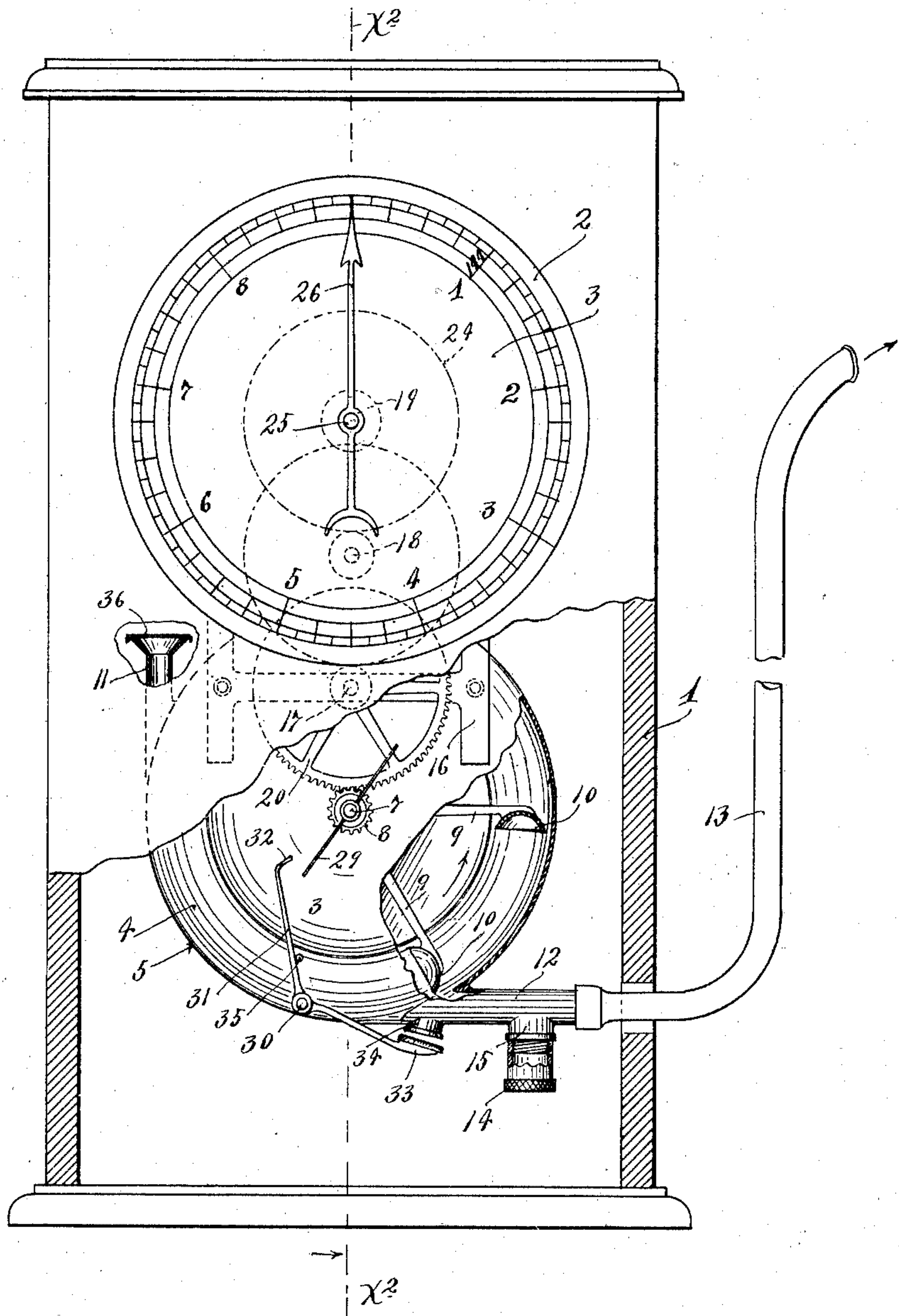


No. 864,908.

F. W. NEBELTHAU. PATENTED SEPT. 3, 1907.  
THERAPEUTIC LUNG TESTING DEVICE.  
APPLICATION FILED FEB. 28, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses.  
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E. W. Jeppesen.

