With Respects of John Morris, M. D.

LOCAL CAUSES

OF

INSANITATION IN BALTIMORE.

BY

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Member of the American Public Health Association, &c., &c.

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Perhaps there is not a city in the United States, certainly not one of equal size, the topographical position of which is so well adapted to secure health to its citizens as Baltimore. That its death rate is not as low as the lowest in the country can readily be understood when the many preventible causes of disease which exist within its limits are pointed out and the manner in which these causes operate fully explained. The investigation of this subject is the object aimed at in this paper.

Among the diseases of a zymotic character due to unsanitory local conditions are, as is well known, diptheria, typhoid fever and scarlatina, all of which prevail to a very serious extent in Baltimore. One hundred and eighty-four deaths from typhoid fever alone occurred during the past year, while deaths from the same cause in the city of New York, with a population three times greater, numbered but two hundred. This is a startling statement when taken in connection with the fact that every case of typhoid fever is due to a local cause, and that that particular cause can, in nearly every instance, be ascertained and prevented, if due pains be taken; and, further, that as a consequence, every case of death from this disease is the result of recklessness or ignorance.

Diptheria, too, has its origin in filth. Dr. Snow, the Health Superintendent of Providence, R. I., one of the best sanitarians in this country, says in his last report:

"The evidence constantly accumulates in this city, that diptheria depends for its existence and prevalence upon foul air, arising from local conditions of filth. Though it is innoculable, and in that way contagious, and is, perhaps, to some extent, infectious, there is no evidence that practically the disease is propagated by innoculation, or contagion or infection. We may expect that diptheria will continue through the winter, though perhaps with less severity than during the last two months; but it will still continue to search out its victims among those whose constitutions are prepared for it, by breathing foul air and other depressing causes."

Slight epidemics of diptheria and scarlatina have also prevailed in the southern and southwestern part of the city of Baltimore. To account for this unusual prevalence of disease it will be necessary to seek out the causes most likely to operate injuriously, and see how far they obtain in our midst. To do this requires a thorough examination of the drainage and sewerage system of the town, as well as the condition of wells, cellars, pavements, water closets, privies, &c.

DRAINAGE.

The drainage of Baltimore, as is well known, is largely of a surface character, to which the city is well adapted, owing, as I have before stated, to its topographical advantages. The subterranean drainage is peculiar and will be fully described hereafter. I am convinced that very little disease arises from bad drainage in the city proper, save that arising from defective kitchen drainage, but in the suburbs and outlying grounds there are numbers of low vacant lots, the foci of malaria. These are to be found in every portion of the city, even in the neighborhood of such well improved sections as Franklin, Lafayette and Harlem Squares. To the existence of these beds of miasmatic poison may be ascribed the great amount of malarial fever that has prevailed in Baltimore in the year 1877. It is a notable fact, that whilst the small towns and the country in the vicinity of Baltimore have been unusually free of malaria, the city itself has suffered in a very marked

degree. (Diptheria has prevailed at Waverly, owing to the fact that the sewerage of the village is suffered to empty into a large open lot.) The digging of new sewers, particularly the extensive one in Carey street, no doubt added to this cause. In this last locality there was an unusual amount of sickness, including diptheria. The drainage in the neighborhood of the Spring Gardens is notably bad, and, unless remedied, must always prove a fruitful source of disease, most certainly so when other factors, hereafter to be mentioned, are added. The drainage in the eastern part of the city from Loudenslager's Hill in every direction is wretchedly bad, and though somewhat improved, through measures taken by the Health authorities, is still defective and a reproach to an enlightened community. I shall dwell more in detail upon this when I come to speak of Harris' Creek and the outlying spaces north of Loudenslager's Hill. Another portion of the city that is badly drained is a small peninsula north and east of Lancaster street, which was the seat of the late outbreak of malignant yellow fever.

SEWERAGE.

The sewerage of the city is extremely defective, and is no doubt the source of a great deal of the disease that prevails during the summer and autumn months. The sewers are too few in number, badly constructed, and when not flushed offensive to the smell. The condition of Harford Run, that of Chatsworth street, and also that of the filthy stream running from Cross street to Spring Gardens, is exceedingly bad, and the attention of the municipal authorities was called to it by the Health Commissioner in his last annual report.

