Lyman

Air Purifier for Ventilating

A. S. LYMAN'S PATENT

AIR PURIFIER

For Ventilating

BEDS, DESKS, AND ROOMS

OF ALL SIZES,

With Pure Air.

Fig. 1.

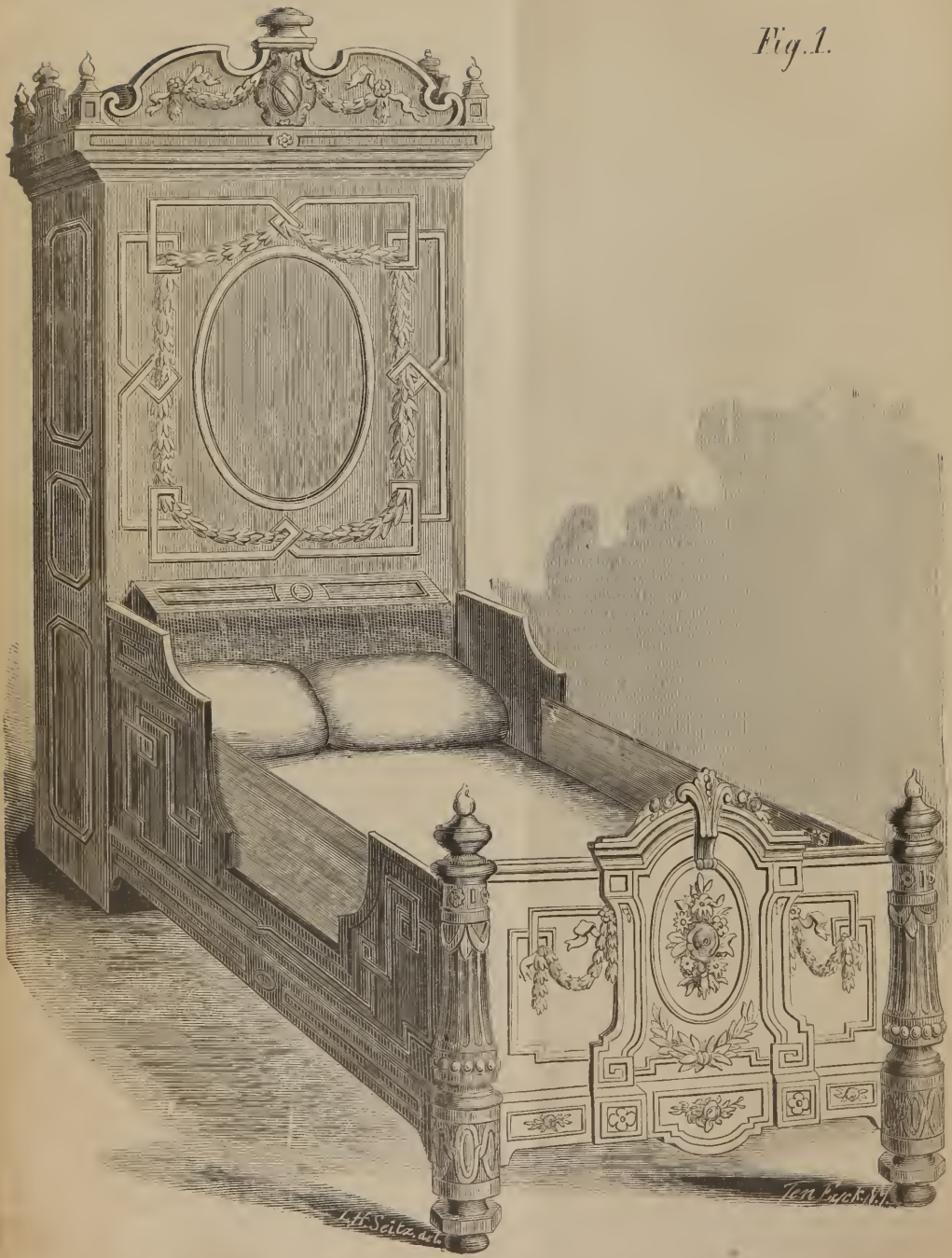
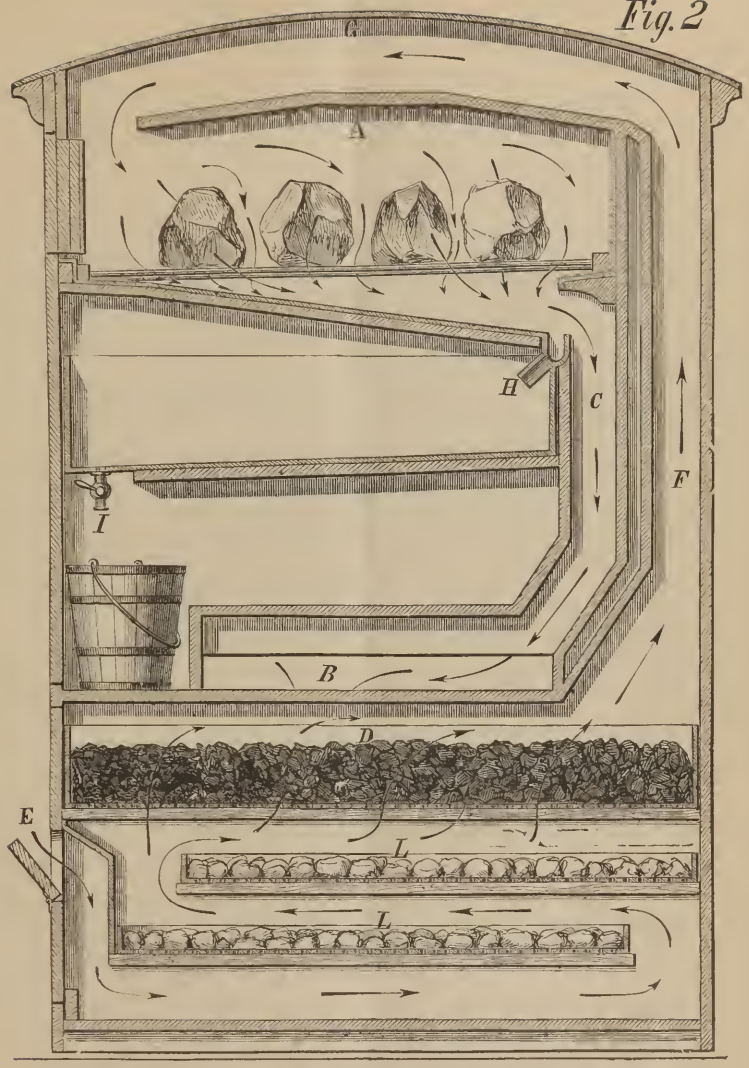


Fig. 2



The above is a section of the Air Purifier as it stands for the head-board of the Bedstead, it is six and a half feet high and lengthens the bed only thirteen inches.

Operation.—The air enters the valve door E and passes in the direction of the arrows under and over the wire gauze shelves, L L, covered with lime. This lime condensing moisture and carbonic acid warms the air, and causes it to rise up through the charcoal filter D, up the flue F, under the sheet metal roof G, through which it gives off its extra heat, over through the ice in chamber A, which cools and accelerates the current down through the grate and cool air-flue C, into the chamber B, and out through the opening back of the pillow.

AIR PURIFIER.

The object of this apparatus is to filter and purify the impure air for respiration, to dry it when too damp, and, in summer, to cool it—somewhat as we would filter, purify, and cool foul water if obliged to use it for quenching thirst.

Practically it is found that when the charcoal, lime, and ice or water are properly provided, and the valve fully open, an apparatus occupying a space of only 15 by 23 inches on the floor, and 6 feet 6 inches high, supplies from 30 to 80 cubic feet per minute, in one constant current of perfectly pure air, dried and cooled to any desirable extent. It does this in any position in which it may be needed, without the necessity of specially receiving air from outside the apartment to form the current, and without any machinery of any kind to become disordered.

