EIGHTH ANNUAL REPORT

OF THE

BOARD OF HEALTH

OF THE

STATE OF NEW JERSEY.

1884.

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1884.

THE STATE BOARD OF HEALTH.

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REPORT OF THE SECRETARY OF THE BOARD.

To His Excellency Leon Abbett,

GOVERNOR—In presenting to your Excellency the eighth report of the State Board of Health of New Jersey, it is gratifiying to be able to speak of the year as one of comparative healthfulness in the State. It is equally encouraging that those of most intelligence, and who have most to do with the moulding of public opinion, are more and more realizing that the health of the people is a vital consideration as to the public prosperity. It is not merely that the ravages of epidemics teach us what a burden these are upon the industrial and monetary interests of a people. Whatever of time, of money and of happy enjoyment are lost by the weariness and waste of avoidable sickness, is a tax on the welfare of all citizens, and so upon the industrial energies and contentment of the population. It is high time that the increase of our resident population and the health and the life of the people had other consideration than that which speaks of it as merely a desirable comfort to be patronized or approved. The healthy man, woman and child are the most valuable of our resources, and are to be fostered and protected with all the forethought and care with which we would guard the honor of the State, or the materials from which it derives its prosperity. They are its productive capital more than the richness of soil, the value of metals or the constructions of machinery. If there is not a vigor of life among the people, there is a constant constriction upon the power which, foremost of all, is indispensable to the development of the State. In our list of resources, families which have homes of health take the first rank. Government and law have few, if any, higher duties than to protect them from the ravages of untimely death, and from those avoidable impairments of vital force that are paralyzing in their effects on prosperity and progress. In the world, there is no value but in human life, and human life has the greatest value when healthy and moral. It is only when we can carefully examine into the health

condition of the people that we can at all realize the burdens that are pressed upon the population by avoidable diseases and untimely deaths. If we turn to the home we find that through the want of requisite information, or by reason of defective drainage, imperfect construction of buildings, or defective methods for the removal of all debris, the inmates are exposed to bad air or to taint of food or water such as must make wasteful demands on vital force, or cause actual disease. If we look into the schools we find pupils subjected to many disabilities in the very process of what we call education.

If we go into the workshop, where the laborers should have healthy surroundings and all the reasonable aids and appliance for health, we too often find that there are various insanitary conditions, and that the average effective life of the laborer is so short as to tell a sad tale of result. If we inquire into actual cases of disease, and the history of epidemics, we find that much of the sickness, suffering and fatality are the result of palpable mistakes and failures in health-care. If we look for evidences from experience to prove what can be done to relieve such conditions, to lower death-rates, and to increase human endurance, the amount of testimony is such as carries conviction to all. The veteran sanitarian, Edwin Chadwick, C. B., at a recent meeting of the Association of Public Sanitary Inspectors, in London, said: "Boston, by improvement in the house drainage, appears to have made an advance from the present common death-rate of the Italian cities, of thirty in a thousand to twenty in a thousand, or about one-third; but it may be confidently affirmed that, by a better self-government and administration of more complete plans, it might gain another third, as has Croyden, where the death-rate, which was twenty-eight in a thousand, is now thirteen in a thousand; or Dover, which was twenty-eight, and now is fourteen; or old Salisbury, with a like gain. But even of such instances, I consider that by the application of the half-time principle of mixed physical and mental training, advances may be made from the death-rates of eleven in a thousand of the children of the school stage of life, to the death-rates even of three in a thousand, obtained in the district half-time schools, or that death-rates of not more than ten in a thousand may be obtained as the average death-rate of a well-governed city. It has become evident that a constant and intelligent oversight of the public health is one of the great prerogatives of government, and so weighty a concern that it must be superintended with administrative skill. While requiring

the aid of the sciences and the professions, and the knowledge to be derived from experience, it also needs the power of the law and its enforcement under the guardianship and direction of the courts. It is encouraging to know that the period of half knowledge and painful experimentation is fast passing away, and we can now say we know the nature and extent of the work which lies before us; we know every day more fully the principles and details which should guide us in carrying it out; and, what is more, we can rely more safely and surely upon the steady growth of intelligent conviction which is rapidly influencing all classes of the community, and enlisting their services in the grand policy of prevention. In addition to the rapidly increasing information as to all sanitary matters, we are able to refer to the former reports of this Board, and to its various circulars, as containing information of much value to the citizens of the State. As being also in constant correspondence with the members of local Boards in all parts of the State, we are constantly able to give to these Boards such information as they may need for an intelligent supervision of their work. This Board is provided by the State in order that, among other duties, it may aid in the dissemination of information, and may instruct local authorities as to their duties. We subjoin herewith reference to a few of the subjects which, at the present time, seem to us most prominently to call for consideration on the part of the citizens of the State.

WATER-SUPPLY.

The importance of a pure water-supply has never been over-estimated, while the difficulties in the way of securing it are constantly multiplying. These are by no means insurmountable, but often involve considerable outlay at the start. It is an occasion for rejoicing that it is probable many of our sea-side resorts can secure a good supply by means of driven or bored wells. Where they have been put down under skilled advice as at Cape May, Ocean Grove, Asbury Park, &c., they have thus far proved successful. Other places, not too compact, depend upon the old form of well. Here the caution as to surface drainage and organic matter near at hand is better understood than formerly. But as not infrequently well-water becomes contaminated by refuse or organic matter in the soil, or pollution from about the curb or pump, the greatest care should be exercised. In some instances the best source of supply is similar to that of Prince-

ton, where advantage is taken of a few hills as a water-shed, and a series of springs are tapped for a supply. These being replenished by the constant source of rain, and the water being filtered through the ground, a good and constant supply is secured. The most serious question is that which relates to the supply of large cities, especially those which, by reason of level position or nearness to tide-water, are not likely to find an abundance of potable water near at hand. Within thirty miles of New York city is to be found half of the population of the State of New Jersey. Of this number, according to the careful and discriminating judgment of engineers, chemists, physicians and boards of health, not one-half are supplied with water fit to drink. It cannot be claimed that the unfitness of the Passaic river, as a water-supply, is any new fact, although the rapidly increasing population magnifies the greatness of the evil. Long ago the State Geologist and various local correspondents pointed to the facts in evidence. Chemists and others, who have begun investigations with the idea that the evils have been magnified, or that they could be remedied by local action, have forsaken such views. The State Water Commission and the chemist of the water boards fully substantiated views already entertained. Nor is it enough to point to the fact of no very great mortality. When so great a city as London can point to a death-rate of only twenty per thousand, and many an English town of 30,000 inhabitants, to a death-rate of only sixteen to eighteen, it will not do for us to claim that Hudson county, with an average death-rate for the whole county of 26.58, and Newark, with a death-rate of 25.49, are in a good sanitary condition. The fact is still more significant when it is remembered how largely the cities are depopulated during the summer, and how many of the deaths that occur are of that zymotic class which largely depends on local evils. No section of country within one hundred miles of New York city has more natural or business attractions that our own State. But if there is neglect of sanitary care, and especially of a good water-supply, it is too late to adopt the policy of concealment, or to point to a death-rate of, say, from twenty-six to thirty as a justification. Such a sustained death-rate in healthy times points to a fearful death-rate if pestilence broods over such nests. Besides, there are evils of sickness, of invalidity, of debility, of depression of vigor, that do not always express themselves decidedly in an increasing death-rate. Where the vigor of population is in any-

wise impaired, and the marriage-rate and birth-rate decreased, these as well as the death-rate are indices of burdens upon prosperity and upon labor, of which those resulting from avoidable disease are the most pressing. It is most noticeable how, in the larger cities of Great Britain, their merchant-princes and their great manufacturers point with pride to the water-supply. If Liverpool has its difficult health problems, it shows a delightful source of water-supply from the hills beyond. If Glasgow has a foul Clyde, it tells you that its people drink only the water of Loch Katrine, stored and filtered amid the great hills of Scotland. London, with its various water companies, is constantly on the alert as to the purity of supply, and by most extended filtering works largely makes up for deficiencies which would otherwise not be tolerated. As our risks from impure water are even more than those from ordinary impure air, it behooves our cities more and more to guard against any contamination of potable water. In the various reports of the State Geologist, and of this Board, as well as in that of the Commissioners of State Water Supply, are to be found valuable facts as to real conditions and as to available sources of water-supply. The great error in some localities has been a too hasty commitment of city interests to some incorporated company. Some of these are excellent and quickly respond to public demand when the water becomes insufficient in quantity or inferior in quality. Others, having become established and profitable investments, resist any popular outcry that requires expense, or very slowly respond to just complaints. A committee at Asbury Park, in a comparison of water-rates in places where the water has been introduced through works owned by the borough or city, found that the rates were over thirty-three per cent. in favor of consumers, as compared with those of incorporated private companies. In other instances, cities have too hastily chosen sources of water-supply on the judgment of non-expert committees, or of engineers little versed in this line of inquiry. The conditions of an efficient water-supply are now so well understood, and the resources of our State in these directions are so good, that no more blunders should occur. We must still urge upon the counties of Passaic, Essex, Union and Hudson the advisability of considering modes of a combined water-supply for the over 500,000 people they contain, and in view of the prospects of a rapidly-increasing population.

SCAVENGERING.

With all that we hear about polluted ground, sewers, etc., we are to remember that the most radical and effective way for keeping the soil clean, is not to allow uncleanliness to get into it. This means a thorough system of scavengering, so prompt as to secure the removal of decomposable or putrescible material before there is time for it to change, and of all cast-off material so that it shall not accumulate in quantities. It also is made to include the emptying of such receptacles as do not find conveyance and discharge through sewers.

Sir Robert Rawlinson, C. E., who has been so largely identified with English systems of sewerage, says: "Since the year 1848, the date of the first Public Health act, very many millions sterling have been expended on main sewerage and house draining; on establishing water works, and on street improvements. I have had something to do with the movement, and must plead guilty to some of the expenditures. I have no reason to repudiate this class of works, but I do wish to exalt something much simpler and cheaper—namely, systematic and thorough scavengering, as unless this is established and attended to, the Sanitary Engineers will, to a considerable extent, have worked in vain. On the full and proper execution of surface scavengering will depend the crowning results of modern sanitary measures. All that water can remove must be washed away; all matter liable to become putrid must be consumed by fire or promptly removed. There must be no large heaps of refuse stored or sorted to enable portions to be sold as manure. The work consists in—

1. The removal of house offal.
2. Removal of ashes and dry house dirt.
3. Cleaning of street and catch basins.
4. Cleaning of cesspools and privy vaults.
5. Removal of manure and other animal refuse.

The first is strictly the refuse from the cleaning of meats, of poultry, of fish; the scrapings and peelings of vegetables; used-up rags or house-cloths, and should be cared for quite distinctly from the dry dirt and rubbish of the house and its surroundings. As it is, much of it, putrescible matter, it needs to be gotten rid of often, especially in hot weather, and with a regularity which will never disappoint. The one essential point is that all these different matters must be regarded as so important as to require a definite and comprehensive plan for

their management." Perhaps no city in the Union has so long been successful in this respect as Boston. In the fifth report of the American Public Health Association, 1879, Eliot C. Clarke, C. E., gives a detailed description of the organization and carrying out of the system. The model should be closely studied by all of our larger cities, many of which have very imperfect plans. Asbury Park, as one of our smaller cities, but as having a rapid summer influx of population, deserves to be singled out as planning fully to carry out a system of surface cleanliness. The method for dealing successfully with all the forms of material is now well understood. If they are kept distinct the problem is greatly simplified. The swill cart gladly receives the first. The ashes and dry house dirt are available for sifting for cement or asphalt pavement, or for in-filling for low places. The street mud is of value in the surrounding country, and when of great bulk is so collected as to be reduced under pressure, as is now profitably done in Glasgow and other cities. With the various forms of excavating apparatus and the decreasing number of cesspools and privy vaults, this department can also be well conducted. The outside vaults can be cleansed by sulphur fumigation. The removal of manure and animal refuse, such as is represented by stables, pens, slaughter-houses and markets, requires active sanitary police vigilance and regularity; but this, too, can be accomplished. Water and air come grandly to our aid in dealing with all surface accumulations, if only we understand by water, not wetting, but washing away, and by airing, not merely the presence of air, but draughts and winds—such ventilation as flushes. All this is the more important, because when a pestilence breaks out it will not do to stir up all the "sleeping dogs" of disease, or to remove, amid heat and moisture, materials which ought never to have accumulated.

DISPOSAL OF ALL HOUSE WASTE.

As the sanitary condition of each house has to do with the health of its inmates, and as a pest-house, even in its most moderate definition, cannot but have effect upon localities adjoining it, or persons passing it, the healthy character of each building becomes a public concern. With the great tendency that population has to center in cities, and with the fact that over one-half of the population of New Jersey is already enclosed in cities of over five thousand inhabitants,

we cannot be too watchful as to these domiciliary conditions. So much depends upon the choice of a healthy site, the proper preparation of the ground by under-drainage, and upon the construction and material of the building, that most of the largest and most advanced cities of Great Britain, and of our own country, recognize this as too much of a public concern to be left to the option of each individual. Hence, building plans of extended alteration are now submitted to competent judges in order that it may be known that proper provision is made for the safety and health of those who are to occupy them. Thus are not only valuable suggestions secured, but impositions upon occupants are prevented, which, unless hindered in this way, they are too often powerless to prevent. We see no other plan upon which proper dwellings can be secured, and by which especially the industrial classes in towns can be protected from the most serious tax upon their industry and resources. As it is practically impossible for each householder in a city fully to provide for the removal of every form of debris, or to determine, independently of his neighbor, what plan shall be adopted, it is incumbent upon all cities and city authorities to regulate certain matters as to the disposal of all "offaling" of the household. It has long since come to be recognized that the use of a cesspool which is to receive the liquid filth of the house, and distribute it through the soil, can only be defended under certain conditions. While a proper soil and proper cultivation, and a proper distance from the house and the well, may make this tolerable in the country, it is always a questionable, and often a dangerous method, where houses join each other closely on streets, or are only separated on the rear by yards of small depths. The risk is greatest where the dependence is upon wells for water-supply, but as foul air is harmful, as well as foul water, the risk is removed only in part by reliance upon a different kind of water-supply. The resort to closely cemented cesspools is safe, but this involves so much expense in the removal of the liquid as to deter many from this method, except where there is a city system of disposal. Hence, sewers have come to be the reliance of most large cities. The proper construction of these is now so well understood, and they are now so well brought to a reasonable expense as to make their use far more extended than formerly. The great difficulty as to them now arises from two sources. Too often the house systems or inside connections are imperfect, so that more so-called sewer gas is generated in the house system than in

the main sewers. The remedies for this, also, are now much better understood than formerly, and where building is under sanitary supervision, and plumbers are licensed or their work inspected, the evil is fast being remedied. Another and great difficulty arises as to the disposition to be made of the liquid sewage as it flows away from the outfalls of the various main pipes that carry it away from the building and from the streets of the city. The most usual method is to discharge it into some adjacent stream. Thus many a little brook flowing through a village or city becomes the receptacle of a stream of sewage, larger than its own volume, and especially so in the summer months, and in times of drouth when the sewage especially needs dilution. That air and water have much power in decomposing fresh sewage and in removing its disease-producing qualities is well known; but where the limits of this are found by experiment and experience to have been reached, it is very hazardous thus to use these small streams. Where a river is used, very much depends upon the soil and the cultivation of the country through which it runs, upon the density of population along its banks, and upon conditions actually found to exist as to the quality of its water. Chemical, microscopical, biological and botanical investigation afford great aids, while the careful observation and experience of physicians, not only as to specific disease or death, but as to the more general vital condition of the population are of the utmost importance. Where it is not found permissible to introduce sewage directly into a stream, various and often successful devices are resorted to. One, is so to impound and hold the sewage for a few hours as to discharge it in bulk while yet fresh, with the outgoing tide, and so by quantity and the direction and force of flow facilitate its conveyance to more open waters. This will do in some places, as on the English coast, where there is a rise of tide of twenty or more feet, but seldom does where the natural fall is small, and where the rise of tide is inconsiderable. A remarkable experiment in this direction was tried a year or so since to relieve a part of the sewerage of Newark. The delivery of the Sixth Ward sewerage into small creeks on the meadows having become an intolerable nuisance, the idea was conceived of digging two canals out to the bay, one of which should hold the sewage, and the other catch and impound the tide. This was attempted to be done with a fall in the first ditch, so small as was sure to be inoperative whenever a sludge had been precipitated by gravity, and by the salt water acting

on the sewage material. Besides the amount of water this impounded was not sufficient for the purpose. The Secretary of this Board gave reasons before some of the citizens why the plan would fail, and advised if anything of the kind be attempted, that reliance should be had upon a pumping station near the terminus. It was concluded, however, to try the experiment, which, at an expense of about $75,000, has proved a total failure. Another more common method where the adjacent stream cannot be used, is to construct sewer pipes or mains far out into broad, and deep, and rapidly-moving waters. This is often a great relief. Yet, after several years, as in the case of the lower Thames, the deposit becomes a great embarrassment. Another plan is to resort to system of irrigation by which the liquid is sprinkled or poured over properly prepared land, and so is ærated and undergoes chemical charges, and is appropriated by growing crops. Generally such irrigation is so managed as to constitute what is known as intermittent filtration, so that instead of continuous flow, plats of land are showered and then have rest. Thus the air and the water-supply to the soil are alternated, and the desired changes go on much more rapidly.

Another plan is to secure this intermittent flow by means of flush tanks and a small-pipe system about a foot under ground, and so irrigate a little below the surface instead of upon it. Methods have repeatedly been introduced to act by gravity and settling basins, by machinery and by chemicals upon the sewage so as to change its character; so as to receive from it its suspended and much of its dissolved matter, and secure what is valuable of it and send the purified water into streams or upon lands. The great difficulty has been that the sludge thus precipitated or separated, has itself had to be dried at large expense and that the material left was bulky and not found valuable enough for land to pay for its separation. Some recent advances as to the compression of this sludge have been made, which much cheapen the cost and gives a condensed manure of value enough to make the reduction of it practicable. This will help to solve the sewage problem for many large towns not on large rivers, and much facilitate the removal of such material. Since our last report the subject of sewage disposal has occupied the attention of many of our cities. Trenton has secured the services of an eminent engineer to furnish a plan for the sewerage of the city. The city of Newark has accepted the plan of several engineers for the disposal of the

sewerage of an important part of the city. The condition of the Passaic river is recognized to be such as to demand some other disposition of the sewage of Passaic City and other towns along its banks. Even with the partial relief which will be thus secured, the use of it as a source of water-supply will probably be ere long discontinued.

HEALTH IN FACTORIES AND WORKSHOPS.

Former reports have not failed to call attention to the very great importance of such State oversight of labor as shall secure for it conditions compatible with the health of operatives or such as shall in extra-hazardous trades or occupations reduce evils to a minimum. Systems of heating and ventilation are now so well understood as to make it possible to secure these so as not to impair the health of indoor operatives. Yet a very large number of factories are greatly defective in this regard. Modes of caring for the dust or particles from most industries are now well understood. The necessity of protection for machinery and of fire-escapes is admitted by all. This State has as yet passed but very few effective laws relating to the subject. Our present Factory act, although of service, has chief reference to the care of minors. Its inspectors do not claim any expert skill in the various details that relate to sanitary arrangements for buildings or the health of those in special industries. For these the English laws provide such medical and sanitary oversight as has greatly mitigated many evils. The English act of 1846 recognized the necessity of surgeons duly appointed, to examine as to the health and physical fitness of those employed among the young, and extended its protection to females. Most of the acts of 1860 dealt with the interests of children and with a regulation of the times and hours of labor. But the act of 1866 provided that every factory to which this act applies, shall be kept in a cleanly state, and shall be ventilated in such manner as to render harmless, so far as is practicable, any gases, dust or other impurities generated in the process of manufacture. Protection to health was a leading feature of this act, extending even to restriction as to the eating of meals in rooms full of dust or of particles from hazardous operations. At this time a close examination among pottery operatives showed how short were the actual working years of most potters, and how many died at an early age.

The English act of 1867 included any premises, "where fifty or

more persons were employed in any manufacturing process." In 1878, a consolidated act was passed of wide scope, including every industry under general jurisdiction, and giving special prominence to the care of the health of all workers as an industrial interest that could not be left either to the judgment of employers or of the municipality. Even in the matter of bake-shops, the reports of a commission showed such evils as to make it necessary to provide that (*a*) "no water-closet, earth-closet, privy or ash-pit, shall be within or communicate directly with the bake-house; (*b*) any cistern for supplying water to the bake-house shall be separate and distinct from any cistern for supplying water to a water-closet, and (*c*) no drain or pipe for carrying off fecal matter or sewage shall have an opening within the bake-house." References to our report of the Health Commission of 1866, and that of 1876, as well as the previous reports, will show how this matter of care of factories, work-shops and workmen has been urged upon public attention. In addition to inquiry in our last report as to the trades and occupations, observation is now being had of several of our important industries, with a view of finding out such defects as injure the health of workmen, and as to the best preventives to be applied. The requirement of the English act of 1878 was that every factory or work-shop shall be kept in a cleanly state and free from effluvia arising from any drain, privy or other nuisance, and shall not be so over-crowded whilst work is carried on therein as to be injurious to the health of workers, and shall be heated and ventilated in such a manner as to render harmless, so far as is practicable, all the gases, vapors, dust, or other impurities generated in the course of the manufacturing process or handicraft carried on therein. The results of such laws, where enforced, have fully vindicated their importance. In one of the dusty industries, that of flax or jute, we have the following testimony: "Fans have been constructed, splash-boards set up, and heat and steam effectually carried off. The masters offered the most willing testimony to these great advantages in promoting the health and comfort of their work people. Another employer asserted two years afterward, that he was at first reluctant to accept the proposed changes, but now he only regrets that his work people had not enjoyed the benefit of these changes sooner." The improvements in woolen and linen industries, in potteries, in metal trades, in printing, and bake-houses, and in numerous other occupations, have been very marked. "It is proved," says Lakeman, "that

the factory act system is capable of universal application, that no sort or condition of employment could not be made amenable to its code, that throughout the Kingdom it revealed that in all trades there were abuses to remove, cruelties to the young to be assuaged, vicious habits to be overcome, parental cupidity to be checked, avarice of many employers to be subdued, civilization, in fact, to be introduced, and order, system and sanitation, the handmaid to health, to be firmly established." While we do not favor any restrictive or arbitrary measures, save such as the welfare of population absolutely require, and while thorough knowledge and prudence are needed by officials under any such acts, we do claim, that as in the schools, so in the factories and work-shops, the State has so much at stake that it cannot afford to leave these at the option of those who may be either careless, or indifferent or uninformed. Both prudence and skill must be at command, so that the inspectors shall point out defects and secure remedies in such a way as will help both employes and employers, and commend itself to all those that are not too greedy, or too unreasonable to be swayed by facts and experience.

TENEMENTS.

A partial inquiry into the modes of rapid and imperfect house construction, and the over-crowding of families in tenement houses, leads us to feel that the time has come when general legislation should recognize, especially in cities, the necessity of some oversight of this matter. The wisdom of the New York laws, which, in this respect, gives large powers to its city Board of Health, has been fully vindicated. Several other cities give like powers. It is a most essential advance of sanitary legislation and has not been found arbitrary, but has been sustained by the court on appeal. We can point to locations in some of our cities which we have personally visited, in which the character of the buildings and the crowded state of their occupancy is not only damaging to the inmates, but a serious menace to the public. In each city, plans of new buildings, or of extended alterations of old ones, should be submitted to the Sanitary Engineers and Health Officers of the Board of Health, and should have the approval of the Board only so far as fairly consistent with the interests of public health. Ill health, idleness and vice are fostered by over-crowding, and restraint upon such construction of buildings as invites and compels it,

must be recognized as one of the great public interests of the State. Sir Robert Rawlinson, C. E., the eminent Chief Engineering Inspector of the Local Government Board of England, has recently, in three addresses, sought to call more decided attention to the study of the domiciliary provision for the people as an essential condition of social and natural prosperity. Not less important is the subject in our American and State nationalities, in which the forces of the household so soon make themselves felt at the ballot-box and in legislation. In Jersey City and Hoboken, in Newark and Paterson, and in a few other of our cities, we should not await wrong construction, but so regulate, especially as to ventilation, light, and all pipe connections, as to secure the house from becoming a danger to the general public. We are fortunate in being able, in this report, to furnish a paper from one who has had large experience in this direction. The analysis given of the New York law will be found well worthy of study.

EFFLUVIUM NUISANCES.

The attention of the Board has during the last year been called more than ever before to the evils resulting from what are known as effluvium nuisances. That the world should be without occasional unpleasant odors is an impossibility. But that communities should not continuously, or for considerable portions of time, be subjected to odors which are believed to be injurious to health, and which render the life of the ordinary citizen uncomfortable, is a principle of common law no less than the dictate of common sense. No one can look into such a law book as Wood on Nuisances, or read the articles of Counselor Atwater, a member of the Board, or refer to various decisions, both of English and American law, without seeing how clearly this opinion is asserted. If the matter be that of pig-pens or slaughter-houses, it is claimed that the people must have pigs and meat, and that it is inconvenient to have pig-pens and slaughter-houses at a distance. The answer to this is that we may have pigs and meat without nuisance, and that inconvenience is sometimes demanded for health and for comfort. Another answer is that where pens and slaughter-houses are under sanitary inspection, or careful and cleanly care, they can possibly be made tolerable. We have seen an abattoir in the midst of a large city so conducted as not to distress the residents. It is, however, because of the great difficulty of keeping pig-pens, cattle-yards and slaughter-houses in favorable conditions, especially during hot weather, that most cities and villages claim that they should not be within several hundred feet of dwellings. While there is, up to a certain limit, a wonderful accommodation in the human system to organic materials, and such adjustment as to many does not cause any ascertainable injury, yet it cannot be expected that the young, or those in impaired health, or the ordinary citizen will have their senses blunted to bad smells, or their bodies hardened into resistance. It is an ascertained fact that nausea and diarrhœa and an extra demand on vital force are the result in the case of many, and that when some special contagion alights or an epidemic occurs the districts nearest to such odors and those newly brought in contact with them are most likely to suffer.

Our attention needs still more to be turned to the various forms of nuisances arising from useful manufactories. Toward these we have all that predisposition which we should have toward the development of important industries. Yet it is to be remembered that an industry which is of real advantage to a few, and yet renders life more or less intolerable to the many, becoming a general nuisance both by its unpleasantness and its menace to health, is not a real advantage to any community. It deducts from the comforts of the masses and often imperils the health of workmen. In these cases the real points to be determined are: How necessary it is to have the industry in the particular locality it occupies; how far is it really afflictive or injurious, and what means science and art furnish to overcome its evils? All of these, of course, are matters either of opinion, of fact, or of evidence, as to which courts must decide. One great error is that many of the factories fail to avail themselves of the best methods to prevent nuisance. The work itself is done in a slovenly way, or apparatus for consuming smoke or malodorous organic material is not used, or, if used, the stoker or other operative does not properly do the work. Dr. Ballard, in behalf of the Local Government Board of England, and in the interest alike of factories and of the public health, has made an admirable series of reports on various industries. We have seen many establishments so conducted, even in the midst of large populations, as not to be a nuisance or a peril. It is not the business of owners to look to those who complain to furnish the remedy, but it is their business to secure such expert aid and such apparatus as shall reduce to a minimum the evils complained of.

More still needs to be said as to a class of factories or works which directly deal with decayed or putrescible material, and which, under the names of chemical works, refineries, or fertilizing companies, are sure to become nuisances unless in the most skilled hands. The strictness of New York laws as to these, and injunctions and decisions of courts in that State, have led some of these to locate in this State. Often they are just outside of city limits, or in places where the amount of nuisance depends upon the direction of the wind. These are nuisances of which local Boards of Health should take cognizance, and do all in their power, both by inspection and by information to this Board, to either abate or control. Whether the course of procedure of a local Board should be a notice to abate; whether private citizens who are aggrieved should proceed by complaint before grand jury; or whether the case should be carried into the Court of Chancery, are questions generally to be settled under legal advice. Every citizen has, under common law, certain rights of abatement of a nuisance, and to go before the courts with his complaint. But he is too often practically helpless by reason of the effective influence of companies, or of a lack of sufficient money to contend. The State law has, therefore, wisely conferred on the local Boards of Health the same powers which inhere in the citizen, and so made it possible for the Board to become the complainant. Further than this the law cannot go. If the influence of capital and individuals can prevent a public sentiment against such nuisances, or elect Boards of Health who either fear or hesitate to do their duty, the residents of the community must suffer or move into a more correct public sentiment. It must not be complained that the law is inefficient. As a Board we do not think that there is need to lodge summary proceedings with us, although we are always found available for examination, opinion, or advice. Where there are lawyers and courts these are generally more effectual, in co-operation with local Boards, than any attempt to transfer to non-legal bodies what is the legitimate sphere of skilled legislation. The rights of local Boards should be well strengthened before the higher courts, in which there is sure to be due consideration of the rights of the citizen, as well as of those of skilled industries.

As to the petroleum nuisances at Constable's Hook, this Board has had much correspondence with the New York State Board, which has had occasion also for much complaint as to the injury done to Staten Island. The Standard Oil Company has made much effort, by new

machinery and skilled appliances, to diminish the evil. Other factories have done very little. The local Boards and citizens have their chief defense in resort to the courts. The law of last winter, prohibiting the throwing of the sludge into the river, was important, as by it our food fishes were being killed or rendered unpalatable for food, and unpleasant and noxious odors were being disseminated.

The dealing with the petroleum sludge, in order to recover from it the sulphuric acid, and the use of the crude sludge in various establishments for the manufacturing of fertilizers, has also occasioned much nuisance. In these fish, meat, bones, or other decayable or putrescible material add to the evil. The Secretary and others, in behalf of the State Board, have made careful inquiry and personal examination both directly and in aid of the local Boards. In one case a warning statement of the facts was made to the grand jury. We believe that much good has resulted and that this evil can be greatly mitigated, or, if necessary, abated, if local residents and authorities do their duty, or if proprietors will profit by methods now found efficient and within reasonable cost. The bone factories near the Passaic, and the rendering establishment on the meadows near the Hackensack, still furnish to the traveling public, and other long-suffering worthies, their annual tonnage of scented particles, but no local Boards have attempted opposition. From Newark many complaints have reached us as to continuous foul smells and odor factories, but as no individuals have instituted proceedings and as the city Board of Health, if strong in its individuality, is weak before the law, no relief has been sought. In general it can be said that if only localities and local Boards would judiciously and prudently, yet promptly, do all that the laws of the State and the higher courts provide, there would be far less menace to the public health.

OUR SCHOOLS AND HYGIENE.

The importance of considering the physical education of the young more and more presses itself upon the attention of this Board. As it is always difficult to change the habits of those of mature age, the chief progress in any permanent improvement of the condition of a people must come from impressions made or habits practiced during the training period of life. It cannot be concealed that our American population has in the last few decades shown deterioration in physical

vigor. In some cases it results from the overcrowding, incident to close city populations; in others it is owing to a want of active occupation in youth. Before the age of twenty-one there is more of idleness, or less, at least, of systematic labor and instruction in exact methods of work than formerly, and so less of incidental physical exercise. It is admitted that under our common school system there is need of a kind of education which shall more thoroughly fit young men and young women for the manual duties of life. From the ages of seventeen to twenty-one there is many a youth whose time is not profitably employed either in actual work, or in that kind of drill or education which shall fit him for useful labor. Often the young come to this age showing a lack of that vigor which, to those not endowed with wealth, is an indispensable prerequisite to success. Health is so much the capital of all work, that plans for its securement cannot be left out of our systems of education. As our school system comes to be examined, it is found not only that no proper attention is given to the teaching and enforcement of practical hygiene, but that children are subjected to influences such as are sure to unfavorably affect their vigor. It is evident that a system of public instruction in this respect is greatly needed. The advances made in the last twenty-five years, in our knowledge of physical laws, as applied to the human body, and in the study of the natural and artificial adaptations and aids to health, are such that it is feasible so to teach physiology and hygiene in the schools as that children shall come to know and to be trained to practice what is needful for their bodily welfare. They would thus become so acquainted with what is requisite for healthy ground, healthy dwellings, pure air, pure water, good food and proper clothing, as that they would know how productive and enjoyable life can best be maintained. To secure this kind of instruction it is not sufficient that some general advice should be given, or a book on physiology be studied a little, or that now and then a lecture should be given. The teaching and practice of hygiene must be conducted just as distinctly as is the exercise in grammar or penmanship, or in any other of the branches usually taught in our common schools. It should have especial prominence in the Normal School, and in the various cities and State Institutes in which teachers are being prepared for their work. We are glad to know that some of the city boards of education have realized this, and have taken measures for more thorough instruction and discipline of this

kind. The past two or three years have been very productive in text-books for this kind of instruction. If a thorough course could be given to the teachers of the State under skilled medical and sanitary direction it would result in a more thorough introduction of this branch of education into our common schools. This Board has a large collection of text-books in this line, and is glad to co-operate with local authorities in attempts to extend its teaching to all of our common schools.

Several of the States have passed laws requiring this kind of study and examinations in physiology as a prerequisite to certificates for teaching. It is not enough to boast of our systems of education if they do not aid in the physical and industrial, as well as the intellectual, and moral welfare of the population.

OUR CHARITABLE AND PENAL INSTITUTIONS.

The attention of the State to the condition of its charitable and penal institutions, although not yet what it should be, shows some commendable advance. In 1866, the State Sanitary Commission made some important inquiries into the care of the insane in county and township almshouses, as well as into the general condition of the houses and their inmates.

In the fourth report of the State Board of Health (1880), a valuable collection of facts was given as to almshouses and jails.

The sixth report, 1882, furnishes additional details as to this inquiry. The seventh report, 1883, still further illustrated the importance of a systematic oversight of these institutions in the interests of the State.

The report of the Bureau of Statistics of Labor and Industries (1883) has a very valuable article on jails, asylums and almshouses. We believe no one can read these series of reports without recognizing that both the health and industrial welfare of our citizens require a systematic attention to the condition of such classes of population. While it is hoped that the Council of Charities and Correction will secure a valuable oversight, the Board of Health and the Bureau of Industrial Statistics cannot but realize their necessary collateral interest therein.

The visits and inquiries which have thus far been made have shown the State institutions as having a much better management than most

of those of the counties and townships. While there has been some occasion to examine and advise upon the sanitary arrangements in these, it has been either when our attention was called thereto and advice asked by the managers or when some minor defects have attracted our attention.

The difficulties experienced as to the sewerage in the asylum at Morris Plains, have been under the advisement of the managers and of the State Board of Health, but the Superintendent of the asylum has been chiefly in oversight.

Both the old and the new asylumns at Newark have been visited, and some suggestions made. While we regard our asylum systems, taken as a whole, as seriously defective, and as not the best possible for health, occupation and recovery, it is not in the power or province of this Board to initiate any change of system. Especially in the county asylums is it the case that the lack of system, and of employment, tends more to confirm defects than to improve the patients.

Before the Asylum for the Deaf and Dumb was occupied, a careful examination was made of its sanitary arrangements, which, with very slight exceptions, were found quite in accord with the most approved modern methods.

The excellent executive ability of the Keeper of the State Prison has extended itself into careful inquiry and oversight as to matters of sanitary construction and administration. While the older parts of the prison are difficult to keep in good sanitary condition, chiefly by reasons of imperfect ventilation, the newer parts have many advantages which are well utilized.

The two penitentiaries of Hudson and Essex counties, which contain prisoners of short term sentences, are, in the main, well adapted for their purpose. As a whole, our jail system is defective.

This is all the more serious, since, as now conducted, they have social charms for the class who occupy them. By the present system, those who have been in them not only lose any self-respect they may have had, but find that the most comfortable disposition they can make of themselves is to do some petty crime, or get drunk, or become so vagrant that they secure commitment. They here are not only fed and sheltered, but have congenial company, and are too often educated into real or worse criminality. Our jails are thus made badly-managed almshouses, and do great harm to their inmates. We believe that the increased expense which thus yearly falls upon

our cities and our counties would more than pay for all the structural and administrative changes that would be necessary to break up this educational system for crime.

The sanitary conditions of the jails and of their inmates is not only bad for the jails, but a menace to the localities which they are in. It was their evils as pest-houses that first awakened the attention of the philanthropist, John Howard. The danger to health, and the even greater danger to the good order and peace of society, demands the earnest attention of our Legislature and of all good citizens, to all our charitable and penal institutions. As it has fallen to the lot of the secretary more than to that of any other citizen of the State to visit and study these institutions, he has reason, on behalf of this Board, to speak plainly as to the need of radical changes.

CHOLERA, AND PRECAUTIONS AS TO IT.

It is occasion for great gratitude that the cholera, which has caused such wide-spread desolation in Southern Europe, has not yet found foothold in America. Yet the history of past epidemics; the delayed but steady march of the invader heretofore, gives us a warning not to be unheeded. The transfer from Egypt to Southern France had a year of interval. With the rapidities of commerce and the frequency of inter-communication, it is not probable that the United States will escape invasion another year. If this were possible, the significant words of the distinguished authority in England, Mr. Simon, in 1873, are still of full weight: "It is important for the public very distinctly to remember that pains taken and cost incurred for the purposes of preventing cholera cannot in any event be regarded as wasted. The local conditions which would enable cholera, if imported, to spread its infection in this country, are conditions which, day by day, in the absence of cholera, create and spread other diseases: diseases which, as being never absent from the country, are, in the long run, far more destructive than cholera; and the sanitary improvements which would justify a sense of security against any apprehended importation of cholera would, to their extent, though cholera should never reappear, give ample remunerative results in the prevention of those other diseases. * * * The peril and the wrong of neglect is therefore not to be reduced by any consideration of a possible, although highly improbable, exemption; neither is it

modified by any increased hopefulness as to the successful treatment of the actively developed disease. Doubtless it is, still lamentable, that one should still have to speak almost with despair of the medical treatment of developed cholera; but so it is. The task continues to be, as from our first acquaintance with the disease it has been, an almost hopeless task to the practitioner. * * * Practically, then, more and more as facts like the above become notorious, the business of resisting cholera on any large scale resolves itself into aims of prevention. And in contrast with the powerlessness of curative medicine, the preventive power which we possess is among the happiest possessions of science."

The doctrine of the cholera-fungus was not new at the time of the former epidemic, and the probable discovery of the comma bacillus by Dr. Koch, while fulfilling expectation and very valuable, does not as yet throw any light upon the treatment of the cholera patient. It does, however, confirm former views as to the alvine secretions being the media of the contagium; also by the apparent fact that the bacillus is very short-lived if only it can soon be subjected to thorough dryness, makes more hopeful our success in preventing the spread of the disease.

These words, uttered in 1866, are still emphatically true:

"For public use in this country the all-important principle of cholera prevention is that 'cholera derives all its epidemic destructiveness from filth, and specially from excremental uncleanliness,' and 'the local conditions of safety are, above all these, two: (1) that by appropriate structural works all the excremental produce of the population shall be so promptly and so thoroughly removed that the inhabited place in its air and soil shall be absolutely without fecal impurities; and (2) that the water supply of the population shall be derived from such sources and conveyed in such channels that its contamination by excrement is impossible.'"

The Cholera Commission of the German Empire, which met in 1873 and reported about 1884, after nearly ten years of research and experience by the ablest authorities, united in this summary:

"'Of all the measures which may be applied to the prevention and combating of cholera, those take the first place which have for their aim the improvement of general sanitary conditions. All specific measures against cholera will prove unavailing, unless we pay the strictest attention in inhabited places to the purifying of the soil from

organic and easily putrifying refuse, to the drainage of the soil, to the constant flushing of the sewers, to the frequent emptying of cess-pits, the complete doing away with pervious cess-pits, the careful inspection of dwellings and closing those that are really hurtful, the provision of pure water both for drinking and other domestic purposes, and the like. The commission expresses here the united opinion of all, that the measures demanded by public, general hygiene offer the best protection, not only against cholera, but against all other epidemic diseases.'"

"Prof. Horsley, of the University of London, in his classic and experimental contribution, says: 'Where there is faulty hygiene and impaired vitality, there is consequent easy invasion by vegetable organisms.' Although the animal system is everywhere surrounded by these parasites, 'during health no vegetable organisms are found in the blood.' The particle-like moisture may be in the air, but the person and the place determine the manifestation. This dew of disease as a rule will not be found in the gravel highways of purity, but will drench with its death-sweat the fields and the bodies rich in the food on which it thrives."

How these results are to be best accomplished is the practical question of a wise forethought and foreact. Of how it was not done in the cholera of 1873, in a certain stricken and desolated town in which there was "great overcrowding and bad house construction; bad water-supply; bad drainage; absence of privy accommodation, and accumulation of surface nuisances," the following is the brief record:

"If a prompt assent and excellent resolutions would have cleaned the town, long before my inspection it would have been clean; but unfortunately it had not been deemed necessary to see to the *execution* of the orders given, or even, I fear, to provide the necessary force for carrying them out. There was no inspector of nuisances for this town of nine thousand inhabitants, devoting to that work, as the circumstances of the town urgently required, his whole time; but the inspection has been made to devolve upon an officer having abundance of other duties, and not especially fitted for this; the scavengering force was inadequate, and though there existed, or was believed to exist, a sanitary committee of the town council, it did not appear that they accomplished very much." The two great and embarrassing hindrances to the uniform administration of sanitary measures are either the absence of a properly organized executing force, or, if so organized, a defect in actual constancy and thoroughness of method and of the pecuniary means for its securement. Yet, the proper modes of

organization and execution are and have been in operation in the best sanitary districts, and there is no kind of work done for a city which there is so much true economy in having done well. And as to all threatening expenditures, it is needful to have in vivid remembrance the fact that "measures of cleanliness taken beforehand are of far more importance for the protection of a district against cholera than removal or disinfection of filth after the disease has actually made its appearance." Indeed, there is some limitation as to the removal of stored filth after the disease has located in a part of a city lest the act of removal may increase a danger which ought never have been allowed so to accumulate, and which will, if these words are heeded now, be removed in advance of any invasion of this State during the next summer. And because fall, winter and spring are so much the most seasonable periods for the removal, which in the case of many cities will occupy much time, it should be begun without delay. "The spread of cholera is generally in proportion to the density and want of cleanliness of the population among whom it occurs."

Besides that general effort for cleanliness, of which the details have been before noted in former reports, there are three to which especial attention should be given.

(1) There should be a careful examination into all sources of water-supply, and into any impurities to which potable water is exposed. Where there are serious contaminations, radical structural changes must be made; where there are not, the incidental sources of temporary deterioration must be watched and the remedies be clearly stated and applied.

Reservoirs and pipes may be greatly improved by attention this winter even, where the supply itself comes to them pure and wholesome. Often, where there is a public water-supply it needs to be accurately known how many houses and families depend on cisterns or local wells, and a record needs to be made, so that in any given cases of sickness or death any possible casual relation may be traced. Sometimes where the supply itself is not altogether satisfactory and new supplies cannot easily be secured, large settling and filtering reservoirs or the local filters of cisterns and house-supply are of essential service. It should also be understood that as a temporary resort, where the water is under suspicion and needing to be used, the boiling and pouring of it from one pitcher to another to aerate it, makes it a safe and a fairly palatable drink. Dr. Farr, in his report to the

Registrar-General of England, on the cholera of 1866, says: "The great explosions of cholera in England have arisen from the use of the water of tidal rivers into which the recent sewage of large populations has been poured."

(2) The next important measure is the prompt and thorough removal of fecal matter and excretions, whether of human beings or of animals, and of every sort of house-refuse or filth, wherever collected in the vicinity of dwellings. And that accumulations may not be going on in unseen places, or that befouled, or leaky, or air-locked or trapless pipes may not be a source of continuous deposit, careful skilled examination should be had by competent inspectors.

(3) As bodily and personal cleanliness and neatness, not only as to all bodily covering, including the skin, but also as to naturally healthful conditions within, have to do with susceptibility to many diseases, it should be known that improper foods and indulgences, bad air, and the special foulness of secretions caused by errors of diet or of life, are invitations to contagion, and that the system should be kept as thoroughly as possible in a natural condition.

In view of the possible invasion of cholera, or other foreign pestilence, there are a few preparations of another kind which need to be considered before its actual approach, since the knowing what to do and the doing of it promptly, as to the source of invasion, as to the person, or as to the house, lot, or vicinity, is often the determining point as to whether the first case or cases shall extend into an epidemic. This precaution, so far as this State is concerned, relates to (*a*) what guards are to be exercised against approach; (*b*) what facilities are to be provided and at hand for any first case or first house concerned; and (*c*) what are the more extended provisions in case of any actual increase of cases. In all this we of course take it for granted that there is now ready and equipped a local Board of Health, and that they have funds at command and will be promptly aided by such of their citizens as they may need to call to their aid.

We think that, in addition, all ports of entry in this State, and all Boards of Health of cities, counties, or townships bordering on the coast, should have similar authority to that given to the Board of Health of Perth Amboy, Chapter XIII., Laws of 1882, or probably, under the general law, may now exercise it. (See Chapter CLV., section 7, Laws of 1880.)

Some legislation should also be had by the State to provide addi-

tional appropriation in case of need. Also, because this State is a great entrance and exit of immense railroad travel and traffic, and because, especially in such epidemics as cholera, yellow fever, etc., cars and the closets and conveniences of railroad stations become chief sources of peril, there should be, on the part of the State or local officers, special charge of these. Such cases as this are on record. In 1873 a colored boy went from Lebanon, Kentucky, where cholera was present, to Columbia. He suffered from diarrhea, and at this latter place used a privy which was overflowed, but to which no sickness had previously been traced. He was found in a state of collapse, and died in a stable near by. The negro man in charge of the stable was attacked and soon died. Farmers who came in from the country, and only visited this privy once, were stricken with cholera. The privy was disinfected, after which no cases were traced to it. At all railroad stations and at all public resorts, the local Boards of Health should require the most perfect cleanliness and disinfection. The investigations of Koch, in the midst of the cholera in Egypt, India and France, seem to fasten the infection so singly to the fluids and excretions coming from the digestive and intestinal tract, that we cannot too thoroughly guard as to these, and as to direct exposure thereto. If the view of Koch is correct, that soiled clothing becomes infectious soon after it becomes soiled, it shows that all discharges should be received into vessels holding a disinfecting solution, or on disinfected cloths. When a patient comes under treatment, it should at once be inquired what privies or water closets have been recently used by him, and a person should be sent to disinfect if the place is within reaching distance. The duties of a municipal Board are so well summarized in a memorandum of the Ontario Board of Health, that we adopt it, with slight changes:

"The local Board of Health should issue and enforce directions for the immediate reporting of all cases or suspected cases of cholera, as of other infectious diseases, in compliance with the public health act of 1882.

"On receipt of such notices, the local health officers should immediately examine into the reports. If the medical attendant reports the case this will be sufficient verification.

"If the person has been taken sick at some public place, and needs removal, a metal ambulance with safety bed should be at command.

"The Board should secure the isolation of those sick with or exposed to the disease.

"Keep record and give notice of infected places, as far as needful.

"Attend more carefully to the relief the poor.

"Regulate as to funerals of persons dead from the disease.

"Cause rooms, clothing and premises to be properly disinfected.

"Give certificates of recovery and of freedom from liability to communicate the disease.

"Every person known to be sick with the disease should be promptly and effectually isolated from the public. No more persons than are necessary should have charge of the patient, and these should be restricted in their intercourse with other persons. The children of the family and other inmates should be prevented from mingling with others in schools or other places until the period of incubation of the disease shall have passed.

"Notices may be placed on the house in which a case of the disease exists, and no unnecessary persons allowed to enter.

"Boards of Health should have distributed in every house copies of the instructions to householders and private individuals as herein contained, or others of a similar nature, and should see that the same are carried out. [See Circulars of this Board.]

"In populous municipalities isolation hospitals should be provided just as soon as intelligence is received of the existence of cholera on this continent. These hospitals, if happily not required for cases of cholera, will be a useful investment for cases of small-pox, scarlet fever, or diphtheria, constantly occurring. In less populous districts they may either be portable, or may be rapidly constructed on the nearer approach of the disease, or if required for other infectious diseases.

"In populous districts reception buildings should also be established for the reception of persons not actually attacked with cholera, but who require to be kept under observation least they should become fresh centres for spreading the disease. Such persons should there be provided with clean clothing, allowed to prosecute some daily avocation, and be kept under observation fourteen days.

"The local Board of Health should provide a public laundry and disinfecting house, otherwise the infected clothing may become a ready means of spreading the disease. Metal vans or carts disinfected or holding disinfecting fluids should be provided for carrying foul clothing. Former circulars give directions as to disinfection. Sulphur cones which can be lighted by a match are convenient for disinfection of vessels, closets, etc., or to set on fire larger quantities of sulphur.

"If it be found that carelessness exists in carrying out the precautions recommended regarding funerals, some officer or officers should be detailed by the local Board of Health to see that they are so carried out.

"It must be borne in mind by local authorities that want of the necessities of life and of medical attendance and medicines favor the spread of the disease and increase mortality, and that such wants are

more apt to occur during a time of epidemic, when bread-winners may be prostrated or waiting upon those who are attacked.

"Local Health Officers should make notes of the source of any case which may occur in their locality, and of all other facts likely to be of service in a statistical point of view, or in the future study of the disease, and its prevention or limitation."

One of the earliest duties of a Board is to pass an ordinance requiring the immediate report by the physician, or other person in attendance, of any case of suspected cholera that may occur.

Each Board of Health should, in advance, have a full plan as to what shall be done with any case of cholera reported, whether as occurring to a person not a resident but passing through the district, or to a resident in some house within their jurisdiction.

The questions that arise are, Shall there be removal? If so, where? How are medical attendance and nurse care to be secured? The question of removal, except in the case of those taken on the highway, or in some public conveyance or station, is a relative one. If the case occurs in a good locality, where the family can command the best of attendance, the duty is to choose, if possible, a high, airy room, to divest it of all unnecessary clothing or furniture, and by means of fire-places or open windows, with wire screens, to secure pure air without draft. The nurses, as well as patient, must be isolated from others as far as possible, lest by garments, etc., they convey the disease. Details as to the management of the sick-room, use of disinfectants, etc., are given elsewhere. But for other cases which are likely to occur in unfavorable localities, there should be no delay in providing isolation hospitals. This Board is prepared promptly to furnish plans for any such hospital.

The desirability of removal to a hospital is always a relative question, but experience has shown that there is less risk in the vacating of an infected spot than in the transfer, if only the transfer is conducted with systematic precaution.

A cholera ambulance, of metal bottom and sides and well disinfected, and its air kept charged with a disinfectant, and with the transfer in skilled hands, is not so likely to cause spread of the disease as the locality itself, which, being cleaned, can be fully and promptly disinfected.

Emergencies arise which sometimes require that a building already infected, and not of the best location, be at once converted into a hospital, the disadvantages being overcome, as far as possible, by scrupulous care and disinfection.

It is of great importance to organize, in an increase of the cases, a medical corps, ready on call, and especially to have at hand efficient nurses, under directions. These can only be had when arranged for in advance. So much depends, not only to the patient concerned, but to entire communities, on the prompt and efficient handling of the first case in any new locality, that this kind of preparation is indispensable. It makes a great difference whether we start to put out a fire an hour after it has begun, when we might have started with the first blaze.

Another matter of great importance is not only that proper directions be given as to management, but that some one in general oversight see to it that they are efficiently carried out. Nothing, for instance, is more common than "dabs of sanitation," or than to "play disinfection." Most of disinfection amounts only to a quieting of the mind. But real and competent disinfection is very successful and of the greatest importance. Methods and the choice of materials are well understood. These are fully given by this Board in Circular VIII., Sixth Report, 1880, Circular XLIV., as to Communicable Diseases, and in the Cholera Circular XLV., and to be had on application to us by postal. To the disinfectants there named, three others may be added: first, corrosive sublimate, in the solution of one ounce to eight gallons of water, is of great value, to be sprinkled about, or to be placed in water-closet utensils, sinks and cesspools, or for soakage of clothing, towels, bedding, or other textile fabrics. As it is a corrosive poison, it must be under the direction of the nurse or physician. Second, commercial sulphuric acid, in the proportion of one pint to eight gallons of water, is very valuable for the same surposes and used in the same way.

As a pleasant and efficious wash to be used around or upon the patient and for personal washing of hands, face, etc., the following solution of crystals of thymol is advantageous:

Two drams of thymol, dissolved in ten drams of alcohol, twenty drams of glycerine and one gallon of hot water, kept in bottles. These are named because they are important additions to our former disinfectants. Our own choice is as follows:

For Washing the Hands and Other Parts of the Body.—Thymol, or

chlorinated soda (Labarrague's solution). If these are not at hand, zinc chloride or lime chloride.

For Utensils Used.—Iron sulphate (copperas) solution, one and a half pounds to gallon, or sulphuric acid, one-half gill to one gallon of water.

To Place Clothing In.—Zinc chloride, one-sixth of a pound to a gallon of boiling water, or, in safe hands, one ounce of corrosive sublimate to eight gallons of hot water.

For Sprinkling or for Washing Furniture, etc.—Solution of corrosive sublimate, as above, or the zinc chloride solution.

For Fumigation of Rooms or Out-Houses.—Burning sulphur (see circulars), or the fumigating cones, mostly of sulphur, and easily lighted by a match, can be used instead.

For Scrubbing Floors.—The warm corrosive sublimate solution, or sulphuric acid, or carbolic acid and water, or the iron sulphate (copperas) solution.

For Disinfecting Privies, Secretions, etc.—The same.

In case of death, roll the body in a sheet saturated and wrung out in a solution of the corrosive sublimate, or copperas, or zinc solution, and await the undertaker, who is presumed to be acquainted with all the methods of rendering the body and the coffin safe for transportation and burial.

Precautions to be taken by Individuals.—During a period of cholera or its threatening, there should be especial caution as to all that relates to a good physical condition.

Undue anxiety or fear undoubtedly seem to make the body more receptive to disease. Precaution can do great good, and fright great harm. If the cholera is in your district, be sure that all water used by you is good; if not, have it boiled or use it as in tea or coffee. As to milk, boil it or know its source of supply, as beside its own possible contamination, the cans may have been rinsed with water which was impure. Alcohol in bad water does not make it pure, and the free use of it or of beer is not favorable to the best health. Such good fruit and vegetables as have been found generally to agree may still be used, but none that are unripe, imperfect or half decayed. Meats should be well cooked, and much care should be taken as to their quality.

Exposure to extremes of heat and cold, and in moist, hot weather, and late hours and loss of sleep, should be avoided. Clothing of

flannel next to the skin is needed. Regular life everyhow is the rule. Directions as to cleanliness of locality have already been given. If you are in an unhealthy house or locality, move from it in time if you can; if not, put it in the best order possible. As cholera is chiefly, perhaps entirely, conveyed by discharges, use no public closet, or if compelled so to do, carry with you some such disinfectant as is recommended for closet use. While physicians and nurses who know what precautions to use and use them are not more liable to the disease than those not in attendance, yet all who are not needed to care for the sick should avoid exposure. Food or water which has been in the room of a cholera patient should be disinfected and thrown away. No one should eat in the room. Persons who need to visit the sick are wise to brush the hair and wash the face and hands with a disinfectant on leaving the room, and they need not to be nervous about the disease. All clothing and utensils in the room are to be looked upon as possibly liable to be soiled and so to be media of communication of disease. Avoid all second-hand articles, clothing, etc. It is believed by many that five drops of aromatic sulphuric acid, in water, taken before and during exposure, and that the presence in the mouth or system of quinine, arsenic, and some other medicines, and their constant moderate use during epidemics, is protective. If diarrhea occurs, at once attend to it as directed in Circular XLV., and until you get a physician use every half hour, if discharges are so frequent, the doses therein named for adults. If unable to purchase medicine, report very promptly to the dispensary. If possible, assume and keep a recumbent posture. The moderate use of mustard-plasters and a bandage of flannel over the bowels, a little medicine ready for any attack of diarrhea, prudence in food and drink, and a quiet spirit, cure many cases of so-called cholerine. So important and effectual is this early attention that in cholera countries intelligent persons generally carry with them some temporary remedy for any bowel disturbance that may threaten. There is no need of panic over single cases. In four late epidemics (1877–8–9–80) in India, there were 154,986 villages attacked. In 58,972 of these there was only one death, and in 20,596 only two deaths. Yet the fact that in these years the total mortality was 1,380,226 shows how fearfully destructive it is when it finds all the requisite conditions, or is not guarded by efficient sanitary police. This of itself shows that some other facts than its accidental arrival determine its virulency. These facts are

generally local filth, personal filth, overcrowding, and the absence of an efficient sanitary administration ready to act forthwith—which means knowing beforehand what to do, and having been provided with means to do it. While certain climactic conditions may still frustrate our efforts in part, yet our only safety is in thus using the means which all are now agreed greatly tend to prevent epidemics or to restrict their extent and virulency. While recognizing our need of looking to a divine Providence for aid, it is chiefly by obedience to natural laws and by seeking guidance in the use of proper means, and by using these means, that pestilences are to be prevented or stayed.

LOCAL BOARD OF TOWNSHIPS.

The importance and usefulness of local Boards of Health is constantly receiving illustration in the correspondence and experience of the State Board. The fact that here and there inefficient Boards are to be found, that even good Boards do not at once or every time succeed with what they attempt, and that local or personal opposition is sometimes aroused, proves nothing more than we find to be true of most salutary laws. Many of our Boards have outlived the times of indifference, and are now looked to as great conservers of that inalienable right which every person has to be protected from avoidable menace or injury to his health, whether resulting from the neglect of the city authorities or from the unsanitary condition of some person or premises.

The powers given to the township Boards of Health are even more complete and satisfactory than those possessed by city Boards, since with the latter there are sometimes collateral or conflicting powers of other Boards, or of the municipal governments, that have to be explained, understood or adjusted. Each township Board, if efficient, can abate nuisances, put in operation laws as to drainage, etc., and secure a complete registry of marriages, births and deaths. Where there is an uninformed public opinion, they can do much to enlighten, and will find this Board ever ready to aid. By the present law they are allowed to spend fifty dollars a year without a direct vote of the township, and the township committee may, in their judgment, vote more, or order the payment of bills exceeding this. It would be well to raise the amount to one hundred dollars, since no Board is so likely to be economical as a local Board of Health. On the other hand, it

is often easy by factious opposition, or an honest ignorance as to the necessity of their action, to curtail their usefulness by leaving them without funds. While we are most conservative in view as to the degree to which the State should direct as to local expenditures of money to be raised by localities, yet, as in many ways the State gives local aid, it also is entitled, for the avoidance of general peril, to require some local sanitary care. It is claimed by some that all members of local Boards should be paid. This is not claimed as to Boards of School Trustees, and it seems to us that it is not unreasonable to expect that some citizens will be found enough interested in this great concern to show their interest by personal and gratuitious attention. This, however, is not to be expected where, as in epidemics or in villages or localities needing special investigation, an inspector or other officer needs to be for a time employed. Many assessors have rendered valuable gratuitious services by inquiries or information. The State permits this Board to aid, to a small amount, local Boards where any special investigation seems to come under the design of the law.

BOARDS OF TOWNS AND CITIES.

Many of the town and city Boards have done effective service. Others are embarrassed by the fact that the municipal authorities consider it their function to enforce a so-called financial economy by restricting the amount to be expended for sanitary purposes within paltry limits. We were sorry recently to notice the great contrast in this respect between our own municipal corporations and those of Great Britain, in which the financial and economic value of Health Board sanitation has been fully tested. A Health Board is there looked upon as so far by courtesy and right supreme in its own particular line, as that its budget of what it regards as necessary outlay is the one rarest of all restricted. Some of our cities still have Boards of Health which, whatever they may be called, are but committees of council to which, in one or two instances, two or three outside members have been added. While charters give power to form Boards of Health and pass ordinances, it seems to be overlooked that in order to enforce ordinances, most of which partake of the nature of police law, there must be statutory enactments and provisions, and exact specifications of methods of enforcement and penalties that have been provided by the State government.

There is also the fatal objection which thought would suggest. Experience has demonstrated that where a Board of Health is thus formed and is necessarily subject to every political change, it cannot have that prudent independence of action needful to the effective sanitary administration of a city. If faithful, it must come in direct opposition to nuisances in which the pecuniary interest of owners is involved. These are generally able, in the end, to rout any faithful sanitary officer directly dependent on political preferment, while the popular ones are those who make a great stir in abating certain kinds of nuisances among those too poor to resist, and do nothing as to others. They seldom *prevent*, and have not that relation to the office which leads to a close study of sanitary art and administration. So signal is the experience in such cities as New York, Brooklyn, Boston, Milwaukee, Detroit and the like, that they have been careful to draw plain lines of separation, not because the chief functions of municipal government should not inhere in the mayor and common council, but because their interest, and a great public interest, requires that the care of public health and the power to deal with the most flagrant causes of disease and the nuisances that are rapidly disease-breeding or death-dealing, should have expert ability, aided by thoughtful citizens who have paid special attention to these matters, and who can execute such laws with a propriety and freedom from embarrassment which cannot be obtained by an ever-changing Board. The law of this State, therefore, has provided for Boards, which, while deriving appointment from the municipal authorities and quite sufficiently under their control, are yet not subject to complete change at every change of administration—only three being allowed to go out at any one time. These have such legislative acts behind them and such conferred standing before the courts as will give effect to ordinances. While we shall not fail to assist as we may even those trammeled Boards which have valuable members and succeed well with those so docile as to yield, or so poor as not to contend, we cannot admit a principle of sanitary government which, in the last fifteen years of sanitary legislation, but one city in America has sought to revivify.

For effective sanitary administration, large powers must be conferred, as in both police and military offices. Men who, because power is given, think that the power must be turned on every time and equally on everything, are never fit for such places, and as soon find their limit as would an engineer who thus dealt with his engine.

On the other hand, any city so conservative on such a matter as the cleanliness and the health of the people that it forms its Board on a system of inherent disability, cannot expect to get along fast in preventing disease and lowering its actual sickness and death-rate. Nor will it, in the long run, flourish in growth and in business. Most of the value of Health Boards depends upon their completeness of organization, their conception of the work intrusted to them, the support of the more intelligent public opinion, the absence of partisan interference, and a proper reliance upon and confidence in the judgment of the Board as to the amount needing to be expended. Their chief duties are summarized in Circular XXXIX. of this Board. No cast-iron rule of procedure can be devised suited to each case. Often the first work is that of instruction. Next, it is to enforce such surface cleanliness as commends itself to good taste, to ordinary neatness, and is for the general interest of every community. It is rarely that a system of spring and fall inspection of premises can be omitted. Suggestions on the part of the inspector are often needed, and, in flagrant cases, the attention of the Board. In a well-cared-for town, the health officer, by reference to his books, or those of his predecessor, is able to tell the underlying soil of each street of the town; the depth of each cellar or basement, and such as are continuously or occasionally very damp or have water in them; the usual water-level in the ground, and the best modes of local drainage where it is needed; the source of the water-supply of each house, and its quality and condition; the position and distance of the water-closets or privies or of any cesspools, and their construction; the places for refuse; the modes and times of removal; the disposition made of garbage; the condition of all house-pipes, or their modes of connection with outside receptacles; the construction of the house as to material, and as to the arrangement of its various pipes and fixtures. He can refer to the record as to the number and causes of death that have occurred in any house for a series of years, or to cases of sickness, with explanatory notes as to them, together with various other items to be taken into account. We outline briefly such a model, not because most will live up to it, but because some communities, especially in Great Britain, have shown how it is possible to keep full account with the health and life interests of citizens on a business basis, and to reap the rewards in prolonged life, in deliverance from sickness, and in that prosperity which is oftenest the outcome of such care.

The one great need of most villages and cities is a really competent health inspector, who, himself, will be able to secure the removal of many evils, and the prevention of many others. Where there is need of complaint, the Board should make it in a formal way, and ask the owner or tenant to abate. If not attended to it is generally better to notify the party that at a certain time and date a magistrate will be asked to issue order for abatement. This is not of the full nature of a trial, since proceedings, which are summary at the start, are allowed, on the ground of impending evil, on the ground that at such a stage, and before the lower courts, questions of this kind are not likely to meet either a speedy or correct solution before a neighborhood jury. The Board, being more responsible than any individual, is answerable in future inquiry if it shall prove to have been unjust, which is so rarely the case.

In other cases, the matter is taken before a grand jury for indictment. In some instances both methods have been followed with effect.

Several Boards have availed themselves of the more summary proceedings provided for under the supplement to an act entitled "An act relating to local Boards of Health," approved March 22d, 1883, especially sections 10, 11 and 12 of the same.

While the common law is very wide in its definition of nuisances and claims that even what is constantly so unpleasant to the ordinary citizen as to render life uncomfortable, may be a nuisance without having been shown actually to have caused sickness, yet Boards should be careful not to yield to captious complaints on the one hand, nor to be deterred from action as to pronounced nuisances on the other. It is not because there are no remedies at common law that special acts are passed, but because sometimes its methods are not summary enough, and also because many citizens are too poor or uninformed to be able to secure relief, and have a right to the municipal or other official defense of their health, which it is the prerogative of the State to grant, and which it thus confers upon Boards of Health. Two or three recent decisions in the Court of Chancery are of much importance in further interpreting the health laws of this State. The first, was the case of the Health Board of the city of Trenton, against the proprietor of the American House for sewering into Petty's run.

The case was vigorously contested on both sides, and had long and patient hearing from Vice Chancellor Bird. Besides some efforts to

invalidate the legality of the laws of the State, it was contended that there had been informality in the organization of the Board of Health, and that the former permission of the common council to sewer into Petty's run was of the nature of a contract. Omitting such points as had reference to the special Board, we quote as follows:

"The defendants urge that the manner in which they use this stream to carry away the hotel filth, is not a nuisance, and in no way hazardous to public health. In this respect, as the testimony stands, they are mistaken. The great, the decided preponderance of testimony, is against them. Whatever conclusions may be reached from isolated facts, when these facts are presented in a body they carry the mind at once to the conviction that the defendants are doing violence to their neighbors and fellow-citizens.

"It has been pressed upon my attention that many others are equally, or more, guilty. This I cannot consider. I allowed some testimony on this point, not because I thought it admissible, but that the defendants might be heard above, if I should be in error. I think each one is separately liable for the nuisance to which he contributes. It is no shelter to the one charged that another may have aided directly or remotely, or otherwise.

"Again, counsel insist that this Board of Health has no authority to prosecute; that it has not shown itself to be within the statute. It is urged that, being a special tribunal, created for special purposes, and clothed with definite powers, it must prove that it has walked according to the line prescribed in every particular, and that any departure is fatal to the entire work undertaken. This admits, however, and so the counsel frankly stated, the legal existence of the Board of Health in the city of Trenton.

"But the power or right of this Board to institute proceedings in this court is denied. It is denied that the Board of Health referred to in section 9 of the act of 1883, (Public Laws, 1883, page 122,) in any sense includes the Board of the city of Trenton. That section declares that any such Board of Health, instead of proceeding in a summary way to abate a nuisance, or such source of foulness, may file a bill in the Court of Chancery. It will be observed that it says any *such* Board. If we follow the ordinary rule, we will look for the antecedent of such. This we find in the section immediately preceding (the 9th). That section provides that whenever any Board of Health now organized, or which may be hereafter organized, under the laws of this State, as referred to in section one of this supplement to an act entitled 'An act relating to local Boards of Health,' approved March 22d, 1881, shall be notified that a nuisance or other source of foulness, hazardous to the public health, exists within the territory within which the Board of Health has jurisdiction or control, such Board may examine the matter in a summary way, and order and cause the same to

be abated.' Now when the words 'such Board may examine the matter in a summary way,' are looked at in connection with the words, 'that any such Board of Health, instead of proceeding in a summary way,' &c., in the very next (10th) section, which gives the authority to sue, it will be found, I think, beyond dispute, that the antecedent to the phrase *any such Board*, in the latter section, is found in the one immediately preceding, in which, and in which only, is used the additional phrase, 'summary way.'

"Hence, of course, the inquiry: Does section 9 of the act of 1883 comprehend the Board of Health of the city of Trenton? I think if it does not it has no right to come into this court. Let us attend to the language of that section. It says, whenever any Board of Health *now* organized, or which may be hereafter organized under the laws of this State, as referred to in section one of this supplement, being the act of March 22d, 1881, (Public Laws, 1881, page 160.) It says, as referred to in section one of this supplement, and section one refers to the act of March 11th, 1880, and to a supplement of March 31st, 1882, and also to the act of March 22d, 1881. So that, most evidently, the Boards of Health which may proceed in a summary way, mentioned in the 9th section of the act of 1883, are any and all such as are authorized by either of the acts above named.

"Is the relator such a Board? Again let us attend to the language of the law. The first section of the act of 1880 (Public Laws 206) reads: 'That any city or borough, or incorporated town, or any town governed by a commission, shall have a Board of Health of not less than five, or more than seven members, of which the keeper or recorder of vital statistics, and also one city physician and city health inspector, shall be members, if there be such officer or officers; and the said Board of Health shall be nominated by the mayor and approved by the common council, or other governing body of the city, borough or town, to serve for not less than three years, but not more than three of the number shall go out of office at any one time.' This section declares that every city shall have a Board of Health. But it is said that such Board does not come within the purview of the section last recited. The claim is that this Board is the creature of the common council of the city, and that it has not and cannot have any other paternity. It is said that the council solemnly and formally organized and established it. It is true that July 11th, 1882, the council did, in the name of the inhabitants of the city of Trenton, ordain that there should be a Board of Health established in the city of Trenton, and that the same should be organized in accordance with the provisions of an act entitled 'An act concerning the protection of the public health, and the record of vital facts and statistics relating thereto,' approved March 11th, 1880, and the supplements thereto. From this it would appear that the council only intended to bring the case within the act referred to and its supplements. This ordinance required the mayor to nominate men as members of the Board of Health, and to send such nominations to the council for its approval. The first section of the act of 1880 requires the mayor to nominate members of such Board and the council to approve of such nominations. The mayor made such nominations and the common council approved of them. All this purports, on its face, to have been done by virtue of the authority conferred by the act last cited.

"In my judgment the law was substantially complied with. The statute says that said Board of Health shall be nominated by the mayor and approved by the common council. It did not require any ordinance. No preliminary steps are demanded by the statute. The first movement contemplated is the nominations by the mayor; and the second, the approval by the common council, both of which were taken effectually in this instance. Nothing else that was done could add to or detract from, either the nominations or approval.

"But, now, the nominations being made and the approval given, it is urged that the prescribed statutory line has been departed from, in the nominations of the health inspector and the physician. The statute declares that one of the city physicians and the city health inspector shall be nominated as members of the Board. Therefore the mayor had no choice. To this extent the legislature made the selection. It is said one of the members must be one of the city physicians and one the health inspector. And this brings us to what is regarded as the fatally weak spot in this branch of the complainant's case, that is, that although the health inspector and one of the city physicians were appointed, their appointment was a nullity, in this case, *because the period of time for which each of them held such office, or could hold such office under the city charter, was only one year, while the first section of the act directing the appointment expressly says that said Board shall be nominated 'to serve for not less than three years.'* Shall a beneficent public work, set on foot by the representatives of the people, fail in its mission because of this seeming irregularity? I feel myself bound to construe the act favorably to the relator. The public are deeply interested; this is made most conspicuous by the title of the act and every line which follows. I must regard the object to be attained or had in view by the legislature, viz., the preservation of the public health. (Sedg. on Stat. Construc. 193). In matters between individuals arising under the statute of frauds, it has been repeatedly adjudged that the act should receive a liberal construction. 'It should be so construed as most effectually to meet the beneficial end in view and to prevent a failure of the remedy.' Potter's Dwarris Statutes 73 and 231, approved by our Court of Errors in Randolph *v.* Larned, 12 C. E. G. 560.

"And there are, I think, some authorities which bring the view as to liberal construction, where third persons or the public are concerned, still nearer in relation to this case. I refer to Perth Amboy *v.* Smith, 4 Harr. 52, 56 and 57. In that case an overseer of the poor had neglected to take the oath of office, but acted as such officer. The

court held that he was overseer *de facto*. Hornblower, C. J., declared that such was the law. 'In those cases where the public good imperatively requires an act to be done without delay, and where individuals have rights *ex debito justitiae* against the public or other individuals which would fail for want of a public functionary to act in the premises.' Hoagland *v.* Culvert, Spencer 387; State *v.* Perkins, 4 Zab. In this case the members of the common council, who had not been legally sworn as such, imposed a tax, the collection of which was resisted on that ground; but the court said: 'That the acts of officers *de facto*, in which other parties or the public have an interest, are valid.' State *v.* Tolan, 4 Vr. 195, 201; The People *v.* White, 25 Wend. 525. 'A clerk of the court, appointed by a judge *de facto*, is well appointed, and may hold his office though the judge be ousted.' People *v.* Staton, 73 N. C. 546; see, further, Savage, Receiver *v.* Ball, 2 C. E. G. 145; Angel & Ames on Corp., Sec. 287, and Bac. Abr., Title Officers, Vol. 7, 283.

"Believing that the object of the Legislature was to achieve some public good, and it being undisputed that officers named were nominated and approved, and that they have acted as members of the board of health, with the numerous cases above cited and referred to before me, there seems to be nothing left for me to do but to regard the objection to the relator's right to sue, because the city physician and health inspector had not, under the city charter, terms of office of three years' duration as untenable. If this objection were to prevail, it would only be by chance that any city could claim the advantages of the act. Every city must not only have the power to appoint such officers for three years, but they must actually make the appointment contemporaneous with the appointment of the board of health, for the loss of a day or a week would as effectually bar as two years. If time be the important principle, its extent or duration must be wholly immaterial.

"I conclude, therefore, the relator is such a body as is contemplated in the ninth and tenth sections of the Act of 1883.

"The counsel of defendants think the proceedings should fail, because the Act of 1881 is unconstitutional. In my opinion the arguments adduced do not reach this case.

"I think the relator was justified in filing the bill. I think the discharging of water-closets, and the like, of the defendants' into Petty's Run, through the pipe named and described in the bill, is a nuisance and hazardous to the public health, and should be abated. I will so advise. The defendants ought to pay costs."

In two other cases—one on behalf of the Board of Health of Lambertville, and the other in behalf of the Board of Health of Bridgeton—parties have been in like manner restrained from the pollution of streams so small as to cause a public nuisance, and in one of the cases affecting the water-supply.

It is evident from cases that have occurred in other courts, that where the facts of nuisance are clearly made out, and there have been no vital errors as to mode of procedure, the series of State health laws is fully sustained.

CEMETERIES.

In the last report of this Board, an able and careful paper on "Interments" presented the reasons why the custom of interments within city limits should cease, and why, also, in townships and near villages, the habit of allowing companies to locate cemeteries without any regard to the approval of Health Boards could be no longer tolerated. Various facts as to graveyards and cemeteries in different parts of the State make it certain that water is often polluted from such causes, and that the air is fouled by exhalations from overcrowded burial grounds. Often spots are chosen without any reference to the relations of dwellings and without proper regard to soil or underdrainage. Since the paper was written, the developments made by the township committee of North Bergen township, in Hudson county, have given great emphasis thereto. They have shown that the five cemeteries of the township have polluted both the air and the water; and that the irresponsible manner of conducting burials, as well as the localities of these cemeteries, has made them a menace to the health of adjacent cities and to the immediate township concerned. Burial has become a commercial industry, so that commercial travelers solicit patronage and secure profits that are large. Success is based upon having the cemeteries of very easy access to cities, and upon the placing of many coffins in the same grave or in the same small plot. On the Weehawken side and Palisade, of the joint cemetery, twenty-eight graves were examined. In five, the top of the box was from eleven to twenty-two inches below the surface; eleven from twenty-five to thirty-eight inches, and nearly all the others less than four feet. Hoboken Cemetery, in about twenty-two graves examined, had seven less than three feet, and the most of the rest less than four feet. In the pauper part "they bury four bodies in one grave." Grove Cemetery, in seventeen examinations, had none as deep as five feet, and most less and four feet. In the burying ground on Snake Hill, in about thirty-two measurements, the depth from the surface of the ground to the top of the box was three and a half inches or less in four cases; from four to eleven inches in ten cases; from twelve to

twenty inches in eleven cases, and but one in the whole number more than twenty-six inches. Much of this probably arises from the plan of putting more than one body in a grave. While these are no doubt not specimens of what universally prevails in cemeteries, it is true that there is need of some more accurate legislation as to cemeteries and burial grounds, so that they shall not endanger the public health.

