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No. I.

ARTICLE I.—*Outlines of Moral Science*, by Archibald Alexander, D. D., late Professor in the Theological Seminary at Princeton, N. J. New York: Charles Scribner, 1852.

THIS treatise, although published after the death of its lamented author, had been fully prepared for the press by him while living, except in a few unimportant details, in the final revision of which he was arrested by his last sickness. It was, however, so far completed by him, that he instructed his sons to give it to the world, and empowered them to make all necessary literary corrections—a liberty which they scarcely found occasion to use. It differs, therefore, from most posthumous publications, in being published by the direction, and upon the responsibility of the author. It exhibits his thoughts on the momentous topics treated in it, in the form in which he has chosen to present them to the world. It is, in every sense, Dr. Alexander's work, and sets forth those ethical teachings for which, with death and heaven immediately in view, he stood ready to be held responsible, not only at the bar of human criticism, but at the tribunal of God. This is not often true of posthumous publications. We doubt whether it was true of President Edwards's posthumous work on one important branch of the subject, his "Dissertation on the Nature of Virtue;" a

Art. VI.—*The Ventilation of Churches.*

The Uses and Abuses of Air; showing its influence in sustaining Life, and producing Disease; with remarks on the ventilation of houses, and the best methods of securing a pure and wholesome atmosphere inside of dwellings, churches, court-rooms, workshops, and buildings of all kinds. Three parts in one. New York: J. S. Redfield, 1849.

The subject of this treatise is justly exciting great and increasing attention. But there are few who yet appreciate its great importance. It needs and it is destined to be urged upon the public mind in popular treatises, tracts and lectures, before it will command the consideration it merits. We welcome this volume, of which Mr. Griscom, of New York, is understood to be the author, as a valuable contribution to this important object. The main positions of his book have, of course, been long familiar to scientific men. His aim is to popularize them, to make them understood and felt by the people. And we think the effort is timely, judicious, and successful. He sets before the reader an array of well-selected facts and illustrations, which cannot fail to enlighten and impress the dullest mind.

People have displayed a singular apathy in regard to the evils and mischiefs of bad air; and whoever now undertakes to introduce the subject to those who have never examined it, confronts an incredulity, which is as obstinate as it is discouraging. There is a reason for this. The air is an impalpable substance, and its qualities, whether salubrious or malignant, are ordinarily imperceptible to those who inhale it. Those, indeed, who pass from the pure outer air to an ill-ventilated or crowded room, will unavoidably perceive the difference. But those who have been constantly breathing vitiated air, are insensible to it, except as they suffer a certain indescribable languor and depression caused by it. Not only so; but the diseases induced by bad air, are gradual, stealthy, and insidious in their progress. They do not attract notice till they are rooted, too often incurably, in the system; and when they are thus fastened upon us, their real cause is seldom suspected.

Men are slow to believe that any poison lies hidden in the air they breathe, or that any artificial appliances are necessary to improve the atmosphere. It is true, that the air in its normal state, in which God has supplied it to us in boundless profusion, cannot be improved. All that is needed is, that we secure a bountiful supply of this pure element for the use of our own lungs, and that we provide sufficient means for displacing, or cleansing, such as has been corrupted from its original purity.

This subject deserves a place in our Journal, not only because educated men, such as constitute the bulk of our readers, must be the first to appreciate and begin all salutary reforms, but because in various ways clergymen have a special interest in the subject. All persons of sedentary and in-door pursuits, suffer great injury from occupying ill-ventilated apartments, in which the air is close, murky, and dead. We believe that it frequently happens, that the languor, debility, and indigestion, of which the clergy so often complain, is due, in a great measure, to the foul air which they constantly breathe in a tight, narrow room, heated by a close stove or drum, without any means of ventilation. Whoever passes from the fresh atmosphere into such a room, quickly suffers oppression and stupefaction. A still greater number, as we believe, have suffered still more severely, from conducting evening services in school-rooms and basements, in which what little air is contained between the low ceilings and floors, is quickly respired again and again by the assembly, who, aided by the lamps and fires, rapidly use up its oxygen, or vitalizing element. There is little doubt that preaching, and taxing the vocal organs, in such an atmosphere, and then exposing them in this excited and inflamed state, to the damp cold air of the night, have been a prolific cause of that scourge of ministers, the bronchitis. Not only so, but every preacher has often had painful experience of the debilitating effect of a close, dead atmosphere upon his hearers. He has seen them dull and drowsy under the most instructive discourses, the most impassioned and eloquent appeals. He has found this invincible stupor assailing and overpowering his most devout hearers in spite of themselves. He has known that the cause of this