The materials used for purifying and cooling the air cause, at the same time, the circulation; and, when properly provided with these, it must continue to blow as long as the law of gravity continues to act. With it we can always sleep in pure air; and persons can even remain in the warmest and most filthy hospitals in the South, and, at the same time, be enveloped in and breathe, an atmosphere as pure and as exhilarating as was ever breathed upon the hights of Oregon.

The expense of materials—that is, ice, lime, and charcoal—for providing a steady current of 50 cubic feet per minute, perfectly purified, and, in the hottest weather, cooled 20° and properly dried, has been less than two cents per hour in this city. Much of the season it is not necessary to cool it over 4° or 5°, merely enough to keep up the circulation through the disinfecting material.

The bed in the form here shown, when the valve-door E is fully open and unslaked lime and ice are abundantly provided, will blow 120 cubic feet per minute in a warm room. This is much more than is needed in any case, and it will then be advisable to partially close this valve-door to economize material. Thirty pounds of ice will blow 60 cubic feet per minute, during 8 or 10 hours in a warm night, even after the lime has been slaked for weeks, and, consequently, aids the circulation but very little, as it is but slightly warmed by condensing the small amounts of carbonic acid and other gases.

What Causes the Air to Circulate?

In the lower part of the apparatus, upon the wire-gauze bottoms of the drawers, L L, (Fig. 2,) are placed lumps of unslaked lime. The air in contact with the lime gives off its moisture and its carbonic acid. This warms, rarefies, and causes it to rise. The air to supply its place enters through the valve door, E, and flows in the direction of the arrows. D is a deep drawer, with wire-gauze bottom, filled with charcoal. The air next flows up through this charcoal filter and the ascending flue, F, and comes in contact with the metallic roof, G, through which it gives off a part of its extra heat. It next passes over and through the fragments of ice in the chamber, A, where it is still further cooled and condensed, and falls down through the grate and the descending cold-air flue, C, and is delivered through the opening B, between the pillow and head board of the bed, as shown in Fig. 1. In hot weather the ice alone, without the aid of lime, causes quite a brisk circulation. In any weather the lime alone will produce quite a steady current. Half a bushel of unslaked lime has blown night and day for ten days, apparently without a moment's intermission. Both materials acting together produce quite a brisk current under all circumstances.

The spout, H, leads off the water, resulting from the melting of the ice, into a pan, from which it is drawn at will by the stop cock, I.

How is the Air Purified by Passing through this Apparatus?

It is well known that there are immense amounts of minute particles of decomposing animal and vegetable matter floating in the air of cities, and more or less in all inhabited districts. There are also the deleterious gases, the products of the decomposition of animal and vegetable matter. These gases are carbonic acid and the compounds of ammonia and of hydrogen.

The air first passes through the lime. One hundred pounds of lime will absorb twenty-four pounds of carbonic acid gas, even when slaked or saturated with moisture. It also absorbs and decomposes sulphureted hydrogen, sulphuret of ammonia, and any other animal exhalations.

After leaving the lime, the air next passes in a zig-zag direction through the charcoal filter.

Experiments have repeatedly shown that each cubic inch of charcoal will absorb about 90 inches of ammoniacal gas, about 80 of sulphureted hydrogen, and considerable quantities of other gases.

But this cubic inch of fresh-burned charcoal is not a mere sponge for holding impurities. Each of its many thousand little cells is really a beautiful chemical laboratory, perfectly fitted up for decomposing impurities and storing

away their products where they can do no harm. The most filthy exhalations, consisting of the minute particles of decomposing animal and vegetable matter, are collected by this charcoal, apparently as a fiter of magnets would collect the minute particles of iron floating through it in the air. Here, in these little cells, these impurities are decomposed, and here their elements are stored away.

The most disgusting gases—the products of putrescence—are sulphureted hydrogen and compounds of ammonia. The first is always present where bilious and intermittent fevers, agues, etc., are generated, and, hence, is supposed by some chemists, to be a principal cause of these diseases ; while, for the same reason, the sulphuret of ammonia is supposed by some chemists to be the prime cause of typus and typhoid fevers, etc. The charcoal seizes the ammonia, takes it into its little cells, and causes oxygen from the atmosphere to unite with it, and thus forms dilute nitric acid and holds it there simple sour water, a harmless substance. In the same way each cubic inch of charcoal will absorb enough of sulphureted hydrogen to instantly kill a dozen men, if Dupuytren and Thenard's experiments are reliable ; and combining oxygen with it forms a few drops of dilute sulphuric acid, which may all be taken with impunity by a single child. These dilute acids remain in the charcoal until it is reburned.

According to Dupuytren and Thenard the 1-1500th of this gas in air is instantly fatal to a small bird ; 1-1000th killed a middle-sized dog ; and a horse died in an atmosphere which contained 1-250th of its volume. It does the mischief by decomposing the blood in their lungs when inhaled by them.

Finally, the air passes through the fragments of ice. Here it is washed as by a hail storm. The water on the surface of this ice is also a powerful absorbant of these impurities. It absorbs sulphureted hydrogen, and also deprives the air of any compounds of ammonia.

"Ammoniacal gas has a powerful affinity for water. Owing to this attraction, a piece of ice, when placed in a jar of ammonia, is instantly liquified, and the gas disappears in the course of a few seconds. Davy in his *Elements*, stated that water at 50°, when the thermometer stands at 29·8 inches, absorbs 670 times its volume of ammonia. According to Thompson, water at the common temperature and pressure, takes up 780 its bulk."—*Turner's Chemistry, article "Ammoniacal Gas."*

The air is also dried by coming in contact with the ice. By being cooled its capacity for moisture is lessened, and the moisture is deposited on the cold surfaces of ice even more abundantly than upon the pitcher of ice water.

The following table shows the amount of moisture contained in one cubic foot of air when saturated, at different temperatures:

	GRAINS.		GRAINS.
At Zero . . .	0·18	At 70° . . .	7.94
32° . . .	2·35	80° . . .	10.73
40° . . .	3·06	90° . . .	14·38
50° . . .	4·24	100° . . .	19·12
60° . . .	5·82		

An inspection of the above table will show that if the air is 80° temperature and saturated, it would be possible to reduce its moisture from 10·73 grains to 2·35 grains per cubic foot by simply passing it through fragments of ice broken sufficiently fine. We have carefully weighed 20 pounds of ice before putting it in this apparatus, with the lime and charcoal left out, and received from it over 21½ pounds of water. The 21½ pounds of water were rendered exceedingly disgusting to the taste by the filth that had been collected from the atmosphere in its passage through the ice.

Here, then, we have in this apparatus three of the most powerful absorbents of impurity known, and when they are properly supplied, the air passing alternately through each, is rendered absolutely pure.

How is the Person always Immersed in Pure Air while in Bed?

In order that the person shall always be immersed in pure air, the bedstead is made with its sides raised near the head and foot, as shown, and strong curtains are hung inside on the bottoms, S S, Fig. 1. This forms a sort of reservoir, or bath. The pure air, which even in cold weather is 3° or 4° cooler than the other air of the room, is flowing in near its bottom, between the pillow and purifier, or head-board, as shown by the arrows. The current is generally broken up by a sort of screen before the pipe, and it moves slowly over the pillow. The cool air may be felt flowing over the top of the reservoir where the side is lowest. If the curtain is let down, the cool air may be felt pouring out toward the floor. While the bed is occupied, the curtain should always be kept tightly closed.

Effects of Pure Air.

When the air is pure we breathe more of it than when impure.