The study of the evils of the drainage and sewerage systems of Baltimore, and the means for their correction, have engrossed my attention for a length of time; and, with a view to secure the most enlightened judgment concerning them, I have conferred with accomplished engineers and gentlemen skilled in sanitary science. One of them, Mr. Richard Randolph, C. E., has kindly furnished me his views on the important matters referred to, which I here subjoin, deeming them of the utmost importance, from the fact that they are based upon an intelligent examination of the whole subject:

"The city of Baltimore, owing to the nature of the ground upon which it is built, possesses advantages, up to a certain point, for health and cleanliness, not surpassed by any city in the world. It is provided by nature with a complete and efficient subterranean drain, ready at any and every point, wherever a well may be made to penetrate it, to receive the waters which are used to wash away its *effete* products, and to conduct them and the matters with which they are charged to the nearest outlets at tide level. Flowing at a depth below the influence of the sun, they are maintained at a temperature so low as to preclude decomposition and the generation of gases until they have issued into the harbor; where they accumulate and stagnate in the heat and drought of summer.

"The testimony of those whose occupation it is to make perforations for sinks and wells all over the city, and of those who have dug foundations and dredged out docks along the water front, establishes the fact, that at about twenty feet below tide level, extending under the harbor and the city, there is a thick stratum of clay, through which no water can find its way downwards, and through which all lower water will rise wherever wells are bored deep enough to reach those veins; that upon this bed of clay there rests a stratum of very coarse gravel, overlaid, in the higher parts of the city, with a heavy deposit of sand; that all of this deposit of gravel and sand is thoroughly pervious to water, which, arrested by the clay, flows through the gravel at the bottom in innumerable and copious streams; and that the tide rises and falls over a large district of this subterranean water, as can be observed in many of the wells in the lower part of the city, many squares from the Basin or Falls.

"Taking advantage of these conditions, the citizens of Baltimore have long been in the habit of getting rid of all *effete* matters without effort or thought, after once establishing a well which communicated with the underlying porous strata. With so much facility and obscurity has this object been accomplished that consequences were no more thought of than if they had been cast into the middle of the ocean. Even the Health Commissioner, who presides over the department whose duties require a study of such questions, would only recognize that they passed off in subterranean streams to unknown regions, and ignored the fact that the harbor

of Baltimore was the final receptacle of the contents of the ever-replenished sinks. And most of those whose attention has been called to this fact could not divest themselves of a conviction that this subterranean conduit had a mysterious power of annulling the laws of chemistry, and of converting all the elements of an offensive decomposition into pure water.

"Upon the hypothesis that this enormous mass of corruption supplied by many thousand of these wells had gone out of existence, the most strained chemical theories were invented to account for the annual exhalations of offensive gases from the harbor. But the history of science proves that whenever a remarkable phenomenon is observed, the cause of which is entirely unknown, scientific men will always invent a cause and uphold their theory with the most scientific reasoning until new light forces them to abandon it in favor of either the true cause or a more plausible one. Influenced by the reports of the chemists who contradicted each other, and who contradicted themselves in different reports, in their endeavors to draw a correct conclusion from mistaken premises; and by the opinions of sea-captains whose experience taught them that bilge water in the hold of a vessel, charged with the molasses which drips from a cargo of sugar during a voyage from the tropics, amounting sometimes to ten per cent. of the weight, gave out an odor similar to that of the Basin in summer, public opinion fixed upon the operations of the Calvert Refinery as being the principal cause of the condition of the harbor. This establishment had the misfortune to be situated at a point where Jones' Falls, after penetrating the most populous sections of the city and collecting from the sewers and porous strata of all that region their polluted discharges, concentrates them in a stagnant pool called the City Dock, to be acted upon by the summer's heat The condition of this dock and of the water of the harbor at its outlet, enveloping the refinery with its fumes, led the imagination to assign their origin to that building; notwithstanding the fact that the water immediately at the point of the discharge of the waste fluids was comparatively free from these manifestations. The justice of this accusation is only equaled by that of the wolf who accused the lamb of disturbing the stream at a point above where he stood. And this charge was insisted upon, although any one with eyes

and a nose could perceive the generation of the black and seething fluids at Baltimore street and far above, and their flowing in a perpetual current towards the refinery. And with equal distinctness at Schroeder's Run, in proportionate quantity, flowing into the Spring Gardens—a locality remote and isolated from all refineries or other factories. And notwithstanding that indisputable documents were on record to prove that the same evil was loudly complained of before the refineries were started.

"Upon the disappearance of the odors last summer, coinciding with the restrictions laid upon the Calvert Refinery and also coinciding with frequent and heavy showers of rain; which latter coincidence the editors, steamboat-men and chemists completely ignored; public opinion under their guidance was satisfied that the refining of sugar had been the true cause of all the evil. The editors collected the testimony of the habitues of the wharves to the effect that the cure was complete and the chemists maintained that their theory was confirmed. But when the rain ceased and an unbroken drought prevailed for three weeks (which had always been a necessary condition of the development of the gases), the local columns of the papers commenced to record the offensiveness of the air and the blackness of the water; and in a few days the evil manifested itself in all its accustomed force; notwithstanding that the gates of Lake Roland were opened, postponing the effects for a few days but giving rise to a water panic. Thus were all of their expectations falsified. And refusing to give credit to the rain as they did in the summer of 1876, they were driven to the absurd conclusion that the refineries must have suspended operarions during the month of clear water and pure air last summer as they did during the summer of 1876.