apathy lay more in the lifeless air, than in his discourse, or the minds and hearts of his people. Bad air thus becomes a most formidible obstacle to the success of his labours and the edification of his flock. Still further, the clergy are leading friends and promoters of education. They justly take the deepest interest in schools. We believe that the bad air of nine-tenths of the school-rooms in this country works fearful injury to teachers and pupils, in body and mind, in their health, studies, manners, and morals.

In the views which we shall now submit, we shall do little more than condense some of the reasonings, statements, and facts, adduced by our author, hoping that our readers will be induced to examine for themselves, this or some similar treatise.

The first question that arises is, whether impurities in the atmosphere, perceptible or imperceptible, are noxious or harmless to those who inhale them. General facts, familiar to all, sufficiently answer. They show, beyond all doubt, that the atmosphere is often loaded with poisons impalpable to the senses, known only in the fatal consequences to those who inhale it. Ship-fever, jail-fever, yellow-fever, are most clearly owing to the state of the air in which they always originate and spread. It would be easy to show that the same is largely true of the typhus, puerperal, and all the worst fevers which scourge our race. The best safe-guard against them is good air and regular habits; the most effective antidote to their power and contagion is a reasonable ventilation of the rooms of the patients. The same is true of any epidemic or contagious disease, every kind of plague or pestilence. We know that their contagiousness is immensely aggravated in filthy localities, and unventilated apartments; that their ravages are slight among well-regulated people, and in clean, salubrious localities; that the most efficacious sanitary measures adopted to guard against them, consist in the removal of all deposits of filth, all stagnant waters, and in disinfecting the air of all miasms generated by decaying animal and vegetable matter. This is about the only antidote to the cholera in which medical practitioners are as yet agreed. Not to dwell at length on this branch of the subject, the comparative salubrity of coun-

try and city in summer, when the high temperature evolves in greater abundance and energy the noxious gases which in other circumstances lie dormant in the accumulated filth of cities, proves conclusivelely that a polluted atmosphere is a prolific cause of disease and death. When we see the pale and sickly children of the metropolis at once made hale, ruddy, and buoyant, by passing a few weeks in the country, the necessity of a pure unadulterated atmosphere to health and vigour is put beyond all dispute.

The next question that presents itself is, whether air is vitiated, or deprived of its salubrious properties, by being repeatedly respired. Here the evidence is more palpable, although less regarded, than in the cases of malaria and infection to which we have already alluded. It is only necessary to enter a room unventilated, which has been for any time occupied by a number of persons, or a dormitory before the air has been changed in the morning, to have the evidence of our senses that the atmosphere is deadened, and unfit for respiration. No possible cause for this can be assigned, but that it has been breathed over till its vivifying properties have been exhausted. And here our senses simply corroborate the results of the most rigid scientific analysis.

It is not our intention to go into any scientific disquisition on this subject, further than to present some of those first rudiments which are requisite to any just practical view of the subject.

Common air is well known to be a compound gas, made up one-fifth of oxygen and four-fifths of nitrogen. Of these, so far as is yet known, nitrogen possesses no decidedly active qualities, and serves principally as a diluent of the oxygen, which is the great vitalizing element taken into the lungs in respiration. This is a most powerful agent. If it be inspired in larger or smaller proportions than it has in common air, it produces derangement of the animal functions. If there be a lack of it, the result is languor, lassitude, and nervous irritability, such as are induced by the atmosphere of a crowded room. If there be an excess of it, it stimulates the pulse, the lungs, the brain, all the animal functions, to a preternatural activity. An illustration of this is found in the strange and

hazardous exhilaration caused by inhaling nitrous oxide gas, which contains one proportion more of oxygen than the atmosphere. This then is shown to be the great sustainer of life, since, in the proportion in which it is found in the atmosphere, it keeps the vital functions in equable and healthful operation; while by any excess of it they are over-driven and over-worked; in the lack of it, they languish; and in the utter absence of it, they die.

