F. BATTER.

APPARATUS FOR THERAPEUTIC TREATMENT OF THE AIR OF LIVING ROOMS.

APPLICATION FILED MAR. 10, 1906.

904,172. Patented Nov. 17, 1908.

3 SHEETS—SHEET 1.

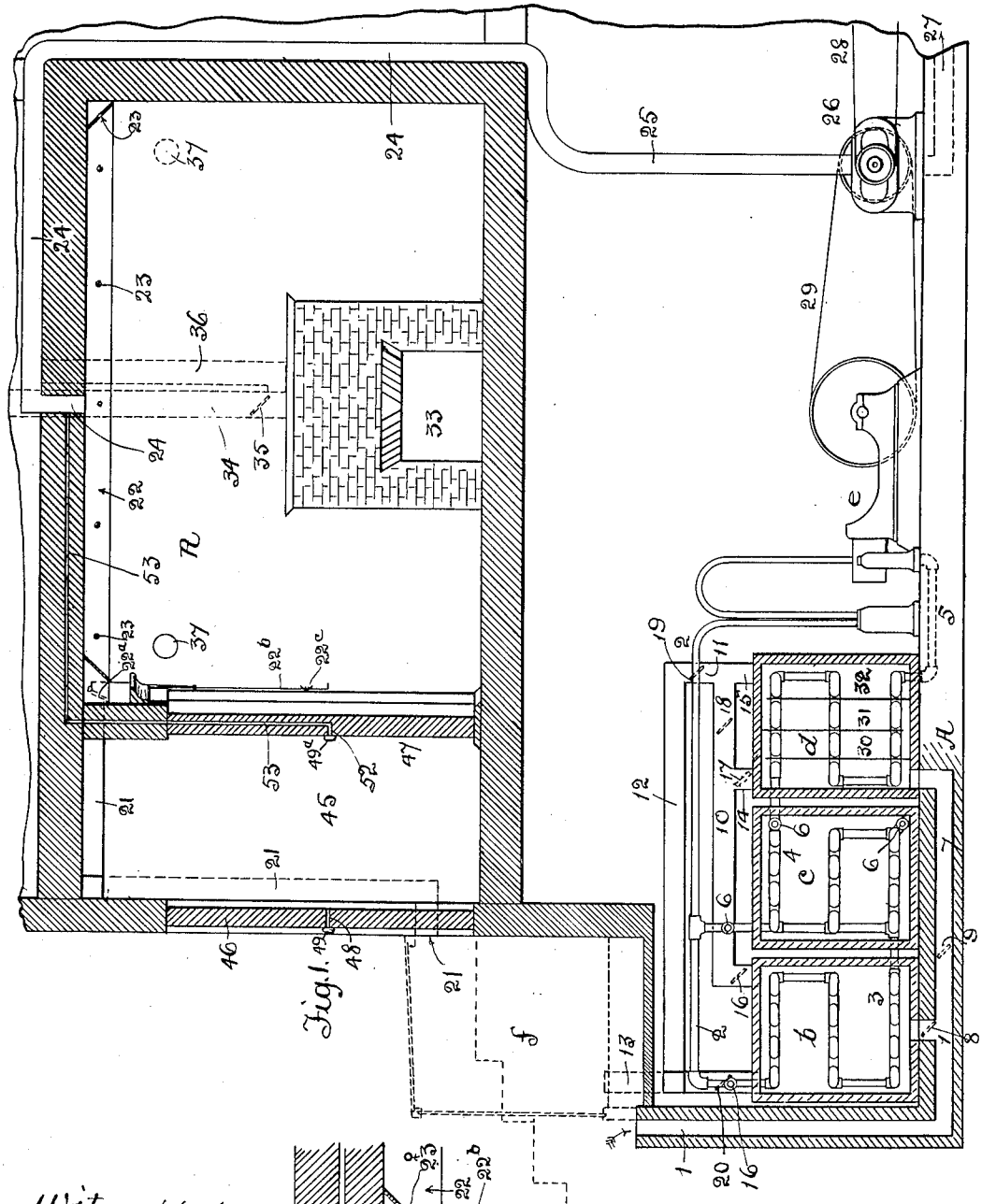

Fig. 1.