DISEASES OF ANIMALS.

Each year the study and care of the diseases of animals has increasing importance both because of the immense amount of capital invested therein, and because of the relation they have to the health of the people. Indeed, the light which their comparative study has thrown upon many diseases special to mankind makes some knowledge of them almost indispensable to studies of the causes of human diseases.

Several animal diseases are common also to men, some are inter-transmissable. Scarlet fever is now claimed to have been recognized in the horse, and students of minute animal and floral life are very closely studying the natural history of other communicable diseases as related to various species. The whole subject has received a new impetus from the apparent discoveries as to the relation between human and bovine tuberculosis. While we must still await the accumulation of facts and their closer analysis, it is significant that so many careful observers believe in the identity of the two diseases, and also that consumption or other forms of tubercle found in children or older persons is often due either to the milk or meat of tuberculous animals.

We have had occasion the past year to deal with a very valuable herd in this State, in which some of the cattle were affected and had to be slaughtered. The Board was able to settle an important dispute as to diagnosis, and to remove the suspicion of a still more formidable disease. Tubercle, as found in animals, does not so generally affect the lungs as in man. It is more apt to show itself at parts of the peritoneum below the diaphragm and in the mesenteric glands. Sometimes cakes and pearl-like bunches of abnormal growth or deposit are attached at various points on the interior abdominal walls, or to the liver or other organs. The udder is occasionally, but not very frequently, involved. We have seen the carcass of a large, fat cow

so filled throughout its lining membranes with this deposit and the meat so dark and mottled as to show utter unfitness for use. Such meat is always condemned at once in the English market. Where any such has come to our knowledge we have advised that the meat be buried, but no law of the State gives authority as to it. There is some difference of opinion as to whether the milk from tuberculous cows will convey disease. While all admit that it is of poorer quality, yet most do not believe that it will directly impart the tubercular condition, unless the udder or milk gland is itself affected. This a careful examination will usually reveal. As to whether a tuberculous cow will impart the disease to another, there has also been some question. The opinion is fast gaining ground that one tuberculous animal in a herd is likely to infect others. The progress is slow, and those nearest are most liable to attack. Cases reported by the veterinarian of the Bureau of Animal Industry, at Washington, as well as those known to us, seem to give strong probability to what is now a much more common belief than formerly. Tuberculosis is greatly on the increase in Great Britain, and to some extent in this country, especially among Jersey cattle or other select high-bred stock. This affords another evidence of how important it is to have all such diseases under careful observation.

During the past year we have had some opportunity of seeing cases, and specimens of foot and mouth disease, which, happily, has not yet a foothold in this country. But its frequent occurrence in Great Britain, and the great loss it has occasioned, cannot make us too watchful.

Contagious pleuro-pneumonia has required the most watchful attention on the part of the Board. Several outbreaks have occurred, the details of which are to be found in the report of the State Board of Agriculture. We have had continued evidence of the good results of inoculation in those herds where immediate slaughter of the sick has not stayed the disease. But the wisdom of the law, which requires that it be only done by the permission of the State authorities, has been illustrated by important cases which have occurred in unskillful hands, or to those not having knowledge of the law. We still hope, and expect to hold the malady in check, but shall never fully eradicate it so long as border States have ineffectual laws, or the general government fails to protect us from its incursion. Some recent examinations by the U. S. authorities in this State have aided us in our work.

Pneumo-enteritis, or the disease known as hog cholera, has caused

heavy losses in Gloucester, Burlington, Mercer, Union, Warren and other counties. While no new facts have been developed as to the treatment, it is yet true that farmers who have clean pens, and who, at the very earliest moment of an outbreak, or when it appears in their neighborhood, at once remove the stock from the old pens, and furnish new pails, hog troughs, etc., meet with less loss. Small doses of sulphur, of carbolic acid, or of the bisulphite of soda may be of some service to animals not yet sick. For those sick, immediate slaughter, and four feet burial are the remedies; valuable because thus there is a better prospect for the rest of the herd.

Texas cattle fever, and the disease of calves known as Husk, or Hoose, has also required some of our attention.

The duties of the Board, growing out of the new law as to glanders, made it incumbent upon us to deal with promptness with the outbreak in the South Orange car stables, as also with an isolated outbreak in Hunterdon county. At one time various embarrassments were interposed to the enforcement of the law. It was not until the 20th of August that we were able to remove the quarantine near Newark. While in so insidious a disease it is difficult to insure immunity, yet it was gratifying to secure the result attained. A defect in the law made it necessary to charge most of the expense to the general appropriation for the contagious diseases of animals.

The duties of the Board, in oversight of the contagious diseases of animals, have taken a wider range this year than before, and shown the law, as in its main features, facile and effective. While admitting of some minor improvements, it is now the best law of the kind on the statute books of any of the States. In duties arising out of the law, and also in those bearing on the public health, we have too frequent occasion to notice the number of stables, cattle-sheds and pens left in a filthy condition, the dirty surroundings amid which milk is gathered, the careless handling of utensils, the unfitness of many places where the animals are slaughtered, and, in general, a laxity of care as to cleanliness, and as to the meat and milk-supply, entirely inconsistent with the best welfare of the people. The use of malted grains and the high demands for milk produce, have induced many dairymen to locate within city limits. It is essential that all our cities adopt a plan of registering all animals kept in city limits, and that they require an inspection of stables. There is great need, too, that more public abattoirs be established. Only thus can there be riddance from the

many slaughter-house and pen nuisances, and a system of inspection of meats, such as is essential to a good meat-supply. Different grades of meat must, of course, be allowed, but when the veterinarians find lame and sick animals being killed in private shambles, diseased livers and lungs being hidden away lest they should betray the condition of the animal, and uterine calves being removed and dressed for tender veal, it is high time that our cities should take action as to the matter. We do not refer to these as very common, but we do find evidence that, especially in large cities, a great deal of meat unfit for food is on sale. Dr. Farr alleges that boils, attributed to other causes, often result from such food, as well as some skin diseases. There are many degenerations of blood and tissue not specific, or causing specific diseases, but, nevertheless, taxing the vital forces of the system in its necessary effort at riddance, and so depressing the system or endangering the general health. The attention of some of the most eminent physicians of England has been turned to this subject, and it may well engage the attention of physicians here, as well as of veterinarians and the public at large. The whole method of the care of animals, of dairies, and of meat-supply, is one requiring attention and regulation, especially in our cities and in markets.

VARIOUS LAWS UNDER OVERSIGHT OF THE BOARD.

The public health is so inwrought with the welfare of the people that it is not surprising to find provisions in very many general laws which have a bearing thereupon. In addition to these, there are others which are more special in their character, or which have directly to do with the office and functions of local Boards of Health.

In the sixth report, 1882, page 255–260, is to be found a list of health laws to that date, and, in addition, the seventh report, 1883, page 31, adds those more recently passed.

The laws to which most frequent reference is needed by Health Boards, are as follows:

Chapter LXXI., page 117, Laws of 1879, as to vital statistics.
" CLV., " 206, " 1880, as to local Boards, etc.
" CXXV., " 160, " 1881, " "
" CLV., " 217, " 1882, " "
" CV., " 117, " 1883, " "
" CLX., " 237, " 1884, " "

It not infrequently occurs that local Boards fastening their attention too exclusively upon one law or one section thereof, are misled as to the terms of the law. It is always wise in framing ordinances, or in taking any important action involving legal questions, either to ask the judgment of this Board, or to secure the best legal advice. As we often have occasion to obtain the opinions of competent authorities, we are thus sometimes able to aid local Boards in a proper interpretation of the law. It can scarcely ever be said of any series of laws that they are complete, and no doubt there will be found reasons for seeking to improve some of those already passed. But it is our experience that such Boards as have been guided by able legal advice, and been most active in the enforcement of the law, are the ones best satisfied with present legislation. Wise administration is more needed than active legislation. It is often claimed that Health Boards, especially in cities, should have greater attributions of power, and not be so dependent upon the municipal authorities. But it is to be remembered that the local jurisdiction of a municipality is always to be recognized. While there are most cogent reasons why a Health Board should not be a mere changing or ephemeral committee of council, and should have assigned to it special duties not to be enterfered with by other governing bodies, yet it is also true that it should be ultimately responsible both to the council and to the people of the locality.

The only exception to this is, that in certain possible emergencies the interests of the State may be so far jeopardized by the delay of the locality, or by some local and political or personal complications as that it may reserve to itself the right, through its State Board or other State authority, to interfere, and cause to be done that which it may claim to be urgently necessary. In general, the principle of local health government is correct, and if the vicinage suffers by its own failures, it must bear the consequences. But there are more flagrant cases in which, no doubt, it is wise for the State to assert its own rights of local jurisdiction. As a rule these are best asserted in the higher courts.

The law passed last year as to local Boards in cities, extends their jurisdiction over certain evils and gives them powers which, while to be exercised with discretion, are manifestly important for the public welfare.

The law requiring the returns of marriages, births and deaths is

showing more and more its value as a means by which the State keeps an account of its vital increase, but is not as yet used in cities for information as to public health as it should be. The local registry which is now most important is that which will enable the keeper of vital statistics, in any decennial or semi-decennial statement, to tell precisely in what dwellings death has occurred, and the cause thereof, with age, etc. Thus not only is the registry of value in its legal and informatory aspects, but as directly pointing out disease localities or districts. For, however misleading such statistics might be for a single year, it is found that when there are enough data and over enough space of time, they are the unerring signals of sanitary defects, and point to many cases of avoidable death. And when it is remembered that each case of death on an average represents many other cases of sickness, it is seen how significant such data are as to the thrift and healthfulness of the population.

The law as to medical registry is valuable as furnishing an index of those who claim to have received a license to practice from some reputable institution, or to have been practicing at least twenty years in one locality. It is the mildest form of saying that those who offer their services as skilled in dealing with human life amid its greatest perils, should be able to show that they have been adjudged worthy of such confidence. Yet it is to be admitted that so long as no prosecutor of the pleas or other person is charged with the duty of inquiring into the validity of the copies of documents furnished, there is much opportunity for strategy. While the law does not and ought not to discriminate in favor of any one class, it ought some how to assure more fully that fraud shall not be perpetrated. The assuming of a title has been found an easy way of imposing upon the credulity of the people. While there are some evils which records and warning help to expose but which law cannot fully remedy, it is questionable whether some county officer should not be charged with the duty of examining into the genuineness of credentials.

A very gratifying result has followed the enactment of the law as to the sale of kerosene for inside lighting. Producers and dealers have found it to their interests to conform to this law, so that accidents seem to be far less common than formerly. We have not been able the last year to record a single case of injury in the State from the explosion of low grade oil. There will always be occasional cases in which spilled lamps or great carelessness result in burns, but there is no longer reason why any actual explosion should occur.

The law as to the adulteration of foods and drugs has received a proper share of attention. Herewith will be found a report from the committee having this in special charge. The object is to draw attention to the chief and most harmful adulterations, and to watch any new attempts at falsification. In some of our largest cities the duties of a local analyst might well be associated with other duties of a Board of Health.

The facts as to the operations under the milk law during the past year will be found in the report of the Milk Inspector. A change made last year weakens its force. Some legislation ought, at least, to give to city Boards of Health the right of rejecting imperfect milk, and of summary proceeding against milkmen who are found vending it.

The law as to diseases of animals has worked well, and has done much to protect the State. The special law as to glanders was also found effective.

There are some minor and verbal defects in some of the laws relating to public health and vital statistics, but, as a whole, it can be said of them that they are found as facile in application as most of the laws on the statute books.

WHAT LEGISLATION IS DESIRABLE FOR THE IMPROVEMENT OF TENEMENT HOUSES.

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The sanitary condition of the houses of the poor is a subject to which public attention has so frequently been called that it is now hardly possible to deal with it without going over well-trodden ground.

From the fact that the moral, social and intellectual status of men and women will bear a certain relation to their sanitary condition, it follows that the practice of housing a large number of families under one roof, all having a common entrance and a common hall-way, where persons of different grades of intelligence, of moral culture and aspirations, are daily brought together, has a natural tendency to equalize the general condition, as it regards social and moral instincts. The more powerful influences will draw upon the weaker; neat and attractive surroundings will stimulate to worthy aspirations, while the opposite condition is almost certain to discourage noble effort, and to reduce, in some degree at least, the social and moral grade of persons who are daily subjected to such influences. Men and women who have, through misfortune, been deprived of the original conditions and associations under which they were born and reared, and compelled to associate with persons of a much lower grade of moral and social standing, struggle as they will against it, sooner or later find themselves nearing the level of those with whom they are in daily intercourse. Energy becomes stunted, or even paralyzed, moral sense to a degree blunted, and the mind gradually sinks to a condition of disappointment, followed by discouragement and misanthropy. Hence the importance of rendering the dwellings of the poor as comfortable and attractive as possible, that the sacredness of home may be to them, not

a simple myth, living only in fable or song, but a grand reality, encouraging the laborer in his efforts, and adding contentment and happiness to the fruits of his industry.

Although the object of this paper is not to portray in detail the evils connected with tenement-house life, a few general remarks on the subject, before suggesting a remedy, may not be out of place. The apartments allotted to each family in a typical tenement house, such as is usually occupied by the daily laborer, consist, usually, of one main room, and one, and sometimes two, small bed rooms. The main, or living room, used as a parlor, sitting room, kitchen and laundry, is ventilated by two windows, opening to the external air, and a door leading to the hall. There is also a fire-place, which is generally closed, a stove being pressed into the service for warming and cooking purposes. Adjoining this main room we find one or two small bed rooms, as the case may be, located in the central portion of the house, and, consequently, having no direct communication with the external air. These rooms vary in size, the average floor area being about eight by ten feet, each room containing a bed, one or two trunks, perhaps a bureau, while, suspended on the wall, is the extra clothing of the family. It is not easy to overestimate the evils of such an arrangement of sleeping rooms, where nearly one-third of the entire lifetime is spent. The importance of the admission of sunlight to every sleeping room during some portion of each day, is universally recognized and so well understood as to require no more than a brief mention on this occasion. The same may be said concerning the importance of direct ventilation. Human exhalations of organic matter assert their presence by their peculiar odor long after the gaseous products of respiration have disappeared in obedience to the well known law of diffusion. They adhere to the plastered walls of the room, to the bedding, clothing and furniture, and require an extended exposure to fresh air and sunlight to effect their entire oxidation. This cannot be had in the dark, pent-up bed rooms of the typical tenement house; and as each floor of such a house is occupied by two or four families, this evil is always present in proportion to the number of occupants.

Damp and filthy cellars, with an atmosphere poisoned by exhalations from accumulations of refuse and from imperfect foundations, the small yard in which is located the neglected privy, reeking odors from which are first to salute the visitor as he sets foot upon the

premises, are also among the features which call loudly for reform, to which may be added the massing a large number of tenements upon a small space of ground. As an example of the latter, it is not unusual to see a row of tenements fronting upon a street, and twenty or twenty-five feet in rear of these another row built upon the rear portion of the respective lots fronting upon the yards. In rear of these rear houses, at a distance varying from a few inches to two feet, stand the corresponding rear houses of the next street, and twenty or twenty-five feet in front of these last mentioned, stand the corresponding front houses. By this arrangement twenty houses, each twenty feet wide, and as high as it pleases the owner to rear them, may stand upon a space of about twenty thousand square feet of ground. Allowing eight families to each of the front houses, and four to each of the rear houses, we have for each family a ground space of only one hundred and sixty-six feet; and yet, even this will compare favorably with some of the crowded tenement-house districts of our large cities.

As long as such massing of dwellings is allowed with no legal restriction, we shall also have the like massing of human beings. The evils resulting from this excessive crowding, especially to the young of both sexes, who are thus early exposed to associations of the vilest nature; the strong inducement on the part of the older ones to seek at the dram shop and gambling house amusements which their own homes deny them, and thus prepare the way to vice and crime; the exposure to disease and death as a just retribution for this gross violation of sanitary laws, have been repeatedly and powerfully set forth from the pulpit, the platform and by the public press, and it now remains for us to prescribe such remedies as are needed and available for improving the homes of tenement populations. To this end we must secure such legislation as will place the whole tenement-house system under proper supervision. Houses at present standing should be placed in as good sanitary condition as their location and construction will allow. Those to be erected should be in accordance with strict regulations in regard to location and construction, and the number of occupants should be so restricted that each one may enjoy an adequate amount of air space, and in all other respects be favored with the ordinary comforts of domestic life.

The earliest attempt at tenement-house legislation of which the writer has had any practical knowledge, was the passage, in 1867, by

the Legislature of New York, of a bill entitled "An act for the regulation of tenement and lodging houses in the cities of New York and Brooklyn." When, in 1866, the Metropolitan Board of Health was organized, the condition of tenement houses in those two cities was such as to demand early attention from the newly-constituted authorities. The Board and its officers, during a considerable portion of the first season of their official existence, were busily engaged in dealing with cholera, which at that time invaded the two cities. How that disease was controlled is a matter of history familiar to all who take an interest in the success of sanitary effort in this country. This emergency having been met and disposed of, the attention of the Board was then directed to the condition of tenement houses with the intention of correcting as far as possible their existing evils, and preventing their recurrence. It was soon found that some special legislation was required to enable the Board to accomplish the work it had undertaken, and recourse was accordingly had to the Legislature of the State, which resulted in the passage of the above-mentioned act, the principal requirements of which were: First, that each and every room occupied as a sleeping room, and having no direct communication with the external air, should have a ventilating or transom window over the door leading into the adjoining room, and another window opening into the hall, the area of each to be three square feet. This latter window, although it was not strictly consistent with the privacy of a bed room, appeared to be the only means by which a thorough ventilation could be effected, and as the same section required a ventilator in the roof at the top of the hall, when both windows were open there was a considerable current established through the room, which, though far from meeting the necessities of the case, was a marked improvement on the stagnant condition of the bed-room atmosphere which obtained previous to these alterations. The next two sections provided for adequate fire escapes, for keeping the roof and stairways in repair, and conducting away the storm water so as not to injure the walls of house. The next section provided for sewerage, the disposal of excreta, etc., the construction of water-closets, privies and cesspools, in accordance with plans approved by the Board of Health. Sections 6 and 7 provided regulations under which cellars and basements could be occupied as dwellings. Section 8, for the disposal of ashes and garbage. Section 9, for the general cleanliness of the premises, including cellars, yards, privies, cesspools and drains; it required walls and

ceilings of the halls to be whitewashed at least twice a year, and the name of the owner or agent to be posted in a conspicuous place in the hall. Sections 10 and 11 provided for the inspection of tenements by officers of the Board of Health, and prescribed the conditions upon which such house could be vacated as unfit for human habitation.

Thus far the law applied to houses already existing; but the remaining sections were enacted to regulate those to be subsequently erected, and other buildings to be converted into tenement or lodging houses. The provisions were for restricting the massing of tenements by prescribing the distance to intervene between front and rear houses, and an open space in the rear of each rear house, size of rooms, height of ceilings and windows, construction of cellars, water-supply, etc. The act concluded by imposing penalties for violation, being a fine of from ten to one hundred dollars, or imprisonment for a term of not more than ten days, and an additional fine of ten dollars a day as long as the violation continued. And finally, a tenement house was defined to be a house in which more than three families lived, all having the same common entrance, hall and stairway, but doing their cooking and washing separately. These provisions, though not fully up to our present ideas of sanitary improvement, were at the time regarded by sanitarians and philanthropists as a long step in the right direction, and by tenement-house owners as high-handed and oppressive, since it meant a death knell to the continuance of their enormous gains. To the Metropolitan Board of Health, whose jurisdiction extended over the cities of New York and Brooklyn and portions of the adjoining counties, was given the duty of enforcing the provisions of this law; and it was decided to commence with the poorer class of tenements and deal with the most objectionable features so far as the construction, location and surroundings of each building would allow of the necessary alterations. The early attempts to enforce the provisions of this act met, as was expected, with a good deal of opposition on the part of landlords and agents, and it was not until these were made through the courts to feel that the Board was in earnest, that they began to yield gracefully to the requirements of the law. After considerable experience in dealing with some of the worst class of buildings, it was decided to exercise a greater degree of stringency, and to extend the work to all houses that came within the legal meaning of a tenement house, however slight the violation. As an instance of the rate at which this work was prosecuted, I might state that during the year

1869, there were in New York 39,270 bed-room windows and 1,922 hall ventilators inserted, and a corresponding number of other violations corrected. The result of this was to improve very materially the condition of New York tenements, and yet as the public became more interested and better educated in sanitary matters, further improvements were loudly demanded; and in response to a great public uprising in behalf of the tenement population, additional legislation in the form of amendments to the law was obtained in 1879.

The main provisions of these amendments were: Regulation of distance between front and rear houses, forbidding the placing of any tenement nearer than ten feet from the rear line of the lot, limiting the portion of ground to be covered by any such building to sixty-five per cent. of the area of the lot, and requiring that each sleeping room shall have at least one window of not less than twelve square feet area, admitting light and air from the street, yard, or as otherwise provided in a manner, and on a plan approved by the Board of Health. By this act the owner of a tenement house containing more than ten families is required to have a janitor or housekeeper, who shall reside on the premises, and have general charge of the same. The act further provides for the appropriation of a special fund to enable the Board of Health to continue tenement-house inspections, and enforce compliance with the law.

This later legislation applies principally to houses about to be constructed, and I will add that its measures have been strictly enforced, some discretion being allowed the Board of Health where circumstances admit of its being exercised. Corner lots are exempt from the sixty-five per cent. clause, but even in these cases the rear space of ten feet is retained.

From what I have seen of the working of this law, I am convinced that any reasonable system of legislation will result in the improvement of tenement houses, and a consequent elevation of their occupants. Under the law we have been considering, every plan of a tenement or lodging house is submitted to the Board of Health for that body's examination and approval. Not only are the means of affording light and ventilation, as shown on the several plans, carefully considered, but, pursuant to the law regulating the plumbing business, it is required that every such plan shall be presented for approval, and a copy of the plan, as approved, be filed among the

records of the Health Department. By this provision the department is enabled to refer at any time for information relating to the construction and plumbing of every tenement house built since the law took effect. Not only has this law secured to new houses some very desirable improvements that cannot be applied to the old, but the latter were made materially better by its workings, and, as these, year by year, are gradually disappearing and a better class of houses taking their places, a complete renovation of the whole tenement-house system may now be regarded as a matter of time. Legislation, to be effective, should be so framed as to enable us to take full advantage of the plan of the ground upon which tenements are to be erected. A full building lot in New York City measures 25 by 100 feet, and the law is so framed as to apply to such a lot. Doubtless a better result as to light and ventilation could be secured, were we able to take a portion from the length of each lot and apply it to the width; therefore, in any attempt at legislation this matter should be considered, as well as the general direction and width of streets.

Were I called upon to suggest points looking toward tenement-house legislation, I would say: provide first for a properly prepared foundation. It is well known that the more desirable portions of every city are selected for the better class of dwellings, while the tenement population is crowded to lower and less valuable districts, often consisting of ground reclaimed from swamps and marshes, and even from portions entirely covered with water. All such grounds are more or less defective in that the material used in filling contains usually a considerable amount of decomposable refuse matter. We can guard ourselves against exhalations from such material by properly draining the ground and preparing it with a thick layer of concrete, cement or puddled clay, sufficient to protect the foundation walls and cellar from moisture and ground air. Thickness of walls, quality of materials and other ordinary matters relating to the construction of a building, are generally provided for in the fire and building laws. The special legislation which is to apply to tenement houses, should provide for light, air-space, ventilation, drainage, the disposal of excreta and house refuse, water-supply and general cleanliness.

The admission of light requires, of course, windows of adequate size and number; but these may be so obstructed as to greatly impair their usefulness. To prevent this, massing of front and rear tenements should be prohibited, and the height of the building should be

regulated by the width of the street upon which it fronts. Narrow streets, bounded on both sides by rows of tall houses, are deprived of direct sunshine during a considerable portion of the year, and it often happens that for several weeks in the winter the sun is excluded from the lower stories of houses, on the north side of a street, by the tall houses opposite.

In regard to air-space, I would insist upon at least six hundred cubic feet to each occupant, and when a family increases beyond that capacity they should seek other quarters. There is a strong tendency to evercrowd tenements, which can be overcome only by strict and rigidly enforced legislation. More legislation is now being asked.

The law should provide that every sleeping room have at least one window of proper size communicating with the open air and capable of being opened to half its area. Where such windows cannot open into the street or yard, there should be a light shaft of at least twelve square feet area, extending from the ground to and through the roof, and so constructed as to allow an inlet of air at the lowest portion, that an uninterrupted circulation may be established. One objection, and a serious one, to this light shaft, is that it some times becomes a depository for filth and refuse of various kinds, exposing the sleeping rooms connected with it to foul emanations. This may easily be obviated by a wire grating or screen placed before each window, which, as it does not interfere with opening and closing the sash, will allow a circulation through the room. The arrangements for house drainage should be simple as possible, and yet, in construction, of the best material and workmanship. An uninterrupted communication with the out-door air, from a point in the main drain on the house side of the trap, through said house drain and main waste-pipe to a point above the roof of the house, is now, I believe, regarded by us all as indispensable. Sinks and other fixtures to be connected with the main waste should be simple and arranged in accordance with the best knowledge of the day. For the removal of excreta, I believe it advisable and possible to abolish the privy vault by legislation. This relic of barbarism is not only unnecessary for our convenience, but is a most disgusting nuisance wholly incompatible with our civilization. It should be emptied, cleaned and disinfected, and then filled with fresh earth. It is not so easy, however, to legislate a substitute any farther than to provide for some receptacle in which no

accumulation can take place. The substitute, which to a large extent is now taking the place of the privy vault where there is sewer connection, is the trough closet. The following is our specification as to it:

"That a receptacle, vault or sink be constructed of a depth not greater than two feet, which shall be impermeable and secured against any saturation of the walls or ground, and shall be connected at the upper end with the Croton water, and at the lower end with the street sewer, and provided with an outlet at the lowest point and on the bottom so as to admit of flushing with water daily, and the complete discharge of the contents whenever the outlet is opened. The outlet shall be kept closed, except during the process of flushing, with a tight-fitting plug, so as to effectually prevent the escape of foul gases and offensive odors; and sufficient water shall at all times be kept in the vault or sink to prevent solid matter adhering to the bottom. The bottom thereof shall be so inclined that the lowest point at the outlet shall be at least six inches below the lowest point at the opposite end."

It is not quite up to the spirit of our day, but it is up to the intelligence and habits of a portion of our tenement population, who still need to be further educated on this subject. I believe, however, that in the near future we shall be able, either by State or municipal authority, to introduce the water-closet into even the lowest class of tenement houses. It is now being done with success in the city of Dublin, where it is to be the only system in all classes of dwellings; and many owners of the better class of tenement houses in the city of New York have already placed water-closets in their houses. To be successful with this system, the closet should be of a kind as simple as possible, and with automatic flushing appliances of sufficient capacity to insure adequate flushing and cleanliness. Several of the improved hoppers now in the market would fill all indications, and be entirely safe in the hands of a large majority of well-meaning tenants. Where no sewers exist, we must resort to the dry system, for which the receptacle should be small and frequently emptied. Either dry earth or ashes will prove a successful deodorizer. The removal of ashes and garbage require prompt action on the part of public authorities, as well as on the part of the landlord. It is the duty of the latter to afford means for delivering the refuse to the public cartman, while the authorities should see that the cartman's rounds are made at regular intervals that the refuse may be promptly removed. General cleanliness cannot be effected without an adequate supply of water, the

importance of which is too obvious to need or even admit of any discussion. It should not only be brought to the premises, but to every floor of the house, that each family may use it freely. Cleaning, whitewashing, etc., of halls and such parts of the house as are common to all the occupants should devolve upon the landlord, while the tenants should be held responsible for the condition of their own apartments.

In every tenement house there should be some person with authority to exercise a general supervision over the premises, to abate and prevent the recurrence of nuisances, see that the house is kept in proper repair, be cognizant of any sickness among the tenants and promptly report to the proper authorities.

The occupation of any portion of a tenement house for other uses than as a dwelling should be restricted by law. And here I would begin by abolishing the ubiquitous saloon that exerts such an influence in degrading our tenement-house people. When we obtain a law forbidding the sale of intoxicating drinks in any portion of a building occupied as a tenement house, we shall have done something towards elevating a large class of our fellows. Other industries, such as storing rags and hides, and everything included in the catalogue of offensive trades, using the lower portion of the building as a stable, etc., should be forbidden. Finally, the builder should be required to file in the office of the sanitary authorities a detailed plan of every house he proposes to build, including the plumbing and fixtures, where it should be kept for subsequent reference.

So far, the legislation proposed affects the tenement-house owner alone, and although it is in no degree severe, I believe the tenant should bear his share of responsibility for the condition of his home, sanitary and otherwise. There are nuisances detrimental to public health which often occur in connection with the tenement house, wholly unknown and even unsuspected by the owner, and for which the tenant, either from stupidity or vicious inclinations, is alone at fault. Tenement-house reformers are too apt to extend all of their sympathies to the poor tenant, who is regarded as the oppressed victim of an avaricious landlord. While the deserving poor need, and should receive our sympathies, we must recognize the fact that there is another class to whom the landlord is the victim. I refer to that class of ignorant, vicious people who appear to regard their landlord as a natural enemy, whom it is their duty to injure as much as possible. Against this class of people he has but little protection, and I do not know that much could be afforded by legislation. I would, however, give him the power to deal with such tenants by summary ejectment whenever they are found violating any of the sanitary regulations. Were it possible to eliminate this class of people from the general tenement-house population, there would be less cause to complain of the sanitary condition of tenement houses, since the law gives us so much control over all constructive arrangements.

WATER-SUPPLY.

BY EZRA M. HUNT, M. D.

The question of water-supply can never cease to be of prominent importance in all considerations of public health and comfort. The necessity that it shall be abundant and easily accessible is imperative for purposes of cooking, of cleanliness, of provision against fires, of manufactures, and for use as a drink. As a great financial and economical question, it has to do with general material interests, while, in its bearings on personal health, accurate and correct knowledge as to it is of the first importance.

As the original fountain of all water-supply is above the earth, instead of in it, it is a very natural question why we do not gather it as it comes fresh from the clouds, instead of drawing it back again from the ground. There is so much force in the inquiry as to have led many to claim that not sufficient reliance is placed upon rain-water for potable or drinking-water use.

Denton, in his work on sanitary engineering, says: "I hold the opinion that, in fact, there exists no more certain source of a pure and sufficient supply than that of properly collected and properly filtered rain-water, which is, with care, to be secured by all persons alike.

"Rain-water collected from clean surfaces is itself so free from pollution that it requires filtration only to protect the consumer against the accidental defilements of mold, soot, and those minor organic impurities which occasionally collect on roofs."

Even the necessity of filtering depends very much on locality. The purest natural water is rain-water. Whilst, in its descent, it comes through the air, the amount of mineral or organic matter with which it comes in contact is very small, except in cities dense with the smoke from manufactories. It is both theoretically and practically far less than when it is drawn from the ground. It has advantages of oxida-

tion and purification fully equal to those occurring in the soil. It is especially free from organic matter. While we do not propose to give it undue prominence over all other sources of supply, yet there must ever be, in parts of this State, much reliance upon it. There will always be places where "rain-water from roofs, or prepared impermeable surfaces, constitute the only source of supply for separate dwellings." We, therefore, briefly outline the mode of its collection and preservation. It is best collected on slate roofs. The leader should always be so arranged as that the first rain can wash off the roof and not discharge into the cistern. Two or three automatic arrangements are used for this purpose. This prevents any fouling from the dust of roofs, the excrements of birds, from leaves, or from the "cellulose or weather-beat" of shingle roofs, if they are relied on. If a leader ends in a hogshead or tank proportioned in size to the roofs, it can receive the first washing, and, when full nearly to the top, an overflow into the permanent cistern will carry off the pure incoming stream, and leave the former to be used for non-drinking purposes. It is best, also, to have the mouth of the leader, as it leaves the roof, protected by a copper gauze, or a galvanized wire covering, so as to prevent any lodgment of leaves, etc.

Whether the cistern shall be near the roof in some upper room, or whether it shall be in the ground, will depend much upon convenience and locality. If near the roof, it should be well built, preferably in a circular form, or, if square and lined, should have such lining as will not furnish lead or copper or too much iron to the water. The overflow should be so arranged as not, when its pipe is empty, to be an open tube to convey foul gases to the water. It, therefore, should not enter into the general soil pipe. The cistern, while constructed so as to be accessible for cleansing and while generally needing a covering, should not be so made as to confine stifled air over the water, but admit of some circulation. As water kept near the roof is apt to become very warm in summer, some devices similar to those used for the preservation of ice are sometimes resorted to for keeping the cistern cooler. Most prefer a cistern in the ground, which then should be deep enough to keep cool in summer and not to freeze in winter, or to be cracked by the action of the frost. As the weight of water is ten pounds to the gallon, the receptacle for any large amount needs to be made strong. Cast-iron or wrought-iron tanks, properly painted or dipped, after the Angus Smith method, are now often used. The circular form is generally the best, as it gives the most strength. The capacity

of the cistern should be ample, as it is best to store the water of long rains rather than that of occasional summer showers. The reason for this is that the first rain-water washes out the impurities in the air and upon roofs. A tank or cistern holding one thousand gallons would be contained in a space six feet square and four and one-half feet deep, or in one of five feet square and six and one-half feet deep, or in a circular cistern of five feet in diameter and fifteen feet in depth. If we reckon the average rainfall at thirty inches, or seventeen gallons a square foot, and allow a loss of six inches for the first water and short rains, and six inches for evaporation, "there would be left on the average roof of three hundred and sixty square feet, available for storage, five hundred and forty cubic feet of water, or three thousand three hundred and seventy-five gallons in the year, which, for the house, would be an average daily supply of nine gallons." "A tank sixteen feet long and ten feet wide will hold one thousand gallons in every foot of depth." The building of a cistern in the attic needs to be well done in order to prevent leakage. When made in the ground, much will depend on the soil. If a clay, the cement is sometimes applied directly thereto after an accurate circular excavation has been made. The cementing is mostly done on brickwork, laid in the best of mortar. Where bricks are used the coating of cement should not be less than one-half inch in thickness. Where the cement is applied directly to the sides of the excavation it is usual to put on three coats, the whole being not less than one inch in thickness. As cracking of the cement would not only cause leakage of the water, but also its possible contamination from outside sources, the cistern must be made in the very best manner. The top is usually covered with a stone flag or cast-iron plate, large enough to serve as a man-hole and air-hole. Such cisterns do not need frequent cleansing, but need examination occasionally as to their condition. Some prefer to build two smaller cisterns close to each other, relying upon one for the potable or drinking-water, and the other for the general supply. It is easy to arrange the inflow leader so as to shift it to the drinking water-supply and thus make selection of the time of filling.

FILTERS.

As the subject of filtration comes up in connection with rain-water as also with other waters, we shall here say much that is applicable to

all forms of artificial filtering. Its design is often three-fold. First, the removal of all foreign particles in suspension. The retention of dissolved matters which are in solution or too minute for the first process of straining. The aeration of the water, or a process of oxidation, by which actual change is wrought upon organic matter in the water. To this might be added sedimentation, which is merely the settling of particles which, being of a higher specific gravity, or greater weight than the water itself, settle to the bottom without any real filtration.

The first process is purely that of mechanical separation or straining, which, by furnishing some fine porous substance, separates many of the finer particles which would not settle soon or at all to the bottom by sedimentation. In large reservoirs settling basins are often used for this form of sedimentation. Even if filters have to be used, the opportunity given for the settling of the coarser particles makes the subsequent filtration more effectual.

It is seldom necessary to use such coarser methods for cisterns if the roofs and leaders are properly cared for, although the settling of such particles to the bottom of the cistern is a reason why no pipes of outflow should be as low as the bottom of the cistern, and also a reason for occasional thorough cleansing, or at least yearly.

The second method of action of a filter has been called that of adhesion. Prescott illustrates it thus: "A solution of organic coloring matters, though so perfectly free from suspended solids as to show no particles under the microscope, when passed through certain porous substances, leaves the coloring matter behind. The capillary attraction of the porous surfaces for the dissolved solids takes them out of solution. Dissolved gases are, to some extent, withdrawn from solution in the same way." The process seems to depend upon the fact that particles of sand, charcoal, or other substance, are so close to each other that no rills of water can flow between them, but only drops or minute capillary currents of the water. It is then brought directly in contact with the adhesive or absorptive surfaces of the material used, and so the very finest particles and the dissolved solids are retained.

If there is too much weight of water it is pressed too rapidly through the filter and so is not allowed time for this slower action. It is a rule in filter-beds not to have over two feet of water.

The third process, that of oxidation, although regarded by most as distinct from this, is closely associated with it. The water thus passed

minutely through adjacent surfaces, itself gets greater capacity for air admixture or adhesion, while the minute particles of sand or charcoal also allow much air between their surfaces. Thus the suspended or dissolved particles are especially exposed to air and undergo that process of oxidation by which organic material is destroyed. "The oxygen condensed by adhesion in the pores is extra active." By the minuteness of the particles of the filtering material and by compelling the water and the air to be jostled about in minute currents amid multitudes of solid inorganic particles, you get that motion which is always favorable to oxidation, and therefore to the removal of all changeable or decayable matter from the water. So not only is this removed but when removed the air and water aid in its destruction, and so help to preserve the filtering-bed in action. Yet, as often more air than is supplied by the water or by the aid in the filter material is needed, as a rule filter-beds should not be so constantly covered as to prevent access of the atmospheric air, for it is one of the conditions of a good filter that it should expose the organic matter which it catches to the largest possible amount of atmospheric air both during the act of its catching it and at intervals between, by the free access of air thereto. Sand, although valuable as a mechanical separater, is too porous to exclude all suspended matter, and if used alone, too fine by reason of its compactness, and does not favor a capillary flow either of the water or the air. Animal charcoal, and especially granulated animal charcoal, being closer in texture on the surface and more open in its particles, has a more valuable porosity, except that it is more difficult to make the water pass actually through its substance. "Due care of a filter requires that all suspended matter, *i. e.* floating particles, should be removed before the water reaches the filterer." Charcoal probably owes more of its value as a filterer to the minuteness of its pores or interstices through which the water in its minute circulation is brought into contact with air, than to any other property. Those who construct filters need to bear in mind such facts so as to adjust mechanical arrangements and the use of materials.

Filters also have a certain value in the more general aeration of the water. Thus, water which has been boiled and has a *deadened* taste, although free from organic matter, by subsequent filtration through aerated material has this overcome. The importance of occasional access of air to filters is such that Denton says that "all filtration in

which the filtering material is placed constantly under water, produces but an imperfect effect. To secure the best results the filtering material should be intermittently aerated." Air is a far better cleanser of a filter-bed than water. The idea, then, of a perfect filter is one which, by the mechanical arrangement of the parts or particles of which it is composed, secures the most perfect mechanical separation of every particle in suspension in the water; which, by adhesion to its surfaces or "mechanical entanglement" in its pores and the securement of a capillary circulation of air and water through it, secure the retention of all minute or dissolved matter; which also, by this arrangement and by intermittent exposure to air secures the most perfect facilities for the aeration of the water and oxidation of all organic matter in it." As there may still be an occasional accumulation of the collected matter, it should admit of occasional removal for cleansing. The chief idea of a filter is well illustrated thus:

Take any common vessel perforated below, such as a flower-pot, and put a small, clean piece of sponge over the hole. Fill the lower portion with gravel stones, over which place a layer of finer gravel and on these a layer of clean, coarse sand, the proportion of each being about the same.

On the top of this place a lid of unglazed clay, either very porous or perforated with small holes, and in this a stratum three or four inches thick of well-burnt, pounded animal charcoal. A filter thus formed will last for a long time, is easily cleaned and will be found to act both by mechanical and chemical purification. (See Blyth and Tardieu.)

The following are good directions from so good an authority as Dr. Parkes:

"The filtration of water is not difficult, even if you cannot afford to buy a regular filter. The compressed charcoal blocks are cheap and good; if they clog, rub them gently with a towel, or, if that does not clear them, with a hard brush; if they are still clogged, they must be gently scraped with a knife. But if the charcoal block is too expensive, a simple filter can be made as follows: Get a common earthenware garden flower-pot; cover the hole with a bit of zinc gauze or a bit of clean-washed flannel, which should be changed from time to time; then get some rather small gravel, wash it very well and put it into the pot to the height of three inches; then get some white sand and wash it very clean, and put that on the gravel to the height of three inches; then buy two pounds of animal charcoal, wash that also by putting it into a jug and pouring boiling water on it, then, when the charcoal has subsided, pour off the water, and put some more on for three or four times. When the charcoal has been well washed, put it on the sand and press it well down. Have four inches of charcoal if possible. The filter is now ready, pour water into the pot, and let it run through the hole into a large glass bottle.

"After a time the charcoal will get clogged; take off a little from the top and boil it two or three times, and then spread it out and let it dry before the fire. It will then be as good as ever. From time to time all the charcoal and the sand also may want washing. The sand may be put over the charcoal, and not between it and the gravel; but this plan sometimes leads to the charcoal being carried with the water through the gravel and out of the hole. The sand stops it.

"By filtering in this way, and by boiling the water, many dangers are done away with.

"If you have a rain-water tank, always filter the rain-water before using it for drink or cooking, as rain-water often is collected from dirty roofs or becomes impure in the tank."

One plan of a cistern and household filter is given by Prof. H. B. Cornwall, in our second report, 1878, pages 100–102. A usual method is to have the part of the cistern which receives the rain-water partitioned off by a brick septum, smaller than the division from which it is to flow out. As the bricks are porous and made from clay free from organic matter, this method is often found quite efficient. The bricks are the usual hand-made bricks, often laid on edge with a good quality of mortar sufficient to hold them in place. Where the cistern is large, the circular or arch form is preferred for strength. This serves some of the purposes of a filter, but, because it cannot be removed for cleansing and is most of the time in the water, so as not to allow intermittent aeration, it is chiefly mechanical in its action, and if the water has much impurity will become clogged. Yet if, when the cistern is low, access is had to the wall, it can be thoroughly rubbed with a stiff brush, and air blown through the bricks by a strong common bellows, and thus its power of clarification be renewed at the time the cistern has its cleansing.

Instead of this, in small cisterns, a similar septum is encased in a strong iron frame-work, which fits into a groove into the cistern, and can be removed and aerated and cleansed when desired. This may be made of thinner porous brick, or clay. Charcoal is also thus used in form of blocks. With our State facilities for clay shaping, there is no reason why portable filters should not be constructed, either of brick specially made for the purpose, or a double row of slabs of clay

fitted to each other, between which filtering material of sand, gravel, charcoal, etc., can be used. Such a filter could be placed so as not to extend to the bottom of the cistern, but to form a kind of box.

Another plan, suggested by Prof. R. C. Kedzie, is very feasible:

"To remove matters held in mechanical suspension it is a good plan to provide a small filtering cistern, filled with clean sand, to receive the water as it flows from the rain-water pipes, carrying this water, after filtering through the sand, directly into the main cistern by a lateral pipe connecting the two cisterns.

"A very simple and inexpensive arrangement will exclude all insoluble impurities from cistern water as it is pumped out. This is constructed as follows: A brick box, twelve to eighteen inches in internal diameter and twelve inches high, is made with well-burned, hand-pressed brick (machine-made bricks are too hard and impermeable by water), laid up with water-lime (the bricks may be laid up edgewise), the box is arched over at the top, and through this arch the pipe of the pump passes inside the box, the pipe being securely fastened in the arch by water-lime. When the pump is worked, the water that reaches the pipe must pass through the brick, by which means all mechanical impurities are prevented from passing to the pump; the water is strained before it is pumped."

Denton, in his Sanitary Engineering (pages 40 and 143–144,) suggests two species of filters: one a box appended, in the tank or cistern, to the pump which drives the water into the house and serving to strain out suspended matter, and the other an oxidizing filter in the house, containing filtering material made of finely-broken stone pots-herds and animal charcoal. This admits of aeration by intermittent filtration also, and is self-cleansing by letting the water itself be so turned on as to work out the filtering material.

Spongy iron, made of hematite, which is a common ore in this State, is also available as a filter in place of sand, charcoal, etc. The spongy metallic iron is so reduced from an oxide without fusion as to preserve its minute, particulate, spongy, porous condition, and in this form, answers an excellent filtering purpose. By washing and drying the layers or materials from which filters are made, we are often able to use them for a much longer period. Instead of taking the filter apart, it is often possible, after it is dry, to blow draughts of air through it. If twenty or thirty grains of solid potassium permanganate, and ten drops of strong sulphuric acid to a quart of distilled water, is poured through the sand, gravel and charcoal filter, and afterward three gallons of distilled water, to which a half ounce of muriatic acid has been added, and then a gallon or more of pure water, the filter will be renewed. Other varied forms of filter, both patented and not patented, are in the market, but with the principles of their action thus made plain, a choice can be made.

We next come to that supply of water which is derived from the ground. Although originally from above, it is variously deposited or retained in the earth. That which is found in lakes and streams, in relation to animal wants, is generally known as the surface water-supply. It is that for which nature has its own reservoirs on the surface of the earth in rivers and streams, made to receive the drainage of water-sheds more or less extended. Sometimes this is spoken of as of two kinds, viz., the surface-water from uncultivated or sterile lands, and that from cultivated lands, since the kind of soil through which the water flows furnishes it more or less with the soil organic matters, which it contains, as well as with mineral ingredients. If the organic matter is so superabundant as not to be diminished by filtration through the soil, or oxidized by exposure to the air, it makes the water impure, while if limestone or other rocks abound, the character of the water is modified in this regard. Also, special plants may give a peculiar odor to water, or, when in very great abundance, may add to it much decomposed material. It has the advantage that being on the surface it is exposed to air and sunlight, and often, by its motion over rock and pebbly bottoms, is constantly aerated. How real is this advantage is sometimes illustrated by the freezing of rivers which are somewhat impure. Then, because of the exclusion of the air, the water which in the summer was not complained of, in winter becomes scarcely fit for use. The disadvantage of such exposed sources of water is that they are subject to various artificial sources of pollution from cities, factories, dwellings and soil enrichment on their banks. Where these sources of contamination abound, the water will be preserved longer by a sanitary patrol like that now exercised by the combined Boards of Jersey City and Newark over the Passaic river. This constant watchfulness now prevents from passage in to the river a great amount of crude sewage and factory products, which formerly were freely discharged into it.

Next is the water-supply derived from shallow wells. These wells are those which are fed by land or surface springs. Though some of them are spoken of as deep, "they depend for their water upon the

area immediately surrounding them, the rain-water falling upon which sinks downward and laterally toward the bottom of the well. The quantity procurable may be likened to the contents of a cone, the base of which is the area around the well, and its apex the bottom of the well, the contents being renewed from time to time as the rain falls. The extent of this area, or base of the inverted cone, is the greater the more porous the ground is for any given depth of well." Such is the water on which, in the absence of public supply, most depend. By passage through the ground strata, and by process of filtration and oxidation, it is usually pure, unless in its course it has derived contamination beyond the power of the natural forces in operation in the ground and air to neutralize. Not only are some soils, such as gravel and sand, more porous than others, but rocks, also, differ in porosity. Thus the new red sandstone is so porous as to act as a filter, and often removes much organic matter. Some forms of rock contain organic matter.

The next supply is that from springs. These are governed in position and depth by that of the different layers of the earth structure. Water finding its way to an impervious bed, has its springs or rivulets formed along that bed, or a water-level there maintained. The direction of the slope, or dips in the slope, or a sudden change in the formation, may allow the water to appear on the surface as a spring, or to be reached by a well. If these are not very deep they represent surface water of recent percolation through soil, and often rise and fall according to the abundance or lack of rain, and so, like the shallow wells, represent the ground-water.

Next we have the deep well which represents what is sometimes called the resident water or the more constant deep water level which is beyond the seasonal influence of drought or storm. To this class belong deep wells, driven and bored wells when deep, artesian wells and most springs of the deeper water-bearing strata.

Of these it may be said in general that supplies nearest the surface may be very excellent if only from the upper soil and surroundings there is no super-abundance of organic matter. They even have the advantage of the more active and continuous presence of air for oxidation purposes. Their risk is that pollution to streams or to wells or to soils about them are more easily added than to the deeper reservoirs.

The deep sources are much surer to be free of organic or decomposable constituents although sometimes altered in composition by the mineral ingredients they have found or with which they are brought in contact at their base.

As to each of these we only desire to single out the more important suggestions and precautions. First as to river and lake supply. Whether this shall be relied upon will depend upon the purity of the source, the character of the country through which it flows, the possibility of preserving it free from contamination such as would add to it decomposable organic matter, or such mineral matter as is harmful, or such taste either from mineral or vegetable sources as would give discomfort. If any such matters are added the question also arises as to how far these are self-correcting in the flow and exposure of the stream and what means can be used to prevent or neutralize the impurity. Also, as a test of actual condition we need the repeated examinations of chemists and the testimony of close medical observers, who, by actual statistics of sickness and death and close observation and analysis of cases, can be able, with reasonable ground, to have opinions which can serve as guides.

Where, owing to appreciable and definable causes, there may be contamination or cloudiness or discoloration or taste, it is to be considered whether filter beds or other methods may not avail for partial or temporary unfitness. Thus even the taste and smell from water plants, as from such as the nostochiæ species, are greatly improved by proper filtration.

The *character and condition of reservoirs* needs to be carefully examined, both as to cleanliness, and as to what is best in the agitation or aeration or protection from heat of the impounded water. For it is known that reservoir water is not always so pure as the source from which it comes and that there are often no comparisons of conditions and strange neglects of examination. We not infrequently find reservoirs that have not been cleansed for years or properly investigated to know whether they are in need of cleansing, with gates or other wood-work or appendages in an improper condition, and with adjacent soil contamination by reason of added pollutions. And wherever a city is supplied with water by a company it is especially important that knowledge as to these matters be sought by the corporate authorities. The reservoir at Camden has recently been cleaned with great advantage. The service pipes, too, are sometimes found in an improper condition, and those having intermittent supply

may need aeration. The growths and deposits on these have sometimes been such as to affect water. If the joints are caulked with organic material, as hemp, etc., the water is sometimes polluted and unpleasant to the taste. The plant life of reservoirs and pipes sometimes needs microscopal examination. Whether a river shall be used as the natural drainage for a water-shed for the inhabitants near it, or whether it shall be practically the water-carriage for sewage, or whether it shall be the source of water-supply, is often a difficult and always a relative question. We must incline to the belief that in the country, where the rain-fall is large and so many other sources of supply are available, that rivers should not be resorted to where water can be obtained from series of wells, gravel bed or other water-bearing strata, or impounded in reservoirs depending upon a supply high up amid uncultivated and comparatively uninhabited hills. This is accomplished by arresting the flow of the storms at a point high up in their course, where forests abound or where there are few inhabitants, and where it does not occasion great overflow of lands. Water thus secured is generally far better than that nearer the outflow.

Upland surface water from uncultivated grounds, which, after percolating through the soil, can be gathered either from springs or wells, or from a kind of elongated well in the shape of a reservoir on the edge of a hill, or so as to intercept a water-bearing strata, is by all acknowledged to be a most reliable source of supply, so far as quality of water is concerned.

The average rain-fall of the country must, with due allowance, be taken into consideration, together with the amount of water likely to be needed. For this State the general rain-fall is forty-four inches. One inch of rain falling on a square foot, gives rather more than half a gallon, so that forty-four inches of rain-fall a year represents a little over twenty-two gallons for each square foot.

There needs to be a careful study of the natural water-shed, its extent, what its loss is by rapid flow from the surface, by sun-heat and evaporation, and by any artificial interruption of or addition thereto. The character of the soil and of the underlying strata needs to be known. The Princeton Water Company, after a careful study of various sources of supply by competent engineers, concluded thus to intercept the supply from a gravel formation on a farm not very far from the town. "The water-works for the supply of Glasgow and

Greenwich, in Scotland, and those of Manchester, Sheffield, Barnsley and many other places in England, are admirable specimens" of the rain-fall of higher grounds thus collected and stored for use. Our own State gives many advantages for this kind of gathering, in cases where the rivers can more profitably be used for sewer delivery. While the supply is equivalent to that from shallow springs and wells, it is a choice of the advantages of percolation and storage, where there is freedom from the dangerous forms of organic matter. When such sources of supply are sought, the choice must be made by those who are judges; and it is seldom that such err in thus securing a good supply.

Many of the wells considered to be deep wells are not such in the technical sense. The Hydraulic Engineer, or the Geologist, by a deep spring or well as sources of water-supply, has reference to that source of water which is so deep as not to be directly affected by the rains of any one season, but which reaches down to that residual water in the earth which has a constancy of presence which does not directly depend on the supply given to it from above by any one season. Such water is generally free from organic matter because it is far from the presence thereof, and in its passage through the soil and the air which the upper ground contains it has been freed of all such substance. To this there are a few rare exceptions, by reason of the character of local deposit or strata or from fissures in the rock formation. Such water, however, by reason of pressure and the prevalent mineral character of the geological structure through which it passes or on which it rests, may have a mineral impregnation which imparts to it odor or may give it either disturbing or valuable mineral properties.

These various forms of wells are fully treated in the Geological Reports for 1879 and 1882. Whether in any given locality such a source of supply can be depended upon is scarcely known except by actual experiment. While these wells help to shut out organic matter from the surface by reason of the water being drawn through tight tubes, yet it sometimes happens that the earth does not pack closely around the tube and that the outside of the pipe will serve as a course by which foul surface or upper soil liquids will find their way directly to the little hidden well at the bottom of the tube, and so be drawn up without much dilution.

The various facts thus condensed and presented as to the sources

of water-supply, will serve to aid the reader in appreciation of the problem and the conditions involved in the securement of so important an essential to personal and public health.

TESTS OF THE PURITY OF WATER.

Too much dependence must not be placed upon the opinions as to the goodness of water which are given by the tasting of that which has just been drawn, or by persons accustomed to its use. Water may have no taste that would be criticised, or seem very refreshing to the thirsty one, even when dangerously impure. Then, too, by use we become accustomed to a particular water, and may prefer it quite independent of its real purity. Also, it seems to be a part of human boastfulness to claim that one's own well is the best in the neighborhood. Nor is it enough that no actual sickness has been traced thereto. It is marvelous how resistful some persons are to imperfect foods and drinks, and how the forces of a reserve energy of health either resist or compensate for depressing influences, or finally there is an adjustment that conceals the evil, or like an engine with a little extra friction, only demands the production of a little more propelling force. Yet there are others who are more affected, and all are making a wastage of resisting power that is more wisely and usefully expended in some other direction. While one need not live in constant suspicion of evil, where the methods of protection are simple and where occasional outbreaks of violent disease reminds us that neglect may be destructive of life, it is well to know how to avoid or correct the error. Often there is need of such examination of waters as can only be made by sanitary experts. The chemist, the physicist and those accustomed to study and weigh all the facts which determine the purity of water, may need to be consulted where the evil threatens serious results. The following ready tests, as suggested by Prof. R. C. Kedzie, of the Michigan Agricultural College, will serve to guide as to the quality of water:

"The following methods of testing such water are presented, not as the most complete possible, but such as any one can employ without the skill and appliances of the practical chemist:

"*Color.*—Fill a large bottle made of colorless glass with the water; look through the water at some black object; the water should appear perfectly colorless and free from suspended matter. A muddy or

turbid appearance indicates the presence of soluble organic matter or of solid matter in suspension.

"*Odor.*—Empty out some of the water, leaving the bottle half full; cork up the bottle, and place it for a few hours in a warm place; shake up the water, remove the cork, and critically smell the air contained in the bottle. If it has any smell, and especially if the odor is in the least repulsive, the water should be rejected for domestic use. By heating the water to boiling an odor is evolved sometimes that otherwise does not appear.

"*Taste.*—Water fresh from the well is usually tasteless even though it may contain a large amount of putrescible organic matter. Water for domestic use should be perfectly tasteless, and remain so even after it has been warmed, since warming often develops a taste in water which is tasteless when cold. If the water at any time has a repulsive or even disagreeable taste, it should be rejected.

"*Heisch's test for sewage contamination.*—The delicacy of the sense of smell and of taste varies greatly in different individuals; one person may fail to detect the foul condition of a given water, which would be very evident to a person of a finer organization. But if the cause of a bad smell or taste exists in the water, the injurious effects on health will remain the same whether recognized or not. Moreover some waters of very dangerous quality will fail to give any indication by smell or taste. For these reasons I attach especial importance to Heisch's test for sewage contamination or the presence of putrescible organic matter. The test is so simple that any one can use it. Fill a clean pint bottle three-fourths full with the water to be tested, and dissolve in the water half a teaspoonful of the purest sugar—loaf or granulated sugar will answer—cork the bottle and place it in a warm place for two days. If in twenty-four to forty-eight hours the water becomes cloudy or milky, it is unfit for domestic use. If it remains perfectly clear it is probably safe to use."

Wells sometimes change in the quality of water. This may be owing to something having fallen into the well, to a seam in the adjacent or underlying rock which has become saturated with filth from some distance or serves as an inlet for some cesspool, or from some sudden discharge or pressure from a cemented privy or some other source. More frequently it happens thus: A cesspool or slop-pipe, or other foul source of organic matter, has for a long time allowed the soil not far off to become saturated without any appreciable effect, because the amount was too small so to saturate the soil as to cause soakage therefrom.

"In the case of a well supplying one or two families only, the circle of measurable influence, as far as the height of the ground-water is

concerned, is quite small; but this is by no means the circle of possible contamination; for the water drawn from the well is not taken from that which falls within this limited area, but is taken from that portion of the ground-water which happens at the time to be passing through the well, so to speak. In most cases, as has already been stated, there is a movement of the ground-water, and it sometimes happens that a source of contamination may be very near the well without affecting it, owing to the fact that the direction of this movement is such as to carry the drainage away from the well. If the supply of water be abundant, it may be possible for offensive or injurious matter to be so diluted that no perceptible effect is produced on the well; but, as the ground becomes more and more charged with decaying substances, the danger of future contamination becomes greater."

Where a well or other source of water-supply has been found and proves satisfactory, it should be considered such a treasure as to be most carefully preserved. The owner should not allow any source of soil contamination to occur within a hundred or more feet of it, and no storage of any accumulated filth within two hundred or more feet of it, according to the character of the soil and underlying structure. If the soil about it is made very rich by fertilizers, or not thoroughly cropped, it may become a source of contamination. Much, also, depends on *the mode of construction* of reservoirs, wells, etc.

Should they be exposed to air.—This is a relative question. If a body of pure gathered water fills its receptacle very nearly or quite full, and is then covered by a clean non-absorbent cover, it may thus be kept so much from decaying leaves, organic matter, foul air, sunlight and heat, as to be comparatively better than if exposed to the free play of air and wind over it, which otherwise would be better. Facts as to taste, as to algoid growths, etc., seem to show that water impounded, as in reservoirs, may become "deadened" or stagnant, or be of different quality from that of the stream it comes from, even where the reservoir is not foul. This, too, has been found especially true, where it is carried through aqueducts which are not full and are not well ventilated, in which the sides, as well as the water, become impregnated. This does not occur in service pipes, kept full, from which supplies are being drawn, unless, by reason of a change of level or supply, there is at times partial emptiness.

Wells, too, may become stagnant when there is very little or any flow into them, or when heavy air settles in the well between the water and the top of the ground. As a rule, then, we would say wells are

better when exposed to the air, if the air about them is not contaminated, and if they are so located and exposed that currents of air can pretty freely circulate in them. But as wells often need to be closed for safety, or are located in the close area of houses, some have advocated that they be so walled about and cemented a few feet down from the top, and then so fitted with apparatus for drawing the water as that the well shall be sealed from the outer air, and the water depend for its supply upon the air drawn from the lower ground as a result of constant use.

Allied to this is the question whether wells are not benefited by modes of drawing apparatus which go down into the water and agitate the air above it, as also the water, and so aerate it. It has been claimed that the old oaken bucket thus aided to purify the water, and that chain pumps and other modes of drawing, which stir the water, have this effect. When we know how water can be aerated by pouring from one vessel to another, and that air in holes becomes stagnant much more than most suppose, we regard it as wise to have open wells where proper protection and situation will allow it, and where the water is agitated in the drawing. We especially object to surface wells located in cellars. Open wells are easily protected by a cover or screen of perforated metal work. Both for the purity of air and of water, all dug wells, whether open or closed, should have the walls cemented at least six feet or more down from the surface, according to the character of the surface soil. This helps to secure the influx of the water into the well from a lower level, so that the water drawn is either that which is from a lower strata or water-level, and spring-like, or that which has been forced to go through a soil percolation down to this point.

In excavations for wells, care must be taken to have them exact circles, so as to secure a stronger and more accurate construction of the lining.

Where, because of the looseness of the soil, a curb is needed, oak, elm or yellow pine plank or boards are generally used, because if wood is used it is desirable to have that which has no unpleasant taste and which will last long under water without decay. Brick of good quality and of a circular form are now preferred to stone, as the placing can be more accurate, and they admit of closer binding by mortar or better covering for the part needing cement. It is important not to place wells too near trees, as not only do the roots often

impregnate the water, but by their presence disturb the lining. The careless construction of wells too often leads to their deterioration. Ernest Spon, in his work on "Sinking and Boring Wells," says: "Too much care cannot be bestowed upon the steining (the cylinder of brick work). If properly executed it will effectually exclude all objectionable infiltration. * * * Half the wells condemned on account of sewage contamination really fail because of bad steining."

The steining of the well should always be carried above the level of the ground, and some of the cement used outside as well as inside, for the upper courses of brick. It often happens that wells become contaminated by slops and spilling about the top. Vessels are carelessly rinsed or slops thrown out until all the soil about is kept damp or over-saturated with filth, ready to be stirred into activity when sun or temperature favor. We know of one well in the State long known as the "Sickness Well," because of fatal cases that were probably attributable to this very cause. After a thorough outside cleansing and a change of method it became entirely pure.

If wells are thus finished and graded around so as to form a slight descent, and then covered level with a flat paving stone, thorough protection is insured. The size of hole in the stone will be governed by the views held as to ventilation and by the form of apparatus used for drawing the water. Allusion has already been made to such as agitate the water. Where the simple action of an exhaust force is sought, the only point is to have the material, of which the barrel or pipe is composed, such as will not, itself, defile the water. Wooden pumps often become very objectionable, because of the decay and the taste of the wood. Stone or burnt tile pipes have sometimes been found very satisfactory. Where metal is used it must be such as will not injure the water or too much affect the taste. Lead tubing is not recommended, as it damages some waters more than others. Where lead is constantly in the water, or where the service-pipe is constantly full, it is claimed that there will be no action of the water on the lead. Iron in some form is extensively used for water-carriage. The tube through which the water is drawn should rest on a center stone and be made firm on the bottom. Many prefer a tube sealed at the bottom, with holes in its sides just above, so that no sediment is pumped up. The spout should have under it a shallow trough to catch all drippings, from the lip or end of which the water can run off, so as not to soak about the well.

We have been specific in detail as to the construction of wells, because so often the impurity of the water is the result of such neglects on the surface and the platform of the well, as foul a water otherwise pure and wholesome. Many of these suggestions apply equally to cisterns. When water suddenly becomes foul, if other water cannot be gotten in its place, none of it should be used for drinking until it has been boiled and aerated, by pouring from one vessel to another. Such precaution often prevents sickness. The well should be thoroughly cleansed and all possible sources of contamination examined. The removal of the water from the well not only gives a new supply running in, but agitates both the air and water, and gives opportunity to examine into the character of the inclosure and the streams that are running in. We know of a case of typhoid fever traceable to a well, in which a cleaning out showed foul streams running in from one direction, while on the opposite side the water was entirely good. It was a very dry season, and it seemed as if on one side the water level had reached some foul deposit in the ground, as no outhouse or cesspool was near. That such occasional drifts or unchanged deposits of foul organic matter, both animal and vegetable, do occur, is well authenticated.

As it now frequently happens that the water is introduced into houses from outside wells or cisterns by means of pumps, care must be taken that the tubes through which the water is drawn in its passage through the brick or other lining of the well, are well fastened and cemented. Cases occur where such metal tubes passing through the soil, make, on their outside, courses along which foul liquids gather and trickle into the well.

HOUSE FILTERS.

Sometimes water may become turbid by reason of innocuous coloring matter from recent rains, or from the color of the soil, as peat or shale, or may have in it some organic matter from some sudden cause. It is in such cases that house filters are sometimes used to advantage. We have already discussed the principles of filters in connection with cisterns. Several patent filters are in the market, of more or less value. They differ chiefly in the methods in which they make available the usual filtering materials and in convenience for their removal. Some of them are arranged so that the water filters upward through them,

such as the syphon and pipe filters. Wool and canton-flannel will separate much of the grosser material, and answer well for a first cleansing, so that the water may be readier for the action of more thorough filtration. Layers of coarse gravel, finer gravel, coarse sand, finer sand, and charcoal, in about equal proportions, form the basis of most house filters. Parkes speaks very highly of filters made from spongy iron and from the magnetic carbide of iron. "On the whole," he says, "a very purifying effect is produced even on dissolved matters." Since the bacterial hypothesis has come in vogue, it is claimed that the smaller forms of vegetable or animal life are not destroyed. But these are mostly ephemeral in their life, and water not intensely fouled, that has been thus treated, has not yet been proven to contain any specific varieties. While usual potable water should be too pure to need filtration, these domestic filters may be very valuable as temporary expedients.

Now that so much attention is given to public and private water-supply and so many investigations are being made by competent men, the use of unhealthy drinking water is a fault before it is a misfortune, and arises far more from carelessness, ignorance or lack of forethought than it does from necessity. This is as true in public as it is in private supplies. It is seldom that a case of contamination happens but that it reveals an absence of proper vigilance.

HARDNESS OF WATER.

"Lime salts are the chief cause of hardness in water; compounds of magnesia, iron, and other elements, however, may contribute to that soap-destroying power of the water, which is practically meant by the term. Chemists recognize two kinds of hardness: 1. Temporary, which is caused by the presence in the water of those elements held in solution in consequence of the presence of carbonic acid. By boiling the water, the carbonic acid holding them in solution is driven out, and the compounds in solution in consequence of its presence, separate in the solid form, and can be removed by filtration. 2. 'Permanent' hardness, which is caused by the above bases, which are in combinations not converted into the insoluble form by boiling—sulphates, chlorides, etc., chiefly the first named. The temporary and permanent hardness together constitute the 'total hardness.'

"To express the hardness in some tangible form, the usual custom in this country and in England is to give results in the corresponding amounts of carbonate of lime, *i. e.*, practically to determine the amount of soap destroyed by a measured quantity of the water, and then to state the results as the amount of carbonate of lime which would destroy that quantity of soap."

Thus water which does not form a suds or lather, curdles, and so wastes the soap. This curd is a precipitate formed by the combination of the soap with the lime and magnesia in the water.

"The hardness has much significance upon the economic side. Hard water is objectionable for domestic purposes, in washing, and for manufacturing purposes in boilers. Linen cannot be washed with hard water, and other materials not as well as with soft water. With regard to its effect upon health, the English Commission took a great deal of testimony. (Sixth Report, pp. 184 to 194.) One witness said that soft water was more conducive to health, as people were more apt to be cleanly when they had soft water to use; another that lime-sulphate in the water appeared to disagree with some persons; another that the death-rate was apparently a little lower in towns supplied with moderately hard water. About ten to fourteen degrees of hardness per gallon (fourteen to twenty per hundred thousand), was deemed by some to be beneficial. The question of the connection of the hardness of the water with the death-rate was investigated, and from numerous statistics taken in the United Kingdom, it was found that there seemed to be no necessary connection. The conclusion of the commission was, that though there were some differences of opinion 'there is almost absolute unanimity as regards the wholesomeness of soft water.' Popular prejudice runs in the same direction, especially when comfort in washing, and economy of soap and boilers are taken into consideration, while for sanitary purposes no objection can be urged to the use of soft water, other things being equal."

As all the water in the limestone regions of this State, and much of that in the red sandstone and some in other parts is hard, we need to be fully aware of its effects. Boiling removes the temporary hardness, but not that known as the permanent hardness. A process known as the Clark process remedies the former, but not the latter, and so becomes a test between the two. This permanent or unremovable hardness, if of much amount, renders the water undesirable for drinking purposes, although it can be reduced by carbonate of soda. The greater the permanent hardness the worse the water. By permanent hardness it is not meant that no chemical process will remove this hardness, which comes mostly from the sulphates (as gypsum, etc.) Distillation and sufficient quantities of soap or carbonate of soda will remove this. But the process is expensive and complicated, and so it

has been called permanent hardness, in contrast with that easily removable. Although most of our hard waters contain, in addition to the carbonates, some of the sulphates, yet when the former is removed they are greatly improved for cleansing purposes.

"Every degree of hardness means that one gallon of water contains one grain of carbonate of lime (common chalk); there are 7,000 grains in a pound weight; therefore, 7,000 gallons of water of one degree of hardness would contain 1 lb. of carbonate of lime, and that would waste 8½ lbs. of soap. But nearly all waters, except rain-water, are much harder than this, their degrees reaching 10, 15, or 20, so that if we were dealing with a water of 20 degress of hardness, our 7,000 gallons would waste 170 lbs. of soap. This quantity of water would easily be used in a year by a family of say seven persons, if we include the washing of clothes, so that, with soap at only 3*d.* a pound, we have a pure loss of 43*s.* per annum in this item alone, or an amount equal to the income tax upon £100. There is also to be added loss caused in cooking, making tea, &c. For persons who get their living by washing, the importance of using soft water is very obvious."

AS TO THE REMOVABLE HARDNESS.

"To determine whether water is hard, we take a gill or thereabouts in a flask and add to it a clear solution of soap in alcohol. If the mixture is then shaken and remains clear with an abundance of soap bubbles over it, the water is soft, but if it becomes white, and curdy-looking masses form and float in it, and no bubbles appears on the surface, it is hard water.

"The hardness is caused by salts of lime and magnesia which are in solution in the water. These salts render the water unfit for washing, as they destroy soap, and they are troublesome in tea kettles and in steam boilers, on account of the incrustation which is formed as the water boils away. But hard water is not specially unwholesome, and it is common to find well-waters containing from 10 to 60 or more grains of solid matter to the gallon, which have been used for years without any injurious effect, though sanitarians recommend that water containing more than 17 grains to the gallon be not used.

Hardness implies one grain of bi-carbonate or sulphate of lime in a gallon of water. Water at or below six grains of hardness to the gallon is not objected to. The report of the State Geologist makes ten grains of hardness to the gallon the limit. Whether the removable hardness injures health cannot always be determined, but as it may cause dyspepsia, diarrhea and calculus, and adds a material not

needed for digestion or assimilation, it is better to use the softer water. The incrustation of boilers by hard water and, which is much worse, from the sulphate hardness, and the great wastage of soap caused by it, are worthy of great economic consideration. The water of Worthing, in England, for instance, is so hard that in one thousand gallons of water twenty-eight and one-half pounds of soap are destroyed or curdled before any lather will come. In the Thames water it is over two pounds, in that of Manchester only about three pounds, while in the Loch Katrine supply of Glasgow it is only two-fifths of a pound. It is easy to see that if such large amounts of soap are thus wasted, and if there may be some peril to health, the hardness of water should be considered in its introduction or remedied afterward. Water kept boiling about a half hour loses most of this removable hardness. Such water, poured on thin slices of well-burned toast, is found to agree with some who, from stomach or kidney disease, are susceptible to mineral ingredients. The Clark process, as described by Church, is thus carried out by the East London Company:

"Slake 18 ounces of freshly-burnt quicklime in a little water: when the lime has fallen to powder, add enough water to make a thin cream with this powder, and stir the mixture in a pail. Then pour this cream into a cistern containing 50 gallons of the water to be softened, rinsing the pail out with more water, but not pouring out any lumps of lime that may have settled. Let into the cistern the remainder of the 700 gallons of water which 18 ounces of lime can soften, and take care that a thorough mingling of the water and lime occurs. The added lime seizes the carbonic acid gas which held the carbonate of lime in solution, and so both the original carbonate of lime and that formed in the process fall together as a white sediment. This takes some time to settle—from 12 to 24 hours—but the water may be used for washing before it has become quite clear. This process is carried out on a large scale at Canterbury, Tring and Caterham. At Canterbury 110,000 gallons are softened daily by the addition of 11,000 gallons of lime water, the total impurities of the water being thus reduced from 23½ grains per gallon to less than 8½. And not only are hardening matters thus removed, but organic substances as well. The process purifies, to some extent, as well as softens; and the method is not only effective, but cheap. It would require 20¼ cwt. of soap, costing £47 1*s.* 8*d.*, or 4¾ cwt. of carbonate of soda, costing £2 17*s.* 6*d.*, to soften the same quantity of water which could be treated by Clark's process for 8*d.*, the cost of 1 cwt. of quicklime.

"The hardness of water is a great defect. Already we have shown some of the drawbacks to the use of a very hard water: others may

be named. In preparing articles of food by boiling them in water, we find that they do not get so well done in hard water as in soft; indeed, it is a good plan to boil the water first before using it for such purposes. Greens, boiled in hard water, acquire a dull gray color, as the earthy matters of the water are deposited upon them. If they are cooked in boiling water, which has also been boiled some minutes before, and especially if a small pinch of carbonate of soda and a little salt be added, this defect will be remedied. For making tea with hard water, it is allowable to use a little carbonate of soda, but a great deal too much is commonly employed. For cleansing the skin, hard water is not nearly so efficient as soft."

Thus we claim that all water extensively used should be tested both as to its total, its removable and its unremovable hardness. Where any other inorganic or mineral ingredients of water are suspected to be present in undue proportions, they may be detected by further analysis. In the cretaceous formations of the State, iron pyrites or copperas (sulphate of iron) are common, and the water often has a slightly astringent taste and blackens tea. Soms of the waters are blackened by peat or by the cedar beds of some swamps. It has been claimed that the slight amount of iron and of cedar and pine present in some waters of the State exercise antiseptic powers and so prevent disease.

It is encouraging that there is in every part of the State so much attention now given to inquiry as to sources of water-supply. Yet it is evident that each family needs for itself to have a certain amount of knowledge as to possible sources of pollution. In the case of cisterns, springs, shallow or deep wells, we need to know that they are so made and used as not to expose them to contamination such as is generally an extra demand on the vital forces and too often causes actual disease and premature death.

ON FILTRATION.

PROF. GEORGE H. COOK.

By filtration, I understand the clarification and purifying of water for culinary and household use. The rapid increase in population, and the great number of manufacturing establishments, all over our Eastern States, is every year rendering the stores of water in the ground, and the streams which flow from the surface, and even the rain which falls from the clouds, more impure. Our well-waters, our lake and river-waters, and even our cistern-waters, are liable to be contaminated with impurities—some disagreeable, others dangerous, and all undesirable—and yet from one or other of these we *must* get our supplies.

How shall we accomplish this end, and at the same time get our supplies pure and wholesome? The answer, in general, must be, by filtration.

The term filtration is by some understood to mean only the straining out from a fluid such particles of floating solid matter as renders it roily or otherwise objectionable in appearance, while others understand by it the removal, not only of the solid floating particles, but also the substances which may be dissolved in it. The first can certainly be done, and the other only to a limited extent.

Water, to be wholesome and acceptable, should be clear and colorless; it should also be free from any organic matter, especially that which is of animal origin, but it is not necessary that it should be entirely free from mineral matter, such as the salts of lime and magnesia, which give the hardness to water. Hard water, even up to that containing fifty or sixty grains to the gallon, is not unwholesome for drinking, though it is very unfit for washing or for making steam. Water which is made hard by the presence of carbonate of lime, may be made soft by the addition of a proper quantity of quick-lime; but sulphate of lime, which causes the hardness in most of the waters of this country, cannot be economically filtered out or separated.