The manner in which the oxygen of the air vitalizes the system is, by combining with the carbon of the blood, which it meets on entering the lungs. This carbon it thus detaches, and, by combination with it, forms a new gas, which is expired by the lungs in place of the oxygen they inhaled. The gas thus formed and thrown out is carbonic acid gas, one of the most poisonous and deadly in nature. It is precisely the same which is produced by burning charcoal, the carbon of which combines with the oxygen of the air, in order to its combustion. It is the same which is often found in long closed wells. Its deadly character, in these cases, all understand. It will instantly extinguish a lighted lamp, and with equal certainty, if not quite as quickly, the lamp of life. An easy experiment to test what we have said is, to invert a glass jar in a pail of water, taking care that the jar is itself filled, and through a curved tube, to breathe into the jar, thus expelling the water by the air ejected from the lungs; then closing the mouth of the jar, let it be turned up. If a lighted candle be at once let down into it, it will go out. We have seen popular assemblies convinced by this simple experiment, as to the poisonous state of the air exhaled from the lungs, when nothing less than such ocular demonstration appeared to impress them. If it be objected, that people after all live in such air, and that this fact is a refutation of such ideas, we answer, that in all such cases, the carbonic acid gas is diluted, and so mitigated in its effects, by the common air into which it is thrown. This does not prove that it has not a deadly tendency and influence, although it be not sufficiently concentrated to kill outright. That it has not been fatal in many instances, has been due rather to crevices, and key-holes, and broken panes of glass, letting in some stray currents of fresh air, than to any intelligent provision

to ward off its baneful effects. Beside the carbonic acid gas exhaled from the lungs, a watery vapour is also ejected by them, which readily displays itself when we breathe out of doors in a dry cold morning, or as it is condensed in wind instruments, or on the windows of a crowded room. Whatever may be the cause of this aqueous exhalation, the fact that it is made, proves that it is important to the health of the lungs, that they encounter no obstruction which prevents their relieving themselves of it. For this purpose, it is requisite that the atmosphere we breathe should have its natural, normal dryness. If it be damp, it carries as much moisture to the lungs as it should remove from them. This accounts for the oppression which we ordinarily suffer from undue dampness in the air. The like oppression is experienced when air from the frequent respiration of it becomes unduly saturated with moisture. From these causes combined, air that has been repeatedly breathed over, becomes in the highest degree deleterious to health.

In regard to the amount of air requisite for the healthy working of the human functions, we quote the following from Mr. Griscom:

"The amount of air required by a human being, varies according to circumstances; the mature and robust requiring more than the weak, infant, or aged—the male more than the female. Also, under all circumstances, more is used during the day than at night—in health than in sickness—in a high temperature than a low—during muscular exercise than at rest —after a meal than when hungry—when the attention of the person experimented upon is drawn to the function of respiration, than when he is unconscious of its performance. These modifying circumstances, lately discovered by Prout, Edwards, and others, were, altogether or in part, overlooked by Black, Priestley, Lavoisier, Davy, and the earlier experimentalists, on this important point; and hence the discrepancy in their calculations, and the difficulty of coming to correct results at the present day. The point of greatest practical utility is not, however, disputed: when air contains above one-half per cent. of carbonic acid, it may not be immediately, or rather palpably, injurious to the organism, but it is eventually so; while,

on the other hand, if it contains above seven or eight per cent., it will prove suddenly fatal. According to some, three or four feet of pure air per minute is sufficient for a proper aeration of the blood. Others, though they admit that this quantity might possibly be endured for a considerable time, without any well-defined deterioration of constitution, contend that this circumstance is no proof of its sufficiency, and advise at least ten cubic feet per minute for each individual. It was observed in the British House of Commons, that any less than ten feet was soon noticeable on the health of the members; and they even expressed feelings of discomfort, in a high temperature, with any less than forty or fifty. According to the most reliable experiments and calculations, it is found that ten cubic feet is a fair standard to test the sufficiency of an atmosphere inhaled; as no smaller quantity is capable of removing all doubts as to the latent and eventual evils of a deficiency.