It is often remarked by chemists, that when an attempt is made to breathe carbonic acid gas, undiluted with air, the lungs refuse to receive it. In spite of every effort, the air passages close against it, and if enveloped in it, the person is strangled to death as suddenly as if choked with a halter. When there is as much as ten per cent. of this gas in the air the person inhaling it breathes less and less, grows cold, and soon the lamp of life goes gradually

out. The more impure the air, the less the person inhales, the more clothing is required, or the more the person suffers from cold. On the contrary, the purer the air the more the person inhales. This fact may also at any time be strikingly shown with this air purifier. The moment a person who has been for some time confined to air of the city or village, or been breathing damp, warm air, commences breathing the air that has been properly filtered and purified in this apparatus, he perceives an involuntary heaving of the chest. He inhales almost twice as much air for a few breaths as he did before. So beautifully and wisely have our bodies been constructed and arranged, and so perfectly have the laws of nature been adapted for our good, that when even a little child while asleep begins to inhale the air that has left its impurities in this apparatus, it at once takes several deep, long-drawn breaths. It has been suffering more or less for the want of pure air, it has found it now, and though asleep, by instinct greedily devours it and is rapidly purified, stimulated, and strengthened, and its lungs are expanded by it. As it breathed much less when in very impure air, so now it breathes much more. The little chest, that was formerly gradually collapsing, many of the cells in its lungs perhaps closing up, as if for the last time, is now rapidly expanding; those closed cells again opening and enlarging. We have seen not only little ones very low with summer complaint and dysentery placed under its influence and restored in a single night as if by magic, but we have seen the little child with weak, narrow chest, after sleeping under it only three or four months, exhibiting a remarkably large, full, and healthy chest. Its general effects are the same on old or young; it simply purifies, stimulates, and strengthens the whole system and expands the chest, increases the appetite, and improves the health. The best authorities substantiate the truth of the assertion, and no intelligent person who has slept a few nights under this air purifying apparatus, properly supplied, will doubt it that by simply breathing pure air during the hours of repose, families in cities who are now so generally growing weaker and rapidly running out, would rather grow stronger, and not only would there be an immense saving of life, as well as increase in numbers, but the race would be greatly improved physically, mentally, and, other circumstances being the same, even morally, with each succeeding generation.

Is there no Danger of taking Cold?

Immediately on inhaling the pure, dry air from this apparatus, the person, as we have remarked, begins to take deep, long-drawn inhalations. More oxygen is consumed, the secretions are increased, and, generally, in a very short time the perspiration begins to become sensible on any part of the body that chances to be heavily covered with the bed-clothing. This has been the case even where, without this apparatus, and consequently in

warmer air, the person suffered continually with cold. Now there is nothing strange in this any more than in the fact that the fire in the stove or in the grate, in cold weather, is much hotter than in warm weather. The draught is stronger, and in that fire the amount of heat generated depends entirely on the amount of oxygen consumed, and not on the temperature of the air of the room, or on the amount of carbon and hydrogen in the grate. Just so in the human system, the amount of heat generated depends entirely on the amount of oxygen burned or united with the carbon, and, probably, hydrogen, in the system. Hence, though the air is 5° or 10° colder, much more oxygen being consumed, the impurities of the blood and the worn out particles of matter in the muscles and extremities, are more rapidly and thoroughly burned up and thrown off in the form of carbonic acid and water from the lungs, and exhaled from the skin. The circulation is improved, the lungs are expanded and invigorated, and the system is in such a condition that there is not only no more suffering from cold feet during the day, but even carelessly sitting in a draught or wetting the feet, that would before have prostrated the person with disease, will now rather stimulate him instead of doing him an injury.

Dr. Griscom in his *Uses and Abuses of Air*, p. 64, under head of "Rationale of taking cold," remarks: "In a healthy, vigorous constitution under ordinary circumstances, the internal organs, instead of being overcome by the sudden irruption and succumbing under the shock, will be stimulated by it to a healthy reaction, and the whole system feel a genial and invigorating glow."

Sometimes when placing this apparatus over children very low with summer-complaint and dysentery, or burning with fever, we have allowed the cold, dry, pure air to discharge directly over their faces whole days and nights, so as, at times, to make their hair wave, and never knew of one taking cold under it. Still, in many diseases, and as a general rule, the current of air should not be allowed to strike the person until he has been some time stimulated and prepared by it, and then it should always flow over the face, so that he may breathe the pure air before it strikes any other part.

How does simply Sleeping in Pure Air, during the Night, tend to Protect from Diseases Resulting from Exposures during the Day?

It protects from colds and their results by building up, strengthening, and invigorating the system, so that, as above quoted, a slight exposure, like wetting the feet, or sitting in a draught, will not overcome, but rather stimulate it to a healthy reaction, instead of causing a cold and prostrating with disease.

It protects from the development of fevers and contagious and other dis-

eases, from the fact that during all that time while the body is relaxed in sleep, pure air only is breathed. This is very important, for it is well known as Florence Nightingale, in her book on nursing, remarks, that, "During sleep, even when in health, the human body is far more injured by the influence of foul air than when awake."

Again, when during the day any impurities are taken into the blood which are not at once burned out, it would seem that they must be thoroughly destroyed during the night, while such an abundance of perfectly pure air is breathed.

Dr. Griscom in his *Uses and Abuses of Air*, p. 121, remarks: "But the process of respiration does not even stop here. It not only removes useless and pernicious carbon, and prepares and preserves in a state of purity a fluid capable of affording to all parts of the body the materials necessary to maintain their vital endowments, but is also employed to separate any injurious matter accidentally received into or retained in the system, which is a circumstance of more frequent occurrence than is commonly suspected. In this way healthy and unimpeded respiration will often purify the blood from miasmata, thus preventing the development of fever or other contagious or pestilential diseases. . . . Thus a copious supply of pure air will very often of itself eliminate morbid matter through the lungs which if allowed to remain, would have produced fatal results."

Again we quote from Dr. Youmans' *Hand-Book of Household Science*, p. 161: "The Harmattan, a dry wind from the scorching sands of Africa, withers, shrivels, and warps everything in its course. The eyes, lips, and palate become dry and painful, yet it seems to neutralize certain conditions of disease. 'Its first breath cures intermittent fevers, epidemic fevers disappear at its coming, and small-pox infection becomes incommunicable.'"

It is by oxydizing or burning out the diseased matter which has been inhaled, or has accumulated from the decomposing products of the normal waste or other source, that the dry, pure wind from the great sandy desert produces so favorable an effect.

Now we do not claim for the Air Purifier that its first breath cures intermittent fever, but we do know that when breathing this pure air during six or eight hours in every twenty-four, and taking proper food and care otherwise, the fluids of the system will be kept so rich and pure, that neither intermittent, nor typhus, nor typhoid, nor scarlet, nor any other fevers, nor erysipelas, nor carbuncle, nor cancer, nor any other ulcer; nor bronchitis, nor catarrh, nor consumption, or other form of scrofula; nor diseased liver, nor dyspepsia, nor neuralgia, nor dysentery, nor cholera infantum, nor Asiatic cholera, nor small-pox, nor any other contagious disease, will find a soil in which to grow. It will do all for the patient in any disease that the Harmattan can do, and vastly more in some diseases. And if the "ounce of

prevention is worth more than the pound of cure," it will prevent diseases even if it could not cure them.

Directions for keeping the Apparatus in Order. The Lime.

Where ice is easily obtained, and the apparatus used in a warm room, so that the lime is not needed to aid the circulation, it need not be changed as soon as slaked, because it will afterwards absorb nearly one-fourth of its weight of carbonic acid gas from the air. It also absorbs sulphurcted hydrogen, sulphuret of ammonia and other poisons, and decomposes them. In such cases we would change it in from two to four months. Be careful and not allow the lime to be laid so thickly upon any part of the shelves that it shall in slaking expand so as to prevent the free circulation of the air. There should be a passage for the air at least thirty inches area between the shelves of lime and twenty inches area between the upper lime and charcoal.

When ice is scarce, and wet surfaces are used in its place, or the room so cold that lime is needed to produce a sufficient current, it is necessary to change it once in from three to six weeks. The best practice is to change half of it every two or three weeks, or as often as may be necessary. To do this without scattering any on the floor, take, say a newspaper doubled, lay it on the floor in front of and close to the door of the air purifier, open the door and draw out the first half of the lower shelf and set it on the paper; take hold of the paper and each side of the shelf so as to carry the shelf with the paper under it, and empty it into the ash hole, or on to the garden. Empty also in like manner the other half of this shelf. Move the upper shelf down in the place of the one just emptied; cover the empty shelf with lumps of lime (not too thick) and place it in the upper space. Shove both of them back as far as they will slide, so that the air may pass around them as represented by the arrows in Fig. 2. The air now comes first in contact with that lime which has been longest in use.