The natural filter of earth, through which the rain and surface-waters have passed to get into our springs or wells, is composed of the earth and sand which everywhere covers the surface. The water, as it descends through these surface materials, loses the impurities which have given color or opacity to it, and at the same time it dissolves and carries along with it more or less of the minerals it has passed through. Such is the water of our springs and wells when the country is new or thinly sttled. But, as more water is drawn from the wells, and the rain-water has to soak through, the surface impurities, which accumulate with increasing population, are carrried farther and farther downwards till finally the earth and sand will intercept no more of them, and the water passes in its impure, though possibly clear and sparkling state, to the wells, to become the cause of sickness with all its attendant evils. The surface-waters which formerly ran from mountains and forest lands, now run off from cultivated and enriched fields or from the roads and streets of towns and villages, and are still farther contaminated by the waters, impurities and filth which necessarily attend manufacturing processes. All these help to make the water in our streams more impure every year.

Many people still consider the well-water to be the best because it is clear and has the most taste, but the majority of people, especially in our cities and towns, take water from public supplies, which are mostly drawn from streams. Such water is liked because it can be drawn in almost unlimited quantities, directly where it is needed, without pumping or carrying. And, though not so pleasing in appearance, it is probably safer than the well-water. But both of them are dangerous, and something should be done to remove or diminish the danger.

In the case of water from streams, very little has been done in this country to improve its quality beyond what can be accomplished by having large reservoirs and allowing the water to stand in them some time, so that the matters suspended may settle to the bottom, and then to have a wire screen for the water to pass through, while fish or other objects, swimming or floating in the water, are kept back. The organic matters in the water are not removed. Such waters, when left to stand in reservoirs, undergo singular and disagreeable changes, especially during the warmer seasons of the year. Sometimes they have a musty taste and odor, some generate a fishy smell, while others are said to have a cucumber smell. It is not yet explained by what change these effects are produced. Fortunately, though disagreeable, they are not

generally dangerous. In some of them, as I have noticed, even boiling the water does not remove the peculiar smell.

In a case of stored water which came under my observation, where a most disagreeable and musty odor and taste was so strongly developed as to be extremely disagreeable, an attempt was made to correct it. The water, on close inspection, was seen to be just a little brownish in color and not perfectly clear. It obviously contained some organic matter. The reservoir of water was about eight feet deep and contained near 4,000,000 gallons. Two barrels or about 500 pounds of alum were dissolved in water and sprinkled over the surface of the water in the reservoir. In the course of two or three days a light scum of slimy coagulated matter gathered on the surface of the water, and was drifted by the wind to the bank. The water itself became perfectly clear and colorless, and its disagreeable smell and taste had disappeared, and this improvement in quality continued several weeks. A like trial has been made on two or three other occasions when the water had developed this disagreeable taste, and the effect was the same in every case. The alum was not sufficient to affect the taste, and I do not think that any one using the water ever suspected there was anything unusual in it. And when the very small percentage used is taken into account, I doubt whether it is possible to detect it by any easy test. Five hundred pounds of alum to 4,000,000 gallons of water, allows 1 pound for 8,000 gallons, or 2 ounces for 1,000 gallons, or about $\frac{1}{30}$ of an ounce for a hogshead of water, and if expressed in the ordinary form of chemical analysis, it would contain only .0016 per cent. of alum.

The trials with this substance are not sufficient to warrant the recommendation of its use, although it is probable that most of the alum is removed in the scum. Still, there may be some well-grounded objections to purifying water in this way. Some more satisfactory and regular mode of purifying water is still needed.

What are called natural filters have been taken advantage of in some cases with success. "Bordering upon all rivers there are found at intervals narrow plains of gravel or sand, brought down and deposited there by the river under the varying positions of its channelway. When these beds of gravel extend to a depth below the bottom of the neighboring stream, they will always be found saturated with water mainly derived from that stream, and however turbid the water of the river, this underground flow will always be found clear, pro-

vided that we tap it at a reasonable distance from the channel-way." (Kirkwood on Filtration, page 17.) The water-supply of Newark was attempted by means of a natural filter of this kind. The pumping works are located on a strip of alluvial ground on the west bank of Passaic river, about a mile above Belleville. The surface is but little above high-water mark, and the basins are about 200 feet back from the border of the stream. Two basins were dug in this alluvial plain as deep as the water would easily permit, and they are each 350 feet long and 150 feet wide, walled up with vertical stone walls, and so deep that water will fill them to the depth of 8 feet. The filtration in this way was satisfactory, and the quality of the water was good. The supply needed for the city is from six to eight million gallons daily. At the present depth these basins will not yield that amount, and they have been obliged to open a passage-way from the river and allow the water to flow in without filtration.

It is to be regretted that a more thorough trial of this natural filter has not been made. The sand and gravel is 40 feet or more in depth, and if the basins had been sunk deeper, the filtration into them would have undoubtedly been much more rapid. The pumps are so set that they will not now draw water from much lower than the bottoms of the basins at their present depth, and to get a fair trial of any increased flow would require some new and differently-arranged pumps. In other cases, instead of open basins, long covered underground galleries have been constructed of dry masonry as far in the ground as possible below the surface level of the river, and the water allowed to filter through the sand and gravel of the alluvial plain into these, from whence it can be pumped up for use. The works at Lyons, Genoa, Toulouse, Angers and Pesth, in Europe, are of this sort, and are said to have been eminently successful in providing a good quality of water. The same plan has also been adopted at several places in the United States. At Lowell, Mass., there is a filtering gallery on the north shore of the Merrimac river, parallel with it and about 100 feet from its edge. Its length is 1,300 feet, width 8 feet and height 8 feet. At Columbus, Ohio, there is a long filtering gallery on the border of the Scioto river. It is a brick conduit, 36 by 42 inches, bricks laid close over the upper half and open in the lower. It is 5,715 feet long, and is said to be one of the best examples of this mode of supplying filtered water. The same plan of construction has been followed in the works at Taunton, Mass.

The daily supply from these galleries must, obviously, be varied with their depth below the surface of the water in the river; increasing with the increase of depth. The European works of this kind, which are cited from Mr. Kirkwood's notes, gave a daily supply from each square foot of their bottom areas of 288, 147, 300 and 182 gallons, respectively. If the Newark basins had supplied water at the rate of 147 gallons daily per square foot of bottom surface, they would have furnished more than 15,000,000 gallons daily—but it is probable that these short and broad basins will not collect the filtered water as rapidly as the long, narrow ones—and their depth is not sufficient, at low tide, to cause any rapid inflow of water. The borders of the Passaic at these and at other places above Belleville, offer fine locations for these natural filters.

In the majority of cases where filtered water is needed, natural filters cannot be found, and resort must be had to artificial filters. The alarming and fatal effects of impure water during the visitation of the cholera in Europe (1849 and 1850), led to a thorough examination and condemnation of the unfiltered water supplied to cities, and to the compulsory construction of artificial filters in cases where polluted waters had to be used. They are now to be found in most of the large cities of Europe. The following description of a filter-bed is taken from Nichols' Water Supply, Chemical and Sanitary, p. 151.

"Filter-beds, as usually constructed, are water-tight basins, some ten feet or more in depth, the sides built of masonry, and the bottom puddled or paved with brick and cemented. The area may be from 20,000 to 50,000, or, in some cases, even 150,000 square feet. In building up the filtering-bed, provision is first made for the ready collection of the water, by constructing, upon the floor of the basin, drains or channel-ways of stone or brick, laid dry; then follows a layer of broken stone, the fragments being three or four inches in diameter. This is succeeded by gravel, screened, so as to be of uniform size, a layer of coarse being followed by one or more layers of finer material; upon the gravel rests sand, likewise separated into layers of uniform size. The exact thickness of the different layers, and the extent to which the separation into the different sizes is carried, are subject, of course, to considerable variation.

"The water stands several feet deep over the surface of the sand, and is allowed to flow down through the filter at such rate as experience shows to be most advantageous. Naturally, when the sand is

clean, a greater quantity of water can be passed in a given time than when the sand has become clogged; practice differs as to the maximum rate, but it is seldom over six inches, vertically, per hour, and often less. At the rate mentioned, each square foot of surface would deliver 12 cubic feet (or 89¾ U. S. gallons) per day.

"When the beds become clogged so as no longer to filter with sufficient rapidity, the water is drawn out from them, and the upper layer of sand, for a depth of a-half or three-quarters of an inch, is removed. When, by successive parings, the thickness of the sand has been considerably reduced, that which has been removed is washed and replaced, so as to restore the original thickness; the waste of washing being made up with fresh sand."

With strict attention to these filter-beds, and the frequent removal of any impurities which collect on the surface of the sand and in its upper portions, these filters have met the requirements of sanitary bodies fairly well; but, when neglected, the effects are soon felt in the bad quality of the water.

Filter-beds have been constructed to filter the water supplied to the cities of Poughkeepsie and Hudson, New York, and they are working satisfactorily. Their general introduction is to be desired. And the expense and want of experience in their management, are probably the causes for their coming but slowly into use. Three filter-beds of 50 by 100 feet each, should be able to supply 1,000,000 gallons of water daily, and, at the same time, allow the cleansing of one of them to go on whenever necessary. The cost of such filtration has been estimated at from $6 to $11 per million gallons.

WELLS.

The water in wells is really filtered through the over-lying and surrounding earth. It becomes impure from the saturation of the earth with the impurities from manures, waste and refuse matters thown on the ground, and still more from sinks, cesspools and privies, which are so constructed as to allow their contents to sink into the earth. Such sources for pollution should be avoided, as far as possible, and the wells should be stoned or bricked up and the lining made water-tight by the use of cement mortar, so that water from near the surface can be shut out and only that from the very bottom allowed to enter. Where water enters from the sides of the well, and

there is any considerable depth of it, that at the bottom is likely to be freer from organic impurities than that near the surface, and it will be better if drawn from the bottom by a pump than from the surface by a bucket, though the latter will probably taste the best from its being better aired. The water from drive wells is safer than that from dug wells, on account of being drawn from a greater depth beneath the surface of the underground water, and, so, less likely to be contaminated with surface impurities.

RAIN-WATER.

This is liable to be contaminated by gases absorbed from the air, by dust and dirt which accumulates on roofs, and by the smoke which escapes from chimneys. It is usually soft-water, and the impurities, though disagreeable, are not dangerous, and when the water is collected in cisterns, which are securely covered so as to keep out surface-water, they furnish a safe supply for domestic use. Cisterns should be deeper than they are usually made, and more capacious. They would fill with cold water during the winter, and as the summer rain is warmer, it will remain on top of the winter water in the cistern, and if there is any overflow it will be of the warm water and not of the cold. In this way cistern water can be stored so as to be always cool, and from its low temperature it is nearly free from any changes which the organic matter in it might undergo at the usual summer heat. Filtering, however, improves rain-water. It holds back some of the impurities and leaves the water clear and bright. Filters for rain-water are made in a great many ways. They have been made of sand, of charcoal, of animal charcoal, of oxide of iron, of porous sandstone, of unglazed brick, etc. The filtering substance being placed in such a way as to require the water to pass slowly through it before being drawn out for use. A solid brick wall, laid carefully in cement mortar, makes a good filter. The bricks should be rather under-burned, and extending through from one side of the wall to the other, and the faces of the wall not covered with mortar. Water will filter through such a wall fast enough for the supply of a family, and if the rain all enters the cistern upon one side of the wall and is drawn out upon the other side, the water is clean and sufficiently pure. The storing of pure water in this way, for drinking, is worthy of more attention than it has received, and the quantity which can be stored from roofs is sufficient for all family use.

Wherever only unfiltered water from streams or wells or cisterns is to be had, its quality may be much improved by passing it through the small filters which are prepared for household use. There are great numbers of these, and it would not be profitable to discuss their merits at this time. The common bag of cotton flannel, or flannel, tied on the faucet of the water-pipe will greatly improve the appearance of drinking water, and will strain out many disagreeable objects. A tube or box with sponge in it will also be satisfactory in clarifying turbid water, and like the bags it is easily and quickly washed and replaced. Granulated animal charcoal in boxes or vessels where the water can filter slowly through it, improves its appearance and quality. Some of the best house filters are made essentially of this substance. Vessels having in them and near the bottom horizontal partitions made of porous brick or sandstone, so that the water can filter slowly through, and be drawn off below, serve a very useful purpose.

There are many filters for clarifying water for manufacturing purposes; their action is mechanical, and their description would be out of place here.

While the benefits arising from the filtration of water have been proved by many satisfying experiments and experiences, the chemical or mechanical changes which it undergoes are not well understood. By some, the changes which it undergoes are said to be due to oxidation, that is, to a chemical combination of the impurity with oxygen from the air, by which the original is destroyed and some new and harmless one is produced. Every chemist knows that substances which are porous or in fine grains have the power of attracting air or oxygen to their surfaces, and in the case of the porous substances, the amount absorbed is equal to a great many times the volume of the porous substance itself. This is notably true of animal charcoal, but it is very observable in sand or in fragments of glass. The organic matter in water, though it may be very active and dangerous, is in extremely small quantity, so that the amount of oxygen needed to consume it is very little. When the filters cease to act it is said to be because the oxygen on them is exhausted, and if they are taken out, cleansed, dried and put in their places again, they act as efficiently as at first. This explanation is plausible, and, though not entirely demonstrated, it applies to the known facts more closely than any other. Numerous chemical examinations have been made of samples of water before and after filtration. They generally show a small diminution

in the amounts of organic matter, but not by any means sufficient to explain the changes which appear to have taken place in the properties of the water. The dangerous effects of organic matter in water are due not so much to its quantity as to its quality. It may well be that in the process of filtration its dangerous properties are to some extent destroyed, while the elements of its substance still remain. This explanation seems consistent and may be accepted till some better one is found. The sanitary benefits of the filtration of water are so well sustained by experience, that we must advocate the adoption of plans for that end wherever water that is liable to contamination is used.

NOTES ON POPULAR HEALTH RESORTS.

BY THE SECRETARY OF THE BOARD.

The sea-coast of New Jersey has not only become the most popular resort for the American people, but has so rapidly increased in permanent residents as to have cities and towns and villages which have an increasing population each year, and which are destined to grow as rapidly as towns in other portions of the State. Indeed, some of them have already so far established their claims as serviceable for winter resorts as to assure a sustained population of this class, even although as to individuals it may be transient. Both as a material interest of the State and as a care of the public health, the Board early recognized the duty of a close and accurate observation of all places offered to the public as having sanitary inducements. We claimed the duty of close inspection, of apprisal of those pecuniarly concerned as to defects either through carelessness or ignorance, and of report to the public if these defects were not remedied. We believed that while owners should not be hastily attacked, and while no sensational statements should be made, the policy of long concealment should be ignored. No one can realize as do members of this Board the need there was of such examination and advice, and the results which have been secured. We can point to place after place where our first visits were occasions of persuasion, of protest, and sometimes of local denunciation, but where Health Boards, and often owners, became convinced of the correctness of views expressed, and proceeded, with greater or less speed, to remedy the evils complained of. For any health officer, a sanitary inspection along the coast to-day is in most cheering contrast with the experience of six years ago. Not that all was then bad, or that all is now good, but there has been a great increase of intelligence as to necessity and methods; and there is a general determination to have the sanitary arrangements complete. This has not been merely as to the most leading and vital concerns,

such as good water-supply and proper disposal of all refuse, but has extended to questions of drainage, of filling in, of ventilation, of housekeeping, and of the proximity of stables, slaughter-houses, pens, etc., to residences.

While eternal vigilance is the condition of health, and while the time will never come when the inclinations to filth and negligence will not need to be watched in all places where multitudes arrive hastily, stay for a while, and then as hastily depart, yet we feel assured that each year will witness more and more attention to the details of sanitary construction and administration. No doubt some contractors will still dare to cover over wet and boggy lands with sea sand without drainage, to build houses on the "scamping" system and to make a great boast about the concealed sanitary appliances. But we are now quite sure that their sin will find them out, and that it will not always be necessary to wait for an endemic or an epidemic to reveal defects. Hotel after hotel along the shore has had its sewerage and plumbing reconstructed. Pipes filled with solid grease; traps rendered useless by solid matter, by water evaporation or by syphonage; the soil about wells saturated with liquid compost, and other revelations made before their eyes, have quite convinced Boards of Health and owners that there must be a forsaking of imperfect methods, and that it pays to secure the best workmanship.

We can now point to many a hotel and boarding-house in the best of sanitary order, only needing good administration to secure its complete healthfulness, and local Boards so intelligent as to sanitary construction as to enter their protest if they see imperfect works in execution.

Beginning at the most southern resort, Cape May Point well illustrates some of the changes wrought. Nearly two years since, an examination there showed great imperfections by reason of hasty sanitary arrangements, and it was believed that only the newness of occupancy had saved, especially the winter and spring guests, from ill-health. The defects were promptly brought to the attention of the Land Improvement Company, which owned the property. After full inquiry, it was resolved to spare neither pains nor expense in providing for the hotels and for the town a system by which all debris from persons or from necessary culinary and household methods should be promptly removed. Proper ventilation was provided for inside closets and vents, to prevent the syphonage of traps. Pipes well laid in cement

and properly separated, carry all liquids to a large tank a long distance from the town. The fall not being great, several flush tanks are provided, which, while they secure adequate flush, have advantages over that kind of construction in which the flush is made by the foul liquids themselves. Grease traps are so built as to separate the grease, and thus still more secure the cleansing of the pipes and the purification of the liquids. The receiving tank or reservoir is closely cemented, an inner wooden curb being used, because of the looseness of the soil. Each day this liquid is pumped out by a small steam engine especially arranged for the purpose. This carries it to such parts of the large tract of land owned by the company as will allow them to adopt a system of intermittent irrigation. While this has not yet been perfected, and some questions of economical disposal are yet to be settled, the system itself, so far as the town is concerned, assures thorough removal of all fouled liquids, if only the administration is accurate. It is always to be borne in mind that the more elaborate the structural methods are, the more risk there is, if there is no overseer or if the engineer falls asleep and forgets to run the machine. But this town seems at present under more efficient management, and there is every reasonable prospect that it will become a favorite resort for winter and spring, as well as for the summer. The irrigation field will, however, need and must early receive attention, or we cannot call it complete.

Cape May City.—Extended improvements have been made during the last year at Cape May. An efficient Board of Health has impressed upon hotel proprietors the fact that a good system of sewerage will not atone for household neglects. Here and there we meet a boasting hotel owner who assumes he understands all about it. Defects are far more noticeable in such hotels than in those where owners have no sanitary devices of their own, but on so expert a question consult good plumbers and such members of Boards of Health as have made special study of sanitary matters. As a rule, every hotel owner should have a competent plumber each fall and spring to examine the entire system of inside pipes, and to put all in working order. Of course, stoppages are always attended to. Not so with leakages and other defects. While the outlets of the sewers of Cape May and the creeks made available thereof, need good sanitary oversight, there is no reason to believe there is any defect in the tides and ocean current, which carry all outflow far away. Yet the depth and incline of outfall

should be watched, and examination had as to any precipitation of sewage in these creeks, for while not now disturbing, it might eventually much affect the gradient and the flush.

Atlantic City.—The value of the water-supply is more and more appreciated. Where people go for health, rest and comfort, they should not be exposed to clouds of dust. So an abundant water-supply has to do with health in this respect, as well as for drinking purposes. This city, like several others, needs to be correcting the relations of the streets and of dust to health, and, by more extended system of watering, to be providing therefor. Last year it was announced that full arrangements had been made for an adequate system of sewerage. Owing to some delays on the part of the company, little has been done. A speedy completion of a system is now being pushed forward. We are glad to recognize that the local Board and its assistants have redoubled their efforts, and that a system of inspection constantly seeks to secure removal.

So long as human nature is no better along the sea-coast than it is in the middle or mountain districts, so long will crowded hotels and houses find it both troublesome and expensive to cart millions of gallons of fouled water a-half mile or a mile away. To avoid it the cesspool will be built, and the more it leaks the more it will be applauded, since there is so much less to cart. The only limitation will be that its overflow will be prevented, and that the soil or ground around will postpone the evil day, so long as, without croppage and the usual mode of appropriating organic decay, it can dispose of the suspended filth. But we have abiding faith that property owners and citizens will not abide this, and will show that any town is hospitable to its guests in protecting them from unseen dangers, as well as in providing fresh air, good food and pure water. Cities like this should compel property owners to use the sewers, when built.

Sea Island City, between Cape May and Atlantic City, and several smaller localities, have been chosen for development and give good promise of success. While it is impossible to visit all these, and many are only represented by a hotel and a few cottages, we have enough information as to them to show a determination to secure good sanitary conditions. Hotels, at such places, are now generally built by those understanding much as to sanitary construction, and mistakes are the exception rather than the rule. Yet it is known to us that occasional cases of local sickness occur, fairly attributable to incomplete sanitary arrangements.

Beach Haven is situated near the lower end of Long Beach, between Barnegat bay and the ocean. It is a quiet and popular resort. Before there is much increase of population, there is great need of some grading of the streets and proper provision for the discharge of surface-water. As it is, with the general low level, the proximity of meadows, pond holes and stagnant water are sure to detract both from beauty and healthfulness. The water-supply is, thus far, very safe, since it is rain-water collected from clean roofs and filtered through the partition walls of cisterns. Garbage seems to be carefully collected and disposed of. There is little or no dependence on cesspools, but all closet material is conveyed by terra cotta pipes to the bay. While it cannot be claimed that, for a time, so large a body of water is likely to be polluted, the flow requires care and watchfulness. Some of the in-door appliances have imperfect flushing of water and of air. So good a location needs a little more skillful sanitary oversight—not so much because of any present peril, as for security in the future.

The same remarks apply to several small places between Atlantic City and Sea Side Park.

Between this and Manasquan, Berkeley, Bay Head and Point Pleasant, are each attending with carefulness to sanitary matters. Chief defects are in inefficient drainage before filling-in low places, or in the attempt to make or to enlarge lakes where the surface pond does not justify that impounding of water and destruction of natural drainage which occurs where the pond is thus artificialized into a lake. Some of the so-called lakes along the coast should be drained or filled up; others should be reduced to their natural dimensions, and just a very few of them are to be cherished as consistent with good drainage. Some of these towns necessarily depend upon cistern water-supply and cemented outhouses. A summer inspector and a regulated scavenger and garbage removal do much to diminish risk, and we are glad to know that in some of these towns these temporary methods are efficiently maintained.

A careful examination has been made of all the localities between Manasquan and Ocean Beach, inclusive. These all fall under the general oversight of one Board of Health. Some defects in and about Manasquan, have been brought fully to the attention of the local Board.

The new locality of Brielle, near there, needs some attention to sur-

rounding drainage. The hotel itself relies upon a cesspool, with some slight improvement in general arrangements. The hotels under the control of one company, which include all the coast to a little beyond Spring Lake, were found, with a single exception, in good condition. This, there was every assurance, would be speedily remedied. The cottages have to depend more upon skilled administration, as generally they are not able to bear the expense of many constructive arrangements.

Some of the boarding cottages at Spring Lake have very complete sanitary arrangements. Most of the hotels on this part of the shore depend upon the dry and prompt disposal of all excretions, and convey slop-water to a distance from the premises or to the sea.

The filling-in now taking place between the Parker House and Spring Lake, and the effort to reclaim some of the land, seems to promise success. The subsoil of sand is covered with loam, and we are assured that attention will be paid to drainage and that the lake will not be made to overflow its natural bottom.

The plan at Spring Lake and the adjacent hotels contemplates a pipe system, by which there shall be removal, to a considerable distance, of all liquid refuse.

Brighton, just beyond Spring Lake, is well located. The sewage of its chief hotel finds exit into the sea.

At Ocean Beach, better attention than heretofore is given to sanitary administration, but there are still some defects. There has been a want of co-ordinate action and some meagreness of expenditure not in keeping with the commanding situation and the many natural advantages. Two of the prominent hotels are very defective in sanitary arrangements. The largest hotel presented a favorable contrast and seemed under good administration. It has arrangements for forcing the fouled liquids away from the buildings and for discharge into the sea. We since find that the hotels most to be complained of are outside the limits of the association.

Key East is a new locality which is being improved with great enterprise. Parts of it are not well adapted by nature for dwellings closely arranged, but if in the filling-in and the drainage are properly cared for, this can be overcome. Speculation does so much to please the eye, and is so apt to slight what is out of sight and yet indispensable to health, that it is wise closely to watch all new localities, many of which are presided over by engineers very competent in levels and

landscapes, but not informed as to the sanitary necessity. This does not at all apply specially to this locality, but is a warning needed not only along the coast, but at many points inland. We have found that the engineer here is intent upon thorough work. The emptying of the sewage into Shark river is not advisable, except under a closely supervised method.

Ocean Grove has a local Board desirous of the most thorough sanitary administration; while for a time defective in realizing or enforcing necessary changes, it has done a great deal of excellent service for the two past years. The artesian wells seem to be a success, and the supply of water is abundant. Important repairs have been made at the ocean end of the sewer system.

The plan is that of constant discharge into the ocean, arranged at a depth and at a distance under water to prevent any return.

Other resorts, such as Asbury Park, which trust to the ocean as the great reservoir, have intermediate close tanks near the shore to receive the fouled liquids from the sewers, and then at night, or at proper intervals, empty into the sea with the outgoing tide.

The question, Shall the sewage enter the sea, and, if so, how? is still under trial. It is a relative question. It is surprising to see how the practical answer, thus far, seems to vary along the coast. We know of one point where all garbage and floating material was carried on the beach of an inlet three miles or more from a city. Yet, a severe storm, which washed up the inlet and over its shore, brought down to the sea-beach of the city enough of cut lemons and other floating material to convince observers that at that point it would not do to conduct the foul materials into the sea.

At other points, for years the liquids from hotels have gone into the sea without the least ground of complaint. It is found, too, on sounding, measuring, or by other examinations, that while at one point the undertow is always out enough to carry everything away, at other points it is not. The same place changes somewhat in the course of years.

With such facts before us, the determination of whether any given place shall send its sewage to the sea, and, if so, whether directly by constant flow, or indirectly by intermittent or flush tank discharge, is a matter of close expert testing and careful local observation. We have had under careful inspection Ocean Grove and Asbury Park, and a few other places. We believe at these two places, and in the

case of one hotel at Long Branch, the outflow thus far has been fully successful.

As these outlets into the sea are usually tide or water-locked, and as there are other reasons, also, great care should be exercised as to the ventilation of sewers. While water-flushing is valuable as a mechanical motor, and to some extent as a pneumatic process, we need, also, the introduction of flowing currents of air at frequent intervals. Whether this shall be done by alternate openings high in the air, or just at the top of chimneys, or by street openings, is also a varying question. If sewers are well ventilated and are kept clean, and the houses or house connections are in good order, there is no reason, save an æsthetic one, why all sewers should not be built with a continuous open grating. But if sewers do become fouled, of course there will be odors from them. To this Mr. Simon has replied—if so, all the better, since such a warning odor is not likely to harm any one, if accepted as a proper and timely notice served on the proprietors to remedy the evil.

Both Ocean Grove and Asbury Park have signal advantage in that the ownership of land is such as to give the association of the former and the chief proprietor of the latter great facility in enforcing the laws, as well as great power of personal advice.

In Asbury Park, Mr. Joseph Bradley has, with wise foresight and intelligent appreciation, co-operated with Dr. Henry Mitchell, with the Health Inspector, and with other members of the Health Board, in measures for securing thorough sanitary construction and administration. Local separating methods, ventilation, flushing, etc., have been applied to the sewer system, and where questionable plans have been tried they are watched and abandoned or modified as skill and experience may indicate. The rapid ingress of population and a summer invasion as of an army in fatigue suit, make it necessary to adopt a discipline like the sanitary police of a camp. While no place on the coast requires more of wide-awake, portable and adjustable sanitary service, we believe that it is and will be found equal to the necessity.

Long Branch, with all its sanitary delays, shows some marked improvements. While some of the large hotels have still rows of cesspools, they are kept in better condition than formerly. Still it must be claimed that this large and growing constituency has not equaled expectation in its efforts to provide a system of sewerage,

which is very much needed. The Board of Health is faithful, and with intelligent oversight will finally convince the people of the policy of more complete sanitary construction.

An important conference of shore Health Boards was held in December, at Long Branch, which showed how ready the various Boards are to co-operate in the health care of our sea-side resorts.

The series of towns stretching from Long Branch to Sandy Hook are among the most attractive along the coast. Not only is the frontage along the sea capable of great attraction, but such rides as that from Sea Bright to Red Bank, and by the main road to Long Branch, afford a picturesque variety and a beauty of landscape, and of artistic adornment, which gives new charms to all that section. Monmouth Beach and Sea Bright, and several prominent hotels between these, or nearer to Sandy Hook, are but examples of a still widening future population. The Heights of the Navesink, Atlantic Highlands, etc., add to the other an extended and charming view over the New York bay. The sail from New York City, these delightful coast views and sea fronts, and the excellent attraction of the homes and residences will ere long lead to a population of wealth, of influence and of permanency which will add much to the resources of the county and State. The time has already come when there should be a full response to plans for wide-extended improvement. A careful survey of the whole section by the Board, convinces us that it is highly politic to protect all this region from any possible nuisances, and so appreciate and protect its health interests as to secure for it that perfection of rural homestead and elegant mansion, for which it is so eminently fitted. But, unfortunately, the Upper Shrewsbury river is itself fast becoming a nuisance. It is so convenient a receptacle for sewage, and is so valued as such by each individual proprietor, that most of such seem incapable of conceiving that just the little that they pour in can do any harm. It is forgotten that the aggregate is large, and that rivers differ greatly as to their capacity of disposing of sewage. Given a river with stony or gravel bottom, of deep water, of rapid current and of wide expanse, and with speedy entrance to the sea, and the water, the air and the sunlight will work wonders in clarification and purification in the distance of a few miles. But substitute in its place a shallow, sluggish, outspread stream, where every steamboat stirs the bottom mud, where the water is just brackish enough to precipitate the sewage in part, and where an abundant

growth of some aquatic plant is able to detain within its meshes the organic matter, and you have conditions just the opposite. Indeed, you get not only results from the sewage, but the aquatic growth also undergoes its forced and unnatural changes and becomes a factor in disease.

A degraded type of malarial complication often appears with the class of fevers and ailments more directly resulting from household debris, and so there is not only confusion of diagnosis or of treatment, but the system seems unable to cope with the hybrid diversity of attack. It is true that so far but few evil consequences have been felt, although close observers who have been in that section for years, agree in noting a change. We beg to counsel those who have chosen this delightful section that they spoil not their own nests, but with an intelligent appreciation of present and future needs, they enter upon some comprehensive plan for the removal of all sewage and for a general improvement. For this the country might wisely contribute its aid so far as the river is concerned, since its own incomes therefrom would fully repay the expenditure.

It may be asked whether in defense of the general interests of the State and in the promotion of its development by inducement for those from adjacent cities to resort hither, it would not be wise to enact a law requiring all hotels and boarding-houses advertising for and receiving over a certain number of guests, to have a yearly spring examination made of their sanitary condition, for which a small consideration should be paid to the borough, town or city in which it is located. The principle of thus protecting or providing for the traveling public or transient guests, has been fully recognized in previous legislation. It is impossible for the State to provide for yearly and minute inspection of all these buildings. But what has already been revealed, both as to the great evils found and improvements made, as also the fact that all such large resorts need special supervision, would, in the opinion of this Board, fully justify the requirement of a system of skilled sanitary circumspection and certification each year. Thus all would be more fully assured and a new impulse be given to that wonderful growth which has already taken place, and which the attractions of the sea and of the various localities would render rapidly progressive.

SUMMARIES OF LOCAL BOARDS OF HEALTH.

BY THE SECRETARY.

Our correspondence this year with local Boards has been more thorough than ever before. They are becoming more informed as to their duties and as to their possibilities of usefulness. Even those that have occasion to meet rarely accept the fact of their organization, and have a better readiness to meet any sudden outbreak. Here and there a township has but little appreciation of what could be done to increase its healthfulness, and so pays for its neglect by having some extra cases of avoidable sickness.

As an introduction to the report of the year, we place a special report for Camden. Its Board of Health is imperfectly organized, and cases of death from manufactured diseases are not infrequent. The report will be found moderate in statement, exact as to facts and such as should lead to a most vigorous sanitary policy in the interests of that important and growing city. It will also be found in many respects a model for sanitary method and study in other localities.

From other reports we give various selections. Those having nothing of special interest, and not needing to be quoted from, are valuable to us as records of health conditions and as guides for sanitary suggestions. We commend this series of local reports to the careful attention of all Health Boards and Health Officers.

REPORT OF SPECIAL SANITARY INSPECTOR FOR

CAMDEN, NEW JERSEY,

1884,

AS MADE TO THE NEW JERSEY STATE BOARD OF HEALTH BY ONAN B. GROSS, M.D.

In compliance with the request of the State Board of Health, I herewith present, as Sanitary Inspector, the following report:

SCHEDULE OF SUBJECTS.

A—Location, geology, topography, climate and population.
B—Streets and houses.
C—Markets and manufactories.
D—Public buildings and schools.
E—Slaughter-houses and diseases of animals.
F—Cemeteries.
G—Refuse and garbage.
H—Water-supply.
I—Drainage and sewage.
J—Public health laws and sanitary expenses.
K—Vital Statistics.
And a general summary.

A—Location, Geology, Topography, Climate and Population.—The city of Camden is situated upon the east bank of the Delaware river, in the county of Camden. In contour it is elongated, extending north and south a distance of twenty-nine squares, east and west twelve squares, counting only the built-up portions of the city's extent. It is bounded on the north by the Delaware river and Cooper's creek, on the east by Cooper's creek and Haddon township, south by Haddon township and Newton creek, and west by the river Delaware. Its area is six and one-half square miles. Though its geological structure is slightly diversified, it in the main is represented by the sandy loam soil with underlying strata of clay and gravel.

The surface does not present any steep grades or elevations, and may be accepted as a typical, level-built city throughout, with a varying altitude from its tide-washed marshes to perhaps a mean height of twenty feet above tide-water.

The climate is mild and temperate, and in the main delightful and healthy.

The population includes representatives of nearly every nationality, but is mostly composed of the native-born element. The first four wards of this city are largely populated by a class of citizens—*i. e.*, merchants, manufacturers and mechanics—who, like the crows of West Jersey, "come home to roost," while crossing the river daily in pursuit of their callings. The number of residents of Camden who have their business interests located in Philadelphia is perceptibly increasing. The admirable system of ferriage between the two cities, and the many advantages of a residence here to such business men, is

having a marked effect upon the increase of population, especially in the better portions of the city. A fair estimate gives Camden a population of 45,000, as compared with the census returns of four years ago—41,658 (census 1880).

B—Streets and Houses.—The streets are of ample width throughout the city, with only a few scattered exceptions, and as a rule have right-angled intersections. There is such a natural and almost even grade everywhere in city limits, that grading of any consequence is required only in filling up marshy ground at certain points along the Delaware river, Cooper's creek and a large tract of meadow and marsh lands in the Eighth ward, known as Line ditch or Little Newton creek. About sixty per cent. of the building-improved streets are paved, and about fifty per cent. of the remainder are curbed and guttered. Most of the paving laid is cobble-stone, which, however, is gradually giving way to a far superior paving, *i. e.*, Belgian block, or in some cases rubble-stone. Several of the finest thoroughfares are laid with asphalt block, which is certainly a cleanly and smooth pavement, but not considered so durable as the Belgian pave.

The city ordinance relating to the cleaning of streets requires that the work should be given to the lowest bidder, who annually contracts to do the work at a cost to the city yearly of from $3,000 to $4,000; the said cleaning having reference mainly to paved streets. This work is usually done at irregular intervals by workmen with scraping hoes, who collect the dirt into heaps for removal with carts. Some of the better-paved streets are sprinkled, and the dirt collected into rows by wagon-sweepers. Brooms are occasionally used. The superintendence of this work is done by the contractor, and, by the present contractor, is done personally, which, to say the least, is a promise of good results.

The removal of ashes, garbage and slops is also a work done by contractors, who annually bid for the work at a cost usually of from $2,500 to $3,500. The collection to be made twice weekly, excepting in midsummer, when collections are made thrice weekly. The supervision of street work is a duty of the Sanitary Inspector, so far as relates to health measures, but is not rigorously enforced. (Refer to Schedule C—Refuse and Garbage.)

The houses of this city are mostly of the single family dwelling sort; but very few tenements of the multiple kind being found. The

construction material, for the most part, is brick, with occasional stone or marble fronts. An ordinance defining building within city limits prohibits the building of frame houses in the upper six wards. And another ordinance provides for the election of a building inspector, and defines his duties, which, however, requires his supervision of the material used and the mechanical construction of buildings, rather than the important work of the sanitation of new buildings, which work is not provided for by any act of city council. This is a serious oversight, and should at once be corrected. While it may be important for an inspector to see that a wall or joist has a certain dimension, it is infinitely more so to insist upon a good sewage and drainage of new buildings, for which no ordinance or enactment provides. (Refer to Schedule I—Sewage and Drainage.)

The number of buildings is now estimated at about 9,000, or one building for every five inhabitants. The increase is represented by the permits issued by the city clerk during the months of April, May and June, which number one hundred and sixty-three, which permits frequently call for the erection of a number of buildings on a single permit issued. Thus it will be seen that several hundred buildings are erected annually without the supervision of a disinterested official, so far as relates to drainage and sewage, and this matter is left to the builder and his plumber, and is too frequently a matter of dollars and cents.

C—Markets and Manufactories.—On account of the custom of selling meats, groceries and greens at small stores, there are but two market-houses in use in this city. The West Jersey Market is, in the main, a meat market, and receives its stock from a distance, with the exception of veal, of which about six calves are butchered weekly. The sanitary condition of this building is good, is under-sewered and the offal and refuse immediately removed. The Federal Street Market contains a few meat stalls, but is largely occupied by farm-produce dealers. This building is well drained and fairly cleanly.

It might be well to mention here the existence of a sealer of weights and measures, whose duties, however, do not include the work of inspection of edibles, which important work is left *undone* and entirely unprovided for. We have no inspection of edibles or milk.

The manufactories embrace woolen, worsted and ironwork mills and the making of steel pens, soaps, chemicals, paper and oil-cloths. A few of the larger buildings, where the most workmen are employed, were inspected in order to learn their system of water-supply, drainage, etc., with the following results:

The woolen mills (300 employes) obtained drinking-water from deep-driven wells, and are well sewered. Found water in no danger of contamination.

Esterbrook Pen Factory (300 employes) was found in excellent sanitary condition and especially well ventilated. City water-supply.

Starr's Iron Works (600 employes) is supplied with drinking-water from a large magnesia-limestone spring on the premises, about 100 feet distant from any building excepting one large privy-well, at seventy-five feet, which the superintendent agreed to move seventy-five feet farther distant from the spring. Drainage satisfactory.

My attention has especially been directed to the hide, fat and tallow-rendering establishments of Baxter's, at Sixth and Kaighn avenue, and Read's, at Second and Mickle, on account of an unpleasant odor arising, during the summer especially. I found Baxter's establishment in fair sanitary condition, excepting the system of surface-drainage employed. One street bordering his place is neither paved nor guttered, and cannot drain anything upon its surface; and although this place, with its twenty-five years' existence, has been carefully managed, this objectionable feature should be remedied by draining this place into the Kaighn avenue culvert.

Read's establishment is underdrained and only objectionable on account of the odor, which seems inseparable from such a calling. "An Abattoir and its Drain," as a part of this establishment, will be referred to under Schedule E, with especial reference to its drainage.

D—Public Buildings and Schools.—Of the public buildings, there are but four requiring special notice.

The City Hall is well sewered, and stands at the head of the Benson street sewer, and on the water-shed line between Cooper's creek and the Delaware river, with an altitude of eighteen feet above tide-water line. The sanitary defects found were principally in the water-closet arrangement of the prisoners' departments. Of the twelve cells on the first floor, each 6x12 feet dimensions, all were provided with water-closets, one in each separate cell. Of the twelve water-closets, only one was found to work satisfactorily; ten were very imperfect, in having become broken, rusty or otherwise disabled, and one closet-

trap was choked, and the outflow was received upon the cell floor. All the closets were foul, and the emanating odors quite perceptible. The twelve basement cells were used principally as a lodging-room for tramps in winter; the cells contained only four or five closets that could be used at all, and they were also in a foul condition. The basement was also very damp and filthy.

The only remedy for this state of affairs in the prisoners' department, is to reduce the number of closets to a minimum and have them under the close and direct supervision of the janitor.

The Court House and County Jail occupy one and the same building. The principal sanitary defects found here have reference to the heating, ventilation, and the basement cell arrangement, water-closets and the handling of garbage. The twelve basement cells are stone-enclosed vaults, with a narrow door and grated window each, and built about five feet under ground, so arranged that one-half the number open into separate corridors, which are common receptacles for the prisoners at certain hours of the day. These corridors each contain a hydrant, bath-tub, water-closets, and a barrel-sized, galvanized garbage box, all of which were grouped at one end of each corridor. The sun rays cannot penetrate into these corridors, and the vaults are dark and damp as dungeons. At this time each cell or vault accommodates about three prisoners, or eighteen to a corridor, who, on escaping the noisome air of the cells, were obliged to breathe the gaseous emanations from the rusted and ill-working water-closet arrangement and the half-filled garbage boxes, which, while being emptied twice weekly, would have been less sour and disgusting to the smell if meantime they were furnished lids. But I think it barely possible for any plan to entirely relieve these unventilated cells and corridors of their noisome condition, excepting the one now proposed, "the removal of all prisoners from the basement to the upper floors, on the completion of the proposed new county building." The ventilation of the building is very defective, on account of its association with this basement filth. And one of the three large heaters located in this basement is lodged on a level with and between the two rows of prisoners' vaults. The air to be heated and distributed to the offices and court rooms overhead is taken directly from the corridors, and is no doubt a contributing cause of complaint made by occupants of the upper rooms of noxious odors being very perceptible on first entering their rooms in the morning. This might be obviated, to a certain

extent, by supplying this furnace, as the other two are supplied, with a box air-conductor; but this alone would not be sufficient, for the very reason that the court room and offices are too closely associated with the prisoners' apartments to be freed from their effluvia. And the proposed removal of the court and county officials to the adjoining new building is a necessity and a wise sanitary procedure, well calculated to abate this old-time nuisance of basement prisons in conjunction with public and, at times, crowded rooms overhead.

Attention was directed, by complaints, to the condition of the city's two largest halls. The first, Wildy's Hall, was found to be very defective in its water-closet arrangement, and Morgan's Hall had broken bell-traps under the streets. The promise of abatement of the respective nuisances was obtained in each of these cases.

The schools were closely inspected, and, for the sake of brevity, the result will here be given with reference only to the sanitary defects found. And as the water-supply for all the schools, excepting two in the Eighth ward, is obtained from the city reservoir, the only fact that need be mentioned in connection with this hydrant-water, is the universal use of bell-pipes to receive the waste-water, &c., which is certainly not sufficient, in the absence of the running drain-traps.

First District.—(1) *Cooper School.*—The underdrainage or sewerage is flushed by roof and yard rain-waters, and is fairly well arranged, and is deficient only in not having a small flush-tank as a protection in a dry season.

(2) *North-East School.*—Heated by steam through pipes well arranged. This school is the only one in the city thus heated, and is decidedly superior to all others. In fact, the portable heaters used in the schools are not provided with air-box conductors, and receive the air to be heated and distributed from the cellar, which, in some of the schools, is very deleterious, on account of the dampness and poorly ventilated condition of the cellar air.

The principal defect found here is the imperfect underdraining of the large privy-well in the yard, mainly on account of the drain-pipes entering the well too far above its bottom, and thus allowing a retention of from 12 to 15 inches of fœcal matter in the well at all times.

(3) *George Genge School.*—Light; ample, but not well-directed in two of the rooms.

Of the two large privy-wells in the yard, one was found partially filled with board and planking debris and very imperfectly underdrained.

SECOND DISTRICT.—(4) *E. A. Stevens' School.*—This cellar floor is not properly cemented, and objectionable on account of one of the four heaters in the cellar being a *portable,* and supplied with air directly from above the floor.

(5) *Central School.*—Heat ample, and supplied by four portable heaters; the cellar air, however, is not as objectionable as the preceding. Cellar well cemented.

THIRD DISTRICT—(6) *Richard Fetter's School.*—On account of privy-well in yard not having sewer connection, and the presence of a fœcal odor in the building mornings on opening, there is good reason for believing this drain not properly trapped. Indeed, the only evidence of any trapping of this underdrain was in the finding of bell-traps under hydrants in yard, and the traps of two water-closets in building. The rain-water conductors run into the drains and flushed them, and received the washbasin waste-water, also; each not supplied with any trapping, and it is no doubt due to this fact that the noxious odors are detected in the building. A running trap between the building and culvert is essential here, in addition to bell-trapping and S bending of all waste-water pipes.

(7) *Isaac S. Mulford School.*—Similar to Fetter's school, excepting odors in building not so easily perceived and yard not well graded. Broken bell-traps in both schools repaired during vacation.

(8) *Kaighn School.*—Light and heat sufficient; ventilation not sufficient. Odors prevalent in this building at times, owing to bad drainage. The two hydrant drains in yard were found choked. The water-closet in building not well flushed, and the drain-pipe in yard-well about one foot above its bottom. This drain needs overhauling.

FOURTH DISTRICT—(9) *Liberty School.*—Is in fair sanitary condition, and its method of underdrainage is worthy of adoption by all the other schools, especially in the construction of the yard-well, which really is the only properly-constructed privy-well in the yards of the city schools, it being a trough closet. Unfortunately, however, this drainage is run into one of the worst culvert systems in this city. *Vide* Tenth street culvert.

FIFTH DISTRICT—(10) *John W. Mickle School.*—The supply of water for this school has heretofore been taken from the dead-level of a water-pipe, but is now being corrected. A peculiar feature of the underdrainage of this building is that all drains are conducted into a large cesspool and privy-well in the back yard, which in turn is cleansed only every few years.

(11) *Central Avenue School.*—This is a small school of two rooms situated in the Eighth ward, and is quite primitive in its appointments. Light ample, though not well directed; heat, by ordinary coal stoves in each room; ventilation, by means of windows and doors only. The water-supply is taken from a pump-well in rear of building, which well is only fifteen feet distant from two privy-wells, which privies are only six feet deep, brick lined, but planted in such loose soil as to render their close proximity to the water-well very dangerous. The privies are cleansed every few years, but no method of cleansing can save the water from contamination.

SIXTH DISTRICT—(12) *Mount Vernon School.*—Light is sufficient, but not well directed. Heat obtained from two large brick heaters in cellar, is ample but is unwholesome for the reason that the heater air is obtained directly from the cellar, in which from January 1st to April 15th, this year, there was nearly two feet of water; often sufficient to put out the fires in the heaters. There are no water-closets in this building, and the two large privy-wells in the yard are underdrained into the Broadway culvert. This drain should be utilized for the drainage of the cellar of water, and it is possible nothing short of a culvert on Mount Vernon street will relieve this school of its very bad drainage, for this street is unpaved and the gutters are very filthy and offensive; and further, the culvert is now too far distant (half square) for an ordinary drain to keep the cellar dry, and run off all waste waters with the privy debris and other waters of the premises.

(13) *Ferry Avenue School.*—This school, like primitive Central avenue school, is beyond the limits of city water-supply and the culvert systems. Light good; ventilation by window and door only; heat obtained from coal stoves in each room; water is supplied from a pump-well eighteen feet deep in rear yard, about thirty-five feet distant from nearest privy-well. The water tastes very badly and is charged with visible organic debris. The odor of the water was far worse than the taste, *i. e.*, nauseous. This place is all surface-drained, and the four box-frame privy-wells in yard were in foul condition. The cellar is poorly ventilated and needed cleansing.

The ventilation of the schools, when not mentioned in above report, is by means of flues and windows. The flues have communication with rooms by means of small registers, and are not by any means reliable without the aid of some force in displacing the cold air in them by an upward current; and the best force is conceded to be

steam when steam is employed for heating purposes. There is but one school thus heated in Camden, and by its efficiency and superiority is worthy of adoption in all the other large schools.

Another ill-advised feature to be met with in our schools is the custom of rough plastering or sanding the walls of rooms and corridors. It is a means of arresting dust and dirt, and far inferior in cleanliness and purity to the smooth or whitewashed walls.

A reference to the sectional report, as just given, will show, however, that the most sanitary defects are found in the drainage of schools. A radical reconstruction in conformity with the principles of sanitary drainage is urgently needed. Here, even more important than in the drainage of private houses, are the services of a sanitary engineer, or, at least, a skilled sanitary inspector, needed in supervising the building of all drains. The importance of sanitary plumbing need not be discussed here, but the importance of supervision must be emphasized, for the double reason of insuring good work to the builder and the public, and protecting the honest and really skillful plumber from unjust and unworkmanlike competition.

The number of children of a schoolable age is thirteen thousand seven hundred and seventy (census 1884), nearly all of whom are accommodated in our schools; and some of the larger schools are capable of seating nearly one thousand pupils.

In addition to the above, the inspection included the West Jersey Orphanage (18 inmates), and the Children's Home (25 inmates), and the result was favorable in each case, excepting a large drain, in the yard of the Home, emptying into the playground of the children, contiguous to the building, all the refuse and waste-water of the building. It was at once agreed to remedy this defect, by extending the drain into a cesspool farther from the building.

E—Slaughter-Houses and Diseases of Animals.—An ordinance relating to the slaughtering of animals was enacted by the city council June 3d, 1850, which prohibited the killing of cattle, sheep, swine and other animals within city limits; prohibiting, also, the depositing of entrails within city limits, punishable by fine, imprisonment, or both. The section of this ordinance relating to killing of animals is a dead-letter. I have visited and inspected eight large slaughter-houses, where killing, &c., is done without intermission, winter and summer, and in this city there are about twelve to fifteen

more where butchering is done in winter only. Of the eight inspected, five were found well under-sewered, two under-drained imperfectly, and one surface-drained into a large cesspool, which, however, is frequently cleansed. All of them were supplied with city water, excepting two; one in suburbs with pump-water, and one in city with driven-well. As to the method of the disposal of animal remains, the hides, fat, bones, &c., is sold to the tallow renderers, and the offal carted daily to the country customers, for use as hog feed or mixed in compost heaps. The summer butchering includes cattle, sheep and hogs (and in one establishment, I am loath to include, sick cows and bob-veal). An abattoir is a great city need.

The diseases of animals is a subject which receives the studious attention of the local State veterinary inspector.

Dead animals are usually carted outside of city limits and buried, or sold to the bone-boilers. The small animals are, however, the most troublesome, and dogs and cats, or chickens are frequently found upon vacant lots or alleyways, and require burial under the direction of our sanitary committee.

F—Cemeteries.—There are but two burial grounds used within city limits, *i. e.* Camden cemetery, in the Seventh ward, at a safe distance from the built-up portions of the city, and Evergreen cemetery, in the eastern section of the Eighth ward, and well isolated. There are other and smaller burial grounds connected with a few churches in the city, but are not now used for new burials, and a finely-kept ground adjoining the Camden cemetery, known as the Friends' burial ground.

Both cemeteries are well taken care of by the keepers; the graves are six to seven feet deep, excepting in the section where the city poor are buried, where a depth of four to five feet is considered sufficient. Graves are sometimes re-opened for new burials in them, but as a rule the graves are never disturbed where the occupants have died of a contagious or infectious disease.

G—Refuse and Garbage.—The disposal of house refuse is not governed by any specific ordinance, for the subject-matter is mentioned only in the general sanitary or Board of Health ordinance, wherein the refuse and garbage is prohibited by fine from being deposited on vacant lots, streets and alleyways.

It is customary, annually, for the street committee of city council to contract to the lowest bidder, the work of collecting the ashes, refuse and garbage. The contract price this year, is $2,887.50 The contract stipulations are very stringent, and require the ashes and garbage to be collected separately, and as often as twice weekly, from about September 15th to June 30th, and three times weekly during the summer season. The stipulation in regard to separate collection, is disregarded, although the contractor states his willingness to collect separately if the people will present the material in that shape, he collects as he finds them, *mixed* in the ash boxes near the curb of residences, and dumps the collection, as stipulated again by contract, either along the river front for filling up to grade, or, as now ordered, on a lot of ground owned by the city, that is bounded by Cooper's creek, Market street and the Pennsylvania railroad, within city limits, and near occupied streets. This ground is about four to five acres in extent, and is entirely under water at high-tide, and will be more fully described under Schedule I (Federal street culvert).

The slop-gatherers are a numerous class of small farmers and pig raisers in the suburbs, who, with nearly every description of vehicle from the barrow to the close box wagon, almost daily are seen on our streets collecting slops. These scavengers are not governed by any enacted rules or laws, and probably not sufficiently under control of the contractor to do their work properly, and, as a matter of course, the rejected slops are carted off in the ashes as described, but much of it finds its way to the hog-pens. Here our ordinances are again defective, and nothing short of a specific enactment can so regulate this work as to make it effective, and save our undergrade lots from a filling-up with garbage mixed with ashes.

Then, again, there are certain portions of the city never visited by the gathering carts, *i. e.*, portions of the Seventh ward, and a greater part of the Eighth ward, where the unpaved streets and undergrade lots are the recipients of ashes, and, in not a few cases, of garbage. In these portions of the city, it becomes a question of the greatest importance, "How to dispose of the refuse and garbage?" The drainage is all surface, and too frequently the undergrade lots and streets are converted into shallow cesspools by this debris.

H—WATER-SUPPLY.—The water-supply of Camden is taken directly from the river Delaware at a point about one mile north of

Cooper's creek. The river opposite the water-works is divided into two channels by Treaty island, the smaller channel being on the New Jersey side. This channel is the one from which the supply is taken, and, geographically considered, is superior to any other within a radius of ten or twelve miles. A bend in the river and the favorable location of the island favors the maintenance of the real channel on the western or Pennsylvania side of the river, which, by its accommodating the greater body of tide-water, carries with it also the heavy sewage matter received from both Philadelphia and Camden.

The maximum depth of the Jersey channel is thirty-five feet; width, half mile; length, one and one-third miles; and the only culverts that may be said to empty into the course of this channel, are the two short culverts, State street and North Second street systems, and the North Front street culvert, and Federal street *via* Cooper's creek, as the main culvert terminations. The dilution which this comparatively small amount of sewage receives may be sufficient to relieve any apprehension of danger from this source. But as the channel is a part of the river proper, the river water must receive our special investigation.

The Delaware river receives its water from such a large and diversified water-shed, that its chemical analysis is of comparatively little importance, for the very reason that it has no specific mineral or inorganic taint. The analysis of *Cooper's creek* water shows it to have some of the magnesia-limestone qualities of Schuylkill water; and as a tributary of our water-channel, the analysis by "Reuben Haines, 1884," is here given:

Lime	0.55
Magnesia	0.49
Ac. Sulph	0.64
Total Solids	3.75
Total Hardness	2.60 (Eng. Deg.) in 100,000

And the usual amount of chlorides and nitrates natural to flowing streams.

The same conclusions as to a microscopic analysis, however, cannot apply; for the very reason that the Delaware river between Camden and Philadelphia is made the common receptacle of the sewage of one million people, and the debris of many hundreds of manufactories.

During the past winter our water was unusually cloudy and dirty, and in the cleansing of the basin this spring a removal of over four

thousand cubic feet of sediment was effected by washing the bottom of the basin or reservoir. It was prior to this cleansing that the following results of microscopic analysis of our water were obtained.

The water was received directly from a hydrant, and the settlings and filterings under the microscope was found to consist mainly of ferns, micrococci, amoeba, and the many varieties of rotifera, with others not specially noted. The vegetable algæ and rhizopods were also abundant; all of which were shown to be of normal cell-color and activity. In addition to the living forms enumerated, there were found fragmentary parts of the eutomostacæ and flocculent deposits, no doubt the remains of animalcular and vegetable debris, and sand in a state of fine subdivision.

The question naturally arises, what becomes of the immense quantity of sewage and filth that is constantly thrown into the river? The natural processes of conversion, and especially oxidation, in so large a body of constantly-moving water, may, under favorable circumstances, be sufficient to render the pollution innocuous; but there are times when these processes are more or less suspended, as for instance in midwinter, when the air and sunlight are excluded by a coating of ice, or, perchance, by filth deposited too close to the receiving end of our water-pipe. Which dangers, however, are preventable by the stringent application of a better legislation than Camden has had heretofore in regard to the protection of this channel.

The water-works are well situated, and are defective only in the position of the receiving end of the water-pipe, which is almost flush with the end of the wharf, and visible at low tides.

The works are provided with two pumping-engines, one with a capacity of 5,000,000 gallons daily, and a reserve engine of 2,500,000 gallons capacity. The reservoir is of a size sufficient to contain 4,500,000 gallons. The average daily consumption of water for the year 1883 was 3,100,000.

The water-pipes leading into the city are well distributed and reach every part except portions of the Seventh ward and a greater part of the Eighth ward.

The number of dwellings and stores supplied is	7,594
Manufactories	35
Railroad depots	4
Total buildings	7,633

And it is estimated that out of a population of 45,000, 38,000 constantly use the city water, and of the remainder a large majority as constantly use well or pump-water. The number of houses not supplied with reservoir-water is about 1,300.

Before the present water-supply system was introduced, it was the custom of the then city authorities to assist the residents in building pump-wells near the curb-line of public streets, which resulted in the planting of such wells in almost every part of the city. A great many of these wells have been filled up since the introduction of the Delaware water, but there remain a full half hundred still in constant use, and two-thirds of this number are in the upper four wards. Many of these wells should be discontinued on account of their proximity to culvert inlets. In some cases they are located on unpaved or otherwise badly-drained streets.

The parts of the Seventh and Eighth wards that are the least well drained are where the pump-well system of water-supply is mostly employed, but as the reservoir water-pipes are being gradually extended into these wards, a few facts only will be cited:

The Seventh ward east of the Camden and Atlantic Railroad is not supplied with city water, and it is the custom of the residents to plant a cucumber pump in a dug well varying in depth from twelve to twenty-five feet, in some convenient place in the yard, without a sufficient regard to the close proximity of a privy-well or surface-pool of stagnant water. In one case we found an interval of only six feet between the pump and privy-well, and many others varied the intervening distances from six feet to about fifty feet, and the users of these wells are frequently driven, after heavy rains, to borrow water from a neighbor's pump, on account of the foul odor and taste of water in their own wells. The population of this district is about six hundred.

Sycamore street, on the west of the railroad, is the only one long street not supplied with city water, but the residents here have access to hydrants on neighboring streets, only a few being obliged to use pump-water; these few pumps are no improvement over those found east of the railroad. Hog alley is a small and horribly dirty street, contiguous to Sycamore street, above Seventh, and was the starting point of the small-pox epidemic here in 1881. The streets of this district are neither paved nor graded.

The pump-well district of the Eighth ward is but a repetition of the Seventh ward, with the exception of a few localities where the

driven well has been introduced, which is far superior to the open well, from the fact that an upper strata of clay of variable thickness is pierced by the pipe before the water-vein is considered tapped. It would prove too lengthy an account to attempt a detailed description of the one hundred and fifty wells in this ward; suffice it to say, "that a depth of from twelve to forty feet, with a siding of brick or board, fairly describes one of these wells;" and a taste of water from most of them is nauseous and unwholesome to any one not accustomed to it. A few of the wells along the line ditch are very shallow, in fact, supply surface-water only. "A cucumber pump stuck in a hole in the ground," fairly describes the situation. There are a few of the old-time pumps in this district which supply a fairly good water, one of them, however, on Miller street, below Central avenue, is planted in low grade, and, after a prolonged rain, is filled by surface-water flowing into the top of the well, standing, as it then does, in a pool of water. There are about four thousand people who use pump-water in this, the pump-well district, of the Eighth ward; the city water pipes only supplying Broadway and a few contiguous streets.

In summing up briefly, it is well to note the existence of certain factors in our water-supply which, in the event of specific contagium, might render the best sanitary precautions abortive. And nothing short of a properly organized Board of Health and efficient inspectors can be relied upon for a safeguard against any threatening or existing zymotic diseases.

I—Drainage and Sewage.—The topography of Camden is favorable in the main to good drainage, when proper means are employed to effect it. The most favorable inclines for drainage are from the water-shed line, as represented in accompanying chart and marked thus × × × ×; in which directions nearly all of the street culverts are laid, with the exception of a few north and south street culverts. The water-shed line has a mean altitude of eighteen feet above tide-water, the inclines running toward the river, Cooper's creek, and line ditch; the outlet of the Tenth street culvert, as represented on the chart, however, is two and a-half feet above tide-water. The streets running north and south have favorable inclines for short distances only, and, therefore, cannot be utilized except for draining into east and west street culverts.

For convenience of description the culverts will be divided into

ten systems, and, for the sake of brevity, the principal defects alone will be described.

1st. The North Second street culvert has a length of 1,364 feet, and is defective only in having its four inlets situated at the intersections of unpaved streets.

2d. The North Front street sewer is 6,580 feet in length, and through its six-foot outlet it sewers the built-up portions of the city north of the Camden and Atlantic Railroad, and most of the water-shed line, excepting only that portion drained by the Second street culvert. Through the man-holes, near the distal ends of this culvert, where the streets were not paved, large quantities of sand were found to nearly fill the sewer's caliber, carried there through the inlets from the unpaved streets, suggesting at once the impropriety of culverting unpaved streets. In other respects this culvert is efficient, and drains a fair percentage of houses along its course.

3d. The large Cooper street culvert drains all the territory north of that street to the railroad, and east to a little beyond the water-shed line, as per chart. This sewer is the largest and best in the city, and has a length of 21,653 feet. The portion that extends north (on Front and Second streets) of this sewer is, however, too nearly on a dead level to prevent the solid debris from accumulation on the sewer bottoms, and one place particularly, at Second and Elm streets, the culvert has the appearance of gradually filling up. The only remedy in preventing the closing up of this important culvert is an extension of the Pearl street sewer into the river, which, as per chart, is now shown to extend to within one-half square of it. The rapid and valuable improvements being made in this part of the city, strongly call for this improvement. This sewer is the means of underdraining more buildings than any other in the city. One other defect may be mentioned in this system, *i. e.*, the great depth of the slip into which this culvert opens; a reference to the chart will show the extension of wharves on both sides of this slip, and at low tide about one-third of this slip-bottom is exposed to the air, which is more or less covered with sewer filth about two hours each day, in fact, until the rising of the tide. The fecal odors at low tide are very perceptible.

4th. The Arch-Federal street sewer is a most excellent one, excepting the one error of discharging the Federal street end into a large cesspool of a square's length before reaching the tide-water of Cooper's

creek. The extent of this system is 14,653 feet, and about 4,000 feet of this length is drained east on Federal street into a ditch alongside of the street, and along the border of a four-acre lot of ground owned by the city, and bounded by Pennsylvania Railroad on the north, Cooper's creek east and Federal street south. This ground is marshy and covered with water every tide, and although this ditch of a square's length is supposed to have a sufficient grade to carry off this sewer debris, it is nothing but a cesspool at its best. Each tide on rising distributes the ditch contents all over this marsh and converts it into a reeking and pestilential pest-hole. Fortunately there are but few buildings in the immediate neighborhood, but the adjoining street is a main thoroughfare and largely traveled, and the best interests of our citizens demand a correction of this, the worst sanitary defect in the city of Camden. The city owns this marsh, and it is being gradually filled up to grade with the ash collectors' debris, beginning at a point farthest from the creek and protecting the encroached-upon trench or ditch with upright planking. The sanitary condition of this neighborhood is also seriously compromised by an open gutter extending along the north side of the Amboy Railroad, and receiving in its course the surface-drainage, including sewage from the premises of about sixty houses, located near the railroad tracks. This condition is especially noticeable in the rear of California row; this row, of about a dozen houses, is the worst of the lot, and could readily be improved by draining into Federal street culvert; all alike, however, should be restricted in the custom of using this gutter for the purposes of a sewer. In all other respects the Arch-Federal street culvert system is in good condition.

5th. The Benson street system of 19,035 feet of culverting was found in excellent condition, excepting that part located on Mickle street, and from thence on Second street to the Benson street main. On account of complaints received from residents on these streets, the city surveyor and myself endeavored to make a close investigation, which resulted in locating the cause of the complaint in the culvert bend at Second and Mickle streets. The sewer was opened, and within a culvert length of thirty feet, no less than five water and gas-pipes were found to pass through the caliber of the sewer and seriously obstruct it. In fact, the sewer was nearly full of sewage and dirt, the location of these water and gas-pipes favoring the lodging of the debris at this point, sufficient, after a heavy rain, to totally obstruct

it, as was verified during the past spring, while the obstructed water was forced through the inlets and low manholes in the street above obstruction. I have examined cellars along Mickle street that bore twenty-inch water marks, and was informed that the heavier rains usually filled the cellars to that depth with water, some of it, no doubt, due to the obstructed culvert, but in part due, also, to the character of the gravel, which is made ground, and at Second and Mickle streets only two and a-half feet above high tide-water. The tide-water enters, or at least obstructs, the culvert flow, so that it is normally filled, at high tide, up Mickle street to Third. It is very evident that gas and water-pipe obstructions, under such circumstances, must prove a most serious defect. And in this instance the culvert obstruction was promptly removed. Other instances, however, of culvert obstructions of a like character have come under my notice, as, for instance, a water-pipe of six-inch dimension running through Second street sewer, between Mickle and Stephens, one of same dimensions at Third and Mickle streets, and a large gas main through a culvert near the gas works. It is very evident that our municipal laws are very defective in thus allowing willful obstructions to be placed in the culverts, and we need an ordinance, specific in its terms, relating to the laying of all gas, water and drain pipes and the building of culverts; giving the culvert the right of way in a question of grade at all times, and never allowing the tapping of a sewer or culvert, excepting by special permit.

6th. The Clinton street culvert of 14,390 feet length and five feet outlet, is in excellent working condition. It is proposed to divert 5,000 feet of the Benson culvert system to the Clinton, on account of the more favorable location of the Clinton sewer for draining this district east of Fifth street. This is a wise and practical proceeding, and is now being effected by changing the Washington street culvert grade, in order to connect at Fifth and Washington the Clinton and other street culverts east of Fifth street, in this locality. This sewer is also now being extended 400 feet towards the river wharf lines, which is a distance of about 1,000 feet from the shore, with an intervening marsh.

7th. Division street culvert system has a length of 11,775 feet. About ninety per cent. of this length is laid on east and west streets, and therefore of good grades. There is a few inches of sand found in culvert bottom, owing to some of the streets being unpaved. There

are comparatively fewer houses and privy-wells underdrained in this district than any other of the described systems.

8th. The Walnut street system is also a good east and west grade sewer, and has a length of 7,220 feet. This culvert is extended well towards the exterior wharf line, and in this respect is far superior to the Division street sewer. There are also more houses underdrained in this district, but the sewer is found in equally as good a condition.

9th. The Kaighn avenue system has a length of 6,085 feet, and is in excellent condition, excepting that part west of Second street, which is run too nearly on a dead level to be kept clear of settlings. A deposit here of about ten inches was found in a sewer caliber of four feet.

10th. The Tenth street culvert, as traced on the accompanying chart, is a large underdrain for the streets of that section of the Seventh ward. There is but one building that drains into it, *i. e.*, the Liberty school. None of the streets under which it is laid are paved, the manholes are deeply covered with dirt, and many of the inlets are too high above the gutters to catch even the rain-fall. And well it is that this culvert is not a sewage drain, for the reason that its outlet is into an open ditch at Tenth and Kaighn avenue, which traverses line ditch for a mile before reaching the river tide-water. The altitude of this point is three and a-half feet above tide-water, and separated from it by two flood gates located between the sewer outlet and the river. The culvert ground east of the railroad is about twelve feet under grade and about one and a-half squares in extent; the undergrade ground is owned by private parties, for whose benefit the culvert was built with an open end, to favor the drainage of this section, but the ground is too low grade. As a result two large ponds of water are constantly present, and by their receiving all the surface drainage of the neighborhood are really converted into large cesspools, similar in some respects to the cesspool outlet of the same sewer. This culvert system includes a length of 11,092 feet, of two, three and four feet culverting, and is really under the circumstances a useless waste of material.

There are in this city three other short culvert systems: One at State street bridge of 1,290 feet; Ferry road and Jackson street, 4,415 feet, and a sewer on Jefferson street of 1,923 feet length. These sewers are in fair condition, excepting the Jackson street branch, which carries more sand than an effective sewer should, no doubt owing to the storm-water washings of the unpaved streets.

There is a total length of 128,492 feet of culverts traversing the streets, which is under the supervision of the city surveyor, so far as relates to the mechanical construction of them. In case of obstruction or inlet choking, the street supervisor is the one to apply the remedy, under the direction of the street committee of city council.

The sewer defects as recorded, are well known to our city officials, and the reason given for their non-correction is "short culvert appropriations." The city is building faster than the culverts can be laid and repaired, under the present so-called short appropriations, which, in true economical sense, should not be the case. And one of the most reprehensible defects in our system of culverts is the presence of water and gas-pipes in them, running through the sewer calibers as though obstruction were of no consequence. This is an error that a short appropriations plea will not defend, and an ordinance defining the grade lines of all pipes and culverts, giving the right of way to the sewage and drain pipes or culverts, is a necessary and essential legislative act in remedying this easily-corrected defect. On general principles an obstructed sewer or drain-pipe is worse than none at all.

In regard to house and lot drainage, we find there is no supervision provided therefor, excepting only when complaint is made to our local sanitary committee or its inspectors. The drainage of new or old buildings is entirely depending for efficiency on the owner or his plumber, and is too frequently a matter of dollars and cents. Drain-pipes are frequently laid by common laborers who do not profess to know what a drain-trap means, and I have become acquainted with a number of cases where house and privy-well drains have been laid without any trapping at all.

The necessity for a close and constant supervision of all work of this kind is so obvious that the Legislature has provided therefor in a special law applying to all cities that have Boards of Health formed under the State law, which this city has not.

The number of cases where houses and lots are badly drained is so numerous that an attempt at details will not be made, excepting two instances of lot drainage. First, of a lot bounded by Second, Washington, Third and Berkley streets, is two to three feet under grade, only excepting the street fronts. This lot is built upon on its four sides, and is travesed by very narrow alleyways (three feet); and a large percentum of the residents are in the habit of dumping their kitchen refuse in these alleyways and in the rear of their lots,

converting the middle of the square into a huge compost heap, sour, rank and very unwholesome. The sanitary committee have long endeavored to suppress this nuisance, but without success; and the reason given by one of the committee is characteristic, "No funds to proceed in the matter." (Refer to Schedule J.) Another undrained lot, at Second and Mechanic, is in a similar condition, and the sanitary committee here have wisely ordered a sewer drain, to correct this evil and run the stagnant and filthy water through it into the Kaighn avenue culvert. There are numerous lots in this section whose owners should be compelled to fill up to grade, or connect with the culvert drain.

One other important matter under this heading, is the undrained privy-wells in all parts of the city. I cannot give in full detail the number and location of such wells, and therefore will give only the system of cleansing employed. Privy-wells are as a rule declared nuisances by our sanitary committee when complained of and found overflowing or filled to within six inches of top, and are abated as such, either by owner on order, or by city at owner's expense. The ordinance rules restrict the cleaning of wells before 11 P. M. by the open method, but allows the odorless excavating apparatus to work at any time during working hours. The privy refuse is all taken beyond the city limits, and much of it used in compost heaps and manures in various ways by farmers and truckers.

J—PUBLIC HEALTH LAWS AND EXPENSES.—The Board of Health of the city of Camden is governed by an ordinance, passed May 7th, 1872, with supplements, March 27th, 1879, and an additional ordinance on the relations of the Inspector to Board, mainly as to his clerical duties, and of no special importance.

BOARD OF HEALTH ORDINANCE.

Enacted May 7th, 1872.

[This ordinance is too lengthy to copy verbatim, since much of it has become a dead-letter, and it will, therefore, be presented in sections in as concise form as possible, and mainly for the purpose of showing its defects.]

Section 1 ordains that five members of city council shall annually be appointed by the president of city council to constitute a Board of Health.

Section 2 provides that a vacancy be filled by city council.

Section 3 ordains that the Board shall meet at such times and places as they may deem proper, and they shall keep a journal of proceedings. They shall have power and it shall be their duty—

(1). To inquire into and inspect all nuisances prejudicial to health, and abate the same in any way deemed expedient.

(2). To detain and examine any persons suspected of carrying any pestilential or infectious disease from an infected place.

(3, 4, 6). Provide for the removal of travelers or residents to hospital, when removal is necessary for the preservation of the public health.

(5). Remove or destroy all furniture that may be tainted with pestilential disease.

(7). Clean, abate or remove all nauseous, offensive or unwholesome matters detrimental to health.

(8). Persons disregarding rule 7, after due notification by the Board, are liable to a fine of fifty dollars.

Sections 4 and 5 ordain that any person who shall deposit filth of any description upon the streets, lots, etc., of the city, shall be liable to a fine of ten dollars.

Sections 6 and 7 provide for the abatal of nuisances by the city authorities at the expense of owner or occupant of such premises, when necessary, and a fine of ten dollars against any owner allowing his premises to remain a nuisance.

Section 8, the cost of abatal of nuisances by city to be collected by the city solicitor.

Sections 9, 10, 11, repealed by the ordinance supplements enacted March 27th, 1879, (to which refer in this report.)

Section 12, employment of nurses in the hospital.

Sections 13 and 14 ordain that decomposed or offensive materials shall not be landed by any ship or vessel until a permit is granted by the Board of Health, under a penalty of one hundred dollars fine. Also gives power to Board, in quarantining all vessels or people on board, in cases of suspected infection of pestilential diseases, &c.

Section 15, a suspected infectious dead body cannot be brought into city without a Board of Health permit.

Section 16, all infectious or pestilential diseases in city must be reported to Board, under penalty of ten dollars.

Sections 17 and 18 fine any person practicing inoculation of smallpox, and also person inoculated, &c.

Sections 19 and 20 relate to the necessary isolation measures to be taken by the Board in infectious diseases, and fine all persons who refuse or neglect to comply with the Board of Health's precautions.

Section 21, precautions to be taken in all contagious or infectious diseases.

Sections 22 and 23 define the duties of physicians or coroners in granting death certificates.

Section 24 not in force.

Section 25 prohibits removal of buried bodies between May 1st to October 1st, without a Board of Health permit; penalty, twenty-five dollars.

Section 26 ordains that all persons practicing midwifery, or, in case of non-attendance of such, the parents, shall report each birth return in full (monthly), or be fined five dollars for each offense.

Sections 27 and 28 prohibit any bone-boiling establishment, compost manufactory or depository of dead animals within city limits, and pronounce it unlawful for any person or persons to possess deposit places for poudrette or privy filth within city limits; penalty, one hundred dollars to two hundred and fifty dollars fine.

Section 29 fines any person for depositing sink or privy filth in any public place.

Section 30 a dead-letter section.

Section 31, any or all persons obstructing the work of the Board of Health shall be fined fifty dollars.

Section 32 provides for the recovery of all fines under this ordinance in an action for debt, &c., or an imprisonment for a term not exceeding ten days.

[Total length, thirty-two sections.]

An important supplement to the above ordinance, enacted March 27th, 1879, after defining the duties of magistrates in imposing, collecting and transfering fines to city treasurer, &c., provides in its

Section II. That the supervisor of highways shall act as inspector of the Board of Health, and his duty shall be to inspect all nuisances for report to the Board, and examine and report, within twenty-four hours, upon all complaints made to the Board, and shall serve all notices of the Board upon offending parties, and shall, at the expiration of such notices of abatal of nuisances, re-examine premises and make a second report to the Board for further action: He shall also examine all cesspools or privy-wells complained of, and, in case the

city is obliged to abate such nuisances, shall take measurements of the same for use of the Board. And he shall see that all special orders of the Board relating to street cleaning and garbage collecting are complied with, and shall receive for compensation one hundred and fifty dollars annually, to be paid out of sanitary committee appropriations.

