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CONDITIONS OF HEALTH IN CITIES.

By J. L. KAINE.



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If certain men would only be considerate enough to die just when they ought, the progress of sanitary science in popular esteem would be more rapid. There are members of the English parliament, for example, who live under the most insanitary conditions, and London barristers who are surrounded by the worst faults the sanitarian can imagine, and yet they are alive and well and even cheerful at 70. All about us are persons who ought, as a matter of conscience, to be decently dead and decomposed as a warning to all who neglect the laws of health, and yet they are perniciously alive and obtrusively well. There are persons who live in houses that are notoriously lacking in all proper sanitary arrangements, and yet they keep so well they are ashamed to look a doctor in the face. And, on the other hand, there are persons who make themselves a common nuisance by their attention to the laws of health, and yet they go off at a ridiculously early age, instead of living to be 90, as an evidence of the virtue of sanitation. These facts are obstacles in the way of scaring men into a respect for the young science. These are some of the reasons why men contemplate the spectre of sewer-gas with serenity, and refuse to be agitated by a chemist's report on the presence of disease germs in the drinking water. Because the science is young, it has many questions still in issue; and because there has been a considerable appearance of dogmatism in sanitary teaching, and some sharp disagreements,



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the average man will weary himself as little as possible with being virtuous in sanitary matters. Perhaps it is true that in this, more than any other science, theories have done more than absolute and established facts to determine principles. The theories may all be sound enough, but there is not demonstrable evidence enough in all cases to convince anybody who prefers to doubt and whose self-interest lies in doubting. Besides, people do not distinguish between capable public sanitarians and individual hygienic cranks. The field of personal hygiene is a clover field for cranks. There has never been a theory of personal hygiene advanced that has not been contradictory of some other theory, and foolish people, who practice whatever is preached, have a lively time of it—coming and going between new and old theories, like Mulligan's blanket which was forever going and coming between Mulligan and the pawnshop. Thus, after it is settled that one obtains fine ventilation by a fire-place, and after everybody has put in a fire place for health and æsthetic effect, a solemn person claiming to be an unmitigated scientific being comes along and tells us we are poisoning ourselves all along of our fire-places. "Because," says he, "the fresh air in the room seeks the floor, being cold, and the draught of the fire-place draws it up the chimney, rather than the warm, polluted air." He happens to be a humbug, but how are people to know a solemn humbug from serious persons of science?

Nothing is certain in this world but bills, yet mankind is convinced that when a bullet strikes a man and he falls dead, there is a positive relation between the two facts. If we could see men drop dead after a whiff of sewer-gas, mankind would readily place sewer-gas and death in its relation of cause and effect. As it is, some fairly sound-minded but very inconvenient persons take the liberty to be disagreeable by asking for more positive evidence than has

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yet been furnished that sewer-gas is poisonous. The sanitarians have no stock of instantaneous deaths to frighten people with, like the enthusiastic but somewhat confused anti-tobacco lecturer who told his hearers that a drop of nicotine on a dog's tail would kill a man. There are persons who maintain that living on the margin of an open city sewer is merely unpleasant to the pampered sense of smell and not at all deleterious to health, and that a little sewage in the drinking water is chiefly objectionable as an idea. There is a lack of unquestionable or at least unquestioned evidence such as sustains the principles of most other sciences.

Of course there is no argument in the fact that some men live long and keep an appearance of health amid insanitary surroundings. There are men who drink an inordinate quantity of whisky and manage to live long and in apparent good health, yet nobody pretends to deny the pernicious and destructive influence of whisky on body and mind. A man's ability to resist destructive influences is determined largely by his physical inheritance. He may be able to withstand injurious agencies that would make short work of another. Two persons in the same apparent condition may be exposed to small-pox contagion in exactly the same way and one may escape the disease; but nobody is foolish enough to affirm that the disease of the other is not due to the exposure. And it is to be considered that there is a steady process of weeding out those who are not equal to resisting the bad conditions of living. The least fit go early—one-tenth of all the children born into the world die during the first month. The process of weeding out the unfit goes on until only one in many tens of thousands of those born into the world reaches the age of three-score-and-ten, under which age nobody ought to die. The race constantly tends to accustom itself to its surroundings, and when the weak-

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est have all been disposed of, those who remain may be considered tough. It is probable that in the course of ages, the race might adapt itself to constantly increasing hardships, and eventually be able to live in an atmosphere that would now be instantly fatal; but in acquiring the conditions necessary to such endurance, only a small fraction of each succeeding generation would be able to survive the increasing difficulties. This is, in fact, the case now—only a small fraction of those born into this world survive the present conditions of living, for any proper length of time.

