THE SANITARY DISPOSITION OF THE DEAD.

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The problem "What disposition shall be made of the dead?" as it confronts us from a sanitary stand-point, is one around which gather very great and important interests and not a few difficulties. Ever since men became gregarious this problem has had its sphere of more or less importance. If it has long failed of recognition, through the inattention, lack of reflection or stupidity of men, the fact of the importance of the problem has existed all the time.

To the honor of the American Medical Association, it should be remembered that some of its prominent members took advanced ground at quite an early day, upon a more sanitary way of disposing of the dead than that of inhumation. At the meeting of the Association in New Orleans five years ago, a committee was appointed to consider the subject of cremation of the dead, and report at the next annual meeting. Dr. James M. Keller, of Arkansas, was made Chairman of that committee, and read his report at the meeting in St. Louis, May 6, 1886, in which he says, "we believe that the horrid practice of earth-burial does more to propagate the germs of disease and death, and to spread desolation and pestilence over the human race, than does all man's ingenuity and ignorance in every other custom or habit. Towards the conclusion of his report he adds: "The grave-yard must be abandoned. The time has come for us to face squarely the problem, how to dispose of our dead with safety to the living. And your committee has an abiding faith that you will earnestly, and at once say, that the earth was made for the living and not for the dead, and that pure air, pure water, and pure soil are absolutely necessary for perfect health. Only sceptics deny that the dead do poison these three essentials of human life." The Association, not yet fully prepared to recommend the adoption of cremation, resolved that "the report with its conclusions be referred to the Section on State Medicine." At the meeting held in Chicago, June, 1887, the committee on cremation presented another report which was again referred to the Section on State Medicine. It does not appear, from an examination of the Society's Journal, that any further report was made at its meeting last year. And therefore the matter is still in the committee. So that in discussing before this Association to-day the question of the sanitary disposition of the dead, I speak to those who are not only prepared to listen, but to a highly intelligent and scientific body, who are ready to lend their indorse-

ment to that method which may be demonstrated to avoid all the objections which lie against others, which will meet all sanitary demands, and will also have respect to those delicate and fondly cherished sentiments which a Divine Father has implanted so deeply in the hearts of his children.

The great and urgent need of an immediate sanitary reform in the disposition of our dead is, even yet, comprehended in any measure, by but very few. The masses, the *hoi poloi*, have no thought whatever of any such necessity. Hence, the few who are coming to take alarm at the situation must think and act for the many. In all thickly populated and long settled districts the dead outnumber the living. And the longer the practice of burying goes on the greater will be the proportion of those beneath the ground in comparison to those above it. All the time the dead are increasing in numbers far beyond the living. So that the oft heard expression "Gone to join the majority" is more true than poetic. Could two pictures be drawn, one showing the activity of life and all human experience on the surface, and the other depicting all that which is but from two to six feet beneath the life-teeming surface, that vast charnel-house, with the slow progress of decay in every stage, sloughing of decomposing bodies, the oözing from coffins poisoning the surrounding earth, and borne by percolation into underground water courses which feed the neighboring wells, or which issue into water-sheds like that of the Croton—in which are eighty-three cemeteries—storing in congenial soil the germs of disease, which will sooner or later, in many cases, come to the surface with epidemic-scourging; and much more, that is too disgusting to mention, could these pictures be drawn true to life and death, and placed side by side, what contemplation, what reflection would they awaken! not to speak of the shock which the contrast would produce!

Says the eminent surgeon and physician, the late Dr. Samuel D. Gross: "If people could see the human body after the process of decomposition sets in they would not want to be buried. It takes a human body fifty, sixty, eighty years, yes, even longer than that to decay. Think of it! The remains of a friend lying under six feet of ground, or less, for that length of time, going through the slow stages of decay, and other bodies all this time being buried around these remains. Infants grow up, and pass into manhood and womanhood; grow old, and get near the door of death; and during all that time the body which was buried in their infancy lies a few feet under ground in its sickening state, undergoing the slow process of decay."

The cemeteries of the city of Brooklyn occupy nearly 2,000 acres of land. An eminent physician gives it as his opinion that the prevailing

wind blowing over these corruption festering plague spots, carries the germs of typhoid fever and diphtheria to Flatbush, and swells the death-rate of that community to its present alarming magnitude.