An ordinance enacted June 12th, 1884, ordains that the inspector shall also be the clerk of the Board of Health.

According to these ordinances and supplements our Board of Health is not constituted in accord with the intent of our present State laws. The members, as appointed from city council, may be out of their element entirely as sanitarians, and the annual re-organization of the Board is but another factor of disability. The appointed members, as merchants, mechanics or manufacturers, may not be in a position to refuse an appointment upon such a Board of Health, and yet, as members of city council, they do accept such a position with good-natured acquiescence, let the result be what it may. The present Board of Health is frequently called by the chairman, Mr. Bourquin, before he obtains a quorum, and when it does meet it is, probably, for the sole purpose of indorsing the actions of its worthy chairman, who has ever taken great interest in sanitary affairs, but who is not efficiently well assisted by the entire Board, or backed by the necessary legislation to make his work effective and satisfactory.

The inspector of the present Board is street supervisor (salary, $1,000 per annum), health inspector and clerk of the Board (salary, $150 per annum), and can't be expected to be more than he is, *i. e.*, street supervisor.

The inspector's report gives the number of nuisances ordered abated as forty-eight, from June 1st to September 1st, 1884. Of this number thirty were privy-well overflows and the balance defective surface-drainage. About thirty-five nuisances were abated by owners, as ordered, and a few abated at city's expense, with about eight or nine remaining unabated.

The annual appropriations for this, the Board of Health work, is $2,000, out of which $1,600 is paid the Camden Dispensary (for medicine and medical attendance to the poor), $150 is paid to the inspector as a yearly salary, leaving a balance of $250 for the work of the sanitary committee, or Board of Health, for a whole year. This, as

might be expected, is soon exhausted, and, as a result, the contemplated sanitary work is suspended. Much of the sanitary work of the city is left undone for this very reason, and under such circumstances the Board shares the responsibility of ineffective sanitary work with the city council and its present defective and dead-letter ordinances.

There are a few sections of the Board of Health ordinance that are really worthy of adoption in a modified form, but so much of the ordinance has become obsolete that all of it may be said to have outlived its usefulness.

Camden, with its 45,000 inhabitants, may be said to have no Board of Health, as Boards are now constituted under the present State laws. Nor can it be said that there are any definite sanitary provisions or enactments that are worthy of being called health laws. A re-organization of our entire sanitary legislation is urgently needed, and if this warning be disregarded let the responsibility be placed where it belongs.

K—VITAL STATISTICS.—Camden has been remarkably free from epidemic diseases for the past year, excepting the mild prevalence of measles, pertussis, and some scarlatina.

In examining the statistic records as kept by the city clerk, I find therein a record of reports as received, without any attempt at tabulation, and defective in the matter of birth returns.

On August 26th, the following reports were tabulated from the record books, for June, July and August:

June, 1884—	
Births	60
Deaths	87
Zymotic disease deaths	20
July, 1884—	
Births	50
Deaths	103
Zymotic disease deaths	19
August, 1884, (prior to 26th)—	
Births	5
Deaths	79
Zymotic disease deaths	10

The birth returns received in each month for registration, differ very materially from the records as quoted. Thus, in June were received seventy-three returns; July, forty-six, and August, eighty-seven. This disparity is owing, no doubt, to the custom of physicians in sending in their reports when convenient; with some it may be once a month, others, three months, etc. And I have good reason for believing that a few are guilty of never reporting a birth.

An effort was made in June last to enlist the services of physicians and others in their making more prompt returns, by the mailing to each of a copy of the State law and a circular, which had the effect of slightly swelling the list of returns, but not by any means of making them satisfactory or complete.

Excepting the birth returns, the statistic returns are complete, and are made according to the legal statutes.

The death-rate of Camden for the three months mentioned is one in every one hundred and sixty-seven population; and the number of zymotic disease deaths as given is merely to be taken as an estimated factor, for the very reason that the death certificates in many cases merely give the immediate cause of death, thus rendering the task of learning the zymotic influences in the causation of deaths a most difficult one.

According to the given estimates, the proportion of zymotic deaths to others is as one to four in June, one to five in July, and one to seven in August. The great prevalence of zymotic diseases in Camden, with its excellent natural conditions attending a residence here, is no doubt due to defective sanitary administration.

As to the location of these reported deaths from zymotic diseases, thirty-one out of the forty-nine occurred in the four lower wards, and a large proportion occurred in that portion of the Fifth ward bordering Line ditch. This ground is much of it under grade, and numerous stagnant pools of water are found, without a possible chance of draining. And the present local Board of Health have with commendable spirit declared the necessity of abating this nuisance by the building of a culvert from this point, Second and Mechanic streets, north into the Kaighn avenue culvert.

Before closing this report, I desire to say that there is much to condemn in the sanitary condition and management of the city. I feel that this report, as the result of a prolonged inspection, loudly calls for the relief embodied in the late enactments of our State laws in regard to local Boards of Health; not only do we need the protection of such a Board, but one that is largely composed of practical sanitarians and able inspectors, organized according to the spirit and letter of approved sanitary science and administrative art.

ATLANTIC COUNTY.

HAMILTON TOWNSHIP. - *Report from* D. B. INGERSOLL, M.D.

Since July we have had a number of cases of typhoid malarial fever. I coin the name to correspond to the general symptoms of the disease. And these cases, fifteen in all, have all, with one exception, been confined to those families who have used water which analysis had shown to be remarkably pure. I may say, however, that a number of other families have used this water exclusively, and yet have escaped the sickness. The stream has been unusually low this fall, and consequently much decayed vegetable, and perhaps animal, matter have impregnated the water. These cases of fever, though generally severe, some of them were almost or quite typical cases of typhoid, were fatal only in two cases, and these the result of influences outside of the fever proper. The drainage usually gives us dry cellars. There are generally no malarial influences, except in very dry seasons.

We would respectfully suggest that the State Board recommend legislation in regard to the tenement houses, forbidding the renting or even the occupancy of them unless there be a sufficient water-supply of good water near the house. In some of our tenement houses they are compelled to drink river, or in very many cases, surface-water from wells, or to carry the water some distance from the wells of their neighbors.

And again, in regard to ventilation, many of the houses are "thrown together," and thus made "good enough to rent," and no possible means of ventilation except by doors or hoisted windows. If the windows in all cases were made to lower from the top we think the health of the inmates would be improved.

The law in regard to minors under a certain age buying tobacco has had a good effect in this township. Yet it is so lame that, as soon as its imperfections are known, it loses its force. As it now is, the parent must prosecute. Make it that any person may prosecute for selling to those under a certain age, and we may protect our youth from its baleful influences.

ATLANTIC CITY. *Report from* EDWARD A. REILEY, M.D., *Sec'y.*

Occupying a portion of the sandy island of Absecon, Atlantic City is underlaid to an unknown depth by the most recent of the tertiary

formations. Clear quartz sand mixed with the debris of modern marine shells, and laid in place by the combined action of winds and waves, is the material of the soil.

This condition has been so modified by the occupancy of about 8,000 people that the winds are no longer geological forces, and the ever-shifting sands of an uninhabited beach are here covered and held in place by houses, graveled streets, and pavements, the general level of the land being constantly raised and producing a totally different set of conditions, as viewed from the standpoint of the sanitarian.

The rainfall, which formerly passed rapidly into the sand, now no longer able to find its way through the closely-packed gravel of the streets, becomes a subject for close attention from the local Board of Health.

Happily in Atlantic City the contour of the ground is such that there is sufficient fall for an admirable system of surface-drainage at small cost, and although in some of the newer streets this system has not been fully completed, yet, taking the city as a whole, the disposal of surface-water is prompt and efficient. In the main avenues flag-stone gutters are the rule, and the tendency is toward their universal adoption.

The raising of the streets and avenues to a fixed grade has made it necessary to fill private property to the same level. This important matter is in the main well attended to by property owners, although there are still a sufficient number of low lots on which rain-water stands until it slowly soaks away, to require the constant efforts of the Board of Health in remedying the evil.

Underground sewerage has not as yet been attempted, but such strenuous efforts are now being made in that direction that probably before the expiration of another year such a system will be in operation.

Meanwhile the prompt removal of refuse and excreta, as well as the dish-water and wash-water of the larger hotels, is rigidly enforced by the Board of Health.

The water-supply of Atlantic City comes partially from the main-land, nine miles distant, and as it is pumped from a pure stream draining a sparsely-inhabited area, the quality of the water is excellent.

The small amount of mineral matter contained in it necessitates the use of other material than lead for pipes, as that metal is readily dissolved in quantities dangerous to health.

Cisterns form another and excellent source of water-supply. Extra

attention is paid to their construction and cleanliness by property owners, and a section of the Sanitary Code, which is enforced, provides that no pigeons shall be allowed at large.

All markets and slaughter-houses are under the strict supervision of the Board, through their sanitary inspector, and the provisions of the code in regard to water-tight floors and general cleanliness are fully complied with.

No trades or manufactories offensive or prejudicial to the public health have as yet gained a foothold in Atlantic City, and in view of the fact that our city is essentially a health resort, public sentiment is strongly in favor of excluding such establishments from the corporation limits.

Swine, goats and geese are not allowed within the city during six months of the year, and there are no interments of human remains on the island.

The cases of contagious diseases during the year have been few. Under the instructions of the Board, the sanitary inspector, with the co-operation of the physicians in attendance, systematically quarantines every case of scarlet fever, and, after the convalescence of the patient, thoroughly disinfects the premises.

By an arrangement with the Board of School Trustees, children from any family having the disease are excluded from the schools until they are re-admitted on the certificate of the sanitary inspector, who is a medical man.

During the past year the general health of the city has been good, and during the summer months, when our population increases sevenfold, the freedom from disease has this year been remarkable.

The peculiar climatological and geological surroundings of Atlantic City doubtless have a larger share in contributing to this immunity from disease than the strictness of sanitary regulations, although we believe our Sanitary Code to be a good one, and it is in the main well executed.

BERGEN COUNTY.

MIDLAND TOWNSHIP. - - - - ——— ———.

No sewerage; a few cellars drained. Houses generally have cellars; generally used for storage of vegetables. Cesspools open bottom and sides.

PALISADE TOWNSHIP. - *Report from* D. H. VOORHIS, *Sec'y.*

The past year has been a very healthy one. There has been no epidemic of any kind whatever. Malarial fevers, which have been more or less prevalent of late years, have been less so than usual during the past year.

There has only been one complaint made to the Board of Health of this township during the year, and that was in reference to the drainage of a vacant lot. This was adjusted by the parties owning the property deepening and widening a few ditches.

There have been no cases of contagious diseases among live stock reported to this Board.

All topics in your schedule have been answered in previous reports of the Board of Health.

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SADDLE RIVER TOWNSHIP. - *Report from* J. E. KIPP.

There have been no contagious diseases of animals reported to us during the past year. The assessor inquires if any losses of animals and of contagious diseases among cattle.

Malarial fever still exists. There can be no doubt that the malarial diseases prevalent in some parts of the township are largely, if not exclusively, due to the low, imperfectly-drained meadow land lying by the sides of railroads and by the side of the Saddle river, which is drained by natural drainage.

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UNION TOWNSHIP. - *Report from* JACOB G. VAN RIPER, *Sec'y.*

Water-supply is from wells and springs. Water good where it is not contiguous to privies and cesspools. Western slope has soft water. The eastern slope water is hard. The Jersey City water works are in the township, for the supply of Jersey City only.

No public drainage or sewerage.

The refuse excreta is in excavated holes in the ground laid up with dry stones. When filled are emptied and mixed with ground, and sold to farmers and gardeners as a fertilizer. This undoubtedly is the cause of a greater part of what is called malaria.

The prevalent disease has been a very mild form of malaria.

BURLINGTON COUNTY.

FLORENCE TOWNSHIP. - *Report from* CHAS. A. BAKER, M.D., *Sec'y.*

Florence, the largest town in the township, situated on the banks of the Delaware; population about 1,000. A large foundry is located here, owning numerous tenement-houses, which are built in blocks, streets and alleys dividing them. These by-ways have received during the past year strict attention from our local Board, and with the gentlemanly assistance of the manager of the foundry great sanitary reform has been instituted in these places and pestilence undoubtedly stayed. The refuse and excreta from these houses is now carted away biweekly with covered carts provided for the purpose.

NEW HANOVER TOWNSHIP. - *Report from* GEORGE C. DAVIS.

Typhoid fever has been prevalent through the summer months and a part of the fall, in some localities. There is no epidemic among animals, although the hog disease is along the borders of our township.

SPRINGFIELD TOWNSHIP. - *Report from* FRANKLIN S. ZELLEY.

We have no swamps or boggy places. The land is mostly well underdrained, although there are some cases of malaria. I don't suppose there is a house in this township without a cellar, and in those cellars are stored away during the winter months apples, potatoes, turnips and cabbage and other vegetables, and for all that we are generally healthy and no epidemic prevails. The hog disease which is very bad in Pemberton township, although adjacent to us has not got over the line yet, but we fear it will. Several farmers there have lost all or nearly all their crop of hogs.

CAMDEN COUNTY.

CENTRE TOWNSHIP. - *Report from* N. BARTON, *Sec'y.*

In January and February there was an epidemic of scarlet fever in the eastern part of the township, followed, in April, by one of measles, though not so extreme as the first.

There have been more fevers, of malarial origin, this year than last.

DELAWARE TOWNSHIP. *Report from* F. E. WILLIAMS, M.D., *Sec'y.*

The drinking water-supply throughout the township comes from wells and springs. It is good soft water, with very few exceptions. Some wells have been rendered unfit for drinking by being too near barn-yards and have been abandoned.

The usual mode of getting rid of the refuse of the house is by throwing it in some low place near the kitchen door, which custom is a bad one, and is no doubt one of the causes of sickness to the inhabitants.

There have been numerous cases of infectious pneumo-enteritis among the swine in the western part of the township, one farmer losing some three hundred dollars' worth. They were put under the supervision of one of the State Veterinary Surgeons and the spread of the disease was stopped.

CAMDEN CITY. - *Report from* GEORGE VAN BENSCHOTEN.

Our water-supply is from the Delaware river, above the city; the city furnishes water; at times discolored by high floods; reservoir and pipes cleansed about every year.

All sewerage, combined system; drain to river. Two blocks back from river, in southern portion, water in cellars, and swamps below southern part of city. Brick sewers; grade low; main sewers, six feet; secondary sewers, two to three feet. High tide or below, storm and tide flushing. Ventilation by perforated man-holes. Sewerage, twenty-five miles.

Surface drainage. About one-half of cesspools drain into sewers; very few with cemented floors; emptied by carts and odorless companies.

Typhoid prevails.

GLOUCESTER TOWNSHIP. - *Report from* JOS. E. HURFF, M.D.

There is a good natural drainage throughout the whole township. The cellars are generally dry, with the exception of a few located in Spring Mills very near the pond. In these houses I learn that the cellars fill with water during stormy and wet times to the depth of several inches. There are drains running from these cellars, but they are choked up. In these houses chills have been quite prevalent this season. There are no sewers. Throughout the township the farmers

use their cellars for storing away their late crops, such as potatoes, &c., but all seem to be kept in best possible condition.

HADDON TOWNSHIP. - *Report from* J. STOKE COLES, *Sec'y.*

We have had several complaints on account of stagnant pools of water—refuse water from sinks emptying into streets through pipes—and a few hog pens. After notifying the owners thereof our request was generally complied with at once. There was one case in which we had to order the pipes plugged.

There have been several pens of hogs affected by "hog cholera" this fall, and, in most cases, they die suddenly. They have lost several hogs at the Camden County Almshouse farm lately from this cause. As soon as possible after being discovered, those that were able to be removed were driven out into a sand field for pure air, and there was no more of it; showing clearly that the disease thrives best in filth.

STOCKTON TOWNSHIP. - *Report from* DR. P. W. BEALE.

Every death, birth and marriage is reported in the township to Eli Browning, the assessor.

As for quarantine and care over contagious diseases this township should be well versed therein, as there is not a year for the last five, that we have not had cases of small-pox.

There was a single case of small-pox in the township, but through the enforcement of vaccination and quarantine we were able to prevent the further spread. The township has been unusually healthy. Malaria in its various forms has had a marked decrease. Several cases of diphtheria of a malignant type occurred, and a few cases of scarlet fever, but comparing the health of the township to that of previous years there have been comparatively few cases of serious maladies. We have had several cases of nuisance of various kinds, but have had no trouble in removing the same.

Stockton township's population is composed of a large number of colored people, and it is in close proximity to Camden and Philadelphia, and the colored people as a rule visit the slums of Philadelphia, and as the cholera is threatening, I think it proper and just to the inhabitants to exert every possible means to keep the township in a good sanitary condition, and any suggestions or information from the State Board will be thankfully received.

CAPE MAY COUNTY.

CAPE MAY CITY. - *Report from* H. A. KENNEDY, M.D., *Sec'y.*

We have been called upon to abate eleven nuisances, consisting of filthy hog-pens, cesspools and deposits of garbage.

Our water-supply is ample and good, there being no change since last report.

Sewerage system has proven satisfactory, and since last year's improvements has not needed any attention.

Our streets are thoroughly cleaned once a week, and well sprinkled every day during the summer months.

There are a number of cesspools and privy-vaults in parts of the city not accessible to the sewers. Some are cemented, others open bottom, and some merely a hole dug in the ground. These are cleaned at night by scavengers.

There has been no disease among horses or animals during the year. No registry of persons keeping horses, cows or hogs is kept.

We have no slaughter-houses or abattoirs within the city limits, but have a number of hog-pens, which become very offensive during hot summer weather. These the Board hopes to be able to remove during the summer months.

During the past year there has been no epidemic, and, with the exception of a few cases of diphtheria among the colored population during the early summer, it has been exceedingly healthy.

MIDDLE TOWNSHIP. - *Report from* STILLWELL H. TOWNSEND.

The water-supply is mostly from dug wells, although there are quite a number of driven wells, and occasionally a cistern, but not many. The water from the driven wells in most cases is excellent, but in far too many cases the water from dug wells is just calculated to produce diseases.

The past year has been one almost entirely free from any of the prevalent diseases. The Board have kept a strict watch over all cases liable to become a nuisance, but up to this time no nuisances have been reported. The hog cholera that is prevailing in some parts of the State has not reached us so far as I know. The Board will keep strict watch, and should it make a break-out, do all in its power to

prevent its spread. The question of cemeteries is one, I think, that demands attention even in this township, although so thinly housed. Houses are built and being built very closely to some of the cemeteries, and I do not see why the germs of diseases should not be drawn off in the water, and I think some speedy action should be taken in this very important matter.

UPPER TOWNSHIP. - *Report from* R. MARSHALL, M.D., *Sec'y.*

Drainage is complete and prompt, as there is a gradual slope to the river. The usual water-level secures dry cellars. In extreme wet seasons, those containing water are only exceptional. Our swamps are free from malarial emanations.

Have had no epidemics. The catarrhal diseases have been dysenteric in character but amenable to treatment. There have been a few sporadic cases of measles and scarlatina simplex.

CUMBERLAND COUNTY.

DEERFIELD TOWNSHIP. *Report from* CHAS. C. PHILLIPS, M.D.

It is proverbial that Deerfield township is the healthiest place on the globe; that no one dies until they become old. The health during the past year has been excellent; no epidemics or endemics. During the months of August and September there was a tendency to looseness of the bowels, sometimes amounting to dysenteric character, but no deaths resulted therefrom. No deaths the whole year excepting a few from old chronic causes.

FAIRFIELD TOWNSHIP. - *Report from* E. R. BATEMAN, M.D.

With the exception of three epidemics that have visited us, the year ending October 1st, 1884, has been one of general health, the sickness and mortality being not above that of previous years. During the fall of 1883 there was but little sickness; in the winter of 1883–4 we were visited by an epidemic of measles, of mild type and average intensity; no deaths. Mumps also occurred epidemically at the same time, and extended later into the spring. Pulmonary troubles prevailed to the usual extent, and during February and March a few cases of influenza, which had been epidemic the year before, were met with.

No cases of scarlet fever or diphtheria are reported. Typhoid fever moderate, and about the same as previous years. Several cases of remittent fever met with in the spring and fall, and few cases of intermittent. Tonsillitis was quite prevalent during the winter and early spring. There was an unusual amount of bowel trouble during the summer; also a widespread and thoroughly-spread epidemic of dysentery. Cases were met with of all grade, from the simple catarrhal to the truly malignant.

HOPEWELL TOWNSHIP. - *Report from* CHARLES H. DARE.

The surface of the land being undulating, there is no need of any system of drainage, as rain-water runs off, and in no portion of the township does it stand in pools after a storm. The cellars are dry, and much above the water-level.

There has been, during the late summer and early fall, a fatal epidemic of hog cholera, so called in the lower portion of this township, along the line of the Cohansey river. In one instance thirty-two hogs and pigs, out of a drove of about one hundred, have died, and in other instances a like proportion have been lost. The causes leading to the disease are to me unknown, but should be vigorously investigated.

The almshouse of the county is located in this township. Since my last report, this institution has been greatly enlarged and otherwise improved, giving it much more room, which has been long needed. Bath-rooms with hot and cold water have been introduced. The institution is heated in all parts by steam. It will now compare favorably with any almshouse in a county of like size in the State.

LANDIS TOWNSHIP. - *Report from* E. H. FOOTE, *Sec'y.*

Houses generally have cellars, which are used to store vegetables to a considerable extent.

The slaughter-houses have engaged the attention of the Board the past summer to some extent. Wells near the pens have been closed and new ones dug not less than fifty feet from the pens. Now the question is, how to dispose of the offal, so as to banish the hogs that are fed on it, or to reduce the number to a minimum to devour the offal.

MILLVILLE. - - *Report from* T. C. WHEATON, *Sec'y.*

Water is secured from private wells. There are water-works in the city owned by a private company; very few citizens use the water from them for drinking purposes.

No sewers in the city—drainage is all surface; the main gutters are flushed weekly. Very little malaria.

Very few cesspools are cemented; they are cleaned by horse and cart, after and before certain hours of the day and night.

ESSEX COUNTY.

BLOOMFIELD TOWNSHIP. - *Report from* CHARLES H. BAILEY.

The township, by a contract made with the East Orange Water Company, has introduced water under pressure in the streets. The contract is made for ten years and is to the full limit allowed by law. Its introduction in dwellings is not very general as yet. The driven well is in general use.

Most of the cesspools are now cemented, and as the soil is a coarse gravel they do not fill fast. Most are emptied by the "Odorless Company," of Newark. In some cases, when houses are far apart the contents of the cesspool is pumped on the lawn or garden.

We have been spared from much sickness and have had no epidemics during the past year. The decrease of malarial diseases has been remarkable, and may in some measure be due to the draining and filling in of wet places secured by preceding Health Boards and the Village Improvement Society. It is proper to say that this policy has been continued by the present Board.

ORANGE. - - *Report from* THOS. W. HARVEY, M.D., *Sec'y.*

The Board of Health has little to report this year beyond routine work. There has been much less sickness than usual and no epidemics present. The usual inspections and the looking after nuisances were made more thorough than usual; our assistant inspectors were appointed for three months instead of by the day.

A committee was appointed, consisting of the Health Inspector and the City Physician, whose function is to take charge of any cases of

epidemic disease, particularly cholera or small-pox, and arrange for the proper isolation. They are further empowered to employ summary measures to stamp out and prevent the spread of these diseases on their first appearance.

When such a case occurs among the poor, where isolation is possible, it is to be enforced at once. Where removal is necessary the patient is to be taken in our own conveyance to a pest-house, the site for which we own, and which we are in position to erect on twenty-four hours notice. A disinfecting corps will be organized, which will take charge of all premises occupied by cholera patients, and who shall thoroughly disinfect the surroundings of the patients and destroy all substances that may convey the poison, as bed-clothing, body-clothing, &c.

Disinfectants are always at our headquarters, to be had for the asking.

When cases occur among the well-to-do, the Board of Health will insist on the same care in isolation and disinfection as in the other cases. We feel that in the case of Orange we can control cholera when in our midst. We only fear the danger that will arise from the many new cases that will arrive in town from outside places, and which will come to the knowledge of the Board too late to prevent conveying infection to others.

SOUTH ORANGE TOWNSHIP. *Report from* A. A. RANSOM, M.D., *Sec'y.*

Have Board of Health and all the law necessary to enforce demands. Have educated the people to take a more active interest in sanitary affairs.

Supervision of contagious diseases and vaccination confided to physician of Health Board.

Prevailing disease, lung trouble. But little, if any, intermittent since the drainage was finished in 1882.

GLOUCESTER COUNTY.

EAST GREENWICH TWP. - *Report from* ELMER BRADSHAW.

We have but little swampy ground, and seldom a case of malaria.

There are no sewers used. Cesspools are built with open bottoms, and are emptied with horse-cart and shovel.

There has been no prevalent disease among human beings. Several horses have died with blind staggers. We cannot give the cause, nor do we have a cure. A number of hogs have died with (so called) hog cholera.

GLASSBORO TOWNSHIP. *Report from* JACOB ISZARD, M.D., *Sec'y.*

The water-supply is from wells and of a good quality.

The drainage is not so very good on account of the flatness of the soil. Since last year there has been a terra cotta pipe laid several inches below the surface of the earth, to carry off the surface-water during rains or melting snows, which has improved the sanitary condition of the lower portion of our town. The length of the pipe is one-third of a mile, and it has cost the township about six hundred dollars. It has proved very satisfactory to the inhabitants in the central part of the town.

The streets and public grounds are kept in good condition.

The refuse is fed to pigs and chickens. The excreta is hauled out of the town by farmers, who ask to remove it on their farms as a fertilizer, which is generally done in the winter time.

Slaughter-houses are built out of the town and the offal is fed to swine.

The public health laws and regulations are adhered to in case of contagious diseases.

The town has had less malaria the past year than it has for many years.

GREENWICH TOWNSHIP. - - *Report from* JOHN STETSER.

This township may be said to be thoroughly drained.

The hog cholera is raging at present, sweeping away whole pens, leaving the farmers pigless. Precautionary measures seem to have proved useless.

Careful arrangements have been carried out to prevent the accumulation of filth so as to become a nuisance and offensive to neighbors.

Scarlet fever was prevalent during the winter and spring months. A few cases of diarrhœa and dysentery occurred during the summer months.

There is a marked improvement in the sanitary condition of our township within the last few years by the removal of the causes of diseases, as well as the abatement of nuisances, by inspection and legal notice.

HARRISON TOWNSHIP. - *Report by* E. E. DEGROFFT, *Sec'y.*

During the summer and fall months there has been an increase of malarial and typhoid fevers over last year, attributable, in two or three instances, to bad water-supply, and damp cellars or imperfect drainage.

Although the character of the disease has been of a lower type than formerly, the mortality has been no greater.

A hog disease has been prevailing in this township during the past few months to an alarming extent. Some persons losing as many as sixty (60) in a month.

In my opinion it is not so much the hog cholera as so many farmers think, but, in many instances, it is a true case of cerebro spinal meningitis. The symptoms are loss of appetite, high fever, vertigo, an eruption along the spine, at times bowels constipated, and, in other cases, diarrhœa, and occasionally there is hemorrhage from both nose and bowels.

We believe it to be highly contagious, and, indirectly at least, hazardous to public health, and that it should demand the immediate attention of veterinary surgery.

LOGAN TOWNSHIP. - - - *Report from* S. B. PLATT.

Surface drainage principally. The water level is such as to secure dry cellars with some few exceptions. In the past year there has been interest taken in the drainage of cellars, and where there has been water or likely to be, a system of tile drainage leading to a natural water-course has been adopted.

No sewers used; waste water generally allowed to run two or three hundred feet from well and remain on surface. Water-closets or privy wells generally situated two hundred feet from water-supply, and in many cases are not water-tight, having open sides and bottom. Are trying to correct the evil of open privy vaults and have met with some success, as all or nearly all being built are cemented on sides and at bottom.

During the past summer blind staggers among horses have been prevalent in the district and in every case fatal, there being sixteen in all. Two cases were reported as staggers, but on examination after death were found to be lung fever. No contagious or epidemic disease of cattle reported. Three cases of hog cholera were reported

in this district, all fatal, while in the adjoining district over one hundred hogs died with the disease.

One slaughter-house in the district, and that in a very bad sanitary condition.

Have adopted sanitary code under laws governing local Boards of Health and circulated them through the district, which has had a good effect except as to drainage of waste water, slops, and privy vaults and slaughter-houses, which we hope to succeed in the coming year without summary measures.

Vital statistics are well reported by physicians, undertakers, nurses, &c.

Have had some few cases of contagious diseases where it was deemed necessary to isolate them, and the instructions were generally complied with. The system of vaccination is not accepted very generally, as we have one man in the district who makes it a point to denounce vaccination in every form upon all occasions.

During spring and first summer month, about thirty cases of diphtheria, one case of which proved fatal. Scarlet fever prevalent in winter and early spring; five cases fatal. All the fatal cases confined to two families.

WASHINGTON TOWNSHIP. *Report from* F. W. HURFF, JR., *Sec'y.*

This township has no system of drainage or sewerage. There are portions of the township where there is considerable standing water after heavy rainfall, and in the vicinity of this standing water wet cellars abound.

On the line of the township, near the Camden county almshouse, is a pond of water which has caused some complaint. The head of this pond is near the house of Mr. Joseph Willits, and, as the meadow is very flat, it causes stagnant water to stand, which is said to cause fever and ague and malaria. The body of the pond being in Camden county, our Board felt that they had no jurisdiction.

We have no system for removing refuse and excreta. Privies are usually cleaned yearly.

The water-supply is from springs and wells.

The prevailing disease of the township during the summer has been malarial fever, but I think it has diminished from previous years. In early spring we had an epidemic of measles, but with no fatal results.

Also, in the latter part of summer, we had several cases of typhoid fever of a malignant type, with few deaths.

Hog cholera appeared at Hurffville during the summer, and has spread nearly all over the township. It has proven fatal in almost every case. Some of the farmers have lost their hogs after having them fatted.

HUDSON COUNTY.

HUDSON. - - - *Report from* C. J. ROONEY, *Sec'y.*

In accordance with your request, I beg leave to present the following brief report on vital statistics, &c., of Hudson county, and cities, towns and townships thereof, for the year ending June 30th, 1884.

An outbreak of small-pox took place in Hoboken in July, 1884. The cases were few; prompt vaccination was enforced by this Board and the disease quickly disappeared.

As compared with the reports for ten years, there was a decrease in the number of deaths from croup, diarrhœal diseases, diphtheria, scarlet fever, and an increase in the mortality from typhoid fever and measles.

Consumption's rate continues high—thirty per ten thousand. This is higher than for any year but 1882, when the rate rose to thirty-two. The lowest rate was twenty-four, in 1876. I should have remarked an increase in the death-rate from pneumonia when contrasted with our ten-years average.

The whole decrease of mortality, as compared with the ten-years average, took place among children under five years old.

Jersey City's death-rate per 1,000 was $\frac{8}{10}$ below the average for ten years. In this time rates have varied from 20.3 to 27.5. There was a decrease in mortality from zymotic diseases, and an increase from consumption.

Hoboken's rate fell $6\frac{9}{10}$ below ten-years average, and was the lowest recorded in that period. There was a very marked decrease in the number of deaths from zymotic diseases; also, a decrease in the mortality from acute lung diseases.

Bayonne sustained a rate of 17.7, which was $\frac{5}{10}$ below five-years average. There was a decrease in the mortality from acute lung diseases as compared with the five-years average.

Harrison town exhibited a rate of 26.2—just up to its quinquennial average rate.

Town of Union, with a rate of 20.1, fell about 5 per 1,000 below five-years average. There was a marked decrease in the number of deaths from zymotic diseases, and a diminution of mortality from nervous diseases.

West Hoboken township had a death-rate of 19 per 1,000, which was nearly 3 per 1,000 below five-years average. The greatest decrease was among acute lung diseases.

Town of Guttenberg's rate of 27.5 was $2\frac{7}{10}$ above the average for five years.

North Bergen's rate of 46.8 was 6 per 1,000 below the average. The decrease of mortality was among zymotic and acute lung diseases.

Kearny township's rate of 13.5 was $\frac{7}{10}$ above the quinquennial average.

Union township's 25.4 was 1 per 1,000 above average.

Weehawken's rate, 15.7, was 10.2 below average.

NOTE.—On account of supplemental returns, these vary slightly from the State records.

There were more deaths from the heat in July than for the same month of the previous six years.

With the exception of May and June, 1884, the county death-rate for every month of the period now reviewed, fell, as compared with the average for seven years.

A notable feature of the reports was the decrease of Hoboken's rate, in every month, as contrasted with average for ten years.

Certain additional ordinances were prepared by the counsel of this Board, John A. McGrath, Esq., at the Board's suggestion, and passed by the Board.

These ordinances are designed to provide a system of licenses and permits in the case of certain offensive trades and manufactures, and also in the case of the keeping of swine, cows, &c. They also give the Board control of the traffic carried on in emigrant-bedding from European steamers. A registry of cattle-owners is also provided for, in accordance with the suggestion made by yourself.

These ordinances seem to give promise of well fulfilling the object of their enactment, and, to some extent, prove a source of revenue to the county.

The schedules sent out from this office, in conformity with your request, are not as fully written up by the cities, towns and townships as might be desired. Much of the information, I am informed, it is well nigh impossible to obtain without much labor and expense.

A very thorough inspection of schools was made by this Board, and the result was embodied in a report to the Board of Chosen Freeholders, who ordered it printed in the various official newspapers of the county. It drew attention to many needs of the schools of a pressing character, and it is to be hoped that it will result in an improvement, where feasible.

BAYONNE CITY. - - - - - - ——— ———.

As a general thing no cellars. Basements not occupied. City has about four and a half miles of sewers. No cesspools, or very few.

HOBOKEN. - - - - - - ——— ———.

Water-supply from the Hackensack river, taken about four miles above the town; place called New Milford. Supply furnished under contract by the Hackensack Water Company.

NORTH BERGEN TOWNSHIP. - *Report from* CHARLES PINNELL.

Our principal supply of water is from wells and springs; a part of the inhabitants are supplied by the Hackensack Water Company, whose main passes through the township; a private corporation; our county institutions at Snake Hill are supplied by the Jersey City Water Company; the water is often discolored, water soft, bad at certain seasons of the year. The Jersey City Water Company receive sewerage above the point of supply.

As to drainage, the natural drainage of the northern part of the township was formerly by water-course emptying into Bellman creek. This water-course is the county-line between the counties of Hudson and Bergen, and has become entirely filled up. After repeated efforts to get the two counties to open the water-course, the efforts of the inhabitants of that district have entirely failed.

JERSEY CITY. - - - *Report from* GEORGE T. BOUTON.

Analysis of Passaic water made October 11th, 1884. Sample received October 3d, 1884, from office of Board of Public Works.

Taste and smell both woody.

	Parts in 100,000.	Grains per gal.
Free Ammonia	0.022	0.0129
Albuminoid Ammonia	0.027	0.0157
Oxygen required to oxidize organic matter	0.38	0.22
Nitrites	0.0002	0.00012
Chlorine (enormous amount)	2.15	1.25
Total hardness	4.2	2.45
" solids	15.05	8.76
Oxygen required (Silver)	0.62	0.36
" dissolved in one liter = 5.1 cc.		
Carbonic acid " " " " = 0.8 "		
Nitrogen " " " " = 14.0 "		
Total gas, - - - = 19.9 "		

Acid reaction equivalent to 0.49 pints Sulphuric acid per 100,000.

Note the great amount of dissolved solid matter, especially chlorides, and the corresponding effect upon the hardness.

The æration is very insufficient and the oxidation of organic impurities correspondingly imperfect.

HUNTERDON COUNTY.

DELAWARE TOWNSHIP. *Report from* ASA H. HOLCOMBE, *Sec'y.*

The general health of the township has been excellent. Malarial fever of all varieties, which has prevailed in the past few years, has to a considerable extent been checked. Cases of it are not as numerous the past year. The majorities of the cases being confined along the banks of the river Delaware.

There has been only one complaint against nuisance; and that was promptly attended to and abated. No general vaccination has been ordered by the Board and precaution is exercised in all cases of contagious diseases.

EAST AMWELL TOWNSHIP. - - *Report from* P. C. YOUNG.

Measles, dysentery and a few cases of cholera morbus during the hot months of the summer have been the most prevailing diseases of the township.

BOROUGH OF FRENCHTOWN. *Report from* GEO. C. LANDON, *Sec'y.*

Cesspools are the main reliance for disposing of the kitchen waste-water and slops. These cesspools are mainly holes dug in the ground

some few yards from the kitchen, into which, by means of a drain the kitchen waste-water is carried. These cesspools are usually covered, and more or less frequently emptied and purified, as the families are ignorant or well-informed upon their influence on health. Slaughter-houses are looked after whenever there is any complaint made, but not otherwise. There do not seem to be any prevalent diseases. There have been some few cases of dysentery and some cases of malaria, but hardly as prevalent as former years.

Since my last report fire-escapes have been placed on one of the large buildings, in which there are two large halls in the third story. The fire department is in about the same condition as last reported. We are still at the mercy of the fiery elements should they at any time be let loose upon us. We have practically learned but little wisdom since our last great fire.

Our cemetery is so located as not to affect the health of the surrounding country.

We are at this time getting our health ordinances and by-laws into shape, so as to conform to the late laws of the State, and hope to make our Board more efficient than heretofore.

HIGH BRIDGE TOWNSHIP. *Report from* W. C. ALPAUGH, M.D.

No. 61, High Bridge district, has a two-story frame school building situated in a low, wet place, having on the northwest the south branch of the Raritan river; on the southeast a steep declivity, covered with wood, extending within twelve feet of the house; and on the southwest the Central Railroad embankment, which is about one hundred feet high and two hundred yards from the grounds. Such surroundings make it a damp, unhealthy place. In the winter the sun does not shine on the house more than three hours in the day. The water-closets are above the well, so that the drainage is from the closets to the well, which make the water unhealthy to drink. This district employs four teachers, and has three hundred and fourteen scholars.

No. 60, Silverthorn district, has a one-story frame house, situated on high grounds and with a good drainage. It has two teachers, and one hundred and thirty-nine pupils.

No. 59, Rocky Run district, has a one-story frame house, and is situated in a low, swampy place, with very unhealthy surroundings. It employs only one teacher, and numbers sixty-one scholars.

No. 65½, Mount Grove district, has a new frame dwelling, situated on high, dry ground, good drainage and a healthy surrounding.

Our township has been quite free from contagious diseases; very little malaria. Bronchial diseases have been quite prevalent; a few isolated cases of typhoid fever and diphtheria.

LAMBERTVILLE. - - - *Report from* JOHN C. MOORE.

No system of sewerage. Many of the cesspools are built of rough stones not cemented, the others are made by sinking hogsheads or barrels in the ground. The liquid matter escapes in the surrounding earth, the solids mostly removed.

No new manufactories. A tomato canning factory has run its refuse in the past years into the underground drain or sewer, and thence into the bed of Swan's creek (nearly dry in summer in city limits), which is situated in a thickly-settled part of the city. Complaint was made to the Board of the horrible stench during the canning season. The Board of Health filed a bill in chancery for an injunction restraining the proprietor of the factory from running his refuse into the sewer, &c. The injunction was granted. (Opinion by Vice Chancellor Bird, filed October 17th, 1884. *Case*, Board of Health of City of Lambertville v. Butterfoss.)

LEBANON TOWNSHIP. - *Report from* A. S. BANGHART, *Sec'y.*

The past year has been healthy. No epidemics have been with us until this fall, when a few cases of typhoid fever occurred in the Junction, but no cases died.

TEWKSBURY TOWNSHIP. - *Report from* O. A. FARLEY, *Sec'y.*

In our report of last year we stated scarlet fever as being prevalent, the number of cases being one hundred and fifty. Within the past year there have been but few cases, numbering about ten. Malarial fever is on the increase.

Three cases of typhoid dysentery occurred in the village of Mountainville, in a family named Wise (a miller by trade), and two deaths resulted. The supposed cause was traced to a spring situated near the house; said spring being so located as to receive deleterious substances that emanated from pig-pen, barn-yard, &c. The use of the spring being abandoned, no further trouble ensued in the family.

MIDDLESEX COUNTY.

MONROE TOWNSHIP. - *Report from* WM. E. PAXTON, *Sec'y.*

As to drainage: In the country districts they drain by regular drain-pipes or tile, and in our village we have large ditches in which are large drain-pipes, and from the properties that need draining, smaller pipes are run to the main or larger ditch. The most of our property is not troubled with wet or damp cellars, but where there are such they are drained as above stated. We are not troubled with chills and fever.

NEW BRUNSWICK. - *Report from* HENRY R. BALDWIN, M.D.

Many of our thoroughfares are in such sad need of repair, that during, and immediately after heavy rains or showers, they afford a lodgment for pools of water. Many of the unpaved streets are improperly drained and the ground is sodden with filth and moisture; such conditions are certainly highly insalubrious.

Our public health laws are defective. The local Boards of Health are not clothed with sufficient powers in certain quarters, and these powers can only be conferred by the municipal body. For instance our Board of Health has no power to compel connection with the sewers even where such course is manifestly for the public good, and thus far common council has failed to grant such power.

Our sanitary expenses are mostly confined to the salary of the sanitary inspector, owing to the fact that we have no superabundance of money. The people vote to appropriate five hundred dollars a year to the Board of Health, but the Board never has funds in hand to meet any emergency, since this sum of five hundred dollars is never paid into the treasury of the Board. We expend as little as possible, send all bills to the common council, and that body orders payment or not as thought proper. Comment seems unnecessary.

We are extremely happy to be able to report that the past year has been remarkably free from epidemics of any kind, and we feel confident that in this respect at least we are much to be envied by many of our sister cities throughout the State.

The tabulated report on vital statistics submitted to this Board by our careful and efficient city clerk, Mr. Edward Tindell, shows that

there were one hundred and thirty-four marriages, five hundred and forty-one births and four hundred and twenty-six deaths during the year. In this report Mr. Tindell says: "The above table is interesting as showing a greater degree of accuracy and carefulness on the part of physicians and midwives in reporting statistics of births and thus conforming to the requirements of the law. Of the four hundred and twenty-six deaths, thirty-two or about thirteen per cent. occurred outside the city limits in the adjacent townships. Compared with the report of last year the death-rate is low, as here shown:

1882–1883	Marriages, 161	Births, 425	Deaths, 515.
1883–1884	Marriages, 134	Births, 541	Deaths, 426.
Decrease of	Marriages, 27	Births, 116	Deaths, 89.

This Board deems it to be its duty to call the attention of the State Board of Health to the following case of malpractice, although occuring beyond the city limits, and therefore beyond the jurisdiction of this Board. Complaint was made against one person, who attempted the treatment of a surgical case (in fact he stole it from the regular physician who was in attendance), without having a registration in the office of the county clerk, in accordance with the requirements of the law. An indictment was found by the grand jury, but the public Prosecutor failed to get a verdict of guilty, as the defendant pleaded he had received no compensation. Should we not have an amendment to the statute?

PERTH AMBOY. - - *Report from* CHARLES K. SEAMAN.

The city water-supply continues to be a subject of concern. There are very few good wells in the city, and these are in danger of becoming contaminated as the city becomes more thickly populated. The water furnished by a private company is supplied by springs and surface-water, and is used by about one hundred and twenty private houses. The water is soft and without any taste of iron, but is so badly discolored by clay as to be unfit to use for washing purposes, and few have the courage to drink it.

Strict attention is paid to incoming vessels, and all coming from infected ports pass a rigid quarantine. There has been some scarlet fever and whooping cough since summer, and a few cases of diphtheria. Malarial diseases have not decreased much.

MERCER COUNTY.

HAMILTON TOWNSHIP. - *Report from* WILLIAM T. YARD, *Sec'y.*

Our township has been in good health. The death-rate is one-third less than last year. We have not had any complaints from slaughter-houses. We have several in our township, but they are kept in good order. We have had the garbage from the city of Trenton stopped from being dumped on the vacant lots on State street road. The night-soil carried to one of our farms is a source of annoyance to the Board. It is hard to keep the oderless company from dumping on the farm and not covering it up. It is left on the top of the ground unless some one of the citizens reports to us, or we find it out ourselves by investigation.

The water-supply is short, it being so dry that the wells are very low, and a great many of them entirely dry.

MILLHAM TOWNSHIP. - - *Report from* JOHN J. CLANCY.

As to drainage: There is no system of drainage; there is no sewerage; there is a point between canal and creek where the cellars are usually wet; there is also a bad swamp adjoining and owned by the Pennsylvania Railroad, that is always in a very bad condition, and there is a large number of cases of malarial fever; we are never without some cases of fever at all times of the year.

This swamp mentioned in D, is, in my opinion, largely the cause of so much chills and fever; it is in the summer time in a very filthy condition; it has on its surface a thick green substance; it is, I think, an overflow from the canal.

CITY OF TRENTON. - *Report from* WILLIAM CLOKE, *Sec'y.*

During the year physicians have reported to this office the following cases of contagious diseases: Diphtheria, thirty; scarlet fever, forty; scarlatina, three; typhoid fever, four. This does not, probably, include all the cases that have occurred in the city, as some physicians, either through ignorance or neglect of the law, fail to report their cases. But it may confidently be stated that Trenton is remarkably exempt from what are known as "filth diseases." This exemption is no doubt

largely due to our exceptionally good and wholesome water-supply. This supply is drawn from the middle of the Delaware river, and is twice filtered before it reaches the consumer. The water of the Delaware at this point is almost absolutely free from artificial pollution, as there are no towns or villages or manufactories within many miles of the city that empty any waste or sewage into it. There are but very few large towns and villages on the river between Trenton and the headwaters of the river, and but very little polluting matter turned into it. The large volume of its flow and the ruggedness of its bed and rapidity of its flow completely eliminate every vestige of such slight impurity long before it reaches this city.

Other reasons for our exemption from filth diseases are: the topography of the city, affording fine grades for the rapid carrying off of water and waste; the vigilance of the Board of Health and its faithful and indefatigable inspector; and the general and intelligent regard of our citizens to the requirements of sanitary laws and government.

During the year about one thousand privies and cesspools have been emptied, and about five hundred other nuisances of various kinds have been abated.

The Board made a test case before the Court of Chancery against persons polluting the stream known as "Petty's Run," by bringing suit against the proprietors of the American House Hotel for sewering into said run. The case was vexatiously prolonged, but a decision was recently rendered by Vice Chancellor Bird, fully sustaining and upholding the Board. The case has been appealed to the Court of last resort, but we confidently expect a favorable issue.

The project of securing a general system of sewers for Trenton is well under way under the auspices of the sanitary committee of common council. Mr. Rudolph Herring, of Philadelphia, has been employed to make the surveys and prepare a plan, and this is expected soon to be ready for submission to the common council. It is hoped to have the new system begun next spring, as soon as the weather will permit.

In view of the possible appearance of cholera next summer, the Board is adopting every possible precautionary measure.

MONMOUTH COUNTY.

ASBURY PARK. - - *Report by* HENRY MITCHELL, M.D.

An ordinance was adopted by the Commissioners of Asbury Park, June 3d, 1884, re-organizing the Borough Board of Health.

The Board has continued its routine work with little change in the general plan pursued during the previous year. House-to-house inspections, and a record of the facts in this way learned, have been the regular duty assigned to the assistant sanitary inspector, the record sheets being corrected to show the condition of each premises at each inspection. The facts gathered and recorded by the inspector are examined by the executive officer of the Board, and a memorandum is made of all cases requiring attention.

The ordinary procedure is then as follows: Notice is sent by the clerk to all persons who are found to be violating any of the provisions of the Sanitary Code. Re-inspection is made when the time named in notice has expired, and if the conditions complained of have not been remedied, the case is brought to the attention of the Board at its next meeting.

Cases of an unusual or especially dangerous character are at once referred by the executive officer to the sanitary committee, who proceed with an investigation. Suit is begun, as a rule, only upon the recommendation of this committee. The effort to get rid of leaching privy-vaults has been successful, and not one is now in use in the borough. The principal undertaking of the Board during the past year has been to abolish leaching cesspools. In this endeavor we are making satisfactory progress, there being now only a few such structures within our limits.

There are 808 dwellings in Asbury Park, and more than 700 of them are provided with suitable means for the disposal of waste liquids.

The sewers have performed their duty in a very satisfactory manner, and no difficulty has occurred in connection with them during the year.

Time seems to be showing that with our system, and in this location, no practical objection exists to casting sewage into the sea.

There are one or two features connected with the sewer system in Asbury Park, which may be here briefly referred to. 1st. All of the sewage is strained by passing it through gratings having three-quar-

ter inch openings. This was undertaken to prevent discharge of paper and other material which might be visible and objectionable when it reached the ocean. The gratings are placed on each premises connected with the sewer. In cases where water-closets are used, a catch-basin is inserted in the course of the house-drain, and placed as near the house as is practicable. The trap on the house-drain is placed on the sewer side of the catch-basin, and the grating is placed over outlet from catch-basin. The cover of the catch-basin is hinged and perforated, and serves as the cold air inlet for the soil-pipe. 2d. Automatic mechanical ventilation has been secured for the receiving vault on the beach. This has been accomplished by connecting the twelve-inch discharge-pipe with the top of the vault by a branch. When the gate guarding the outflow of sewage is closed, the sea continually rushes into and flows out of the twelve-inch pipe; and before the branch connecting this pipe with the top of the vault was introduced, a water-hammer was formed against the gate. By venting the twelve-inch pipe a few feet from the gates, the water-hammer was prevented, and by conducting the vent into the receiving vault near its top, a puff of air is sent into the vault by each succeeding wave, and, in turn, a puff is sent out of the ventilator connected with the vault, thus securing continuous stirring of the air in the vault. The streets of the borough have been kept in admirable condition, and, during the past summer the dust nuisance has been overcome by thorough street sprinkling.

The artesian well which was sunk last year in this borough, continues to flow without diminution, and the quality of the water remains unchanged and is excellent.

Another well is now being bored at the corner of Kingsley street and Asbury avenue.

During the past year gas has been introduced into the borough, but it has not yet come into general use.

Garbage is carted away by the public carts, daily during the summer, and twice each week during the winter. Rubbish is also carted away at public expense. Excreta is mainly disposed of by means of the sewers. Licensed scavengers excavate privy-pits when necessary, and cart the night-soil several miles back into the country, where it is composted for use as a fertilizer.

There are no slaughter-houses in the borough.

Livery-stables and fish-markets have proved to be the most objectionable business places with which we have to deal.

No disease has been prevalent in this district during the past year. We have not had a case of typhoid fever, diphtheria or small-pox during the year, and no death from any zymotic disease has occurred. We have found authority in the laws now on the statute books for nearly all measures necessary to effectually carry on the work of health protection, but wish to call attention to two needed additions to the laws now in force. 1st. Provision should be made for the creation of health inspectors and assistant health inspectors, and definite authority should be given local Boards of Health to order inspections of private property. 2d. There should be authority for the making of ordinances which will provide for the ventilation of privies, cesspools and other stationary receptacles for filth.

EATONTOWN. - - - *Report from* E. W. CRATER, M.D.

Water-supply mainly from Shrewsbury river and small branches fed from the ocean, and all subject to tide fluctuations.

Refuse allowed generally to take care of itself. Closets cleaned occasionally, at owner's expense.

Scattering cases of dysentery, intermittent and remittent fevers.

FREEHOLD TOWNSHIP. - *Report from* W. J. MCCLURE, *Sec'y.*

So far as healthfulness is concerned, we have been exempt from contagious diseases; an occasional case of scarlet fever or measles, which has yielded to prompt treatment, and no epidemics have prevailed.

We are without any system of drainage, and recourse is had to cesspools, many of which are improperly constructed and prove to be nuisances; many privy vaults are in like condition, but we hope by due persuasion to have the evils remedied. Some of these cases have been complained of, and, after due notice from the Board and knowledge of the law, the nuisance has been abated.

Our Board had occasion to visit the jail in July, which was found to be in a very unsanitary condition. Notice served upon the county board of freeholders had the desired effect, and the premises have undergone a complete overhauling; the cells and interior have been thoroughly cleansed, painted and white-washed. Our Board is of the opinion that the present accommodations, (there being only one water-closet and one bath-tub) is inadequate for the number of per-

sons in confinement, there being at the time of the visit more than thirty persons, and latterly the number has increased to over fifty.

A large cesspool in the yard in the rear of the jail, receives all the liquid and solid matter, which is conveyed away frequently in a tight box wagon, but from the rapid accumulation it occasionally becomes offensive. There is no ventilation except from the top (man-hole), and the Board has advised the running of a pipe to a point above the jail of sufficient size to carry off the gases.

Another matter which we have not as yet been able to remedy, is the fouling of a water-course which occasionally becomes offensive from accumulations, stagnant water and slops from house drains.

We have not as yet published any ordinances, but before another season expect to take such measures as will insure our town against sickness or anything that may seem objectionable, so far as is possible.

A matter that calls for special attention is the hog-pen nuisance, and we have on hand your printed letter to F. H. Lum, Chatham, which we consider applicable to our case.

LONG BRANCH. - - *Report from* E. B. BLAISDELL, *Sec'y.*

Extra precautionary measures have been taken to put Long Branch in the best sanitary condition possible, in view of the possible visitation of contagious diseases, or the advent of Asiatic cholera in the spring. The Long Branch brook has been cleaned out from its mouth to its source, involving a large expenditure of money. This was a judicious movement, as the brook was obstructed by branches of trees, and in some cases, despite the vigilance of the inspector, had become the dumping-place of much rubbish, vegetable and organic matter.

During the fall $125 was paid to Mr. George Waring, a civil engineer of Newport, R. I., for a report, to be submitted in writing, of a system of sewerage—the thing so long needed by this place. It is hoped before spring it will bear some practical results. If effected it will conduce much to the sanitary condition of Long Branch.

Application has also been made to the city council, who refused any appropriation to the Health Board, to have the main street macadamized, that surface-water may run off and thus prevent the accumulation of debris and mud-holes in the main thoroughfare of the city.

The Board has been untiring in its efforts to abate all nuisances,

and where complaints have been made the sanitary inspector has been diligent in the performance of his duties.

The president, S. H. Hunt, has devoted much time and labor to interest the citizens in the project of sewerage, and many of the non-residents have signified their interest in the movement by organizing a company for the purpose of effecting that which now seems impossible, owing to the opposition to bonding the city or incurring further debts.

MATAWAN TOWNSHIP. - *Report from* BENJ. GRIGGS, *Sec'y.*

There has been erected on the outskirts of the village a soap manufactory, also used for the manufacture of fertilizers from the carcasses of dead horses and other animals, the smell from which has been exceedingly offensive. Complaint was made by persons living in the vicinity, and the Board of Health visited the premises and advised the proprietor to desist the operation, which he promised to do or remedy the evil. Since then complaint has been made before the grand jury of the county, and an indictment as a nuisance obtained, which case is now before the county courts.

There has been more malarial fever in the last six or eight months than we have had for two years past, but mostly in a mild form; otherwise our vicinity has been quite healthy.

OCEAN GROVE. - *Report from* Rev. A. E. BALLARD, *Sec'y.*

The water-supply is still mostly derived from driven wells, and, so far as we can tell, remains uncorrupted. There have been a few cases where it has been suspected that the nearness of cesspools for waste-water has affected injuriously the wells near them. The location of wells or pools in every such instance has been changed.

The water from the artesian well has not diminished in its flow or changed in its purity. It still sends to the surface its fifty gallons each minute. The pipes by which it is conveyed through the Grove were saturated with coal-tar in their preparation and the water tasted of the tar. For this reason it has not been introduced generally. Several of the large hotels and a few of the smaller houses take their culinary and drinking-water from it, and as the tarry taste is disappearing, many more people are expecting to arrange for its use. It is never discolored, has no iron taste, is soft, it is not bad at any season

of the year; its pipes are cleansed by free flushing at suitable intervals and discharging into the sea.

The question of receptacles for water-waste is receiving increased attention. The larger houses have been induced to abandon the cesspools and substitute sewer connections for both pools and privy vaults. But the smaller ones, where there are but few occupants, and are only used during a part of the summer, mostly decline the expense of sewer connections, and the cesspool seems to be the only method left. That the danger of water-pollution from this source is continually increasing is accepted as a fact, and anxious consideration is being given to the subject. Large cemented vaults for the storage of water-waste are costly in construction and embarrassing in discharging, but as yet in the transition from the system where it percolates into the ground from uncemented vaults. There does not appear to be anything better at the present for this class of houses. The true remedy which must eventually be adopted by all, is connecting with the sewer.

There has been a gratifying increase in these connections during the year just past. Ninety-two new places have been added to the list, making altogether at the present time, two hundred and four connections. The extent of pipe already laid is over seven miles. They are cleaned at suitable intervals with water from the lakes forced into them by our steam engine. This grade is regular, on a fall of over twenty feet to one-third of a mile, and at the sea the outlet is both rapid and continuous. Up to this time there has never been any obstruction, and there is no perceptible odor or discoloration of the water for a distance of over three to five feet from its discharge. The taredo worm last fall destroyed the trunk by which the sewage was carried out into the sea, and which had cost us to lay, over four thousand dollars. It has been replaced by a system of galvanized wrought iron pipes bolted to pilings, devised by D. H. Brown, Esq., treasurer, and which appears to work perfectly.

From the pipes through which it is drawn the water from the driven-wells sometimes tastes of iron, and in some cases discolors the tea or coffee made from it.

Except in a small area located in the southern part of the grounds, the cellars are dry. In these exceptional parts they are cemented.

There are now no swamps near to us. The upper part of Fletcher Lake has been excavated to a clear gravel bottom, and its sides filled in with gravel. That portion lying outside, between the turnpike and

railroad, has been filled in from three to five feet in depth with the best material obtained from Elberon, except a few feet, which is now being done under the supervision of the association. The utmost care has been taken to provide for drainage of surface-water into the lake below, and the free flow of the stream above the railway track. Extra large iron pipes have been laid for this purpose and carry all the flow.

The work is pronounced by competent engineers to be of great sanitary value to all the surrounding territory. Upon this property a railroad depot is to be constructed, whose cemented privy vaults will either connect with the Asbury Park sewer, or whose contents will be removed in accordance with the rules of the Board.

The streets have surface-drainage into the sea. The camp grounds are raked over daily and the rubbish carted away.

The parks and other public grounds are frequently subjected to the same process.

The streets are rounded in the center and the surface collections are removed as often as the needs of sanitation or comfort require.

Decaying matter left carelessly upon the ground around dwellings, obstructed cesspools, waste-water thrown upon the surface, rubbish upon vacant lots, garbage missed by collectors, have required incessant oversight, but in no known case have the offensive conditions been allowed to remain.

An official inspection of all the houses in the Grove was made during the past winter, by the secretary and assistants. Defective conditions were remedied by the secretary. The good effects have been felt for the whole of the past summer.

Kerosene is generally used by the people for artificial light, and the streets and shore are lighted with it. Up to this time no serious accident has occurred from its use.

The auditorium uses a gas made from iron combined with chemicals, which has given general satisfaction. A proposition to introduce gas into the Grove through iron mains has been seriously considered.

From about the middle of June to the middle of September the garbage is collected daily, and removed to a distance of over two miles. In the cooler months the removals are made semi-weekly or tri-weekly, as may be needed. Cesspools and privy vaults are cleaned, when necessary, by an excavator at any part of the season, and the contents carried the distance named above and buried. The thick matter which accumulates in these during the season is taken out in

the winter and either composted with muck and lime or buried with the rest.

The sanitary arrangements for tents elsewhere are on the basis of those required of cottages, which demand full provision for water, cesspools and privy vaults.

The houses are all annually inspected with reference to their arrangements for fire, and special attention is given in oversight of the construction of flues while they are building; outside iron fire-escapes are required on all large buildings.

The cemetery is nearly two miles from the Grove, situated upon a high elevation, and the burials are conducted in harmony with the advice of the State Board.

There has been a general compliance with the ordinances of our Board of Health, in the rules and regulations. The general registration and vital statistics are attended to by the officers of the township.

Contagious diseases are reported to the secretary, and a personal quarantine established over them by the secretary in connection with the advice of the attending physician and the regulations of the State Board. There have been four cases of mild scarlatina reported, all of which recovered speedily. Two of typhoid fever, with one death, cause unknown.

The sanitary expenses in sewer outlet, the reconstruction of commodes, the removal of garbage, salary of secretary and policeman, and incidentals, have been large, but have all been met by the Ocean Grove Association, and do not appear on the books of the Board.

In all general matters the secretary has been guided by the published rules of the State Board. In special cases he has endeavored to obtain the advice of its secretary, which has always been freely given.

In the execution of its ordinances the Board has sometimes been compelled to intrude upon privacy and exercise arbitrary power. It has been so sustained by the officers of the Association as to make its work practicable, and in most cases the people have been willing to co-operate with the Board in the arrangements deemed necessary for the public good.

SHREWSBURY TOWNSHIP. - *Report from* RICHARD A. SICKLES.

The water-supply is from wells, and generally good, except in the thickly-settled parts of the township, where in many cases the water

is getting very poor. In the town of Red Bank, containing a population of nearly four thousand, the supply now is entirely from wells, and the water from them is very much contaminated with foreign matter or soakage. The commissioners of the town have made a contract for the erection of water works to supply and be owned by the town. It is to consist of a well fifteen feet in diameter, sixty-four feet deep, to reach the water-bearing sand below the marl, the water to be pumped from the well into a reservoir situated on a hill about one and a half miles distant, the water being forced from the well to the reservoir on the hill by large-sized pumps. The pipes connecting the two are laid. Hydrants for fire and street purposes are stationed at intervals along the main, and connecting pipes to be laid in all the streets in the corporation. The well at the present time is down fifty-six feet, and the water is coming in freely, to the extent of about two hundred thousand gallons per day. Three experimental pipe-wells were sunk to determine the exact depth of the water-bearing sand below the lower marl bed, where the State Geologist was confident an abundant supply of pure water under pressure existed. These experiments prove the correctness of the theory, and at a depth of sixty-three to sixty-seven feet the water rose to within ten feet of the surface. Pumping freely from the pipes showed the supply to be practically inexhaustible. Samples of the water were analyzed by the State Geologist, Prof. G. H. Cook, who reported it pure and soft, unexceptionable for laundry purposes, steam boilers and family use. It is expected that the water works upon the plan adopted will be completed by the beginning of the year.

In all other respects I believe the condition of the township is the same as the report made last year.

MORRIS COUNTY.

CHATHAM TOWNSHIP. - *Report from* I. A. DE HART, M.D.

Complaint was made to this Board of a butcher both as to his slaughter-house and a pig-pen containing twelve pigs, adjoining the slaughter-house, into which all the offal and other refuse was thrown. Notice was served upon him to remove them, and as he did not do so, after waiting a reasonable time the counsel of the Board was instructed to notify him that legal proceedings would be commenced against him at once if he did not comply with the notice sent him.

Numerous other complaints numbering twenty-five have been made to the Board from time to time of overflowing cesspools and privies, foul pig-pens and cisterns. In every case where complaint has been made, an investigation followed by the president and health physician. When nuisance was found to exist, the owner thereof was duly notified to abate said nuisance, and there has been cheerful compliance.

Several cases of scarlet fever occurred early in the summer, from which there were but three deaths. The second week in September a case of diphtheria developed in a child that was visiting one of the families where scarlet fever had previously existed. Four days after the development one of the children of this family was taken ill with it and died with diphtheritic croup. Four other children in the same family also had it, and one of them died after three days' illness. The father has since been very ill with it, but recovered. Three other families, whose children were likewise exposed to the disease by playing with the first child while it had a sore throat, but were not thought ill enough to call a physician, also had the diphtheria. One of these families also had the scarlet fever and lived in the rear of the first family that had diphtheria. There were twelve cases in four families and four deaths. These were all children except one adult, who recovered. Since then there have been three cases, one child and two adults. One of the latter, a lady who assisted in the care of two of the children that died, was taken suddenly ill with diphtheria and died after four days' illness and six days after exposure. The physicians attending these families reported the cases to the Board, and an immediate inspection of all the premises where the disease existed, and also of the adjacent premises, was made by the president and health physician. A bad sanitary condition was found in all the premises. The yard in the year of the residence of the first family attacked, contained two cisterns nearly filled with impure water, and a large privy which received all the waste-water from the sink. This privy overflowed after a heavy rain-fall and ran into an adjoining yard. Both of the cisterns were thorougly cleaned and a new privy vault was built, perfectly water-tight. The owner of the premises would not allow a nuisance to exist on his property at all, if informed of the fact.

The yard of the second family was surrounded by several nuisances, consisting of three privies, all of which required immediate attention; and within six feet of the rear of the house was a pig-pen. The parents said that the stench from the pig-pen was so fearful during the warm

weather that the windows and doors were kept closed, and frequently they were made sick by going out of the back door and inhaling the odor. Nevertheless they endured this after both of their children had scarlet fever, and now both have had diphtheria. Another pig-pen also exists across the street, and directly opposite this house which has just been complained of. The third family had a very foul cistern under the kitchen and a privy within twenty-five feet from the back door. In the rear of the fourth family the yard contained three privies, underneath which were shallow pits to receive the material, and all of them were overflowing. Notices were served on the owners of all the premises inspected to have the nuisances abated immediately and they most cheerfully complied.

Owing to the rapid development of diphtheria, it was thought best to close both the public and Catholic schools for a short period, as many of the children attending the schools were obliged to pass through the infected district in going to and returning from school.

There have been about twenty-five complaints of nuisances made to the Board since June 15th, and all have received due attention and been abated as speedily as possible, except one, which it was thought would require legal proceedings to compel the owner to comply with the ordinance and abate the nuisance; but when he found that the counsel of the Board was about to commence proceedings, he consented to abate it.

Malarial fevers have not prevailed as frequently in our midst during the past spring and summer as formerly, and where they have developed it has been mostly in persons who have previously been afflicted with them. Owing to our high altitude we should be entirely free from malaria. The supply of good water for culinary and drinking purposes in the township of Chatham, and especially in the village of Madison, is very deficient.

There are but few wells, and many families depend upon unfiltered cistern-water, while some have cisterns with a filtering apparatus. There are numerous springs in some parts of the township, and especially in the village of Madison.

Many houses have no sewers or cesspools, but allow the waste-water to run into the garden or street gutters by means of small drain-pipe. A few have cemented cesspools, which are emptied by means of pumps, while others have cesspools with cemented bottoms and sides laid with alternate layers of brick, thus allowing their contents to be absorbed

by the earth. An odorless apparatus has been in use in an adjoining town for the past year, and has been used in our village for emptying cesspools with very good results.

There are two large cemeteries in our township, Hillside and Catholic, and a small cemetery where a few families bury.

Our secretary, who is township assessor, keeps a record of vital statistics.

During the prevalence of diphtheria the laws of 1883, relating to public funerals of those who die with contagious diseases, were published in our weekly paper so that all might be informed of their existence.

HANOVER TOWNSHIP. - *Report from* G. A. BECKER, M.D.

There have been a few mild cases of scarlatina, with one fatal case, during this year. Malarial diseases have been on an increase, due, probably, to the wet season followed by the drouth. The southern portion of the township is low meadow land, and after heavy rains or protracted wet spells is nearly all under water, and then, when a hot, dry spell succeeds the wet spell, there is a great deal of decomposing vegetable matter.

PEQUANNOCK TOWNSHIP. - *Report from* E. W. MARTIN, *Sec'y.*

There has been no contagious disease among us. The subject of vaccination has been attended to.

WASHINGTON TOWNSHIP. - *Report from* E. C. WILLET, *Sec'y.*

The supply of water in this township is mostly springs, and the drainage of the township as a general thing is natural.

We have but one slaughter-house in the township. There has been no complaint against it. It is kept in better condition than formerly.

Our school-houses through the township are in good order and well ventilated.

There has been no prevailing epidemic this year. Malaria we have had to some extent; some few cases of dysentery; pneumonia, but few cases.

MORRISTOWN. - - *Report from* CHAS. H. GREEN, *Clerk.*

Our water-supply is from springs; furnished by the Morris Aqueduct Company. Streets are kept very clean and in good order; the principal streets are macadamized. Cesspool system. No sewers.

Refuse is deposited on public dumping ground, buried in trenches.

Two burying grounds in city, but seldom used; two cemeteries out of city limits.

Quarantine when necessary, and contagious diseases looked after by health physician. Expenses about eight hundred dollars.

OCEAN COUNTY.

LACEY TOWNSHIP. - *Report from* FRANKLIN MATHEWS, *Sec'y.*

Well-water is used. Cellars wet, contain water often. No malaria. Two school-houses, in good condition. Vaccination not well kept up. Pneumonia and typhoid fever.

PASSAIC COUNTY.

MANCHESTER TOWNSHIP. *Report from* JOHN H. VAN HOUTEN.

No sewers in the township. Cesspools, where used, are generally with open bottoms and sides, and are emptied by having contents taken out by buckets. If slops and water, these leach through the ground, and then, what remains, is shoveled out and taken to the manure or compost heap.

CITY OF PASSAIC. - - *Report from* F. H. RICE, M.D.

The health of the city has been unusually good for the past year. No epidemic or prevalent disease has invaded the city. Malaria decreases year by year. The old arrangements for the water-closets still prevail, but are growing less popular. The water-supply comes from the Passaic river, but for drinking purposes cisterns and driven wells are mostly used. The Board have called the attention of the city council to the necessity of having a system of sewerage at once. They have taken initiatory steps to secure the same. So, by another year, we hope to have the city sewered, or some part of it at least.

PATERSON. - - *Report from* WILLIAM K. NEWTON, M. D.

In our report for the year ending October 1st, 1883, we outlined the facts relating to items A, B, C, D, H, K, R, S, T and U in the schedule.

Under water-supply we would add to last year's report by stating that we have availed ourselves of the provisions of the supplementary health law of 1884, and have passed an ordinance relating to the water-supply. Each well in the city is being examined, and the water thereof analyzed by the health officer. Eleven public and three private wells have been ordered closed or unused.

One mile of new sewers has been completed this year. Under authority given by the Board of Aldermen, we have ordered three hundred and forty-eight houses connected with the public sewers, where such connections did not exist.

A form for the sanitary survey of a house has been prepared, and we shall be able to report in a year after the statistics shall have been tabulated.

We have made but little headway in methods of disposing of house-waste. Two odorless companies now do all the work of removing night soil, all other methods being prohibited.

A thorough inspection of our schools is to be made this winter.

The system outlined in our last report has been followed out to our satisfaction. During the year embraced in this report five hundred and forty-seven nuisances have been abated. Prosecutions before the recorder have been rare, and penalties not to exceed forty dollars in all have been imposed.

The clerk of the board of aldermen is, by virtue of his office, register of vital statistics, and not being a physician, and taking no interest in the subjects, vital facts of great value are not used. The board of aldermen has been petitioned to assign this work to this Board, but for political reasons have so far refused to act. In the meantime figures of extreme value to us in the study of the sanitary condition of the city go for naught. We hope for a change in the future.

The plan noted in the report for 1883 has been followed out with partial success. The following cases of contagious diseases have been under our care:

DIPHTHERIA.

	Cases.	Deaths.
1883. October	9	5
November	12	6
December	15	6
1884. January	24	6
February	8	2
March	11	3
April	9	–
May	2	–
June	1	–
July	2	–
August	2	1
September	3	–
Total	98	29

Percentage of deaths to cases, 29.59 per cent.

SCARLET FEVER.

	Cases.	Deaths.
1883. October	41	6
November	69	9
December	73	7
1884. January	58	4
February	22	5
March	45	3
April	15	2
May	37	3
June	34	–
July	40	6
August	26	2
September	18	1
Total	478	48

Percentage of deaths to cases, 10.04 per cent.

No cases of small-pox are noted. It is conceded that the reports of cases of diphtheria and scarlet fever are pretty full, very few cases escaping notice.

The city government appropriated three thousand six hundred dollars for the uses of this Board for the fiscal year ending March 20th, 1885.

WAYNE TOWNSHIP. - *Report from* RICHARD J. BANTA, *Sec'y.*

The drainage of lands in the western part of the township is needed very badly, and the people begin to see the advantage they would derive from it. Some have already commenced, and I think others will follow.

SALEM COUNTY.

LOWER ALLOWAYS CREEK. *Report from* W. WINFIELD PATRICK.

Dysentery and malarial diseases have been prevalent, also measles and mumps.

The losses of animals have been small, and have had no contagious diseases.

LOWER PENNS NECK. - - *Report from* SAMUEL LECROY.

No disease of animals except a few cattle that have died in the meadows a few weeks ago.

We have had this year typhoid fever, some malaria, fever and ague.

QUINTON TOWNSHIP. - - - *Report from* G. A. AYARS.

Public health laws and regulations receive careful attention from Dr. A. G. McPherson, member of local Board of Health.

Sanitary expenses, total up to date, $16.

No special diseases, but all slightly tinctured with malaria.

CITY OF SALEM. - - *Report from* WILLIAM T. HILLIARD.

In presenting this our second annual report, we feel there is cause for congratulation that the health of our city has been generally good; no epidemic or contagious disease having prevailed to any considerable extent during the year.

As stated in our last report the public water-supply is from Laurel run. The works are owned and conducted by the city, the water being conveyed through cast-iron pipes a distance of three and a half or four miles. The quality of the water continues to be unsatisfactory, so that it is used for drinking and culinary purposes only to a very limited extent, except in winter. The water of the run when it enters the pond is pure and the quality good, but the bottom of the pond being swamp, mud or turf, causes a considerable discoloration of the water, and imparts to it a disagreeable taste. It has been introduced into about two hundred and five premises. The water of our wells, as previously mentioned, is quite hard, with a slightly unpleasant taste to those unaccustomed to it, but is believed to be entirely

wholesome. One of the ordinances which the Board have under consideration, restricts the placing of privies too near wells, though in most cases the depth of the lots has allowed of their being placed at a safe distance.

The excessive rains of last February and March caused many cellars to have water in them which had been exempt for more than twenty years, it being an unusual circumstance, since our streets were graded and the gutters paved, for our citizens to be thus inconvenienced. The bank meadows, which are contiguous to the city, are well drained, and malarial diseases have not, it is believed, been more frequent here than in other places. We have no public sewers, except two short ones to convey the gutter water across the street, and a short distance away. One of these claimed our attention during the summer, but has since been repaired and partially rebuilt under the direction of a committee of the city council.

As intimated above, the city is without any regular system of public sewers, but private sewers or drain pipes are in many cases used to convey the contents of indoor water-closets and kitchen slops to reservoirs or cesspools, which have heretofore been constructed in no particular or prescribed manner, and but very seldom with cemented bottom and sides. This is another subject concerning which an ordinance is now pending. It might be mentioned that the two creameries located in the city, where ice cream is largely manufactured, in order to avoid annoyance to the public, convey their waste-water in underground pipes a considerable distance.

The condition of the slaughter-houses, and what disposition to make of them, has claimed much of our attention, particularly during the summer months. The owners have exercised increased care in regard to them since this Board has had them under its supervision, but it seems to have become almost a positive fact that the health and comfort of those living in their neighborhood demand that they should be removed outside of the city limits. Some recommend their being located on the creek, so the blood and offal which are now consumed and manipulated by swine, might be discharged into it; but, it being a tide-water stream, the animal matter so emptied into it might, by the action of the tide, be prevented for some time from passing very far down the stream, and so become a cause of annoyance.

No new manufactories have been built which would be likely to

affect the public health. The four canning factories are all located near the creek, so their refuse can be discharged into it, which has been done with one exception, and in that case this Board have notified the owners of the necessity of making a change before another canning season.

We have had under our consideration a code of ordinances relating to the public health. Our city not being compactly built, and containing only between five and six thousand inhabitants, requires fewer ordinances of this character than larger and more populous cities; but we feel the importance of having certain regulations on this subject.

In our last report it was mentioned the board of chosen freeholders were considering the expediency of building a pest-house for the accommodation of persons afflicted with contagious diseases, but we regret to say the opposition to it was so great in some quarters, it was given up. Though we have had no cases of smallpox during the year, yet our past experience induces the belief that something of the kind would be very useful.