"At this time the Mayor having made a visit to Newport, and having occasion to observe the effects of a sewer emptying into the harbor there, returned impressed with the fact that sugar refining was far from being responsible for all the subject of complaint. He might have read the Sanitary reports of some of the largest cities in Europe and in this country, particularly London, where he would have seen described precisely the same effects that are so noticable in Baltimore and to the same or greater extent, and all ascribed without a question to the same cause as that existing at

Newport. He has since recommended the construction of the intercepting sewer which had been projected some time before: which shows that he was at least moving in the right direction. And had he remained in office two more years he probably might have gotten down to the true source of nearly all the offence. But he and his advisors would have had to penetrate with their investigations to a depth of twenty feet below the level of tide. They would have had to recognize the fact that at that point there was a thick stratum of impervious clay extending under nearly the whole of the city and harbor, and that upon this rested a stratum of coarse gravel through which the water percolated with facility, carrying with it all matters held in solution or suspension, and that about forty thousand sinks discharge their contents continually into it, and that there was no possible outlets for these fluids except into the harbor; either directly or by way of such streams as Jones' Falls, Shroeder's Run and Hartford Run.

"If the intercepting sewer is built, as it has been designed, the great expenditure will be made without abating the nuisance to an extent that will be appreciable. It may carry off the comparatively innocent fluids flowing in the gutters and the contents of the sewers in its neighborhood; but what is to become of the enormous product of the sinks which will continue to increase in number and efficiency every year, and of the many sewers that will be required in some of the northern sections, and which must discharge into Jones Falls? It can not be expected that the people of Baltimore will throw away the great boon which nature has conferred upon them, by filling up their wells, and, abandoning their natural drain, substitute a network of sewers over the whole city, at an enormous and ruinous expense, which, in consequence of its being subject to the heat of the surface and its numerous vent holes, will become a vast generation of noxious gases, far more dangerous than those which escape from the Basin. They will contruct sewers only where wells can not be made to act, and discharge them by the shortest route into the Falls.

"Although nature has done so much for the convenience, cleanliness and health of Baltimore, she has left something for the citizens to do for themselves. They must supplement her plan, if they wish to abolish that scourge to the senses which at every dry

period in summer forbids the stranger to stop over night, and threatens to drive away the most desirable class of residents. But what can be done? is the question asked by many who dispair of any relief. To answer this question is the object of this paper.

"If it is established, as stated from the testimony of those mechanics who have dug wells and foundations at innumerable points in the city, that the water which pervades the underlying gravel does not penetrate the clay upon which it rests; then a dike or wall of clay, erected upon this floor of clay, connecting with it at the bottom and rising above the level of tide, will prevent such water from passing beyond and compel it to seek an outlet at the nearest point where this wall does not intervene. Therefore, if a trench, beginning at the base of Federal Hill and extending along Light street and Pratt street to the Falls, were dug down to the clay bed and then the trench filled up with impervious clay, the foul waters, percolating through the gravel, would be prevented from passing into the Basin. They would seek the nearest outlet into Jones' Falls above Pratt street. Communication by percolation might still be open to the harbor below Federal Hill, or to the more distant Spring Gardens; but the resistance offered by such longer distances would determine the great bulk to issue at the nearer points along the Falls, especially if the head were constantly drawn down by an artificial current emptying that stream. The more this dike of clay is extended along the harbor margin the more perfectly will it be intercepted and diverted into the Falls, but carried out to the extent just mentioned, it would cause the whole of the fluids, which have been the cause of the nuisance, to issue into the bed of the Falls, where the greater part of them have always gone. This stream must necessarily, for all time, be the great conduit for the surface and subterranean drainage of, by far, the largest and most populous part of the city, and will drain all its future extensions towards the north.

"Having forced all the foul waters into this one receptacle, and having shut it off from the harbor by a gate, so constructed as to fall and lie upon the bottom when all the water-way might be required by a flood, or when it was necessary to admit a boat; it would then be necessary to construct a conduit from above this gate and connecting with the Falls, to the broad and moving

waters of the Patapsco beyond the quarantine line, giving it a capacity and establishing a flow sufficient to carry off the volume of the Falls, at its low stages during droughts; thus depriving it of the opportunity to become foetid by stagnation and heat.

