Fig. 4 is a section taken on the line  $x^4 x^4$  of Fig. 3; and Fig. 5 is a section taken on the line  $x^5 x^5$  of Fig. 4.

The numeral 1 indicates a tubular mouth-piece, the outer end of which is enlarged and formed with two seats 2 and 3. An air passage 4 extends from the small end of the mouth-piece and terminates in the seat 2. The seat 3 also opens into the air passage 4. The indicator mechanism and the fan are mounted in a small metal casing 5 which has two chambers  $5^a$  and  $5^b$ . A small fan 6 having a spindle 7 is mounted to rotate in the chamber  $5^b$ . The inner end of the spindle 7 carries a small spur pinion 8 that meshes with a relatively large spur gear 9. This gear 9 is mounted in an extended portion of the chamber  $5^a$  and is provided with a short trunnion or shaft 10 that is journaled in the partition wall 11 of the casing 5. The casing

5 is provided with a rigidly secured but detachable face plate 12 that nearly closes the upper portion of the chamber  $5^a$  but is cut away to afford an air passage  $12^a$ . The passage  $12^a$  constitutes an inlet port that alines with the opening  $11^a$  in the partition wall of the casing. The bottom plate of the casing 5 is formed with air passages 13, as best shown in Fig. 4.

Journaled in the face plate 12 with its axis concentric to the axis of the spindle 7, is a short sleeve 14, to the outer end of which is secured a pointer 15 and to the inner end of which is secured a relatively large spur gear 16. The pointer coöperates with suitable graduations formed in part on the face plate 12 and in part on the upper surface of the rim of the casing 5, as shown in Fig. 3. The gear 9 is provided with a small gear driving pin 17 that is located close to but slightly eccentric from the axis of its shaft 10. Once under each rotation of the gear 9 this pin 17 will be thrown into engagement with the tooth of the coöperating gear 16 and will impart a step of movement thereto.

As clearly shown in Figs. 1 and 2, the casing 5 with the indicator mechanism and fan is fitted within the seat 2 of the mouth-piece 1. The said casing is detachable from the said mouth-piece but is suitably held therein by friction or otherwise. Fitting within the seat 3 and preferably held by friction, is a plug 18, to the inner end of which is attached a body of sponge 19 or other absorbent material, preferably secured to the said plug by means of a wire loop 20. This absorbent material 19 is adapted to be saturated with medicated liquid, vapors from which will be breathed into the lungs in the act of inhalation. The plug 18 and the extension thereof formed by the absorbent material 19 constitute a plug that is adapted to be moved more or less into and out of the air passage 4 and thereby constitute a choke device for restricting the flow of air therethrough. This makes it possible to operate the fan under varying resistance, or, in other words, makes it require more or less force to run the fan at a predetermined speed.

Preferably, but not necessarily, the enlarged end of the mouth-piece 1 is surrounded by a rotary thin metal sheath 21 that is provided with peripheral openings 22 and 23. The opening 22 is adapted to register with the seat 2 when the device is to be used, and at such time the opening 23 will be turned



out of registration with the seat 3. When the sheath 21 is given approximately a one-fourth rotation, both of the seats 2 and 3 will be closed thereby, but when it is given a one-half rotation from the position shown in Figs. 1 and 2, the opening 23 will be brought into registration with the seat 3, thereby permitting the plug 18 to be removed from working position or to be replaced in working position within the said seat 3.

When the small end of the mouth-piece 1 is placed in the mouth and air is drawn into the lungs by inhalation, air will be drawn through the openings 12<sup>a</sup>, 11<sup>a</sup> and 13 of the casing 5 and through the air passage 4 of the said mouth-piece, and air thus passing to the lungs will cause the fan 6 to rotate, and through the mechanism described will cause the pointer 15 to rotate, so that the distance which the said pointer travels over the graduations 15<sup>a</sup> will indicate the amount of air inhaled. Furthermore, the air which is inhaled will be charged with the medicated vapor evaporated from the medicated liquid contained on the absorbent material 19, so that the throat and lungs will be thoroughly treated with such vapor. Of course, the kind of liquid used will depend on the nature of the disease which is to be treated or upon the conditions desired to be produced by the use thereof. In some instances a medicated vapor may not be desired, in which case the absorbent material will be removed from the mouth-piece.

The device described is of small cost, and

has the much desired feature that it is small and may be easily carried in the pocket. Very much the best results can be obtained by the arrangement of the device for use as a respirometer, that is, a device in which the fan and indicator are driven in the act of inhalation. Nevertheless, the device may be used as a spirometer and the fan may be driven by exhalation of air through the lungs.

What I claim is:

1. In an inhaler, the combination with a mouthpiece or holder having an air passage therethrough, of a casing seated in said air passage, and a fan and an indicator pointer mounted in said casing, the said casing having an air passage for directing the air against said fan and the said fan being geared to said pointer, substantially as described.

2. In an inhaler, the combination with a mouthpiece or body having an air passage that extends axially through the main portion thereof and terminates in an enlarged seat opening at one side thereof, of a fan having obliquely set blades, means rotatively supporting said fan within the enlarged seat of said air passage, and an indicator pointer geared to said fan, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

AMPLIAS G. WARDE.

Witnesses:

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