SOMERSET COUNTY.

BEDMINSTER TWP. *Report from* WM. P. SUTPHEN, M.D., *Sec'y.*

The Board of Health of Bedminster township are happy in saying that it has no especial matter to report. Whether from an especial favor from the Giver of all Good, or from reasons in which this Board may have been in part instrumental, we can say that we have passed through a year of unusual good health.

No contagious diseases have visited us, and malaria, though existing, has not assumed a general character, and has confined itself to places where it had cause to come. Prompt action by the physician of the Board (and our people are becoming more attentive), has had favorable results in almost every instance. The water-supply of the township is by wells and springs.

BERNARD TOWNSHIP. - *Report from* W. PENNINGTON, M.D.

Malaria exists two miles below, in the Morris county plains (alias Swamp), but has no effect on health of the villages, and only seems to occasion chills and kindred diseases there when the Passaic is low or after a heavy freshet.

Streets are kept clean, with the exception of some few individuals whose pleasure it is to heap their garbage in the public street, which seems to be only disagreeable to the eye and good taste, but not prejudicial to health.

The houses, for the most part, have cellars, which are used for vegetable storage. Houses are generally occupied by single families.

The public health laws are not kindly considered as of much account by the township officers. In fact, the only party who would endeavor to give you a statement of the township condition is my humble self.

We have had sporadic cases of diphtheria, pneumonia, rheumatism, typhoid fever, &c., but no epidemics.

BRIDGEWATER TOWNSHIP. - *Report from* WM. S. POTTER, *Sec'y.*

There has been no disease prevailing as an epidemic or endemic during the past year. A few sporadic cases of diphtheria only have occurred.

Slaughter-houses have claimed and received considerable attention from the Board. In one case the Board ordered the cessation of slaughtering, and compelled the party to remove to the suburbs. In other cases disinfectants were ordered used, and the parties compelled to keep them in a cleanly condition, so as not to be a nuisance, detrimental to health.

All nuisances of this character have been closely watched and immediately abated whenever they came to the knowledge of the Board. (This Board has recently printed a valuable circular for households, which can be had on application.)

HILLSBOROUGH TOWNSHIP. *Report from* W. H. MERRELL, M.D.

Slaughter-houses are managed fairly well.

Most of the cemeteries are by the church-yards. These have not been located with regard to sanitary principles.

The care over contagious diseases is in the physician's charge; vaccination likewise. This is neglected until there comes a case of varioloid, and then a rush comes.

Just now I am having under treatment a family of whom three of the four members are having typhoid fever. The entire water-supply is obtained from the cellar. Here is a spring of lasting water. The

water does not seem to be very bad, but in rainy times it overflows the entire cellar, and this is filled a foot or two for days and weeks. It has not been overflown now for four months, but there is a stench which salutes one boldly upon entering. The privy is up the elevation from the spring, but I have not learned that the water is contaminated. Further investigations will show.

SUSSEX COUNTY.

BYRAM TOWNSHIP. - - *Report from* JOSEPH MCMICKLE.

Drainage and sewerage on property in the village of Stanhope is not decided yet. At the last annual assessment of taxes for all purposes I was ordered to assess $1,000 for drainage and sewerage.

MONTAGUE TOWNSHIP. - *Report from* GEORGE N. COLE.

We have but one slaughter-house in our township, and our attention was called to it by some neighbors saying it was a nuisance. The Board met and made a thorough investigation of said house and examination of the grounds and surroundings, and came to the final conclusion that there was nothing there to constitute a nuisance. Therefore, the said Board proceeded to issue a permit to Peter D. Warner, a lessee, to continue the butchering business in the same place, for no specified time, the Board reserving the right to revoke said permit at any time when, in the judgment of the Board, there was anything to warrant their action.

In relation to vital statistics the reports have been regular from all the practicing physicians in our locality, as well as from other sources.

STILLWATER TOWNSHIP. - *Report from* C. V. MOORE, M.D.

Almost every house in the township has a cellar under it, in which vegetables are stored for the winter. The cellars of many houses are damp from springs, and in many cases water is conducted into cellars and collected in vats for cooling of milk and butter, the farmers thus rendering the rooms of the house damp and, in my judgment, rendering the house unhealthy. More than once, I am satisfied, cases of diphtheria have had their origin from this cause.

The water-supply of this township is mainly from wells and springs, and a few persons or families depend upon cistern-water for drinking purposes.

WALPACK TOWNSHIP. - - *Report from* FRANK BEERS.

A few instances were reported where it was necessary for our Board to recommend the removal of buildings which we believed would prove detrimental to health. In every case these instructions were complied with.

There is some malaria, confined mostly to the northern part of the township. No epidemics of any kind.

UNION COUNTY.

CRANFORD TOWNSHIP. - *Report from* EDWARD S. CRANE, *Sec'y.*

Township unusually healthy. The prevalent disease, diphtheria. Twenty cases seemed caused by use of addition to school-house two days after finishing plastering, of which only one case proved fatal up to date. One trustee of school being away, and the other two differing in opinion, the Board of Health ordered the school closed for one week, and the addition vacated for one month and thoroughly ventilated. Fires were kept in them day and night.

ELIZABETH CITY. - - - *Report from* A. R. REEVE.

Public water supplied from the sources of the Elizabeth river, principally surface-water and spring, by Elizabeth Water Company; quite a number of private wells, also.

There are thirty-seven miles of sewers, brick and pipe, which empty partly into the Newark bay and Staten Island sound, and partly into the Elizabeth river, the latter being, however, considered only a temporary outlet.

No contagious diseases except scarlet fever and diphtheria.

The only deaths of animals of importance was in the case of the horses of the Elizabeth Ice Company, in which stables over twenty-five horses were stricken with typhoid pneumonia within the month of October, eight of which proved fatal. The cause was believed to be a polluted well within the stable, and improper drainage.

No fire-guard or escape known in the city. Ten fire companies; six steamers, furnished with jumpers, tenders, &c.; two hook and ladder companies, &c.

Board of Health organized under the recent State laws, and a sanitary code adopted and enforced. Eight thousand dollars provided by city council.

FANWOOD TOWNSHIP. - *Report from* F. W. WESTCOTT.

I know of but one case of disease of animals, which was immediately reported to Trenton. It resulted in a loss of seventy-five hogs. I am happy to say that by care the disease did not spread, and has entirely disappeared.

Slaughter-houses have ceased to be a nuisance during the past year, being conducted in a cleanly manner.

Births, deaths and marriages are reported by those in charge, and in case of births when no physician is present the report is made by the assessor, due pains being taken to report every case.

Due care over contagious diseases is taken by the Board of Health, all cases being immediately reported first to local Boards, and then if necessary to the State Board.

We have no prevalent disease to report. The past year has been a remarkably healthy one. Especialy we are happy to report the decline of malaria. A very few cases, not sufficient to say prevalent, have been known in the township. Two or three cases of scarlet fever have been reported and these of a mild type, and we have very free from all kinds of bowel trouble. Vaccination has received due attention. A list of those unvaccinated is furnished the Board each year, and at this date only three are reported in our limits as unwilling to yield to vaccination.

LINDEN TOWNSHIP. - *Report from* JOHN A. ETHERIDGE.

The commissioners of the borough of Linden have organized a Board of Health for their district and have made some improvements in regard to drains, &c., and will endeavor to look after the health laws.

The health of Linden township has been good the past year. Some cases of malaria, but not as bad as past two years.

Altogether, our township is improving, and the inhabitants now find the benefits derived from the health laws.

CITY OF PLAINFIELD. - - *Report from* O. B. LEONARD.

The source of water-supply is exclusively from wells, either dug, driven or drilled. The quality of the water is excellently pure and in never-failing abundance. The average level of this subterranean supply is about sixteen feet below the general surface of the ground.

There is no established system of sewers, and the house refuse is discharged into private cesspools, built with open bottoms and loosely stoned sides. They are emptied at the discretion of the owners or tenants, and at very irregular intervals. Outdoor privy vaults are numerous, and do not get that careful attention which is necessary for the best sanitary condition of the localities in which they are situated.

SPRINGFIELD TOWNSHIP. - - *Report from* W. B. STILES.

Open ditches are mostly used. Some under-draining is being done on heavy clay soil. In the majority of cases it is possible to have dry cellars. There is a belt of low land of a swampy nature which ought to be reclaimed. This could be accomplished by lowering the bed of the river and then by ditching.

SUMMIT TOWNSHIP. - - *Report from* D. M. SMYTHE, *Sec'y.*

We are gradually correcting health abuses that may exist, more by persuasion than force, and our good work is both seen and appreciated.

WARREN COUNTY.

FRELINGHUYSEN TOWNSHIP. - *Report from* F. RORBACH, M.D.

The year ending with the 1st inst. has been characterized by a greater amount of sickness and mortality than for several previous years, owing, I think, to the singularly irregular atmospheric conditions. The mortality, however, has been mostly confined to the aged and chronic cases. The epidemic of scarlatina reported last year as prevalent during the spring and summer, continued until about December 1st, but the majority of the cases were of mild type, and out of the whole number (sixty-four) but three were fatal, one from the fever and two from albuminuria, &c. During the winter and spring, acute pneumonitis, pleuritis and pleuro-pneumonia prevailed to an unusual extent, but all yielded to treatment. Typhoid complications

were less frequent than usual. Sporadic cases of measles and röthelen were met with, but not any of diphtheria. The latter, as also malarial diseases, which up to three years ago were so prevalent here, have become comparatively infrequent, owing to greatly improved hygienic conditions. Commencing about the 1st of August and still continuing, though rapidly abating, we have been visited by an epidemic of gastro-intestinal diseases—cholera-infantum and entero-colitis in children, and cholera-morbus, enteritis and mild dysentery in adults.

During the past three or four years much improvement has been made in the surroundings of dwellings as to cleanliness, drainage, &c., so that malaria, diphtheria and typhoid diseases, once so rife, have become exceptional.

GREENWICH TOWNSHIP. - *Report from* WM. SHERRER, *Sec'y.*

Drink water from cisterns and springs and a few wells. The wells are mostly hard water. Our streams come from the mountain springs, the water used for watering stock. No sewage supply above source.

No drainage; cellars dry; no swamps; malarial fever prevalent.

Houses, without exception, have cellars, and largely used for storage of vegetables. Very seldom more than one family in a house.

Intermittent fever prevalent. No inquiry as to loss of animals nor as to contagious diseases.

Slaughter-houses not inspected.

HARMONY TOWNSHIP. - *Report from* J. D. DEWITT, M.D.

Vaccination is not properly attended to. Many families do it themselves, obtaining the lymph from neighbors, regardless of the hereditary tendencies. The trustees of the school districts do not require a scholar to be vaccinated as a condition of admittance.

Scarlet fever has prevailed, in a mild form, during the whole year. Many children remained out of school only a few days.

From April to July we had whooping-cough and measles prevailing; also we have had a few isolated cases of dysentery, typhoid and malarial fevers, and one death from typhoid fever.

Hog cholera has prevailed somewhat extensively.

KNOWLTON TOWNSHIP. - *Report from* MARSHALL COOL, *Sec'y.*

The general health of the township has been very good. In July there was a number of cases of dysentery in the village of Delaware.

The village is located in a valley, quite low. The inhabitants use, principally, well-water, heavy showers passing over that section of country flooding the surface of the valley and settling in the wells. This was supposed to make the water impure. This caused a greater number of cases of dysentery, of which several proved fatal. We had but two cases of typhoid fever prove fatal.

LOPATCONG TOWNSHIP. *Report from* JEREMIAH YEISLEY, *Sec'y.*

The general topography, drainage and other facts relating to the general outlines of the township have been given in former reports, and nothing new has happened relating to these facts. The water-supply is pure, and all sanitary arrangements are kept up to the required standard, and there has not been any complaint made to the Board on account of violations of the laws of health.

No prevalent diseases have occurred among the people of the township, and only one case which was remarkable, namely, the family of Patrick Kelegher, who lost four children by a disease called the bloody dysentery; otherwise the general health has been good, and the number of deaths have been twelve less than last year. There has been a disease prevalent among the hogs in the township, which I think has prevailed in the western part of the State. It has taken about one-third of the hog stock of the township, but the disease is now about abated.

OXFORD TOWNSHIP. *Report from* L. B. HOAGLAND, M.D., *Sec'y.*

Have had a few (perhaps fifteen or twenty) cases of diphtheria in a mild form, with one or two deaths. Malarial fever is at all times prevalent among us. In fact, almost every disease met with takes on the intermittent type.

POHATCONG TOWNSHIP. - *Report from* S. W. WIEDER, *Sec'y.*

The public health has been good. Malaria has been very limited the past season. People are generally careful about any decaying vegetables, or anything that will create any nuisance.

During the season I was called to inspect some calves, pronounced by a veterinarian to have pneumonia. Five died, but I think it must have been some other disease. About midsummer a disease started among the swine in the western portion of the township. It first

appearance in a field where hogs were put to pasture in stubbles and left there to get along the best they could. They did not have any fresh water, but drank from pools that stood on the ground. The disease still exists in Hunterdon and Warren counties. In this township the loss is from $2,500 to $3,000 this season, many farmers losing all their hogs. Those that have had the disease are worthless. Several farmers have killed and buried those that have had it. All known remedies have been of but little value.

WASHINGTON TOWNSHIP. - *Report from* F. M. COOK, M.D.

Cesspools are the usual termination of drainage-pipes, and are not, as a rule, cemented. As a general thing, an old barrel, sunken in the ground, or a hole filled with stones and covered with dirt, answers as the receptacle for all the kitchen drainage.

The houses have cellars, which are very often used for storing vegetables during the winter.

Hog cholera, for the last two months, has been epidemic.

This year has been remarkably healthy. During the early part of last spring scarlet fever prevailed in a very mild form, and, after that, an epidemic of measles.

REPORT OF THE COMMITTEE OF ANALYSTS TO THE STATE BOARD OF HEALTH.

INTRODUCTORY REPORT, BY PROF. ALBERT R. LEEDS, PH.D., CHAIRMAN.

Owing to the extremely restricted means which were placed at its disposal, this committee has been able to do but a small portion of the work which it could have done with great advantage to the public interest of the State and the health of its inhabitants. For, besides being charged with carrying into effect the provisions of the general law relating to the adulteration of food, drink and drugs, its time and energies have also been largely devoted to the inspection of kerosene and the restriction of the sale of dangerous oils throughout the State. With reference to certain articles of food, the committee has, as yet, done nothing. Most important of these articles is the air we breathe, which, on account of the development of manufacturing industries, accompanied by the production of vile and poisonous gases, has become, in many localities, polluted to such a degree as to render it offensive to the senses and dangerous to the health of the inhabitants therein. In England, where similar nuisances have arisen, the government has enforced their abatement by requiring the manufactories to be carried on under suitable sanitary restrictions.

WATER-SUPPLY.—Next in importance to air, as an article of food, is water. It is gratifying to record that in no State has a greater amount of attention been paid to this vital subject than in New Jersey. Suits instituted at common law in this State have resulted repeatedly in the verdict that persons that have polluted, by sewage and other ways, the waters of streams, have been guilty of maintaining a common nuisance, and that the right obtained by charter, usage or otherwise, of employing the water of a stream for

manufacturing or other uses, confers no right whatsoever, under the common law, to abuse it. The same intent is strongly manifest in certain specific legislation upon this point. The contrary doctrine, that rivers can, in any instance, be employed as sewers, if the convenience or profit of those living on their banks so dictate, is a doctrine so fraught with evils of untold magnitude, that no exertion should be spared to oppose it, both in writing and in action. The most notable instance of the good results thereby obtained, is that presented in the case of the lower Passaic river, which is used as the water-supply of both Newark and Jersey City. In September, 1881, the contamination of this stream became so alarming that the Newark Aqueduct Board and the Jersey City Board of Public Works appointed a joint Board of Pollution of the Passaic River and its Tributaries, whose business it should be to examine into and restrict this growing evil. As the result of the labors of this Board, every source of contamination has been diligently inquired into and a strict surveillance maintained. The co-operation of a large number of manufacturers, residents, and even of communities, sewering into the river, who were at first lukewarm or opposed, has been secured. At the time of writing, the fruit of these labors is shown by the much-improved and pure condition of the water. This statement being founded not upon opinion, but upon the evidence presented by the chemical analysis of the drinking-water of these two cities, such analysis having been made on the first of each month for several years past. The great obstacle to the completion of the work thus happily begun by the joint Board of Pollution, has hitherto been the sewage of the city of Newark, this being carried by the reflux movement of the tide up the Passaic river, beyond the intakes of the Jersey City pumping station. To obviate this difficulty, both cities endeavored to obtain the passage, by the Legislature, of a bill authorizing the construction of a tidal dam. But this bill failed of passage, on account of its possible injury to the navigation of the stream. A much better plan, however, has recently been adopted by the city of Newark, which is to construct a system of sewerage that will enable it, after draining from different quarters to a common reservoir at a lower level, to pump its sewage and carry it out into Newark bay, beyond the influence of the tide. This earnest on the part of the city of Newark to do all that lies within its power of taking care of its own sewage, will, no doubt, urge the committees farther up the river to put into execution suitable plans for doing

likewise. They have already the experience of more than a quarter of a century in England, and are able to adopt, without the costly experience of disastrous failures, methods which have been tried and proven successful, of disposing of the sewage of towns much larger than any situated on the Passaic above Newark. If these steps are taken there is no reason why the water-supplies of Jersey City and Newark, without abandoning their costly pumping stations, may not soon become again as clear, attractive and wholesome as the water-supplies of Brooklyn, Rochester and other favorite cities.

It is important, before leaving this subject, to note that disastrous troubles may arise in connection with the water-supplies of communities, entirely apart from sewage or any artificial contamination. During the course of the year just passed, the city of Hoboken has been afflicted in this manner. In the month of July its water-supply, drawn from the river Passaic in its upper portion, at a point where no sewage had entered it, suddenly became very unpleasant to taste and smell. Inquiry revealed the fact that the unpotable condition of the water was due entirely to natural causes: the vegetable and other organic matters carried into solution in the water during a prolonged period of summer drouth, being greater in quantity than could be satisfactorily disposed of by the regenerative agencies naturally at work in the waters of a flowing stream. On being pumped into the reservoir at Hoboken, an enormous development of oscillariæ and similar plant-growths which find a congenial habitat in non-aerated waters surcharged with vegetable matter, immediately took place. No time was lost in applying the remedy indicated by the nature of the difficulty, and the water was rendered, and has since remained, sparkling in appearance, and excellent, both as regards taste and smell.

Great assistance has been rendered during the past two years in the way of obtaining accurate statistics relating to the amount and distribution of potable water-supplies throughout the State, by the State Board of Water Commissioners. On the basis of the topographical surveys, executed by the State Geologist, this Board has prepared hydrographic maps, which have rarely been equalled in perfection and thoroughness of execution. These maps are intended to show the relations existing between the natural distribution of the State water-supply in its various hydrographic basins, to the artificial requirements of the water-supplies of the communities now and in the future,

possibly existant in these various basins. This much-needed work is the first of its kind, so far as I am aware, which has been executed within the United States. The example will be extensively copied, and will supply a solid foundation for the future scientific discussion of the vital problem of pure water-supply.

WELLS.—Allied to this work has been that of investigating the water-bearing strata in a number of places, to discover whether they are adequate to supply the needs of local communities. The results obtained have been of a most gratifying character, and will give a great impetus to inquiries of this nature, inasmuch as large communities, like that of Princeton and Brick Church, have thus obtained supplies of potable water far in excess of their present wants.

On the other hand, the last year has supplied additional testimony, already unhappily very large, of the morbific nature of the water in the surface wells located within city precincts or in contiguity to dwelling-houses in town and country. The inspectors of numerous Boards of Health have utilized the services of this committee by sending a large number of samples of well-water to be analyzed. In very many instances the analyses have demonstrated the poisonous character of the samples, and the wells have been accordingly closed by the orders of the local Boards. Of the many instances, one may be more particularly cited of a well located in the immediate vicinity of a cemetery, and which proved on analysis to be most dangerously polluted, and yet was being used by the children of an adjacent schoolhouse. The Committee of Analysts regards the inspection and condemnation of contaminated surface wells as a work of pressing and vital importance. The inspectors of local Boards are requested to make a searching inquiry into all such suspected cases within their jurisdiction. In localities where local Boards exist, the cost of such analyses, which is but little greater than the actual expenses of conducting the same, should be paid by the local Boards. In other instances, the expenses will be defrayed out of the funds appropriated by the State for the enforcement of the general law relating to the adulteration of food. The cost to any local Board of such sanitary water-analysis is about ten dollars for a single analysis, and for a number of analyses performed at any one time such a reduced sum as will comport with the magnitude of the work and the extent of the services rendered.

MILK.—The good results attendant upon the enforcement of the "Act to prevent the adulteration and to regulate the sale of milk," are growing more and more apparent. In those cities where a violation of the provisions of this act has been followed by immediate prosecution and punishment at the hands of the proper officer of the law, the diminution in the amount of adulterated milk offered for sale has been very rapid; and out of a given number of samples inspected, the percentage of those which have been reported by the Inspector, and proven on analysis, to be adulterated, has diminished from month to month until, in some communities, the finding of a sample of adulterated milk has ceased to be a common occurrence. So far as the committee is aware, no sample of milk has been condemned or fine imposed, under the provisions the act, which was not justified by the amplest and most convincing proof of the fact of adulteration. The more analyses are multiplied in this and in neighboring States, the more convincingly has it been demonstrated that the standard of twelve per cent. for the total solids in milk is a just one, and one which inclines towards leniency rather than the reverse, favoring the producer rather than the consumer, and making a most ample allowance for every possible variation properly due to the influence of season, feeding and breed upon healthy cows. To debase this standard below twelve per cent. would be to legalize the traffic in watered milk. Happily these views, in consequence of the beneficial operation of the law, are upheld in most portions of the State, and in those in which a prejudice against the milk law still exists, signs of the growth of a more favorable sentiment are becoming apparent.

The importance of this subject becomes still more apparent in relation to the vital problem of artificial infant feeding. In the report of the State Board of Health for 1882, the results of an inquiry into the nature of and results obtained by all the various articles of infant food at that time in the market, is given at length. The final conclusion arrived at was, that no artificial food could obviate the necessity for the use of cow's milk as being the most available, and practically the best substitute for woman's milk in the nutrition of infants. Subsequent research has confirmed the justice of the proposition therein maintained. A very extended inquiry and comparison with other methods has shown that Ritthausen's method, an outline of which is detailed in the report for 1883, is a rigidly accurate one for the analysis of milk, and this method was followed in the comparative

analysis of a large number of samples of cow's and woman's milk. The most important result is contained in the following table:

ANALYSES OF EIGHTY SAMPLES OF WOMAN'S MILK.

	Average.	Minimum.	Maximum.
I. Specific gravity	1.0313	1.026	1.0353
II. Albuminoids	1.995	0.85	4.86
III. Sugar	6.936	5.40	7.92
IV. Fat	4.131	2.11	6.89
V. Solids not fat	9.137	6.57	12.09
VI. Ash	0.201	0.13	0.37
VII. Total solids (by addition of constituents)	13.268	10.92	16.79
VIII. Total solids (directly by evaporation)	13.267	10.91	16.66
IX. Difference between VII. and VIII	0.001	0.00	0.21
X. Water	86.732	83.21	89.08

This extended series of eighty analyses confirm the statements made in the earlier report (that on infant foods), that the albuminoids are the most variable constituent of woman's milk, while the fat is next most variable, and the sugar the least. But they likewise show that *the average amount of albuminoids* in woman's milk may be regarded without sensible error, as *two per cent.*

The practical outcome and object of these researches has been to establish the relation existing between the constituents of cow's and human milk, both as their percentage composition and as to their physiological nature and value in infant nutrition. This being established, it becomes possible for the physician to write out a prescription and formula whereby the composition of cow's milk may be so modified that it becomes in composition and properties a substitute for human milk, and whereby it may be used as such in the feeding of infants. Evidently, however, in order that this prescription may be of value, it is necessary that the cow's milk shall not have been tampered with before being brought into market, but that it shall represent what the prescription calls for, which is whole milk.

BUTTER AND OLEOMARGARINE.—As preliminary to the inspection and condemnation of substitutes for butter, sold otherwise than under their real names, the methods of analysis of these articles have received careful study by the committee, and a very valuable inquiry into these

methods has been made by Professor Cornwall, and will be found later on in the report. It is gratifying to learn that the detection of adulterations of butter has reached the stage of precision and certainty, so that when steps are taken to restrict the illicit sale of such sophisticated articles, the analyst will not be hampered by the raising of doubts as to the validity of the proof presented by him in court.

KEROSENE.—The influence of the repressive legislation against the sale of dangerous illuminating oils has been very great, and in those portions of the State where regular inspection has been maintained, has resulted in driving those grades of kerosene flashing notably below 100° Fahrenheit, the standard prescribed by law, out of the market. When the law regulating the sale of illuminating oils went into effect in July, 1883, the retail dealers in Essex and Hudson counties generally sold two qualities of oil—the "amber oil," having a flashing-point varying from 85° to 92°, and the "white or astral oil," having a flashing-point varying from 96° to 102°. During the past year, in which I have had the assistance of Inspector Dr. T. B. Stillman, 130 samples of kerosene have been inspected and tested in these counties. Of these, 40 were amber and 90 white oil. The flashing-point of the former varied between 88° and 94°, with an average of about 92°. Of the 90 samples of white oil, 10 were over 100° flash-test, the highest being 106°, and the others varying between 101° and 102°. Sixty samples of the white oil fell just below 100°, their flash tests averaging 99°. These sixty samples had been bought by the retail dealers as being in most cases 103° flash-test, and were supposed by them to be in accordance with the provisions of the law. Twenty samples of white oil flashed between 94° and 98°, with an average flash-test of 96.5°.

Of the amber oil, 40 samples were inspected, flashing between 88° and 94°. But, as remarked above, this grade of oil has ceased to be sold where the retailer has been notified of the provisions of the law, and is now seldom met with except in localities where as yet a system of inspection has not been instituted. By inspection of such kerosene as was not sold under the name of "head-light oil," Mr. Wallace obtained 20 samples, all of which flashed between 90° and 95°. Seven samples of kerosene sent to Dr. Newton to be tested, proved to be in conformity with the State standard. The latter gentleman calls attention in his report to the dangers attendant upon the use of gaso-

line and naphtha in stoves for cooking purposes. As yet the only safeguard against these dangers is, that the law provides that gasoline and naphtha can only be sold in cans or vessels marked "not for inside light."

Apart from these statistics, however, the good results of the inspection of kerosene are evident in the greatly diminished number of accidents now, as compared with those previously. Happily such accidents are at present comparatively rare.

FOODS.—The Committee of Analysts in previous reports have called attention to the nature and amount of adulteration in many articles of food. In certain cases this information has been rendered more specific by means of laboratory investigation during the course of the past year, and will serve as a basis for future practical action. The general diffusion throughout the State of the facts made known in previous reports, and the growing opinion in favor of the proper enforcement of the law concerning the "Adulteration of Food, Drink and Drugs," are inciting the inspectors of the various local Boards to institute legal proceedings in regard to certain articles of food, and there is every prospect of an encouraging advance during the coming year in this direction also.

METHODS OF BUTTER ANALYSIS.

BY PROF. H. B. CORNWALL.

The preparation of the following paper was begun at the request of Dr. William K. Newton, State Inspector of Milk in New Jersey, and continued for the present report of the State Board of Health. Its object is not to present an exhaustive essay on butter analysis in general, but rather to treat of the methods commonly employed for determining the nature of the fat in commercial butters, genuine as well as artificial.

The general subject of butter analysis has very lately been so admirably and comprehensively discussed by Prof. G. C. Caldwell, (*Second Annual Report of the State Board of Health of New York*, 1882,) that a new paper on the subject would be superfluous, but several points of great importance with reference to the chemical analysis of butter fat have been published during the last two years. These, together with some of the writer's own results, will be presented in this paper.

It may be well to present a very brief statement of some of the best rapid methods for a general examination of butter before discussing the special questions already mentioned.

Genuine butter from cow's milk commonly contains from 82 to 90 per cent. of true butter fat, together with water, curd (casein), salts and a very little milk sugar, which are contained in the buttermilk that remains with the butter after it is worked. Usually some common salt is also added to butter, and occasionally a little saltpetre and sugar to preserve it better. The natural, more or less yellow color of butter, varies with the nature of the cow's food, and no objection need be made to the use of various harmless coloring matters to heighten the yellow tint; the use of objectionable additions, like chrome yellow and aniline derivatives, although rare, is

said to have been practiced. Genuine butter often loses its yellow color on exposure, showing white streaks and spots, which, to the inexperienced, may appear as very suspicious indications. It also, unless carefully freed from buttermilk by thorough working, is very liable to become rancid, owing to decomposition of the glycerides of the volatile acids present, especially butyric acid. Artificial butter contains usually little or no butyric acid and, therefore, seldom becomes rancid. No mistake is commoner than the condemning of real butter as a false article on account of this very rancidity, the absence of which, in old butters at least, is rather to be taken as a suspicious sign.

Butter is commonly adulterated in two ways: by the addition of various make-weights, such as water, excess of salt, farinaceous substances, chalk, soapstone and similar materials; and also by the addition of various foreign fats. Some of the butter now sold contains no true butter fat.

Of the first class of adulterants, little need here be said. Their detection is a very simple matter. The mere appearance of the butter, its behavior in the mouth, and a microscopical examination of it, will ordinarily quickly reveal the presence of solid, non-fatty adulterants.

For a rapid estimate of the quantity of non-fatty substances in butter, Hoorn's method may be adopted. It was followed by Caldwell (*op. cit.*), and is thus described by him:

"Hoorn, (*Fresenius' Zeitschrift*, 11, 1872, 334,) in a graduated tube with a narrower graduated part at the lower end, melted 10 grams of butter and mixed it with 30 cc. of petroleum ether by shaking; calling a cubic centimetre of these matters 1 gram, he found, usually, 12 to 14 per cent. in good butter, and over 20 per cent. only in adulterated butter; the result is more reliable if the first ethereal solution is decanted off and the residue is shaken up with a fresh quantity of the ether. All other adulterations that are not fatty will remain with the water."

Caldwell applied Hoorn's test as follows: "About 10 grams of the butter were put in a tube graduated to tenths of cubic centimetres and melted by immersing the tube in warm water; the volume of the melted butter was then noted, the petroleum ether added, and after corking the tube the solution of the fat was effected by vigorous shaking; then, after standing three or four hours, the volume of the matters

not fat, collected at the lower end of the tube, was noted and the per cent. by volume calculated."

By this method, he found as a minimum percentage of non-fatty matters in various butters, genuine and artificial, 7.74; and as a maximum, 30.75, the lower figures being generally yielded by the artificial butters.

If it is desired to determine more accurately the proximate constituents of a butter, the following method may be adopted:

One or two grams of the butter are heated in a shallow dish in an air-bath, at 100° C. (212° Fahr.), until it ceases to lose weight. The loss of weight is water, which should not exceed 20 per cent., although more than twice this proportion has been fraudulently incorporated with butter by processes known to the initiated. The dried butter is then treated with hot ether, which dissolves only the fat. The ether solution may be decanted into a weighed vessel (or passed through a dry, weighed filter, if necessary,) and the treatment with ether repeated until the fat is completely extracted. The ether solution is evaporated and the fat dried and weighed as before. Its weight ought to be not less than 80 per cent. of the weight of butter taken. The residue left undissolved by the ether is also dried and weighed.

A qualitative examination of the non-fatty residue may be made by washing out all soluble matter with water, digesting the remainder with ammonia to remove the casein, and testing the final residue for starch with tincture of iodine; and for mineral matters, chalk, gypsum, soapstone, barytes, etc., by well-known chemical tests.

Any considerable addition of mineral matters to butter may be detected by igniting a gram or two of the butter and weighing the ash. This does not usually exceed two or three per cent., and, according to Blyth, (*Foods, their Composition and Analysis*, 1882,) should not, in the opinion of most chemists, exceed 8 per cent.

Borax or alum, which, according to Dietzsch, (*Nahrungsmittel und Getränke*, 1884,) have been used to facilitate the incorporation of excess of water with butter, should be sought for in the water solution from washing the non-fatty residue just mentioned. The details of the tests need not be given.

The second class of adulterants, foreign fats, furnishes, without doubt, the most general means of adulterating butter at present; of these fats, oleomargarine is the best known. Originally, oleomargarine was made from animal fats, but now vegetable oils also enter into it

composition, or into the artificial butters made from oleomargarine. Lard, cotton-seed oil, benne oil, olive oil, rape-seed oil, and other vegetable oils also enter into the mixtures sold under the names of oleomargarine, butterine, lardine, etc., etc. The writer has been informed by one of his colleagues that cocoanut oil is also used in this country, while Dietzsch states that it is used in making "Schmalz-butter."

To Hehner and Angell belongs the credit of devising the first reliable method for the chemical analysis of butter fat. The method depends upon the fact that pure butter fat contains not only glycerides of the insoluble fatty acids, oleic, palmetic and stearic, but also a considerable proportion of the glycerides of certain fatty acids more or less soluble in water, especially butyric acid, which is readily soluble.

The following table from Blyth's *Foods, their Composition and Analysis*, London, 1882, shows the apparent general composition of butter fat:

GLYCERIDES		EQUAL TO FATTY ACIDS.		
Olein	42.21	= Oleic acid	40.40	
Stearin and Palmitin,	50.00	= Stearic and Palmitic acids,	47.50	
			87.90	Total insoluble acids.
Butyrin	7.69	= Butyric acids	6.72	
Caproin, Caprylin and Rutin,	.10	= Caproic, Caprylic and Rutic acids,	?	
	100.00		94.62	Total acids, calculating soluble as butyric.

Other animal fats, which are ordinarily used for adulterating or imitating butter, contain only the glycerides of the insoluble fatty acids, oleic, stearic and palmitic, the theoretical yield of which, as obtained by saponifying the fat and decomposing the soap with an acid, may be placed at 95.5 per cent. of the weight of the fat. Further investigation has shown that the percentage of insoluble fatty acids obtained from some of the commonest vegetable oils is very nearly the same, as in the table below:

Rape-seed oil	95.00
Poppy oil	95.38
Palm oil	95.60
Benne oil	95.60
Olive oil	94.03
Almond oil	94.02

The foregoing figures are taken partly from Wagner's *Jahresbericht*, 1879, 951, and partly from *Archiv der Pharmacie*, IX., 1878, 134.

Cocoanut oil contains, on the other hand, besides the glycerides of palmitic, myristic and lauric acids, a considerable proportion of the glycerides of caproic, caprylic and capric (rutic) acids, which are all more or less soluble in water; caproic acid dissolving with moderate ease in cold water, while caprylic is soluble in 400 parts of boiling water, and capric acid is but very sparingly soluble in boiling water. Consequently, when cocoanut oil is saponified, and the soap decomposed with an acid, the above slightly soluble acids are but slowly washed out from the insoluble ones, even with boiling water. They likewise distill over very slowly when the decomposed soap solution is boiled.

A large number of tests, chemical, physical and microscopical, have been proposed for the examination of butter. While several of these are more or less useful as accessory tests, none of them is capable of supplying a definite solution of the problem.

The specific gravity test is the most important of the physical tests. It has been largely used as a confirmatory test, for which it is generally well suited, and Dietzsch (*op. cit.*) prefers it to all chemical or other tests. He regards any butter having a specific gravity of 0.865 or less, at 100° C. (212° Fahr.), as adulterated. Blyth regards a specific gravity of less than 0.911 at 37.7° C. (100° Fahr.) as strongly indicative of foreign fat. This test, however, has lost much of its value since Muter has described (*Analyst*, VII., 93,) what he considers a cotton-seed oil product, cotton "stearine," having a specific gravity of 0.9115 to 0.912 at 100° F., which, added to artificial butter, not only gives it a better appearance in winter, but increases its specific gravity.

The only methods accepted as at all reliable for examining butter fats depend either upon the more or less thorough quantitative determination of the fatty acids obtainable by decomposition of the fat, or on allied operations.

Three of these methods, which have found extended use, have been tried by the writer: Hehner's, as well as a modification of it described by Blyth; Reichert's, and Koettstorfer's. Another method, in actual use by some analysts, proposed by West-Knights, (*Analyist*, V., p. 155,) the writer had not time to try. It depends upon the difference in solubility between the oleate, stearate and palmitate of barium or calcium, and the corresponding salts of the more or less soluble fatty

acids. It is probably open to the same objections which the writer finds against Hehner's process.

Hehner's process (*Zeitschrift für Analytische Chemie*, 1877, p. 145,) consists, as is well known, in saponifying the butter with alcohol and caustic potash, by the aid of heat; expelling the excess of alcohol by evaporation; dissolving the resulting soap in water; decomposing the soap by addition of dilute hydrochloric or sulphuric acid; collecting the insoluble fatty acids on a weighed filter; washing them with hot water until all the soluble (volatile) acids are removed; drying the insoluble acids and weighing them. The details of the method need not be given, but one of them will here be dwelt upon. Hehner states that the washing is to be continued until the filtrate shows no acid reaction, with sensitive litmus solution, and that 3 grains of fat will ordinarily require three-quarters litre of boiling water. This is probably true, but several writers have stated that they found butters requiring more water. Fleischmann and Vieth (*Fresenius Zeitschrift*, 1878, p. 287,) sometimes used 2 litres of water, and state that, even after using more than 2 litres, a very feeble reaction still remained. They finally adopted the plan of washing until 5 cc. of the wash-water showed no diminution of the exceedingly feeble acid reaction with a few drops of litmus solution.

A. Hanssen (*Inaugural-Dissertation*, Erlangen, 1882,) found difficulty, also, in determining how long the washing should be continued. He finally decided to use, at the most, from 2 to 3 litres of water for 2 to 2.5 grams of fat, and to use always a constant quantity of water, as the surest means of avoiding error, either by leaving a notable quantity of soluble fatty acids with the insoluble, or by a possible decomposition of the insoluble acids.

As regards the percentage of insoluble fatty acids in butter, Hehner states that it is usually between 86.5 and 87.5, and he sets the highest limit at 88. These figures will certainly be found true in the great majority of cases, but many instances have been published of pure butter giving higher percentages. Fleischmann and Vieth (*loc. cit.*) found 85.79 as the lowest limit, and 89.73 as the highest, in the examination of a large number of butters, and admit that, in the rarest cases, pure butter may yield 89.8 per cent., so that they set the limit at 90, while admitting the general applicability of Hehner's figures. They distinctly state that a butter, which on imperfeet washing yielded 90.06 to 90.47 per cent. of insoluble acids, yielded when

when washed with quantities of water varying from 1,100 to 1,350 cc. fatty acid, from 88.88 to 88.31 per cent. Another butter, which had yielded with imperfect washing from 91.03 to 91.17 per cent., yielded on longer washing 89.73. It was on account of this last butter that they fixed the highest limit at 89.8, and everything in their article points to the conclusion that in their later experiments they were satisfied that they had washed thoroughly enough.

Fleischmann and Vieth further quote from the *Journal of the Royal Agricultural Society* (England), 1877, to the effect that Bell, director of the Somerset House Laboratory, in examining fifty butters as to their percentages of insoluble fatty acids, had found the limits to vary between 85.5 and 89.8.

Kretzschmar (*Berichte d. d. chem. Gesellschaft*, 10, 2091,) in the laboratory of the agricultural experiment station at Bonn, found several pure butters yielding over 89 per cent. of insoluble fatty acids by Hehner's method, and thought the highest limit should be raised to 90 per cent., while indorsing the method in general. Kuleschoff, (Wagner's *Jahresbericht*, 1878, p. 999,) obtained as much as 89.72 per cent. Jehn (*Archiv der Pharmacie*, IX., 1878, 335,) found 89 or more per cent. of insoluble fatty acids in three out of ten butters that he examined. It is true that he deviated sometimes from Hehner's method by collecting the insoluble acids in wax, and that all of these higher figures were obtained in cases where he used wax; but it is equally true that in one of these cases he found 89 per cent. when using wax, and 88.8 without it; and, also, that in four cases where he did use wax his figures varied from 86.6 to 87.5, so that the high figures are not with certainty to be ascribed to the use of the wax. De la Source (Wagner's *Jahresbericht*, 1882, 929,) found, in two tests of butters from cows fed with oil cake, 89.1 and 89.4 per cent. of insoluble acids, and objects to the French standard of 88 per cent. as too low. In the *Analyst*, IV., 197, it is admitted that genuine butter, when old and at certain seasons, may contain nearly 89 per cent. of insoluble acids, in which case it will also contain less soluble acids.

It seems to be reasonably certain that a butter ought not to be absolutely condemned unless the insoluble fatty acids obtained by Hehner's process reach 90 per cent., or very nearly that limit. If this be so, then, as Fleischmann and Vieth show (*loc. cit.*), it might very rarely happen that a butter could be adulterated with 50 per cent. of many foreign fats and yet escape detection; although, accepting

Hehner's limit as more common, the amount of adulteration could not exceed about 25 per cent.

R. W. Moore, however, states (*Chemical News*, December 5th, 1884,) that he has found cocoanut oil to yield only 86.43 per cent. of insoluble fatty acids by Hehner's process, and the experiments of the writer tend to confirm his statement. One experiment, conducted according to Hehner's process, was interrupted by accident, and lack of time before this paper had to leave the writer's hands, has prevented a repetition of it. It was carried far enough to show, however, that after the insoluble acids from 4.158 grains of cocoanut oil had been washed with 1 litre of hot water, there still remained enough soluble acids to require for each successive 100 cc. of wash-water the following quantities of one-tenth normal alkali: for the first 100 cc., 0.95 cc. of the alkali solution; for the second, 0.9; for the third, 0.95; for the fourth, 0.8. Manifestly, the soluble fatty acids were but slowly removed. These figures, calculated as butyric acid, represent nearly 0.2 per cent. of the weight of the cocoanut oil taken for each 100 cc. of wash-water.

A second experiment was instituted according to a modification of Hehner's method, described by Blyth (*op. cit.*) The fat is saponified in a closed flask with a definite quantity of alcoholic potash solution of known strength, and after expelling the alcohol the soap is transferred to a 500 cc. flask and decomposed with dilute sulphuric acid of known strength. The fatty acids are then melted and washed in the flask by successive additions of hot water, the wash-water being each time drawn off from the flask after allowing the fatty acids to become solid by cooling. The wash-water is passed through a filter, the insoluble acids being retained in the flask, and, finally, after sufficient washing, the flask, containing a little warm water, is adapted to an upright Liebig's condenser and boiled, or connected in the usual way with a Liebig, which has as a receiver a flask furnished with a mercury valve to form a closed system. After five or ten minutes' boiling, the distillate is added to the filtrates and the liquid in the flask run off from the fatty acids when cool. To these acids is added the ethereal solution of any insoluble acids adhering to the filter, and the whole is dried and weighed. The soluble acids in the combined wash-waters are titrated with one-tenth normal alkali, each cc. equal to 0.0088 of butyric acid. Blyth says that the wash-water will amount to from 600 to 700 cc. without calling attention in any way

to the necessity of ascertaining that the last wash-water is really free from soluble acids. If logically carried out, testing the wash-water as to acidity, this method may become extremely tedious, and, applied to cocoanut oil, would give the same percentage of insoluble fatty acids as Hehner's original method. If the washing is really to be stopped at 600 to 700 cc., the method becomes an arbitrary one and could not stand in a legal case. It is, moreover, in the writer's opinion, a mistake to allow the wash-water to become cold before it is removed from the insoluble fatty acids. An expert defense counsel might make very plausible objection to such a method of washing.

The method was, however, tested by the writer, limiting his wash-water to 1,050 cc.; the last five wash-waters, 100 cc. each, requiring respectively, 1.1, 0.9, 1, 0.85, and 1 cc. of one-tenth normal alkali for neutralization. It was plain that the soluble fatty acids were regularly being extracted at the rate of about 0.2 per cent. of the weight of the cocoanut oil taken (4.46 grams) by each 100 cc. of wash-water, but the washing was purposely stopped at this stage. Even with this imperfect washing the insoluble fatty acids corresponded, when dry, to 89.70 per cent. of the oil taken, while the soluble acids amounted to 3.44 per cent. The low total, 93.14 per cent., is easily accounted for by the persistent loss of weight of the impure insoluble acids in drying on the water-bath. They were losing a part of the soluble (volatile) acids and constant weight was not to be obtained. Another litre of wash-water would have brought the cocoanut oil nicely within the generally accepted limits for pure butter fat. As it was, it would have passed for three-fourths pure butter. The cocoanut oil, as purified by the writer, was bland in taste and almost absolutely odorless, and the writer has been informed by a colleague that cocoanut oil is used in making some artificial butters in this country. Moreover, Jeserich and Meinert (Wagner's *Jahresbericht*, 1882, 932,) have patented in Germany a process for rendering vegetable oils, cocoanut oil, palm-nut oil, etc., edible and suitable for making artificial butter by treatment with superheated steam, followed by saponification with one-quarter per cent. of calcined magnesia to remove any free fatty acids. After long stirring and careful washing they claim that a perfectly odorless fat, not rancid, is thus obtained. This claim appears to the writer a probably just one, and the possibility that cocoanut oil may indeed enter into the composition of artificial butters cannot be denied. In any event, Hehner's process,

pure and simple, must be held incapable of distinguishing cocoanut oil in mixtures, if not alone, from true butter fat.

Koettstorfer (Fresenius' *Zeitschrift*, 1879, 199,) devised a process for testing butter fat. Since, as already stated, genuine butter contains a comparatively large percentage of glycerides of the more or less soluble fatty acids (especially butyric), all of which have a lower molecular weight than the insoluble fatty acids, it follows that pure butter fat will require a smaller proportion of alkali for its saponification than fats consisting wholly or almost wholly of glycerides of the insoluble acids. Koettstorfer saponifies from 1 to 2 grams of the filtered fat in a narrow beaker of about 70 cc. capacity, covered with a watch-glass, by heating to gentle boiling, at first with stirring, for 15 minutes on a water-bath, with 25 cc. of a solution of caustic potash in highly-rectified alcohol, the solution being of known strength and about one-half normal. The watch-glass is then rinsed into the beaker with alcohol and the excess of potash titrated with one-half normal hydrochloric acid, phenolphthalein being used as an indicator. Two drops of a solution of 1 part of phenolphthalein in 30 parts of alcohol (90 per cent. by volume) is a suitable addition. The litre of the alcoholic potash is liable to vary slightly; hence 25 cc. of it should, from time to time, be tested by boiling as above, without any addition of fat.

Koettstorfer found that 1 gram of pure butter fat required from 221.4 to 232.4 (average 227) milligrams of KHO for saponification. For various other fats he found the following figures: beef tallow, 196.5; lard, 195.5; oleomargarine, 195.5; mutton suet, 197; olive oil, 191.8; rape-seed oil, 178.7. Assuming 227 as the mean for butter fat and 195.5 for lard and oleomargarine, he gave the following formula for determining the percentage of foreign fats in a butter; n representing the milligrams of KHO used for 1 gram of the fat: (227—195.5): (227—n):: 100: x. He found that rancid butter required 1.5 to 1.4 milligrams less KHO than when fresh.

The process has found much favor, since a very large number of animal and vegetable fats were found to give, always, figures far below those obtained with true butter fat. A considerable number of such fats have been tested by Valenta (Wagner's *Jahresbericht*, 1883, p. 1152,) and by Allen, (*Ibid.*, p. 1157,) also by Moore (*loc. cit.*). All of these experimenters found that cocoanut oil yielded figures far above those given by butter fat, Moore obtaining from a good refined oil, before and after thorough washing with hot water, 250.3 and 246.2

milligrams of KHO, respectively, for 1 gram of oil. As Moore states, it is possible to mix oleomargarine with cocoanut oil so as to bring the results within Koettstorfer's limits for pure butter. To prove this, he calculated from results of his own tests, the quantities of a certain oleomargarine and the cocoanut oil which should be mixed in order to approach closely to Koettstorfer's two extremes, and the following is one of his results:

Cocoanut Oil (Washed).	Oleomargarine.	Milligr. KHO per grm.
53.1 p. c.	46.9	223.6
75.9 p. c.	24.1	234.9

The oleomargarine alone required 193.5 milligr. KHO.

Relying on Koettstorffer's test alone, no chemist could be certain that he was not certifying to the genuineness of a butter which was really free from any true butter fat.

Reichert (Fresenius' *Zeitschrift*, 1879, 68,) acting on the principle that underlies the Hehner method, modified the process so as to estimate a portion only of the soluble fatty acids, taking advantage of the fact that where an aqueous solution of a saponified butter fat is decomposed by an acid and boiled, the greater part of the soluble fatty acids can be distilled over with comparative rapidity and in reasonably constant quantity.

The fat to be tested is melted, best on a water-bath, any water or other foreign substances allowed to settle and the fat filtered through good filter-paper or cotton. If not perfectly clear it must be filtered again. Then 2.5 grams of the liquid fat are weighed in a flask of about 150 cc. capacity (Erlenmeyer's form is best), 1 gram of solid caustic potash and 20 cc. of 80 per cent. alcohol are added, and the whole heated to gentle ebullition on a water-bath, with frequent agitation, until the resulting soap is absolutely free from alcohol. The writer continues the heating until the air sucked out of the flask has no taste of alcohol; the flask being heated at the last, when danger of frothing is over, by placing it within the water-bath, so that it may be surrounded by steam. The removal of all the alcohol is essential. Afterwards 50 cc. of water is added to dissolve the soap, and when completely dissolved the soap is decomposed with 20 cc. of dilute sulphuric acid (1 of pure, strong acid to 10 of water), which is poured into the flask. The latter is then connected with a small, but efficient, Liebig's condenser, and the contents heated to moderate boiling, with

addition (as proposed by Caldwell) of two or three bits of pumice stone attached to platinum wire spirals, to prevent bumping. (Reichert proposed to prevent bumping by a current of air, which is unnecessary.) A bulb tube, or other contrivance to prevent mechanical carrying over of sulphuric acid, is advisable; but it should not be such as to cause undue condensation of the steam. The writer simply uses a moderately wide tube, ground slanting at the lower end, and reaching about 3 inches above the flask before it bends. The distillate, which contains some insoluble acids, and, in case of foreign fats, much, as it drops from the condenser, must be passed through a small, wet filter into a 50 cc. graduated flask, and as soon as 10 to 20 cc. has come over it is returned to the first flask. The distillation is then continued until 50 cc. has come over, which is at once titrated with one-tenth normal alkali solution. Reichert used one-tenth normal soda, with litmus solution (4 drops) as an indicator. The titration is ended when the blue color of the litmus remains permanent for some time.

As regards the execution of the above test, the writer finds that it is not necessary to weigh the solid potash with extreme care (differences of a centigramme are immaterial), nor to observe unnecessary caution as to the strength of the alcohol; but the method is strictly a comparative one and must not be arbitrarily altered. The writer has not made many duplicate determinations, but the few he has made have been exceedingly satisfactory. He also found that the result was not materially affected by using an inverted condenser during the saponification, to prevent possible loss by escape of butyric ether. Very great differences may result, however, if the sulphuric acid is added before the soap is dissolved.

The potash used for saponification should be practically free from chlorides and nitrates. Both it and the alcohol should be subjected to a blank test.

Reichert in his paper admits that his test needs further trial, and invites the same. From his own results he concluded that the distillate from pure butter would require an average of 14 cc. of one-tenth normal alkali, and never less than 12.5. He also found for:

Oleomargine	0.95 cc.
Rape-seed oil	0.25 "
Kidney fat	0.25 "
Lard	0.30 "
Cocoanut oil	3.70 "
Commercial butter	10.50 "

His formula for determining the percentage of butter fat in mixed fats is $B = 7.3\ (n - 0.3)$; n being the number of cubic centimeters of one-tenth normal alkali used in titration. Adopting his conclusions, the method would be capable of detecting 10 per cent., or any more, of foreign fat.

Meissl (Dingler's *Polytechn. Journal*, 1879, 229,) modified Reichert's process by employing twice as much fat and potash, with 50 cc. of 70 per cent. alcohol, and decomposing the soap with 40 cc. of the dilute sulphuric. He distilled until 110 cc. had passed over, and then titrated with one-tenth normal potash solution. He obtained a range, in the case of 49 pure butters, of from 27 to 31.8 cc., corresponding to 13.5 to 15.9 according to Reichert's method. Meissl's modifications were devised to guard against loss by volatilization of butyric ether and to secure greater accuracy in titration. They have been adopted by some chemists, but they appear to the writer to be cumbersome and unnecessary, although not affecting the result materially. Ambühl (Wagner's *Jahresbericht*, 1881, 839,) used 14.05 to 15.55 of one-tenth normal alkali for 2.5 grams of fat; Medicus and Scherer (Fresenius' *Zeitschrift*, 1880, 159,) recommend Reichert's process, but find that the more fusible part of genuine butter, separated from the rest by partial cooling, may yield higher figures, viz.: 17.3 cc., instead of 14 cc. yielded by a well-mixed butter on which the experiment was tried. (Meissl made a similar observation.) They obtained for butters, from 13.6 to 14; for lard, 0.2; for rape-seed oil, 0.3; for benne oil, 0.35; for olive oil, 0.3; for palm oil, 0.5.

Seudtner (Wagner's *Jahresbericht*, 1883, 979,) following Meissl's method, obtained from a large number of butters, made at all times of the year, figures ranging from 24.25 to 32.25; his lowest results were obtained in February and July. He recommends that the lowest limit be placed at 24 cc. (12 cc. by Reichert's method), but would not, without further investigation, condemn a butter requiring 23 to 23.5 cc. (11.5 to 11.75 Reichert). His experiments were made on butters produced near the Tegren See and Starnberg See, also near Pasing.

Reichert's method is rational and convenient. It was selected by Caldwell in preparing his report (*op. cit.*), and yielded him the figures 14.1 and 13.9 in the case of two genuine butters. He says it "was followed with much satisfaction."

The writer has obtained with it the following results; the genuine butters were known to be such, the oleomargarine butters were bought

as such. The table gives also the results, in most cases, by Koettstorfer's method, and occasionally by Hehner's:

	Reichert. cc. one-tenth normal alkali for 2.5 grm. fat.	Koettstorfer. Milligr. KHO for 1 grm. fat.	Hehner. p.c. insoluble fatty acids.
1. Genuine butter,	14.5	228.2	.....
2. " "	14.4	225.4	87.33
3. " "	13.1	224	86.65
4. " "	13.8	222.5	.....
5. " "	12.9	225.8	.....
6. Oleomarg. butter,	0.6	197.4	95.56
7. " "	0.4	195	.....
8. " "	0.5	194.5	.....
9. " "	1.4	196.9	.....
10. " "	1.55	194.7	.....
11. Suspected butter,	13.25	227	86.01
12. Butter,	12.9	226.3	.....

There is no doubt that No. 11 was unjustly suspected.

The writer found his duplicate tests by Reichert exceedingly satisfactory in the very few cases where he made them; thus No. 12 gave 12.9, 12.9 and 12.8, the two last results being obtained when an inverted condenser was attached to the flask during saponification, to avoid anticipated loss of butyric ether. Another butter gave, in duplicate tests by different persons, 14 and 13.8 cc. Another butter, about one-half pound in quantity, which gave in May, 1884, 13.8 cc., was kept in a loosely-covered vessel in the laboratory during the next eight months, the thermometer rising at times to above 90° Fahr. It was then found to be very rancid, smelling like cheese, covered on top with a dark mould, and in large part changed to a brown mass. A fair average sample of it now required 13 cc. of one-tenth normal alkali, showing that Reichert's method is still applicable to very rancid butter, although it would doubtless be well to lower the standard for such a butter—about to Seudtner's suggested limits.

Reichert's test has maintained itself very well, so far as the preceding authorities show. Beckurts (Wagner's *Jahnesbericht*, 1883, 978, an abstract from *Pharm. Centralhalle*, 1883, 557), following Reichert's method exactly, used from 15.6 to 17.5 cc. of one-tenth normal alkali, and thinks Reichert's standard is too low. His results, if we accept those of Medicus and Schorer on melted butter already quoted, are unique and need confirmation. Wagner does not state how many butters Beckurts tested. It may be added that Beckurts

gravely asserts that Reichert's proportions must be exactly observed, and naively states that when he dissolved the soap in 150 cc. of water, instead of 50 cc., he used only 11.9 cc. of one-tenth normal alkali to neutralize the first 50 cc. of distillate! It does not seem necessary to raise Reichert's standard until others shall have obtained figures as high as Beckurts found.

A. Hanssen. (*op. cit.*), following Meissl's modification, obtained a confirmation of his results.

E. Reichardt (*Archiv der Pharmacie*, 222, 1884, 93), following Reichert's method, obtained as the average from 35 genuine butters, 14.16 cc. one-tenth normal alkali, with extremes of 13.8 and 14.7. His experiments were systematically conducted so as to include butter made in every month of the year, and with every variety of fodder for the cows, which were of Dutch breeds. Reichardt states also that recent tests by Birnbaum, in Baden, never required less than 13 cc. one-tenth normal alkali, at whatever season of the year.

The only proposition to lower Reichert's standard, or at least the standards of Seudtner and of Meissl, has been made by Munier (Fresenius' *Zeitschrift*, 1882, 394). He concluded, from his experiments on pure butters at Amsterdam, Holland, that the standard should be varied for different months; making it 11 cc. from August to October; 10 cc. from October to March; 12.1 cc. from March to May, and 12.4 cc. from May to August. He found, in the case of one butter, made in December, as low as 9.2 cc., one-tenth normal alkali. His figures, which include a large number of butters, range from 9.2 (in December) to 14.5. Why did he not at once propose to reduce the limit to 9.2 cc., at least for December? These figures of Munier would greatly lessen the value of Reichert's test, if Munier had followed the latter's method. But he did not. He saponified with 5 cc. of a solution of 20 grains caustic potash in 100 grains of 70 per cent. alcohol; that is, he used only one-quarter as much alcohol. Moreover, he decomposed the soap with phosphoric acid solution, instead of sulphuric acid (20 cc. of a mixture of 4 parts phosphoric acid solution of 1.1595 sp. gr. with 6 parts water). Finally, he removed the alcohol by sucking air through—he does not say what, whether through the still liquid soap, or through the flask—after the soap solution had been concentrated by evaporation. These modifications he calls "unessential." In publishing results calculated to discredit Reichert's process, without publishing any comparative analyses

to prove that his process always gave the same results as Reichert's, Seudtner (*loc. cit.*) rejects his results altogether. Reichardt says: "It is not commendable to offer constantly modifications of a method without giving comparative tests, which must show that the new modification gives exactly the same results." The experiments of Reichardt, Seudtner and Birnbaum, already quoted, were made with the express purpose of testing Munier's conclusions as to variation in the results of Reichert's process with butters made in different months, and they, as well as the writer's briefer experience, give his theory absolutely no support.

Reichardt thinks it possible that the small quantity of alcohol used by Munier may be the cause of his low figures, and states that several of his own experiments show this to be the case, but he gives no analyses to support this statement.

Direct comparison of Reichert's and Munier's methods were instituted in the laboratory here at Princeton, N. J. When phosphoric acid prepared from glacial acid by long boiling with water, was used, Munier's method gave extremely low figures, often as low as 6 or 7 cc.; but with phosphoric acid (Merck's) bought for the purpose, better results were obtained. The experiments so far conducted indicate that Munier's process gives lower figures than Reichert's, as shown by the following tests with genuine butter:

	Reichert.	Munier.
No. 1	13.10 cc.	12.00 cc.
	13.15 "	12.15 "
	13.10 "	12.05 "
No. 2	12.80 "	11.45 "
	12.75 "	11.50 "
No. 3	13.10 "	12.45 "
No. 4	14.25 "	14.20 "
No. 5	14.40 "	14.20 "
No. 6	13.60 "	13.15 "

Until Munier's figures have been confirmed by further tests of his own, or by other chemists, they cannot be received as conclusive.

The essential feature of Reichert's process consists in the limited fractional distillation which it secures. The writer has been asked why he preferred to follow Reichert, and distill over only part of the soluble (volatile) fatty acids, rather than, as is the practice of some analysts, to distill so long as any acid comes over. To do this would be to lose the whole advantage of Reichert's process. Cocoanut oil

yielded to the writer, by Reichert's process, a distillate requiring 3.5 cc. of one-tenth normal alkali, the experiment giving these figures three successive times. On adding 50 cc. of water to the decomposed soap solution, and again distilling off 50 cc., a distillate was obtained requiring 2.3 cc.; repeating the addition of 50 cc. of water and distillation of 50 cc., 1.5 cc. of one-tenth normal alkali was required; the fourth trial gave 1.4 cc.; the fifth, 1 cc.; the sixth, 0.9 cc.; at which point the experiment was stopped, although manifestly the volatile fatty acids were by no means all distilled over. A genuine butter similarly treated required for the first distillate of 50 cc., 13.6 cc. of one-tenth normal alkali; for the second, 1.65 cc.; for the third, 0.45 cc.; for the fourth, 0.25 cc.; at which point the experiment was stopped. No further argument seems necessary for adopting Reichert's plan.

The writer is convinced that Reichert's is the only one of the three methods depending on Hehner's principle, which he has tried, that is with any practical degree of accuracy capable of distinguishing between cocoanut oil, in mixtures or alone, and pure butter fat.

The comparative tests of butter by Reichert's method and Munier's modification, were made by Dr. L. W. McCay, of Princeton College, with one exception.

REPORT OF SHIPPEN WALLACE, MEMBER OF THE COMMITTEE OF ANALYSTS.

I submit my report of work done the past year, as one of the analysts appointed by the State Board of Health.

For Dr. Wm. K. Newton, the State Inspector of Milk, I have made a number of analyses of milk which had been condemned by either him or his deputy, and have also made eight analyses of milk, the purity of which was known, at the request of the owners of the cows. The result was to confirm the fact that the State standard of twelve per cent. milk solids is not too high. The prejudice against the milk law which has existed in West Jersey among a number of producers, still continues, but, I think, not to as great an extent as formerly. The quality of milk supplied to the consumer has certainly improved, and especially in Atlantic City.

In the report of Prof. Cornwall, for 1881, he mentioned the fact that in the examination of canned goods, which he had made, he found that canned asparagus contained tin to a much greater extent than any other canned goods which he had examined. Thinking that it would be well to investigate this subject more fully, I have during the past year examined the canned asparagus to be found in the market, with the result of confirming this statement to a greater extent than I had expected. He mentions the fact that in one one-quart can he found 4.13 grains dissolved tin. Whether the length of time the asparagus is canned before being used has any particular influence on the amount of tin taken up, I do not know, but it seems likely it has. The reason for this canned article of food containing tin to the extent it does, lies no doubt in the vegetable acid, asparagaric, present. It is not uncommon to find tomatoes, peas and corn in which no tin can be detected, but in the article referred to, of the ten different cans examined by me, there has not been the slightest difficulty in detecting its presence; although I am not aware of any cases of sickness produced by eating canned asparagus, yet such may have been the case.

There is to be found in the market this same article sealed (?) in glass, and I do not know but that it might be well for the attention of canners to be called to the fact that in putting up in tin they run the risk of some one being made sick by eating it, and to advise them to use glass. In one can I obtained over seven grains dissolved tin (7.11 grains); in another, 3.92 grains, and three yielded over 5 grains. The quantity in the remaining five cans was not determined, but there was no difficulty in detecting its presence. All canned goods should be removed from the can as soon as opened, and, if not used, kept in some earthen vessel, and should by no means be cooked, as is often done, in the original tin. This subject is an interesting one, and I should like to see it examined to the extent of analyzing all the brands of asparagus in the market, and also noting the length of time since being put up.

The examination of kerosene has been continued. I have learned of no accidents resulting from its use in West Jersey, but that there have not been any, I am not prepared to state.

I have examined in all twenty samples, which, at the time they were obtained, I had every reason to suppose would not come up to the State standard, inasmuch as they were not bought for "head-light oil" (150° fire test), but simply for kerosene, which, as a rule, is 110-112° fire test, and which, as I stated in my report of last year, will flash at from 90-95°. They all flashed between these points. I have found no oils sold under fancy names except in one case. This party sold last year, and I have notified him that in case he continues the law will be enforced. He is thoroughly aware of the law, but seems inclined to ignore it. The oil is sold under the name "Genii oil," and is substantially benzine. The samples examined were obtained in Camden, Salem, Atlantic City and Bordentown.

NOTES ON SOME SAMPLES OF KEROSENE.

BY PROF. H. B. CORNWALL.

I have the honor herewith to submit my report on various samples of kerosene. The samples were collected in the latter part of November by Mr. James H. McGuire, Inspector, of Trenton, N. J.

Twenty-two samples were tested, having been collected from the following places: Manasquan, Monmouth county, 4; Englishtown, Monmouth county, 1; Point Pleasant, Ocean county, 4; Trenton, Mercer county, 5; Bound Brook, Somerset county, 4; Lambertville, Hunterdon county, 3; Princeton, Mercer county, 1.

The tests were all made according to the regulations in the last report of the New Jersey State Board of Health; duplicate tests being made of all flashing below 100° Fahr. It will be seen from the figures below that oils are still sold in this State which do not come up to the required standard of safety.

Temperature of oil at flashing	96°	98°	99°	100°	102°	104°
Number of samples	1	1	3	10	5	2

NOTES BY WM. K. NEWTON, M.D., MEMBER OF THE COMMITTEE OF ANALYSTS.

During the past year seven samples of kerosene have been sent to me to be tested, all of which proved to be up to the State standard.

In Paterson, the introduction of gasoline stoves for cooking purposes brought up the question, whether the law contemplated the regulation of the sale of gasoline and naphtha for heating purposes. After reading the law and after consulting legal authority, it was found that the law only regulated the sale of oils intended for illumination.

The agents for the stoves were, however, notified that the gasoline could only be sold in cans or vessels, marked "not for inside light." The papers published articles warning persons about the dangerous character of naphtha and gasoline, and some little good was done.

As was anticipated by me, the danger of using these very explosive articles was soon made very evident by the explosion of two reservoirs connected with the stoves and the destruction of much property. Fortunately, no lives were lost.

Some samples of "noodles" were collected in Newark, as it was thought they were covered with chromate of lead. The samples were sent to Prof. H. B. Cornwall, but at the time of writing the analysis has not been completed.

It seems to me essential, to a proper enforcement of the law, that rules for the government of analysts and inspectors should be adopted.

REPORT OF THE MILK INSPECTOR.

WM. K. NEWTON, M.D., PATERSON, N. J.

I herewith hand you my fifth annual report.

The work of inspection done during the year just past has been much the same as that performed in the past four years, and it seems hardly necessary to burden this report with many details, as it would be but a repetition of former reports.

I have visited nearly all the dairy sections of the State, besides inspecting the milk supplied to many of our principal cities and health resorts.

Mr. Peter L. Vandegrift has acted as my assistant in the southern and western parts of the State, and has inspected the milk supplied to the cities and towns of Gloucester, Camden, Burlington, Salem and Atlantic counties, and Atlantic City, Cape May and other summer resorts. He has proved to be a careful and conscientious worker, and has done exceedingly efficient work.

Mr. Henry B. Everhart, of Stevens Institute, was appointed assistant for Hoboken and Jersey City, and by strict attention to duty has done much to insure the purity of the milk supplied to those cities.

Messrs. Edward R. Martin and William Moller, the former Chemist and the latter Inspector for the New York Dairy Commissioner, were also appointed assistants and given power to inspect milk in this State. This was done so as to enable them to have supervision over milk produced in New York but passing through this State destined for New York city. They have aided me very much.

The New York State Dairy Commissioner, Mr. Josiah K. Brown, appointed me chemist to his department—a complimentary office, but one that gave me authority to inspect milk in that State.

The Legislature of 1884 enacted an amendment to the milk law which gave defendants a right to a jury trial; also, entitling them to

an appeal from justices' courts to the Courts of Quarter Sessions. This law, then, is equivalent to one which entitles all persons, tried under the milk act, to two jury trials, and hence increases the chance of escape through various legal technicalities.

I adhere to the opinion, formerly expressed, that in public health matters speedy trial is necessary, and the character of the evidence offered is such that no jury is required. The judgment of juries, drawn to try cases under this act, is apt to be biased by local associations and prejudices. This has often proved to be the case.

In a trial held in Sussex county, where not only was the evidence offered by the State convincing, but was supplemented by a written confession of guilt by the defendant, the jury failed to agree.

In another case, tried on appeal to Quarter Sessions, the judge charged the jury to bring in a verdict in accord with the evidence presented, yet a verdict of "not guilty" was brought in.

During the year twenty-seven complaints have been made against persons violating the milk law. Of these, thirteen entered a plea of guilty; four were tried and convicted, and ten cases are now pending in the courts. The sum of $850 has been collected by the justices for penalties and should have been paid into the State treasury before this time.

In many instances, when dissatisfaction has been expressed respecting the State standard, I have offered to have any dairy examined free of cost, but the offer has never been accepted.

The limit set up by law is still disputed by all against whom complaints have been made in court, and I doubt not that if the standard was reduced to ten per cent. of milk solids, that some would be found to claim such a figure too high. We have proved to our own satisfaction that our limit is just and accurate, and not too high for commercial milk. It has been adopted in New York State, with the rigorous requirement that all milk shall contain three per cent. of fat and twelve per cent. of cream by volume. In Massachusetts, thirteen per cent. of solids are required by law, and the limit has been repeatedly sustained by the courts.

Very little assistance was rendered, this year, by local Boards of Health. With one or two exceptions there seems to be decided apathy for the work. In Newark, where last year a great amount of work was done, hardly any cases have been tried. At Asbury Park, the usual energy has characterized the local Board, and supervision of the milk-supply has been maintained.

In closing, I would repeat a few suggestions that I have before offered:

With so excellent and comprehensive a law as that enacted to prevent the adulteration of food and drugs, it seems to me unnecessary to have a special milk law. If an amendment was enacted requiring the Inspector to make his complaints, for milk adulteration, under the food law, and at the same time enabling him to inspect other foods, a great deal of very efficient work would be done.

It seems to me necessary, also, that local Boards of Health be invested with power to compel a registration of milk dealers, and to make such registration a prerequisite before selling milk. The cow-stables, also, should be placed under supervision. It is almost impossible for the Inspector to visit all towns in the State, and local Boards should be compelled by law to aid in this work.

The law has operated well this year, and the undersigned, while fully aware of the unpleasant position in which he is often placed, would rely on the support of honest and unprejudiced citizens and those interested in sanitary progress.

CIRCULARS AND LAWS.

CIRCULAR XLIV.

OF THE

STATE BOARD OF HEALTH OF NEW JERSEY.

HOW TO PREVENT THE SPREAD OF SMALL-POX, SCARLET FEVER, DIPHTHERIA AND OTHER COMMUNICABLE DISEASES.

These diseases are spread by infectious particles which pass from person to person, directly or by means of discharges (called secretions or excretions), or by clothing, furniture or other surroundings. We seek to prevent this transfer, chiefly as follows:

a. By avoiding contact as far as possible or proper.
b. By abundant supply of pure air and ventilation.
c. By removing all unnecessary materials which receive or absorb the infective particles.
d. By the most exact cleanliness of persons and things.
e. By disinfectants.

We specify the diseases with which we have most to deal and the chief sources from which the particles are diffused:

f. Small-Pox.—From the pustules, chiefly of the skin.
g. Scarlet Fever.—From the mouth, throat, nasal passages and the skin.
h. Diphtheria.—From the mouth, throat and nasal passages.
i. Measles.—From the mouth, throat, nasal passages and skin.
j. Whooping-Cough.—The expulsive breath from the air passages; also from the sputa.
k. Typhoid Fever.—The discharges from the bowels, and perhaps constant exposure to other secretions or excretions from the patient.

As to small-pox, its contagion is very diffusive, and continues for a long time in the scabs of the pustules.

Scarlet fever is probably conveyed by the peeling skin longer than by the breath, but it is not so diffusive as small-pox or measles.

Diphtheria is not communicable at long distances, except in very close rooms. The membrane itself is the most dangerous source of contagion, particles of which may be carried and impart the disease at almost any distance if there is not full exposure to air.

Measles is very communicable, and probably more so because the cough tends to propel and diffuse the breath, laden with infective particles.

The same is true of whooping-cough, and besides, the sputa or phlegm, when it becomes dry, helps to diffuse the infection.

Typhoid fever seems chiefly to be communicated by the discharges, after they have undergone change by exposure to the air and to materials such as milk, which can absorb the particles, and when used convey it into the system.

It is true of this and the other contagions above named that they may pass into water or food as well as air, and be conveyed into the system by such means.

While these are the chief, they are not the only infections which may be conveyed.

Thus typhus fever is directly conveyable through the breath or the eruption.

Cholera, like typhoid fever, is conveyable chiefly through the discharges.

There is a follicular form of sore throat which is different from that of scarlet fever or diphtheria, which often seems to be communicated by near contact or inhalation of the breath. Direct breathing in of the breath of others is never healthy, and should be guarded against, especially where there is sickness.

Mumps are communicable at a small distance.

Some forms of skin diseases are conveyed by contact. Persons with any form of sore eyes, or unnatural discharges of any kind, should not use a towel which is to be used by others.

It is now believed that to some persons consumption may be communicable where there is imperfect ventilation, or to some susceptible persons who are constantly brought in direct contact with the breath or dried sputa of one sick with this malady. Individual care and

cleanliness go a great ways in preventing the catching and in reducing the severity of any disease.

Personal cleanliness, personal good habits and good health help to ward off many diseases.

We have selected the six diseases first named because they are the chief ones to which so many are exposed, and which, therefore, most need guarding against.

We may name some general rules which apply with nearly equal force to all of these diseases:

1. When any one has sore throat, foul breath, or eruption, however slight, he should be kept apart from all except an adult nurse or attendant, until it is known whether he has some one of the communicable diseases. If there has been known exposure to any communicable disease, special precaution should be used. Mild cases, just because they do not prevent moving about, often communicate these diseases. Scarlet fever does not, as a rule, occur sooner than six days, and diphtheria in from six to twelve days. Small-pox and measles not sooner than twelve days. There should be early diagnosis of what the disease is by some skilled person, even when the attack is mild and does not require much subsequent attendance.

2. Every person suspected or known to be sick of small-pox, scarlet fever, diphtheria, measles, &c., should be isolated from all other persons except necessary attendants. The garments of the patient and those of the attendants should be of such material as will admit of disinfection, boiling and washing. Persons entering or remaining in the room should not take off such garments as hats or coats or gloves, and put them on again in the room, as they thus serve to enfold and convey infective particles. Nurses should have occasional baths and be scrupulously clean, and, if compelled at any time to mingle with others, should first, after washing in some mild disinfectant, expose themselves a few moments to the open air. Close cutting of the hair and beard is often advisable. Women should have the hair covered by a cap; men when nursing, especially in small-pox, should remove the whiskers. It is quite certain that the smaller domestic animals, as the dog and the cat, convey, and may even contract some of these diseases. They should never be allowed in the sick room. No food, or milk or water which has stood in the sick room should be partaken of

by others. Dishes long in the room should be rinsed in some disinfecting fluid before removal.

3. The bedroom of a person sick with small-pox, scarlet fever, diphtheria, measles, &c., should be cleared of all unnecessary furniture, clothing or drapery, and of all kinds of bed or bedding that are not needed. Articles in the room when the sickness had fully begun, should not be removed to another room until they have been in the open air. Often it is best to remove the carpets, as rugs will answer and are more easily cleansed afterward. The room should never be less than 10x14, with an eight or nine-foot ceiling, and capable of having plenty of light admitted. It is better not to have the bed put in a corner or against walls. It is important that windows be so located as to admit of good ventilation without draught on the patient. If a piece of board is placed under the length of the lower sash so as to cause an opening between the lower and upper sash, or if there is at the top of the window a wire gauze slanting toward the ceiling, or any other arrangement for letting in air and yet interrupting a direct downward *draught*, much air can be admitted without any current being felt.