Inventor.  
F. W. Nebelthau.  
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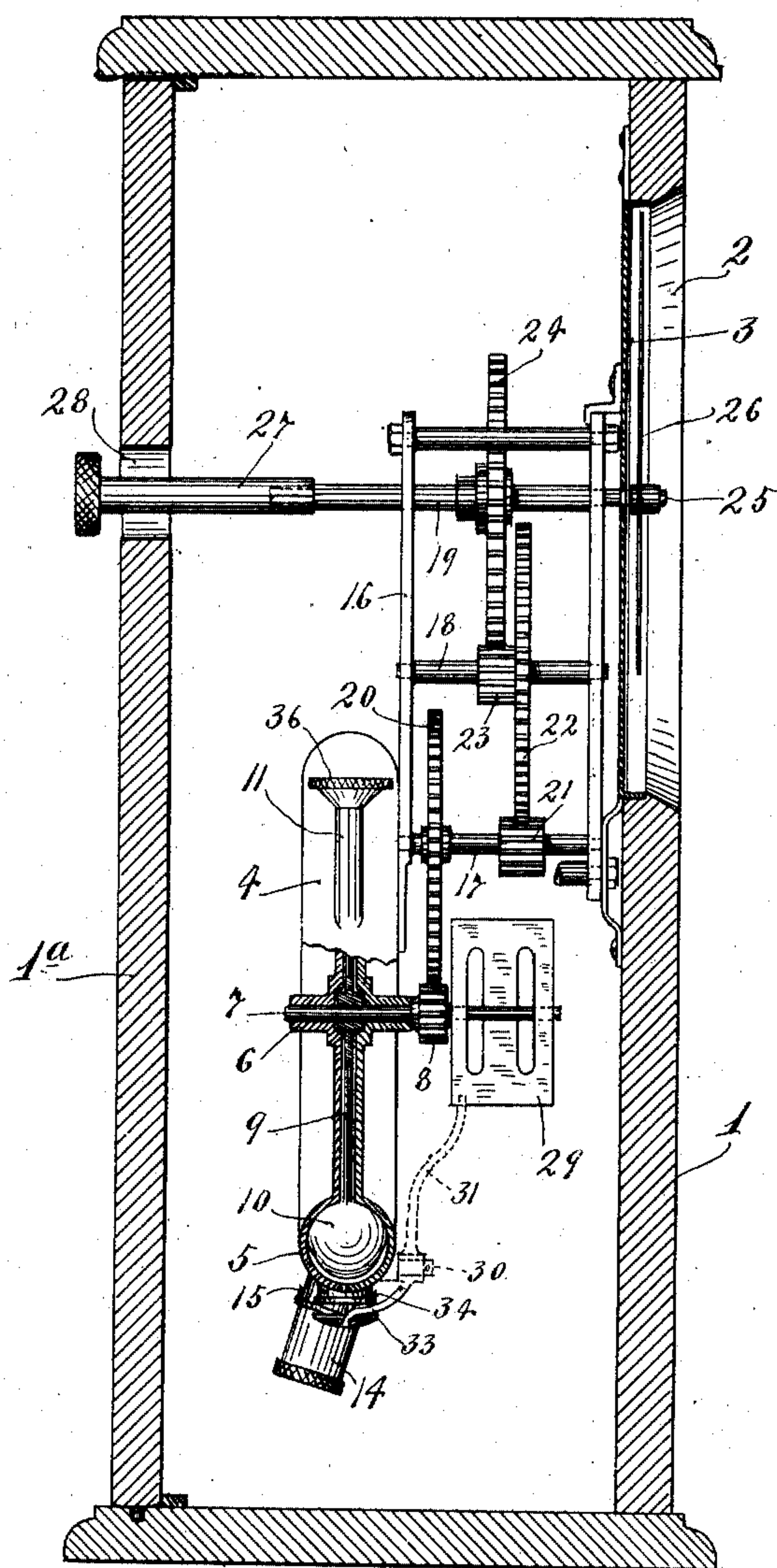
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2 SHEETS—SHEET 2.

*Fig. 2.*



*Witnesses*  
*A. H. Opsahl.*  
*E. W. Jeppesen.*

*Inventor.*  
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*William, Michael*



# UNITED STATES PATENT OFFICE.

FREDRICK W. NEBELTHAU, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR TO LUNG MANUFACTURING CO., OF MINNEAPOLIS, MINNESOTA, A CORPORATION OF MINNESOTA.

## THERAPEUTIC LUNG-TESTING DEVICE.

No. 864,908.

Specification of Letters Patent.

Patented Sept. 3, 1907.

Application filed February 28, 1905. Serial No. 247,673.