It is not established that sewer-gas, for example, is poisonous—no exhaustive and conclusive experiments have been made to that end. But there is a reasonable presumption, sustained by good evidence, amounting almost to a certainty and acceptable to the most intelligent men as conclusive, that it is poisonous. It is about as certain as anything can be without the most absolute proof, that typhoid fever and diphtheria owe their existence and virulence to filth. A man may be able to keep alive and in seemingly good health in an atmosphere tainted with sewer gas, but there is strong reason to believe that he will not be as much alive or in as actual health as if his air were pure. And there is strong reason to believe that persons with less power of resistance are either poisoned to death or into invalidism in varying degrees by the presence of sewer-gas; and that any person is made more susceptible to disease by breathing an air touched by the emanations from the sewers. There is no use asking why, if sewer-gas is so generally found in city houses, we are not all dead. We *are* all dead—all except a small fraction. Compared with the number who come into the world, the number of persons who live as long as men ought to live is ridiculously small. As a rule, we are all dead before 70. In laying down the rules of living, sanitary science does not pretend to say that every man who

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neglects them shall surely die, but it does say that most men's chances of living are better when these rules are observed.

About the only compensation for the trouble of living in a world of fog-horns and pianos and church-bells and concerts, is freedom from sickness. A perfectly well man cannot be unhappy — no matter how the elections go or his own schemes miscarry, if the schemes of a perfectly well man ever miscarry. The science which undertakes to point out how health may be maintained, deserves to rank at the head of all sciences, for it really undertakes to point out how the worst evils of life may be eradicated. There is an enormous amount of disease in the world, ranging from fatal sickness to the slightest states of discomfort, and including all the conditions that make criminals and drunkards and other kinds of fools of men — the various states which impair the faculties and waste the energies of the race. It is the conclusion of sanitary science that at least one-fourth of the cases of sickness can be prevented. This does not include disease due to inherited defects, the causes of which defects are also largely preventable.

The evidence that supports the principles raised by sanitarians is good enough for practical purposes. In a house where there is typhoid fever or diphtheria, may be found a break in the drain pipe or a lack of traps in the closets, and the skeptic may object that as almost all houses are equally defective, the evidence as to causation is not conclusive; but the study of disease germs is leading to results that sustain the sanitarian's view. It ought to be good evidence that hygiene is capable of saving life, when a reduction of death rate invariably follows the enforcement of what are considered sanitary conditions; but again it is urged that improvement in the methods of treating disease may be responsible

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for the lower mortality. The sanitarian knows, however, that there are also fewer cases of sickness for medical science to treat. That vaccination has almost destroyed small pox as an epidemic disease is positive. There has been no advance in the medical treatment of the black-death, which destroyed forty millions of lives in Europe in one long course, or of the plague, yet these diseases are now almost unknown in Europe, where some of the worst of insanitary conditions have been abolished. The cholera has tried in vain, so far, to effect a landing in England since special efforts have been made to overcome the conditions believed to be favorable to the disease. Leprosy has been almost destroyed in Norway since the application of preventive measures. In Berlin, since the improvement of the sewerage system and the abolition of cess-pools and vaults, the death-rate from typhoid fever has been reduced one-half, and in Brussels to one-fourth. In London, where there are now no cess-pools, the death-rate from typhoid fever is 26, and from diphtheria 18 per 100,000 of population; while in Paris, where cess-pools still exist, the death rate from typhoid fever is 70, and from diphtheria 75 per 100,000. Sanitarians in England assumed that typhoid fever had its origin in poisoned air and poisoned water, and their serious fight against it on this line began in 1869. In twelve years the death rate from this disease was reduced 46 per cent and there was an almost equal reduction in the number of cases of typhoid fever illness. In the general death-rates of that country, a striking change has taken place in the last ten years — a reduction in the number of deaths of 750,000 as compared with previous periods. Everywhere and always the institution of what are regarded as sanitary conditions in barracks, is followed by a marked reduction in the sick-rate of soldiers. Twenty years ago the percentage of deaths among the British soldiers in India, was 69 per

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1,000 annually. Sanitarians have been allowed full swing there, and now the percentage is only 18 per 1,000. The disappearance of intermittent fever has followed proper drainage all over the Northern states.