Charcoal.

Re-burn, or change the charcoal for that which is known to be fresh-burned, at least once in four months' use; and where the air is very impure, oftener. In some very filthy positions it might be advisable to change it once a month.

The charcoal should be split or broken up somewhat, and laid in so as to cause the air to flow up through it in a zigzag direction. We have a very simple apparatus for smothering the coal after it is burned without wetting it; this is furnished, if desired, with the Air Purifier.

The Ice.

The more the ice is broken up, the more surface there is exposed, and of course the more it cools and dries the air, and the greater its electrical effect; but the sooner it melts. When fresh ice is put in, always see that the copper pan for water under the ice chamber is emptied. It is a good rule with the small Air Purifier, which has a pail instead of a pan under the grate, to always bring the ice in this pail, and after setting the pail under the chamber, put the ice, lump by lump, in its place.

See that the small door (E. Fig. 2) is kept open while in use. If you wish to preserve the ice, or lime unslaked, it should be kept shut when not in use.

Caution.

Never allow the apparatus to be used with unslaked lime and charcoal alone without ice, or a supply of moisture for a person in bed, or where the air from it is exclusively breathed, because if there is much lime unslaked it will blow an air so dry as to be injurious in most diseases. It makes a person very restless. It dries up the air passages in the head and throat, and would, if persisted in, perhaps cause inflammation there.

We quote the following from Dr. Youmans' "Hand-Book of Household Science," to show the importance of attention to this apparatus, when lime and water are used instead of ice, in order that it may supply air in proper condition in respect to moisture:

"How Moist Air affects the System. (Art. 291.)

"Air which is already saturated with moisture, refuses to receive the perspiration which is offered to it from the skin and lungs; the sewerage of the system is dammed up. Much of the oppression and languor that even the robust sometimes feel in close and sultry days, is due to the obstruction of the insensible perspiration by an atmosphere surcharged with humidity. Not only are waste matters generated in the system thus unduly retained, but malarious poisons introduced through the lungs by respiration, are prevented from escaping; which would lead us to anticipate a greater prevalence of epidemic diseases in damp than in dry districts. Such is the fact as we notice in cholera which follows the banks of rivers and revels in damp low situations. Moisture joined with warmth is most baneful to the system. . . . . Damp air, at the same temperature as dry air, has a more powerful cooling effect, producing a peculiar penetrating chilling feeling, with paleness and shivering, painfully known to New England invalids as accompanying the east winds of spring."

"Effects of Dry Air. (Art. 292.)

"Dry air favors evaporation. By promoting rapid transpiration from the pores of the skin, it braces the bodily energies and induces exhilaration of the spirits. Cold dry air is invigorating and reddens the skin, with none of the distressing symptoms of cold moist air. If very dry it not only accelerates perspiration but desiccates and parches the surface and deprives the lining membrane of the throat and mouth of its moisture so rapidly as to produce an uncomfortable dryness or even inflammation. Dry climates which quicken evaporation, are best adapted for relaxed and languid constitutions, with profuse secretion as those afflicted with chronic catarrh with copious expectoration. The *Harmattan*, a dry wind from the scorching sands of Africa, withers, shrivels and warps everything in its course. The eyes, lips and palate become dry and painful, yet it seems to neutralize certain conditions of disease. 'Its first breath cures intermittent fevers. Epidemic fevers disappear at its coming, and small pox infection becomes incommunicable.'"

Now when water is substituted for ice in the Air Purifier, great care is needed. If too large an amount of wet surface is supplied, the air may be as nearly saturated as that of the east winds on the coast of New England in spring. Again, by neglecting to supply moist surfaces, the same apparatus may furnish air as dry as that of the Harmattan. When ice is used, the amount of moisture in the air is properly regulated by it. If the lime has absorbed nearly all the moisture, the ice adds a little to it. If the lime has been slaked, so that it absorbs but little or no moisture; the moisture of the air will be condensed on the surface of the ice.

Note.

After purifying the air, we may give it the peculiarities of any locality that we choose. The pine hills are noted for their healthy and stimulating air. The atmosphere of such regions is of course very pure compared to that of our cities, and in addition, it is loaded with vapor from gums and resins. It was long ago demonstrated by Schonbein that the vapor of tar "ozonized the air," as he expressed it, that is, produced such a change in the oxygen as to render it doubly powerful. Hence its stimulating and beneficial effect upon the system. Hence the scores of quack medicines containing tar or some form of balsam, or what seems to be equally as good, the ordinary white pine turpentine of this region. Whether it is mixed with some oil and rubbed upon the chest, or otherwise dissolved and swallowed, the oxygen inhaled is, to a greater or less extent, ozonized by it, and that we believe to be the cause of its beneficial effect.

When either of those substances is taken into the stomach, even in very

small quantities, it is more or less injurious to that organ, sometimes doing much harm. We have often used them to perfume the air after it is purified, by spreading them upon plates, placed under the pan below the ice in the small independent Air Purifier or in the chamber B, made for this purpose in the Air Purifier Bedstead. We have sometimes used a small bunch of the whittlings of pitch pine, and have seen tarred rope picked to pieces and the fibres placed so that the air filtered through them. But too much of these substances renders the air too stimulating for most persons in health. In one case, where fibres of tarred rope were introduced, the child awoke near midnight and commenced singing. The tarred rope was removed and the child stopped singing and slept quietly till morning. It will do no harm when a consumptive or any other person desires it to let them have it as rich as they wish it, either in tar, balsam of any kind, pitch pine, tamarack, or spruce gum. Some prefer one, some another.

When tannin is to be inhaled, we have used fragments of hemlock or oak bark saturated with water, and piled upon plates in the chamber B, or spread on sheets of wire gauze, and laid upon the grate instead of the ice.

Effects of Impure Air.

Dr. Youmans, in his *Hand-Book of Household Science*, after showing that the various fevers, dysentery, cholera, or other forms of pestilence, consumption and other forms of scrofula, are caused by impure air, remarks as follows:

Art. 323. **"Bad Air undermines the Vital Powers.**—And yet the fatal effects of mephitic air are by no means confined to those terrible maladies, Cholera, Fevers, Consumption, and Infantile disease, by which the earth is ravaged; by undermining the health it paves the way for all kinds of disorders. . . . Individuals may often continue for years to breathe a most unwholesome atmosphere without apparent ill effects, and when at last they yield, and are prostrated or carried off by some sudden disease, the result is attributed to the more obvious cause, the long course of preparation for it by subtle and insidious poisoning being entirely overlooked. The mass of mankind refuse to recognize the action of silent, unseen causes. Our youth in the morning of their days, and men in the meridian of their strength pass abruptly away, and we will be satisfied with no solution of the problem which refers the mournful result to reprehensible human agency."

Dr. Griscom, in his *Uses and Abuses of Air*, besides showing that impure air is the cause, not only of all the various fevers that afflict the human race, also of dysentery and of infantile diseases, and of the various forms of

pestilence, when speaking of consumption and other forms of scrofulous disease, remarks as follows:

"M. Baudelocque, a celebrated French writer, has made the causes of this disease a subject of the most careful investigation, and as his opinions have been pretty generally adopted by the best physicians in Europe and America, and are in accordance with our own experience, it will, perhaps, be necessary to make a few quotations from his treatise: 'Invariably it will be found that a truly scrofulous disease is caused by a vitiated air.' . . . In speaking of the hereditary descent of the disease, Baudelocque admits that scrofula may be propagated from parents to their offspring, but adduces numerous examples that tend to diminish very much the importance generally attached to hereditary constitution as a cause of the disease, and which prove that it is possible to destroy the predisposition and to avoid the malady by simply respiring pure air. . . . Finally, M. Baudelocque affirms 'that the repeated respiration of the same atmosphere is a primary and efficient cause of scrofula, and that if there be entirely pure air, there may be bad food, bad clothing, and want of personal cleanliness; but that scrofulous diseases cannot exist,' and supports the assertion by numerous cases and incontrovertible facts."

