No. 738,583. PATENTED SEPT. 8, 1903.

R. WATSON.

PNEUMATIC MASSAGE APPARATUS.

APPLICATION FILED OCT. 10, 1900.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

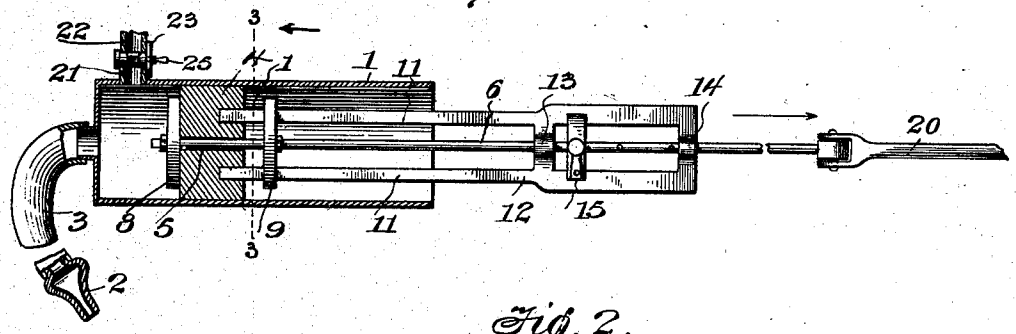


Fig. 2.

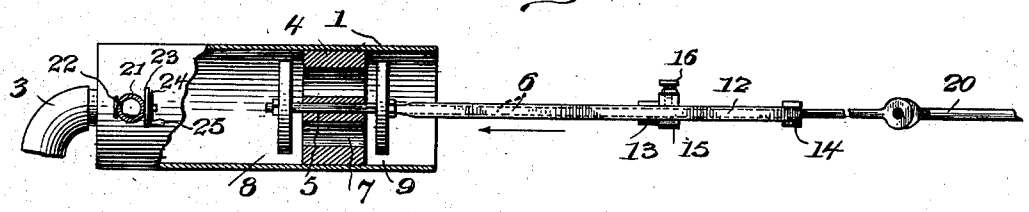


Fig. 3.

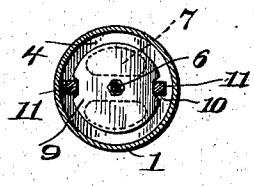


Fig. 4.

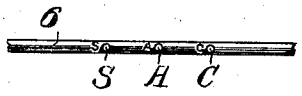


Fig. 5.

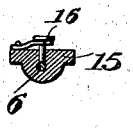
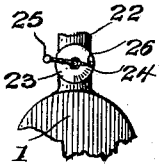