*To all whom it may concern:*

Be it known that I, FREDRICK W. NEBELTHAU, 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 Therapeutic Lung-Testing Devices; 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 apparatus for use in the treatment of diseases of the lungs and throat, and also for catarrhal troubles. To this end, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

My improved apparatus I term a "therapeutic lung tester", and it is adapted, at the same time, to test the air containing capacity of the lungs under inhalation, and to apply to the lungs, or other affected part, a medicated vapor. The device, therefore, affords both amusement and a beneficial medical, as well as physical, treatment.

In the accompanying drawings, which illustrate my invention, like characters indicate like parts throughout the several views.

Figure 1 is a view principally in front elevation, but with some parts sectioned, showing the improved device; and Fig. 2 is a vertical section, taken approximately on the line  $x^2 x^2$  of Fig. 1, some parts being left in full.

The numeral 1 indicates a suitable case, in the front face of which is an opening 2 that is closed by a graduated dial 3. Rigidly secured within the case 1 is a fan case 4, having closely spaced walls that are bulged outward at the periphery of said case 4, to form an annular channel 5 that is approximately round in cross section. At its central portion, the fan case 4 has bearing hubs 6, in which is mounted a short fan shaft 7. To the fan shaft 7 is secured a pinion 8 and a plurality of arms 9, which arms work between the closely spaced walls of the case 4, and are provided at their outer ends with cup-shaped fan blades 10 that work within the channel 5 of said case 4. The fan case 4 is provided with a peripheral air inlet tube 11, shown as funnel-shaped at its upper end. Said case 4 is also provided with a peripheral outlet tube 12, to the projecting end of which is applied a flexible tube 13. At its bottom, the fan case 4 is provided with a detachable medicine cup 14, shown as applied to a threaded nipple 15 depending from the outlet tube 12 of said fan case 4.

Rigidly secured within the case 1, is a skeleton frame 16, in which is loosely journaled shafts 17, 18,

and 19. The shaft 17 carries a spur gear 20 that meshes with the pinion 8 on the fan shaft 7, and it also carries a pinion 21. The shaft 18 carries a spur gear 22 that meshes with the pinion 21, and it also carries a pinion 23 that meshes with a spur gear 24 frictionally mounted on the shaft 19. To the outwardly projecting end of the shaft 19 is secured a pointer 26 that works over the graduated dial 3. The inner end of the shaft 19 is formed angular, and is adapted to be engaged by a detachable key 27 which, as shown, projects through the perforation 28 in the back plate of door 1<sup>a</sup> of the case 1.

The frictional engagement between the gear 24 and shaft 19 is such that the pointer 26 will normally be carried by said shaft, and hence caused to travel over the dial under movements of the fan. To set the pointer back to zero, the key 27 is applied to the shaft 19, and the pointer may then be turned without movement of the chain of gears or of the fan head.

On one end of the fan shaft 7 is a fanlike blade 29, which acts as a retarding device for the fan, and performs another important function, presently to be noted.

Pivoted at 30 to one side of the fan case 4, is a trip arm 31, provided at one end with a stop 32, and at its other end, with a flattened head 33, that serves as a valve, to open and close an air vent 34 in the outlet tube 12, or other suitable part of the fan case. A stop 35 on the fan case 4 engages as a stop with one arm of the tripping lever 31, thus limiting the inward movement of the upper arm of the lever 31 to a position in which its stop 32 will engage the blade 29 and intercept the rotary movements of the fan. The head or valve 33 of the tripping lever 31 is of such weight that said lever will normally stand as shown in Fig. 1, with said valve very close to the face of the air vent 34. A very fine meshed screen 36 is preferably placed over the mouth of the air inlet tube 11 to the fan case 4, so as to prevent the entrance of dust, small insects or other noxious substance into the fan case, and from thence, into the lungs.

The dial 3 is graduated to indicate the expansion of the chest in inches, and also the cubic contents of the lungs in inches. In Fig. 1 the large numerals 1 to 8 inclusive marked on the face of the said dial, indicate the chest expansion in inches, while the small numerals marked thereon indicate cubic inches of air inhaled through the device.

A suitable medicated oil or liquid is placed in the medicine cup 15 and, when the fan is thrown into action, the vapors arising therefrom will be thoroughly commingled with the air which is drawn into the fan case through the tube 11 and out through the tubes 12



and 13. When a very strong vapor is desired, medicated liquid may be run into the case through the inlet tube, and the liquid thus introduced will drop into the cup-shaped blades of the fan and will be dashed about and thoroughly commingled with the air, under the rotation of the fan.