Again, Chap. XVI., Dr. Griscom remarks: "One of the most insidious means by which impure air or inefficient respiration assails the happiness and undermines the health of mankind, is through the action of the superabundant carbon upon the brain during sleep. . . . The slow and gradual poison of carbonic acid covers its approaches and secretly and silently saps the constitution of the teetotaler as well as the intemperate; of the industrious laborer as well as the spendthrift; of infancy and youth as well as old age; of the rich as well as the indigent; and, in too many instances, of the learned as of the ignorant. In fact, people seem to be generally unaware in regard to atmospheric impurities, that an invisible cause is capable of producing a visible effect, and because they do not here see that cause, they think they need not dread its effects. This error of judgment is the more glaring and inconsistent, as they are in the habit of admitting the former principle and rejecting the latter in almost every other department of philosophy."

Besides the long catalogue of diseases caused by impure air, which really carry off more than seven-eighths of the human race,* he shows, Chap. XIII., that, 1st, "Vitiated air produces inaptitude for study, and, therefore, ignorance;" that, 2d, "the judgment is perverted by it and it produces quarrelsomeness; that, 3d, "vitiated air encourages intemperance in the use of

* Dr. Barton, in his work on the "Causes and Prevention of Yellow Fever," estimates that "Preventible diseases are proportioned to non-preventible, about as eight or ten to one."

intoxicating drinks;" that "impure air encourages vice, the most degrading vices;" that 6th, "vitiated air produces deformity, imbecility, and idiotcy."

He gives facts from M. Baudelocque and others, which, as he remarks, "Show in almost as strong language as can be employed, that atmospheric impurities are capable of degrading man to the lowest deep to which he can, in his present state, be precipitated." On p. 184 he remarks: "It should be always recollected that when the smell of any substance is perceived, the particles of that substance come in actual contact with the lining membrane of the nose, and pass into the lungs and commingle with the blood." And when in this connection we reflect upon the fact that every day several thousand tons* of decomposing animal and vegetable impurities are mingled with the air in this city of New York; that the whole atmosphere on this island, and of other cities and villages is, during half the year so loaded with filth, that when one has been for a few hours enjoying the air which has left its impurities in this apparatus, and leaves it for the other atmosphere around him, he is for a few seconds disgusted with all the stinks he ever before perceived, and some that are entirely new to his senses; can we wonder that the most sensitive part of the community are almost universally delicate and sickly? Can we wonder that half the children born here die before six years of age? No. The wonder is that so many live (poor sickly lives, though they are in their younger and more sensitive days, during the summer months,) and grow up to manhood, and sometimes become able and useful men. What, we naturally ask, would these children become, if they enjoyed the luxury of pure air together with their other advantages?

To the question which has been so often asked, "Is there no remedy for this undermining of the constitution and destruction of life in infancy and youth in our cities?" we answer certainly, there is a very simple remedy. It is surely better to filter out these poisons with lime and charcoal, and deposit them upon our gardens or ash-heaps, or burn them, and send their products up our chimneys, rather than let our lungs and the lungs of our children, continue to be unceasingly used as filters for collecting these animal and vegetable impurities and mingling these poisons with our blood, and then *taxing the vital forces of our systems for their destruction.* Taxing them so often beyond their powers of endurance. Taxing them so often again so near the verge of their endurance as to unfit them for any other

* The average amount of carbonic acid expired daily by a person of ordinary size, is estimated at from 13¾ to 22 cubit feet; 13 cubic feet of this gas weighs 1½ lbs. Suppose the 1,000,000 persons on this island expire 1,500,000 pounds of carbonic acid and other impurities per day, this equals 750 tons exhaled from the lungs and skin.

The exhalations from sewers, gutters, and filthy streets, back-yards, privies, etc., etc., will certainly exceed fifty times as much more. But $750 \times 50 = 37{,}500$ tons (thirty-seven thousand five hundred tons), of filthy poisonous gases or decomposing animal and vegetable matter mixing daily with the air on this island.

business. There are many who can probably for many years endure it, but who are anxious to spend all their forces in some more elevated employment, in which they can be of service to their fellow men.

Dr. Dixon, editor of *The Scalpel*, in the first article of the number preceding the last, (Vol. XII., No. 3,) on the questions of "Diseases of Defective Nutrition in the Young Girl. Can Medicine cure Scrofula or Pulmonary Consumption? Has it any Influence on Spinal Disease, or Diseases of the Joints? What should be done for them?" remarks as follows:

"The impossibility of treating effectively tubercular or scrofulous affections of the bones, diseases of the hip and knee joints, abscesses and curvature of the spine, without pure air and great increase in the quantity of food consumed, is now thoroughly understood by all intelligent people.

"Medicine can never add material to the body, if it cannot heal an ulcer in the lungs or spine; it cannot affect the absorption of the tubercles which cause it; it cannot straighten a curved spine or leg, or give blood to the feeble girl; nor can the most perfect mechanism impart natural strength or tone to the muscles that support the spine or move the limbs. Medicines are generally inert and too often injurious; they destroy appetite and digestion, which is the source of strength. Mechanical appliances are only useful adjuvants to take off the weight from the diseased part, and to aid the effect of a surgical operation, or what is far better to prevent its necessity.

"*There is no true tonic but pure air;* there is no material of repair but blood. In all diseases originating in a low condition of the vital force, more air must be breathed, that more food may be consumed, or the red blood that makes and gives tone to the muscles that support the spine will not be supplied; the scrofulous tubercle will not be absorbed nor will the ulcer heal. . . . . There is a very fatal error in regard to exercise. It can never benefit when carried to the fatigue point in any young person. The laboring man endures it, but for the most part he dies in middle life and of congestive complaints; the young girl or school boy of healthy stock outgrows it; but the feeble and precocious in brain and body die of convulsions or tubercle or dropsy in the head.

"No one can tell precisely when latent tubercle in the lungs or joints will ulcerate, or when the blood-vessels of the brain will give way, and convulsions and death in a child will occur. They will appear as soon as the blood is poor enough. Poor blood makes weak or porous blood-vessels.

"We may judge of the approach of tubercle in this way; the child or young girl is exhausted after a walk; they say they are tired and lie down perhaps on the floor; then they say the hip, some part of the spine, or the knee 'hurts them.' Flushing of the face and short breath is evidence of starvation of red blood: tubercle threatens. A child or young girl or boy thus affected, should have their entire course of life changed; medicine can do no possible

good. If you do not give more rest and less study, and place them under such circumstances that all the vital and organic forces can be raised, they will soon break down somewhere. . . . . Air is the first and last want of our bodies. Our first cry and last gasp attest its power. The lungs are the two fire-places of the system; air is the fuel; the fire smoulders in the air-tight stove till the valve is raised, when it bursts into flame. Air, food, sleep and the cheerful emotions are the only restoratives of exhausted nerves and blood-vessels."

In an appendix to the same number, Dr. Dixon says of the "terms 'Anæmia' and 'Neuralgia.' The first means 'bloodlessness,' the second, 'pain in a nerve.' Neither is correct, for those whom physicians tell that they are *anæmic*, have often as much blood as healthy people, but it is poor and watery, and unfit to nourish the tissues of the body. Such people are often plump, but they have always pale lips, cold hands and feet, and blueness under the eyes. The second term, 'neuralgia,' is correct enough, because neuralgia may exist, but pain in a nerve is only a symptom of anæmia, which is the disease that causes it. It ought to be called neuræmia, or nerve starved. . . . . More air, food and sleep are the only means of restoring the lost power of producing blood and continuing the full action of the nerve-power."

Objections to Present Bed-Rooms and Beds.