"This volume will never reach the capacity of the conduit from the Gupowder River. A large portion of the supplies derived from the Gunpowder and Lake Roland will flow directly into the harbor and the Middle Branch, and another large portion will be evaporated upon the streets and pavements. The water which falls in rain and snow, washing off the dust of the streets and flushing the gutters on the surface and swelling the volume of the Falls beyond the capacity of the diversion conduit, would flow into the harbor with no worse consequence than a temporary turgidness, as it would transport so few substances capable of offensive decomposition.

"But as we have to go below the level of tide in order to intercept the waters to be removed, we cannot expect the force of gravitation to do the work of transportation unless the external pressure of tide water at the outlet of the conduit is removed by steam or other power. This would entail but a small expense and need be used but for a short time each year.

"When the new supply from the Gunpowder is introduced it will flow through a circular conduit whose transverse area is 113 square feet, and with a descent of one foot in 5,000, causing it to flow at the rate of about 125 feet per minute. Now the power applied by gravitation to cause such a column of water 5,000 feet long to move at this rate is the same which an engine and propeller would be required to apply in lifting 113 cubic feet of water, or 7,000 pounds, 125 feet per minute, or 875,000 pounds one foot per minute. And as one horse power is the raising of 33,000 pounds one foot per minute, the engine and propeller would have to apply the power of 26½ horses. If the column of water was 20,000 feet long on the same inclination, 105 horses would represent the power applied by gravitation. Therefore an engine which would apply a power of 105 horses to the removal of the pressure of tide water at the outlet of the conduit of this capacity and inclination, connecting Jones' Falls at Pratt street with the Patapsco beyond the Lazaretto, would cause the same quantity of

water to be discharged as that which will flow naturally through the tunnel of the Gunpowder supply. Which is to say that a 150 horse engine driving a propeller wheel in this conduit at its outlet will cause to be discharged beyond the Lazaretto all the contaminated water which gives rise to the discoloration of the harbor and the offensiveness of the air when the city has reached its utmost anticipated population. If it were not for the objection of causing wet cellars in the very low districts, and that of forcing some of the foul water to issue where there was no intercepting dike of clay, the engine and wheel could be dispensed with by maintaining a head of four feet above tide in Jones' Falls above Pratt street.

"Such a conduit would not require to be built in the expensive manner of an ordinary sewer; which, generally resting upon the upper strata of yielding and uncertain character, requires masses of masonry for its foundation to insure it against fracture; and being above the level of permanent water must necessarily be hermetically sealed with cement to prevent its contents from escaping into the adjoining soil or rising to the surface. But founded upon the firm stratum at a depth of ten or fifteen feet below tide level, and constantly submerged, it will require only two parallel walls of large stone masonry, without mortar, surmounted with a semi-circular arch of rough stone or brick. These walls should be pervious to water in order that the polluted under drainage of the south-eastern section of the city, including Canton, which will become more populous and sanitary as time advances, may find its way into the conduit to be discharged with the rest at the outlet. It would also be necessary to contiune the clay dike from the Falls at Pratt street along the lower side of the conduit so as to prevent the foul water from issuing into the harbor and that of the harbor from being drawn into the conduit, to the parttal exclusion of that desired to be removed.

"If the city continues to grow and the western sections become populous, it is only a question of time when the Spring Gardens and the Middle Branch will present the same conditions as that of the basin and harbor at present. When that time arrives the same remedy can be applied of interception and diversion either by discharging at Ferry Bar or connecting with Jones' Falls.

"Such in brief is the outline for a plan for intercepting the whole of those matters of the present and the future which are the cause of the pollution of the harbor and the atmosphere. It contemplates the general use of sinks to be made efficient by depth of penetration and the avoidance of all sewers except where these are impracticable. That such a practice is consistent with the highest degree of health, the renown which Baltimore has heretofore had for cleanliness and salubrity is sufficient proof. And the large amount of water which can be commanded at all elevations will render it the most convenient and sanitary for the whole population.

"Nearly all the elements for calculating the cost of such an improvement can be obtained by borings and other investigations. But enough is now known to warrant the assumption that the cost will be less than that estimated for the proposed intercepting sewer, and will not much exceed that of the perfectly useless temporary supply.