It is good evidence in support of the doctrines of sanitarians when certain diseases attack many persons subject to the same alleged special causes and do not attack others under the same general condition but with the special causes absent. In the State Reform School at Morganza, Pa., recently, there were twenty-three cases of continued fever, of which the first fifteen occurred among the inmates of a particular building, into the sleeping room of which sewer-gas could find its way, while the other eight cases were distributed among five other buildings. In the Pittsburg epidemic of two hundred cases, all the original cases were confined to two parts of a district through both of which ran a sewer having twenty-nine untrapped street drops, and which sewer was choked with a mass of filth from one to three feet deep. The typhoid fever epidemic at Plymouth, Pa., was traced to the dejections of a single typhoid-fever patient. In innumerable instances typhoid-fever epidemics have been found to be due to the use of contaminated well water, persons not using it escaping the disease until affected through contact with the sick. We have had a recent case of this kind in Racine county.

There is no reasonable doubt that if the public would apply such laws as sanitarians are agreed about, there would be an immense saving in human life and in the time and money now lost through sickness. The conditions of health in cities involve only fresh air and wholesome water. Given these, which a man cannot provide for himself, and given the exercise of some control over the character of the food supply, a man can take care of the other conditions himself

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—he can keep a clean skin and be temperate and take exercise.

THE AIR WE BREATHE.

Perhaps the greatest speech ever delivered in the House of Commons was by Sir Isaac Newton. He never made but one, but this deserves to go thundering down the ages, for it involves the welfare of the human race more than the fervid orations of Burke and Fox. Sir Isaac Newton arose from his seat and asked a man in the gallery to open a window.

The least knowledge of the physiology of breathing is convincing as to the importance of pure air. All the vital processes depend upon the exchange of carbonic acid for oxygen in the lungs. Shut off the supply of oxygen entirely and the candle of life flickers and goes out. Shut it off in a measure and the process goes on imperfectly. To whatever degree the air is vitiated, to that degree the functions of life are disturbed. In this matter the conclusions of science are unquestioned. There are no skeptics here, and yet impure air continues to be the leading cause of death, for consumption is essentially a disease of bad air. It is not because men do not know better, that bad air is breathed. At a meeting of the Paris Academy of Sciences, some years ago, it was decided that the hall in which the scientific men met was the worst ventilated in the city; and it was shown that every member had known it for ten years. And yet it was an evil that could be corrected in one week. There is hardly a doubt that much of the criticism directed against legislators should be directed against the bad air of the legislative halls, instead.

It isn't becoming, even if it were possible, for a man to wear a clothes-pin on his nose to escape breathing a vitiated atmosphere. He is bound to suck it in and get what

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oxygen there is in it. The general atmosphere of a city is vitiated to some degree, and that of houses to a still greater degree. On the measure of dilution of specific poisons in pure air depends their effect on people. All cities increase in size and there is a constant increase in the measure of corruption of the air through the emanations from the sewers, and particularly from open sewers and vaults, from cemeteries, from slaughtering-houses, meat-shops, soap-factories, stables and the like; the air is corrupted by coal gases, the putrefaction of vegetables and the gases from damp soils. It has been shown that in the spring, when the ground is wet, the atmosphere of a crowded cemetery is a deadly poison. Air from such a cemetery injected under the skin of pigeons produces all the symptoms of typhoid fever, and death results in a few hours. The corruption of the general atmosphere is not serious as compared with that of buildings, except when infective elements are involved and except in particular localities. But it is certain that the best health cannot be maintained in the city atmosphere of the present. Children taken from the streets of ^WWarsaw to the country, with no great change in the matter of food, gained enormously in weight and strength from the better air. A typical case was a boy of eleven, who gained eight pounds in four weeks and whose muscular strength increased from forty-five to eighty, as tested by the dynamometer. A Babylonian or an Andalusian of the old time would refuse to live in one of our cities. Because the death-rate of a city with an open sewer is not larger than that of other cities, is not conclusive evidence that the air is not dangerously polluted by the emanations. Every city has its own special causes of disease as well as its own special conditions of health. A city with an open sewer as a cause of disease, may be so situated as to climate and natural conditions of surface drainage as to offset the statistical results