"Let us suppose the case of a school-room, containing 10,000 cubic feet ($50 \times 20 \times 10$) of perfectly pure air (if such there be,) with two hundred pupils. To each of them will be allowed ten cubic feet of air per minute. To avoid every chance of exaggeration, and to adapt the calculation to age and size, no deduction will be made for the pupils themselves, or for their seats, desks, furniture, books, &c., all of which substances do displace an equal bulk of air, and by so much reduce the quantity actually in the room.

"According to these premises, there would be fifty feet for each pupil; and supposing that there existed no communication with the external air (which would generally be the case if the doors and windows were closely shut), the air of the room would be rendered unfit for respiration by the carbonic acid alone, without including the other exhalations, *in just five minutes.* Or in other words, the pupils would, at the end of five minutes, begin to inhale, again and again, the excrementitious matter from their own and one another's bodies. Again, suppose, with Liebig, that ten ounces of solid carbon would be excreted from each of their bodies in twenty-four hours—at the end of one hour, eighty-four ounces, or seven pounds troy, of this poison, would be held in solution in the air of the room, and be constantly going the round of the circulation, sowing

the seeds of death. These seven pounds of carbon would, in an hour, form one hundred and seventy-six cubic feet of carbonic acid, which implies the removal of one hundred and eighty feet of oxygen. And as the oxygen originally amounted to (as 80 : 20 : : 10,000 : 2500) twenty-five hundred cubic feet, this gas would (supposing the circumstances favourable for its combination with carbon) be entirely exhausted in fourteen or fifteen hours. But as the accumulation of carbon in the atmosphere of the room, impedes the excretion of more from the beginning, and as this substance is as fatal to life when retained as when inhaled, many of the pupils would not be living, a long time before the entire removal of the oxygen.

"It may be objected that cases such as the above seldom occur. Admitted; but this depends upon the fact, that there are generally broken panes,* keyholes, or crevices of some kind, through which there is an ingress for the fresh, and an exit for the impure air; and it is true, that when there is a certain amount of ventilation, there is a limit to the concentration of carbonic acid. This circumstance, however, instead of divesting impure air of its terrors, in reality enhances them, as the inmates are thus lulled into a false security, whose deceptiveness is only discovered, if it ever is, when the seeds of disease which have thus been sown, germinate and ripen into fatal maturity." pp. 66–68.

In order to illustrate principles, especially to the conviction of the incredulous and indifferent, it is often necessary to take strong and rare examples. In proof of the injurious and destructive effects of breathing over the air of an apartment, which allows of no renovation of it by fresh supplies from without, it is barely necessary to refer to the horrible mortality which prevails in slave ships, and which sweeps away a large proportion of the wretched creatures who are crowded into the unventilated holds of vessels, in the prosecution of this infamous traffic. There are few who have not heard of "the memorable tragedy of the Black Hole of Calcutta, into which were thrust a garrison of one hundred and forty-six persons, one hundred

* How many lives have broken panes been the means of saving, as well as destroying!

and twenty-three of whom perished miserably in a few hours, being suffocated by the confined air."

The following passage, which we extract, displays not only the deadly character of the gas exhaled in respiration, but a degree of ignorance on the subject at the present time, in enlightened nations, which must be dispelled, before we can expect entire immunity from similar horrors:

"The steamer Londonderry, Captain Johnston, left Sligo, at four o'clock on Friday evening, December 22, 1848, for Liverpool, with about one hundred and ninety steerage passengers—emigrants—on their way, via Liverpool, to America, and two or three cabin passengers. As she proceeded on her voyage, the weather became exceedingly foul, and after midnight, the wind rose to a perfect gale. About one o'clock that night, or rather Sunday morning, it was deemed expedient to put the steerage passengers below, and the order was executed, not, we understand, without some resistance on the part of many of them.

"Most of our readers are probably acquainted with the dimensions of a steerage cabin of an ordinary steamer—a compartment rarely more than eighteen feet long, by ten or twelve in width, and in height about seven feet. Into this space, ventilated only by one opening, the companion, one hundred and fifty human beings, as we have been informed, were packed together. The steerage being thus occupied, it was next, as we alleged, feared lest the water should get admission through the companion, and this—the only vent by which air could be admitted to the sufferers below—was closed, and a tarpaulin nailed over it, thus hermetically sealing the aperture, and preventing the possibility of any renewal of the exhausted atmosphere.