4. Discharges from the nose or the mouth, and from the throat and lungs, should be received upon cloths or rags or soft paper, so as to be quickly burned, or put into cups or vessels containing some one of the disinfectants hereafter named. Handkerchiefs are convenient, but too often are left to become soiled, or to convey contagion. After they are soiled, at once put them in very hot water or some disinfectant.

The discharges from the bowels and the bladder should be passed into vessels containing a pint of disinfectant, and without undue delay be buried at least one hundred feet from any well. When this is impracticable, the use of the disinfectant should be more plenty, and the removal to the common receptacle should be speedy.

The soiled bed or body linen or towels of the room should not be mingled with other soiled clothes, or put into the general wash or wait for the weekly washing, but should be covered over with a disinfecting fluid or promptly cleansed by hot water, and by the usual laundry methods.

5. No person who has recovered from small-pox, scarlet fever or diphtheria should mingle with others until there has been washing of

of the whole body and entire change of clothing. The time for return to society must be regulated by the physicians.

Two weeks after *complete* recovery from diphtheria or measles is usually sufficient. But by complete recovery—we mean this lapse of time *after* all symptoms have disappeared. After small-pox or scarlet fever, a longer period must elapse, since the skin is for some time separating its contaminated particles. From four to six weeks is the time generally named, but very much depends as to time upon the home cleanliness of the family and of the person.

When death has occurred from any communicable disease, the body should be washed with a chloride of lead or zinc, or corrosive sublimate solution of double strength of that described under disinfectants, and then be wrapped in a sheet wet with the same. Shavings or "excelsior," moistened with a disinfectant, may be placed under the body. In no case should the body be exposed to view. In most cases it is desirable to avoid a public funeral, and especially the attendance of children. Much depends on the skill and knowledge of the undertaker. (See Third Report, pp. 111–121.)

Disinfection of House and Surroundings.—The first requisite is the most thorough exposure of the room to air, unless it is in such very close proximity to other buildings as that it is best to *fumigate* first.

The following directions will guide as to materials and methods of disinfection.

Disinfectants to be Employed.—1. Roll sulphur (brimstone) or chlorine gas for fumigation.

2. Sulphate of iron (copperas) dissolved in water in the proportion of one and a half pounds to the gallon; for soil, sewers, etc.

3. (Zinc solution) sulphate of zinc and common salt, dissolved together in water in the proportion of four ounces sulphate and two ounces of salt to the gallon; for clothing, bed linen, etc.

4. Thymol solution.—Two drams of thymol (crystals) dissolved in ten drams of alcohol, twenty drams of glycerine, and one gallon of hot water.

5. Solution of corrosive sublimate.—One ounce to eight gallons of water.

6. Commercial sulphuric acid.—One pint to eight gallons of water.

How to Use Disinfectants in the Sick-Room.—*The most available agents are fresh air and cleanliness.* The clothing, towels, bed linen, etc., should at once, on removal from the patient, and before they are taken from the room, be placed in a pail or tub of the zinc solution, *boiling hot* if possible.

Unnecessary furniture—especially that which is stuffed—carpets and hangings, when possible should be removed from the room at the outset; otherwise, they should remain for subsequent fumigation and treatment.

All discharges should either be received in vessels containing copperas solution, or, when this is impracticable, should be immediately covered therewith. All vessels used about the patient should be cleansed with the same solution.

One-half pound of sulphate of iron (copperas or green vitriol), or one ounce of sulphate of zinc (white vitriol), or one ounce of sulphate of copper (blue vitriol), or one ounce chloride of zinc (butter of zinc), or one ounce of chloride of lime (bleaching powder), put to a quart of water will answer for this purpose.

Fumigation with sulphur is a practical method for disinfecting the house. For this purpose the rooms to be disinfected must be vacated. Heavy clothing, blankets, bedding, and other articles which cannot be treated with zinc solution, should be opened and exposed during fumigation, as directed below. Close the room as tightly as possible, place the sulphur in iron pans supported upon bricks placed in wash-tubs containing a litttle water, set it on fire by the hot coals or with the aid of a tablespoonful of alcohol or saltpetre, and allow the room to remain closed for twelve hours. For a room about ten feet square, at least two pounds of sulphur should be used; for larger rooms, proportionately increased quantities, placed at two or three points.

To disinfect an ordinary room with chlorine gas: having tightly closed all the openings of the room, place in it an earthen dish containing four ounces of peroxide of manganese. Pour on this one pound of strong muriatic acid, being careful not to breathe the fumes. When certain that continuous liberation of chlorine is taking place, leave the room and close the door.

Cellars, yards, stables, gutters, privies, cesspools, water-closets, drains, sewers, &c., should be frequently and liberally treated with copperas solution. The copperas solution is easily prepared by hanging a basket containing about sixty pounds of copperas in a barrel of water, or by dissolving in hot water a few pounds of copperas.

Corrosive sublimate is cheap and has excellent disinfectant properties, and can be used the same as the iron or zinc sulphates. The vessel containing it should be marked "poison."

Sulphuric acid has been found very effective for sprinkling and general disinfection.

Where a disinfectant wash of pleasant odor is desired for common use by the person sick or the attendant, the thymol solution, derived from thyme and some other plants, answers a good purpose.

We have not especially referred to carbolic acid and other phenol compounds, because, while useful, they are not preferable to those already named.

Body and Bed-clothing, &c.—It is often *best* to burn articles which have been in contact with the persons sick with contagious or infectious diseases (and especially if the disease be small-pox). Articles too valuable to be destroyed should be treated as follows:

a. Cotton, linen, flannels, blankets, &c., should be treated with the boiling-hot zinc solution. Introduce piece by piece, secure thorough wetting and boil for at least half an hour.

b. Heavy woolen clothing, silks, furs, stuffed bed-covers, beds and other articles which cannot be treated with the zinc solution, should be hung in the room during fumigation, their surfaces thoroughly exposed, pockets being turned inside out. Afterward they should be hung in the open air, beaten and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, &c., should be cut open, the contents spread out and thoroughly fumigated. Carpets are best fumigated on the floor, but should afterward be removed to the open air and thoroughly beaten.

After fumigation it is desirable to cleanse all wood-work with soft soap and hot water, to thoroughly brush hard or papered walls and to whitewash the rest. A thorough, general house-cleaning is desirable.

Circular VIII. of this Board, as contained in the third and fourth reports of the Board, pages 85 and 260, gives other important directions as to cleanliness and disinfection.

The question whether beds can be safely fumigated and re-used, will depend upon the amount of soiling or use. All things which are not to be or are found not capable of being thoroughly cleansed, should

be at once burned. As contagions are often stored up and kept over because of imperfect airing and cleansing, safety depends upon what has been done after the cases have ceased.

In these directions it is not claimed that in every case of communicable disease there is to be so much labor and destruction. But the most perfect methods are presented as models, to be varied, if proper, under the advice of the physician, who also thus needs to be reminded of what *thorough disinfection means.*

SPECIAL DIRECTIONS AS TO VACCINATION FOR THE PREVENTION OF SMALL-POX.

With the present facilities for travel and the thoroughfare character of this State, there is no reasonable expectancy that any person will reach the age of twenty-one without great risk of small-pox, unless the disease is prevented by vaccination. The person who runs the risk not only endangers his own life and comfort, but imperils others to a degree not justifiable.

By the provisions of the Health Law of March 11th, 1880, all school boards are authorized to vaccinate, at public expense, any pupils attending school who are unable to procure vaccination.

All local Health Boards need to see to it that vaccination is recommended, as well as rapid isolation of cases secured, if any occur. The cost of local epidemics of small-pox is very great, besides the peril to life and public health. The prevention of the disease is within the range and duty of your control. All our local Health Boards and School Boards should co-operate in influence and provision for more general vaccination, and for revaccination of persons who have not been vaccinated since full growth. The heads of large manufacturing establishments need to attend to it, both in the interest of capital and labor.

Bear in mind and act upon the following suggestions:

I. Let every parent see to it that each child is vaccinated before one year of age, and sooner, if possible.

II. Let no teacher or child be admitted to a public school without vaccination.

III. Let provision be made by school trustees and Boards of Health for free vaccination to such as need this provision. (See *Chapter 153, Section 10, Laws of 1880.*)

IV. Would it not be well, just before each April vacation, to have schools close an hour earlier and thus have a *vaccination day,* on which all scholars could be invited to be vaccinated by their physicians, at home, or, by some public arrangement, at the school building?

V. Do not concern yourself about the kind of vaccine or lymph used any more than you would about the source of medicine you take, but hold the physician responsible therefor. Have the sore examined and take a certificate from the vaccinator that, in his judgment, you are successfully vaccinated.

VI. Have vaccination repeated or retried after the age of sixteen. Most persons, if fully vaccinated the first time, will have but little result from the repetition, but it is advisable to have this additional assurance of safety.

VII. If small-pox or varioloid occurs in your house, do not attempt concealment. At once send for your physician and do as he advises you, or notify the Board of Health. Have every member of the family vaccinated. By some means prevent the possibility of persons coming in unawares. If you know of any person who has been exposed, send him word so that he may be vaccinated.

VIII. Where there are factories, the superintendents should advise or direct all their employes to be vaccinated.

Most of our physicians have full confidence in humanized vaccine lymph, which is easily secured. *Vaccine lymph directly from the animal* is preferred by those who have any fear of communication of other diseases through humanized lymph—a fear that is greatly magnified in the popular mind. It is, nevertheless, due that all have their preference, and that where vaccination is insisted upon as a condition of school attendance, bovine lymph be used, if desired. Many physicians prefer to use this. The New York City Board of Health, 301 Mott street, New York, furnishes it daily by mail. H. A. Martin & Son send it direct from their herd, Roxbury Station, Boston, Mass. Dr. E. L. Griffin, State street, Chicago, is prompt in remittal. Ready supplies can also be had from Philadelphia and other cities. The price per point is about twenty cents, and less in larger quantities. There is reason to believe that much is sold for bovine lymph which is not such, or that there is a failure in effect because of age and imperfect keeping.

We urge upon all physicians great exactness in selecting lymph, and upon the people protection from the disease. Its outbreak every

few years is not a proof of epidemic tendency. The periodicity rather occurs because that, after an epidemic, as soon as years enough have passed for a younger product of children to be out in public child-life, the susceptible material becomes so abundant as to insure extension if a single case is introduced from another section. Then there is an outbreak of small-pox and of vaccination. Would it not be better if, somehow, the young population could be systematically protected? Let our various communities and the local Boards secure this, not only under present threatenings, but as a wise preventive measure.

Small-pox is the one contagious disease which ought never to occur, and which could forever cease if the preventive methods now well understood could be enforced. Every case is the result of public or personal imprudence. Where one has been exposed, unless there has been recent vaccination, he or she should be at once vaccinated. If this has been neglected, it should be done even if there has been neglect for several days after exposure. It is not certain but that thorough vaccination, even when too late to prevent an attack, mitigates the severity of the secondary fever.

GENERAL PREVENTIVE MEASURES.

All contagious diseases should be reported to the Board of Health, since public safety requires it, especially in cities, and no public use is made of the fact, save where there is great danger of an epidemic.

Every local Board should have its executive officer, who should know how to stop the spread of the fire before it has attained headway. We urge upon all local boards the prevention of small-pox, scarlet fever, diphtheria and other preventable diseases.

To pursue a disease, in order to stop it, is often a duty; to get ahead of it, both a privilege and a duty, and very often possible. To prevent is to anticipate, to go before; and Health Boards, as well as individuals, may thus be of great service. Afterthought is sometimes good—forethought is better.

When a case of contagious disease occurs in your district, do the right thing promptly, and do not waste the first week in consultations.

While it cannot be claimed that this or that kind of filth can account for the outbreak of every particular or specific disease, we do know *that cleanliness* of person or of surroundings are great preventives or checks to contagions.

Pure air, pure water, pure homes, pure soils, pure persons and pure surroundings are the surest safeguards against disease of every kind. Where an epidemic occurs in any locality, it may here and there alight upon those whose homes are in good sanitary condition. But it is wonderful to see how general is the rule that pestilences have their choice of persons and places, and how uniformly those who can furnish the most insanitary conditions are surest to be visited. Malignancy is often in direct proportion to uncleanliness and filth, or to errors in methods for the disposal of decayable material.

Secure dryness for every part of your dwelling, and proper drainage, fresh air and sunlight.

Examine the cellar or basement and see that it is dry and clean, with whitewashed walls, with no concealed wells or cesspools, or decaying vegetables.

See that all house soil-pipes and connections are properly trapped, ventilated and disconnected from the outside cesspool or sewer by a trap, and also an intervening air opening, and that the house system also has a ventilating opening on the roof. Have all garbage frequently removed. Decomposing heaps of animal or vegetable matter near the dwelling are always hazardous.

If wells are used for drinking water, their surroundings should be perfectly clean, no vessels being rinsed by them nor any slop-water thrown on the ground near them; nor should cesspools or privies be located within a hundred feet.

If a cistern is used, it should be cleaned each year or oftener. If at any time the odor of water becomes bad, do not use it without boiling, until you have ascertained the cause.

If only individuals and local Boards recognize the conditions under which communicable diseases occur and spread, and, when they do occur, act promptly and intelligently, it is surprising how life is saved, disease diminished and epidemics prevented.

For copies of all circulars, address E. M. Hunt, M.D., Trenton, N. J.

Trenton, April 15th, 1884.

CIRCULAR XLV.

Of the State Board of Health of New Jersey.

CHOLERA.

Trenton, N. J., January 1st, 1885.

Whenever the possibility of an outbreak of cholera is threatening, all methods for thorough cleanliness should be applied with renewed vigor. For it is a mistake to suppose that cholera falls like a thunderbolt and accomplishes wide-spread destruction without regard to locality. On this point the Cholera Commission of the German Empire, which convened in 1873, and has met from time to time since and just reported (1882), is full and explicit. "The most important part is played by the locality itself to which the disease germ is brought." It depends in part on "the saturation of the soil with the decomposition of certain substances, and a condition of soil which favors such decomposition." Part VI., pages 314–318, says: "The commission expresses the united opinion of all the most experienced physicians when it says that the strictest attention to all the measures demanded by public general hygiene, offers the best protection against cholera."

Along highways of travel, as wherever else it lights, with occasional apparent exceptions, an analysis of the facts shows the rule to be that its virulence is in proportion to the neglect of sanitary conditions. "It is spread more by infecting localities than by infected persons."

For these reasons city and village officers and all householders should see to it that no form of decomposable matter is kept on or about the premises, that all pipes are thoroughly flushed and ventilated, that there be close inspection of dwellings and surroundings, that pure water and wholesome foods are used, and where soil or cesspools are already filth-sodden and cannot be removed, that the disinfecting solution of copperas and carbolic acid herewith recommended be thoroughly and frequently sprinkled.

But because "all measures for the cleansing of the soil and its better drainage are too often too late when begun, at the time of the outbreak of an epidemic, all places should institute close sanitary

inspection and proper cleansing in advance, so as to prevent an outbreak or limit its extent."

In dealing with epidemics which come from without, a great secret of success is in doing beforehand all that can be done to prevent the settling and spread of the disease, and in learning just what you will do with the first case or cases that occur.

Whatever may be the differences of opinion, we are safe in acting on the basis that the following facts are settled as to cholera:

I. Although the view of direct contagion is not supported, transmission of the disease takes place without doubt in two ways: (*a*) From the patient particles or secretions are thrown off which are not capable at once of acting as cholera poison, but which in a few hours are so changed as to become the specific poison; and (*b*) so also in the presence of such a center of infection, material for disease may attach itself to soil, locality and surroundings, and "whenever it finds appropriate conditions for its reproduction, it may light up an epidemic."

While these facts need not cause attendants to fear catching the disease, they are reasons why the patient should be isolated, why only persons needed should be in attendance, and why all in charge lose not the opportunity of dealing with materials and surroundings which, although not cholera poisons, are quite sure to become so if nothing is done.

As persons may unavoidably be brought in contact with infected localities, such are advised to use, at time of exposure and before each meal, two grains of quinine, four drops of aromatic sulphuric acid, and two drops of the tincture of chloride of iron, in a half tablespoonful of water which has been boiled.

In necessary visits to infected premises "consume nothing while there but the air you breathe and carry nothing home."

What to do with the first case that occurs: Consider that the wise management of it may not only determine the welfare of the patient but of the whole community.

1st. Get the history of the case as soon as possible, and take care of all baggage and clothing and all that appertains to the patient. If you can control where the sick person is to be taken, seek isolation from other houses if possible; if not, an isolated room, and avoid taking the patient into a notoriously unhealthy locality. Carry out a thorough system of disinfection, both in the treatment and as regards all surroundings of the patient. All laundry material should be

placed in a disinfecting solution previous to washing. Some things are best burned if soiled. With this memorandum before him, the health inspector or physician will direct as to what to do with each. He seeks to prevent the locating and transmission of the disease as well as to save his patient. Read carefully Circular VIII. on Disinfectants, or Circular XLIV. on Communicable Diseases.

What to do with premonitory symptoms or with any purging disorder of the digestive tract:

Resolve at once to attend to it and control it, not because it is cholera, but because few who attend to such symptoms ever die of cholera, and because such attacks, if uncared for, seem often to invite the disease. If there is diarrhea, take a recumbent posture, apply a mustard plaster over the abdomen, and if there is a recurrence of discharge, use the following prescription until you have time to seek medical advice:

Laudanum, Spirits of Camphor, } each *one* part.
Tinc. of Ginger, Tinc. of Capsicum, } each *two* parts.
Dose, one teaspoonful in a wine-glass of water.

Or,

Compound solution of Opium (Squibbs', Spirits of Camphor, Spiced syrup of rhubarb, Tincture of capsicum, } of each, equal parts.
Dose, for adult one teaspoonful in a tablespoonful of water.

How to take care of yourself and family during a cholera summer:

Practice a close adherence to all the ordinary rules of health. Most persons are best off where they can control all the circumstances of their condition, so as to be able to have good surroundings, good housekeeping, good, well-cooked foods, and conveniences for bathing, exercise, etc., and for immediate rest or care if there is sickness. Avoid cholera districts unless duty calls. Avoid public water-closets. Make no special change of diet, except to avoid those articles of food which you have found to occasionally disagree. Anxiety of mind, overwork, over-heating, and any irregularity of habit or life seems to invite epidemic influences. The more we analyze facts, the more we find that epidemics do not fall on places or persons at random. While

here and there the most correct and those best situated fall victims, with rare exception the imprudent, the exposed, the poor are the chief sufferers. Be particular as to the use of water, unless you know its source. Tea, hot or cold, or coffee, can be used instead. If you have any suspicion of your own well-water, boil what is used for drinking.

Disinfectants—How to use them.

Fresh air has no substitute. In order to cleanse places already infected, or being made so by sickness, there is need of *draught* through the room or building.

Hot air.—Clothing or bedding is thus cleansed by being put in a furnace of dry heat at from 230° to 300° F. It should be subjected to the heat for about one hour.

Hot water.—Very hot or boiling water is applicable to the cleansing of all garments, utensils, etc., admitting of such a method. Put them in when the water is quite hot and allow it to come to a boiling point. Where garments have been soiled, it is well to throw them first into a tub containing a disinfectant solution and from it transfer them to the water.

A. Iron sulphate, called also green vitriol, copperas, green copperas, (2 cents per pound).—Stir in water until well dissolved, in proportion of one pound to a gallon. A teacupful of this solution should be in the utensil before using, or twice as much added to the water-closet each time of use. For use in sprinkling foul premises make it of double strength.

Carbolic acid solution (Squibbs' No. 2) may be added to it in the proportion of one-tenth.

B. Carbolic acid.—One gill to a pint of warm water, for use in stools, water-closets, sinks, etc.

Chloride of Lime.—A valuable disinfectant, chiefly because it contains from 30 to 35 per cent. of chlorine, which is liberated under proper methods of use. If purchased for cities, it should be tested as to the amount. It is not overrated as a disinfectant if only its quality is known, and its mode of use is judicious. It needs slight moistening, frequent stirring, and sometimes the addition of an acid, as vinegar or common spirits of salt. The test of its efficiency is that the odor of it be kept constantly perceptible.

One pound to a gallon of water for utensils, sinks, water-closets,

drains, &c. One ounce to a gallon of water for all linen, which must not be left long in the solution, but wrung out in fresh water.

Chlorinated Soda, usually known as Labarraque's solution, is a convenient liquid preparation, valuable for use in saucers in the sick-room or in utensils. Its odor should be perceptible to strangers entering.

The chlorides are not to be used with carbolic acid.

C. To disinfect a room, ship or building, so needing disinfection that its contents and surfaces cannot be easily dealt with singly, close the room or building, its windows, doors and chimneys so as to exclude the outer air as far as possible. Vacate the house. Break roll sulphur in small pieces, place it on an iron plate or other metallic dish, and set this on a pair of tongs, or other cross-bar, over an iron pot in which there is water, or over a large box of sand, so as to avoid danger of fire from small particles of burning sulphur. Light it by a few hot coals or some alcohol poured around the sulphur and lighted. Then leave and shut the door after you. A pound and a half of sulphur is sufficient for 1,000 cubic feet of space. The sulphur will convert all the oxygen of the air into sulphurous acid, and all organic particles are likely to be changed. Keep closed three hours after the burning has ceased, and then air well six hours before occupying. Clothing and bedding needing disinfection may be hung on lines and left in the room. Most furniture is not permanently injured, but needs dry wiping and then washing off afterwards.

D. *Lime—Plaster—Charcoal—Dry Earth—Sifted Ashes.*—All these have value, chiefly to be tested by the rapidity with which they correct odors. Fresh slaked lime should be scattered in all places of foul odor. It or charcoal or plaster may be scattered over heaps emitting foul odors. Calx powder is made by pounding one bushel of dry, fresh charcoal and two bushels of stone-lime, and mixing them, and is of great practical use.

All these substances absorb foul gases and dry up moisture, and so help to retard decomposition, or else absorb its results. Where lump charcoal is used it may be refitted for use by reheating it. Quick-lime and ground plaster should not be used where they may be washed into pipes and form lime-soap or obstruct by hardening.

E. One-half pound of sulphate of iron (green vitriol), or one ounce of sulphate of zinc (white vitriol), or one ounce of sulphate of copper (blue vitriol), or one ounce of chloride of zinc (butter of zinc), or one ounce of chloride of lime (bleaching powder), put to a quart of water—any one of these is available for neutralizing discharges or for sinks, used in quantities sufficient to cover the bulk they are intended to disinfect. Where any articles are to be moved from one place to another for airing and disinfection, as trunks, clothing, &c., they should be put in a bag or sheet, like a pillow-case, which is yet moist from having been wrung out in one of these disinfecting solutions.

To sextons and others in charge of the unburied dead:

Use any of the solutions named under E, of double strength for washing. Under and around the body (which should be early placed in the coffin, even if not closed,) use dry chloride of lime or the zinc chloride or the iron sulphate. The body may be wrapped in a solution of these or be placed in a solution in a water-tight coffin. When dry disinfectants only are used, fine shavings, or oakum, or tow, or sawdust, mingled with the disinfectant, or with tar, should be placed beneath and around the hips. A plug at the lower bowel prevents after purging.

Burial should be within thirty hours after death, and the coffin should not be closed early and *then re-opened*, since this lets out concentrated and confined foul air.

For copies of circulars send to E. M. Hunt, M.D., Secretary, Trenton, N. J.

CIRCULAR XLVI.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

TRENTON, October 1st, 1884.

Inclosed herewith please find an outline for the Annual Report for the year ending October 1st. Under the schedule of subjects for report, in the case of cities and townships which have had Boards of Health and reported previous to this year, it will not be necessary to repeat as to *A, B, L, G, I, O*, as most of the facts are on file.

Under *A*, in the case of all cities or incorporated towns, it is desirable to report the number of acres included in the incorporation.

C. State exact source of water-supply. If a public supply, is it by the city or a private company? How many houses take it? Is the water ever discolored? Has it an iron or other taste? Is it hard or soft? Is it bad at any one season of the year? Are reservoirs or water pipes cleansed? Does the source or stream from which it is taken receive any sewage above the point of supply? Any other facts as to source, quantity or quality. How many depend on wells? How many on cisterns?

D. As to drainage, state whether any system of drainage for the ground is used as distinct from sewerage. Is the usual water-level such as to secure dry cellars? If there are swamps near you, or malaria is frequent, give particulars.

As to *sewers*, state their construction, their grade or fall per 100 feet, their size, their outfall, their flushing and ventilation, and whole length.

F. State whether houses generally have basements or cellars. If a city, whether the basements are occupied; if country, whether largely used for storage of vegetables. How many tenement houses of more than two families?

H. State how far sewers are used. If cesspools, state whether they are cemented, or whether built with open bottom or sides. How are they emptied?

J. State any known or prevalent diseases. Does the assessor inquire each year as to losses of animals and as to contagious diseases? If a city, is there a register of all persons keeping horses, cows, hogs, etc.?

K. Are slaughter-houses inspected so as not to be a nuisance to neighbors?

L. State any new manufactories, and any evil to health therefrom.

Look carefully at each heading and state what you know.

Do not put down a disease as prevalent unless you have personally known of at least ten cases. Often the physician of the Board should make out or aid in the report, and add such suggestions as occur to him; but let there be no delay to make return during October. We must trust chiefly to the assessor and the physician to keep the other members of the Board acquainted with health conditions, and with the rights and duties of the Board. Any neglects reported to us will be inquired into. Refer to Circular XXXIX., before sent you, for further suggestions. We send from time to time lists of physicians

and of undertakers that you may cross off any deceased or removed, or who do not continue their business. Add all new ones who have *settled* for practice in your city or township. Give name and *post office address*, etc., *plainly*, and only those who are practitioners and who *reside* within the limits you represent. Mail all to us, in envelope herewith sent, by November 1st.

E. M. HUNT, M.D.,
Secretary.

CIRCULAR XLVII.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

PREVENTION OF SERIOUS INJURIES TO THE MIND, THE EYES, THE EARS.

TRENTON, December 1st, 1884.

It is a noble charity for a State to have *asylums*, where those whose minds have been impaired, or those who are blind, or who are deaf and dumb, can be cared for. It is a nobler charity to prevent such afflictions. Both the individual and the State are involved in such losses. The individual is embarrassed as to the pleasure and profit of useful labor, and the State loses his aid in its own industrial resources. The State also has to make large expenditures for the support and comfort of those who thus become dependent. The dictates of interest and economy unite with those of philanthropy, in leading us to seek for the causes of such calamities with a view to prevent or overcome them.

Mental disability is often the result of early errors and neglects. *Spasms* caused by some indigestible article of food, or by some sickness, not infrequently become chronic by neglect. A single attack is often incidental to other symptoms, and of no grave import. But the system is often left nervous or irritable and at a period more or less remote, another attack occurs. Often a habit of abnormal action is thus made permanent without any organic change at the start.

In other cases imperfect control of disposition or unfavorable surroundings develop into insanity, what at first was only defective self-

control. In some the derangement is the direct result of bodily sicknesses, which have been imperfectly treated or put under skilled medical oversight too late. *Whenever epilepsy or spasm in any form has occurred, it should not only have medical care in the first instance, but the person should from that time be under such medical oversight as will secure treatment to prevent recurrence.* The last ten years mark such advances as to the management of nervous diseases as should lead to a great diminution in a class of cases now found in asylums. The treatment of these cases is very hopeful if begun soon after a first attack. The treatment of all disturbed or impaired mental condition is far more hopeful than formerly, if only it comes at once under skilled treatment. The recovery of persons who have had no treatment for a year is comparatively rare. Many of those now in asylums would never have been there if only their cases had been met at the very beginning of derangement.

THE EYES.

Blindness is rarely congenital, but usually occurs from accident or disease after birth.

Physicians are constantly seeing cases of neglected eye disease, which either end in total blindness or in such impairment of vision as interferes with the pursuit of an industrial occupation. Not a few of these diseases are of a communicable character. A slight inflammation beginning in the eyelids or conjunctiva, or cornea, obscures or destroys vision, although the instrument and the nerve behind it are sound.

Of these the most common is the disease known as purulent opthalmia. We once had occasion to see its ravages in a large school of over a thousand of the London poor, where it was not gotten rid of without the most serious disaster.

C. R. Agnew, M. D., of New York, thus speaks of it:

"The occurrence of an epidemic of purulent opthalmia not only produces cases of partial or entire blindness, but spoils the integrity of the lining of the eyelids. This latter condition of proliferation or thickening of the conjunctiva of the eyelids, and production of so-called granulations is a most obstinate and incorrigible affection. It leads in very many cases to a life of troublesome eyes, to a cloudy cornea and imperfect sight, or ultimately ulcerations, staphyloma, and possibly destruction of one or both eyes.

"The bad effects of this preventable malady are not confined to the limited school life, but run through the entire career of the sufferer or make him a vehicle of contagion to others. I have often seen an entire family inoculated by the arrival in their midst of a case from a public institution. I have seen it carried into a community and there spread by a child discharged from such a school. It will be seen that we have not only the acute malady to deal with, but the baleful after effects, in blindness, chronic eye trouble and the spread of catarrhal eye disease in tenements and other communities. The authorities then, and those who make the reduction of the expenses of public charities the special object of their zeal should become broader students of the matters they undertake to regulate."

We are indebted to Charles J. Kipp, M.D., of Newark, for the following outline and directions as to the prevention of communicable eye diseases:

"HOW TO PREVENT THE SPREAD OF CONTAGIOUS DISEASES OF THE EYE, AND WHAT TO DO FOR THEM.

"The contagious diseases of the eye are the most destructive of eye diseases, and often lead to hopeless blindness, if they are neglected or improperly treated.

"In the vast majority of the cases the contagious disease of the eye is caught by using the towels, sponges, napkins, handkerchiefs, wash-basins or other articles used by persons afflicted with the disease, in washing or wiping their eyes; in other cases, the disease is caused by bringing the discharge from a specific disease in contact with the eyes. From this statement it will be seen that by proper precaution the spread of the disease is easily prevented.

"In order to enable our readers to form some idea of what constitutes a contagious eye disease, we will state that any affection of the eye which gives rise to the formation of much matter (discharge) may be looked upon as contagious. The most prominent symptons of the disease are a copious, thick, yellowish discharge from between the lids; swelling and redness of the eyelids, and redness of the white of the eye.

"To prevent the spread of the disease the patient should, if possible, be isolated; that is, he should have a room by himself, and no one but the nurses should be allowed to enter the room.

"A large and well-ventilated room should be selected.

"All the linen used by the patient should be washed by itself, and, if possible, should be soaked in some disinfectant solution before washing.

"All articles used for cleansing the eyes should be destroyed by burning, especially the cloths and sponges.

"The nurses attending the patient should carefully and thoroughly wash their hands in hot water and use the nail brush before leaving the sick-room, and they should never be allowed to touch any other person's eyes while in attendance on a patient suffering from such a disease as the one here described.

"If the nurse should at any time have reason to think that some of the matter from the patient's eye has got into her own, she should at once wash out the eye with plenty of clean tepid water, and consult a physician as soon as possible.

"No person afflicted with a contagious eye disease, even if it is not sufficiently severe to confine him to his room, should be allowed to go among others.

"Teachers and persons in charge of asylums, schools, &c., should not permit a child with sore eyes to attend school, or be admitted into an institution containing children, unless a competent physician has certified that the eye disease is not contagious.

"A very serious form of eye disease is sometimes developed in new-born children on the third, fourth or fifth day of life, rarely later.

"To prevent this the child's eyelids should be very thoroughly cleansed with a clean soft cloth, or a new clean sponge, immediately after birth, before it receives a bath; and after bathing, its eyes should be thoroughly washed out with clean tepid water, which may be dropped between the gently opened lids from another new and clean sponge or from an eye-dropper. For some days after this, great care should be taken that none of the sponges, napkins or other articles used for the mother are used about the child, and especially about its face.

"If, notwithstanding these precautions, the infant's eyelids begin to swell and become red, and a watery discharge makes its appearance, some days after birth, it may be assumed that the infant's eyes are in great danger, which can be averted only by placing it at once under the care of a good physician, and by faithfully carrying out the latter's directions. *In all such cases it is the imperative duty of those in charge*

of the infant to see that a competent physician is placed in charge of the case, for, if properly treated, the disease will, in all probability, pass away without damage to the sight, while if it is neglected, hopeless blindness is only too often caused by it. It is said that nearly one-half of the inmates of the schools for the blind have lost their sight from this disease. Until a physician can be obtained, the patient's eyes should be frequently cleansed in the manner above described, and all the precautions mentioned against spreading this disease should be strictly observed.

"The danger of blindness from this disease is as great in older children and grown persons as in infants, and no time should, therefore, be wasted in trying the different domestic remedies or patent eye-waters, before consulting a physician."

All cases of inflamed eyes or granular lids should receive the earliest attention.

There is also, in connection with our schools, need of more care as to the eyes. By the relation of light and shade to the room, the position of the blackboards or excessive weariness of the eye, the foundation is laid for permanent impairment of vision. Where there is short-sightedness or other defect, it should early be remedied by glasses. In the best foreign schools it is now the habit to have the eyes of children carefully examined, in order that defects may be noted, and either cured or prevented from becoming excessive.

DEAFNESS AND CONSEQUENT LOSS OF SPEECH.

An analysis of cases found in most of the deaf-mute asylums, shows that by far the larger number result from disease. Scarlet fever, by affecting the middle ear and the chain of bones therein, often causes loss of hearing and speech. Other affections of the throat or tonsils also inflame the minute tube leading from the middle ear to the throat, or so close it as to prevent the record of sound. Many of the minor inflammations of the external ear also have to do with impairment or loss of powers in the organ. In every case of scarlet fever, of diphtheria, and of mumps, there needs to be watchfulness as to the acuteness of hearing for some time after the local swelling or inflammation has subsided. Often the doctor leaves the case doing apparently well, and the impairment goes on gradually afterward. Pain in the ear, of any kind, needs early attention. Even where the middle ear is not

the seat of the trouble, the drum or septum, between the external and middle, may easily become involved from the outer side. Many of the domestic remedies for ear-ache are worse than useless. But little can be known as to the treatment of even the external ear until the canal has been examined as far as the drum.

Often where the family physician may not have all the instruments of precision for testing the acuteness of the senses, his opinion is of great service in directing to those prepared for more accurate diagnosis. It is estimated that a large percentage of those who now find their way to the public charitable institutions of the State, could be prevented from this necessity, if only the possibilities of precaution and early aid were known.

It is the design of this circular to impress the importance of such prompt and intelligent action as will save persons, families, and the State from losses which our charities seek to mitigate, but for which they cannot compensate.

E. M. HUNT, M.D.,
Secretary.

CIRCULAR XLVIII.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

TRENTON, October 1st, 1884.

G.—AS TO ANIMALS.

INFECTIOUS PNEUMO-ENTERITIS.—SWINE PLAGUE.

There is some difference of opinion as to the earliest appearance of this disease. Diseases of swine until recently were less fully classified than those of most other farm animals, and so under the names of "Anthracoid Erysipelas," "The Distemper," "Hog Cholera," "Blue Sickness," "Typhoid Fever," etc., ailments really different have been associated. At one time it was regarded as caused by a worm, the Stephanurus dentatus (See Cobbold, Fleming, White, Fletcher), which was not infrequently found, but is now known to have no causal relation.

Nusken, in his general pathology on veterinary science, (Munster and Ham, 1829,) and Spinola in his treatise on "The Diseases of the Pig," Berlin, 1842, describe symptoms which many identify as the same disease.

Dr. G. Sutton, of Aurora, Indiana, described this disease in 1858 under the head of "Swine Pestilence," in the *North American Medico-Chirurgical Review.* In the U. S. Agricultural Report of 1861, Dr. E. M. Snow, of Providence, Rhode Island, gives a detailed account of the disease, and states that it was recognized in this country in Indiana, in the summer of 1856.

Harms, (Hanover, 1869,) under the name of pig erysipelas and pig plague (pamphlet), is believed to describe this disease.

Dr. Budd, in a lecture to the members of the Royal Agricultural Society in 1865, and in his treatise on typhoid fever, speaks of it as the exact counterpart of typhoid fever in man, as does Professor Wartly Axe, of London, in *The Veterinarian*, July, 1865. They were both mistaken, as shown by Dr. Murchison and others. Roell (Wien, 1876,) follows nearly the views of Harms. If, as is probable, the disease is included in the one so often described as Anthracoid Erysipelas, according to Fleming (1875), it prevails as a "most fatal and destructive malady in Great Britain, on the Continent, and in America and Australia." In the U. S. Agricultural Report of 1878, Professor James Law accurately defines the special symptoms and gives details of autopsies made by him in Scotland. He has also since made important culture and other experiments as to it. The medical officer of health of Great Britain, in an introductory note to the report of Dr. E. Klein, V.R.S. (1877), says of the swine plague and hog cholera that "the disease is rife in all parts of England and Ireland, and it produces oftentimes great ravages among herds."

Zundel (Paris, 1874,) probably describes the same disease, as does Ballinger in *Ziemssen's Cyclopædia of Practical Medicine*, London, 1875, where he says of swine, "They are subjected to a scourge which is frequently, though falsely, reckoned as anthrax, and is indeed similar to it in many features and equally dangerous, viz., the hog plague."

Dr. J. M. Partridge, in the second annual report of the Indiana State Board of Health (1884), says:

"Swine plague, or hog cholera, undoubtedly appeared in this country as early as 1860. It was not then regarded as a contagious disease, and received no general attention or public notice until fifteen

years later, or about 1875. At this time its wide-spread proportions and fatally destructive character began to cause great consternation throughout the pork-producing regions of the Northwest, as it was estimated that the loss to the producers from this disease amounted to the enormous sum of $15,000,000 annually. In this emergency Congress appropriated $10,000 to be placed in the hands of the Commissioner of Agriculture, for the purpose of investigating diseases of domesticated animals. The Commissioner, finding that the loss of swine was greater in numbers and value than that of all other animals combined, wisely determined to expend the greater part of this appropriation for investigations in this direction. He therefore appointed an examiner in each of the seven States where this disease was most prevalent. Their examinations and reports have done great credit to the authors, and rendered most valuable service to the country."

For one of the earliest and the most thorough inquiries into the disease, we are indebted to Dr. E. Klein, F.R.S., whose valuable research and reports on its history, pathology, etc., are to be found in the Public Health Reports of the Medical Officer of England, for the years 1876 and 1877. These have been followed up by the valuable series of investigations by Detmers, Law, Salmon, and various others under the auspices of the U. S. Agricultural Department. See reports of 1875, 1877, 1878, 1879, 1880, and 1881–1882. Professor W. Osler, of Montreal, has closely studied the disease.

In the fall of 1878, H. J. Detmers, V. S., of Chicago, claimed to find a special form of bacteria, which he called "bacillus suis," which he believed to be the contagious particle. Dr. D. E. Salmon, of the Bureau of Animal Industry, Washington (Report of 1881–2), disputes the views both of Klein and Detmers as to the pathogenic agent or contagion being a bacillus, but views it as a micrococcus (page 269), found both in the glands, the blood and the tissues.

Because of the great mass of investigation and literature to be found on the subject, of which those referred to are but specimens, this Board, under the present provisions of our law, did not regard it as essential to do more as to pathological investigation of the disease than to make enough post-mortem examinations to confirm its diagnosis. As there had been sporadic cases of it in the State before, it was carefully noticed in the first circular of this Board as to contagious diseases of animals, issued in 1879. (See 4th Report.)

It is not necessary here to enumerate all the various symptoms or pathological changes which are found in various cases, but only such as are the most constant and diagnostic. Only the condition of the

lungs, the intestines, especially the large intestine, and the lymphatic glands, are constant as to post-mortem appearances. In addition the changes in the skin, in serous membranes, in the heart, the liver, the spleen and the kidney, are worthy of note.

The disease is not transmissible to men, but is, although not readily, to some of the lower animals, as the rabbit, the mouse and the sheep.

The following is mostly Klein's description of a typical case:

In the severer cases we observe constitutional and other disturbances in the living animal after an incubation period of two to five or more days. The animals do not feed well, are dull, creep into their straw, probably from a sense of feeling cold. Their skin feels hot and the body temperature is raised. This last symptom shows, however, great irregularity and variation. In some of the severer forms we find the skin of the groins, neck, inside of the thigh and perineum swollen and of a patchy or diffused redness. This redness may be absent altogether, or it may be only transitory: it may appear only for a short period at the outset, or near the fatal termination of the disease. Hæmorrhages in the red patches are occasionally seen; they lead to the formation of scabs. The red patches of the skin, at all events, are a very inconstant symptom.

In many severe cases the animals suffer from diarrhea. This may be persistent or only temporary, disappearing and coming on again. When it is of a permanent character, the animals become soon emaciated to a considerable extent.

The respiration is quick and impeded. There is often hoarseness and cough.

On post-mortem examination we find that ulceration of the ileo-cœcal valve, and especially of the colon, is very marked. In the latter we may find confluent ulcerations of great dimensions, occasionally several inches in diameter. As a rule they are round or oblong. The Peyer's glands near the ileo-cœcal valve are distinct. In the lower part of the colon we find the solitary lymph-follicles very marked, projecting more or less over the surface of the mucous membrane as nodular swellings. The mucous membrane of the large intestine and duodenium (in some cases also that of other parts of the small intestine), presents numerous small hæmorrhages. The submucous tissue of the large intestine—especially the colon—is the seat of hæmorrhages.

The lymphatic glands of the pelvis, the mesenteric glands and the glands in the porta hepatis are greatly enlarged and firm; in their interior may be seen fibrinous deposits; their peripheral parts are more or less filled with effused blood.

The spleen is occasionally enlarged, its capsule shows numerous small hæmorrhagic spots. In one case I have seen considerable number of white brittle nodular or irregularly-shaped masses in the

substance and underneath the capsule of the enlarged spleen. The liver is occasionally enlarged, full of blood; in some cases it shows hæmorrhagic spots underneath the capsule.

The peritoneum is highly inflamed, containing numerous hæmorrhagic spots; there is considerable amount of clear or more or less blood-tinged and coagulable exudation in the serous cavity. Masses of solid lymph are found on the omentum, the mesentery and the serous covering of the large intestine, which in some cases show also numerous minute false membranes. The pleura and pericardium are in most cases more or less inflamed, their cavities containing inflammatory exudation.

The lung is the seat of more or less severe lobular pneumonia; considerable portions of both lungs become airless and more or less consolidated. The trachea and bronchi contain muco-purulent matter slightly tinged with blood.

The tongue, mucous membrane of mouth and epiglottis occasionally show hæmorrhagic patches or even ulcerations.

The disease is highly infectious. By direct experiment it can be proved that the diseased lung, the contents of trachea and bronchi, the diseased intestine—particles of ulcerated mucous membrane that are discharged with the fæces—the diseased spleen aud the peritoneal exudation contain the materies morbi. The disease can be produced in a healthy animal by inoculating a minute quantity of the materies morbi into the skin or mucous membrane. The disease may be induced also by mixing the materies morbi with the food. I have not been able to determine definitely, whether the fresh blood of diseased aminals when inoculated does or does not, as a rule, induce the malady. The disease can be produced by simple cohabitation with a diseased animal, or by putting a healthy animal in a place where a diseased one had been previously kept.

The eruption is not always present, and yet most look upon it as an eruptive or exanthematous disease. In severe cases it is rarely absent. There is a "uniform or patchy redness on the under part of the abdomen and on the inside of the forelegs and thighs. The eruption is in the form of small round raised spots of a papular appearance, but the minute pimples sometimes fill with a thin fluid, and so become vasicular and dry away into crusts." According to Prof. Axe the pimples are often successive to a third or fourth crop.

Klein made various culture experiments and cautiously claimed that the microphyte or "specific plant germ," found by him, differed from any other known. (See pages 169 and 217.)

A condensed and well arranged description of the disease is to be found in "The Relation of Animal Diseases to Public Health," F. G. Billings, D. V. S., New York, 1884.

The disease, when caused by inoculation, developed in from three to five days, but its period of incubation, when caught, is not very accurately known, being given as from five to fifteen days. It is communicable by contact, through the air and by articles or persons that have been in contact with the pens, &c.

"The external symptoms are a dullness of the eyes, the lids of which are kept nearer closed than in health, with an accumulation of secretion in the corners. There is hanging of the head, with lopped ears, and an inclination to hide in the litter and to lie on the belly and keep quiet. As the disease advances, the animal manifests more or less thirst, some cough, and a pink blush or rose-colored spots, and papular eruption appears on the skin, particularly on the belly, inside of the thighs and forelegs, and about the ears. There is accelerated respiration and circulation, increased action of the flanks in breathing, tucked-up abdomen, arched back, swelling of the vulva in the female as in heat; occasionally, also, of the sheath of the male, loss of appetite, and tenderness of the abdomen, sometimes persistent diarrhea, but generally obstinate constipation. In some cases large abraded spots are observed at the projecting points of the body, caused by separation and loss of the epidermis. In such cases a slight blow or friction on the skin is sufficient to produce such abrasions. In many case the eruption, blush and spots are entirely absent; petechia are formed in only about one-third of the cases. In some cases there is considerable inflammation of and discharge from the eyes. Some animals emit a very offensive odor even before death. In large herds, where the disease prevails extensively, this offensive effluvia can be detected for a great distance to the windward. In nearly all cases there is a weakness or partial paralysis of the posterior extremities, and occasionally this paralysis is so complete in the first stage of the disease as to prevent walking or standing.

"As symptoms of special diagnostic value, which are scarcely ever absent in any case, the following are mentioned: Drooping of the ears and of the head; more or less coughing; dull look of the eyes; staring appearance of the coat of hair; partial or total want of appetite for food; vitiated appetite for excrements; rapid emaciation; great debility; weak and undecided, and frequently staggering, gait; great indifference to surroundings; tendency to lie down in a dark corner, and to hide the nose and even the whole head in the bedding; the specific offensive smell, and the peculiar color of the excrements.

"If the animals are inclined to be costive, the feces are generally grayish or brownish, black in color and hard; if diarrhea is present, they are semi-fluid of a grayish-green color, and in some cases contain an admixture of blood."

The disease is not transmissible to man, although some are sickened by its odor. It is transmissible by inoculation and perhaps by contagion to some of the lower animals, as rabbits, mice and sheep, but not readily. Pigs that are kept in a filthy way, that drink polluted water, or are kept in open fields exposed to changes of weather, contract the disease when it is prevalent more readily and severely than others. It seems especially active when the grass is wet, or when animals by reason of pasturage in stubble or for other reasons have sores or scratches about the snout or body. The infection is exceedingly persistent, and while cold weather and the slaughter of so many hogs in early winter diminishes the disease, the freezing of the virulent matter does not destroy its activity (Law). While no ill results followed experiments as to the use of the salted and well-cooked meat of mild cases, as the amount of fever and the changes which have occurred in cases apparently not severe cannot be fully known, any animal at all sick should not be killed for food.

It thus appearing that the character of the disease, its symptoms, its lesions and its contagiousness are well understood, the practical question is what is to be done to check the ravages, since it is now domiciled in over thirty States, and yearly causes the loss of animals whose value counts into the millions of dollars.

I. No reputable authority claims that much is to be done for the sick swine by way of treatment. The most of these die, and if they recover are so reduced or diseased as not to be worth fattening.

II. This, however, does not at all indicate that nothing is to be done by way of *preventing* the spread of the disease. The following are the chief directions when a case occurs. *Do not remove the sick pig, but remove all the rest.* If the herd is a large one, divide it into two or three herds. Let new, temporary pens be made of entirely new boards, with new troughs, new pails, new swill, and to which or about which no one shall go who has had to do with the old pen. This course carried out *accurately and rigidly* will save most of the hogs in most of the cases. If after removal new cases occur, at once transfer them to the old pen or kill them, and if there are more than one or two cases move the hogs again. After the first case occurs,

give to each well hog, of one hundred pounds weight, three times each day, a full half teaspoonful of flowers of sulphur dissolved in milk. For those of heavier weight increase the dose in proportion.

Some good authorities claim equally good or better results from the use of ten drops of carbolic acid (full strength) to each one hundred pounds of weight, and given three times per day in solution of a half pint or pint of water.

The only other remedy suggested by a sufficient number of good authorities, is some one of the combinations of sodium with sulphurous acid known as sulphite or bisulphite of soda.

Half dram doses, three times per day in their usual food, may be given for each one hundred weight of flesh. We prefer the bisulphite in about teaspoonful doses.

You may choose either of these three named remedies and give them systematically, and see that the pig *really gets* the amount attempted to be given. The treatment should be followed up for at least two weeks.

The same treatment in double quantities for all these remedies is claimed to be of service to sick hogs as well, but full proof cannot be found. In giving such medicines to swine, it is often best to scoop out a part of a cooked potato and then plug it with part of another, and so give it to the animal, as the potato is likely to be eaten, and thus the whole amount given reaches the stomach. The scattering of fine charcoal, of sulphur, of lime, or of plaster on the boards, or more cleanly parts of the pen near the trough, may also be wise. It is not believed, however, that a pen in which a case has occurred ought to be occupied at all by the well hogs, or by any new herd, until all straw and manure have been entirely removed, all fences whitewashed, and all troughs, and pails, and swill barrels disinfected as directed in former circulars.

As the disease is no doubt often conveyed from the pens or herds of neighbors, or from running water which comes through the premises of those who have the disease, or even through the air from adjacent farms, too great care cannot be taken by any one whose herd has it, that it be not transmitted. Hogs turned out to pasture, especially before or after it is wet with dew or mild rains, seem to get it, because the wafted material is more apt to alight and remain amid moisture. There are some remarkable examples of exemptions to herds whose owners have been skilled and consistent and exact in their

precautions. Where a neighbor's herd is affected, in the opinion of most authorities it is wise to put adjacent herds on some one of the treatments named, and to use precautions as to the field exposure, as to cleanliness, and even as to change to new pens, so as to anticipate attack.

When hogs die or are killed they should be promptly buried not less than *four feet* under ground, and where other hogs will not have access for two or more years.

No hogs should be allowed to run at large, and if owners are careless, Chap. LIV., Sec. 4, Laws of 1881, provides a remedy.

As the disease is so readily transmissible, swine sent by cars or any public conveyance may so infect these as to impart the disease to other animals.

If the disease continues to show the virulency and extent shown recently in this State, and so common in portions of other States, some special powers should be given township Boards of Health acting under the directions of this Board and its veterinary assistants. Already the veterinarians, whose directions have been closely followed, attest the value of the methods suggested. It is believed that known preventive measures, faithfully carried out by owners, can prevent or much restrain the spread of the disease.

While the disease now attacks herds that are well kept, we are learning from this and other animal diseases the direct result of ill-treatment of our domestic animals.

Dr. Detmers has well said:

"The domesticated animal does not approximate the habits of his pioneer ancestor in point of cleanliness. It is the instinctive habit of the animal to bathe in water and wallow in mud to counteract heat and as a protection against flies; but in a state of nature, when the mud has served its purpose, the animal cleanses himself by friction with the nearest tree; the filthy bed which the domestic animal becomes satisfied to occupy in a state of confinement is never occupied by animals running in the forest, and given opportunity to make and change their sleeping-places at will—in short, when allowed to provide for his own existence, he exercises a more intelligent regard for his wants than is ordinarily exercised for him by his owner, who attempts to supersede instinct by reason."

Cobbold, in his "Treatise on Animal Parasites," says that "swine are not attacked by a greater variety of entozoa than other domesticated animals." The prevalence of these and of various microphytes or "disease organisms," animal or vegetable, in animals, is usually the result of the artificial conditions established by man. We are to seek riddance from such destructive animal pests, not by finding specifics for disease, which do not exist, but by finding our way back to natural methods of dealing with animals, and so preventing those immense losses to agricultural and stock-rearing industries, which are so rapidly increasing. Thorough and enforced cleanliness for all domestic animals is for the interests of their owners, because for the welfare of the animals. Impure water, spoiled foods, poor ventilation, filth or imperfect care generally, will tell upon man or upon beast, and, unfortunately, the innocent owner must suffer with the ignorant and the careless. This and every other epizootic or enzootic prevailing among animals should lead to a careful study of the indications as to food, habits, care, and all that contributes to their most perfect health.

CIRCULAR XLIX.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

TRENTON, December 1st, 1884.

(H. AS TO ANIMALS.)

HUSK OR HOOSE AND TUBERCULOSIS IN CATTLE.

HUSKS OR HOOSE IN CATTLE.

Among the various forms of parasites that infest the lower animals, are those belonging to the nematoda (round worms.) Some of them are common to men and animals. Others are not, in any of their forms of life, transferable from the one to the other.

Cobbold says the nematodes of the ruminants (cud-chewing animals) are both numerous in and destructive to their bearers, those infesting the lungs being productive of a parasitic bronchitis, termed husk or hoose. In cattle, the lung-worm (strongylus micruris) is particularly fatal to calves, while strongylus filaria attacks sheep, and

especially lambs. A larger but less common lung strongyle (S. rufuscens) is sometimes found associated with the latter. In 1875 I conducted experiments with the view of finding the intermediate hosts of strongylus micruris, and I arrived at the conclusion that the larvæ of this parasite are passively transferred to the digestive organs of earth-worms. The growth and metamorphoses which I witnessed in strongyloid larvæ taken from earth-worms (into which I had previously introduced embryos) were remarkably rapid.

The strongylus micruris is quite similar to the strongylus filaria, the parasite found in the lungs of lambs and sheep. To the affection, as found both in lambs and in calves, the names husk or hoose, phthisis pulmonalis verminalis, and parasitic bronchitis are given. It is better, however, since the worm itself is somewhat different, to give different names. Neither should be called phthisis pulmonalis verminalis, since phthisis has come to be so exclusively applied to consumption, or wasting due to tuberculous deposit. The name "parasitic bronchitis" is the best, if a general term, applicable to all animals thus affected, is used.

The bronchial cough of the calf makes the name husk or hoose quite distinctive for it. The parasite strongylus micruris gains access to the pulmonary tissue and bronchial tubes through the circulation, the ova being absorbed from the digestive canal. The seat of the irritation is indicated by a bronchial cough, "husk or hoose," loss of flesh, a varying degree of constitutional disturbance and death by suffocation, if the sufferer is not relieved. If any mucus be coughed up and examined, the parasites may be discovered. Bronchial irritation occurring in calves during summer or autumn, should always be looked upon with suspicion, and its source thoroughly inquired into. The disease is rarely found in cows and oxen, although cases of it do occur in these. It is said to be most frequent where calves are exposed to dews and pastured on wet pasture or low, ill-drained lands, or where, in dry summers and scarcity of water, they are supplied by stagnant pools which eventually become dry. It is most common in the late summer and fall. Most of the veterinarians of the Board have had occasion to distinguish between it and pleuro-pneumonia, as it is often confounded therewith.

The treatment recommended is as follows: "The calves are to be warmly housed if the nights be cold; the affected animals are, upon all occasions, to be removed from the healthy—not that the disease is

contagious in itself, but that the parasites, or their ova, are apt to gain access in the bodies of the healthy—and, for the same reason, the healthy should be removed to fresh pasture and to dry situations, as the fields upon which the disease has prevailed will, for a time at least, be tainted by the parasites and ova." In treatment, chief reliance is placed on the inhalation of fumes, either of sulphur or chlorine, as both sulphurous acid and chlorine gas will kill the parasite. The mode of using these is the same as in the disinfection of dwellings, and the details can be given by any competent veterinarian.

Generally three or four inhalations, of fifteen minutes each day, will much limit the disease and finally cause it to disappear. Salt, turpentine, lime-water, etc., have been found useful.

"The enclosures in which the animals have been temporarily housed should be thoroughly scoured with boiling hot water impregnated with salt." The free use of commercial sulphuric acid, one pint to eight gallons of water, sprinkled over the yard and thorough whitewashing, add to the security against the recurrence of the disease.

TUBERCULOSIS IN CATTLE.

The existence of tuberculosis in animals, and especially in cattle, has long been recognized. Several circumstances have of late led to a closer inquiry as to it. The disease has seemed to be largely on the increase. Villemin and others have established its communicability, both by the exposure of animals thereto and by the test of inoculation. Fleming has given facts in support of its probable spread by infection and to show that the disease may, in exceptional circumstances, be conveyed from diseased to healthy animals.

Creighton and others claim to have shown that human and bovine tuberculosis are so nearly the same disease as to be interchangeable. Gerlach claimed, from his feeding experiments, that the flesh and milk of tuberculous animals must be excluded from human food, since by using it in its raw or half-cooked state tuberculosis is liable to be reproduced in man. The hereditary tendency of the disorder seems to be established. The possible communicability of consumption in some cases has also given a new interest to bovine tuberculosis. These various views by competent and skilled observers, even if not yet accepted as conclusive, cannot but lead to the most earnest inquiry, since the health and welfare of man and of all other animals is directly involved.

In the report of the New Jersey State Board of Health, 1881, T. B. Rogers, D.V.S., thus refers to it:

"Tuberculosis is not uncommon. In one autopsy made last spring the tubercular deposits extended to almost every tissue of the body. The first noticeable trouble in this case was mammatis, the post-mortem showing that the hardening of the mammæ was due to tubercular deposit and not to common or ordinary causes of the trouble. Practitioners, in view of this, will do well to exclude tubercle before pronouncing this affection local and harmless. Whether the milk from a tuberculous animal is fit for human food, or her flesh fit for beef, is a question which should receive grave consideration from your Board. My own opinion on this subject is very decided, and I strongly advocate the slaughter and burial of these cases wherever found."

During the last summer a series of cases came under the examination of this Board. Cases having occurred in a valuable herd in this State, it became our duty to consider whether it was to be regarded as subject to the law relating to the contagious diseases of animals. At that time, with the advice of the veterinarians in attendance, it was decided that no prohibitory action was required, but that full inquiry as to the extent and character of the malady would be desirable. As a result, it must be stated that there is a growing conviction on the part of veterinary authorities that the disease is not infrequently communicated from animal to animal; that, in some cases, both the meat and the milk may become unfit for food, and that stables in which it has occurred may become so permeated with the infection as to give it to the animals not in direct contact with the diseased ones. Within the last year, one owner in New York State of a herd of Jerseys, has been compelled, after other losses, to slaughter forty-five of his cattle. If the views of its communicability are accepted, it must be remembered that it is not claimed as a diffusive contagion, or that the meat is always unfit for use, or that the milk is harmful, unless the udder itself is diseased. The Board, however, thinks it proper to issue a circular which shall give some description of the disease, of its alleged causes, and a statement as to the precautions to be taken for its prevention, or as to herds in which it is found to exist.

"It is characterized by the deposition of tubercular matter in serous membranes, in the lungs and other organs, wasting of the tissues and other signs of imperfect or malnutrition, which lead more or less rapidly to a fatal termination; the tubercular matter undergoing various characteristic changes, according to the length of time it has been deposited, and modifying the symptoms accordingly." (Fleming.)

Prof. Walley speaks of the serous membranes, such as the pleura and the lining membrane of the abdomen, as showing tubercular lesions oftener than any other structure.

The most usual form seen with us can be thus described: "The tubercle at first is very small, about the size of a pin's head, then that of a pea and a hazel-nut. In the course of time these become converted into small, hard, globular nodules, of the color of connective tissue; gradually, however, they become gray and somewhat translucent in sections, and constitute the so-called gray or fibrous tubercle. These gray miliary nodules may remain discreted and scattered over the surface of the membrane like millet seeds; they may become connected together by delicate bands of new connective fibrous tissue, forming the so-called grapes of England, the angleberries of Scotland; or they may become aggregated together and form immense masses, which may degenerate in particles or en masse, or they may remain fibrous.

The "grape" or "angleberry" appearance is, perhaps, better described by the German name of "perlsucht" or pearl disease. This post mortem appearance, so often seen, is very diagnostic.

Besides the serous membranes, tuberculosis of the lungs, tubercular infiltration of the lymphatic and mesenteric glands, tubercle in the liver and in the alimentary tract are not rare. Fortunately, tuberculosis of the mammary gland or udder is not so frequent as of other glands.

Where there is tubercular deposit in the digestive tract the fæces are not infrequently tinged with blood. Ulcers are found here and there. Prior to irruption of the ulcer, in chronic cases, the mucous membrane is elevated by the tuberculous nodule, which is readily distinguished by its yellow color. These nodules are found in various parts of the intestinal tract.

Tuberculosis of the lungs, when occurring in animals, has not a few of the symptoms which characterize the same disease in man. In these cases, cough is a more prominent symptom and the diagnosis from pleuro-pneumonia, especially in the chronic stages, is not always easy.

In whatever form tuberculosis attacks cattle, the animal does not thrive. With some, the symptoms are loss of appetite, scouring, and

mucous or dysenteric discharges and other symptoms of imperfect digestion. With others, the cough and uneven respiration indicate the affection of the respiratory organs. Where the lymphatic or mesenteric glands are involved, the animal will not take on flesh and remains long in an unhealthy state. Where the mammary gland is attacked, the diseased part, when cut, is apt to have a reddish hue, and the secreted milk is liable to be contaminated with the tuberculous products. In most cases the milk deteriorates in quality, if it does not diminish in quantity.

When we come to examine into the causes of tuberculosis among cattle, they are found to be very similar to those detected as to man. That it is hereditary, the discovery of the disease in calves, and its tracing in the offspring of unhealthy cattle, abundantly proves.

High breeding, and especially in-and-in-breeding, seems to favor the development of the disease. Animals ill-fed, or kept in large numbers in poorly aired apartments, are most likely to show the disease.

Cows which are abundant milkers, or which are forced in order to secure large returns, are most apt to fall victims to the malady. There is also much probability that an animal seriously affected with tuberculous disease will impart it to other susceptible animals near by. Cases enough are on record to show such transfers, and that a particular stable, or part of a stable, where cases have occurred, seems unhealthy for other animals until full disinfection has been practiced. It may not be so actively communicable as to deserve to be called contagious, as many claim that the cases in which it is communicated are exceptional. They are chiefly, if not entirely, those in which the lungs are so diseased as that the breath is full of infective particles; those in which the discharges from the bowels, as dropped upon the grass, come in contact with grazing animals, or those in which a diseased udder conveys the malady to calves.

Prof. Walley, of Edinburgh, is so pronounced in his views as to say that a tuberculous animal is "useless for breeding, dangerous for dairy purposes, valueless and dangerous as a companion, and its flesh nocuous for human food," and so claims that our whole energy should be directed, not to curing an animal, but to preventing the disease.

Prof. Williams, speaking of those cases in which the tubercular deposits have become masses, says that they are to be viewed as excrescences, and if they are carefully removed and the membranes and

structures in which they are imbedded and from which they grow are carefully dissected from them, the flesh is perfectly good. Others insist that all such flesh shall only be used after thorough cooking. The question as to the use of the milk has been made to depend much upon the condition of the udder, and upon the presence or absence of tuberculous deposit in it. This is often hard to determine until after death. It is also difficult to see how, in a cow greatly affected in the alimentary canal or in the lungs by a constitutional disease, such a secretion can remain pure. It is now believed by many physicians that the uncooked milk from tuberculous cows is a frequent cause of tuberculosis, and especially of mesenteric tuberculosis, in children.

For the prevention of tuberculous disease in animals, the following good rules are given:

"1. All flesh and offal of affected animals, especially in the advanced stages of the disease, should be destroyed.

"2. All suspected animals should be carefully isolated until pathognomonic signs or tests have become developed.

"3. All actually affected animals should be slaughtered.

"4. All contaminated food, litter, &c., should be disinfected or burned.

"5. All infected houses should be disinfected.

"6. No animal, whose history is tainted even in the slightest degree, or in whose system there exists the least suspicion of tubercle, should be used for breeding purposes.

"7. Great care should be exercised at the period of birth to avoid any influences which will weaken the tissues in adultism.

"8. Breeding animals should be carefully shielded—as far as is practicable—against debilitating influences of any kind.

"9. The system of feeding and general management of our high-class stocks should be regulated on a more rational and conservative basis than that on which it at present rests."

The treatment of an animal suspected of tuberculosis, and yet not so affected as to be of no value, should aim at fattening. If the muscular tissues are, to all appearances, healthy, as tubercle is never, as a rule, developed in such tissue, it is not to be rejected as food simply on the fact that masses are found in the abdominal cavity, or that the lungs or glands are diseased. There seems to be stronger evidence that the uncooked milk of animals suspected of tuberculosis should not be used. Yet if there is no tubercle in the udder, there are those who still claim that the milk is not to be condemned.

The fact that tuberculosis in cattle is admitted to be largely on the increase in Europe, in Great Britain and in this country, and that it is an outcome of forced and unsanitary methods, and is especially prevalent among high-bred and pampered stock, should lead all stock raisers to a closer watchfulness over the laws of health which pertain to cattle, not less than to human kind. Pure air, pure water, cleanliness of skin, good bedding, proper food and exercise, and special attention to milch cows, is essential to the preservation of the health of herds.

NOTE.—All those circulars as to Contagious Diseases of animals, will soon be printed together, as Circular L., and can be had on application, by postal, to the State Board of Health, Trenton.

LAWS.

The chief laws relating to health passed by the Legislature of 1884 are as follows:

Chapter XXIV.—An act to provide for drainage and sewage in densely-populated districts in which there is a water-supply.

Chapter XLIX.—Supplement to an act entitled "An act to prevent the spread of glanders in horses."

Chapter XC.—A supplement to an act entitled "An act to prevent the adulteration and regulate the sale of milk."

Chapter CXXXVII.—A supplement to an act entitled "An act to limit the age and employment hours of labor of children," etc.

Chapter CLX.—A further supplement to an act entitled "An act concerning the protection of the public health."

Full references to former laws will be found in the Sixth Report, pp. 255–260, and the Seventh Report, pp. 31 and 32.

As throwing additional light on the interpretation of the health laws of this State, and upon the right and the duty of summary authority in so great an interest as the protection of the public health, we are glad to be able to furnish the text of the recent charge of Justice E. W. Scudder, of the Supreme Court, in the case of Hyers *v.* Cole and others:

GENTLEMEN OF THE JURY—The plaintiff in this action has brought a suit against five different parties for alleged assault upon him, followed by arrest and imprisonment in the lock-up, at Asbury Park. This, it is alleged, took place on the 14th day of September, 1883, and he claims large damages of these defendants for the injury which he has sustained at their hands. The particulars of the occurrence are given by the parties and their witnesses, and the first question for the court and jury to determine, relates to the legal rights of the Board of Health and the police of Asbury Park; their right to inspect premises, and their right to arrest for breaches of the peace.

I do not intend to examine these laws and ordinances at this time critically; it might only embarrass you in the considerations of the facts in this case. It is the duty of the court to tell the jury what the law is, and then it is the jury's duty to apply the facts to the law.

After an examination, in the short time I have had, of the charter of Asbury Park, the laws of our State relating to Health Boards, the ordinances of the commissioners or council of Asbury Park, my conclusion is, that the health officers duly appointed, as these appear to have been, under the charter and ordinances, and the laws of our State, had the right to inspect premises, houses and lands adjoining residences in that place. I do not say what further they can do under the charter and ordinances and laws, but they had the right to inspect premises that they might base upon that inspection some action for the abatement of the nuisances, if they existed. In doing this, the inspector, whoever he may be, appointed under the charter and ordinances, must act upon reasonable cause, and that seems to me is the great guard in this case. We have heard much about officers going into people's houses and examining from mere curiosity, as an abuse of private rights, but that is not the question. The question now is, whether a man acting under public authority, duly clothed with the power of the law, has a right to make an inspection where there is reasonable cause to believe a nuisance exists. Whether there is a reasonable cause or not, is, of course, a question of fact for the jury. That is the fundamental point that lies at the basis of this action, whether they had reasonable cause to believe that there was a nuisance affecting public health upon those premises, and whether they made their examination in a reasonable way.

There is another rule of law that is fundamental to these proceedings, and that is this: when an attempt is made to enter upon a man's

premises, officers must make known to him their authority, and why they are there. Any one would resent a stranger entering upon his property and examining his premises, but if he came to you saying, "I am an officer of the law; I have reason to believe, unwittingly perhaps, you have something on your premises that is injuring the health of your family and in that way may spread in the neighborhood and do harm; I am here as a public officer to make the necessary examination; here is the badge of my office, and this is my purpose." A good citizen under these circumstances should not resist the officer and say: "You have no right here," and order him off, but would say, "For the sake of my family and my neighbors, I am willing to submit and give up some of my legal rights in this matter." There are these two points, therefore, to be determined: first, whether there is reasonable cause for the examination, and second, whether he makes known to the party the reason of his official visit. The Health Board law requires that he shall wear the "health badge." Mr. Cole testifies that he had it upon him at the time he entered the plaintiff's premises. The plaintiff says he did not see anything of the kind. It may have been there, nevertheless, if he did not see it. These badges are worn on the breast, where they can readily be seen, or if the plaintiff had asked to see his badge of office, it might have been shown, but he asked for a paper, as if he expected some warrant to make the examination; but he was not bound to show him any warrant merely to make an examination; he had not come there to remove the nuisance, but he came as an inspector, as he has testified.

Another rule applicable to this case is this, that in making this inspection the officer must use no unnecessary force himself; and if he goes there with a power and purpose to examine and see whether there is anything wrong, he must go with the manner of a man who has a duty to perform, and not to insult and annoy. He must use no unnecessary force or violence. If, however, he is resisted in a fair examination of the premises, I think he may go as far as it may be necessary to overcome opposition, in order to discharge his public duty. The more perverseness there is in the man opposing him, the greater may be his reason to believe there is something wrong. The Inspector says he saw a heap of manure and it was covered with offensive matter, as he and Dr. Mitchell say, with maggots feeding upon something likely to breed disease. He went to the nearest door and found a man there who, when spoken to, flew into a rage and ordered him off the premises. It would be most natural to suspect, under these facts, that he had something to do with it. Why should a man be so indignant if he were innocent? All he had to do was to say that he had nothing to do with it, in a quiet way, and then, if the officer insisted upon an examination, in the discharge of his duty, it was his duty to answer his inquiries and submit to a proper examination. The officer could insist, in a respectful way, on seeing whether it came from his house. The question then was, whether there was reasonable cause to suspect

there was some nuisance there, and that it was traceable, according to the conduct of this man, to his own premises. He says he had been making root beer of some kind in his house. If the officer knew that, and he says he had heard it, it was natural for him to suppose that this refuse that he saw on the manure heap might come from that; although the plaintiff denied it, he was not bound to believe that, therefore he went in to make the inspection.

Now, so far, in looking at the ordinances, the laws and the charter, I think there was power, at least, for the officer to inspect those premises if he had a reasonable cause to believe that there was a nuisance of some kind there, likely to breed disease. You will find in the charter of 1874 quite a general power. It says: "The said commissioners (that is, the governing body of Asbury Park,) shall have power to appoint a police justice and police officers sufficient for the preservation of order, and determine the compensation they shall receive, and to suppress any nuisance, to make and enforce all necessary sanitary regulations." That is a very general power. They can "make and enforce all necessary sanitary regulations;" that is, regulations necessary to preserve the good health of that borough. The act of 1880, which has been referred to, says: "The Board of Health of any city, borough, incorporated town or township, shall examine into all nuisances, foul or noxious odors, gases or vapors, or causes of ill health or disease that may be known to them." The Board of Health may examine into all nuisances that may be known to them. They of course may make inspection; they may appoint officers to examine; it is not to be supposed that the Board itself is to examine all parts of the town; they appoint their proper officers to do it, and in this case they appointed health inspectors. In that way the Board of Health examined into all nuisances as all official bodies do. They act by committees and special officers, who are delegated to certain ministerial duties, and so the Board of Health, in this case, although they did not all go to examine these premises, yet, acting under this law and their ordinances, they had appointed health inspectors to examine into all nuisances. "The Board of Health shall examine into all nuisances that may be known to them or be certified to them," the law says. As this officer passed along the street, or the alley, he noticed this place, he says; he was an officer of the Board, not a mere intruder, or stranger, and he was acting for the Board and by their authority; he was looking into this matter and beginning to make his inquiries about it. And so as to other particulars, in going through the laws, although they are somewhat confused, the general conclusion that I have reached is that the inspector had the right to examine and see whether there was a nuisance upon the premises. The question for you is, whether he exercised that right properly. It is said that the officer must find the owner, or the occupant of the property, where it exists. Well, accept that as the law, was not the plaintiff in this case the occupant of those premises? He occupied a portion of the building in front of this land where the manure-heap

was found, and, finding the door open, the inspector went to make inquiry. He may be said to be the occupant, as far as the public are concerned. There may have been other occupants, having the right to use this yard for certain purposes, but the inquiry was addressed to a proper person. At the first visit made by Mr. Cole, finding what he says, he entered or attempted to enter the house when the door was open, saw the plaintiff, and made his inquiry of him. The plaintiff said he had nothing to do with it; that it belonged to others, and it ended in his ordering the officer to go away from the house. Mr. Cole says at that conversation he used some pretty high language in reference to the Board of Health, as to their authority to come there. After Mr. Cole left, he went to the president of the Board. One of the ordinances of 1880, which has been read, authorizes the president to act, when the Board is not in session, and between their meetings he has the power to give orders. He did not convene the Board, and you can see that could not conveniently be done; to call all the members together whenever there was a case directly in view under inspection would nullify the whole law. The Board had given authority to the president to act between their meetings, and this inspector went to the president, who, by the ordinance of 1880, was acting for the Board when not in session. The president of the Board went with him to this place. They testified that they went together and examined the place where it was alleged this difficulty was found. You have heard the testimony of Dr. Mitchell of what he found there. After this examination, they went to the house and there saw the plaintiff; and Dr. Mitchell testifies, and Mr. Cole also, that they spoke to him of the nature of this offensive matter, and offered, if he would furnish a barrel, that they would have it removed. That was the first remedy they proposed. He refused to do anything, according to their evidence, and that induced Dr. Mitchell to make further examination, and in looking around the house he found some indications that induced him to believe that the origin of this trouble was in the house. He may have been mistaken about that, but as I have said, you are to say whether they were acting upon probable cause in making this examination and in going to this house. He testifies that he saw upon the ground near the house indications of something that was not right—something offensive and that led him to desire an admittance to the house. You will recollect also that these officers, acting as they did, had this further cause to believe there was something wrong, and that the plaintiff was the origin or cause of it, because Mr. Cole testified that in his first interview with Mr. Hyers he told him that he threw this offal out there himself. This is denied by Mr. Hyers, and it is not said that upon their second visit he made any such admission; it stands, therefore, upon Mr. Cole's testimony alone. If that be true, and these officers went there with that knowledge, they had some cause, at least, to look to him and to his premises for the reason. The cause might be, as has been intimated, the manufacture of beer or something of that kind inside, which the plaintiff now admits that he was doing. He says that it was root-beer, that he got the ingredients from New York and there was no offensive refuse from it. If that fact was known to these officers and they saw this offal outside, was it a reasonable cause for them to examine the premises? The president, Dr. Mitchell, says they told him who they were and the purpose of their visit, but he resisted and objected to any examination being made; flatly denied that he had anything to do with this offal outside and stood upon his rights; said his house was his and nobody could go into it. If that be so, then we might as well abolish all Boards of Health. If a man's contradiction is to stand against an officer's inspection of what they see and what they say he admitted; if his refusal is to stand in opposition to the law, our Boards of Health can act upon nothing except what can be seen outside the house. The great cause of disease may be inside a man's dwelling and he may be utterly unconscious of it, and if the officers come to him, stating their purpose in a peaceable way, and ask leave to make their examination, I doubt very much whether his house, under those circumstances, can be considered his castle, when the law, in express terms, authorizes an examination to be made. They entered his house, as they say, and began the examination; he objected to it; of course we must assume that, from all they say. He says distinctly that he told them to go out, when they came in the house; and then his version is that they got hold of him and took him out; that he demanded a paper authorizing them to make the search, and they said they had none. He says they used violence, and all that he did was to hold back; but he did not strike them or resist them in any way, except by holding back. When he was outside he says that Mr. Cole threw him down and held him there until these other defendants came and took him off to the lock-up.