According to the report of the French Academy of Medicine, "The putrid emanations of Pere-la-Chaise, Montmartre, and Montparnasse have caused frightful diseases of the throat and the lungs, to which numbers of both sexes fall victims every year." "Thus a dreadful throat disease which baffles the skill of our most experienced medical men, and which carries off its victims in a few hours, is traced to the absorption of vitiated air into the windpipe, and has been observed to rage with the greatest violence in those quarters situated nearest the cemeteries."

It is said that Professor Selmi, of Mantua, has discovered in the strata of air which have remained during a calm for a certain period of time over a cemetery, organisms which vitiate the air and which are dangerous to life. This was proved after several experiments. When the matter in question was injected under the skin of a pigeon a typhus-like ailment was induced, and death ensued on the third day." Experiments prove that these mephitic gases will rise to the surface through eight or ten feet of earth, and that there is practically no limit to their power of escape. In a grave-yard at Stuttgart, in which only 500 bodies were interred yearly, and not more than one in a grave, the north-west wind rendered the emanations from the dead perceptible in dwellings 800 feet distant.

It is related that a grave-digger in Italy named Pisto, went into a vault to steal the shoes from a corpse, when he was overcome with the poisonous gases and met with instantaneous death, falling on the dead body. Unger relates the case of a grave-digger going into a vault in Madrid for the purpose of disposing of another corpse, who fell down dead. Two other men who tried to save him were likewise overcome and died.

Cases similar to the above are very numerous, and have doubtless been met with in the reading of every member of the Association. The usual symptoms of the poisons are faintness and giddiness, and often suffocation. Sir Spencer Wells says that, "decomposing human remains so pollute the earth, the air, and the water, as to diminish the general health and average duration of human life." Dr. Playfair says that "the inspiration of grave-yard gases, entering the blood produces fever; communicated to the viscera, it gives origin to diarrhoea; and may be the cause of consumption."

While ammonia and offensive putrid vapors are given off from bodies decomposing in graves, carbonic acid, which makes cemetery gases so dangerous, is the largest product. Pasteur has published within a few months an account of ex-

periments he and some assistants have recently made with the soil on the tops of graves. He claims that living germs from decaying bodies reach the surface; that animals inoculated with these germs show all the symptoms, and die of the disease which proved fatal to the occupant of the grave. These germs, as well as the poisonous gases, so permeate and pollute the soil, that they find their way into the underground water-courses, and pollute much of the water used for domestic purposes. The Croton water-shed, in which there are 183 cemeteries, large and small, is a conspicuous example. Who can wonder that those who have even a slight conception of the unsanitary horrors of inhumation should bound to the opposite extreme cremation? and, not knowing of any other method, should prefer burning to burying? But, granted a method quite as sanitary as cremation, and yet in perfect consonance with the delicate sentiment, which demands for the departed dead the greatest reverence and respect, would it not be very acceptable? The most enthusiastic cremationist is a sanitarian. If, then, his demand for a sanitary disposition of the dead is as fully met by another method, which to the vast majority of people will be, for many good reasons, more acceptable, will he not be more than willing to aid in its adoption? The sanitarian will not object to being a humanitarian as well. But the mere Dictum, on the part of anybody, respecting the possibility, and even feasibility of such a plan, must, naturally enough, be taken *cum grano salis*. But, were it not so, it would be unfair to impose on anybody's credulity, or to expect the acceptance of a postulate without providing good and sufficient data.

Very happily in this instance, such data is at hand. Experiments in the desiccation of human bodies have been going on for the past two years. In a laboratory connected with one of the medical colleges in New York, an apparatus has been prepared for carrying on these experiments in an exact scientific manner. The result is procured by the use of dry air. Air-tight boxes of galvanized iron are used. After placing a body within, a glass top, the length of the box, is sealed on. At one end of the box is an induction pipe, at the opposite end a conduction pipe. The atmosphere is rendered anhydrous by the use of calcium chloride. After the humidity is extracted the dry air at once enters the box and comes in contact with the body, then passes on to a flue and through a large gas flame which is kept burning therein. A record is made three times daily of the hydrometer, at the point where the atmosphere enters the outside induction pipe; also of a second hydrometer placed at the point where the air is driest after passing over the calcium chloride, also at the point of entering the box; and of a third hydrometer placed in the conduction