"The steamer went on her way, gallantly braving the winds and waves, unconscious of the awful work which death was meanwhile doing within her. In the darkness and heat and loathsomeness of their airless prison, its wretched inmates shrieked for aid; and there were none to hear their cries amid the boisterousness of the storm, or if they were heard, none sagacious enough to interpret the dreadful meaning they meant to convey. At length, one man—the last, it is said, who had

been put down, contrived to effect an opening through the tarpaulin of the companion, and pushing himself out, communicated to the mate that the people in the steerage were dying for the want of air. The mate instantly became alarmed, and obtaining a lantern, went down to render assistance. Such, however, was the foul state of the air in the cabin, that the light was immediately extinguished. A second was obtained, and it too was extinguished.

"At length the tarpaulin was completely removed, and a free access of air admitted. When the crew went below, they were appalled by the discovery that the floor was covered by dead bodies to the depth of some feet. Men, women, and children were huddled together, blackened with suffocation, distorted by convulsion, bruised and bleeding from the desperate struggle for existence, which preceded the moment when exhausted nature resigned the strife. After some time, the living were separated from the dead, and it was then found that the latter amounted to nearly one half of the entire number. Seventy-two dead bodies of men, women, and children, lay piled indiscriminately over each other, four deep, all presenting the ghastly appearance of persons who had died in the agonies of suffocation. Very many of them were covered with blood, which had gushed from the mouth and nose, or had flowed from wounds inflicted by the tramping of nail-studded brogans, and by the frantic violence of those who struggled for escape. It was evident that, in the struggle, the poor creatures had torn the clothes off each other's backs, and even the flesh from each other's limbs. Nearly all of the steerage passengers were poor farmers, from the neighbourhood of Sligo and Ballina, with their families, and many of the dead were naked from poverty.

"An inquest was held on one of the bodies, and the jury returned the following verdict:

"'We find that death was caused by suffocation, in consequence of the gross negligence and total want of the usual and necessary caution on the part of the captain, Alexander Johnston, Richard Hughes, first mate, and Ninian Crawford, second mate; and we therefore find them guilty of manslaughter; and we further consider it our duty to express, in the strongest terms, our abhorrence of the inhuman conduct of

the remainder of the seamen on board on the melancholy occasion, and the jury beg to call the attention of proprietors of steamboats to the urgent necessity of introducing some more effectual mode of ventilation in the steerage, and also affording better accommodations to the poorer class of passengers.'" pp. 169–171.

While this illustrates both the deadly quality of the gases thrown out in respiration, and the dangerous ignorance which prevails in relation to the subject, it is of course seldom that the poison exists in so concentrated a form as to be immediately fatal. If such occurrences were common, they would be their own cure. Yet it is certain that such a poison cannot be constantly inhaled in smaller than fatal proportions, any more than arsenic can be taken in less than fatal doses, without most deleterious consequences. And there is often a much nearer approach to the point of suffocation in the deteriorated air of a crowded room, than is commonly supposed. An eminent chemist of Scotland, took away a bottle of the air in a church when it had been filled with a crowded assembly during a religious service of the usual length. He found that a fly immersed in it could scarcely live. The Hon. Ira Mayhew, superintendent of public instruction in the State of Michigan, relates, that an evening meeting held in a school-house in that State was broken up before the regular conclusion of the services, because, as the people said, "we all began to feel sick, and the lights went almost out." He adds, they little suspected that the light of life was as nearly extinct as that of the candles.

The injurious effect of breathing air vitiated by carbonic acid gas, in proportions not immediately fatal, is gradually to impair the vital functions, corrupt the blood, and ultimately to induce disease, either chronic or acute, according to the predisposition of the patient. Our author shows by a large induction of well authenticated facts, that it is a powerful cause of some of the direst distempers to which our race is subject. As it acts immediately on the lungs and blood, it must of course tend strongly to generate all diseases connected with the respiratory, circulative, and digestive functions. And what diseases are not connected with them? We should be

glad, if we had space, to present the well concatenated array of facts and arguments by which a large proportion of the consumption, scrofula, and indigestion which afflict men, are traced to this source in this treatise. This indeed is not always, perhaps not generally, the only cause of these and other diseases to which it contributes. But, beyond all doubt, it accelerates and aggravates the action of other causes.