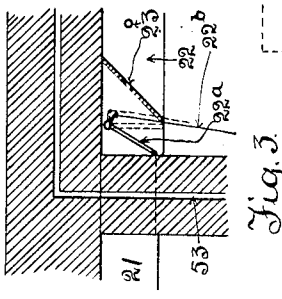

Fig. 3.

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3 SHEETS—SHEET 2.

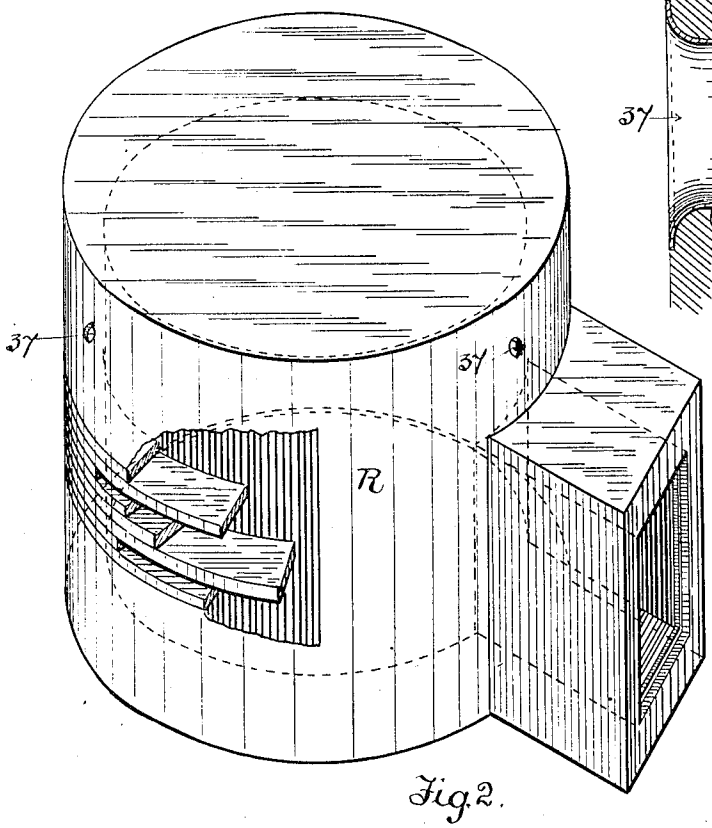

Fig. 2.

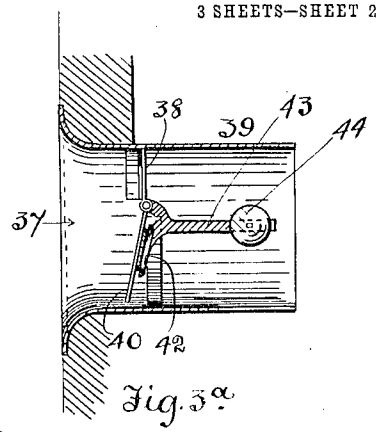

Fig. 3a.

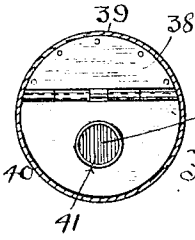

Fig. 4.

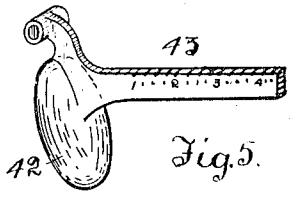

Fig. 5.

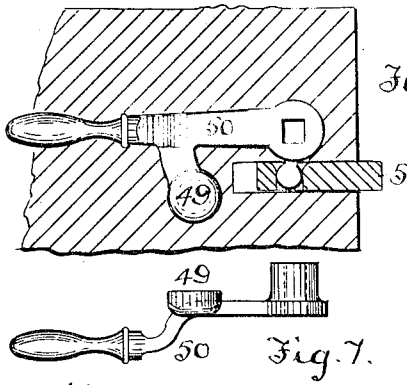

Fig. 6.