pipe at a point beyond the cadaver, recording exactly the amount of moisture the air has absorbed from the body in its passage. At a more remote point in the conduction pipe an anemometer is placed showing the velocity of the air current; which current can be regulated from one hundred feet to eight hundred feet per minute, as desired. But this is only a temporary apparatus, and cannot, therefore, embrace the conditions which a properly constructed Mausoleum will contain, and some description of which must be given in order to gain any clear or correct conception of the sanitary system of the desiccation of the dead. It is needless to remark that this method is an entirely new departure from any heretofore employed for disposing of the dead. It avoids all the loathsome and revolting features of earth-burial, with its endless train of unsanitary evils, and dangers through poisoning the air, earth and water, and the storing of disease-germs liable to break out in epidemics; avoids the dangers of the unsanitary tomb, and also avoids the shock to the delicate sentiment, which shudders at the thought of the destruction of the remains of loved ones by fire; it avoids the medico-legal objection to the destruction of the evidences of crime, and is even more perfectly sanitary than the process of cremation. The tissues are deprived of moisture, leaving them in a state of complete preservation. A condition which renders a critical examination and a chemical analysis of them, at any time, a very simple and easy matter.

A great number of sepulchres are constructed together in one grand Mausoleum. The sepulchres are formed of concrete, in rows and tiers, similar to the vaults in a safe deposit bank; except where family groups or clusters are specially arranged, with sitting-rooms or parlors adjoining them. These sepulchres are to be constructed in large, magnificent and elegantly appointed Mausoleum buildings, much finer and grander than any the world has heretofore known. They may be built after any style of architecture, Egyptian, Corinthian, Renaissance, Romanesque, or in less classic forms. A building one hundred feet square will contain ten thousand sepulchres. One three hundred feet long by one hundred wide, will contain thirty thousand, or a number equalling the usual allowance for a cemetery of some ninety acres. Thus, showing a great economy in space, which is so valuable near large cities. These buildings are to be constructed of concrete throughout except the outer walls, which may be of granite, brick, vitrified brick, blocks of glass, blocks of slag, or of any time-proof and indestructible material. The sepulchres have one opening, which fronts a corridor, for admitting the body; and, when that is placed within, a plate-glass front is hermetically sealed into that opening, and this is again covered with

a marble or metallic door and made secure. There are conduits formed in the concrete, which bring dry air into the sepulchres at one end, and others which take it out at the opposite end. The air, as it passes out is no longer dry, but is laden with gases and moisture which it has absorbed from the bodies, and is now borne through conduits to a furnace, located in an annex adjacent to the mausoleum, where it passes through the fire and is purified; so that no deleterious gases or offensive odors can ever escape into the atmosphere. The air which is drawn into and passes through the sepulchres is first rendered anhydrous in a large drying room into which it is forced, and from which it is distributed to the sepulchres, where it absorbs the moisture from the bodies in its passage. By this process a steady current of dry air is pouring into and through the sepulchre, and doing its work most efficiently on its way.

Very few persons, even among chemists, are fully aware of the marvellously absorbing power of absolutely dry air, and the greedy avidity with which it seizes and appropriates moisture. When a moderate current of such air envelopes a human body in an air-tight sepulchre, constantly drawing the moisture out of the body and bearing it away, the dry air flowing in as the moisture-charged air and gases are drawn out, the process of desiccation goes steadily and rapidly forward until it is accomplished, which is done in about four months.

After the work is finished the conduits are closed. As dry air only can be in the sepulchre at the time it is closed, and as the sepulchre is hermetically sealed, and therefore, atmospheric air cannot reach the now desiccated body. Here it will repose in security and cleanliness thereafter. The body of a man who died one year ago is now lying in an apparatus at the New York University Medical College in a complete state of desiccation. Another body of an adult is now undergoing desiccation in a similar apparatus, the process having been commenced eight weeks ago.

Having witnessed experiments made in Washington, D. C., Dr. A. Y. P. Garnett, formerly President of this Association, in answer to an inquiry from New York, writes:

WASHINGTON, D.C., April 14, 1888.

Dear Sir: Your favor of the 12th has been received. In reply I take pleasure in saying, that I have had an opportunity of witnessing the experiment of desiccating a human body, and feel persuaded that the invention for that purpose is destined to prove one of vast importance. The principle upon which it is constructed is one of scientific accuracy, and has been reduced to a practical fact, so far as I can see. I do not hesitate to pronounce the scheme a positive success. A. Y. P. GARNETT.