Fig. 6.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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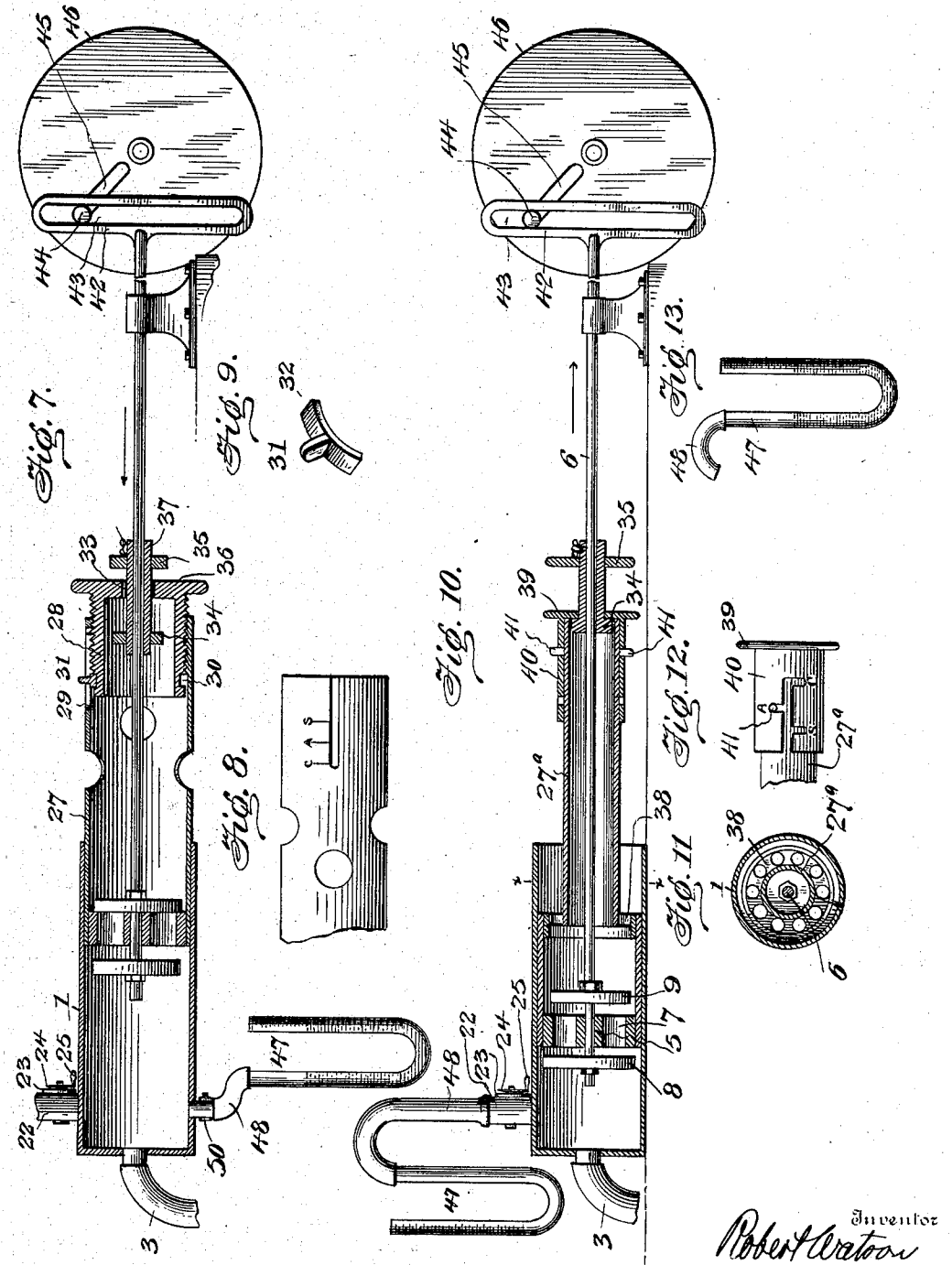
NO MODEL. 2 SHEETS—SHEET 2.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 738,583. Patented September 8, 1903.

UNITED STATES PATENT OFFICE.

ROBERT WATSON, OF SCRANTON, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO CHARLES A. KRAM, OF WASHINGTON, DISTRICT OF COLUMBIA.

PNEUMATIC MASSAGE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 738,583, dated September 8, 1903.

Application filed October 10, 1900. Serial No. 32,566. (No model.)

To all whom it may concern:

Be it known that I, ROBERT WATSON, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Pneumatic Massage Apparatus, of which the following is a specification.

My invention relates to improvements in apparatus for giving massage treatment to the ear-drum, such as is described in my Patent No. 660,233, dated October 23, 1900. The apparatus shown in said patent includes an earpiece adapted to fit into the outer ear and means for compressing and rarefying the air within said earpiece, the internal and external air-pressures being equalized after each operation of rarefaction or compression.

The present invention relates to an apparatus by means of which the air within the earpiece may be successively rarefied or successively compressed or alternately compressed and rarefied, as desired, the internal and external air-pressures being equalized after each operation, so that the ear-drum may be successively drawn outward or pressed inward or moved alternately outward and inward.

While the apparatus is particularly designed for operating upon the ear-drum, it is equally applicable for treating other parts of the body by vacuum and pressure.

In the accompanying drawings, which illustrate my invention, Figure 1 is a plan view of one form of my apparatus, the cylinder and piston being shown in central section. Fig. 2 is a side view of the same, the cylinder being shown partly broken away and partly in section. Fig. 3 is a section on the line 3 3 of Fig. 1. Fig. 4 shows a section of the piston-rod. Fig. 5 is a longitudinal section through the tappet shown in Figs. 1 and 2. Fig. 6 is a front view of the pressure-regulating valve and dial. Fig. 7 is a central section through a modified form of apparatus. Fig. 8 shows a part of the tubular extension of the piston illustrated in Fig. 7. Fig. 9 is a perspective view of the pointer for indicating the position of the stop shown in Fig. 7. Fig. 10 is a central sectional view through another modification. Fig. 11 is a section on the line $x\ x$ of Fig. 10. Fig. 12 is a side view of the adjustable cap shown in Fig. 10, and Fig. 13 shows a mercury column for visually indicating the air-pressure.