Fig. 7.

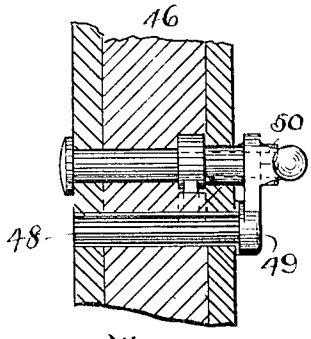

Fig. 8.

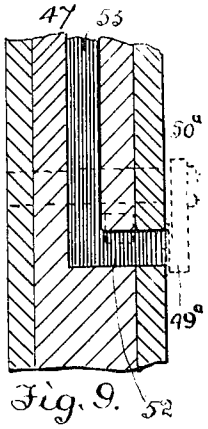

Fig. 9.

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APPLICATION FILED MAR. 10, 1906.

904,172. **Patented Nov. 17, 1908.**

3 SHEETS—SHEET 3.

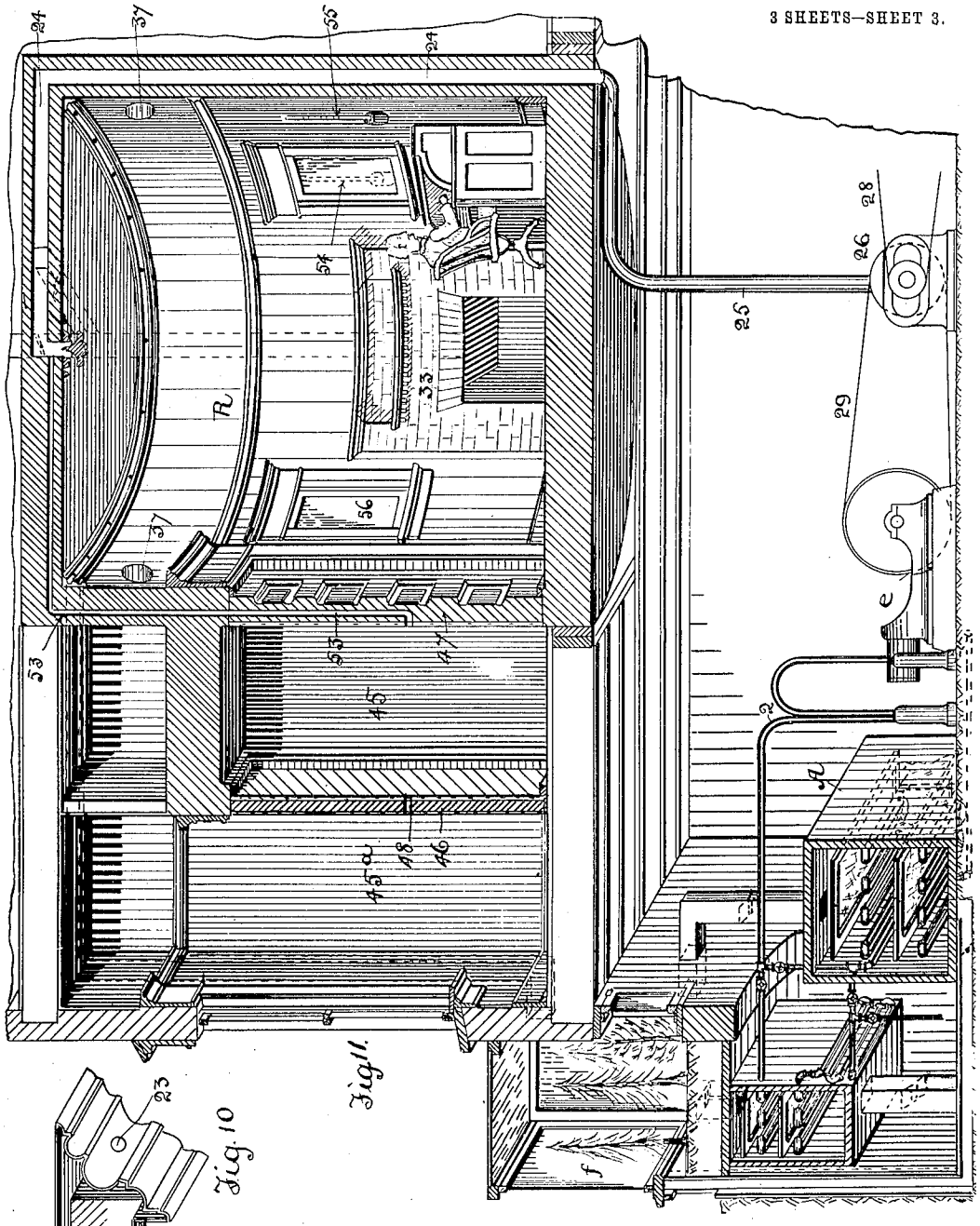

Fig. 11.

Fig. 10

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UNITED STATES PATENT OFFICE.

FRANK BATTER, OF ST. JOHNS, OREGON.

APPARATUS FOR THERAPEUTIC TREATMENT OF THE AIR OF LIVING-ROOMS.

No. 904,172. Specification of Letters Patent. Patented Nov. 17, 1908.

Application filed March 10, 1906. Serial No. 305,406.

To all whom it may concern:

Be it known that I, FRANK BATTER, of St. Johns, county of Multnomah, State of Oregon, have invented a new and useful Apparatus for Therapeutic Treatment of the Air of Living-Rooms, of which the following is a specification, reference being had to the accompanying drawing as constituting a part thereof.

It is now well known that in many cases of physiological impoverishment, due to the fact that the blood has lost some of its vitality, the patient will be benefited by living, for some time, in a comparatively high altitude; and it has been scientifically established (see *Air and Life* by Henry de Varigny, M. D. Sc. D. re-printed in *Smithsonian Miscel, Collections*, Vol. 39, 1071, page 56) that this beneficial influence of high altitudes is due to the increase of the respiratory capacity of the blood, occasioned by the rarefied condition of the air. In other words, "the blood of creatures living (in rarefied air) acquires the power of accumulating a larger proportion of the oxygen" of the air; and the blood will be found to contain a larger proportion of hemoglobins and of oxygen than if the creatures had lived under normal air pressure. Therefore, my invention has for its object to carry this knowledge to practical account, by providing a room in a sanatorium, hospital, or other convenient building, in which the air can be artificially rarefied to simulate any desired altitude; and thus to be able to offer relief and benefit to the suffering without the inconvenience and expense of a trip to the high mountains. Furthermore, it is manifest that a room in which the air is artificially rarefied can be arranged to afford much more comfort than it is possible to provide in a mountain inn.

To this end my invention comprises the combination of the following steps, and of means for accomplishing the same, namely: the process involving the steps of,

1. Providing a continuous artificial circulation of air through a room;

2. Controlling the volume of air admitted into the room by such circulation; and

3. Exhausting the air confined within the room a degree faster than the same can be re-supplied, by such controlled circulation.

My invention incidentally includes furthermore, the step and means for rendering the air supplied to the room dry and warm, and, if desired, besides impregnated with a fragrance of growing plants such as ferns, small pine-trees, wild-flowers, etc.

