Improvements in medical vaporizers or inhaling apparatus / [Robert Lee Benson].

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COMPLETE SPECIFICATION.

Improvements in Medical Vaporizers or Inhaling Apparatus.

I, Robert Lee Benson, Manufacturer, of No. 157, Michigan Avenue, Chicago, Illinois, one of the United States of North America, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention relates to atomizing vaporizer apparatus. It is well known that the inhalation of vaporized medicaments is very efficacious in the treatment of nearly all diseases of the respiratory tract; but one difficulty that has presented itself in the thorough application of drugs to affected air-passages has been in the expense, unsatisfactory action, and imperfect construction of atomizing inhalers that have been formerly used. Especially is this rule in any vaporizing apparatus for individual use that has heretofore been devised. It is also well known that mere inhalation of the medicaments is not sufficient to force them into all portions of diseased lungs, from the trachea bronchial tubes down and into the pulmonary alveoli. While it is possible to carry minute nebulized medicaments into the smallest bronchi and pulmonary alveoli of a healthy lung, this is not true of a diseased lung, where it is partially, through adhesive inflammation, closed these passages, and, as scarcely any fresh air enters such lung passages, substances mixed with air will not enter. It is therefore necessary to apply pressure at the entrance of the respiratory passages, and by the joint action of pressure and aspiration secure the desired absorption of medicament that the aspiration alone would not effect.

It is the object of my invention to provide inexpensive improved means for overcoming the mechanical difficulties in the way of the satisfactory operation of nebulizing atomizing apparatus for individual use, by which chemically pure atomized vapor may be thoroughly supplied to the air passages of the respiratory tract under pressure, by the patient himself, or by some one for him, either at home or when travelling about.

Generally speaking the entire apparatus of my invention when completely assembled, comprises a pump, a filter through which the pump is adapted to force air, a chamber receiving the air, a nebulizer through which the air is then forced, means being preferably added for heating the medicated menstrum before it is passed to the lungs. Parts of this apparatus may be used, however, and still come within the spirit of my invention. I have provided an improved nebulizer having relatively adjustable nebulizing ducts or tubes, one being preferably longitudinally placed with respect to an induction duct or tube and transversely with respect to an eduction nebulizing duct or tube, the longitudinal nebulizing duct being preferably mounted upon a sleeve and longitudinally movable with respect thereto. The pump is also of improved construction, having improved valves that make its operation very efficacious.

I will explain my invention in detail by reference to the accompanying drawing in which Fig. 1 shows the assembled apparatus partly in section ready for use, the cover of the containing case being removed; Fig. 2 a detail view of a portion

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of the nebulizing apparatus; and Fig. 3 a detail view of a couple of valves for the pump. Like parts are indicated by similar characters of reference throughout the different views.

I preferably employ a double acting hand pump having a pump barrel 1 suitably closed at the top and bottom. A hollow piston rod 2 is united with a piston 3 upon the interior of the pump barrel, while a duct or tube 4 that is preferably flexible is connected and communicates directly with the piston rod. A valve 5 is provided above the piston and a valve 6 below the same, these valves opening and closing valve passages provided in the piston rod, which are adapted when the valves are in suitable position, to effect direct communication between the piston rod and the pump barrel.

To secure better operation of the valves 5 and 6 I mechanically unite the same to maintain them in proper alignment with respect to each other, this interposed mechanical connection preferably being an integral part of a strip of leather, the ends of which constitute the valves proper. Valves 7 and 8 are provided at the upper and lower ends of the pump barrel. The valves are preferably provided with wire stems 9 to one end of each of which the corresponding valve is secured, while the other end is preferably enlarged or bent into the form of an eye, the valve passages being larger than the valve stem passing through the same. A collar 10 is provided upon the piston rod above the valve 5 and acts to limit the upward travel of the piston rod to prevent breakage of the said valve structure. The stop also contains a recess 11 which acts to collect oil and grit that might otherwise find access to the valve. The operation of the pump will be clearly understood from the drawing.

The air is forced from the piston rod through the connecting tube 4, a metallic coupling 12, a metallic tube or duct 13, and a filter 14 into a storage chamber 15. The filter consists essentially of a cylindrical chamber into which the inlet and eduction tubes or ducts 13 and 16 project. A dust absorbing material is provided in the filter, such as cotton, which thoroughly cleanses the air flowing through the same. Loose gauze is preferably provided in the bottom of the chamber and is saturated with a limited quantity of antiseptic compound such as oil of cloves. The oil vapor mixes with the air and renders it antiseptic. The antiseptic air leaves the storage chamber by means of the tube or duct 17 and finds passage through the nebulizer 18 into the chamber 19. The nebulizer is of improved construction having a tube or duct 20 communicating with and extending transversely of the induction tube 17 and a second tube or duct 21 extending longitudinally of the induction tube 17 and adjustable with respect to the duct 20 preferably by being mounted on a sleeve that slips on the said induction tube. To prevent rotation of the longitudinally extending duct with respect to the transversely extending duct, I preferably provide a groove 22 that engages the latter duct to prevent the said rotation. The lower end of the duct 21 projects into the medicated menstrum provided in the bottom of the chamber 19 and the jet of air issuing through the transverse duct 20 forces the said menstrum through the longitudinally extending duct. The medicated menstrum is vaporized and blown in a fine spray toward the upper part of the chamber 19 and against its side, a part finding passage through the eduction tube or duct 23, while the remainder returns to the bottom of the chamber. The eduction tube 23 is continued in the form of a metallic coiled pipe 24 which in turn is continued in a flexible terminal duct or tube 25 having a nozzle 26 for insertion within the nose or mouth of the patient. The medicament is heated by a burner 27 some degrees higher than the normal temperature of the throat or lungs in order to facilitate the deposit of the vaporized medicament upon the colder pulmonary passages, thus promoting and assisting the penetrability of the vaporized medicament and aiding absorption, whereby consolidated areas enclosing encapsuled bacilli may be reached. A drip 28 provided with a movable cap 29 is preferably employed for the purpose of drawing off any condensed liquid. A coupling 30 composed of non heat-conducting material as wood, is placed between the heater and the rubber duct or tube 25. I preferably