Referring to Figs. 1 to 5, inclusive, of the drawings, 1 indicates a cylinder having an opening at one end communicating with a suitable earpiece 2 by means of a flexible tube 3, the cylinder, tube, and earpiece constituting a laterally-inclosed air-chamber. Within the cylinder is arranged a piston 4, having a central opening 5, through which extends the piston-rod 6. The opening 5 is large enough to permit the piston-rod to play freely through it. Openings 7 extend longitudinally through the piston, and valves 8 and 9, secured to the piston-rod on either side of the piston, are arranged to abut against the piston alternately when the piston-rod is reciprocated, these valves serving the double purpose of closing the openings 7 and moving the piston. The valve 9 is cut away at the sides, as shown at 10, Fig. 3, and rods 11, carrying a rectangular frame 12, are secured within suitable openings in the piston on either side of the valve 9. The piston-rod extends through the ends 13 and 14 of the rectangular frame, and these ends form stops for an adjustable tappet 15, arranged upon the piston-rod within the opening in the frame. This tappet, as shown in Fig. 5, is provided with a spring-pin 16, and the piston-rod is formed with three depressions being marked "S," "A," and "C," respectively, to indicate "suction," "alternate," and "compression." When the tappet is arranged in the central position marked A, the movement of the piston-rod will not caused the tappet to strike either of the stops 13 or 14, for the reason that the valves 8 and 9 will first engage the piston. It will be apparent, therefore, that in the central position of the tappet when the piston-rod moves forward the valve 9 will close the ports 7 and force the piston forward, thus compressing the air within the air-chamber, the earpiece being fitted air-tight within the ear. At the commencement of the return stroke the valve 9 is drawn away from the piston and the valve 8 is drawn against it. During the interval while the valves are out of contact with the piston the air may escape through the open-

ings 7, thus equalizing the internal and external air-pressures. Upon the return stroke of the piston the valve 8 closes the ports 7 and draws the piston forward, thus rarefying the air within the air-chamber, and at the end of the return stroke the air-pressures are again equalized by the lifting of the valves from the piston at the change of the stroke. In this manner alternate rarefaction and compression of the air within the air-chamber is produced when the tappet is in the central position. If, however, the tappet be moved along the rod to the point marked S, indicating suction, the forward movement of the piston will cause the tappet to engage the stop 13 before the valve 9 comes in contact with the piston, as indicated in Fig. 2. The piston will then be forced forward by the tappet bearing against the stop, and the ports 7 will remain open during the forward stroke of the piston, thus permitting the air to escape instead of being compressed. On the return stroke of the piston, however, the valve 8 will close the openings 7, the tappet moving away from the stop 13, as indicated in Fig. 1. The air will thus be rarefied within the air-chamber successively without being compressed. In like manner if the tappet 15 be moved to the indicator-mark C it will engage the stop 14 on the rearward stroke, thus moving the piston rearward and preventing the valve 8 from seating against the piston. Therefore the air will pass freely through the piston during its rearward stroke and the air will not be rarefied within the air-chamber; but upon the forward stroke the valve 9 will seat against the piston, pushing it forward and closing the ports 7, thus compressing the air within the chamber. It will therefore be seen that by simply adjusting the tappet 15 to the appropriate indicator-mark the apparatus may be employed to draw the ear-drum outward repeatedly without forcing it inward, or it may be employed to force the drum inward repeatedly without drawing it outward, or the drum may be moved inward and outward alternately, as desired. The piston may be operated in any suitable way—as, for instance, by means of a link 20, connected to a suitable crank-arm upon a driving-shaft. The degree of compression and rarefaction may be controlled by varying the length of the stroke; but I prefer to give the piston a uniform stroke and to vary the degree of compression and rarefaction by means of a valve 21, arranged within a pipe 22, communicating with the air-chamber. It will be seen that by opening this valve so that the air may pass through it freely little or no effect will be produced in the earpiece by the operation of the piston and that as the valve is moved from the open position to the closed position the effect within the air-chamber will be gradually increased. I arrange a dial 23 upon the side of the pipe 22 and a pointer 24 upon the handle 25 of the valve. A scale 26 is arranged upon the dial and by moving the handle to bring the pointer opposite the different graduations on the scale various degrees of compression or rarefaction may be obtained without stopping the apparatus.