"This plan requiring the expenditure of three-quarters of a million, is predicated upon the present absence of renovating supplies of fresh water during the droughts of summer, or in contemplation of the future expansion of the city, when its increased population will proportionately aggravate the causes of the evil and the necessity of a remedy—a time when a larger portion of the water to be derived from works now in progress will be applied to domestic uses. But, as we have seen so often, the nuisance mitigated by a few showers of rain and entirely abated by a continued and heavy rainfall, as happened in 1875 while the refineries were in extensive operation although financially suspended; and in 1876, aided by the removal of a year's accumulation of foul deposits, and, as happened last summer, after the heavy rains which succeeded the orders of the Health Commissioner to the Calvert Refinery, and as was witnessed after the drought of last summer, the postponement of the revival of the nuisance for several days, simply by the general flushing of the sewers from the meagre supply of Lake Roland, there is ground for the hope that the daily flow of one hundred and fifty superfluous millions, which will be available when the new works are complete, will have the effect of preventing the Basin from reaching that degree of pollution which causes

so much complaint. If that much water had been at hand last summer instead of the petty store of Lake Roland it is almost certain that those holding to the sugar refining theory would have had it in their power to seemingly maintain their position by keeping down the odors after the Health Commissioner's injunction to the Calvert refinery—for in a week the rains came to their relief.

"It is only at periods of prolonged drought, such as occurred in 1874, when the Gunpowder river itself will be reduced to a volume less than half of the capacity of its conduit to the city, or when the city has become much more populous, that the plan here proposed, or one accomplishing the result in view, would be demanded by the taxpayers.

"At the present time when taxation has become so onerous, economy will dictate the postponement of all heavy expenditures on account of the Basin evil until the extent of the relief to be afforded by the new water supply is experienced and its efficiency tested. When other measures are imperatively demanded by the great majority of the citizens it is probable that their numbers and the taxable basis will have much increased.

"It will not require any special arrangements or extraordinary outlay in order to take full advantage of the surplus water of the new works in renovating that of the Basin and Falls. There is no need of its being made to rush in under a head, creating a local stirring up, or of admitting it at very many points. The more quietly it is admitted the better; the only thing requisite being quantity. It would be impossible with any quantity attainable to cause a current in the broad expanse of the Basin sufficient to carry off solid matters stirred up at the bottom by the force of water emitted from pipes under pressure. They would all be deposited at a short distance from the point of disturbance. But the water itself, charged as it is with the elements of the foul gases in solution and very fine suspension, being gently pressed outward and replaced by pure water will become so scattered and adulterated by that of the harbor as to rapidly diminish the development of odors. Therefore if the water is admitted by way of the street gutters and the sewers which now empty into the Basin the object will be accomplished.

"But the bed of Jones' Falls is the receptacle of by far the larger portion of these impurities; which, being a long and con-

tracted channel, need only have the fresh water admitted at the nearest and most convenient point to the outlet of the new reservoir at Montibello. It would find its way just as well by a ravine as by a pipe and would be just as serviceable for all purposes of flushing and renovating."

These views of Mr. Randolph are well worthy the attention of the municipal authorities. They intelligently point out a ready and practical mode of getting rid of a great and increasing evil. So far as they relate to the offensive stench of the Basin, during the summer months, I am not prepared to adopt them, though I do not deny their correctness. It is not my purpose to discuss the subject of the Basin at this time, inasmuch as I have not deemed it absolutely one of the local causes of the city's insanitation. The matter, however, attracts a great deal of attention, and is looked on as a vital one by many of our citizens. This interest will increase from year to year, and, therefore, any investigation that serves to throw light on the subject cannot fail to prove a boon to the community. The authorities of the city of Baltimore must be aroused in some way to a sense of the importance of their duties in connection with the health and lives of the people. Judging from their past indifference and neglect, it would appear that nothing save a visitation from Heaven, in the shape of some fearful scourge, will prove sufficient to awaken them to a knowledge of their responsibilities.

HARRIS CREEK AND JONES' FALLS.

The first of these streams, if so turbid and tideless a water course can be called a stream, is the greatest nuisance in the city, and, in my judgment, is a prolific source of disease. It is the receptacle of all the vegetable and animal debris of the eastern portion of Baltimore, including the refuse of the slaughter houses on Loudenslager's Hill. As long as it is suffered to remain in its present condition, it must necessarily be a factor in the production of local diseases.

Jones' Falls is not so narrow and sluggish as Harris' Creek, but at certain seasons of the year, and under certain conditions, does give rise to diseases of a malarial character. I have, as a medical man, watched for more than thirty years the origin and spread of

epidemics in Baltimore, and I have always thought I could trace out an influence arising from Jones' Falls—a wave of disease, so to speak, adding to, if not producing, the original trouble. The improvements at present being made on this stream, expensive as they are in character, may add to the security of property in the vicinity, but will prove of very little service in a sanitary point of view. An open bed like Jones' Falls for the sewerage of a city cannot fail to be unwholesome. Central avenue, formerly Canal street, was many years ago an open run. Intermittent and remittent fevers of a very serious nature prevailed every year along its course. Since the filling up of the street and the erection of the sewer these diseases have almost entirely disappeared. At the time to which I allude animal refuse did not form a part in any large degree of the decaying matter, and, consequently, typhoid fever was not common. (It may be added, however, that the sewer or culvert that has been built to take the place of the open run on Central avenue is inadequate, and not at all adapted to the purpose for which it was constructed.)