Some of the most eminent American Jurists have already given, privately, the opinion, that should incineration threaten to become a prevalent mode of disposing of the dead, statutes

would have to be enacted inhibiting it, because of its absolute destruction in many cases of the evidences of crime. Not alone in the cases of poisons, but of malpractice and of assault, in every diversity of form. It may be replied that a competent board or commission could be provided for, who should make an examination into the cause of death in every case, and thus meet the legal objection raised. But due reflection must show the fallacy of such a suggestion. For, as will be admitted by every practitioner, though the symptoms and manifestations may seem to point directly to certain causes of death, the unmistakable cause can not, in a vast number, if not in a majority of cases, be absolutely and infallibly known without a complete autopsy.

The almost insuperable objections and embarrassments in the way of such a practice as that, are too apparent to be seriously considered by thoughtful minds. Therefore it would seem to be quite impracticable.

I have intimated that this system may be even more sanitary than cremation.

When Abraham buried Sarah in the field at Machpelah, the question of sanitation was not raised. But when in 1843, the elder Chadwick, and others with him in London, began their investigations of the very unsanitary manner in which the dead of that great metropolis were disposed of, the question of sanitation, which was raised, imperiously demanded public attention, and the passing of statutes to regulate it.

So, when at Washington, Pa., or at Fresh Pond, L. I., two or three bodies are burned a month, the question of sanitation as the accompanying result of the burning is not raised. But let burning become the one means for disposing of the dead, and the situation would be greatly changed. Suppose New York City with its suburbs, where the deaths are said to number near 75,000 annually, were to employ no other means, this would require the burning of about 230 bodies daily. At an average weight of 100 lbs. to a body, this would make 7,500,000 lbs. of "green" human flesh to be burned annually, or 33,000 pounds daily. The fumes from a rendering house are voted to be an intolerable nuisance everywhere, and, hence, it is demanded that these and like nuisances shall be far removed from human habitation. But a crematory which should burn the dead of New York, would be nowhere tolerated in the incessant pouring forth of its unendurable odors. The question of sanitation would then become a debatable one between inhumation and cremation. But the process of desiccation burns only the gases and vapours which are drawn from the bodies. The process is a slow one, and, therefore, the escaping products of the bodies are very easily disposed of in the most sanitary manner possible. They are during the whole process under perfect control.

Another advantage possessed by this Mausoleum method is the prevention of body-snatching. The building is so perfectly secure and constantly watched that sepulchre robbing is impossible.

An Irish woman had lost her husband. A neighbor went in to lend her sympathy. The widow replied "O t'is hard, indade, but I know where he is o' nights now!" Had she really known the insecurity of the grave, she would not have been so confident.

An electrical device, with wires to be placed in contact with the body, is provided for, so as to prevent entombment alive. I may add, in conclusion, that the expense of sepulture in the new Mausoleum can be made less than that of cemetery burial.

DR. FORMAN, of Philadelphia, said that we shall probably not live long enough to see much reform in this direction, but he wished to say that the danger of contagion from the dead body had been greatly exaggerated. Germs die quickly in our dead bodies. Virchow, for instance, always allows a body to lie a few days after death for this to take place, for there can be no danger of infectious fungus in a body one week after death. Even the danger of infection from small-pox and scarlet fever disappears in a short time.

DR. CARROLL, of New York, said the contagion was often spread not so much from the dead body as from the pall and other fabrics used which served to convey fomites. But, that it is an established fact that disease germs live in the dead body, and propagate themselves in the grave.

DR. BELL, of Brooklyn, thought that the relation to water supply was the important matter. The dead are buried too deep, and the emanations do not pass off above, but below, through the water; in this way he has been able to account for epidemics of typhoid in New York.

DR. HARVEY, in closing the discussion, said that by the method which he advocated the form and features of the diseased were left plainly recognizable for an indefinite length of time; furthermore he reiterated his opinion that unsanitary effects will not result from this plan proposed.

PUERPERAL NEPHRITIS.—DR. COTMAN, at a recent meeting of the Hunterian Society, showed the kidneys from the body of a plethoric woman, aged 40, who had puerperal eclampsia, and died comatose seven days after the birth of her tenth child. A condition of recent inflammation in an early stage was shown, the pyramids being dark and the cortex swollen and soft. She had apparently recovered from the convulsions, and albumen had nearly disappeared from the urine, when the fatal coma supervened.—*Brit. Med. Journal.*