Dr. Hall, editor of *The Journal of Health*, in his book on "Sleep," p. 56, remarks; "It is an almost unknown thing that any sleeper within the four walls of any private house or hotel, gets one single breath of real pure air in a whole night." Again we quote from the same book, pages 70 and 71: "The insensible perspiration from a sleeper during the night, is of itself enough to taint the atmosphere of a whole room, even a large one, as almost every reader has noticed on entering a sleeping-chamber in the morning after having come directly from the out-door air; and it is the breathing and rebreathing of an atmosphere contaminated in the variety of ways alluded to, which makes the night the time of attack of the great majority of violent human ailments; it is this which fires the train of impending disease, and which would have been deferred, if not entirely warded off, with the advantages of a pure chamber. It is from close bed-rooms come the racking pains of fever, its torturing thirst, and speedy death; this it is which wakes up the cholera morbus, the cramp colic, the bilious diarrhæa, and the multitudes of other ailments which surprise us in the night-time, and from which it is worthy of repetition, a night of good sleep in a clean, pure, and well-ventilated chamber, would have effected a happy deliverance, as expressed in the familiar phrase of 'Sleeping it off.'"

Florence Nightingale, in her book on Nursing, remarks: "With private sick, I think, but certainly with hospital sick, the nurse should never be satisfied as to the freshness of their atmosphere unless she can feel the air gently moving over her face when still." Again, Chap. VIII.: "A few words upon bedsteads and bedding, and principally as regards patients who are entirely, or almost entirely, confined to bed. Feverishness is generally supposed to be a symptom of fever—in nine cases out of ten it is a symptom of bedding. The patient has had re-introduced into the body the emanations from himself, which day after day, and week after week, saturate his unaired bedding. How can it be otherwise? . . . The patient must inevitably alternate between cold damp, after his bed is made, and warm damp before, both saturated with organic matter, and this, from the time the mattrasses are put under him, till the time they are picked to pieces, if this is ever done.

"If you consider that an adult in health exhales by the lungs and skin in the twenty-four hours, three pints at least of moisture, loaded with organic matter ready to enter into putrefaction; that in sickness the quantity is often greatly increased, the quality is more noxious; just ask yourself next where does all this moisture go to? Chiefly into the bedding, because it cannot go any where else. And it stays there; because, except, perhaps, a weekly change of sheets, scarcely any other airing is attempted. A nurse will be careful to fidgetiness about airing the clean sheets from clean damp, but airing the dirty sheets from noxious damp will never even occur to her. . . . Must not such a bed be always saturated, and be always the means of re-introducing into the system of the unfortunate patient who lies in it, that excrementitious matter, to eliminate which from the body, nature has expressly appointed the disease?

"My heart always sinks within me, when I hear the good housewife, of every class, say: 'I assure you the bed has been well slept in,' and I can only hope it is not true. What! is the bed already saturated with somebody else's damp before my patient comes to exhale in it his own damp? Has it not had a single chance to be aired? No, not one, 'It has been slept in every night.'"

How different the condition of the person, sick or well, occupying one of these Air Purifying beds. As there is a constant pressure of pure dry air in at the head of the bed, and it is constantly moving toward the foot, its occupant is not allowed to re-inhale any of the contaminated air. The bed is also being steadily, though slowly, dried and purified even when no idea of drying or purifying the *bed* ever enters the mind of any person connected with it.

Again, when a single person occupies one of these beds, the half of the bed not occupied can even in winter be thoroughly dried and purified in a few minutes, without disturbing the patient or allowing him to re-inhale any

of his exhalations. Half of his bed may be opened and ventilated by the pure dry air which is sweeping it from head to foot while he is breathing perfectly pure air.

Again, in cases of fever and other diseases, as well as in health in hot weather, the covering of the bed has sometimes been left open at the head and foot by the occupant, so as to allow the cool dry air from the Purifier to flow under the sheet in contact with the body, and pass off by the feet, thus constantly ventilating the body as well as drying and purifying the bed while the person is breathing pure air. In very hot weather, when the atmosphere is loaded with moisture, nothing can be imagined more agreeable, stimulating, and beneficial, either for the sick with fever or other diseases, or for the person in health.

We might go on and quote a thousand pages from able physicians and others on the importance of pure air, but will merely give the preface of the very interesting and instructive book of 350 pages, on "Sleep," by Dr. Hall, editor of *The Journal of Health*. The whole Preface reads as follows:

"PREFACE.—It is the aim and end of this book to show that as a means of high health, good blood, and a strong mind, to old and young, sick or well, each one should have a single bed in a large, clean, light room, so as to pass all the hours of sleep in a pure fresh air, and that those who fail in this, will in the end fail in health and strength of limb and brain, and will die while yet their days are not all told."

Now we sometimes see four healthy children sleeping in two of these Air-Purifying beds, in a room but sixteen feet square, and they sleep in purer air than can be found in any four bed-rooms, large or small, without the Air Purifier, on the surface of this earth.

To illustrate by facts which have long been familiar to the intelligent community, in directions for raising trout we often read: "If you have a good deep spring of perfectly pure, cool water, the trout will live and do well even when so thick that you can hardly see the bottom of the spring, provided they have an abundant and constant supply. But if you have no spring or stream of pure water, no matter how large and deep your pond may be, your trout will all die."

Now, in this reservoir of perfectly pure air, your children can sleep as independent of the filthy atmosphere of the city or village around them, as the trout, in the pure, cool spring, are of the filthy pond below them.

We close by quoting the last paragraph of *Uses and Abuses of Air*, by Dr. Griscom: "Let those who have these things in charge, answer to their own consciences how they have discharged their duty in supplying to the young, the responsibility of whose lives and education they have assumed, A PURE ATMOSPHERE, THE FIRST REQUISITE FOR HEALTHY BODIES AND SOUND MINDS."

Opinions of Physicians.

There is no subject on which Chemists and Physicians, and intelligent men generally, are more unanimously agreed than on the question of the importance of pure air for the preservation of health, and also as an aid to the Physician in the sick room.

Leading Chemists and Physicians, who have never consented to write a letter recommending any new medicine, do not hesitate to write recommendations of an apparatus that furnishes Pure Air, because it can never do harm, but must always do good.

The following letter is from Dr. Austin Flint, Professor of the Principles and Practice of Medicine in the Bellevue Medical College, and author of several works on Medicine:

NEW YORK, *December* 27, 1865.

MR. A. S. LYMAN—*Dear Sir,*—Your apparatus for supplying pure cool air has been attached to two beds, in one of the male wards of Bellevue Hospital, for about three months, and I have been interested in observing its operation. During the period just stated, the two beds furnished with your apparatus have been occupied successively by several patients affected with different diseases. The trial has been too brief and on a scale too limited to warrant conclusions as to the amount of influence exerted upon disease; but I am able to state that the apparatus has contributed not a little to the comfort and welfare of the patients under my observation, who have had the benefit of it; and I do not doubt that it will be found highly useful in the hygienic management of the sick, both in hospital and private practice. As conducive to the preservation of health, and as an article of comfort or luxury, especially in the summer season, it must be desirable for persons not affected with disease.

AUSTIN FLINT, M. D.,

Professor of the Principles and Practice of Medicine, Bellevue Hospital Med. College.

R. Ogden Doremus, Professor of Chemistry and Toxicology in Bellevue Hospital Medical College, and Professor of Chemistry and Physics in the New York Free Academy, has not only spoken favorably of this apparatus in his lectures in those institutions, but has kindly furnished us the following very valuable letter:

NEW YORK, *January* 22, 1866.

MR. LYMAN—*Dear Sir,*—Convinced of the hygienic importance of your simple but effective invention for purifying the air of our rooms, I venture to depart from my usual custom in such matters, and will briefly express my opinion of the necessity and value of such an instrument.

The amount of disturbance in the nice adjustment of the gases of the

atmosphere, produced by pulmonary and cutaneous respiration, being a matter of serious importance, has been repeatedly determined by Chemists and Physiologists in every civilized nation.