If these views are not wholly erroneous, they open up a wide sphere for sanatory reform in the construction, or at least in the prevalent arrangements for supplying pure air to churches, halls, lecture-rooms, school-houses, manufactories, ships, steamboats, barracks, railway cars, omnibuses, sick-rooms, hospitals, nurseries, dormitories, the cellars, shanties and garrets, which are so often the only abodes of the poor, to say nothing of ordinary dwellings. And we have no doubt that the subject is destined to command the attention of philanthropists, artizans, and men of science, until the evil in question is greatly abated, if not wholly removed: and the awkward, and often impracticable, expedients for ventilation, now in use, give place to those which are so cheap, tasteful, and effective, as to ensure general acceptance and adoption.

We cannot forbear to quote from our author a passage showing the disastrous effects of the prevailing practice of muffling, not to say smothering, infants.

"In a hospital in Dublin, between the years 1781 and 1785, no less than 2,944 children out of 7,650 died within a fortnight after their birth. This was more than one in three. Dr. Clark, the physician, suspecting the cause to be a want of air, contrived to introduce a full supply of this important element, by means of pipes, six inches in diameter, into all the apartments. The consequence was, that during the three succeeding years only 165 out of 4,243 children died within the first two weeks, or less than one in twenty-five. What a surprising difference! Is there a doubt that of the first number of deaths we have mentioned, about 2,650 died for want of pure air?"

He argues that these facts warrant the conclusion that some 50,000 children under five years of age die annually in the United States, in consequence of being deprived of the pure, unadulterated air of heaven!

The following is a specimen of a large number of cases cited in the book, mostly gathered from the testimony of eminent English physicians to the Commissioners for inquiring into the state of large towns and populous districts in England.

"Many instances are on record where the progress of an epidemic has been suddenly stopped by ventilation. 'When I visited Glasgow,' says Dr. Arnott, 'with Mr. Chadwick, there was described to us one vast lodging house, in connection with a manufactory there, in which formerly fever constantly prevailed, but where, by making an opening from the top of each room through a channel of communication to an air-pump, common to all the channels, the disease had disappeared altogether. The supply of pure air obtained by that mode of ventilation, was sufficient to dilute the cause of the disease, so that it became powerless.' " pp. 81, 2.

The physical evils, however, vast and deplorable as they are, which result from breathing corrupt air, are of small moment in comparison with the moral and mental degeneracy induced by it. Such are the mysterious reciprocal influence and sympathy of mind and body, that all influences which permanently depress the one, almost necessarily injure both. This is especially true of air vitiated by repeated respiration. By deteriorating the blood, it of course assails the brain, which is supposed to receive about one-fifth of the blood of the whole body, and is therefore dependent upon the healthy condition of that blood for its own healthy action. It of course tends to disturb and vitiate those mental operations which, in their turn, are mysteriously connected with and dependent upon the brain. Indeed the first ill effects of vitiated air, of which we are ordinarily sensible are, a certain languor, laziness, and insuperable inertness of our mental faculties. Of this our readers have all had some experience in schools, churches, court-rooms, and in close, small, unventilated studies, which shows conclusively that the brain suffers at once from inspiring the poison of foul air. If then such air be constantly inhaled through life, must it not tend to debase the moral and intellectual man? Moreover, if the mind requires good air in order to any healthy vigour and activity, it needs it most when it is most severely tasked with labour. In hours of study, thought and medita

tion the brain needs a supply of blood most perfectly aerated and decarbonized. We are prepared then to see at least presumptive evidence of the justice of the author's positions, when he tells us that vitiated air often gives birth to, or stimulates the growth of the following hideous progeny. 1. Inaptitude for study and therefore ignorance. 2. A perversion of the judgment. 3. Intemperance in the use of intoxicating drinks. 4. It encourages vice. 5. Also pusillanimity and cowardice. 6. It produces deformity, imbecility and idiocy. We think that all careful observers must have detected some of these results, and that none will remain sceptical after pondering the facts and reasonings adduced by Mr. Griscom. No competent inspector of schools will deny that the following representation is as just and important as it is graphic. pp. 68, 9.