In Fig. 7 I have shown a modification in which the piston is continued outward in the form of a perforated tubular extension 27, and this extension is internally threaded at its outer end and adapted to receive a threaded plug 28. The tube 37 is formed with a longitudinal slot 29, having indicator-marks along its edge. The plug is formed with a groove 30 near its inner end, and within this groove is a pointer 31, arranged upon an arc-shaped base 32, which slides freely within the groove when the plug is turned. It will be seen that by turning the plug the pointer will be moved along in the slot and may be brought opposite any of the indicator-marks. The plug has a central opening 33, as shown, through which the piston-rod 6 extends, and tappets 34 and 35 are arranged upon said rod on either side of the cap 36 of the plug. As shown, the tappets are arranged upon a sleeve 37. The plug answers the purpose of a stop for the tappets. By adjusting the plug so that the pointer will come opposite any one of the indicator-marks the action of the apparatus will be controlled accordingly, and successive suction or compression or suction and compression alternately, may be obtained. In Fig. 7 the pointer is shown at the center or alternating position, in which position the tappets cannot engage the stop in either direction of movement.

In Fig. 10 I have shown another modification in which the tube 27^a is of smaller diameter than the diameter of the piston and is connected thereto by a perforated disk 38. Instead of having a threaded plug, as shown in Fig. 7, a cap 39, having a sleeve 40, is fitted over the outer end of the tube, and this sleeve is provided with three bayonet-joints on its opposite sides, which are adapted to be engaged by pins 41 upon the tube. The notches which form the joints are marked with letters indicating suction, alternate and compression, and by adjusting the cap outward and inward upon the tube the tappets 34 and 35 upon the piston-rod may be made to engage the cap or to clear it, as desired, thus controlling the apparatus in the manner described in connection with previous figures. In Fig. 10 the pins or pointers 41 are shown within the notch indicating compression, while the tappet 34 is in engagement with the inner side of the cap, the piston being moved in the direction of the arrow. The engagement of the tappet 34 with the cap prevents the seating of the valve 8, as shown. In Fig. 12 the pin 41 is shown within the central notch, indicating alternate suction and compression, in which position neither tappet would engage the cap.

In Fig. 10 I have shown a convenient means for operating the piston-rod, which requires

less space than the arrangement in which the rod is driven by a link connected to a crank. In this figure the rod 6 is provided with a head 42, having a slot 43 at right angles to the line of movement of the rod, and within this slot is arranged a crank-pin 44, which pin is adjustably secured within a radial slot 45 in a driving-wheel 46, the latter being mounted upon a suitable shaft. By adjusting the pin 44 outward or inward along the radial slot 45 the travel of the piston may be varied, if desired.

Fig. 13 shows an indicator for visually indicating to the operator the degree of compression or rarefaction within the chamber. This indicator, as shown, consists of a graduated glass tube 47, containing mercury, said tube being U-shaped. The tube may be connected temporarily by a suitable flexible connection 48 to the pipe 23, as shown in Fig. 10, for the purpose of indicating the degree of compression or rarefaction; but I prefer to connect it to an additional pipe 49, as shown in Fig. 7, said pipe being provided with a valve 50, by means of which communication with the air-chamber may be cut off or established at will.

Other forms of apparatus may be employed to accomplish the purpose of this invention; but I prefer the form shown, in which the port is located in the piston and the valves for opening and closing said ports are secured to the piston-rod, said rod and piston being relatively movable.

It will be apparent that where a single tappet is used, as in Fig. 1, a double stop is necessary and that a single stop requires a double tappet in order to get the desired results, as shown in Figs. 7 and 10.

The "earpiece," which constitutes the forward end of the chamber, may be of any suitable form adapted to be closed by placing it against the ear or other part of the body to be treated.

Having described my invention, what I claim is—

1. A pneumatic massage apparatus comprising a laterally-inclosed air-chamber having an opening adapted to be closed by the part of the body to be treated, means for alternately compressing and rarefying the air within said chamber, means for permitting the internal and external air-pressures to equalize after each operation of compression and rarefaction, and means for adjusting said apparatus to produce compression of the air within the chamber repeatedly without rarefaction, when desired.

2. A pneumatic massage apparatus comprising a laterally-inclosed air-chamber having an opening adapted to be closed by the part of the body to be treated, means for alternately compressing and rarefying the air within said chamber, means for permitting the internal and external air-pressures to equalize after each operation of compression and rarefaction, and means for adjusting said apparatus to produce rarefaction of the air within the chamber repeatedly without compression, when desired.