provide a by-pass 31 between the induction tube 17 of the nebulizer chamber and the eduction tube 23 which is closed by a stop cock 32 when the apparatus is used as an ordinary nebulizer inhaler. I also employ a stop cock 33 or other suitable closing means in the eduction tube 23 which may be used when desired. The use of the apparatus will be clear to those skilled in the art. Suitable couplings, preferably metallic may be employed to unite the pipes 4 and 13 and the sections of the pipe 17.

By the application of antisepticized air under pressure to the apparatus, I am enabled to supply the germicide medicament to all affected passages without depending solely on the endosmotic power of the lungs. The pulmonary areas with impaired respiratory capacity are reached by means of this pressure and any germ will be medically acted upon unless it be too thickly encapsuled, in which case, however, it is unlikely to do further damage.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claims is:—

1. The improvement in vaporizing apparatus wherein air is forced by a pump through a filter into a chamber containing medicament, and thence through a duct to the nozzle, past heating apparatus located between the nozzle and the pump, as herein described with reference to the drawing.

2. In connection with the above Claim 1, forcing the air by a pump through a filter into an intermediate chamber and thence through a nebulizing apparatus (18) into a medicament chamber and from this through a flame heated coil and flexible tube to a nozzle as herein described with reference to the drawing.

3. In connection with the subject matter of Claim 1, arranging a by-pass between the tube 17 leading from the intermediate chamber and the tube leading from the medicament chamber, as herein described with reference to the drawing.

4. In connection with the subject matter of Claims 1 and 3, providing the machine with valves or stop-cocks to cut off the communication with one or the other of the chambers 15, 19 as herein described with reference to the drawings.

5. In connection with the subject matters of Claims 1 and 2, forming the nebulizer 18 in chamber 19 with two ducts 20 and 21 the former of which extends transversely to the tube 17, and the other longitudinally thereof and is longitudinally movable thereon, as herein described with reference to the drawings.

6. In connection with the subject matter of Claim 1, providing the pump with a hollow piston rod, carrying the piston within the barrel, and arranging two valves on the piston rod, one on each side of the piston, to afford communication between the pump-barrel and the piston-rod.

7. In connection with the subject matter of Claim 1, arranging a non-heat-conducting coupling between the nozzle and the heating device, as herein described with reference to the drawing.

Dated this 13th day of November 1900.

HERBERT HADDAN & Co.,
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18, Buckingham Street, London, W.C.

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[This Drawing is a reproduction of the Original on a reduced scale.]

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BENSON'S Complete Specification.

(1 SHEET)

Fig. 1.

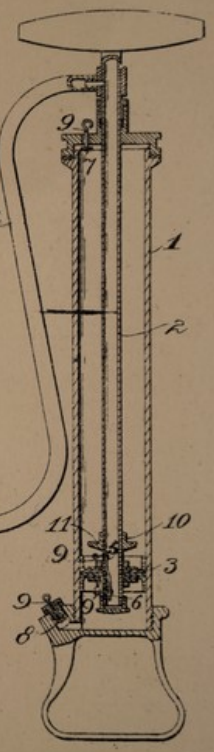


Fig. 2.

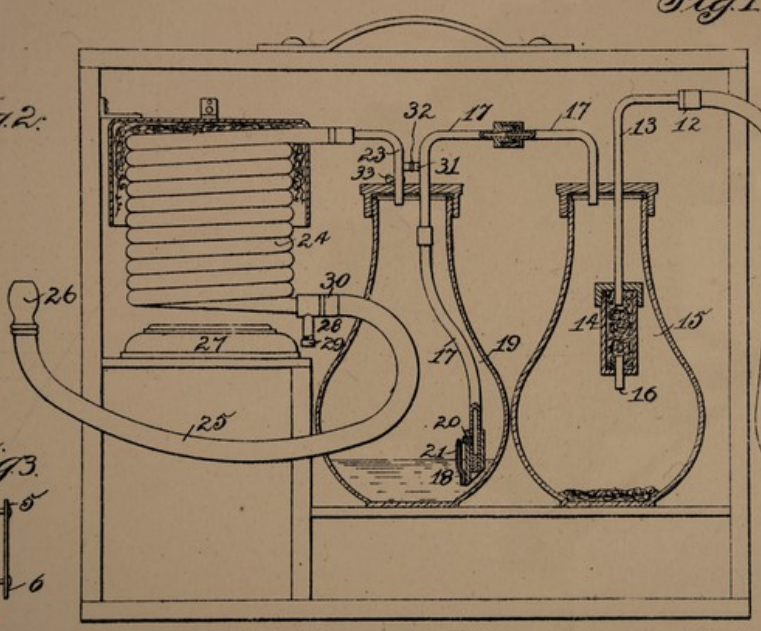
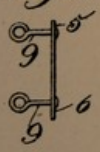


Fig. 3.



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