The apparatus by which I accomplish my object is illustrated in the drawings, in which—

Figure 1, is a longitudinal section of a building provided with a room the air of which is to be rarefied, and with apparatus for accomplishing the various steps of my invention; Fig. 2, is perspective illustrating a convenient, inexpensive method of building a room able to withstand the higher pressure of the outer atmosphere; Fig. 3, is a detail of a check valve, provided in the inlet air-duct for controlling the volume of air admitted into the rarefaction room; Fig 3^a, is a detail of an auxiliary air-vent controlled by a safety valve; Fig. 4, is a cross section of Fig. 3^a, exterior of the valve; Fig. 5, is a perspective detail of the safety valve; Figs. 6 to 9 are details of special means for locking the doors of the vestibule leading into the rarefaction room, and facilitating the entrance and exit, into and from, such room; Fig. 10, is a detail of the ceiling molding of the rarefaction room; and Fig. 11, is a sectional panoramic view of a building adapted to my invention, and provided with the necessary equipments for practicing the same.

The numerals and letters designate the parts described.

In order to accomplish the several steps of my process, I use apparatus arranged to operate as follows: The apparatus may be conveniently installed in the ground floor of a building, in the upper floor of which is provided a room R, the air of which is to be maintained in a rarefied state. The air is drawn from the outside through an intake 1, leading into an apparatus A, by which the air drawn in may be dried and cooled or warmed, as required. The particular type of apparatus by which the drying, warming or cooling is done, is immaterial, of course. I have represented in the drawings, a refrigerating apparatus of the direct-expansion ammonia-process type, slightly modified to suit my purposes. The compressed, heated ammonia, is conducted through pipes 2, into chamber *b*, and is utilized incidentally to heat such chamber. From chamber *b* the ammonia pipe coil 3, leads into an adjoining condensing chamber *c*, which in practice will be filled with a cooling liquid so as to cause condensation in the pipe 4, which leads into an expansion chamber *d*, in which a freez-

ing temperature is maintained. The pipe 5 leads back to starting point, and valve-cocks 6, are provided as usual. The intake 1, has a branch 7, leading into chamber *d*, and is provided with checks 8, 9, so as to be controllable to direct the inflowing air-current into either of the chambers *b* or *d*. Connected with the roofs of the chamber *b*, *d*, is an air-duct 10, leading into an uptake 11, leading into a duct 12, leading into an uptake 13, which also extends downward into the chamber *b*. The right end of the duct 10 has two branches 14, 15, entering the roof of the chamber *d;* and checks 16, 17, 18, 19, 20, are provided by the adjustment of which, in connection with a suitable adjustment of the checks 8, 9, the apparatus A, can be arranged to fulfil all requirements. That is to say when the checks 8, 16, 17, 19 are open and checks 20, 9, 18 are closed the indrawn air will enter first through the warming chamber *b*, and thence pass through chamber *d*, which course would be useful to dry the air; by closing the checks 8, 16, and opening check 9, the indrawn air will pass directly through chamber *d;* by opening checks 8, 20, and closing checks 9, 16, the indrawn air would pass through the warming chamber *b*, and thence directly into the duct 13, and by closing checks 8, 19, and opening checks 9, 18, 16, 20, the indrawn air will be caused to enter first into the chamber *d*, and thence pass through chamber *b*, into the duct or uptake 13. By the uptake 13, the air is delivered into a chamber *f*, which I term a fernery. In this chamber are growing plants—small pine-trees, ferns, wild-flowers, or whatever may be deemed suitable to impregnate the air with a pleasant fragrance suggestive of the woods and fields. This fernery may however be omitted. The air current is next directed into a duct 21, entering a passage 22, encompassing the ceiling of the room R, and provided with a series of small orifices 23, disposed equal distances apart, through which the air enters the room. I prefer to divide the inflowing air into numerous small streams, so as to prevent chilling drafts. The admission of the air into passage 22 is controlled by a damper 22^a, adjusted by a dependent rod 22^b, secured in place by a suitable clamp 22^c. The adjustment of the damper 22^a being like the adjustment of the common transom over a door. The air is withdrawn from the room by means of a passage-way 24, leading up from the center of the room and connecting with a pipe 25, leading to a suction pump 26, by which the exhausted air is expelled through an outlet 27. 28 is the main belt running from the engine (not shown) and 29 is the belt running the ammonia pump *e*. Let it now be supposed that we have to deal with an atmospheric condition representing the following: temperature, 50 degrees, (Fahrenheit), barometer 29.80 inches, humidity, from dampness to saturation. I would so arrange the apparatus A, as to cause the air admitted through intake 1 to enter the room *d*, where the temperature of the air would be lowered several degrees and the suspended moisture precipitated.