The average result of experiments, conducted in various ways, demonstrates that a person of ordinary size consumes from 15 to 25 cubic feet of oxygen gas each day—and in the same period expires from 13½ to 22 cubic feet of carbonic acid—together with vapor of water (from 9 to 18 oz.), ammonia and certain odoriferous substances, the result of organic decomposition, which though in small quantities are very deleterious. The most bulky portion of the air, the nitrogen, enters the system and escapes from it without chemical change.

These exhalations vary with the purity, temperature, pressure and degree of moisture of the atmosphere; consequently, with the season of the year, and at different periods of the day; also, with the age, size and sex of the person; with the nature of the solid and liquid nutriment and stimulus; whether before or after eating or drinking; whether asleep or awake, in a state of muscular or mental activity, in health or in disease.

Another source of contamination, grossly neglected by us all, is the carbonic acid from the materials used in producing artificial light.

An Argand lamp, burning sperm oil, evolves three cubic feet of carbonic acid gas each hour, equivalent to the expiration of said gas from five persons in the same time.

An ordinary gas jet, consuming five cubic feet of illuminating gas per hour, produces a little more than five cubic feet of carbonic acid, representing the quantity of carbonic acid exhaled by nine persons of varying sizes.

We can thus approximately estimate the relative amount of contamination of the air (as regards carbonic acid) produced by human respiration, or in the consumption of coal gas, if we multiply the number of burning jets by nine.

Illuminating gas would abstract more oxygen from the air, for it produces a much larger amount of water by the combustion of its hydrogen than does the human being. The greater part of the moisture discharged from the skin and lungs is derived from the food and drink: (many Physiologists assert that we have no definite proof of the combustion of hydrogen in the body:) whereas a pound of coal gas, when burnt, yields 2·$\frac{7}{10}$ths lbs. of water—$\frac{8}{9}$ths of which is oxygen.

Additional impurities are poured into the air from this source, according as greater or less care is bestowed in fabricating the gas, such as ammoniacal and sulphurous compounds.

The atmosphere of our large cities is largely contaminated with unclean exhalations from the streets, sewers, etc., as well as from the numerous factories, which too often are diffused in it to a disgusting point.

In many of our houses the organic impurities, brought in contact with the hot surfaces of the furnaces so often employed in the winter season, undergo decomposition, and thus impart another flavor to the air, which is anything but wholesome.

Physiologists and Chemists assert that when the atmosphere of a room contains $\frac{1}{100}$th part of carbonic acid, its inhalation is injurious to health—when contaminated to the extent of $\frac{1}{10}$th, it will speedily prove fatal. The organic matter, likewise, though in comparatively small quantities, is esteemed by many as more poisonous than the carbonic acid.

Your ingenious device provides a series of layers of quick-lime, and a thick stratum of charcoal, through which the air is made to circulate, partly by the heat produced from the moisture combining with the lime, and more vigorously by fragments of ice placed in another part of the apparatus.

I find that the *lime* absorbs moisture and carbonic acid, also compounds of sulphur and organic matter, which it decomposes, and mechanically it filters out many other impurities.

That the *charcoal* also abstracts not only the substances mentioned, but destroys by oxydation the ammoniacal, sulphurous and organic compounds:

That, finally, the *ice* serves not only to provide a moderate current of cool air, thus purified, but acts as a *corps de réserve*, to absorb impurities which perchance may have escaped the other guards, at the same time yielding a small amount of moisture to the air.

In the sick-room I have found your invention of great value.

Though Chemistry has not completed its list of evil spirits, ghosts, or gases, which oftentimes produce diseases, and are in turn produced by them, nevertheless, we know of means by which they may be robbed of their virulence.

Your Purifier does not generate the "vital air," oxygen, yet it is efficient in removing the ill-odored gases, as any can testify who try it, and in destroying many of those more poisonous emanations which are not to be recognized by the senses. It must necessarily, therefore, be of great service for the preservation of health, and an efficient aid to the Physician in coping with disease. By modifying the materials through which the air circulates, it could be adapted to many varying conditions of the patient.

R. OGDEN DOREMUS, M. D.,

Prof. Chemistry and Toxicology, Bellevue Hospital Med. College, and Prof. Chemistry and Physics in Free Academy.

The following article by Dr. David Prince, of Illinois, is from the last number (Feb., 1866,) of the *Medical Examiner* of Chicago, edited by Dr. N. S. Davis :

" Upon the subject of ventilation, there is evidence that the world moves. The problem has been, how to secure the comfort of a home with the purity of outdoor air. It has been supposed that this was the utmost possible attainment. More than this has been achieved. It has been found practicable to make an artificial mountain air without its rarity.

" Mr. A. S. Lyman has, through twenty years of study and experiment, finally perfected an arrangement of chemical agents, so as to deprive the air of all its impurities and make it equal to that found above the influence of emanations from the surface of the earth.

" The expedient consists in passing air over unslaked lime, which absorbs carbonic acid and some water and organic impurities, and elevates its temperature, giving it a tendency to rise. It then passes through fresh-burned charcoal, losing most of the impurities which the lime had not taken up. The purified air then ascends to the top of the apparatus, and, turning to descend, it passes over ice, which cools it and accelerates the current, which next passes out through orifices in which the current is divided up by wire screens, so as not to blow in one compact current. This apparatus is the head of a bed, or the back part of a desk or bookcase, or, on a larger scale, it is a part of a system of ventilation of a whole house.

" When the apparatus is part of a bed, the sides of the bed are made high enough, either by curtains or the arrangement of the wooden frame-work, so that the cooled and purified air flowing in, at the head of the bed, does not flow immediately off upon the floor, but accumulates upon the patient or sleeper, covering and immersing him thus in a bath of cool pure air.

" For the greatest benefit of this expedient, when applied to a desk, there should be a tight enclosure for the reader or writer to sit in, which becomes filled higher than the top of his head, so that, in the impure air of a city on a hot summer's day, he may sit in and breathe a chemically pure atmosphere, reduced to a temperature compatible with vigorous mental activity.

" Other substances may be used for the purpose of taking impurities out of the air, but Mr. Lyman, from numerous trials, has come to prefer fresh-burned lime, fresh-heated charcoal, and ice. In winter time, the ice is a less essential part of the ingredients, but in hot weather, the cooling of the air is a source of health and comfort which all can appreciate.

" The principle of purification applies to the air of marshy regions occasioning ague, to general impurities of air, arising from all the innumerable kinds of decomposition in cities, favoring whatever epidemic may be impending, whether erysipelas, cholera, or dysentery, and to the air of crowded

rooms, and the wards of hospitals generating typhus and typhoid fevers, and imparting to wounds erysipelas, diffuse suppuration, and gangrene, and where the bone is involved in injury, ostitis and osteomyelitis ; generally contaminating the blood with the poison absorbed with decomposing fluids, and involving the whole system in the low fever of pyæmia.

" The infection of air contaminated with the decomposing organic exhalations from the lungs, or from pus and blood in a state of decomposition, is no less destructive to puerperal women who are very much in the condition of persons recently wounded, and who are subject to the same accidents of local and general poisoning through the contact of decomposing fluids and of air loaded with fœtid gases and floating cells and scales, ready, like spores, to produce their like wherever they may alight.

" The device of Mr. Lyman secures for patients a pure air to breathe, and in which to lie, but another *desideratum*, not yet fully realized, is an arrangement by which the expired air and other emanations of patients with infectious diseases shall be carried directly away without contaminating the air of the room in which they lie, thus affording protection to physicians and nurses who must sit or move about in the room.

" It will be gratifying to the medical profession and to all philanthropists to know that Mr. Lyman proposes to make his invention free of any charge for patent right to hospitals maintained for the benefit of the poor.

" Some beds with the purifying attachment have been in operation, during the winter, at Bellevue Hospital, to the very great satisfaction of those who have watched the progress of the cases submitted to the influence of the purified air.