On the other hand, the statement is this: That Dr. Mitchell and Mr. Cole entered the house for the purpose of making an inspection based on what they had seen outside, and that Mr. Cole went upon one side of the room to make an examination into a barrel, and while the doctor was looking upon the other side of the room, and as Mr. Cole was stooping over the barrel, he saw the plaintiff, Mr. Hyers, strike Mr. Cole violently on the side of the head with his fist, and, as he recovered from it, kicked him in a painful part of his person. If this statement be true and believed by you (and Mr. Cole and Dr. Mitchell say it is so), whether these defendants had any right to these premises or not, he is guilty of an assault and battery for which they had a right to arrest him. There is no law in this State that justifies a man in striking and kicking a person who is a mere trespasser upon his land. It is greater force than is necessary under the circumstances. Your first right is to order a trespasser off your lands. If he refuses, and resists and strikes you, you may strike him back—using just as much force as is necessary to resist force—and remove

him from your premises. Admitting that these gentlemen had no right there, but Mr. Cole and Dr. Mitchell had mistaken their duty and went outside of the ordinances and laws, and that they came into the man's house when he did not want them there, he could order them out, but he had no right to strike Mr. Cole as he did—he became a trespasser himself in doing so and committed an assault and battery. It is your province, not mine, to weigh this testimony. He says he did not strike them at all, but they dragged him out. They say when he committed this assault, Dr. Mitchell said to Mr. Cole, "Arrest him," and he, being also a police officer of Asbury Park, did so. If he was a peace officer, acting as such, he had a right to make the arrest when he saw the assault committed, without a warrant. Dr. Mitchell testifies as to the resistance he made and the difficulty Mr. Cole had in keeping him; that he went to Mr. Bailey, the chief of police, and Mr. Buchanon, the chief commissioner of the borough, for assistance. If a man resists an arrest by an officer having authority to make it, others may assist him when called on. It is the duty of all good citizens to aid a police officer in making an arrest and in discharging his duty to the public. The persons who are joined as defendants in this case are Mr. Cole, Dr. Mitchell. Mr. Buchanon, the commissioner, Mr. Bailey, the chief of police, and Mr. Buckalew, who was a police officer and called upon by the chief of the police to assist in making the arrest, who assert that they were justified by the resistance of the plaintiff. It is also testified that the plaintiff attempted an escape during the time they were trying to arrest him. He, it is said, asked permission to go in his house in order to put away some of his property, and after he had entered he locked the door. He says himself that he went in and locked the door and they came in after him. Mr. Buckalew, the constable, was ordered by the chief of police to re-arrest him, and he broke in the door, or forced it open, as he had a perfect right to do, if the plaintiff was attempting to escape. A man cannot shut his door, when arrested for crime, in the face of a public officer and put him at defiance. He may break in the house to make a criminal arrest. This was done, according to the evidence, by Buckalew, who entered the house and with help took the plaintiff to the lock-up. No magistrate being found immediately, he was put in a safe place until they found one; then he was examined, and after examination bail was taken for his appearance to answer for the offence. A man under arrest is entitled to a speedy examination so it can be determined by the proper magistrate whether he has committed a crime that will justify holding him to bail. The nearest magistrate, it is said, was found without unnecessary delay; the examination took place and he was admitted to bail.

The testimony of the respective parties is conflicting. The plaintiff insists that here has been an outrageous violation of his rights by coming into his house, arresting him and locking him up without legal cause. On the other side it is claimed that they were acting in

the interest of the public, the enforcement of the laws of the Board of Health, and the whole difficulty arose from the plaintiff's unlawful resistance, the violence of his attack upon Mr. Cole, and that was the cause of their subsequent treatment of him in locking him up in the public place kept for that purpose.

The great importance of this question, of course, is in construing the power of the health officers under the charter, laws and ordinances, which is a question of law; the manner in which they execute them is a question for the jury, depending on the facts of the case. We are not to speculate on other cases, but ascertain what was done in this case by these particular parties. It is said that it is a great outrage to private rights if a man's house is searched by public officers, appointed by the law, without warrant or accusation of crime. This power, when lawfully exercised, is based on and justified by the law of public necessity and it is part of the police power of our State, sometimes exercised when it becomes necessary to deal summarily with abuses and dangers for great public ends. In case of fire, houses are not only entered but they are blown up and destroyed to stop the spread of a great conflagration—that the whole town or city may not be burned down and hundreds rendered homeless and impoverished. When great ends are to be accomplished for the public safety and for public health, the Legislature sometimes delegates part of the police power of the State to municipal bodies or selected persons, whose right is undoubted, provided they act in accordance with the law and in a fair and reasonable manner. If the acts complained of were done by these defendants in an arbitrary way, by asserting their authority because they happened to be officers of the borough, and overpowering and oppressing the plaintiff without legal excuse, then they should be punished; but if, on the other hand, they used a reasonable discretion and acted as prudent men in the discharge of their duty, there is no liability at all; they should be commended rather than condemned. These are the principal points of the case which are submitted to you, and I will allow the counsel any exception to the construction which has been put upon the law and the ordinances.

The jury found the defendants not guilty.

MEDICAL REGISTRY.

The seventh report of this Board, 1883, contained a list of all names returned to us of medical practitioners in this State, who had registered in the clerk's office of their respective counties, under "An act to regulate the practice of medicine and surgery, approved March 12th, 1881, and the supplement thereto," approved March 22d, 1883. By this act no person is allowed to practice medicine or surgery in this State in any of their branches for gain, or to receive or accept any fee or reward, directly or indirectly, unless having the title of M. D., and having recorded a diploma, or, in case of twenty years' practice, a certificate thereof, in the office of the county clerk of the county. This large registry is to be found in the seventh report. The list herewith given is the addition sent by each county clerk of the registries since the last report, with the addition of a few who have requested a correction of some error in the former list. Especially in Camden county list, Pennsylvania University is sometimes confounded with University of Pennsylvania. While the whole list cannot be repeated each year, effort is made to obtain knowledge of all local changes. The lists furnished this year are as follows:

ATLANTIC COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
North, James	Hammonton	—— —, '68	Jefferson Med. College, Phila.
Parkhurst, G. H.		Mar. 3, '60	
Way, Jacob H.	Atlantic City	Mar. 12, '75	Hahneman College, Phila.
Nivison, Mrs. S. S.	Hammonton	Mar. 10, '85	Female Med. College, Phila.
Marvel, Philip	Atlantic City	May 1, '84	University of Penna., Phila.
Elmer, Ulrich	Egg Harbor City	Feb. 24, '83	University of France.
West, Maximilian	Atlantic City	Mar. 12, '75	University of Penna., Phila.
Merritt, David		Mar. 6, '51	Penna. Col. of Gettysburg.

BERGEN COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Adams, Charles Francis...	Hackensack.....	Mar. —, '84	N.Y. Hom. College, N.Y.City.
Ballard, James J.....	Tenafly.....	Mar. 9, '82	University of N.Y , N.Y.City.
DeYoe, Charles P.....	Ramsey.....	Mar. 15, '83	Maryland Acad'y, Baltimore.
Howard, C. I.....	Lyndhurst.....	Mar. 4, '84	Col. of Phy. and Surg. of Md.
Parsell, Lewis B.....	Closter.....	June 14, '81	L. I. College, Brooklyn, N.Y.
Terry, J. Wadsworth.....	Englewood.....	July 30, '62	Yale College, N. Haven Conn.

BURLINGTON COUNTY.

Beegle, Isaac N. Fitch...	Ocean Grove.....	Mar. 1, '70	Bellevue Hospital, N. Y.
Brown, Richard E.....	Mount Holly.....	Mar. 10, '63	Jefferson Med. College, Phila.
Campbell, Robert A.....	Burlington	Mar. 12, '75	St. Louis Medical College.
*Haines, A. C.....	Columbus.....	Mar. 8, '80	.....
Harker, Charles.....	.....	Mar. 29, '84	Jefferson Med. College, Phila.
Jones, Gilbert Eli.....	Mount Holly.....	Nov. —, '71	Dartmouth College, America.
Jenkins, Mozart.....	.....	July 6, '84	University of Vermont.
Jackson, Moses Jose.....	.....	—— —, '84	Eclectic College.
Kollock, M. Henry.....	.....	Feb. 21, '69	University of Pennsylvania.
Tolson, B. Franklin.	Masonville.....	Mar. 9, '72	Jefferson Med. College, Phila.
Waln, I. Byers.....	.....	Mar. 29, '84	Jefferson Med. College, Phila.
Young, D. Irene.....	.....	Mar. 7, '48	Pennsylvania College, Phila

*In the case of A. C. Haines, the register gives date of filing 1880, but diploma cannot be found.

CAMDEN COUNTY.

Wills, Joseph H.....	.....	Mar. 15, '80	Pennsylvania University.
Archibald, Henry C.....	.....	.....	Pennsylvania University.
Shafer, William.....	.....	.....	Jefferson College.
Theis, Wilhelm.....	.....	Mar. 10, '77	Jefferson College.
Townsend, E. P.....	.....	Mar. 10, '63	Jefferson College.
Wells, Jesses J.....	.....	.....	Jefferson College.
Marvel, Philip.....	.....	.....	Pennsylvania University.
Diekel, John G.....	.....	June 25, '69	Eclectic College.
Raughley, Gulielnum	.....	.....	University of Pennsylvania.
Finlaw, James P.....	.....	Mar. 3, '84	Electric Med. College, N. Y.
Somerville, G H	.....	.....	Hahneman College

CAPE MAY COUNTY.

Patterson, Austin H.....	Ocean City.....	Mar. 1, '73	University of the City of N.Y.
Gardiner, William H.....	Philadelphia, Pa...	Mar. 10, '79	Hahneman Med. Col. of Phila.
Kirkpatrick, Andrew B..	Cape May Point...	Mar. 29, '84	Jefferson Med.Col., Phila.,Pa.

CUMBERLAND COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Ayars, Sherman Edwin..	1113 Girard St., Phila.	Mar. 3, '84	Eclectic Med. Col , N.Y. City.
Adams, O. H.....	Vineland.....	Nov. 13, '83	Dartmouth College.
Bidwell, Edwin C	Vineland.....	Jan. 20, '44	Yale College, N. Haven, Conn.
Bidwell, Edwin H.....	Vineland.....	Apr. 3, '83	University of Penna., Phila.
Brewer, Charles.....	Vineland.....	Mar. 6, '55	University of Md., Baltimore.
Harris, George M.....	Dorchester	Mar. —, '81	Eclectic Med. Col. of N.Y.
Jones, Eli G.....	Bridgeton.....	Nov. 1, '71	Dartmouth College, N. H.
Wilson, Howard A.....	Deerfield.....	Mar. 29, '84	Jefferson Med. Col., of Phila.
Wade, John W.....	Millville.....	Mar. 29, '84	Jefferson Med Col , of Phila.
Moore, John H	Bridgeton.....	Mar. 15, '80	University of Penna., Phila.

ESSEX COUNTY.

Crane, Jr., Matthias	.....	Feb. 27, '78	Columbus Col. of Med., Ohio
Carroll, William E.....	.....	May 13, '84	Columbia Col. of Med. and Surg.
Duffy, Charles J.....	.....	May 13, '83	Columbia College.
Dewey, Raphael Pelham.	.....	June 20, '70	Philadelphia College.
Everitt, Edward	.....	Mar. —, '79	N. Y. Hom. Med Col.
Harrington, Rich. Chas...	.....	Mar. 13, '84	Bellevue Hos. Med. Col., N.Y.
Johnson, Jotham Clark..	.....	Sept. 21, '82	Col. of Phy. and Surg , N.Y.
Jones, Eli Goellet.....	.....	Nov. 1, '71	Dartmouth Med. Col , N. H.
Mueller, Edward.....	.....	Aug. —, '83	Med. Society of New Jersey.
Newman, Emanuel D.....	.....	Sept. 30, '84	Col. of Phy. and Surg., N.Y.
Phelan, Thomas Francis..	.....	Mar. —, '82	Bellevue Hos. Med. Col., N.Y.
Roth, Jr., Philip.....	.....	July 9, '81	University of Vermont.
Snyder, Mrs. A.....	.....	—— —, '83	University of Leipzig.
Sealy, Edward.....	.....	Mar. 13, '84	Bellevue Hos. Med. Col.
Sleght, Berier Has. B.....	.....	Mar. 14, '82	Hahneman Med. Col., Phila.
Van Busker, Roswell.....	.....	Jan. 8, '84	Affidavit of 20 years' practice.
Wright, Benjamin M.....	.....	Oct —, '69	Hosocamii Ins Lan. College.

GLOUCESTER COUNTY.

Philips, Cyrus B.	.....	Mar. 1, '82	Academy of Maryland.
Weeks, Charles B.....	Mantua.	Mar. 30, '83	Jefferson Medical College.
Currie, Margaret.....	Bridgeport	.....	United States Med. College.
Tuller, Malcolm B	Woodbury.....	Mar. 10, '73	Hahneman Med. Col., Phila.
Beckman, Oswald H ...	Clarkston...	Mar. 29, '84	Jefferson Med. College, Phila.
Speakman, Howard D....	Woodbury.	Mar 1, '—	University of Penn., Phila.

HUDSON COUNTY.

Adam, Clovis.....	....	Mar. 1, '77	Columbia College, N. Y.
Baker, Jane M..	.....	Mar. 11, '82	Eclectic Med. Col. of N. Y.
Briggs, James E.....	....	Feb. 4, '75	Eclectic Med Col. of N. Y.
Brown, Cecelia A	.....	Mar. 8, '82	Hom. Med. College, N. Y.
Cornell, G. B.	....	Mar. 4, '64	University of City of N Y.
Carpenter, B. D.....	.....	—— —, '46	University of City of N. Y.

HUDSON COUNTY—Continued.

NAME OF PHYSICIAN.	P. O ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Corwin, Fred. Miller		Mar. 8, '81	University of City of N. Y.
Drain, John S		Mar. 5, '84	University of City of N. Y.
Duszowski, Henry W		Mar. 6, '79	Eclectic Med. Col. of N. Y.
Darlington, Wm. L		Mar. 11, '75	Jefferson Med. Col., Phila.
Freeman, Aurry		Mar. 13, '84	Bellevue Hosp. Med. College.
Finnerty, John Henry		Mar. 13, '84	Bellevue Hosp. Med. College.
Finch, R. G. D		Mar. 8, '81	University of City of N. Y.
Hopper, C. Percy		Mar. 15, '83	Hom. Med. Col., N. Y. City.
Hoegelsberger, H		Mar. 5, '84	University of City of N. Y.
Healy, Dennis J		Mar. 13, '80	University of City of N. Y.
Jackel, Charles E		Mar. 13, '84	Hom. Med. College, N. Y.
Jones, Wm. Fred		July 7, '83	University of Vermont.
Loomis, Albert J		Sept. 1, '84	Bellevue Hosp. Med. College.
Luck, John T		Feb. 28, '68	Columbia College, N. Y.
Lutz, Fred. H		Mar. 16, '82	Hom. Med. College, N. Y.
Majonka, Eleanor		Jan. 23, '80	Danzig Inst of Midwifery.
McKenzie, Wm. V		May 13, '84	University of Pennsylvania.
Pindar, John		April 4, '53	University of Pennsylvania.
Russell, Jr., Wm. H		Mar. 10, '77	University of City of N. Y.
Reed, John W		July 9, '84	University of Vermont.
Rosenkrans, James H		Mar. 14, '83	Bellevue Hosp. Med. College.
Rhodes, T. C		Mar. 9, '65	University of City of N. Y.
Schmidt, Frederick		Aug.—, '70	Acad. of Geo. Augustus, Ger.
Senderling, P. M		Mar. 9, '56	University of Pennsylvania.
Tompkins, Abraham W		Mar. 1, '83	Eclectic Med. Col. of N. Y.
Van Derback, John		July 20, '66	Griefswold Univ., Prussia.
Wilkinson, James		Oct. 14, '58	University State of N. Y.
Warden, Albert W		Mar. 13, '80	University of City of N. Y.
Warke, D		Mar. 9, '65	University of City of N. Y.
Wilkinson, George		July 15, '83	Bellevue Hosp. Med. College.
Youlin, J. J		Mar. 1, '54	Hom. Med. Col, Cleveland.
Yarnall, J. H		Mar. 1, '83	Eclectic Med. Col. of N. Y.

HUNTERDON COUNTY.

Funey, William F	Frenchtown	Mar. 12, '74	University of Penna., Phila.
Anderson, J. E	Stanton	Mar. 4, '84	Col. of Phys. and Surg., Balt.
Warrington, C. B	Clinton	Mar. 5, '60	University of Penna., Phila.

MERCER COUNTY.

Sands, Oscar Gilbert			Bellevue Hosp. Med. Col.
Schicht, Emilie		Aug. 29, '68	Karl Ferdinands Univ. in Könegreiche Böhmen.
Wetherill, Horace G	Trenton, N. J		University of Pennsylvania.

MIDDLESEX COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Applegate, Grover T	New Brunswick	Mar., '83	Hahneman Med.Col.Chicago.
Baldwin, Abram V. N	New Brunswick	Mar. 16, '82	Col of Phys. and Surg., N. Y.
Carroll, Edgar		Mar. 10, '80	Jefferson Med. Col., Penna.
Dewey, Raphael P	(Traveling Phys.)	June 20, '70	Eclectic Med. Col., Penna.
Davis, Francis A	Spotswood	Mar. 1, '71	Bellevue Med. College, N. Y.
Davis, Edwin T	Sayreville	Mar. 14, '82	Hahneman Med. Col., Phila.
Janeway, Thomas L	New Brunswick	Mar. 12, '67	Col. Phys. and Surg., N. Y.
Jones, Eli Grellett	(Traveling Phys.)	Nov. 1, '71	Dartmouth Medical College.
Leonard, Franklin A	Milltown	July 9, '84	University of Vermont.
Lewis, Smith H	South Amboy	Mar. 14, '81	University of Pennsylvania.
Snyder, S. M	Spotswood	Mar. 11, '64	University of Pennsylvania.

MONMOUTH COUNTY.

Andrew, Russell G	Navesink	Jan. 9, '66	Col. of Medicine, of Albany.
Bennett, Henry A		Sep. —, '83	University of Vermont.
Barr, David M	Ocean Grove	Mar. 10, '84	Jefferson College, Pa.
Christine, William B	Asbury Park	Mar. 12, '77	University of Pennsylvania.
Cooper, James E	Colts Neck	Mar. 12, '67	Columbia College.
Curtis, D. Farquhar	Long Branch	Mar. 10, '81	Columbia College.
Disbrow, Stephen M	Farmingdale	Nov. 13, '66	Columbia College.
Ford, Edward J	Asbury Park	Mar. 1, '60	Col. of Phys. and Surg., N. Y.
Follett, William M		Mar. 1, '83	Eclectic Med. College, N. Y.
Higgins, Archibald A	Manasquan	Apr. 1, '54	University of Pennsylvania.
Hepburn, G M	Freehold	Mar. 10, '80	University of Pennsylvania.
Haines, Alfred C		Mar. 31, '43	University of Pennsylvania.
Jones, Eli G		Nov. 1, '71	Dartmouth College.
Johnson, William E		Feb. 22, '66	Cincinnati College.
Johnson, William M		June 30, '81	University of Michigan.
Kent, William		June 6, '37	Collegii Hosocomii, Brooklyn
Kirkbride, M. Frank		Mar. 22, '74	University of Pennsylvania.
Lytle, Richard Ridgeley		June 28, '77	University of Virginia.
Leonard, F. A		July 9, '80	Univ. of Vermont Agr. Col.
Morris, Henry		Mar. 12, '78	Jefferson College, Pa
Nagle, J. E		June 16, '52	University of Vermont.
Pumyea, Peter B	Allentown	Mar. 1, '68	Bellevue Medical College.
Rankin, E. G		——, '78	New York Medical College.
Socarras, de Rodolfo		Mar. 15, '82	Bellevue Hosp. Med. Col.
Slocum Sidney T	Asbury Park	July 16, '84	New Jersey State Dent. Soc.
Urie, William A		Mar. 10, '79	Electropathic Inst., Phila.
Vansant, Eugene L		Mar. 29, '84	Jefferson College, Phila.
Woodman, Johannum		Mar. 15, '83	Columbia College.
Wainwright, James B	Manasquan	Mar. 1, '77	Columbia College.

MORRIS COUNTY.

Ayers, Daniel S	Rockaway	Mar. 2, '70	Columbia College, N.Y. City.
Ayers, J. S	Madison	Mar. 15, '83	Hom. Med. College, N. Y.
Bright, Leonard	Woodpost		University of Vermont.
Dodge, H. N	Morristown	Feb. —, '68	Columbia College, N. Y.
Parker, W. Thornton	Morristown		
Reid, S. H	Madison	——, '81	Columbia College, N. Y.
Salmon, Johanna	Boonton	Sept. 13, '79	Prov. Nurs'y Inst., Germany.
Simon, Charles I	Boonton	——, '79	Columbia College, N. Y.
Woodruff, Marietta C	Boonton	Sept. 29, '75	N. Y. Free Med. Col. Women.

OCEAN COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Badger, Merritt O	Manchester	July 9, '81	Univ. Urbis Neo Eboraci.
Bradford, T. Hewson	Berkeley	Mar. 3, '74	Collegii Jeffersoniensis.
Bennett, Henry Allyn	Point Pleasant		Collegii Agricultural.
Huntsinger, Edward	Toms River	Oct. 16, '68	University of Pennsylvania.
Taylor, John M	Beach Haven	Oct. 7, —	University of Pennsylvania.

PASSAIC COUNTY.

Griffiths, John L	Paterson	June 9, '84	University of Vermont.
Joussett, Albert D	Paterson	Mar. 14, '83	Bellevue Hosp, Med. Col.
Millspaugh, Lewis C	Paterson	Mar. 5, '84	Univ. of the City of N. Y.
Millspaugh, Daniel T	Paterson	Mar. 5, '84	Univ. of the City of N. Y.
Van Riper, Cornelius	Passaic	Mar. 8, '66	Col. of Phys. and Surg., N.Y.

SALEM COUNTY.

Currie, Margaretta H	Woodstown	Mar. 6, '81	U. S. Medical College.
Jones, Eli Grellet	Salem	Nov. 1, '71	Dartmouth Medical College, Hanover, N. H.
Robinson, C. M.	Elmer	Mar. 16, '62	University of Pennsylvania.

SOMERSET COUNTY.

Cooley, Justus H		Mar. 3, '84	Eclectic Medical Col., N. Y.
Jackson, Moses J		Mar. 1, '84	Eclectic Medical Col., N. Y.
Searls, Wellington B		Feb. 28, '72	Col. of Phys. and Surg., N. Y.
Hoagland, Garret G		Mar. 9, '84	Jefferson College, Phila., Pa.
West, Heston R		Mar. 19, '84	Hahneman Med. Col., Ill.
Voorhies, Amidee F		Apr. 7, '54	The Medical Society of N. J.
Stelle, Ephraimum M	Bernardsville	May 13, '84	Col. of Phys. and Surg. N Y.

SUSSEX COUNTY.

Beers, Francis	Flatbrookville	Mar. 12, '81	Jeffersonian College, Penna.
Condit, Arthur W	Andover	June 29, '82	University of Michigan.
De Leon, Edwin	Orange Co., N. Y.	Oct. 17, '77	Eclec. Med. Soc. State of N.Y.
Huston, O. P	Flatbrookville	June 27, '78	University of Michigan.

UNION COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Armstrong, George A	Elizabeth	——, '84	Univ. of the City of N. Y.
Bull, Charles G	Plainfield	Mar. 10, '81	Bellevue Hosp. Med. Col.
Bachelor, H. M	Summit	——, '77	University of New York.
Davis, Thomas S		Apr. 2, '84	Hahneman Med. Col., Phila.
Donovan, Alfred Q	Elizabeth	Mar. 25, '82	Bellevue Medical College.
Griffin, J. F	Plainfield		
Gale, William	Westfield	June 26, '67	Long Island Col. Hosp.
Hedges, Elias Walton	Plainfield	Apr. 13, '83	University of Pennsylvania.
Jones, Eli Grellet	Elizabeth	Nov. 1, '71	Dartmouth Col., N. H.
Oliver, Allen H	Elizabeth	Mar. 25, '82	University of Pennsylvania.
Stites, Joseph Augustus	Linden	Mar. 1, '75	Bellevue Med. Col, N. Y.
Ulmer, Henrietta Young	Elizabeth	July 3, '84	College of Midwifery. N. Y.
Wheeler, James Albert	Elizabeth	Mar. 13, '84	Hom. Col. of Med., N.Y. City.
Wilson, Norton L	Roselle	Mar. 13, '84	Bellevue Hosp. Med. Col.
Walker, John Evans	Elizabeth	——, '84	University of New York.

WARREN COUNTY.

Bowers, Jeremiah K	Washington	——, '73	American Univ. of Penna.
Bergen, E. J.	Hope	——, '77	University of New York.
Deacon, T. Eayre.	Phillipsburg	——, '84	Hahneman Med. Col, Phila.
Linaberry, Wm. L.	Allamuchy	——, '83	Col Phys. and Surg., Chicago.
Roberts, D. Edgar		——, '83	Univ. of the City of N. Y.
Stiger, J. D.	Delaware	——, '84	Col. of Phys. and Surg., Md.
West, Heston R	Phillipsburg	——, '84	Hahneman M. Col., Chicago.

REPORT

OF THE

BUREAU OF VITAL STATISTICS

OF THE

STATE OF NEW JERSEY

FOR THE

Statistical Year from July 1st, 1883, to July 1st, 1884,

WITH ADDITIONAL QUINQUENNIAL TABLES AND CLIMATOLOGY.

DEPARTMENT OF STATE.

TO HON. HENRY C. KELSEY, SECRETARY OF STATE.

By EZRA M. HUNT, M.D., Sc.D.,
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INTRODUCTION TO THE REPORT ON VITAL STATISTICS.

The importance of vital statistics is so well recognized by all who understand their bearing, that it is now seldom necessary to explain the work begun in this State in 1838, and rendered more complete by recent laws.

Since political economy, social science and the study of population have come to be recognized as very essential factors of prosperity, not a few are getting closer insight into the work. It is a great concern of the State whether a proper guard is placed upon the conditions of marriage, whether the evidence of parents' consent to minors, of the reality of the ceremony, and of the competency of the parties to the contract, are established. The family is the essential unit of the State, because it is of all society. On it depends more for the State than upon any other of its institutions. The English requirement of notice of marriage, and the plans still adopted in some of the States and in the District of Columbia, did not arise from inquisitive officiousness, but from what both reason and experience had taught as to the concern which the State has in properly-considered and attested marriages. It is believed that the influence of the method of the Society of Friends and of our early laws on this subject has been very salutary, and help to account for the fact that the grounds for divorce and its frequency are not so commonplace in this State as in many others. The marriage certificate now furnished has, in addition to the blank, a certificate which the parties may be asked to sign, and which not only is valuable as a defense to the person performing the ceremony, but is also a proper guard to the parties.

The record of deaths not only serves to identify, but is the mildest form of certificate that the life of a human being has ceased and that there has been proper care exercised as to it. So long as one of the chief objects for which the State exists is the protection of human life,

such certificates are not incidental but essential to a proper conduct of social and civic administration. We have constant evidence of the salutary influence which the system has exerted upon that oversight of human life and its perils, which cannot be too carefully impressed upon citizens. Strange as it may seem, very many incline to be careless in the protection of life. The flagrant case which occurred in this State during the past year, as to the burial of twenty or more infants, is but an illustration of how far an act of great impropriety may take place without that reflection which is due to the sacredness of life and to the relation which each life bears to the State.

As the incident of birth is none the less real in its civic relations than that of marriage or death, and as we also need to know the age and character of the material on which the forces of disease are acting, this record comes in as essential to the other two.

As to all, it may now be said that we know of no one who has made a study of political and social economy, who does not realize that, for social as well as for legal purposes, there should be this uniform method of collecting the statistics so as to make them not only accessible but comparable with each other for statistical and sanitary purposes. While one who works in such a field has great reason for humility, by reason of the imperfections realized, yet he also has great reason for encouragement, since the imperfections decrease, and, even with them, the greatest guides and lights of social and sanitary progress have realized and exhibited their essential value.

The only rare and incidental friction that occurs is from the fact that an occasional physician or undertaker claims that he is rendering a service for which the State should award him some compensation. The first plea is that the State has no right to require this service of him, since it should be asked, if at all, from the family in which the death has occurred or from the parent of the child born.

The answer which other countries or States have seen fit to give to this is, that there are reciprocal duties always growing out of the relations between a government and its people, and that, in its supreme right, the State must decide from whom certain duties are to be asked and what duties these shall be. If it decides that, for the social and political welfare of the State, it is necessary that the State should have the information, it makes its own choice as to who shall impart it. Thus it asks of the head of the family the facts as to a census, or of

the farmer the number of sheep or cattle he has, while it passes by the teacher and does not ask the number of pupils in his district but gets the information in another way. It selects the person or persons from whom it is likely to get the most correct information, and that is always some person having essential relation to the case. If the State has the right to call on anybody, it has the right to make this choice. The fact of payment or non-payment does not determine the right of the State to exact the service, for, if the State has no right to command this and other services of a citizen because of his special relations and capacity for correct information, it has no right to make him impart the information because of the proffer of pay.

If, however, it is claimed that the State should offer compensation, the reply is:

1st. That the State necessarily requires many duties of its citizens for which they get compensation in a general way, and for which it does not give specific remuneration. It sends out its census blanks or property blanks, and proffers no pay for their infilling. It requires reports of business and incomes, if it deems such returns to be needful. It summons persons on jury without attempt at any adequate pay for their time. It compels able-bodied men, if called out by an officer, to aid him in arrest, if no police force is at hand, and detains innocent persons as witnesses, if the public good requires it. The law imposes many duties on citizens and classes of citizens without direct compensation, where such duties are not burdensome or where they grow out of the special relations the individual has come to bear to society or to the State. It is, of course, important that these duties should not be unduly multiplied, or that no one person should have exacted from him a variety of such special duties. But when it is remembered that professional life practically excuses the physician from all jury duty, and recognizes him as an expert to a degree that allows him some compensation for services rendered, it can scarcely be claimed that the requisition as to these returns is burdensome.

It is to be remembered that the laws as to vaccination, as well as the general guard over births and deaths, results in emoluments to the profession at large. Even the right to practice medicine at all in a State is not a right inherent to the individual, but has to do so intimately with the health of the people that it has always been regarded as special in its character.

So readily has the right of States to require these returns to be

made been conceded by the medical profession, that we know of but one case that has ever reached the Supreme Court, viz., the case of the State of Iowa *v.* D. M. Hamilton (1882). The opinion of the court was given by Justice Beck, and on this point is as follows:

"The statute requires the collection of statistics pertaining to the population of the State and the health of the people, which may impart information useful in the enactment of laws and valuable to science and the medical profession, to whom the people will look for remedies for disease and for means tending to preserve health. *The objects of the statute* are within the authority of the State, and may be attained in the exercise of its police power. Similar objects are contemplated by States requiring a census."

The same principles of law are well stated by Dorman B. Eaton, Esq., now of the Civil Service Commission, in an article on "Sanitary Legislation in England" (New York, 1872). Also, in a paper by O. W. Wight, M.D., counselor-at-law, Detroit (A. P. H. Asso., 1882); in an article by Thomas M. Cooley, LL. D., of the Supreme Court of Michigan, on "What can the law do for the health of the people?" and in the case of the State of West Virginia *v.* F. M. Dent, before the Supreme Court (Justice Green), as decided November 1st, 1884.

"If a legislature saw fit to make it a condition that practitioners of medicine should not practice without a stated license, for which they should pay a fee, they might do so, or they may make the simple and easier condition that they shall give certificates of death or birth, and be registered as physicians." The court, in the case of Bradley *v.* N. Y. & N. H. R. R. Co., 21 Conn. 306, plainly enunciates the principle which covers all these cases: "It is universally understood to be one of the implied and necessary conditions upon which men enter into society and form governments, that sacrifices must sometimes be required of individuals for the general benefit of the community for which they have no rightful claim to specific compensation." Our State has shown that it has not the least tendency to be exacting in this regard by the terms of the law as to certificates of marriage, birth and death. In cases where a Board of Health, on account of threatening contagion, sees fit also to require for a time a report of contagious diseases, it allows adequate compensation, and thus draws the line between a vital event and the incidents of sickness.

Formerly, it was required of ministers to register marriages in the

county clerk's office of the county of their residence, and to pay one shilling for the registry. The law has now been made the same for them as it is for physicians and undertakers.

But one complaint has reached us the last year—from a physician—who, while intelligent in other matters, plainly shows that he has not given the same deliberate study to political economy or to the reciprocal relations of the State and the citizen, that he has to the more technical and business study of his profession. We have greatly to thank the medical profession of the State for the earnestness with which, as a body, it has responded to the efforts in behalf of public health, and believe that the State documents on the subject, which are mailed to all physicians, have aided in developing this interest. It is one of the satisfactions of this service that we are so often able to answer the inquiries of physicians or to direct them to sources of exact information on topics concerning the physical welfare of the people.

On the part of ministers, justices of the peace and others who perform marriage ceremonies, the returns are mostly satisfactory. It is very important that no marriage should escape record. Small books are now provided, similar to those for death and birth record, which can be carried in the pocket when needed, while the stub serves to keep that record which needs to be retained by the person officiating. These prepared books can be had by ministers and physicians instead of the blanks in stub, by applying to the city registrar or assessor, or by a postal directed to this office.

REMARKS ON SOME OF THE SEMI-DECENNIAL TABLES OF THIS AND THE FORMER REPORT,

WITH A RECORD OF THE NATIONALITY OF THOSE MARRIED IN THE STATE.

The seventh annual report of the State Board of Health contains the fifth report of the medical superintendent of vital statistics, under the re-organized method of securing returns. In connection with it is given a condensed statement of certain facts as to marriages, births and deaths for the five years ending June 30th, 1843. Also the climatology of New Jersey for the same period, as registered at seven representative localities in the State.

A table as to marriages which could not be completed in time for the former report, is also contained in this report.

The design has been so to group figures for the last five years as to give a larger aggregate of vital facts as to our population. It is not possible to state all the vital facts as to every marriage, birth or death that occurs, since, in some cases, they are not known or given, and in others supplemental reports were too late to be analyzed with the others. But this does not affect the series of facts collected as to the large numbers, about which statistics in full have been furnished since. If a sufficiently large number of data, reaching over a sufficiently large number of years, are secured, it is safe to infer that what has been found true of many tens of thousands through a series of years, would also be equally true of any small fraction thereof, whose record has not been reported or secured.

While the yearly returns of marriages, births and deaths are of much value as considered yearly, yet it is always to be remembered that the general health of any locality is never to be inferred from the record of a single year; generally the population is not large enough

to make full deductions. This is especially true of all precincts having less population than ten thousand. Also, there may be temporary and incidental causes at work, or the outbreak of some sudden pestilence has caused the unusual mortality. Even as to marriages and births, accidental circumstances may give a variation from a usual standard for a single year. It is because the laws of nature are uniform, that when studied in their entirety and with large aggregations of facts and figures, errors balance each other or become such very minute decimals in the general calculation that the result of vital statistics have been found to afford safe guides as to sanitary conditions. We do not mean by this that tables for single years are not valuable. Where there is a variation from the usual semi-decennial or decimal death-rate, there is always need of inquiry to see if the variation can be accounted for. It is very desirable, too, that cities should not merely consider the bulk of their vital statistics, but that, as to marriages and births, they should consider these as occurring in native or in foreign populations, or amid different classes and occupations. As to deaths, that is an imperfectly governed city that cannot tell each house where a death has occurred for the last decade or more; what was the sickness; what the age and nationality of the person deceased, as also the ascertained or probable cause of sicknesses or deaths in that house, if the disease was a local or communicable one. Thus, even so soon as a single year, and sometimes in a single week, where there has been a sudden increase in the number of deaths, immediate attention has been so attracted thereto as that causes have been discovered and abated.

The quinquennial table, page 379 of the seventh report, gives a very near comparative estimate of vital conditions in the several counties and cities traversed. While returns are a little more dilatory in some sections than in others and there may be a few more supplements in one than in the other, the proportion is so very small as not even by partial fractions to disturb the comparison. As to births it can not be claimed that they furnish so approximate a return of the real facts as do marriages and deaths. While the proportion for the State for five years is 21.47 as against 19.63 of deaths, the real number is claimed to be much greater. We may take the cities of Paterson and Orange as a fair estimate of what the more complete returns are for cities. We find that the returns of these for the last five years are: Orange, 2,103 to a population of 13,207; Paterson, 7,145 to a population of 51,031. This gives a birth-rate for Orange of 27.66,

and for Paterson of 28, per 1,000. The birth-rate in twenty-eight large English towns (of an estimated population of eight and one-quarter millions of persons), for December, January and February of 1883–4, was 31.7, 34.9 and 35.3 per 1,000 respectively.

The brith-rate of the whole kingdom for the year 1882 is given as 33.7.

There are some reasons for believing that the birth-rate of this country is lower than that of England. Thus the birth-rate for Massachusetts for 1883 is 23.82 to 1,000 of estimated population.

Rhode Island, whose system of registration is quite complete, gives for 1882 a birth-rate of 24.7 per 1,000, which is a little ahead of its general average. Providence, with a population of 119,405, had for 1883 a birth-rate of 24.42 per 1,000. While our record for the last five years gave an average of 21.47 per 1,000, as the returns have shown, a yearly increase, and as a delay in returns makes the percentage less than it really is, 22 may be stated as the average return for the State.

As is usual, the returns for cities exceed those for the country, although in the operation of our State law, by reason of the fact that assessors can collect births in townships in addition to physicians, the returns from townships are more complete.

A comparison of the returns as to sex shows the prevalence of the same law found elsewhere, viz.: that, as if to make up for the greater exposures of men in their occupations, the number of males born exceed the number of females. Thus of those as to whom the vital facts are given, on page 384 of the last report, 59,998 were males and 56,736 were females.

In our returns effort has been made also to secure a record of the number of previous children, and of the number actually living at the time the birth return was made.

In an aggregate of 337,163 children it is thus found that 257,343 only were living, thus showing that 77,820 had died while the parents were still in the child-bearing period. Adding to these the number of 7,195 dying just at the period of birth, we have a loss of 87,000 children. With all the sentimentality about the survival of the fittest, it is nevertheless true that the material resources of a country are best when the vigor of stock or the conditions of living and of surroundings are such as to greatly diminish this loss. If the average deaths among horses or cattle equalled this, we should, as a mere economic

consideration, have large provision made by the government to ascertain the cause of so chronic a mortality. As we come to study the death tables, we shall find that children, beyond all others, perish from preventable diseases, and that their proportionate loss is a fair indication as to the presence of those ailments which also destroy the larger proportion of the adult population who die before fifty years of age. The extremes can also be shown by the comparison of the aggregate of cities of over five thousand with the population of the State outside of cities, as also by comparing cities with such rural counties as have few if any cities.

The number of children born in the five years, as to whom the facts are stated, is 116,734. The number of native fathers is 74,844, and of native mothers 81,120. The number of foreign fathers is 40,058, and of foreign mothers 33,971. While the State has a large foreign population, this seems to show that the native stock is not dying out. The 14,876 of mixed parentage is also to be considered as adding to native stock, since where one parent is native and the other has adopted the State as a home, the influence is generally that of more rapid assimilation to the customs and manners of the people. It is evident that the native-born Jerseymen cling to their State with more tenacity than is shown in New England and in most western populations, as there is no large emigration from the other States to this State.

It is noticeable, however, that the actual number of children born is small in proportion to the number of families represented. For the sum of native and foreign fathers is 114,902, and of native and foreign mothers 115,091—allowing for some double marriages, for some where the facts as to only one parentage are given, and for some omissions of return as to the number of children. When we note 121,408 children returned as born (116,736 having the actual facts given), with 7,195 still-births, we find that we come short of an average of two children born in every five years. This would be an average of six for families as a whole for the whole child-bearing period, which extends to about thirty years. Whatever raises the average birth-rate of children born in wedlock, for parents living in the State and whose surroundings are such as are favorable to health, also furnishes a real increase of productive resources to the State. It is a marvelous and instructive study of history to see how some kingdoms and some rulers have recognized this; also, to see how prosperous periods have

been marked by a fair increase, while periods of financial calamity or social degradation result in national burden or national extinction because of the decrease of population.

The greatest calamity of Rome was the lowness of its birth-rate and the highness of its death-rate.

The statistics of this State are as yet not sufficiently numerous or complete for us to arrive at more than approximate conclusions. But the progress of the last five years clearly shows that it is feasible for us to study even what facts we have by the light of those expectations of natural life and prosperity which can be calculated from older nations, and thus arrive at some indices as to the promotion of marriage, of family homes and of surroundings favorable to the rearing of native-born, industrious and educated citizens. For it is out of such conditions that nationality grows and that national existence and prosperity are assured. Patriotism and true thrift are fostered by such oversight.

As only 2,846 colored children are reported as born for the five years, it is shown that these form a very small proportion of our population. As a rule, they are not under such favorable circumstances as most of the white races. The large demands of our summer resorts and other influences, are likely to retain many colored families in the State, and good attention should be given to their education and industrial occupation.

MARRIAGES.

The marriage-rate for the State for the five years, as given in the last report, is 15.10 to every 1,000 persons living. Inasmuch as the first year the system of registration had not become familiar to all, and as there are, no doubt, occasional failures of return, this is something below the actual proportion. The fact that divorces are less common in New Jersey than in the other States, also adds to the significance of the marriage record. That for Rhode Island for 1882 was 18.33 for each 1,000 of population; that of Massachusetts being 18.60. The rate in England for 1882 was 15.5 persons married to 1,000 persons living.

The study of occupations is, in this country, much more difficult than in foreign tables, because persons so often do not have any trade, or if they have one, change the occupation during life. We therefore have preferred to take the given occupation of the person at the time

of marriage as given by himself, rather than to rely upon the one named in the death certificate.

In a synopsis of 39,219 marriages, as to which such particulars are given, we find as follows:

Cultivators of ground	7,226	Manufacturers	277
Water employes	1,263	Masons	343
Railroad employes	1,361	Millers	176
Laborers	4,758	Painters	742
Bakers	387	Photographers	36
Barbers	319	Physicians	276
Blacksmiths	659	Plumbers	166
Brewers	124	Police and watchmen	93
Bricklayers	71	Potters	273
Butchers	641	Printers	339
Cabinet makers	115	Restaurant keepers	77
Carpenters and joiners	1,467	Shoemakers	561
Carriage makers	124	Stationers	22
Cigar makers	300	Stone cutters	131
Clergymen	179	Surveyors and civil engineers	57
Clerks and book-keepers	2,910	Tailors	307
Coopers	90	Tanners	118
Dentists	72	Teachers	241
Druggists	210	Telegraphers	199
Editors	47	Tobacconists	58
Furnacemen	9	Weavers	357
Glass makers	364	Wheelwrights	97
Grocers	386	Workers in wool, silk and cotton	460
Harness makers	145	Other trades	5,860
Hatters	620	Merchants	2,101
Innkeepers	304		
Jewelers	356	Total	39,219
Lawyers	271		
Machinists	1,074		

Cultivators of the ground outnumber any other occupation, which shows how agriculture, in some form, maintains its prominence as a chosen industry of our people. This is the more noticeable, since one-half of our population live in cities of over 5,000 inhabitants.

It is worthy of note how well the trades are distributed, and, at the marriageable age of young life, we have a fair share of carpenters, (1,467), machinists (1074) and other trades. Masons and bricklayers number 414, which is small for so large a city population, although many take up the business afterward. 1,361 railroad employes and 1,263 water employes, married, also stand for a large number engaged

in these avocations. 2,910 married clerks and book-keepers shows a mercantile constituency constantly increasing. The marriage of 620 hatters, 364 glass-workers, 273 potters and 357 weavers, is also an indication as to these industries. Also, the localities and concentrations of industries are there shown. Thus, of the hatters married, 550 resided in Essex county. Of the glass-workers, 189 in Cumberland, 276 in Gloucester county; of the potters, 237 in Mercer county, and of the weavers, 192 in Passaic county.

Yet there are other industries that are well distributed throughout the State. It is hoped that the time will come when well-endowed industrial schools will aid in the work of the various mechanical industries, and so enlarge the sphere in which there are so many indications for great extension. It will be understood that the numbers here given do not represent the actual number now engaged in these various occupations in the State, as very many pursue these industries who were not married in the State. But it is an indication of what are the chief and chosen occupations of those who were reared in the State, or at an early age made it their home.

The tables as to nationality, which are published in the present report, but relate to the records to July 1st, 1883, also furnish the facts herewith given.

The first column of figures stands for those born in the United States; the second for a parentage in which one of the parents was native; the third for Irish; the fourth for Germans, and the fifth for all other countries.

SUMMARY OF MARRIAGES.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign.
Atlantic county, 1878–79	90	3	2	16	8
1879–80	84	2	6	13	6
1880–81	67	3	.....	19	4
1881–82	67	7	1	12	3
1882–83	64	2	.....	18	4
	372	17	9	78	25
Atlantic City, 1880–81	14	6	.....	1	2
1881–82	32	2	3	2	5
1882–83	49	1	.....	5	5
	95	9	3	8	12
Bergen county, 1878–79	131	9	18	20	21
1879–80	117	6	9	31	24
1880–81	131	5	9	20	20
1881–82	124	10	9	41	31
1882–83	97	6	12	35	14
	600	36	57	147	110
Burlington county, 1878–79	206	17	8	8	16
1879–80	232	11	9	6	9
1880–81	219	15	10	13	8
1881–82	221	9	13	8	10
1882–83	220	7	7	20	8
	1,098	59	47	55	51
Bordentown, 1878–79	32	2	8	1	4
1879–80	36	1	8	1	.....
1880–81	24	.....	8	2	.....
1881–82	34	2	7	2	1
1882–83	40	1	10	5	2
	166	6	41	11	7
Burlington city, 1878–79	61	.....	2	.....	2
1879–80	43	.....	8	.....	6
1880–81	33	4	4	2	2
1881–82	53	4	3	1	3
1882–83	43	2	6	.....	1
	233	10	23	3	14
Camden county, 1878–79	69	6	2	10	2
1879–80	88	5	3	7	6
1880–81	84	1	.....	2	3
1881–82	48	4	2	4	2
1882–83	66	.....	.....	5	1
	355	16	7	28	14

SUMMARY OF MARRIAGES.—Continued.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign.
Camden city, 1878–79	212	41	21	23	25
1879–80	280	21	35	28	36
1880–81	286	15	25	38	18
1881–82	327	19	18	35	31
1882–83	323	14	24	37	36
	1,428	110	123	161	146
Gloucester City, 1878–79	13	1	12	2	.....
1879–80	19	3	14	1	4
1880–81	18	1	7	2	2
1881–82	17	2	12	1	6
1882–83	21	3	5	1	10
	88	10	50	7	22
Cape May county, 1878–79	78	8	1	1	2
1879–80	74	3	1	.....	1
1880–81	58	2	1	3	1
1881–82	54	2	2	.....	1
1882–83	48	2	.....	.....	1
	312	17	5	4	6
Cumberland county, 1878–79	114	4	.....	1	5
1879–80	120	6	2	4	7
1880–81	132	.....	3	.....	2
1881–82	141	4	3	2	6
1882–83	125	2	1	5	12
	632	16	9	12	32
Bridgeton city, 1878–79	73	4	.....	4	.....
1879–80	112	1	2	5	3
1880–81	81	2	1	4	3
1881–82	98	2	2	8	4
1882–83	71	5	1	7	2
	435	14	6	28	12
Millville, 1878–78	51	5	.....	.....	2
1879–80	71	6	5	3	.....
1880–81	52	5	4	3	2
1881–82	88	1	6	2	2
1882–83	58	2	4	1	4
	320	19	19	9	10
Essex county, 1878–79	77	14	38	18	19
1879–80	84	9	43	16	21
1880–81	71	9	37	17	16
(East Orange)	59	3	3	6	20
1881–82	111	15	36	28	30
1882–83	86	8	41	20	31
	488	58	198	105	137

SUMMARY OF MARRIAGES.—Continued.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign
Newark, 1878–79	257	34	149	341	124
1879–80	276	51	145	418	151
1880–81	328	62	147	510	172
1881–82	365	58	147	574	182
1882–83	320	54	130	623	144
	1,546	259	718	2,466	774
Orange, 1878–79	24	3	47	6	9
1879–80	32	3	48	18	9
1880–81	31	2	35	8	14
1881–82	28	6	52	23	10
1882–83	35	5	46	17	15
	150	19	228	72	57
Gloucester county, 1878–79	128	13	9	11	6
1879–80	133	5	7	7	15
1880–81	148	4	7	12	9
1881–82	141	2	8	10	5
1882–83	130	3	15	9	5
	680	27	46	49	40
Hudson county, 1878–79	11	1	3	10	11
1879–80	12	6	4	16	6
1880–81	9	3	4	20	8
1881–82	10	5	14	22	9
1882–83	14	4	12	29	27
	56	19	37	97	61
Bayonne, 1878–79	6	.....	1	4	3
1879–80	11	1	13	9	7
1880–81	21	5	23	7	7
1881–82	21	4	23	15	9
1882–83	15	2	23	7	6
	74	12	83	42	32
Harrison, 1878–79	3	2	7	1	4
1879–80	4	.....	10	1	4
1880–81	9	1	14	1	5
1881–82	.....	4	17	1	3
1882–83	8	1	15	1	4
	24	8	63	5	20
Hoboken, 1878–79	40	5	5	70	69
1879–80	37	6	13	77	60
1880–81	26	6	21	113	53
1881–82	39	4	59	127	87
1882–83	39	12	50	113	70
	181	33	148	500	339

SUMMARY OF MARRIAGES.—Continued.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign.
Jersey City, 1878–79	161	32	85	127	100
1879–80	242	42	127	162	127
1880–81	251	53	124	181	137
1881–82	279	51	142	218	154
1882–83	269	59	133	261	141
	1,202	237	611	949	659
Town of Union, 1878–79	.....	.....	1	28	5
1879–80	3	.....	1	42	2
1880–81	2	.....	.....	42	4
1881–82	6	3	1	48	12
1882–83	3	1	.....	69	6
	14	4	3	229	29
Hunterdon county, 1878–79	249	.....	14	5	5
1879–80	244	4	17	4	6
1880–81	232	2	6	4	5
1881–82	218	3	8	5	7
1882–83	235	4	8	3	5
	1,178	13	53	21	28
Mercer county, 1878–79	113	5	16	9	8
1879–80	122	3	12	13	11
1880–81	117	8	14	11	8
1881–82	99	2	7	2	9
1882–83	78	6	9	3	6
	529	24	58	38	42
*Chambersburg, 1878–79	.....	.....	.....	.....	.....
1879–80	.....	.....	.....	.....	.....
1880–81	.....	.....	.....	.....	.....
1881–82	9	1	1	5	11
1882–83	19	2	6	11	8
	28	3	7	16	19
Trenton, 1878–79	134	19	38	29	38
1879–80	156	10	57	42	44
1880–81	168	12	37	38	53
1881–82	175	18	55	40	47
1882–83	183	16	46	42	46
	816	75	233	191	228
Middlesex county, 1878–79	98	7	2	19	14
1879–80	125	7	17	15	11
1880–81	120	8	12	10	16
1881–82	132	5	23	22	56
1882–83	136	15	26	28	55
	611	42	80	94	152

*Included in Trenton.

SUMMARY OF MARRIAGES.—Continued.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign.
New Brunswick, 1878–79	69	11	6	13	6
1879–80	70	5	13	17	7
1880–81	70	4	27	25	10
1881–82	89	8	30	27	17
1882–83	56	10	43	26	13
	354	38	119	108	53
Monmouth county, 1878–79	299	24	24	4	18
1879–80	340	18	39	11	18
1880–81	362	16	33	10	23
1881–82	344	15	34	17	15
1882–83	377	18	34	19	29
	1,742	91	164	61	103
Morris county, 1878–79	144	4	23	13	26
1879–80	176	11	22	9	45
1880–81	188	11	26	7	40
1881–82	168	13	34	7	49
1882–83	188	8	27	13	50
	864	47	132	49	210
Morristown, 1878–79	29	1	1	4	2
1879–80	22	5	3	1	3
1880–81	29	1	2	4	5
1881–82	21	4	3	.....	4
1882–83	25	1	12	1	7
	126	12	21	10	21
Ocean county, 1878–79	68	1	2	2	2
1879–80	91	6	2	.....	3
1880–81	83	.....	1	2	3
1881–82	79	.....	.....	1	1
1882–83	96	2	2	2	2
	417	9	7	7	11
Passaic county, 1878–79	52	5	5	2	21
1879–80	69	2	4	2	8
1880–81	70	1	3	1	3
1881–82	59	2	5	.....	7
1882–83	55	4	.....	1	8
	305	14	17	6	48
Passaic City, 1878–79	.....	.....	.....	.....	.....
1879–80	14	3	12	3	13
1880–81	20	2	22	6	15
1881–82	21	2	15	2	29
1882–83	18	2	13	7	23
	73	9	62	18	80

SUMMARY OF MARRIAGES.—Continued.

	U. S.	U. S., in part.	Irish.	German.	Other Foreign.
Paterson, 1878–79	93	22	53	39	116
1879–80	139	19	48	54	154
1880–81	153	41	50	53	213
1881–82	153	31	64	50	244
1882–83	140	24	76	46	238
	675	137	291	242	965
Salem county, 1878–79	155	6	.....	4	5
1879–80	145	4	1	4	5
1880–81	92	2	3	8	2
1881–82	88	2	2	3	5
1882–83	96	.....	2	1	1
	576	14	8	20	18
Salem city, 1878–79	.....	.....	.....	.....	.....
1879–80	.....	.....	.....	.....	.....
1880–81	32	2	3	1	1
1881–82	39	1	4	.....	3
1882–83	47	1	2	.....	.....
	118	4	9	1	4
Somerset county, 1878–79	112	5	13	14	7
1879–80	117	7	11	14	11
1880–81	135	3	12	18	11
1881–82	114	3	15	18	12
1882–83	115	6	16	14	8
	593	24	67	76	49
Sussex county, 1878–79	149	3	1	2	8
1879–80	149	6	1	4	8
1880–81	131	2	5	.....	7
1881–82	158	4	5	5	9
1882–83	173	3	3	3	7
	760	18	15	14	39
Union county, 1878–79	25	.....	5	2	3
1879–80	32	4	3	5	11
1880–81	23	5	5	4	11
1881–82	31	.....	1	6	4
1882–83	37	2	4	5	3
	148	11	18	22	32
Elizabeth, 1878–79	54	10	43	40	19
1879–80	72	10	24	33	19
1880–81	85	11	56	38	28
1881–82	73	13	70	50	45
1882–83	81	9	53	48	26
	365	53	246	209	137

SUMMARY OF MARRIAGES.—Continued.

	U. S.	U. S., in part.	Irish.	German	Other Foreign.
Plainfield, 1878–79	14	1	4	.....	1
1879–80	40	1	5	6	7
1880–81	34	3	2	4	5
1881–82	45	4	5	5	13
1882–83	32	1	10	4	6
	165	9	26	19	32
Rahway, 1878–79	27	2	7	13	7
1879–80	34	4	6	9	4
1880–81	29	5	2	7	9
1881–82	31	2	5	7	5
1882–83	25	2	7	9	10
	146	15	27	45	35
Warren county, 1878–79	194	6	7	9	4
1879–80	173	6	6	7	8
1880–81	184	3	13	4	13
1881–82	160	7	6	6	15
1882–83	190	7	8	5	12
	891	29	40	31	52
Philipsburg, 1878–79	30	3	11	4	2
1879–80	46	.....	3	2	4
1880–81	54	4	6	4	5
1881–82	53	1	4	4	2
1882–83	69	2	1	8	2
	252	10	25	22	15

CLIMATOLOGY.

In a State which presents such a diversity of soil, of climate and of altitude as our own, the study of climate as related to disease is most important. The relation, too, of the long extent of sea-coast and the diverse character of our rivers and lakes, cannot be too carefully considered. Practitioners of medicine who are located in one section for a score of years, come to know much as to these local influences. They are often able, within the area of their own ridings, to point out the effects of geological strata or drift of rivers, ponds or the soil of water-level, of winds and of hills, woods and valleys, and so to estimate how to secure changes of climate without distant removal. We ask such to carefully study these tables of climate as related to disease, and in correspondence to add the results of their own observations. In the report of last year space did not permit a completion of the tables relating to the five years from July 1st, 1878, to July 1st, 1883. These will be added after the tables of this year, and will thus be available for reference and study. This report and the last will thus furnish a condensed weather table for five years. In reference, especially, to respiratory and malarial diseases, we think the careful student will be able to trace important differences in different localities of the State. We call attention to former articles in the reports on climatology, as these have so supplemented each other as to be an aid to the student. Our reports are mostly from the localities before chosen. On account of the removal of Mr. Richardson from Freehold, we have not a complete report therefrom. We miss, too, the accustomed hand of Hon. Wm. A. Whitehead, deceased, whose labors are of such value to all students of climatology, and especially to those in this State. We are indebted to the following observers:

I. Newton, Miss E. Foster.
II. Paterson, Wm. Furgason.
III. Newark, Arthur Ward, M.D.
IV. New Brunswick, P. V. Spader, Esq.
V. Freehold, ——— ———.
VI. Vineland, John Ingram, M.D.
VII. Barnegat and Cape May, U. S. Signal Service.
VIII. Sandy Hook, U. S. Signal Service.

The tables of New York and Philadelphia are accessible for comparison. We may mention Lakewood, Atlantic City and Cape May as having shown advantages of winter climate that have been carefully recognized by many physicians and invalids. In summer not alone at our seaside, but also amid the hills of Morris, Sussex and Warren, and at some of the small lakes, there are found very desirable resorts.

METEOROLOGICAL SUMMARY OF VARIOUS STATIONS FROM JULY 1ST, 1883, TO JULY 1ST, 1884.

STATION, DENNIS LIBRARY, NEWTON, N. J.

Latitude, 41° 2′ 45″ N.; Longitude, 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVER, MISS E. FOSTER

	BAROMETER Reduced to 32°.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (inches).	Days when Precipitation equaled 0.01.	Cloudy Days.	Rain-fall on days. Thunder and Lightning on Days.	Snow-fall on Days.	Fog.	Hail.	Frost.	Lunar Halos.
	Max.	Min.	Mean.	Max.	Min.	Mean.												
1883.																		
July	29.476	28.955	29.240	96.7	49 3	74 02	63 00	S. W.	4 00	.....	14	3	14	14 ...	3	1	...	...
August	29.557	29.003	29.299	90.2	46.3	69.12	61.36	S.W., N. E.	1.43	.....	6	6	7	3 ...	2	...	2	3
September	29.693	28.656	29.332	82.0	38.0	60.73	64.91	S.W., N. E.	2 85	.....	8	10	10	3 ...	2	...	5	5
October	29.875	28.656	29.404	80.2	28.9	50.88	66.15	N. E.	6.645	.....	11	13	13	1 ...	5	...	6	4
November	29.779	28.894	29.357	69.3	17.7	43.41	60.63	S. W.	1.665	trace.	11	10	11	.....	4	4	4	3
December	29.880	28.767	29.636	59.0	0.0	31.22	66.60	S.W.,N.W.	3.306	22.5	16	11	9	.....	8	3	7	5
1884.																		
January	29.996	28 336	29.308	46.2	5.0	23.58	69.66	S.W., N. E	4.31	20.0	14	15	7	.....	9	1	17	...
February	29.890	28.481	29.281	55.6	1.0	33.54	73.36	N. E., S. W.	4 635	14.0	16	15	15	.....	4	9	3	1
March	29.655	28.765	29.236	62.9	2.7	36.00	69.18	N. E.	4.33	6.5	16	12	12	1	8	2	1	6	2
April	29.394	28 435	29.081	76.5	29.6	48.10	59.72	N. W.	2.29	4.5	8	8	7	1	3	...	...	6	4
May	29 510	28.826	29.186	92.5	36.8	60.89	58.21	S W., N, W.	3.42	.....	15	6	16	6	...	3	...	2	...
June	29.741	28.951	29.329	97.9	42.5	71.97	65.00	S.W., N. E.	2.37	.....	5	4	7	2	...	3	...	3	...
For the year	29.703	28.727	29.307	75.75	24.81	50.28	65.23	S. W.	41.251	67.5	140	113	128	31	36	37	2	61	24
Extremes	29.996	28 336	.....	97.9	0.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Including melted snow.

REMARKS.—1883, July—Frequent thunder showers occurring at night. Precipitation above the average. Duration less than one-half that of July, 1882. There were two days of entire cloudiness. Rheumatism, pneumonia and typhoid fever appeared during the month. August—Average temperature low, the mean of the maxima being 4.5° below the average for August. No rain from 2d to 16th. Heavy dews. From 7th to 12th, winds were from points S E and N. E. During that period, a severe form of influenza appeared among families living near the low, wet meadows which lie northeast of the town. Frost on 27th. Scarcity of water in wells. Diphtheria prevalent at close of the month. Autumn, 1883, was nearly 1.7° below the average. Rain-fall deficient in September and November. First killing frost on October 6th. Ground frozen. Intermittent fever appeared. The northwest winds of November were frequent and disagreeable. Epidemic rose-rash appeared in the early part of the month. December was mild until the 16th. Then ten days of snow and rain, which left 10 inches of snow on the ground at the close of the month. The temperature on the 23d did not rise above zero the entire day. Remittent fever, fatal. The low mean humidity of the six months, July to December, is greatly in contrast with the corresponding period of 1882, which shows 80 per cent., all of the months having a higher mean. The general health of the community has been good. 1884, January—Daily range of temperature was normal; monthly range was 5° below the average. The month was steadily cold. Ground covered with snow and ice 31 days. Dysentery appeared in latter half of the month. February—Frequent fogs and mists. There were 171 hours of precipitation. Cellars flooded from the 15th to the 29th. Temperature of 29th unprecedented, average for the day being 6.6°. Rheumatism and deafness prevalent. Winter, 1883-84, was 1.69° above the average. March—Memorable for the ice-storm of the 8th and 9th. Trees covered with ice five days. No abrupt changes in temperature until during the gale of 29th and 30th, there was a fall of 40° in 12 hours, temperature remaining below the freezing-point 24 hours. Cellars were flooded from 19th to the close of the month. Catarrhal fever and rheumatism appeared. April—Cold, icy winds; low humidity. Scarlatina and diphtheria prevalent. May—First half wet and foggy. Ice formed on the 29th. June had a wider daily range than any of a series of seven years. Low night temperature. Rain-fall deficient. The yearly mean temperature was 0.29° low.

STATION, PATERSON, N. J.

Latitude, 40° 55′ N.; Longitude, 74° 11′ W. Height of Rain Gauge above Sea Level, 142 feet.

OBSERVER, WILLIAM FERGASON, CITY SURVEYOR.

	BAROMETER. Reduced to 32°.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1883.													
July	.....	.....	.....	97	59	70	38	.....	.....	2.92	.....	11	...
August	.....	.....	.....	90	57	71	33	.....	.....	1.30	.....	4	.....
September	.....	.....	.....	81	49	66	32	.....	.....	5.41	.....	8	.....
October	.....	.....	.....	85	34	52	41	.....	.....	4.38	.....	12	.....
November	.....	.....	.....	70	22	44	46	.....	.....	0.97	.....	7	.....
December	.....	.....	.....	53	.....	32	53	.....	.....	2.89	25.5	12	.....
1884.													
January	.....	.....	.....	49	.....	26	45	.....	.....	5.16	12.5	12	.....
February	.....	.....	.....	52	5	35	47	.....	.....	5.74	10.5	16	.....
March	.....	.....	.....	69	6	38	63	.....	.....	3.20	2.5	10	.....
April	.....	.....	.....	76	33	48	49	.....	.....	2.40	.....	8	.....
May	.....	.....	.....	87	40	60	47	.....	.....	4.47	.....	11	.....
June	.....	.....	.....	92	48	69	37	.....	.....	4.36	.....	6	.....
For the year	.....	.....	.....	.....	.....	.....	.....	.....	.....	43.20	50	117	.....

* Including melted snow.

STATION, NEWARK, N. J.

Latitude, 40° 41′ N.; Longitude, 74° 10′ W. Height of Barometer Cistern above Sea Level, 35 feet.

OBSERVER, DR. WARD.

	BAROMETER. Reduced to 32°.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1883.													
July	30.2	29.8	30.0	97.0	55.0	75.37	20.33	.....	N.W.	2.76	.....	15	13
August	30.3	29.75	30.02	90 0	54.0	70.65	21.411	.....	W., N.W.	2.46	.....	4	14
September	30.33	29.653	29.991	84.0	41.0	62.21	17.45	.....	N.E., S.W.	4.74	.....	8	11
October	30.65	29.525	30.09	78.0	33.0	57.75	13 878	.....	N.E., N.W.	5.36	.....	10	15
November	30.63	29.76	30.22	69.0	19.5	43.33	11.59	.....	W., S.W.	1.43	.....	8	12
December	30.78	29.75	30.033	54.0	2.0	32.3	10.1	.....	W., N.W.	2.72	.25	13	15
1884.													
January	30.9	29.4	30 15	42.75	3.0	22.02	15.07	.....	S.E., N.W.	5.16	4.25	9	17
February	30.7	29.3	30.0	55.5	5.0	34.28	10.88	.....	W., N.W.	4.14	7.0	10	25
March	30.4	29.55	29.97	61.0	3.5	36.35	17.15	.....	N.W.	5.63	1.0	8	24
April	30.2	29.225	29.71	69.5	31.0	48.337	16.83	.....	N.W.	2.66	.....	7	25
May	30.275	29.7	29.98	89.0	42.0	61.116	18.66	.....	N.W., S.W.	4.04	.....	8	30
June	30.3	29.65	30.02	94.0	50.0	72.35	19.96	.....	S.E., S.W.	4.95	.....	4	22
For the year	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Including melted snow.

STATION, NEW BRUNSWICK, N. J.

Latitude, 40° 29′ N.; Longitude, 74° 26′ W., or 2′ 37′ E. Height, 115 feet.

OBSERVER, P. VANDERBILT SPADER.

	BAROMETER. Reduced to 32°.			THERMOMETER.				Mean Humidity.	Prevailing Wind	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1883.													
July										3.44		14	
August										4.40		6	
September										3.35		12	
October										4.29		12	
November										1.49		11	
December										3.61		14	
1884.													
January										5.63		13	
February										5.28		19	
March										4.23		15	
April										2.20		9	
May										3.17		11	
June										5.34		9	
For the year										46.43		145	

* Including melted snow.

STATION, VINELAND, N. J.

Latitude, 39° 29′; Longitude, 75° 1′ W. Height of Barometer Cistern above Sea Level, 110 feet.

OBSERVER, J. INGRAM, M.D.

	BAROMETER. Reduced to 32°.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1883.													
July	30.069	29.580	29.856	98	56	77.68		68.87	S.W.	3.515		8	13
August	30.095	28.654	29.902	94	50	70.95		61.32	N.E., S.E.	2.000		6	7
September	30.221	29.521	29.932	84	40	65.38		72.19	N.E.	4.980		8	17
October	30.462	29.311	30.025	82	32	55.76		77.01	N.E., N.	7.050		14	14
November	30.458	29.663	30.033	76	20	46.07		63.58	S.W., N.W.	1.870		8	12
December	30.433	29.446	29.981	62	10	35.44		63.47	SW NE NW	5.160	8.75	11	14
1884.													
January	30.656	29.060	29.993	52	4	28.11		65.48	N.E., N.W.	11.555	12.00	14	13
February	30.587	29.070	29.970	67	10	40.15		74.31	S.W., N.E.	6.775	0.50	15	16
March	30.213	29.358	29.772	68	10	41.44		71.64	N.W., N.E.	6.590	8.00	14	17
April	29.950	28.961	29.672	74	28	50.53		70.10	W., N.W.	3.330	2.00	6	16
May	30.041	29.410	29.736	92	42	64.93		67.27	S.W.	1.990		5	10
June	30.399	29.669	29.952	98	48	73.43		64.56	S.W.	1.968		7	10
For the year			29.903			54.15		68.315		56.793	31.25	116	159

*Including melted snow.

STATION, BARNEGAT CITY, N. J.

Latitude, 39° 46′ N.; Longitude, 74° 6′ W. Height of Barometer Cistern above Sea Level, 22 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	BAROMETER.† Reduced to 32°.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Range.‡						
1883.													
July	30.238	29.703	29.965	91.0	59.5	72.9	31.5	81.5	S.W.	2.43		14	3
August	30.248	29.648	30.014	86.0	58.0	70.4	28.0	76.7	E.	2.13		7	4
September	30.396	29.524	30.049	77.0	48.0	64.4	29.0	80.5	E.	4.84		12	9
October	30.614	29.424	30.133	74.0	40.3	55.4	33.7	78.6	E	6.51		19	13
November	30.615	29.714	30.134	63.0	24.0	46.3	39.0	74.0	S.W.	1.06		14	8
December	30.637	29.465	30.057	57.0	11.0	37.2	46.0	75.7	N.	2.83		16	13
1884.													
January	30.828	29.139	30.113	52.0	7.0	28.9	45.0	77.7	N.	5.25		15	11
February	30.716	29.145	30.052	56.8	§13.0	37.8	43.8	87.7	N.W.	1.11		21	10
March	30.454	29.470	29.995	63.0	11.3	39.0	51.7	79.2	N.W.	2.38		18	10
April	30.176	29.092	29.827	61.9	32.3	46.9	29.6	71.8	N.W.	0.97		8	12
May	30.289	29.571	29.934	81.2	42.4	58.7	38.8	74.5	S.W.	0.79		9	6
June	30.491	29.744	30.061	82.8	48.1	66.2	34.7	77.6	S.W.	2.24		5	4
For the year													

* Including melted snow, dew, fog, sleet, hail and frost.
† Corrected for temperature and instrumental error only.
‡ The mean daily range is probably what is desired.
§ From exposed thermometer, minimum broken.

STATION, CAPE MAY, N. J.

Latitude, 38° 56′ N.; Longitude, 74° 58′ E. Height of Barometer Cistern above Sea Level, 27 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	BAROMETER.† Reduced to 32°.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Range.‡						
1883.													
July	30.213	29.672	29.963	89.0	59.0	73.7	30.0	80.7	S.	2.39	.....	8	1
August	30.211	29.634	29.999	86.0	57.0	71.6	29.0	75.4	S.	3.03	.....	5	4
September	30.361	29.588	30.033	80.0	44.5	66.2	35.5	77.5	N.E.	4.59	.....	5	7
October	30.564	29.422	30.115	74.0	38.0	56.9	36.0	76.1	N.E.	8.63	.....	15	9
November	30.608	29.751	30.129	64.0	22.0	48.3	42.0	73 6	N.W.	3.39	.....	10	7
December	30.620	29.461	30.085	57.0	14.0	39.7	43.0	79.6	N.W.	3.81	.....	13	8
1884.													
January	30.777	29.228	30.110	50.5	11.0	31.6	39.5	80.0	N.W.	5.56	.....	17	11
February	30.656	29.125	30.052	54.0	13.0	39.5	41.0	84.0	N.W.	6.22	.....	17	8
March	30.421	29.448	29.990	54.5	13.0	40.0	41.5	82.9	N.W.	5.61	.....	18	8
April	30.183	29.168	29.834	63.5	32.0	48.2	31.5	79 0	N.W.	2.34	.....	11	10
May	30.260	29.591	29.926	80.0	43.0	59.8	37.0	76.2	S.	1.19	.....	8	6
June	30.383	29.679	30.034	86.0	49.0	67.6	37.0	79.8	S.	1.03	.....	8	7
For the year													

* Including melted snow, dew, fog, sleet, hail and frost.
† Corrected for temperature and instrumental error only.
‡ The mean daily range is probably what is desired.

STATION, SANDY HOOK, N. J.

Latitude, 40° 28′ N.; Longitude, 74° 0′ W. Height of Barometer Cistern above Sea level, 28 feet.

OBSERVER, ——— ———.

	BAROMETER.† Reduced to 32°.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Range.‡						
1883.													
July	30.22	29.697	29.955	95.0	59.0	74.8	36.0	70.4	S.W.	2.3	.....	15	5
August	30.279	29.655	30.018	91.0	61.0	72.2	30.0	68.5	W.	3.44	.....	7	4
September	30.427	29.488	30.058	83.0	49.0	64.3	34.0	73.0	N.W., S.E.	4.63	.....	10	10
October	30.636	29.381	30.146	77.0	39.0	55.2	38.0	72.1	E.	5.2	.....	12	7
November	30.591	29.691	30.129	67.0	22.0	46.0	45.0	74.1	N.W.	1.54	.....	10	5
December	30.675	29.401	30.090	57.0	5.5	35.4	51.5	73.7	N.W.	2.57	.....	14	11
1884.													
January	30.832	29.116	30.115	50.0	8.0	27.7	42.0	72.4	W.	6.76	.....	15	8
February	30.73	29.157	30.067	62.5	6.0	35.8	56.5	81.5	E	4.72	.....	18	9
March	30.443	29.489	30.002	63.6	6.9	38.0	56.7	75.9	N.W.	4.32	.....	17	11
April	30.164	29.102	29.829	67.0	34.0	47.2	33.0	76.1	N.W.	3.15	.....	9	11
May	30.299	29.563	29.931	86.0	45.0	58.9	41.0	70.1	N.W.	5.27	.....	11	5
June	30.523	29.734	30.065	91.2	51.3	68.4	39.9	70.6	S.	4.52	.....	5	3
For the year													

* Including melted snow, dew, fog, sleet, hail and frost.
† Corrected for temperature and instrumental error only.
‡ The mean daily range is probably what is desired, and will be sent on application.

In order to complete the tables of previous years, we add first the tables of Cape May, Barnegat and Sandy Hook for the four years previous.

STATION, CAPE MAY, N. J.

Latitude, 38° 56′ N.; Longitude, 74° 58′ W. Height of Barometer Cistern above Sea Level, 27 feet.