It is to be noted that the chamber *d*, is provided with a series of blankets 30, 31, 32, which are fastened on three ends so as to leave a passage-way for the air over the remaining end; that is to say, the first blanket 30, is fastened on its two sides and bottom, the second blanket 31, is fastened to the sides and the ceiling of the chamber, and the third blanket 32, is arranged in like manner as the first blanket; furthermore the blankets may be so arranged that said air passage around the ends thereof diminish progressively in area, so as to retard the travel of the air from the exterior of the blanket 30, to the space intermediate of the blankets 30, 31, and to again retard the air in passing to the space intermediate of the blankets 31, 32, and exterior of the blanket 32, thereby prolonging the contact of the air with the cold surfaces of the blankets, and promoting the precipitation of the moisture. The air, having been sufficiently dried, is next conducted from the chamber *d*, through the air-duct 10 into the warm chamber *b*, where its temperature is raised to point desired. From thence it passes through the air-duct 13 to the fernery, thence into passage-ways 21, 22, and thence through the orifices 23 into the room R, being withdrawn from the latter by means of the pump 26 and its connections, as already mentioned.

By governing the volume of air admitted into the room R, I can so arrange the workings of my apparatus as to cause the air to be taken out faster than it is admitted, thus causing a partial vacuum within the room R, and enabling me to reduce the atmospheric pressure within the same to any desired degree, or, in other words, make the atmospheric pressure within the room simulate the atmosphere of any altitude desired. At the same time it will be observed that the air within the room is maintained absolutely fresh, because of constant circulation.

In order to provide for the convenience and cheerfulness of the room, I build in the same a fire place 33, of the usual construction, having a flue 34, controllable by a damper 35. When the room is used as an ordinary room, the damper 35 is opened, thus establishing a natural draft in the fire-place 33, through the flue 34. But when the pressure of air of the room has been reduced, as mentioned, below that of the outside air, the damper 35 is closed, and the smoke and gases of the fire-place 33, are then carried through flue 36, connected with the exhaust passage-way 24, and are withdrawn and discharged

in the same manner as the air is withdrawn from the room.

The room R besides having inlet and outlet air-passages 21, 22, 24, is also provided with auxiliary air-vents 37, leading to the exterior of the building and respectively controlled by a valve adapted to close automatically while my apparatus is operated to reduce the atmospheri pressure within the room, but preventing any diminution of the volume of the air within the room R below the point of comfort, or safety. That is to say, referring to the details of the valve 37, shown in Fig. 3ª, a partition 38, rigidly affixed within the valve-casing 39, has dependently hinged to its lower edge a valve 40, made with an opening 41. The last mentioned opening is normally covered by a disk 42, being an integral part of an arm 43, also hinged on the partition 38, and provided with a movable weight 44. Compare Figs. 3ª, 4, 5. The operation of the valve just described, is as follows: So long as the atmospheric pressure within the room is about equal to that of the outside air, the valve 40 will be held open by the weight 44, on the arm 43. As soon as the atmospheric pressure within the building is reduced below the normal, the pressure of the outside air, rushing in against the exterior of the valve 40, will close the same, and the pressure of the air within the room may then be further reduced to any desired point.

The weight 44, may be adjusted to cause the disk 43, covering the hole 41, to resist a predetermined excess in the weight of the outer air over that confined within the room R. But as soon as the resistance of the weight 44 is overcome by the outside air-pressure, the disk 42 will be forced inward and allow the outside air to enter the room. Therefore, the proper adjustment of the weight 44, on the arm 43, is an automatic safe-guard against the reduction or rarefaction of the air within the room below the point of safety. I prefer to use two air vents 37, and dispose the same at opposite ends of the room.