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of an open sewer. That a city which is free, by natural conditions of situation and climate, from zymotic diseases, should present a death-rate not materially lower than that of other cities less favorably situated, is evidence of special and artificial causes of disease. In the use of the modern facilities for moving about in a city, people escape the worst effects of localized poisons and are often simply not at their best physically and mentally as a consequence of the degree of poisoning they undergo. Decent air implies a good sewerage system, which few cities have.

But for the beneficence of bricks and the blunders of builders, most of us would be dead as smelts. Prof. Pettenkofer has shown that houses breathe through their walls, as men breathe through their skins. He has made a tube by means of which the flame of a candle can be blown almost out through a brick or a piece of mortar. We try to build houses air-tight, but rarely succeed. The only way by which air can be kept out of a brick house is by building on damp soil from which the bricks can absorb moisture and so become impervious to air. Every brick will absorb a pound of water, and a house with damp walls will fatten a graveyard with the victims of consumption and enteric fevers. Dampness is deadly. It not only keeps out fresh air, but it nourishes the seeds of disease. In the mud houses of Glasgow, which are always damp, are found the confirmed victims of rheumatism and rickets, and the bandy-legged children whose bones are too weak to sustain the body without bending. A damp cellar is just about as good a thing as Death can ask for. A musty house has its pores stopped by moisture. Builders help humanity a good deal by failing to make windows and doors air-tight. The air a house gets by its own methods of breathing helps dilute the poison of sewer and cellar gases and makes them less

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deadly. Dampness and sewer-gas together make busy undertakers.

Hardly any houses with sewer connections are entirely free from sewer-gas. How sewer-gas gets in is plain enough. There are at least a score of cheap books on house-draining and plumbing, one of which every man should have. A man who lives in a house, who has a wife and children whose health depends upon proper sanitary conditions, cannot afford to be ignorant on this subject or to trust to the plumber. It is better to pay half a dollar or so, for such a book, than to pay a hundred times as much to doctors and undertakers. The man who builds a house without knowing what measures to take against dampness, or who isn't able to superintend the selection and putting-in of pipes and traps and ventilators, offers a premium for the most destructive diseases. An old French poem recites that Death once held a competitive examination among his agents, including war and famine and pestilence, and the highest prize went to intemperance. In this day he would probably bestow the chief honor on those who poison the air and the water. It is a lamentable fact that comparatively few householders know anything about the connection of their house drains with the sewers. The worst conditions may commonly be overcome easily and cheaply.

The literature of school hygiene is extensive, and no excuse exists for a single insanitary condition about a school-house. Yet it is a fact that many city school buildings are defective. The Spartans used to send their children into the mountains to struggle against the weather and wild animals, considering them fit to live only if they were able to live against these hardships. That is less inhuman than the sending of children into damp or poorly ventilated buildings to pore for an excessive number of hours over books, the pages of which are badly lighted. While there has been

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a general improvement in the sanitary conditions of school buildings, many of them are still overcrowded, particularly in the primary rooms. It is moderate to demand 500 cubic feet of air space for every pupil, which would limit the number in a room forty feet square by twelve feet high to about thirty-six pupils. The half-day system would remedy much of the fault of overcrowding of the rooms as well as overcrowding of the brains.

THE WATER WE DRINK.

The modern Perseus is the sanitarian and health is his Andromeda. The dragon he has to fight is not a monster of hideous mien, but a microscopic creature more terrorizing than a thousand dragons. The bacillus, the disease-germ, is the true terror of mankind. The American likes to deal with big things—his Washington monument overtops all others in the world, his statue of Liberty makes the Colossus a pigmy, but he is downed by the microscopic bacillus which comes to him in the air he breathes, but more frequently in the water he drinks.