Doctor Thomas H. Buckler always contended that Jones' Falls is the source of the malarious diseases prevailing in the lower portion of the city, and in his last *brochure*, written before his departure for Europe, he advocated the theory that the gases of the Basin are rendered innocuous by the counteracting and antagonizing influence of the malarial poison arising from the bed of this stream. Be this as it may, the Falls will always be looked on with apprehension by medical men. The great expenditure now being made for its improvement is made entirely without reference to the health of the people. and in that view must be considered as money recklessly thrown away.

PRIVIES AND CESS POOLS.

The privy system of Baltimore is perhaps as bad as that of any city in the United States. It is a memento of the past, the well-preserved and filthy relic of a village history. The existence of forty or fifty thousand of small superficial holes, denominated privies, a few feet in depth, poisoning the atmosphere with their putrid gases, is not a boon to a great city; and yet the citizens of Baltimore appear to cherish this peculiar institution with as much

pride as they do their monuments and the memories of their brave men and fair women. These privies are no doubt the most positive and prominent of all known factors in the production of local diseases in Baltimore. The gases, alone, would account for much of the sickness found to prevail at certain seasons; but apart from this, owing to the proximity, in many instances, of the out-door hydrants so commonly in use, the water, otherwise pure and wholesome, is rendered unfit for use and the source of zymotic disease. My attention was drawn to this evil, some years ago, by the circumstance that I was called on to treat a whole family of patients, suffering from typhoid fever, in a small tenement in the neighborhood of Belair market. On an examination of the premises, I discovered an overflowing privy within a few feet of the hydrant. I could not, at the time, understand how the poisonous excrement could find its way into the water of the hydrant, though I felt convinced it was the cause of the severe malady that had prostrated a whole family. Mentioning the subject in one of the medical societies of the city, my friend, Doctor Erich, in the course of the discussion, stated that his attention had been called to this matter by a similar experience, and that he had investigated the subject, and believed he had discovered the modus by which poisonous gases and morbid material contaminated the water consumed by thousands of the people of Baltimore. At my request, the Doctor has kindly furnished me the explanation which I subjoin; it is a plain and clear statement, and will, no doubt, claim the attention which it merits:

"In compliance with your request, I have the pleasure of furnishing you a short summary of the results of my investigations in reference to the pollution of hydrant water by local causes.

"My attention was first directed to the subject by a lady to whom I had pointed out the dangers of using pump water. She assured me that she had frequently drawn earth worms, hair and sand from the hydrant in her yard, and proved her statement by actual demonstration. After an examination of the mechanism of the 'non-freezing hydrants,' such as are found in the yards attached to dwellings, I am convinced that they are all liable to admit impurities after they have been in use for some time. They are provided with vacuum chambers for the purpose of drawing

or 'sucking' the water contained in the pipes after each discharge under ground, below the freezing point. This action, being frequently repeated, causes the plunger, as well as the leather or rubber packing surrounding it, to wear and become leaky. The vacuum chamber, being constantly immersed in stagnant water, derived from the gutter in front of the hydrant, and in some instances from adjoining privies, a portion of this filth is sucked in whenever the hydrant is turned off, and is then discharged with the water the next time the hydrant is turned on.

"The correctness of this statement may be readily verified by emptying a bottle of the ordinary washing blue into the top of the box surrounding the hydrant, when, after a few forward and backward turns of the crank, we will have its presence in the water plainly apparent to the eye. I would venture the opinion that not less than nine out of every ten of the hydrants in use will be thus found to be leaky. As a remedy I would suggest the abolishment of 'non-freezing' and the general adoption of in-door hydrants."

The true remedy, however, to obviate the whole trouble is to dig down low enough in the construction of privies, if these cloacæ are still to be retained, to prevent superficial drainage as well as the generation of noxious gases.

WATER CLOSETS.

The water closets in many of the private houses and some of the small hotels, particularly those erected some years ago, are very defective in construction. This fact is made apparent to medical men in attendance on the families residing in these houses and hotels by the presence, at times, of offensive gases, This is particularly the case in those houses, not a few of which are to be found in the city, in which the closets are placed in the very centre of the building. These are not lighted or ventilated. A number of cases of typhoid fever, among the better class, have had their origin from defective traps and overlooked leakages in these closets. The wells into which they empty are entirely too superficial, as has been before pointed out, and the whole system of their construction bad and insanitary. These closets, in my judgment, play an important part in producing infantile diseases in the families of the wealthy.