The room R, may be made of any convenient shape, though a room of circular form is best adapted to withstand the load of outside air-pressure.

In Fig. 2, I have shown an inexpensive design for building a rarefaction room of lumber.

The entrance to the room R, must be provided with a passage-way or vestibule 45, controlled by two air-tight doors 46, 47. Both of such doors are so arranged as to open outward with respect to the room R. It is necessary to have two doors with an intermediate vestibule leading into the room R, so as to render it convenient to enter and leave the room, notwithstanding the inequality between the atmospheric pressure within the room R and that outside of the building.

The door 46, is provided with an air-vent 48, leading from the outside to the vestibule 45, and normally closed by a disk 49, carried by a latch-lever 50, adapted to project and retract a locking bolt 51, entering a cavity therefor provided in the casing of the door. The latch-levers of both doors are respectively provided with handles, so that each of the doors may be opened from the outside or inside. The door 47, is provided with an air-duct 52, leading into an air-duct 53, connecting with the exhaust passage-way 24. A latch-lever 50ª, is also provided for the door 47, and such latch-lever has also a disk 49ª, adapted to normally close the duct 52.

The air-ducts in the doors, and the valve-disks controlling the same, serve the following purpose: In lifting the latch-lever of the outer door 46, the duct 48, is uncovered, thus allowing the outer air ingress into the vestibule 45, and causing the air pressure therein to become equal with that of the exterior of the building. The door 46 may now be freely opened, and the person having entered the vestibule 45, closes the outer door behind him. Now proceeding to open the inner door 47, by lifting the latch-lever thereof, the air-ducts 52, 53, are opened, thus establishing a communication between the vestibule 45 and the exhaust passage-way 24, with the effect that in a few seconds the air in the vestibule is reduced in pressure to correspond with that in the room R, and the door 47, may now be readily opened. Having entered the room, the door 47 is closed, and the apparatus allowed to act to rarefy the air within the room R to suit the occupant.

When leaving the room R, the occupant thereof would again manipulate the doors 46, 47, as described, in the inverse order, and is able to reach the exterior of the building without inconvenience to himself, or having to handle the doors otherwise than about as he would ordinary doors.

In Fig. 10, I have shown a molding, which may be built into, and is designed to encompass the ceiling of the room, for the purpose of providing an air passage-way 22, having a series of small inlet-orifices 23, through which the fresh air is supplied to, and distributed in the room R.

The window panes 56, should be made of convexed glass, so as to be adapted to resist the pressure of the outer atmosphere.

It is also convenient to provide a pair of barometers, one thereof 54, positioned outside of the building, to indicate the normal pressure of the atmosphere, and the other 55, placed within the room; both being located to be conveniently observed by the occupant of the room.

The inside barometer could be provided

with an index indicating the atmospheric pressure prevalent at certain geographical localities, and also to give the pressures which have been found beneficial to persons afflicted with asthma, or other ailments, so as to aid the occupant of the room to adjust the atmospheric pressure therein to whatever condition he believes will afford him the greatest comfort.

The extent of rarefaction of the air in the room depends upon the speed of the pump 26; and thus it is a simple matter to control the apparatus as desired.

The pictorial representation of the practice of my invention Fig. 11 shows an ante room or additional vestibule 45ª, and in some other respects slightly varies from Fig. 1; but the figure nevertheless is intended to represent merely the idea of means above set forth.

I claim:

1. In a therapeutic apparatus for the purpose specified, the combination of a room normally cut off from the outer air, means adapted to artificially circulate air through the room, means adapted to control the volume of air admitted by said circulating means into the room, means adapted to continuously exhaust the air confined within the room a degree faster than the same is admitted through such controlled inlet, a vestibule leading into the room, outer and inner doors in such vestibule, and means whereby the air pressure within the vestibule may be adjusted.