"Among the effects produced by remaining in an impure atmosphere, there is an almost immediate one to which the attention of teachers, and all concerned in the care of schools, should be constantly drawn; it is that condition of listlessness, languor, and irritability, so often observed in both pupils and teachers. Irritability of the nervous system, as well as dullness of the intellect, is unquestionably the direct result of a want of pure air. The vital energies of the pupil are more or less prostrated by it—he becomes restless and indisposed to attend to his books and rules—his mind wanders from his studies—and he unavoidably seeks relief for the natural appetite for air, in disorderly actions which call for reprimand from his teacher, who, from the same cause, is perhaps in the same irritable and unhealthy condition of mind and body, which must also find a vent somehow and upon something. Thus irritability grows to irritation, until it becomes a question of serious import, how far, as a corrective, or rather, preventive, of this evil, pure air would serve in substitution for the ferule, and whether the natural stimulation of oxygen would not be more easy of application and more sure of effect, than the artificial sedative of the strap.

"It has fallen to the lot of the writer to see many instances of the injurious influence of the foul air of school-rooms, both private and public, on the health of pupils, even to fatal terminations. He has seen children grow pale and thin, and gradu-

ally droop and sicken, without any cause visible to the parents, who, in their grief, have attributed all to the dispensation of an inscrutable Providence, without a thought of the true source of the calamity, until it has been (alas, too late!) pointed out to them. It were easy to cite, from actual experience, cases of sickness and death of pupils, the commencements of which were undoubtedly laid in the places, which, of all others, should be least obnoxious to the charge; the most unhappy feature of which is, that the teachers themselves are, in too many instances, ignorant of the true merits of pure air, and unwilling to admit the humiliating fact, so easily demonstrated, that the atmosphere of their school-rooms is offensive and dangerous."

There are few clergymen who will not appreciate the following extract:

"The pulpit orator, too, finds that his midnight lucubrations, manufactured while he is cooped up within the precincts of a study which is small, ill-ventilated, and hampered with books and manuscripts, will often fail to charm his audience, especially when they are nodding under the influence of the densely-carbonized atmosphere of an ill-ventilated church.

"An anecdote very illustrative of this, is related of an old Scottish pulpit orator, of a standing above mediocrity for eminence and ability, who was so mortified and annoyed at the unaccountable apathy, inattention, and drowsiness of his hearers, that he deemed it expedient to preach a series of sermons on "*The sin and shame o' sleepin' in kirkes.*" This resolution was carried out with an extraordinary fervour and force of argument, but without any appreciable effect. His lions and angels neither roused the fears, nor excited the admiration of his seemingly lukewarm flock, and the flowers of his eloquence only "lost their sweetness on the [poisoned] air." There one sat yawning with his eyes half-closed, his face flushed, head aching, and languor and mental inactivity evident on his countenance, which also indicated a partial unconsciousness of his own existence. Here another, in the corner, with his forehead lazily resting on the back of the pew before him, enjoying a rather comfortable nap, interrupted though it was by his having occasionally to raise his head, to show the pastor and those around him, that he was not absolutely sleeping.

"At last, a thought fortunately crossed the preacher's mind, that a mouthful or two of fresh air might possibly have some beneficial effect, in stimulating the mental appetite, and keeping up attention. The sexton was accordingly ordered to throw the windows partially open during the hours of service. The experiment was attended with complete success, and tended greatly to improve the understanding between the pastor and his flock." pp. 149–50.

If by this time our readers are convinced that air repeatedly respired is unfit for further respiration; that in all cases fresh air ought to be introduced in its place by some effective process of ventilation; and that the consequences of neglecting such ventilation are deplorable and alarming, our main object will have been accomplished. If they are sufficiently aroused to undertake to effect it, where it is needed, in the various spheres in which they move, they will doubtless obtain better information from other sources, as to the best means of doing it, than we have room to give, if we had the requisite knowledge. For this purpose we can safely refer them to the treatise under review, taking due care to protest, however, that as it is beyond our province to recommend this or that man's patents, so we think our author would have shown his wisdom, had he used a little more caution in one or more instances of this sort. We are sorry that a book of so much real merit and adaptation to popular wants, should weaken its own influence and circumscribe its own usefulness, by affording even a pretext for the suspicion, that it was any part of the writer's object to puff any man's wares. We will, however, offer one or two brief suggestions relative to the general principles bearing upon the subject.