KITCHEN DRAINAGE.

The drainage from the kitchens in Baltimore is not carried off to the gutters by pipes, but flows most commonly over a large space of intermediate ground, permeating the soil through the interstices between the bricks, where it remains covered and hidden to be acted on alternately by the rain and sun. The offensiveness of these accumulations when the bricks are moved can scarcely be conceived, a fact that I discovered on making some repairs in my own yard. How far this condition of things is prejudicial to the health of the city I am not prepared to say, but it certainly is an evil that should be corrected.

CELLARS.

No cellars in the world can be constructed in a worse manner than those of Baltimore. The pre-requisites for a good cellar, cleanliness, dryness, light and ventilation, are almost entirely wanting. Not one thousand of the eighty thousand cellars of Baltimore, I will venture to say, possess these qualities so indispensable to health. Owing to the peculiar nature of our subsoil, heretofore described, they become the receptacles of noxious gases which course through the houses, permeating and contaminating carpets, beds, clothing, &c. In tracing out the local causes of typhoid fever in the families which I have been called on to attend (and I always endeavor to seek out a local cause) I have been compelled in the majority of instances to attribute it to the condition of the cellars, and, therefore, I am convinced they play a greater part in producing the insanitation of the city than drainage, sewerage, or many of the other causes which are supposed so produce the diseases of large towns. During the past year a slight outbreak of typhoid fever which took place in several of the tenement houses on President street, near Eastern avenue, was due, in my judgment, to the foul condition of the cellars and outbuildings. I was compelled to report twice to the Health Department before the landlord would do his duty in the premises, and then it was done with the utmost reluctance. Three cases of typhoid fever, one of them fatal, occurred in the house adjoining my own on Franklin street, from the same cause during the previous year. No part of a dwelling requires so much care in its

construction, and, after construction, in its sanitary supervision, as the cellar; and yet not the slightest attention is exercised in the matter. I venture the assertion, that if all the cellars of Baltimore were examined at this moment, not one in one hundred would be found free from causes, which, under certain conditions, would be likely to generate disease. When the Inspector of Buildings is a man possessing some sanitary knowledge, and it is made his duty to reject buildings not built in accordance with known health laws; and when the sanitary inspectors, that is, the vaccine physicians, are properly paid and do their whole duty under the law, and, further, when the police are made conservators of the public health, this will not be the case, and thus one of our most potent, if not the most potent, of our sanitary evils will be forever removed.

IRON FLATS.

Another source of mischief, the more dangerous because overlooked and insiduous, is the existence of the iron flats covering the gutters introduced into our city during the past few years. These flats, owing to their peculiar construction, become the centres of contagion—they catch and hold to the exposure of the sun a portion of the vegetable and animal debris intended to pass through them, and thus become sources of disease. My attention has been particularly directed to one of these nuisances on Franklin street, corner of Larew's alley, the stench from which during the past summer drove the neighbors to the country weeks before the usual time, and which is believed by some persons living in the vicinity to have engendered typhoid fever in the neighborhood, no less than five persons dying in one house in Larew's alley.

OYSTER SHELLS.

An additional cause of sickness of a typhoid character is the presence of large collections of oyster shells which are suffered to remain and decay at different points in the eastern part of the city. My friend, Doctor Arnold, reports to me that he treated seven cases of typhoid fever in Philpot alley during the past year, due, in his judgment, to this cause. The proprietors of the oyster

packing establishments in the city and suburbs should be compelled to remove the shells and refuse on their premises daily.

FILLING UP LOTS AND STREETS WITH REFUSE.

A very objectionable practice, highly detrimental to public health, has prevailed in Baltimore during past years, viz: the filling up lots and the beds of streets with garbage and refuse. This is an evil that must be permanent, for the processes of decay are ever going on, provided the necessary elements of heat and moisture are brought into action. I do not know that at the present time this practice is allowed to continue, but certain portions of the city, markedly those of north Charles street beyond the bridge and the north east end of Washington street, were filled up in the manner indicated. These accumulations may prove inocuous for years, when suddenly, if a spark of contagion is allowed to fall into them, a fearful outbreak of disease is sure to occur. This was the case at Norfolk and Portsmouth in 1855. The accumulations of chips and shavings and other debris at the navy yard were suffered to remain for years without evil results, when a ship from South America communicated the spark which lighted up the fearful outbreak of yellow fever that decimated those two cities. Lots that have been filled up in the manner described are now built over, and may, in the end, prove a serious scourge to a whole community. Even if not productive of sickness, they are unsightly and unpleasant frequently to the senses.

DRINKING WATER.