If there is one thing above all others the public should demand of its agents it is good water—a water that is certainly wholesome, free from sewage, free from animalcules, whether animal or vegetable and whether living or dead—a water at no season of the year or in periods of epidemics liable to propagate disease. This means water absolutely without the possibility of sewage contamination. No amount of water can sufficiently dilute sewage to make any particle harmless—dilution can only diminish the chances of getting the harmful particle in any particular glass of water. The minute germs that constitute the noxious part of sewage are held in mechanical suspension and not in solution. When chance carries them into the particular glass of water a person drinks, they do their fatal work as well as if they had never floated for miles in water.

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Great is the power of little things. A thousandth part of yeast, a minute fungus, when added to a vat of sweet wort, converts the whole into an intoxicating drink. Some of the smaller animalcules found in water are not more than the thirty thousandth part of an inch in size, and yet one microscopic entozoa which finds its way into the blood will multiply there in thousands. The Damascus sore, which has killed thousands in the East, is due to a minute vegetable cell. The fungus of the foot disease of India, is conveyed into the blood through the drinking water. The record of the wells of Hurdwar, from which the cholera epidemics have sprung, makes the destructive record of the whisky distillery seem tame.

No system of filtration can purify water containing the noxious germs of sewage, and no practicable measure of dilution can render them harmless. A single cholera stool in any body of water used for domestic purposes, may extend the disease indefinitely. The dejections of a typhoid-fever patient were emptied into a running stream miles away from the town of Plymouth, Pa., last year. This water was used for domestic purposes, and in one month there were 1,200 cases of the disease in the town, with 120 deaths. In a Dublin hospital, forty cases of typhoid fever were traced to the dejections of typhoid-fever patients emptied into the water twenty-five miles up. Any economy that stops short of absolute certainty in the matter of wholesome water is reckless extravagance — extravagance in the waste of human life and strength. A water actually polluted in some degree may have no apparent bad effect upon a community in ordinary periods, though no one can say it does not do actual harm, but in a period of cholera or typhoid epidemic it will almost certainly become the means of extending the disease. Any system of sewage removal that gives room for a reasonable suspicion of contaminating

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the supply of domestic water, should be abolished at whatever cost. Unhappily, chemical analysis cannot always tell us of the danger in water. There are noxious qualities that escape the utmost researches of the chemist. When he finds salt above a few grains to the gallon in water, he can say with positiveness that there is contamination from sewage, for nearly all the salt used for domestic purposes passes out with the sewage and is inseparable from it; but he cannot always tell when water is free from all contamination.

In a city, well water is never well water, but sick water. Pump-water may be put aside at once as unfit for domestic use. The fact that it is sometimes used without apparent evil is of no consequence. In a city, no well can escape pollution from surface and soil impurities and such polluted water is one of the most frequent means of propagating disease. In periods of epidemic, the chances that anybody using such water will escape are few. In a London cholera season, 600 deaths were traced directly to the use of pump-water that had been apparently harmless before. Taste and color are not tests of water. First-class drinking water should not contain more than a grain of organic matter to the gallon, yet some clear waters, pleasing to the taste, contain ten times that amount.

THE FOOD WE EAT.

The yearnings of the stomach are the inspiration of all human endeavor. Until a man's stomach is satisfied, there is no recognition of the Humanities. As a man is fed, so will he think and so will he be. A man's ancestors determine the maximum of health and of sense he may have, but within the limits of this restriction he is largely what his food makes him. There may be murder in a mince pie or a poem in a leg of mutton. "C'est la soupe que fait le soldat," say the French. There is an intimate relation between meat and morality. A man with indigestible food in

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his stomach is not a free moral agent. Digestion depends upon what we eat and a man's views of life depend upon his digestion. If the characters of men are to be improved, the quality of their food must be looked after.