All ventilation is accomplished by means of currents of fresh air passing through the apartments to be purified, which sweep out, and take the place of, the foul air. In factories, vessels, and other structures, in which steam or any powerful motor is employed to propel machinery, this motor may be attached to an apparatus for exciting currents of air, which shall produce adequate ventilation. In rooms which, like most, admit of no such fixtures, during the warm season, the windows and doors, unless they are very deficient, may usually be opened

with safety so as to replenish the atmosphere by fresh supplies from without. The great difficulty is during the cold season, when the external air is too cold to be admitted with safety unless previously warmed. It is sure that an open grate or fire-place, with a good draught, will not draw off the foul air, and so make a vacuum, which the fresh air will rush in to fill, with sufficient rapidity to keep the atmosphere in a good degree salubrious, in a room occupied by but few persons, as in an ordinary dwelling. Of old, the great fire-place did good service of this sort in school-rooms. It will not, however, adequately warm the tender youth of this more effeminate age. Moreover, on grounds of economy and convenience, the close stove, whose greatest recommendation is to be *air-tight*, has generally supplanted all other modes of warming, in kitchens, parlours, school-rooms, and churches. Of this, it is safe to say, that it allows no adequate ventilation for public, and rarely for private rooms. Every one knows the difference between the atmosphere produced by it, and that produced by an open fire or a hot-air furnace. Moreover, no open fire-place is, of itself, at all sufficient for cleansing out the impurities of the air in a crowded room. The only means yet discovered, of procuring a bountiful supply of salubrious air, of the right temperature, is to warm the room by a furnace or stove which brings in heated air from without. With this should be united some effective apparatus for withdrawing the foul air from the building. It is of little use for this purpose, merely to have an opening into the attic. That merely enlarges slightly the volume of air to be respired in the room, and so makes only a slight and momentary improvement of its quality. Nor is it of any avail merely to cool the air by letting the fire go down. Cold air (contrary to the common idea) is just as liable to be foul, as if it were hot. There should be a free entrance of warmed fresh air in one part of the room, with ejecting venti-ducts, so disposed in other parts, that this fresh air, before reaching them to make its exit, will sweep through the apartment. Thus, if the hot-air stove or furnace register be at one end, or side, or corner, the ejecting flue should be at the opposite end, side, or corner. If one of these be at the centre, the other should be at the sides or corners. The ejecting ducts

should start from the floor, and pass out above the apex of the roof. They should be controlled by registers at the top and bottom of the room, to be used as circumstances require. They may be made of wood, with an ejecting ventilator at their top, and then they will be sure to act efficiently when the wind blows. But they will be more reliable, in a still atmosphere, if they are made of brick, like large chimney flues, and have the pipe of the stove or furnace carried up through them, thus, by means of heat, creating a positive upward current, under all circumstances. Without these arrangements for the exit of the foul air, the mere process of warming, by the introduction of heated air from without, is a vast improvement upon close stoves. With these, or substantially similar arrangements, we believe that the atmosphere of our public rooms would be purged of its noxious ingredients, and become balmy and salubrious. We commend the subject to our readers, as one having not only a physical, but a high intellectual, moral, and even religious importance.

SHORT NOTICES.

Robert and Harold; or the Young Marooners on the Florida Coast. By F. R. Goulding. Philadelphia: William S. Martien. 1852. 16mo. pp. 422.

There is in this little volume for the young, a singular blending of fact with fiction, of curious and useful information with exciting adventure; such as almost tempts us to set it apart as a new species of juvenile literature. The adventures of the young Marooners are nearly as wild and exciting as Robinson Crusoe; and yet we understand the author to say, they are substantially true. The incidents of the story are adroitly arranged to bring into view a great variety of curious information, much of which is as useful as it is novel and stirring. Without, for example, once suspecting any such utilitarian or unromantic design, the young reader is led by the interest of the story, to master the best methods of treating an animal struck with lightning, or securing the accidental wound of an artery, and other such like things; to say nothing of the know-