The drinking water of Baltimore is as pure as possible, and no portion of the disease of the city can rightfully be attributed to it, when not exposed to contamination. The wells formerly used have been to a great extent abolished and their places supplied by public hydrants and fountains. In the eastern part of the city, in the vicinity of Thames street, owing to the want of public fountains, the abandonment of the old wells has not unfortunately taken place, and they are still largely used. It was believed that after the startling analysis of the character of the water of these wells made by Professor Tonry the authorities would take some action looking to their abolition, but, so far, nothing has been done.

The physicians practicing in the neighborhood believe them to be necessarily dangerous to the public health, and the Health Commissioner of the city, in his report, expresses the same judgment and earnestly urges their condemnation. One or two fountains in other portions of the city supplied by springs are used by wayfarers, but not so constantly as to give rise to apprehensions from their use. One of them, quite near me on Calvert street, below Franklin, is saturated no doubt with organic matter, but it is not much used by the neighbors. Twelve liquor saloons in the same block are necessary, however, to protect strangers from its noxious influences.

PREVALENCE OF DIPTHERIA AND SCARLATINA.

The prevalence of diptheria and scarlatina to an unusual degree in the southern and southwestern portions of Baltimore has been before alluded to. To discover a reason for this fact it is only necessary to examine the filthy stream running from Cross street to the Spring Gardens, as well as the condition of the intervening ground between these points. If Doctor Snow is right in stating (and I believe he is undoubtedly so) that diptheria is preëminently a filth disease, and that it occurs most frequently, and in the most malignant and fatal form, where dampness and filth do most prevail, then no spot in the whole world could be better selected for the propagation of this disease than this part of our good city. Another factor has, however, been added during the past year to its already existing foulness. I am assured, on reliable authority, that large quantities of night soil have been dumped into the Patapsco at this tideless point, without the knowledge of the health authorities. The excrement could at times be seen floating on the lazy stream, proving offensive to those living in the neighborhood, and adding to the noxiousness of the surroundings. Our Health Commissioner, Doctor Steuart, in his last report, called attention to the noisome state of the Cross street stream, but he was not aware, of course, of this additional element of danger to the citizens of South Baltimore. How much longer this section of the city is to be neglected rests alone with the people themselves. Unfortunately, owing to their ignorance of sanitary laws, they are unconscious of the many dangers that surround them.

SANITARY INSPECTORS.

The law in relation to the inspection of the houses of the people of Baltimore is as perfect as possible. The only difficulty is, it is not enforced. Under its provisions the police and the vaccine physicians are made the custodians of the public health. The vaccine physicians are required to visit and examine every house in their respective districts, and to report on their sanitary condition. Were this statute properly enforced, and a conscientious and thorough examination made of all the houses, cellars and outbuildings, including the hydrant in the yard, typhoid fever would become a rare disease.

The police can only be agents in a very rude way to carry out sanitary laws. They have not the special knowledge which the vaccine physician is presumed to possess; but they have noses, and eyes, and common sense, and, from the possession of these, can be of great service in discovering insanitary conditions. They can also see that health laws are executed faithfully.

The present sanitary inspectors, though respectable and excellent men, are a heritage of a system of village insanitation, and are utterly useless as far as the prevention of disease is concerned, and, moreover, completely inefficient, owing to their entire ignorance of sanitary science, to remedy existing evils, to which their attention may be drawn. They are appointed solely for political reasons, and possess about as much knowledge of hygiene as they do of the Pandects. They search out nothing, investigate nothing, unless directed to do so. In a word, they are a heritage of a bad system, having its origin and growth in political patronage—an evil which should never be suffered to affect the health and lives of a community.

Let it once be understood that every case of typhoid fever has a local cause, that some one is responsible for it, that some public functionary is to blame, and then the trouble will cease.

CONCLUSION.

In the foregoing observations I have endeavored to point out a portion, perhaps the most prominent portion, of the obstacles to the perfect healthfulness of the city of Baltimore. Were these

removed, and a complete system of sanitary rules enforced, I am convinced, as I have stated in the beginning, that Baltimore would become one of the healthiest, if not *the* healthiest, of the cities of the world. To secure this, however, it is important that the executive officers of the city connected with its improvements should all be men versed in sanitary science. The Commissioner of Public Works, in addition to being a civil engineer, should be a sanitary engineer. The Inspector of Buildings should also be a man possessing sanitary knowledge. The Sanitary Inspectors should be competent medical men, particularly versed in matters pertaining to the laws of health.

Let men of this character be appointed to these places, and rigid sanitary laws be enacted (the Councils in the meantime doing their duty), and, as sure as anything in the future can be predicted, Baltimore will surpass even the inland towns of the West in salubrity, and exhibit to the world the lowest possible death rate attainable in a great city.