2. In a therapeutic apparatus for the purpose specified the combination of a room normally cut off from the outer air, means adapted to artificially circulate air through the room, means adapted to control the volume of air admitted by said circulating means into the room, means adapted to continuously exhaust the air confined within the room a degree faster than the same is admitted through such controlled air-inlet; a vestibule leading into the room, outer and inner doors in such vestibule, latches on the doors, and means operated by the opening of the latches, respectively adapted to adjust the air pressure within the vestibule as specified.

3. In a therapeutic apparatus for the purpose specified, the combination of a room normally cut off from the outer air, means adapted to artificially circulate air through the room, means adapted to control the volume of air admitted by said circulating means into the room, means adapted to continuously exhaust the air confined within the room a degree faster than the same is admitted through such controlled air-inlet; a vestibule leading into the room, outer and inner doors in such vestibule, latches on the doors, means operated by the opening of the latches, respectively, adapted to adjust the air pressure within the vestibule as specified, and means whereby the temperature of the circulated air may be adjusted in advance of its admission into the room.

4. In a therapeutic apparatus for the purpose specified the combination of a room normally cut off from the outer air, means adapted to artificially circulate air through the room, means adapted to control the volume of air admitted by said circulating means into the room, means adapted to continuously exhaust the air confined within the room a degree faster than the same is admitted through such controlled air-inlet; a vestibule leading into the room, outer and inner doors in such vestibule, latches on the doors, means operated by the opening of the latches, respectively, adapted to adjust the air pressure within the vestibule as specified, and means whereby the degree of moisture and temperature of the circulated air may be adjusted in advance of its admission into the room.

5. In a therapeutic apparatus for the purpose specified, the combination of a room normally cut off from the outer air, means adapted to artificially circulate the air through the room, means adapted to control the volume of air admitted by said circulating means into the room, means adapted to continuously exhaust the air confined within the room a degree faster than the same is admitted through such controlled air-inlet; a vestibule leading into the room, outer and inner doors in such vestibule, latches on the doors, and means operated by the opening of the latches, respectively, adapted to adjust the air pressure within the vestibule as specified, means whereby the degree of moisture and temperature of the circulated air may be adjusted in advance of its admission into the room, and means adapted to impregnate the circulated air with the fragrance of plants in advance of its admission into the room.

6. A therapeutic apparatus, for the purpose specified, comprising a room, controllable air-inlets for the room, means whereby to exhaust the air from the room relatively to its admission, a vestibule leading into the room, outer and inner doors, and means whereby the air pressure within the vestibule may be adjusted, and means adapted to medicinally impregnate the circulated air in advance of its admission into the room.

7. In a therapeutic apparatus for the purpose specified, the combination of a room normally cut off from the outer air, means adapted to artificially circulate air through the room, means adapted to control the volume of air admitted by said circulating means into the room, means adapted to continuously exhaust the air confined within the room a degree faster than the same is admitted into the room, a vestibule leading

into the room, outer and inner doors in such vestibule, means whereby the air pressure within the vestibule may be adjusted, and automatic safety air-inlet valves, arranged in the room to prevent rarefaction of the air therein confined below a predetermined standard.

8. A therapeutic apparatus, for the purpose specified, comprising a room, controllable air-inlets for the room, means whereby to exhaust the air from the room relatively to its admission, a vestibule leading into the room, outer and inner doors, and means whereby the air pressure within the vestibule may be adjusted.

9. A therapeutic apparatus for the purpose specified, comprising a room normally cut off from the outer air, an air-inlet, a check controlling the admission of air through the inlet, means whereby to exhaust the air from the room relatively to its admission, a vestibule leading into the room, outer and inner doors, and means, whereby the air pressure within the vestibule may be adjusted.

10. A therapeutic apparatus for the purpose specified, comprising a room normally cut off from the outer air, an air-inlet, a check controlling the admission of air through the inlet, means whereby to exhaust the air from the room relatively to its admission, a vestibule leading into the room, outer and inner doors, means whereby the air pressure within the vestibule may be adjusted, and automatic safety air-inlet valves, arranged in the room to prevent rarefication of air therein confined below a predetermined standard.

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