3. A pneumatic massage apparatus comprising a laterally-inclosed air-chamber having an opening adapted to be closed by the part of the body to be treated, means for alternately compressing and rarefying the air within said chamber, means for permitting the internal and external air-pressures to equalize after each operation of compression and rarefaction, and means for adjusting said apparatus to produce either compression of the air within the chamber repeatedly without rarefaction, or to repeatedly produce rarefaction of the air within the chamber without compression, as desired.

4. A pneumatic massage apparatus comprising a laterally-inclosed air-chamber having an opening adapted to be closed by the part of the body to be treated, means for alternately compressing and rarefying the air within said chamber, means for permitting the internal and external air-pressures to equalize at the completion of each operation of compression and rarefaction, means for adjusting the apparatus to produce either compression of the air within the chamber repeatedly without rarefaction or to produce rarefaction of the air within the chamber repeatedly without compression, as desired, and indicating devices for indicating the proper position of said adjusting means to produce said results.

5. A pneumatic massage apparatus comprising a piston having a port therethrough, a cylinder within which said piston is arranged, a piston-rod movable relatively to the piston, and valves attached to said rod and adapted to close said port when the piston-rod is moved in either direction.

6. A pneumatic massage apparatus comprising a cylinder forming part of a laterally-inclosed air-chamber open at its forward end, a piston having a port extending therethrough, arranged within said cylinder, a piston-rod movable relatively to the piston and valves connected to said rod and adapted to close said port to prevent the passage of air through the piston when the latter is moved in either direction and to open said port at the change in direction of the stroke of the piston-rod.

7. A pneumatic massage apparatus comprising a piston having a port extending therethrough, a cylinder within which said piston is movable, valves adapted to close said port, a piston-rod movable relatively to the piston and to which said valves are attached, a tappet carried by said rod and a stop secured to said piston, said stop and tappet being relatively adjustable, and indicator-marks arranged to indicate the relative positions of said stop and tappet.

8. A pneumatic massage apparatus comprising a piston having a port therethrough, a cylinder within which said piston is arranged, a piston-rod movable relatively to the piston, valves attached to said rod and

adapted to close said port when the piston-rod is moved in either direction, and means for preventing one of said valves from seating when desired.

9. A pneumatic massage apparatus comprising a piston having a port extending therethrough, a cylinder within which said piston is movable, valves adapted to close said port, a piston-rod movable relatively to the piston and to which said valves are attached, a tappet carried by said rod, and a stop secured to said piston, said stop and tappet being relatively adjustable.

10. A pneumatic massage apparatus comprising a cylinder open at its rear end and having a tubular earpiece communicating with its forward end, a piston having a port therethrough arranged within the cylinder, a stop secured to said piston by a support extending outwardly beyond the rear end of the cylinder, a piston-rod carrying a tappet adapted to engage said stop, said rod being movable relatively to the piston, and valves carried by said piston-rod and adapted to move the piston and close the port, said valves being arranged on opposite sides of the piston.

11. A pneumatic massage apparatus comprising a cylinder forming part of a laterally-inclosed air-chamber open at its forward end, a reciprocative piston within the cylinder and suitable valves adapted to cause compression or rarefaction of the air within said chamber during the stroke of the piston and to permit the internal and external air-pressures to equalize at the end of the stroke, a device for visually indicating the degree of compression or rarefaction of the air within the chamber during each stroke of the piston, and means for regulating the degree of compression or rarefaction of the air within the chamber.

12. In a pneumatic massage apparatus, a cylinder comprising part of a laterally-inclosed air-chamber, said chamber having an opening adapted to be closed by the part of the body to be treated and having an air-port, a piston for compressing and rarefying the air within said chamber, automatically-operated valve mechanism normally closing said port during the piston-stroke in both directions of movement, and arranged to open and then close said air-port at the end of each piston-stroke in order to produce alternate compression and rarefaction of the air within the chamber during successive piston-strokes, and adjustable means for preventing the valve mechanism from closing the port during either stroke of the piston while permitting said mechanism to close the port during the succeeding stroke, in order to produce compression repeatedly without rarefaction or rarefaction repeatedly without compression, as desired.

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

ROBERT WATSON.

Witnesses:
M. F. SANDS,
JOHN M. CORBETT.