" It is an old story in hot weather, in the progress of an epidemic, ' If the weather would only change—if the wind would only blow from the northwest, we should have an improvement in the patients.' It will certainly be a boon to mankind, and especially to all sick persons, to have the means of changing the weather, and, for the space of a few feet, of producing a northwest wind, as pure and as bracing as any that was ever manufactured in the laboratory of the heavens.

" A new era in hospital construction will have dawned, when plans shall have been adopted to give them a purer atmosphere than exists in the free breezes outside. That this has been the desire of all who have investigated the subject, any one can see who reads a few pages, at random, upon what has been written upon hygiene during the last twenty years. I cannot do better than to quote a paragraph from Dr. Krackowizer, from the *Bulletin of the New York Academy of Medicine*, Vol. II., 1865, p. 438 :

" ' If, then, physicians look with a certain awe and resignation upon the ravages of pyæmia, it is not because they know less of its causes and of its nature than of other diseases, but because they see plainly how the cause

might be removed, yet, under certain circumstances, are denied the means to prevent the disease.

"'It is bad enough that the surgeon and the obstetrician find inherent difficulties in the treatment of wounds, in the management of abnormal labor, that they cannot help sometimes making mistakes in choosing the times for operations and in performing them; but it is discouraging to have to take an element into the calculation, in performing one's professional duty, that neither lies in the nature of the case, nor can be warded off by any degree of scientific acumen or professional skill.

"'The preventive hygienic treatment goes before everything. If the sums spent all over the world for every sort of medicine in healing pyæmia—quinia included—could be accumulated in a fund wherewith to build a hospital in some part of the world, so perfect in its hygienic arrangements that pyæmia in it would be impossible, more would be done for diminishing its ravages, than by all the attempts to heal patients when they once are its victims.'

"Dr. Krackowizer truly says, 'the *preventive* hygienic treatment goes before everything.' According to Dr. Hammond (in his *Military Hygiene*, p. 426,) the amount of carbonic acid in the military hospitals which were found in the best condition, was considerably above that in the outdoor air. While outside there were $\frac{37}{100}$ of a part in 1000 part, there was in those in which there was the least attention paid to ventilation, $2\frac{11}{100}$ parts by volume in 1,000 volumes of air.

"Leblanc found in one of the wards of the Salpetriere, 8 parts of carbonic acid in 1,000 by weight, or $5\frac{33}{100}$ by volume, in 1,000 volumes.

"Dr. Hammond expresses the opinion, that 10 parts of carbonic acid in 1,000 volumes air, renders it altogether unfit for respiration, and that a smaller amount must be unhealthy in proportion. But it is probable that the organic material proceeding from the lungs and cutaneous surface is far more injurious than carbonic acid. Quoting from *Hammond's Hygiene*, p. 168: 'When we enter a room in which many persons are contained, we are struck at once by the oppressive character of the air. That this is not altogether due to the presence of carbonic acid, is very apparent from the peculiar odor evolved. The same is true of a chamber in which one has slept, and which has not yet been purified by ventilation; or of a bed which has been lain in.'

"At St. Cloud, it was noticed, a few years ago, that there was an annual visitation of typhoid fever in connection with doubling the number of soldiers in the barracks, on the annual visits of the King. (*Hammond's Hygiene*, p. 428.) Medical literature is full of such instances of the origin of disease in overcrowding, especially in court-rooms, when constructed, as they formerly were, without any reference to the necessity for fresh air to breathe.

"It may not be always practicable to have the freedom of out-door air, but it is now practicable for all sleepers, sick or well, in hospitals or private dwellings, to have air that is as good as out-door air, and sometimes a great deal better."

From the Scalpel, Vol. XII., No. IV., just issued, March 15, 1866.

"Is it True that so Many of our Children Die from '*the mysterious Providence of God?*' Art. LXIX.

"No subject of more vital interest can present itself to the mind of a medical man, than that of the impure condition of the air which he usually finds in his patient's chamber; and the mother, when she sees her female children pining away and refusing their wholesome food, and calls to mind the condition in which she finds the air of their sleeping-rooms on entering them in the morning, it would seem, should begin to suspect it as the cause of their condition. In the leading article of our last number, we have said: 'Air is the first and last want of man; his first sigh and last gasp attest its power.' It is THE LIFE-GIVING ELEMENT. Our food cannot add a single grain to the weight of bodies or stimulate even the heart and lungs to perform the very action which vitalizes the blood and makes it plastic and reparative, till it has *first passed through the lungs.* Nature has, therefore, so carefully insured this great result, that she sends the only vessel which conveys the liquid food, or chyle, into the great VEIN that penetrates every particle of both lungs, and conveys it to every air-cell by myriads of its branches. Had she thrown this into an ARTERY, it would then have gone the rounds of the body UNVITALIZED by the air, and could not have added a grain of weight to the body, or repaired any injury that might exist from disease or accident.

"The lungs DECARBONIZE the blood or throw off the carbonic acid imbibed from the entire body by the blood that has been used to make it grow, or repair its waste; this passes through the heart at the rate of two ounces or thereabouts each inspiration, so that all the blood of the body is decarbonized every ten minutes at the furthest. All this carbonic acid is thrown out into the sleeping-room; it is, when concentrated, destructive to life: yet, if not removed, it must be breathed again.

"In the first article of our last number, we have taken up the subject of the diseases of the feeble girls and children, which are so numerous in this country; these we pronounced to be chiefly produced by want of pure air acting on a feeble constitution. And in this number we have declared cholera to be developed by the atmosphere poisoned by carbonic acid and the animal exhalations of the body.

"Florence Nightingale, that rare spirit, who combines the vigor of a philosopher's mind with the gentleness and charm of a true woman, says in

her book on nursing: 'The very first canon of nursing—the first and the last thing upon which a nurse's attention must be fixed, the first essential to the patient, without which all the rest you can do for him is as nothing; with which, I had almost said, you may leave all the rest undone—is to KEEP THE AIR HE BREATHES AS PURE AS THE EXTERNAL AIR, WITHOUT CHILLING HIM.'

"In the ordinary bed-room the expired carbonic acid is re-inhaled, together with ammonia, and other impurities thrown off by the exhalations. When the night air is let in, it is more or less impure, often very foul from the sewers, and damp.

"Mr. A. S. Lyman, of this city, has invented and patented a scientific bedstead, for the purpose of purifying the atmosphere of sleeping-rooms, and explained it to the satisfaction of our best medical men. They are now in use in the families of those gentlemen, and in our public hospitals. Professors Doremus and Flint, have pronounced them admirable in their results, and we are convinced the views of these gentlemen are correct. We propose to use them ourselves as soon as we can be supplied. Having thoroughly examined the Air Purifier, we give it our cordial approbation. Mr. Lyman has given the subject of the purification of the air twenty years' thought, and this invention shows it.

"In this beautiful bed the person sleeps in a reservoir, supplied by a constant current of air which has just been purified by being passed alternately through filters of lime, charcoal, and ice. These filters are in an apparatus which in outside appearance is merely a large head-board to the bed. This apparatus, or head-board, is about six feet high, and lengthens the bed about one foot. There are two forces at work, either one of which will produce a current without any machinery. The lime on the lower shelves condenses moisture and carbonic acid; this generates heat, rarefies the air, and causes it to rise upward through a deep filter of charcoal and an ascending flue to the metallic top of the apparatus, through which it gives off, to the outer air above, its extra heat. From this it flows over through ice, which cools it more or less, as more or less surface is exposed, and accelerates the current down the cold-air flue and delivers it between the pillow and head-board of the bed. The lime not only condenses moisture and nearly one-fourth of its weight of carbonic acid gas, but decomposes sulphureted hydrogen, sulphuret of ammonia, and filters out and destroys other impurities. The charcoal also absorbs carbonic acid, and destroys by oxydation any other animal exhalations or decomposing matter which may be floating in the air, perhaps the germ of cholera or other infectious disease. The water from the melting ice, also condenses sulphureted hydrogen and almost any amount of ammonia that may be brought in contact with it. It is indeed perfectly philosophical."