The fan is adapted to be thrown into action and rotated in the direction indicated by the arrow marked thereon in Fig. 1, by suction produced in the tube 12 and its flexible extension 13. This suction may be produced by placing the end of the tube 13 either in the mouth or in the nostril, and inhaling the medicated vapor. The first effect of inhaling with the tube 13 in the mouth or in the nostril is to produce a suction which will cause the valve or head 33 to move upward and close the air vent 34, thereby carrying the tripping arm 31 into a releasing position, that is, into a position in which its stop 32 stands out of the path of movement of the blade 29 on the fan shaft 7, thereby releasing the said fan. The fan will be rotated as long as suction is produced in the fan case by inhalation, but the instant that this suction is stopped, the valve 33 will drop from the air vent 34 and move the stop 32 into position to intercept the movements of the blade 29, and thereby stop the fan. The said tripping lever, and its valve or head therefore act as a tripping and stopping device for releasing the fan under the initial air pressure or suction, and for stopping the fan the instant the said pressure or suction is stopped or interrupted.

As is evident, the greater the amount of air that is inhaled into the lungs by the use of the device, as above described, the farther the pointer 26 will be caused to travel over the graduated dial, thereby indicating the amount, or relative amount, of air inhaled by different persons, or at different times by the same person, both in cubic inches and in chest expansion. This apparatus will indicate the chest expansion in inches which is actually due to inhalation, but will not indicate the chest expansion due to muscular action. It is a well known fact that some persons have the ability to produce an enormous chest expansion by muscular action, so that the actual chest expansion is not a true measure of lung capacity. In practice, separate mouth and nose pieces will be provided for application to the free end of the flexible tube 13.

By experiment, I have determined, to my own satisfaction, that the measure, by inhalation, of the air storage capacity of the lungs is the only proper way to test the lungs, and, of course, inhalation is the only means of carrying medicated vapor into the lungs. The

efficiency of the apparatus above described has been tested and thoroughly proven in actual practice.

From what has been said, it will be understood that the device described is capable of modification within the scope of my invention as herein set forth and claimed.

What I claim and desire to secure by Letters Patent of the United States is as follows:—

1. In an apparatus of the character described, the combination with a fan, the case thereof having an air inlet and an air outlet, of a suction tube applied to the air outlet of said fan case, whereby said fan may be driven by suction produced by inhalation, a fan trip normally holding the fan head against rotation, and means operating to throw said trip into an inoperative position, to thereby release the said fan head under the initial suction, substantially as described.

2. In an apparatus of the character described, the combination with a fan, the case thereof having an air inlet and an air outlet, of a suction tube applied to said air outlet, whereby said fan may be operated by suction produced by inhalation, the air passage which leads through said fan case having an air vent, and a trip normally holding the fan head against rotation and provided with a valve coöperating with said air vent and adapted to be moved by suction, to close said air vent and to release the fan head, substantially as described.

3. In an apparatus of the character described, the combination with a fan comprising a case and a rotating fan head, said case having an air inlet passage, a tubular air outlet passage, and an annular marginal chamber, which is approximately round in cross section, and said fan head having radial arms, provided with cup-shaped legs, working in the annular chamber of said case, the air inlet passage of which case stands in position to discharge a liquid directly into said cup-shaped blades, substantially as described.

4. In a lung tester, the combination with a fan, an indicator driven thereby, and means for causing said fan to be operated by suction, of a tripping lever normally holding said fan against rotation, and means for throwing said tripping lever into an inoperative position under an initial suction, substantially as described.

5. In an apparatus of the character described, the combination with a fan and an indicator operated thereby, the case of said fan having an outlet tube provided with an air vent, a blade or arm carried by the rotating head of the fan, and a tripping lever normally engageable with said arm or blade, to prevent rotation of the fan head, and provided with a valve coöperating with said air vent and adapted to be moved by suction, to close said air vent and release the fan head, substantially as described.

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

FREDRICK W. NEBELTHAU.

Witnesses:

ROBERT C. MABEY,  
F. D. MERCHANT.

It is hereby certified that the name of the assignee in Letters Patent No. 864,908, granted September 3, 1907, upon the application of Fredrick W. Nebelthau, of Minneapolis, Minnesota, for an improvement in "Therapeutic Lung-Testing Devices," was erroneously written and printed "Lung Manufacturing Co.," whereas the said name should have been written and printed *Lung Bath Manufacturing Co.*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 15th day of October, A. D., 1907.

[SEAL.]

E. B. MOORE,  
*Commissioner of Patents.*