The literature of the subject of food is so extensive and handy, that there seems to be no excuse for pointing out the most serious faults in the food supply of cities. The chief evils the municipality can be asked to remedy are the sale of diseased meats, stale vegetables and fruits, and the milk of unhealthy cows. Diseased cows are brought into the large markets almost daily. Outbreaks of typhoid fever and other infectious diseases have been traced to sick cows. Disease germs have been found in milk and traced to water used for its adulteration. At least it is reasonable to insist that if our milk is to be watered it shall be with good water. It is impracticable, with present means of inspection, to undertake to prevent many of the present adulterations of food articles; and we can only protest against the roasting and grinding up of old boots and shoes to be mixed with pepper. This may be only a prejudice, but it is widespread enough to deserve respect.

The whole subject involves only a question of closer inspection—larger appropriations for the inspection of meats and vegetables and milk and for the training of capable inspectors. There is no doubt that the infant mortality of cities might be enormously reduced by a close inspection of the milk supply, and still further by the attention of medical men to the subject of infants' food. But the hygienic education of mothers would doubtless give the most fruitful results.

WHAT SHALL BE DONE WITH SEWAGE?

The city of Milwaukee is under indictment to-day, a bill being found by a grand jury, for maintaining an open sewer, or in other words, for using the city rivers as receptacles of

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sewage, to the danger of the people. It is a wholesome finding, even if it has no other practical result than to stand as a protest against the criminality of allowing sewage to course its sluggish way through the rivers into the lake where, according to the evidence of both chemists and microscopists, it pollutes the supply of water used for domestic purposes. The grand jury justly says "that any system which allows the sewage to be deposited in the rivers and carried forward into the lake through the harbor is hazardous, because of the liability of imparting to the water supply the germs of deadly disease." This covers the whole case. A single case of typhoid fever or of diphtheria in the city of Milwaukee is evidence of a public crime. The thousands of deaths annually from preventable diseases in any city tell of official neglect, of the failure to dispose of the sewage properly, of the refusal to provide ample funds and facilities for sanitary inspection.

Plans for disposing of the sewage of cities are innumerable and a few are practicable. But of all plans, unquestionably the worst from every point of view, is the pouring of the excreta and waste of hundreds of thousands of people and thousands of households, and slaughtering houses and noxious establishments of all kinds, into a river which crawls through the city and empties its awful mass into a body of water in such a way that any part of the noxious matter can be drawn into the pipes which supply the city with water. Undoubtedly the simplest, cheapest and best way to dispose of the sewage of a city situated as Milwaukee, without any present demand for refuse as a soil fertilizer, is to empty it into the lake. But to do this with safety involves the intercepting sewer system advocated by sanitary engineers. More than all, it involves the removal of the intake for the water supply to a point absolutely beyond the possibility of sewage contamination. The essential

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thing is prompt removal of sewage before decomposition takes place.

Probably it is only a question of time when the germ theory of disease will be abundantly established, and when porous sewers, with surface ventilation, of a size to take care of storm water, and subject to the retention of sewage in process of putrefaction, will be universally abandoned, and when sewage pipes and surface-drainage pipes will be laid separately. But an earlier and more certain change will be the construction of pumping works for the prompt emptying of sewers and the removal of water intakes to a point of absolute safety.

One astounding fact is the apparent indifference of life-insurance companies to questions of public health. While their terms are based upon the probable duration of life as established under the present insanitary conditions, which allows them an ample security against an excess of losses over receipts, there is no doubt that a general improvement in public sanitary conditions would increase the number of acceptable risks enormously and lead to an immense increase in the number of insured by the diminished cost of insurance. Sanitary science ought to find its strongest support among life-insurance companies.

The number of causes which impair the health of a community is vast, including not only air, water, food, drug and other adulterations, but also ignorance and neglect of the first laws of personal sanitation. But the remedy lies for all in a more efficient system of inspection, a higher sense of duty among legislators and officials, and a better system of sanitary instruction. Indeed, the last includes all and the one remedy may be said to be proper practical hygienic instruction in public schools and the establishment of departments of preventive medicine in medical colleges. It is to the physician that people look for whatever measure

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of protection they are to have from insanitary conditions. As a rule, the physician is as innocent of proper instruction on the subject of public hygiene as any other class, including the plumber.