	BAROMETER. Reduced to 32°.			THERMOMETER.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.	Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1878.													
July	30.19	29.60	29.95	90	66	75.6		77.3	S.	2.43		7	5
August	30.20	29.62	29.91	85	60	73.8		78 3	S.E.	6.41		10	7
September	30.44	29.68	30.11	86	46	70.6		76.7	N.E.	1.33		6	6
October	30.39	29.22	30.03	77	36	60.0		72.9	N.W.	3.38		9	6
November	30 53	28.95	29.96	64	29	47.3		74.0	N.W.	3.17		10	9
December	30.54	28.84	30.01	59	18	36 3		71.1	N.W.	7.09		14	7
1879.													
January	30.53	29 30	30.04	55	1	29.9		78.7	N.W.	3.81		9	7
February	30.74	29.48	30 06	50	12	32.1		74.3	N.W.	3 09		13	14
March	30.70	29.33	30.07	61	21	42.1		76.6	N.W.	2.99		15	13
April	30.39	29.38	29 88	76	29	47.6		74.0	N.W.	4.34		10	13
May	30.42	29.71	30.02	77	43	61.5		70.7	S.	0.25		4	5
June	30.25	29.50	29.94	81	52	69.2		72.3	S.	4.21		9	11
July	30.31	29.59	29.97	83	57	72.7		77.6	S.	4.94		8	9
August	30.20	29 51	29.94	87	58	72.7		79.1	S.	16.58		12	11
September	30.44	29.76	30.10	81	45	67.1		75.0	S.E.	1.89		8	8
October	30.31	29.54	30 14	81	33	63.9		73.3	S.W.	0.97		5	4
November	30.57	29.50	30.14	69	22	48.1		65.1	N.W.	1.09		8	7
December	30.63	29.65	30.15	60	15	43.9		75.8	S.	6.19		16	14
1880.													
January	30.65	29 58	30.16	56	18	43.2		80.3	N.W.	2.17		17	8
February	30.64	29.24	30.09	59	12	41.7		80.7	S.	2.40		7	9
March	30.48	29.39	30.02	65	23	42.6		71.5	N.	7.91		16	15
April	30.39	29.55	29.99	67	31	52.3		66.6	S.	1.68		11	4
May	30.33	29 81	30.04	81	41	65.2		75 1	S.	1.27		9	8
June	30.29	29.63	29.97	89	52	71.2		75.3	S.	3.79		8	8
July	30.20	29 70	29.96	90	56	75.3		77.6	S.	4 58		14	12
August	30.39	29.75	30 04	84	57	73.2		80.5	S.	7.49		13	13
September	30.36	29.69	30.02	87	52	69.1		74.1	N.W.	2.91		9	6
October	30.45	29 49	30.08	75	42	58.7		70.8	S.	5.07		8	8
November	30.70	29 60	30 21	67	16	44.1		68.1	N.	4.79		15	14
December	30.50	29.57	30.00	55	2	31.2		78.1	N.W.	9.21		15	12
1831.													
January	30.68	29.36	30.11	46	6	29 6		78.7	N.W.	7.36		11	13
February	30.78	29.41	30.16	51	5	33.6		73 2	N.W.	4.23		11	7
March	30.34	29.03	29.72	53	25	40.5		70.3	N.W.	4.94		11	12
April	30.34	29.49	29.87	70	27	45.9		74.0	N.W.	1.34		12	11
May	30.46	29.59	30.02	75	43	59 6		82.7	S.E.	3.51		10	12
June	30.17	29.61	29.88	83	53	66.5		76.8	S.E.	5.11		15	10
July	30.20	29.67	29.90	87	62	75 4		68.6	S.	1.20		12	9
August	30.31	29.66	30.02	87	58	73.5		77.5	S.	2.26		8	6
September	30.32	29.84	30.07	85	55	74.5		79.8	S.	1.22		8	4
October	30.52	29.54	30.11	81	39	62.7		76.1	S.	4.53		10	11
November	30.71	29.64	30.15	67	27	51.6		77.0	N.W.	5.22		15	17
December	30.65	29.46	30.16	63	20	43.3		75.5	N.W.	2.07		14	15
1882.													
January	30.84	29.18	30.11	52	5	36.0		77.2	N.W.	6.32		19	15
February	30.66	29.26	30.10	58	23	40.8		73.6	N.W.	3.19		12	8
March	30.64	29.57	30.04	63	23	45.0		70.7	N.W.	4.90		13	12
April	30.48	29.42	30.01	66	29	49.6		74.4	N.W.	2.44		12	9
May	30.40	29.43	29.95	75	34	55.1		78.6	N.E.	4.40		12	11
June	30.26	29.55	29.84	83	53	68.5		76.5	S.	2.62		9	8

* Including melted snow.

STATION, BARNEGAT, N. J.

Latitude, 39° 48′; Longitude, 74° 9′. Height of Barometer Cistern above Sea Level, 20 feet.

	BAROMETER. Reduced to 32°.			THERMOMETER.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.	Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
1878.													
July	30.20	29.57	29.94	94 0	61.0	71.7		82 4	S.	6.39		10	7
August	30.21	29 65	29.90	85.0	59.0	71.8		80.7	S.	4.78		16	7
September	30.46	29.69	30.12	84 0	49.0	67.8		79.4	E.	2.90		10	7
October	30.39	29.36	30.02	75.0	38.0	57.0		76.5	N.W.	2.35		11	6
November	30.53	28.96	29.95	62.0	28.0	43.4		77.3	N.W.	4.75		13	9
December	30.49	28.80	29.99	57.0	12.0	32.5		79.2	N.W.	6.74		10	6
1879.													
January	30.51	29 29	30.02	61.0	−1.0	27.5		81.6	N.W.	3.69		9	8
February	30.76	29.46	30.05	47.0	8.0	28.7		78.2	N.W.	3.82		16	8
March	30.70	29.25	30.07	65.0	21.0	38.4		73.9	S.	3.46		20	9
April	30.40	29.36	29.89	69.0	23.0	44.9		76.2	N.W.	4.42		14	14
May	30 50	29.73	30.05	72.0	39.0	53.0		77.2	S.	2.00		7	5
June	30.28	29.47	29.96	84.0	48.0	65.7		78.5	S.	4.03		12	5
July	30 30	29.53	29.97	96.0	53 0	69.5		80.7	S.	3.57		14	7
August	30.19	29.47	29.93	92.0	53.0	70.9		81.4	S.	12.33		11	11
September	30.46	29.76	30.11	84.0	45.0	63.7		78.3	S.	2.15		8	8
October	30.79	29.47	30 14	82.0	30.0	59 0		79.5	N.W.	1.05		9	5
November	30.58	29.43	30.13	73.0	18.6	42.2		76.2	N.W.	2.10		13	7
December	30.64	29.63	30.16	60.0	10.0	39.6		86.0	N.W.	6.68		17	18
1880.													
January	30.69	29 52	30.16	61.0	43.0	40.5		85.3	N.W.	1.75		18	11
February	30.63	29.09	30.09	70.0	59.0	36.8		77.0	N.W.	3.29		13	10
March	30.48	29.34	30.02	73.0	55.0	39.1		73.9	N.W.	6.51		20	14
April	30.38	29.55	30 00	79.0	53.0	48.0		73.9	S.	3.29		13	7
May	30.33	29.74	30 04	91.0	57.0	62.5		75.2	S.	0.88		6	4
June	30.29	29.59	29.97	93.0	45.0	69.1		77.3	S.	3.67		11	5
July	30.19	29.68	29.96	94.0	58.0	72.9		79.6	S.	5.78		18	11
August	30.44	29.72	30 04	87.0	55.0	70.7		82.2	S.	6.15		10	11
September	30.37	29.65	30.02	89.0	49.0	66.4		78.3	S.	3.14		9	6
October	30 42	29.43	30.09	79.0	33 0	54.7		75.9	S.	4.05		10	7
November	30.74	29.59	30.21	67.0	13.0	39.9		74.3	N.W.	4.35		14	14
December	30.45	29.56	29.99	52.0	−7.0	27.8		79.9	N.W.	5.95		15	9
1881.													
January	30.64	29 23	30.11	49.0	1.0	26.6		78.4	N.W.	8.43		15	15
February	30.78	29.35	30.15	59.0	−4.0	29.4		78.2	N.W.	5.39		15	10
March	30.35	29.03	29.70	53.0	21.0	36.9		75.2	N.W.	7.58		15	15
April	30.34	29.41	29 86	70.0	22 0	43 5		73.3	N.W.	1.36		12	11
May	30.46	29.58	30.02	84 0	37.0	56.4		86.8	S.	1.77		11	11
June	30.16	29.60	29.88	86.0	48.0	63.5		80.9	E.	6.18		14	12
July	30.21	29.58	29.91	92 0	60 0	72.4		79.6	S.	1.99		7	6
August	30.31	29 62	29.99	88.0	59.0	71 1		81.3	S.	5.51		11	5
September	30.32	29.82	30.06	96.0	58 2	71.6		85.1	E.	3.55		5	7
October	30.54	29.45	30.11	82.5	38.5	59.8		79.1	S.	4.35		9	12
November	30.67	29.57	30.15	70.5	22.5	47.3		76.9	N.W.	3.64		14	14
December	30.62	29 38	30.13	60.0	21.0	40.8		81.0	N.W.	3.50		14	15
1882.													
January	30.82	29 12	30.12	54.0	−1.0	32.7		79.9	N.W.	8.29		18	13
February	30 72	29.26	30.12	52.0	18 0	36.3		81.6	N.W.	8.91		14	8
March	30.68	29.55	30.07	60.2	20.0	40.1		74.2	N.W.	4.44		12	12
April	30.51	29.40	30.01	74.0	26.6	45.9		71.8	S.	4.16		11	12
May	30.43	29.42	29.99	75.8	36 0	52.2		79.4	S.	7 22		13	9
June	30 25	29.51	29 88	95.6	52.0	66.2		76.8	S.	3.26		11	5

* Including melted snow.

STATION, SANDY HOOK, N. J.

Latitude, 40° 28′ N.; Longitude, 74° 1′ W. Height of Barometer Cistern above Sea Level, 28 feet.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation reached 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1878.													
July	30.19	29.57	29.93	97.0	62.0	75.5		75.7	W.	6.08		9	9
August	30.26	29.58	29.89	90.0	63.0	72.5		79.4	W.	6 19		12	11
September	30.48	29.66	30.12	87.0	48.0	67.8		78.3	E.	4.09		9	8
October	30.37	29 34	30.00	79.0	42.0	58.5		70.9	W.	2.74		10	7
November	30.56	28.94	29.93	60.0	30.0	44.4		73.5	W.	6.96		12	10
December	30.49	28.77	29.96	59.0	13.0	33.5		72.7	W.	7.78		10	11
1879.													
January	30 47	29 37	29.97	49.0	—3.0	27.0		76.4	W.	3.22		8	10
February	30.75	29.34	30.03	53.0	8 0	28.1		72.9	N.W.	2.72		10	11
March	30 69	29.24	30.06	60.0	21.0	37.7		71 6	N.W.	4.84		11	8
April	30.37	29.35	29 88	71.0	24.0	44.8		70.1	N.W.	6.30		13	13
May	30.40	29.68	30 04	87.0	41.0	60.0		70.9	S.E.	3.59		8	5
June	30.26	29.43	29 93	92.0	50.0	69.3		71.8	S.W.	5.86		15	15
July	30 27	29.49	29.95	96.0	59 0	73 4		71.0	S.W.	5.76		10	14
August	30 16	29.56	29 92	92.0	59.0	72.0		70.9	S.W.	12.44		10	12
September	30.42	29.72	30.10	87.0	48.0	64.2		73.2	S.W.	1.13		7	9
October	30.77	29.47	30.12	84.0	34.0	60.5		71.1	W.	0.47		5	7
November	30.50	29 38	30.11	71.0	18.0	44.1		70.1	N.W.	2.15		6	10
December	30.60	29.58	30.15	61.0	10.0	38.5		78.2	S.W.	8.02		14	16
1880.													
January	30.70	29.49	30.16	58.0	21.0	39.6		80.3	W.	1.77		13	13
February	30.59	29.88	30.07	64.0	10.0	36.6		75.3	W.	1.67		11	9
March	30.47	29.33	30.01	67.0	17.0	37.6		72.1	N.W.	5.86		18	12
April	30.32	29.48	29.97	77.0	27.0	49.3		69.0	N.W.	2 69		10	10
May	30.40	29.66	30.02	93.0	35.0	64.8		71.0	S W.	2.01		8	4
June	30.26	29.50	29.95	93.0	50 0	71.4		68.6	W.	2.78		6	2
July	30.15	29 62	29 94	89.0	50.0	75.1		72.6	S W.	6.43		13	9
August	30.39	29 66	30 03	90 0	59.0	71.7		79.4	S.W.	4.26		9	8
September	30.34	29.63	30.00	92.0	51.0	67.5		73.8	W.	3.35		6	8
October	30 37	29.43	30.09	78.0	36.0	56.1		71.1	S.W.	3.97		11	6
November	30.70	29.48	30.20	69.0	14.0	43.1		65.7	N.W.	3.76		8	4
December	30.42	29 55	29.98	52.0	—5.0	29.5		69.2	N.W.	2.51		8	10
1881.													
January	30.65	29.25	30.09	40.0	8.0	26.2		73.1	N.W., W.	5.03		10	12
February	30.80	29.33	30.14	53.0	zero.	29.1		75.7	N.W.	5.37		12	6
March	30 35	29.02	29.70	53.0	22.0	37.5		77.2	N.W.	6.92		12	13
April	30.37	29.39	29.86	74.5	23.0	45 6		69.3	N.W.	1.41		8	5
May	30 46	29.57	30.02	91.0	42.5	60.9		79.3	S.E.	3.33		13	10
June	30.19	29.61	29.88	87.2	50.5	65 4		77.1	N.W.	6.80		16	11
July	30.22	29.56	29.91	89.2	63.2	74.0		74.9	S.E.	2.43		10	5
August	30.31	29.59	29.99	96.2	60.9	74.9		72.1	S.W.	0.63		10	3
September	30.37	29.82	30.07	101.0	58.0	74.1		77.3	S.E.	3.57		10	6
October	30.56	29.43	30 11	87.0	39.0	61 3		68.4	N.W.	2.71		8	8
November	30 66	29.56	30.15	73.0	26.0	49.1		67.2	N.W.	3.54		12	12
December	30.62	29.34	30.12	68.5	23.0	41.9		77.1	S.W.	5.00		12	13
1882.													
January	30 82	29.21	30.12	50.0	zero.	31.9		79.5	N.W.	6 47		17	12
February	30 73	29.36	30.11	58.5	20.0	36 6		77.7	N.W.	4 85		11	6
March	30.68	29.55	30.06	58.0	20.0	40.5		75.3	N.W.	4.00		12	6
April	30.51	29.35	30.00	69.0	27.0	46.8		73.0	N.W.	3.19		13	10
May	30.44	29.42	29.99	79.0	38.0	54.3		74.9	N.E.	7.21		15	10
June	30 23	29.47	29.87	91.0	50.5	68.7		73.7	N.W.	2.60		10	4

*Including melted snow.

Next we place the observations for all the Stations, from July 1st, 1882, to July 1st, 1883, thus completing the aggregate for five years:

STATION, DENNIS LIBRARY, NEWTON, N. J.

Latitude, 41° 2′ 45″ N.; Longitude, 2° 19′ 48″ E. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVER, MISS E. FOSTER.

	Barometer. Reduced to 32°.			Thermometer.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July	29.576	28.829	29.262	94.7	53.3	74.16		74.41	S.W.	2.40	trace.	8	3
August	29.603	28.868	29.298	96.1	50.0	72.06		79.28	S.W.	3.68		8	11
September	29.533	28.912	29.313	86.0	40.2	65.11		87.00	N.E.	9.36		12	12
October	29.623	28.981	29.343	74.0	36.0	55.51		88.66	N.E.	2.595	trace.	13	14
November	29.780	28.880	29.376	68.2	18.2	39.25		80.41	N.E.	1.20	12.0	4	10
December	29.677	28.863	29.302	48.0	6.9	29.19		70.43	N.W.	1.85	3.3	8	15
1883.													
January	29.839	28.782	29.377	46.3	0.2	23.86		72.44	N.E.	3.441	20.3	16	17
February	29.932	28.834	29.464	52.2	11.2	29.96		65.86	S.W., N.W.	3.143	11.0	17	12
March	29.669	28.496	29.174	62.0	6.2	31.60		61.74	N.W., S.W.	2.33	14.8	7	6
April	29.699	28.864	29.245	70.2	19.8	47.60		65.51	S.W., N.E.	3.935	2.3	15	8
May	29.616	28.748	29 207	86.0	37.0	60.69		62.08	S.W.	2.92		10	8
June	29.701	28.830	29.237	94.5	46.8	71.81		69.56	S.W.	4.83		11	8
For the year	29.687	28.824	29 299	73.18	27.15	50.06		73.11		41.684	63.7	129	124

* Including melted snow.

REMARKS.—1882, July had a high humidity; auroras were frequent; snow fell on the 5th. August to October, dews, fogs and mists. September 20th to 25th, excessive rain-fall. No frost until November 3d. Autumn of 1882, warm and humid. Winter of 1882-3 had a low humidity. From November 26th to March 31st, the ground was covered with snow 100 days. Season severe, but there were no abrupt changes of temperature. Spring of 1883 was cold and backward; humidity low. Auroras were frequent from November to July.

There were forty-five fogs, nineteen frosts and twenty-five thunder-storms during the year.

STATION, PATERSON, N. J.

Latitude, 40° 55′ N.; Longitude, 74° 11′ W. Height of Rain Gauge above Sea Level, 142 feet.

OBSERVER, JOHN T. HILTON, CITY SURVEYOR.

	BAROMETER. Reduced to 32°.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July				96	58	75.31			S.W.	7 01		8	
August				95	56	71.0			S.W.	2.37		6	
September				87	50	67.0			S.W.	25.98		12	
October				78	37	56.0			W., S.W.	3.31		14	
November				63	13	39.0			N.W.	1.62	.21	6	
December				40	18	30.61			W.	4.00		9	
1883.													
January					45	26.0			N.W.	4.22	15.5	15	
February				52	11	30.0			N.W.	5.125	12.0	10	
March				60	9	32.0			N.W.	1.91	.11	6	
April				68	27	43.0			W.	5.99		12	
May				85	39	59.0			S.W.	5.85		11	
June				95	56	66.0			S.W.	5.80		11	
For the year													

*Including melted snow.

STATION, NEWARK, N. J.

Latitude, 40° 44′ N.; Longitude, 74° 10′ W. Height of Barometer Cistern above Sea Level, about 30 feet.

OBSERVER, W. A. WHITEHEAD.

	BAROMETER.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when precipitation equaled 0.01.	Cloudy days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July	30.30	29.55	30.06	96.5	55.0	76 82			W., N.W.	3.52		6	13
August	30.35	29.80	30.08	93 25	52.5	73.31			S.E.	1.31		7	13
September	30.25	29.90	30.06	86.0	47.0	66 75			N., N.E.	17.66		13	16
October	30.45	29.90	30.14	72.5	41.0	57.05			N. E., S.E.	2.00		12	14
November	30.55	29.88	30.22	70.0	19.0	47.52			N.W.	1.77	13.25	9	9
December	30.48	29.78	30.14	46.75	10.75	30.59			N.W., S.W.	1.95	1.75	6	10
1883.													
January	30.62	29.72	30.25	44.75	2 5	25.60			N.W., S.W.	3.71	14.0	13	15
February	30.75	29.85	30.33	53.25	14.0	30 48			N.W., S.W.	4.93	11.0	10	11
March	30.58	29.70	30.07	60.0	7.25	32.31			N.W., S.W.	2.00	8.5	6	8
April	30.93	29.75	30.05	71.0	23.5	47.65			N.W., N.E	4.65	3.0	9	11
May	30.45	29.55	30.16	86.5	38.0	61.06			N.E., N.	3.35		10	16
June	30.30	29.65	30.01	94.0	50.0	72.85			S.E., S.W.	4.97		9	13
For the year	30.93	29.55		96.5	2.5					51.82	51.50	110	149
Mean	30.50	29.74	30.13			51.24							

*Including melted snow.

STATION, NEW BRUNSWICK, N. J.

Latitude, 40° 29′ N.; Longitude, 74° 26′ W., or 2° 37′ E. Height, 115 feet.

OBSERVER, P. VANDERBILT SPADER.

	BAROMETER. Reduced to 32°.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July				91	59	70.76				3.04			
August				93	54	69.51				3.20			
September				96	50	64.75				15.52			
October				78	41	56.24				1.42			
November				71	16	37.18				1.60			
December				45	4	27.78				1.91			
1883.													
January				45	3	24.90				3.71			
February				55	6	28.25				4.67			
March				62	7	29.63				1.96			
April				76	25	41.36				4.03			
May				82	29	54.51				2.82			
June				95	50	69.57				5.24			
For the year										49.12			

*Including melted snow.

STATION, FREEHOLD, N. J.

Latitude, 40° 15′ N.; Longitude, 74° 16′ W. Height of Barometer Cistern above Sea Level, 216 feet.

OBSERVER, CHARLES F. RICHARDSON.

	BAROMETER. Reduced to 32°.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.	Thunder and Lightning on Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.							
1882.														
July	30.08	29.44	29.78	96.0	54.0	74.6		72.6	S.W.	2.11		8	3	6
August	30.08	29.41	29.80	90.0	50.0	70.4		82.2	S.	5.64		10	5	3
September	30.02	29.39	29.82	86.0	43.0	65.8		85.3	N.	11.61		14	11	7
October	30.10	29.51	29.86	74.0	38.0	55.3		85.5	N.	2.43		16	14	2
November	30.28	29.47	29.91	70 0	16.0	38.3		77.7	W.	1.63	7.6	10	6	
December	30.17	29.49	29.86	46.0	8.0	29.8		75.4	W.	2.17		7	6	
1883.														
January	30.35	29.32	29.94	43.0	1.0	25.5		79.5	N.	4.00	13.9	18	14	1
February	30.44	29.51	30.01	61.0	11.0	30.8		76.1	W.	5 62	12.6	15	6	
March	30.21	29.06	29.74	63.0	10.0	32.5		64.4	W.	1.73	9.4	7	2	
April	30.18	29.43	29.78	71.0	24.0	44.9		77.7	S.	3.90		12	8	4
May	30.13	29.29	29.74	83.0	34.0	58.6		73.6	S.	4.12		10	9	9
June	30.19	29.41	29.76	91 0	48.0	70.5		79.1	S.W.	6.91		12	4	9
For the year	30.18	29.38	29.75	72.8	28.0	49.7		77.4	W.	51.87	43.5	139	88	41

*Including melted snow.

First frost, October 25th; latest frost, May 18th. No snow in measurable amount in December.

STATION, VINELAND, N. J.

Latitude, 39° 29′ N.; Longitude, 75° 1′ W. Height of Barometer Cistern above Sea Level, 111 feet.

OBSERVER, J. INGRAM, M.D.

	BAROMETER. Reduced to 32°.			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.	Clear Observations.	Average Clouds.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.								
1882.															
July	30.180	29.534	29.887	96	54	77.78	.....	70	S.W., N.W.	2.23	.....	7	31	20	68.33
August	30 178	29.423	29.924	88	51	71.94	.....	79	S.W., S E.	9.29	.....	13	28	28	61.50
September	30.112	29.505	29.906	87	45	66.01	.....	79	S.W., N.	12.35	.....	8	28	25	65.33
For 3 mos.	30.156	29.487	29 906	90	50	72.58	.....	76	.....	23.87	.....	23	87	73	65.17
October	30.170	29.609	29.954	74	37	59.58	.....	71	N.E., S.W.	1.77	.....	11	27	27	67.73
November	30.342	29.718	30.015	72	22	41.48	.....	63	N.W., N.E.	.99	.....	6	28	27	63.73
December	30.286	29.619	29.990	51	10	33.17	.....	60	N.W., W.	2.47	.....	5	30	34	56.90
For 3 mos.	30.266	29.648	29.986	66	23	44.74	.....	65	.....	5.23	.....	22	85	88	62.79
1883.															
January	30.472	29.323	30.060	45	4	28.73	.....	56	N.W., N.E.	6.13	18.75	17	29	13	80.20
February	30.612	29.591	30.173	66	18	35.65	.....	59	N.W., S.W.	6.47	4.50	12	28	13	74.20
March	30.360	29.145	29.775	64	12	35.95	.....	55	N.W., S.W.	2.93	8.50	6	27	37	54.80
For 3 mos.	30.481	29.353	29.983	58	11	33.44	.....	56	.....	15.53	31.75	35	84	63	69.73
April	30.297	29.524	29.931	80	26	49.24	.....	66	S.W., N.W.	3.96	.....	11	30	18	73.30
May	30.158	29.319	29.819	84	34	63.65	.....	66	S.W., N.E.	1.80	.....	5	29	23	67.60
June	30.269	29.550	29.846	92	50	75.24	.....	71	S.W., S.E.	3.72	.....	7	28	21	67.10
For 3 mos.	30.241	29.464	29.832	85	36	62.71	.....	67	.....	9.48	.....	23	87	67	69.33
For the year	30.286	29.488	29.926	75	30	53.37	.....	66	.....	54.11	31.75	108	343	296	66.74

* Including melted snow.

REMARKS.—Under the head of "cloudy days" is to be understood *all* days in which *any* clouds were found. By "clear observations" is to be understood the total observations free from clouds in each month, and the "average clouds" explains itself.

STATION, CAPE MAY, N. J.

Latitude, 38° 56′ N.; Longitude, 74° 58′ W. Height of Barometer Cistern above Mean Sea Level, 27 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	BAROMETER.†			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July	30.274	29.632	30,004	86.0	62	73.7	.....	79.8	S.	3.49	.....	7	3
August	30.289	29.629	30.001	83.0	55	73.3	.....	79.3	S.	10.29	.....	13	11
September	30.251	29.474	30.008	83.0	50	70.0	.....	78.8	S.	7.05	.....	9	8
October	30.325	29.701	30.051	75.0	48	64.3	.....	78.6	N.E.	1.46	.....	11	9
November	30.500	29.708	30.126	68.0	30	47.8	.....	68.4	N.	1.88	.....	8	10
December	30.465	29.629	30.099	60.0	14	38.3	.....	74.8	N.W.	3.88	.....	7	5
1883.													
January	30.630	29.463	30.149	50.0	11	33.8	.....	79.3	N.W.	5.00	.....	15	12
February	30.745	29.715	30.248	56.5	21	39.4	.....	74.6	N.W.	5.67	.....	14	4
March	30.483	29.285	29.984	56.0	17	38.8	.....	74.3	N.W.	4.66	.....	11	6
April	30.382	29.534	29.984	62.5	29	48.5	.....	77.9	S.	4.69	.....	12	4
May	30.314	29.369	29.929	74.0	43	60.1	.....	76.7	S.	1.17	.....	8	3
June	30.398	29.657	29.969	81.0	55	68.6	.....	82.7	S.	5.50	.....	12	3
For the year													

* Including melted snow.
† Corrected for temperature and instrumental error only.

STATION, BARNEGAT CITY, N. J.

Latitude, 39° 46′ W.; Longitude, 74° 6′ E. Height of Barometer Cistern above Mean Sea Level, 22 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	BAROMETER.†			THERMOMETER.				Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.						
1882.													
July	30.293	29.563	29.988	92.5	58.7	72.5	.....	80.2	S.	3.92	.....	10	6
August	30.290	29.602	30.012	85.0	56.0	72.1	.....	80.9	E.	8.21	.....	10	12
September	30.228	29.477	30.014	83.0	49.0	68.5	.....	81.8	E.	14.65	.....	14	9
October	30.338	29.694	30.057	71.0	43.3	60.1	.....	84.0	E.	4.16	.....	11	10
November	30.509	29.681	30.122	70.0	24.4	43.3	.....	76.0	N.	2.32	.....	9	11
December	30.436	29.614	30.087	51.0	13.0	34.1	.....	76.2	N.W.	3.36	.....	8	5
1883.													
January	30.623	29.410	30.156	48.0	6.4	30.8	.....	83.3	N.W.	3.91	.....	14	19
February	30.784	29.684	30.244	60.0	17.0	35.2	.....	76.6	N.W.	5.98	.....	15	9
March	30.471	29.128	29.952	62.0	12.0	36.0	.....	67.9	N.W.	3.28	.....	9	7
April	30.444	29.598	29.989	61.3	32.0	46.0	.....	79.5	S.W. & E.	3.93	.....	17	12
May	30.359	29.439	29.949	75.0	46.2	56.5	.....	80.5	E.	1.97	.....	15	7
June	30.477	29.593	29.972	84.0	54.3	67.8	.....	84.6	S.W.	4.09	.....	11	3
For the year													

* Including melted snow.
† Corrected for temperature and instrumental error only.

STATION, SANDY HOOK, N. J.

Latitude, 40° 28′ N.; Longitude, 74° W. Height of Barometer Cistern above Mean Sea Level, 28 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	BAROMETER.†			THERMOMETER.								
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean Monthly Range.	Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow.	Days when Precipitation equaled 0.01.	Cloudy Days.
1882.													
July	30.309	29.526	29.986	92.5	59.0	75.0	.....	72.3	S.E.	2.35	.....	7	4
August	30.299	29.595	30.016	88.0	61.0	73.3	.....	74.6	S.E.	2.95	.....	8	7
September	30.244	29.548	30.021	87.0	52.5	68.6	.....	79.0	N.E.	11.48	.....	13	9
October	30.327	29.677	30.069	76.0	46.0	59.9	.....	77.9	N.E.	2.95	.....	11	9
November	30.533	29.610	30.128	68.0	24.0	43.0	.....	73.1	N.E.	1.51	.....	9	7
December	30.428	29.594	30.082	53.0	3.0	33.3	.....	77.9	W.	2.58	.....	7	7
1883.													
January	30.619	29.509	30.166	84.0	3.5	28.4	.....	81.6	N.E.	3.35	.....	14	14
February	30.759	29.604	30.238	58.0	16.0	32.6	.....	79.8	N.W.	4.22	.....	13	7
March	30.466	29.244	29.943	62.0	10.0	34.4	.....	73.4	N.W.	1.45	.....	5	5
April	30.453	29.600	29.992	68.0	27.0	46.6	.....	73.4	N.E.	5.79	.....	13	5
May	30.379	29.474	29.918	84.0	40.0	58.6	.....	73.8	S.E.	4.66	.....	11	7
June	30.474	29.575	29.966	90.0	50.0	70.3	.....	77.1	S.W. & S.E.	4.94	.....	11	5
For the year	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Including melted snow.
† Corrected for temperature and instrumental error only.

QUINQUENNIAL DEATH-RATES.

REMARKS ON THE QUINQUENNIAL DEATH-RATES AND COMPARISONS OF THE NEXT TABLE.

The following table is intended to present, in a condensed form, (*a*) the death-rate by counties, including cities; (*b*) the death-rate of cities without the counties, and (*c*) the death-rate of the counties without the cities, for the first quinquennial period of the vital statistics of the State, as ending July, 1883. In addition, it presents the proportion of deaths under five years of age in the counties, including the cities, and in the cities without their counties. Also, the proportion of the chief preventable diseases to the entire deaths for the five years in the counties, including the cities, and in the cities without their counties.

Quetelet gives four chief rules as to such statistics:

I. Never have preconceived ideas as to what the figures are to prove.

II. Never reject a number that seems contrary to what you might expect, merely because it departs a good deal from the apparent average.

III. Be careful to weigh and record all the possible causes of an event, and do not attribute to one what is really the result of the combination of several.

IV. Never compare data which have nothing in common.

The following table, although exceedingly valuable for comparison to those who will accept it as a generalization and deal with it as to be studied alongside of modifying facts, is capable of being used in a plausible and yet utterly misleading way. Yet, in general, these modifying considerations are not difficult to estimate. In all large cities, and in large counties, for instance, the statistics are most informatory, since we are dealing with so large an aggregate of population as to neutralize or reduce to a minimum what might otherwise be a dis-

turbing factor. Thus the facts as to Newark and Jersey City are for five years those which concern about 600,000 of population each. The same kind of a statement for five years, as to a city of 5,000, represents 25,000 people. Even this is very valuable, but in so small a number some temporary cause of mortality would affect the average rate more than in a very large population. Again, if a city is situated in a populous county with many small villages, the contrast between its death-rate and that of the county, will not be marked. Sometimes, as in Hudson county, the condition of the whole county is such, or the population of the county is so small, as compared with its cities, as that the death-rate of the county is higher than that of its combined cities. This does not necessarily prove that the county is more unhealthy than the cities, but leads us to inquire whether the smallness of the population is such as that some local influence in some one district, or some local mortality or some presence of city institutions, has not magnified the death-rate. If so, we are able to allow for this and still get guide from our tables.

Atlantic county has its death-rate made higher than it would be, by incidental circumstances—the county being affected by some local epidemic largely in proportion because of its small population, and Atlantic City appearing high because, for four months of the year, it has about an eight-fold population, which would give more than a two-fold average for the year, and so reduce the death-rate one-half. Yet this merely necessitates that the city and county should keep or have an accurate analysis as to the residence of those that die, should study indications and should await facts over a sufficient long period of time to give it the correction of large numbers. Often it is well for those in localities of county or city to reckon the general death-rate without that of their own district, and so see how even the general death-rate may be magnified by their own locality. Thus the average death-rate of the State is largely increased by that of Hudson, Essex and Passaic counties, and that of the two last counties by their cities. When health officers and other local students of causes come to study them, if they will do it without having started to prove the healthfulness of their district, they will be able, on the one hand, to account for what may seem a relatively high statement of mortality, and, on the other, to detect the causes which are producing an excessive death-rate.

Always, too, it is to be borne in mind that the number of births and

the number of children under five years, or from five to twenty years of age, modifies results. It is hoped that our semi-decennial census will enable us to know just how many there are in the State, or in localities, of those various ages.

In our study of these statistics we should have paid more attention to the increase and decrease of population, but that the five years embrace a period both before and after a decennial census, and so the population of that census was, for the time, a fair basis. It is not necessary to discuss, in detail, various matters in this table, but we place it on record for permanent reference and for the study of local statisticians, health officers and physicians, as it is of great value as a guide.

The following table shows the quinquennial death-rates under five years, and from the chief preventable diseases for period ending June 30th, 1883:

QUINQUENNIAL DEATH-RATES.

	DEATHS AT ALL AGES.						
	Death-rate by counties.	Death-rate by cities.	Death-rate of counties without cities.	Comparison death-rate under 5 years by counties.	Comparison death-rate under 5 years by cities.	Comparison death-rate from chief preventable diseases by counties.	Comparison death-rate from chief preventable diseases by cities.
Atlantic county	18.48	.....	15.80	41.03	.....	20.26	.....
Atlantic City	.....	22.24	.....	.....	*50.41	.....	31.36
Bergen county	16.28	.....	16.28	35 06	.....	21.80	.....
Burlington county	15.91	.....	13.24	34.84	.....	21.82	.....
Bordentown	.....	16.61	.....	.....	28.89	.....	16.25
Burlington	.....	19.31	.....	.....	31.18	.....	20.17
Camden county	20.19	.....	15.25	40.04	.....	28.53	.....
Camden	.....	20.58	.....	.....	41.35	.....	30.21
Gloucester City	.....	17.92	.....	.....	40.29	.....	22.96
Cape May county	13.17	.....	13.17	19.13	.....	25.66	.....
Cumberland county	16.56	.....	14.27	36.01	.....	25.76	.....
Bridgeton	.....	18.41	.....	.....	36.99	.....	30.63
Millville	.....	19.87	.....	.....	46.12	.....	35.35
Essex county	21.26	.....	13.63	40.61	.....	27.66	.....
Newark	.....	23.36	.....	.....	41.55	.....	27.58
Orange	.....	19.58	.....	.....	*43.46	.....	24.13
Gloucester county	15.96	.....	15.96	34.85	.....	24.15	.....
Hudson county	24.79	.....	31.90	45.58	.....	29.82	.....
Bayonne	.....	19.18	.....	.....	50.82	.....	27.14
Harrison	.....	20.12	.....	.....	44.67	.....	30.40
Hoboken	.....	25.58	.....	.....	49.07	.....	32.21
Jersey City	.....	24.26	.....	.....	45.31	.....	30.04
Town of Union	.....	27.11	.....	.....	53.59	.....	41.23
Hunterdon county	13.74	.....	13.74	28.94	.....	20.49	.....
Mercer county	19.12	.....	16.20	32.23	.....	22 02	.....
Chambersburg	.....	20 34	.....	.....	41.95	.....	30.38
Trenton	.....	20.54	.....	.....	37 89	.....	22.92
Middlesex county	17.61	.....	16.54	36.08	.....	25.74	.....
New Brunswick	.....	19.76	.....	.....	41.98	.....	30.66
Monmouth county	17.12	.....	17.12	35.25	.....	22.49	.....
Morris county	17.04	.....	13.76	32.32	.....	22.22	.....
Morristown	.....	19.59	.....	.....	29.25	.....	19.25
Ocean county	13.82	.....	13.82	31.53	.....	20.82	.....
Passaic county	22.54	.....	10.53	42.57	.....	28.53	.....
Passaic	.....	20.82	.....	.....	50.59	.....	29.41
Paterson	.....	24.51	.....	.....	43.08	.....	28.92
Salem county	16 08	.....	15.21	33.28	.....	21.86	.....
Salem	.....	18.91	.....	.....	33.05	.....	19.87
Somerset county	15.68	.....	15.68	28.92	.....	21.31	.....
Sussex county	14.48	.....	14.48	26.35	.....	22.06	.....
Union county	18.59	.....	14.65	38.37	.....	25.73	.....
Elizabeth	.....	19.65	.....	.....	42.57	.....	22.21
Plainfield	.....	16.49	.....	.....	39.10	.....	25 22
Rahway	.....	21.78	.....	.....	32.57	.....	19.77
Warren county	16.34	.....	12.21	36.49	.....	22.11	.....
Phillipsburg	.....	18.33	.....	.....	48.48	.....	30.39
Totals	19.45	20 23	14.62	38.69	42.93	26.09	28.43

*See remarks as to health resorts, high birth-rate, etc.

NUMBER OF MARRIAGES, BIRTHS AND DEATHS, BY TOWNSHIPS.

FOR THE YEAR ENDING JUNE 30, 1884.

ATLANTIC COUNTY.

	M.	B.	D.
Absecon	6	13	6
Atlantic City	74	156	178
Buena Vista	1	15	10
Egg Harbor City	31	30	32
Egg Harbor Township	35	79	48
Galloway	11	36	27
Hamilton	7	34	27
Hammonton	24	57	47
Mullica	2	12	5
Weymouth	2	17	7
	193	449	387

BERGEN COUNTY.

	M.	B.	D.
Englewood	20	39	61
Franklin	21	44	36
Harrington	16	41	33
Hohokus	20	43	24
Lodi	15	79	71
Midland	8	20	30
New Barbadoes	47	95	68
Palisade	13	20	19
Ridgefield	9	66	65
Ridgewood	15	29	22
Saddle River	2	21	24
Union	10	78	48
Washington	4	54	34
	200	629	535

BURLINGTON COUNTY.

	M.	B.	D.
Bass River	4	29	11
Beverly	14	19	49
Bordentown	40	133	105
Burlington City	53	144	137
Chester	36	62	30
Chesterfield	5	20	17
Cinnaminson	19	53	24
Delran	21	17	23
Eastampton	2	17	10
Evesham	5	33	18
Florence	8	44	15
Little Egg Harbor	16	46	17
Lumberton		30	5
Mansfield	11	40	21
Medford	16	42	28
Mt. Laurel		20	27
New Hanover	10	43	31
Northampton	70	96	113
Pemberton	22	43	42
Randolph	4	9	7
Shamong	2	9	9
Southampton	9	54	21
Springfield	3	34	23
Washington	1	10	8
Westampton	2	5	6
Willingboro		9	10
Woodland			3
	373	1,061	810

CAMDEN COUNTY.

	M.	B.	D.
Camden City	498	807	932
Centre	8	49	41
Delaware		15	16
Gloucester City	39	145	116
Gloucester	17	60	66
Haddon	20	65	33
Stockton	13	63	37
Waterford	9	43	25
Winslow	14	52	25
	618	1,299	1,291

CAPE MAY COUNTY.

	M.	B.	D.
Cape May City	16	44	31
Dennis	15	52	14
Lower	9	35	33
Middle	21	62	35
Upper	17	28	31
	78	221	144

CUMBERLAND COUNTY.

	M.	B.	D.
Bridgeton	118	242	163
Commercial	14	17	33
Deerfield	13	28	15
Downe	12	26	24
Fairfield	18	74	35
Greenwich	6	21	18
Hopewell	12	42	30
Landis	65	135	117
Maurice River	16	55	22
Millville	100	240	142
Stoe Creek	5	12	10
	379	892	609

ESSEX COUNTY.

	M.	B.	D.
Belleville	15	48	43
Bloomfield	42	114	83
Caldwell	20	45	42
Clinton	11	58	36
East Orange	46	215	105
Franklin	6	30	27
Livingston	9	8	9
Milburn	7	44	19
Montclair	26	154	82
Newark	1,257	3,889	3,372
Orange	99	380	291
South Orange	14	66	51
West Orange	14	86	51
	1,566	5,137	4,211

GLOUCESTER COUNTY.

	M.	B.	D.
Clayton	13	59	28
Deptford	2	38	24
East Greenwich	3	14	15
Franklin	11	58	33
Glassboro	23	75	43
Greenwich	11	38	25
Harrison	10	41	19
Logan	4	33	27
Mantua	11	35	32
Monroe	12	47	29
South Harrison	4	16	12
Washington	12	34	24
West Deptford	3	29	29
Woodbury	26	69	47
Woolwich	20	54	40
	165	640	427

HUDSON COUNTY.

	M.	B.	D.
Bayonne	66	229	208
Guttenberg	12	38	33
Harrison	20	198	152
Hoboken	365	961	766
Jersey City	989	1,841	3,041
Kearny	6	44	35
North Bergen	15	42	218
Town of Union	92	226	137
Union	7	44	28
Weehawken	1	19	25
West Hoboken	58	202	111
	1,631	3,844	4,691

HUNTERDON COUNTY.

	M.	B.	D.
Alexandria	6	14	17
Bethlehem	10	43	35
Clinton	7	39	19
Delaware	15	43	43
East Amwell	15	25	20
Franklin	13	28	12
Frenchtown	9	21	14
High Bridge	17	41	23
Holland	15	34	19
Kingwood	8	33	15
Lambertville	32	71	39
Lebanon	21	49	33
Raritan	32	47	50
Readington	12	53	35
Tewksbury	24	39	26
Town of Clinton	10	26	16
Union	9	6	6
West Amwell	1	22	7
	256	634	429

MERCER COUNTY.

	M.	B.	D.
Chambersburg	42	183	124
East Windsor	19	39	32
Ewing	4	15	72
Hamilton	7	44	57
Hopewell	33	68	54
Lawrence	3	27	22
Millham	5	57	38
Princeton	13	71	72
Trenton	360	626	632
Washington	4	27	14
West Windsor	7	24	17
	497	1,191	1,124

MIDDLESEX COUNTY.

	M.	B.	D.
Cranbury	24	28	17
East Brunswick	23	82	59
Madison	1	15	11
Monroe	13	26	13
New Brunswick	149	462	397
North Brunswick	2	23	24
Perth Amboy	66	223	150
Piscataway	28	64	48
Raritan	16	39	47
Sayreville	14	18	23
South Amboy	33	98	76
South Brunswick	6	45	41
Woodbridge	9	91	72
	384	1,214	978

MONMOUTH COUNTY.

	M.	B.	D.
Atlantic	6	16	18
Eatontown	24	53	36
Freehold	46	72	70
Holmdel	9	26	14
Howell	25	74	35
Manalapan	12	34	17
Marlboro	6	24	21
Matawan	29	55	53
Middletown	15	78	74
Millstone	11	26	25
Neptune	72	141	125
Ocean	71	212	92
Raritan	35	86	63
Shrewsbury	64	157	110
Upper Freehold	26	71	46
Wall	41	143	59
	492	1,268	858

MORRIS COUNTY.

	M.	B.	D.
Boonton	23	54	50
Chatham	33	49	64
Chester	11	79	21
Hanover	12	56	103
Jefferson		16	19
Mendham	9	17	23
Montville	2	16	14
Morristown	54	165	142
Mt. Olive	17	37	21
Passaic	11	21	23
Pequannock	9	53	32
Randolph	47	189	94
Rockaway	29	95	90
Roxbury	18	43	21
Washington	22	72	31
	297	962	748

OCEAN COUNTY.

	M.	B.	D.
Berkeley	1	15	8
Brick	19	87	56
Dover	24	45	37
Eagleswood	9	8	8
Jackson	11	39	22
Lacey	5	22	14
Manchester	4	31	14
Ocean	3	9	11
Plumstead	18	48	28
Stafford	7	10	19
Union	11	24	9
	112	338	226

PASSAIC COUNTY.

	M.	B.	D.
Acquackanonk	4	29	25
Little Falls	7	23	18
Manchester	1	13	12
Passaic	71	194	154
Paterson	469	1,641	1,446
Pompton	11	34	32
Wayne	4	22	7
West Milford	17	16	25
	584	1,972	1,719

SALEM COUNTY.

	M.	B.	D.
Alloway	8	39	28
Elsinboro		8	11
Lower Alloways Creek	1	26	23
Lower Penn's Neck	10	12	16
Mannington	4	26	37
Oldmans	19	35	17
Pilesgrove	21	70	60
Pittsgrove	10	63	25
Quinton	3	43	23
Salem	44	126	78
Upper Penn's Neck	19	29	36
Upper Pittsgrove	19	16	22
	158	493	376

SOMERSET COUNTY.

	M.	B.	D.
Bedminster	8	26	28
Bernards	18	34	32
Branchburg	4	21	18
Bridgewater	50	155	104
Franklin	17	65	47
Hillsborough	19	40	42
Montgomery	8	36	28
North Plainfield	30	58	35
Warren	9	11	14
	163	446	348

SUSSEX COUNTY.

	M.	B.	D.
Andover	7	17	12
Byram	13	17	21
Frankford	14	15	27
Green	6	13	9
Hardyston	16	5	33
Hampton	6	2	19
Lafayette	12	3	10
Montague	1	6	2
Newton	26	30	38
Sandyston	6	11	11
Sparta	16	13	19
Stillwater	7	31	15
Vernon	9	31	22
Walpack	5	13	5
Wantage	24	27	50
	168	234	293

UNION COUNTY.

	M.	B.	D.
Clark		2	
Cranford	4	20	19
Elizabeth	263	925	591
Fanwood	4	18	11
Linden	10	28	28
New Providence	4	11	20
Plainfield	31	163	132
Rahway	58	97	111
Springfield	7	14	9
Summit	20	41	32
Union	8	35	33
Westfield	7	47	35
	416	1,401	1,021

WARREN COUNTY.

	M.	B.	D.
Allamuchy	......	13	6
Belvidere	15	39	32
Blairstown	7	43	13
Franklin	10	30	15
Frelinghuysen	8	16	7
Greenwich	8	26	15
Hackettstown	26	59	36
Hardwick	......	8	6
Harmony	4	33	18
Hope	11	39	17
Independence	8	13	5
Knowlton	6	26	24
Lopatcong	2	42	14
Mansfield	9	15	27
Oxford	28	156	51
Pahaquarry	1	6	8
Phillipsburg	53	265	130
Pohatcong	7	34	20
Washington Borough	32	52	32
Washington Township	3	23	13
	238	938	489

TOTALS OF MARRIAGES, BIRTHS AND DEATHS FOR ALL THE COUNTIES.

	M.	B.	D.
Atlantic	193	449	387
Bergen	200	629	535
Burlington	373	1,061	810
Camden	618	1,299	1,291
Cape May	78	221	144
Cumberland	379	892	609
Essex	1,566	5,137	4,211
Gloucester	165	640	426
Hudson	1,631	3,844	4,694
Hunterdon	256	634	429
Mercer	497	1,191	1,124
Middlesex	384	1,214	978
Monmouth	492	1,268	858
Morris	297	962	748
Ocean	112	338	226
Passaic	584	1,972	1,719
Salem	158	493	376
Somerset	163	446	348
Sussex	168	234	293
Union	416	1,401	1,021
Warren	238	938	489
	8 968	25,263	21,716

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

COUNTIES. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total.	Population, Census of 1880.	Death-rate per 1,000.	Death-rates without cities of over 5,000.	Deaths under five in comparison with total deaths.
Atlantic	128	41	40	98	80	387	18,704	20.69	15.80	43.67
Bergen	110	51	46	171	152	535	36,786	14.54	14.51	30.65
Burlington	169	59	75	237	261	809	55.403	14.60	13.24	28.18
Camden	349	162	104	420	232	1,291	62,942	20.51	15.25	39.58
Cape May	32	13	10	36	52	144	9,765	14.75	14.75	31.25
Cumberland	141	65	46	175	178	609	37,687	16.16	14.27	33.82
Essex	1020	614	368	1432	761	4,211	189,929	22.17	13.63	38.80
Gloucester	76	50	38	133	122	427	25,886	16.49	16.49	29.51
Hudson	1257	686	413	1711	613	4,689	187,944	21.95	31.90	41.44
Hunterdon	66	32	39	125	165	429	38,570	11.12	11.12	22.84
Mercer	217	174	114	340	253	1,124	58,061	19.36	16.20	34.79
Middlesex	190	162	138	288	186	978	52,286	18.70	16.54	35.99
Monmouth	202	85	63	260	240	858	55,538	15.45	15.45	33.45
Morris	142	87	60	237	222	748	50,861	14.71	13.76	30.61
Ocean	44	22	16	69	71	226	14,455	15.63	15.63	29.20
Passaic	430	301	171	502	304	1,719	68,860	24.96	10.53	42.52
Salem	90	33	35	101	111	376	24,579	15.30	15.21	32.71
Somerset	50	26	29	125	115	348	27,162	12.81	12.81	21.87
Sussex	54	14	23	95	102	293	23,539	12.44	12.44	23.21
Union	252	124	118	300	226	1,021	55,571	18.37	14.65	36.83
Warren	104	41	49	152	137	489	36,589	13.36	12.21	30.26
Total	*5123	2848	1995	7007	4583	21,716	1,131,117	19.20	14.62	36.70

COUNTIES. Statistical Divisions.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.	Comparative number of deaths from chief preventable diseases.
Atlantic	......	7	...	14	......	2	8	52	4	25	31	20	19	22	......	17	11	......	32	27	21.45
Bergen	19	18	...	6	1	3	18	50	9	60	33	31	23	47	4	36	10	......	31	36	22.21
Burlington	8	25	2	27	1	2	32	90	10	62	34	69	39	79	3	51	18	4	45	70	23.48
Camden	12	50	3	45	3	16	53	134	14	111	82	76	36	79	5	64	19	2	90	115	24.86
Cape May	......	1	...	5	......	......	3	16	2	14	7	13	2	17	......	12	6	......	11	10	17.36
Cumberland	2	17	...	6	1	2	13	64	10	57	49	38	20	55	3	47	13	......	41	57	17.73
Essex	34	113	...	99	53	10	226	488	39	486	347	232	194	274	13	182	103	4	353	279	24.60
Gloucester	4	10	...	19	1	3	8	54	4	35	26	24	16	36	2	35	8	......	33	37	18.97
Hudson	56	180	...	88	54	21	196	649	46	527	399	253	165	247	12	207	88	18	333	336	26.85
Hunterdon	4	2	1	10	2	1	13	22	7	49	15	38	23	65	4	26	12	......	26	43	13.75
Mercer	9	25	...	49	4	16	90	113	13	76	56	75	31	138	7	40	37	7	83	83	27.85
Middlesex	8	31	...	35	10	1	109	110	10	66	67	47	55	66	......	52	24	3	63	75	31.39
Monmouth	16	19	...	9	3	5	20	93	7	95	59	88	40	71	3	35	15	5	54	66	19.58
Morris	10	18	...	7	4	11	29	57	7	80	47	57	30	115	5	40	21	3	40	57	18.85
Ocean	2	9	...	3	1	3	4	16	1	26	14	11	7	22	3	18	10	2	6	26	18.14
Passaic	15	41	...	70	46	11	90	212	8	193	157	76	83	85	7	77	28	2	139	139	28.79
Salem	6	16	1	4	4	3	16	55	3	23	13	17	15	34	......	22	7	2	32	38	27.92
Somerset	3	7	...	11	1	1	11	18	9	24	20	27	18	48	1	18	14	3	32	21	15.23
Sussex	4	7	...	2	......	2	8	26	2	43	11	21	9	27	4	23	7	1	23	31	18.09
Union	16	26	...	33	......	......	62	127	9	78	87	77	45	87	2	50	16	2	58	64	26.05
Warren	2	12	...	5	......	......	18	36	7	44	44	34	22	50	2	23	17	4	32	45	15.34
Total	230	640	7	517	189	116	1027	2462	221	2174	1598	1324	892	1664	80	1075	481	62	1557	1658	24.40

* Of those that died under one year, 1,495 died under one month, of which 996 died in the larger cities.

Total deaths from consumption for the State, as compared with total deaths, 14.80.

Rates for short periods, or which deal with small numbers, are only approximate, since temporary causes may have been in operation, and small numbers do not eliminate or balance errors which practically disappear in large aggregates. So, five or ten years analyses are more important than any single year. The number of deaths before twenty, in proportion to the rest, are much more informatory as to local causes affecting health, than the total deaths. So, also, the number dying from the zymotic diseases, and especially from fevers, croup, diphtheria, diarrheal diseases, consumption, and brain and nervous diseases of children.

Return of Deaths from all Causes and Certain Specified Diseases, in the Cities of the State of New Jersey, of over 5,000 Population, for the Year ending June 30th, 1884.

CITIES HAVING OVER 5,000 POPULATION. Statistical Divisions.	DEATH AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of Children.	Diseases of heart and circulat'n.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intest'l diseases.	Cancer.	Ac'te rheumatism.	Consumption. M.	Consumption. F.	Comparative number of deaths of chief preventable diseases.
Atlantic County.																														
Atlantic City	59	17	26	50	26	178	5,477	32.50	42.70	.....	5	...	7	.....	1	4	24	.....	10	18	13	12	12	...	6	8	.....	16	7	23.03
Burlington County																														
Bordentown	15	10	13	36	30	105	5,334	19.68	23.81	.....	4	...	12	.....	.....	3	7	3	10	3	9	1	17	...	11	1	.....	3	7	24.76
Burlington	39	11	7	42	37	137	7,237	18.93	36.50	1	3	...	1	.....	.....	7	19	.....	7	5	13	13	14	...	7	2	.....	10	9	22.63
Camden County.																														
Camden	264	121	78	290	162	932	41,659	22.37	41.31	7	34	3	28	3	10	44	101	11	74	66	50	23	51	4	47	17	1	65	79	25.11
Gloucester City	32	14	13	46	8	116	5,347	21.69	39.65	2	6	...	10	.....	5	3	8	2	8	5	6	4	5	...	4	1	.....	7	13	29.31
Cumberland Co.																														
Bridgeton	33	26	11	48	44	163	8,722	18.69	36.20	.....	4	...	2	.....	1	5	23	1	20	10	11	8	8	1	12	2	.....	14	18	22.08
Millville	38	8	13	45	38	142	7,660	18.54	32.39	1	4	...	2	.....	....	2	13	4	15	8	5	3	9	...	10	3	.....	12	18	15.49
Essex County.																														
Newark	836	503	295	1147	580	3,372	136,508	24.70	39.71	28	87	...	79	48	6	176	402	29	407	284	183	162	215	6	140	82	1	276	210	24.67
Orange	81	44	25	103	38	291	13,207	22.03	42.95	1	8	...	12	1	1	15	35	4	31	25	12	11	8	3	15	5	.....	31	23	26.12
Hudson County.																														
Bayonne	55	32	19	80	22	208	9,372	22.19	41.83	1	15	...	1	....	.....	12	32	3	16	18	11	7	11	1	6	1	1	12	15	29.81
Harrison	39	17	13	66	17	152	6,898	22.03	36.84	5	9	...	3	1	....	9	15	1	19	21	7	2	7	...	5	4	1	14	11	27 63
Hoboken	208	84	62	283	68	706	30,999	22.13	41.36	2	24	...	12	5	1	23	95	12	65	78	46	25	29	2	37	10	7	44	59	23.23
Jersey City	794	473	277	1081	404	3 036	120,722	25.15	41.73	37	116	...	63	45	20	122	425	25	384	240	153	106	157	6	137	61	7	209	209	27.47
Town of Union	43	22	6	45	20	137	5,849	23.42	47.44	2	8	...	1	.....	2	5	32	2	11	8	10	3	9	1	4	3	2	14	8	37.23
Mercer County.																														
Chambersburg	36	27	8	37	14	124	5,437	22.81	50.81	2	.....	..	7	1	1	7	26	3	8	8	9	2	9	...	3	7	.....	7	12	35.48
Trenton	131	119	66	192	107	632	29,910	21.13	39.56	3	21	...	33	2	14	61	62	9	44	31	32	18	52	3	24	18	1	51	42	31.49
Middlesex County.																														
New Brunswick	81	65	69	109	68	397	17,166	23.13	36.77	2	14	...	7	2	.....	66	51	4	27	28	18	27	21	...	16	11	2	26	27	35.77
Morris County.																														
Morristown	27	17	9	44	42	142	6,837	20.77	30.98	.....	3	...	.....	.....	.....	11	11	1	6	14	18	5	14	...	5	7	.....	8	19	17.60
Passaic County.																														
Passaic	41	12	16	56	27	154	6,532	23.58	34.41	.....	6	...	1	1	.....	6	16	.....	22	21	8	5	8	1	9	2	.....	12	18	20.13
Paterson	363	280	141	403	250	1,446	51,031	28.33	44.47	12	34	...	68	43	10	82	185	8	155	127	59	75	64	6	61	24	2	121	108	30.43
Salem County.																														
Salem	23	5	6	24	18	78	5,056	15.43	35.90	2	1	1	2	.....	.....	.....	12	2	5	2	4	2	5	...	7	2	1	6	10	23.08
Union County.																														
Elizabeth	164	85	69	177	96	591	28,229	20.93	42.13	11	13	...	22	.....	.....	42	76	6	47	57	42	25	41	1	30	13	1	31	35	27.92
Plainfield	32	10	16	39	35	132	8,125	16.25	31.82	1	4	...	2	.....	.....	11	15	.....	6	10	9	9	18	...	5	.....	.....	8	10	25.00
Rahway	23	11	13	31	33	111	6,455	17.19	30.63	1	4	...	3	.....	.....	2	11	.....	11	9	11	4	10	1	3	1	1	6	8	19.82
Warren County.																														
Phillipsburg	40	16	10	42	22	130	7,181	18.10	43.08	.....	4	...	1	.....	.....	7	16	1	8	14	7	6	12	1	5	3	.....	6	12	22.31
Total	3497	2029	1281	4516	2206	13,612	576,950	23.59	40.61	121	431	4	369	152	72	725	1712	131	1416	1,110	746	558	806	37	609	288	28	1009	987	26.62

Total of consumption for all cities as compared with total deaths, 14.66.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

ATLANTIC COUNTY. Population, 18,704. Statistical Divisions.	DEATHS AT ALL AGES. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute Rheumatism.	Consumption—male.	Consumption—female.
Absecon	4	1	.....	1	.....	6	507	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	1
*Atlantic City	59	17	26	50	26	178	5,477	32.50	.....	.....	5	.....	7	.....	1	4	24	.....	10	18	13	12	12	.....	6	8	.....	16	7
Buena Vista	2	1	2	2	3	10	885	.....	.....	.....	.....	.....	.....	.....	1	.....	2	.....	1	.....	1	.....	1	.....	.....	1	.....	.....	.....	.....
Egg Harbor City	11	4	2	8	7	32	1,232	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	6	1	2	.....	.....	1	1	.....	1	1	.....	3	3
Egg Harbor Township	13	6	1	14	14	48	3,568	.....	.....	.....	1	.....	.....	.....	1	.....	.....	6	1	3	8	1	1	3	.....	5	.....	.....	3	8
Galloway	3	1	4	8	11	27	2,337	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	2	1	3	.....	1	.....	1	1	.....	5	4
Hamilton	6	9	1	4	7	27	1,464	.....	.....	.....	.....	.....	.....	1	.....	.....	8	.....	4	1	.....	.....	1	.....	2	.....	.....	3	1
Hammonton	26	2	1	10	8	47	1,776	.....	.....	.....	1	.....	.....	.....	.....	2	2	1	3	1	1	1	1	.....	1	1	.....	2	3
Mullica	.....	.....	2	1	2	5	717	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	1	1	.....	.....	.....	.....	.....	.....	.....
Weymouth	4	.....	1	.....	2	7	741	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....
Totals	128	41	40	98	80	387	18,704	20.69	.....	.....	7	.....	14	.....	2	8	52	4	25	31	20	19	22	.....	17	11	.....	32	27

*This and all other cities that are health resorts have an excessive death-rate by reason of temporary increase of population, which also includes a proportion of invalids above the average. Local Boards show this on their records.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

BERGEN COUNTY. Population, 36,786. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Englewood	10	8	5	20	18	61	4,076	.....	.....	4	1	.....	3	.....	.....	1	5	1	6	.....	6	.....	1	.....	.....	1	.....	4	7
Franklin	5	8	3	10	10	36	2,206	.....	.....	3	.....	.....	.....	1	1	3	2	1	2	3	3	.....	1	.....	.....	.....	.....	3	2
Harrington	6	.....	4	10	13	33	2,570	.....	.....	.....	1	.....	.....	.....	.....	.....	3	.....	.....	.....	3	2	1	.....	.....	.....	.....	1	2
Hohokus	4	1	1	8	10	24	2,920	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	3	1	2	4	.....	.....	2	.....	2	4
Lodi	17	10	4	18	22	71	4,071	.....	.....	.....	6	.....	.....	.....	.....	2	11	1	11	5	5	.....	.....	.....	.....	.....	.....	3	2
Midland	5	1	7	11	6	30	1,591	.....	.....	2	3	.....	.....	.....	.....	3	1	.....	6	1	1	2	.....	.....	.....	.....	.....	3	2
New Barbadoes	15	8	6	26	13	68	4,248	.....	.....	1	3	.....	1	.....	1	3	6	3	10	4	1	3	4	2	.....	.....	.....	3	4
Palisade	2	2	1	6	8	19	2,302	.....	.....	1	2	.....	.....	.....	.....	1	2	.....	.....	1	3	2	2	.....	.....	.....	.....	2	1
Ridgefield	22	4	6	20	13	65	3,952	.....	.....	2	.....	.....	1	.....	.....	1	2	.....	8	2	2	2	2	.....	.....	.....	.....	2	4
Ridgewood	4	2	1	8	5	22	1,478	.....	.....	1	.....	.....	.....	.....	.....	1	3	.....	2	2	2	.....	2	.....	.....	5	.....	2	1
Saddle River	4	2	2	6	10	24	1,355	.....	.....	2	.....	.....	.....	.....	.....	.....	1	.....	3	3	.....	1	.....	.....	.....	1	2	1	4
Union	12	5	5	17	9	48	3,161	.....	.....	1	.....	.....	1	.....	1	2	.....	.....	4	3	3	1	3	5	.....	2	.....	2	.....
Washington	4	3	1	11	15	34	2,853	.....	.....	1	2	.....	.....	.....	.....	1	3	.....	5	1	1	3	4	1	4	.....	.....	3	3
Totals	110	54	46	171	152	535	36,786	14.54	.....	19	18	.....	6	1	3	18	50	9	60	33	31	23	47	4	36	10	.....	31	36

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending June 30th, 1884.

BURLINGTON COUNTY. Population, 55,403. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Bass River	4	.....	.....	5	2	11	1,006	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	1	.....	.....	.....	1	.....	.....	.....	.....	1	2
Beverly	10	4	7	16	12	49	3,128	.....	.....	.....	1	.....	3	.....	.....	2	8	1	1	7	5	1	2	.....	1	1	1	2	4
Bordentown	15	10	13	36	30	106	5,334	19.68	.....	.....	4	.....	12	.....	.....	3	7	3	10	3	9	1	17	.....	11	1	.....	3	7
Burlington	39	11	7	42	37	137	7,237	18.93	1	.....	3	.....	1	.....	.....	7	19	.....	7	5	13	13	14	.....	7	2	.....	12	9
Chester	6	1	.....	11	12	30	2,855	.....	.....	.....	1	.....	.....	.....	.....	.....	4	.....	5	3	4	1	3	.....	2	1	.....	5	3
Chesterfield	1	2	1	8	3	15	1,525	.....	.....	.....	.....	.....	2	.....	.....	.....	1	.....	2	.....	2	.....	.....	.....	1	.....	.....	3	3
Cinnaminson	8	1	1	9	4	23	2,184	.....	.....	.....	2	.....	.....	.....	.....	.....	4	1	4	.....	2	.....	.....	.....	1	2	.....	3	1
Delran	4	2	3	6	8	23	1,760	.....	.....	.....	.....	.....	.....	.....	1	1	2	.....	1	2	1	1	4	.....	2	1	.....	1	1
Eastampton	2	1	4	2	1	10	1,602	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	2	.....	.....	.....	1	.....	.....	.....	.....	3	1
Evesham	3	1	3	5	6	18	566	.....	.....	1	.....	.....	1	.....	.....	1	.....	2	.....	2	1	2	2	1	.....	.....	1	1	1
Florence	4	1	1	8	1	15	1,528	.....	.....	1	.....	.....	.....	.....	.....	1	.....	2	1	1	1	1	1	1	.....	.....	.....	1	1
Little Egg Harbor	3	.....	4	4	6	17	1,881	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	.....	.....	2	4	.....	1	.....	1	2
Lumberton	2	.....	.....	1	2	5	1,689	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	1	.....	.....	.....	1	.....	.....	1	.....	.....	.....
Mansfield	6	1	1	4	8	20	1,648	.....	.....	.....	.....	.....	.....	.....	.....	1	3	.....	1	.....	1	.....	2	.....	1	.....	.....	1	2
Medford	5	1	.....	5	17	28	1,980	.....	.....	2	2	.....	.....	.....	.....	.....	3	1	2	.....	3	3	4	1	.....	1	.....	.....	.....
Mt. Laurel	9	4	1	4	9	27	1,739	.....	.....	.....	1	.....	.....	.....	.....	2	6	.....	1	2	2	2	1	.....	2	1	.....	1	1
New Hanover	8	4	4	6	9	31	2,373	.....	.....	1	.....	.....	2	.....	.....	2	2	1	3	2	1	.....	3	.....	4	1	2	1	3
Northampton	14	7	11	40	40	113	4,630	.....	.....	1	5	1	2	.....	1	7	9	1	4	6	10	3	8	2	4	3	.....	4	20
Pemberton	7	4	3	8	19	42	2,885	.....	.....	1	3	.....	.....	.....	.....	1	5	.....	7	.....	1	2	4	.....	5	1	.....	.....	4
Randolph	.....	3	1	1	2	7	428	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	1	.....	1	.....
Shamong	2	.....	2	1	4	9	1,097	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	1	.....	1	1	1	.....	1	.....	.....	.....	1
Southampton	2	.....	3	4	12	21	2,269	.....	.....	.....	1	.....	1	.....	.....	.....	1	.....	1	.....	2	1	5	.....	2	.....	.....	2	1
Springfield	9	.....	3	1	10	23	1,886	.....	.....	.....	1	.....	.....	1	.....	.....	3	.....	4	.....	4	.....	1	.....	.....	1	1	.....	.....
Washington	1	.....	.....	2	5	8	389	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	1	.....	1	.....	.....	1	2
Westampton	3	.....	1	2	.....	6	715	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	1	2	.....	.....	.....	1	.....	.....	.....	.....
Willingboro	1	.....	1	5	2	9	743	.....	.....	.....	.....	1	.....	.....	.....	.....	1	.....	1	.....	2	1	1	.....	2	.....	.....	.....	.....
Woodland	.....	1	.....	1	.....	2	325	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Totals	169	59	75	237	261	809	55,403	14.60	.....	8	25	2	27	1	2	32	90	10	62	34	69	39	79	3	51	18	4	45	70

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

CAMDEN COUNTY. Population, 62,942. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
*Camden	264	121	78	290	162	932	41,659	22.37	.....	7	31	3	28	3	10	44	101	11	74	66	50	23	51	4	47	17	1	65	79
Center	11	6	5	7	9	41	1,532	.....	.....	1	3	.....	.....	.....	.....	.....	8	.....	4	3	5	1	1	.....	3	.....	.....	2	2
Delaware	2	.....	1	8	5	16	1,481	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	5	.....	1	.....	2	.....	.....	.....	.....	1	1
Gloucester City	32	14	13	46	8	116	5,347	21.69	.....	2	6	.....	10	.....	5	3	8	2	8	5	6	4	5	.....	.....	1	.....	7	13
Gloucester	17	2	2	27	17	66	2,527	.....	.....	2	1	.....	2	..	.....	1	8	.....	4	3	7	2	7	1	5	1	.....	3	7
Haddon	5	2	3	10	13	33	2,551	.....	.....	.....	2	.....	3	.....	.....	.....	3	.....	4	.....	3	3	6	.....	3	.....	.....	.....	2
Stockton	8	8	1	14	6	37	3,532	.....	.....	.....	3	.....	1	.....	1	4	2	.....	5	3	1	.....	4	.....	1	.....	.....	3	5
Waterford	3	5	.....	10	7	25	2,149	.....	.....	.....	1	.....	1	.....	.....	1	2	.....	5	.....	1	3	3	.....	.....	.....	.....	3	3
Winslow	7	4	1	8	5	25	2,158	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	2	2	2	.....	.....	.....	.....	1	.....	1	6	3
Totals	349	162	104	420	232	1,291	62,942	20.51	.....	12	50	3	45	3	16	53	134	14	111	82	76	36	79	5	64	19	2	90	115

*Cities are generally more unhealthy than their death-rates indicate, since the population is in many of them much decreased for four months in the year, and thousands remove themselves instead of removing the evils which distress and sicken those who remain. Hence, in many of our cities, the death-rate for June, July, August and September, reckoned for the remaining population, would be a fair criterion of the health of locality, or at least should be considered for purposes of correction. So health laws are a great defense to all, but especially to the working classes of cities. See page 330.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

CAPE MAY COUNTY. Population, 9,765. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Cape May City	8	2	3	8	10	31	1,699	.....	.....	.....	.....	.....	.....	.....	.....	2	6	.....	3	2	3	.....	5	.....	1	1	.....	1	1
Dennis	3	2	2	6	1	14	1,812	.....	.....	.....	.....	.....	3	.....	.....	.....	1	.....	1	1	.....	.....	1	.....	1	.....	.....	.....	3
Lower	10	3	3	7	9	33	1,977	.....	.....	.....	1	.....	1	.....	.....	1	4	.....	4	2	1	1	5	.....	1	.....	.....	3	4
Middle	7	3	2	4	19	35	2,575	.....	.....	.....	.....	.....	1	.....	.....	.....	2	2	5	2	6	.....	3	.....	4	3	.....	2	1
Upper	4	3	.....	11	13	31	1,702	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	1	.....	3	1	3	.....	5	2	.....	5	4
Totals	32	13	10	36	52	144	9,765	14.75	.....	.....	1	.....	5	.....	.....	3	16	2	14	7	13	2	17	.....	12	6	.....	11	10

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

CUMBERLAND COUNTY. POPULATION, 37,687. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Bridgeton	33	26	11	48	44	163	8,722	18.69	.....	.....	4	.....	2	.....	1	5	23	1	20	10	11	8	8	1	12	2	.....	14	18
Commercial	11	4	3	10	3	33	2,265	.....	.....	.....	1	.....	.....	1	.....	.....	5	3	.....	4	1	1	.....	3	3	.....	.....	2	3
Deerfield	3	.....	1	5	6	15	1,643	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	1	.....	3	1	2	1	.....	.....	1
Downe	8	5	1	5	5	24	1,687	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	1	.....	1	.....	1	2	2	.....	.....	3	1
Fairfield	8	2	2	7	16	35	3,215	.....	.....	.....	2	.....	1	.....	.....	2	4	.....	5	.....	3	1	4	.....	2	.....	.....	3	1
Greenwich	4	2	1	5	6	18	1,215	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	1	1	1	1	4	1	1	.....	.....	.....	1
Hopewell	3	3	2	8	13	30	1,764	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	2	4	2	2	5	.....	3	.....	.....	1	1
Landis	25	13	10	33	36	117	6,005	.....	.....	.....	6	.....	.....	.....	.....	1	10	1	11	18	2	2	16	.....	10	.....	.....	6	8
Maurice River	7	1	1	6	7	22	2,374	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	2	8	1	2	1	.....	1	.....	.....	1	2
Millville	38	8	13	45	38	142	7,660	18.54	.....	1	.....	.....	1	.....	.....	.....	2	13	4	15	8	5	3	9	.....	10	3	12	18
Stoe Creek	1	1	1	3	4	10	1,107	.....	.....	1	4	.....	2	.....	.....	.....	.....	1	.....	.....	.....	1	.....	3	.....	.....	.....	1	1
Totals	141	65	46	175	178	609	37,687	16.16	.....	2	17	....	6	1	2	13	64	10	57	49	38	20	55	3	47	13	.....	41	57

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

ESSEX COUNTY. POPULATION, 189,929. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Belleville	8	1	6	18	10	43	3,004	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	4	3
Bloomfield	18	15	5	23	21	83	5,748	.....	.....	2	1	.....	3	.....	.....	6	3	.....	7	2	1	5	3	1	5	1	1	6	4
Caldwell	5	3	3	18	12	42	3,167	.....	.....	.....	2	.....	1	1	1	1	1	.....	2	5	1	5	3	1	4	3	.....	5	7
Clinton	11	5	4	8	8	36	2,742	.....	.....	1	1	.....	1	.....	1	1	3	.....	4	3	.....	1	5	.....	1	1	.....	3	1
East Orange	13	8	11	40	33	105	8,349	.....	.....	.....	3	.....	.....	1	.....	.....	3	.....	4	.....	.....	.....	5	.....	2	.....	.....	13	7
Franklin	4	3	.....	10	9	27	1,617	.....	.....	1	6	.....	3	.....	.....	1	10	3	10	4	5	8	13	.....	7	1	.....	1	2
Livingston	.....	2	.....	5	2	9	1,401	.....	.....	.....	1	.....	.....	1	.....	2	1	.....	4	1	3	.....	2	.....	.....	.....	.....	.....	3
Millburn	5	3	.....	4	7	19	1,743	.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	1	.....	.....	1	1	.....	5	1	.....	.....	1
Montclair	19	13	7	23	18	82	5,147	.....	.....	1	.....	.....	.....	.....	.....	2	2	1	4	.....	2	1	2	.....	.....	.....	.....	.....	3
Newark	836	503	295	1147	580	3,372	136,508	24.70	.....	28	87	.....	79	48	6	176	402	29	407	284	183	162	215	6	140	82	1	276	210
Orange	81	44	25	103	38	291	13,207	22.03	.....	1	8	.....	12	1	1	15	35	4	31	25	12	11	8	3	15	5	.....	31	23
South Orange	6	6	7	20	12	51	3,911	.....	.....	.....	1	.....	.....	.....	.....	7	3	2	4	4	6	2	1	1	1	.....	.....	5	9
West Orange	14	8	5	13	11	51	3,385	.....	.....	.....	1	.....	.....	1	.....	3	9	.....	1	4	3	.....	3	.....	3	1	1	4	2
Totals	1020	614	368	1432	761	4,211	189,929	22.17	.....	34	113	.....	99	53	10	226	488	39	486	347	232	194	274	13	182	103	4	353	279

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

GLOUCESTER COUNTY. Population, 25,886. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Clayton	7	3	2	10	5	28	1,981	.....	.....	.....	.....	.....	1	.....	.....	.....	1	3	1	3	1	.....	1	.....	1	.....	.....	5	2
Deptford	3	4	2	9	5	24	1,520	.....	.....	1	1	.....	1	.....	.....	.....	3	.....	6	2	2	.....	1	.....	1	.....	.....	.....	1
East Greenwich	2	.....	2	4	7	15	.....	.....	.....	.....	.....	.....	2	.....	.....	1	1	.....	1	.....	1	2	1	.....	1	.....	.....	.....	1
Franklin	5	7	2	9	9	33	2,480	.....	.....	3	.....	.....	1	1	1	1	2	.....	3	1	.....	1	2	.....	1	.....	.....	4	2
Glassboro	9	4	2	11	17	43	2,088	.....	.....	.....	.....	.....	.....	.....	.....	2	3	.....	6	5	.....	1	4	.....	.....	3	2	4	3
Greenwich	2	1	1	11	7	23	2,598	.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	1	.....	3	3	2	1	.....	1	.....	1	2
Harrison	3	2	4	6	4	19	2,841	.....	.....	.....	2	.....	.....	.....	.....	.....	1	.....	3	1	2	.....	4	.....	.....	1	.....	.....	1
Logan	5	3	5	7	7	27	1,765	.....	.....	.....	.....	.....	.....	5	.....	.....	1	1	2	.....	2	.....	5	.....	.....	3	1	4	2
Mantua	10	7	1	8	5	32	1,718	.....	.....	.....	1	.....	.....	2	.....	1	6	.....	6	.....	2	.....	5	.....	.....	2	.....	4	2
Monroe	5	3	3	10	8	29	1,858	.....	.....	.....	1	.....	.....	.....	.....	.....	4	.....	2	4	2	2	.....	.....	1	3	2	3	3
South Harrison	3	1	.....	4	4	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	1	.....	.....	.....	.....	.....	.....	2	.....	1	2
Washington	5	2	1	5	11	24	1,366	.....	.....	.....	.....	.....	.....	.....	.....	1	3	.....	1	1	.....	.....	2	.....	.....	2	.....	4	4
West Deptford	5	2	5	8	8	29	1,399	.....	.....	.....	.....	.....	3	.....	.....	.....	2	.....	2	1	3	2	1	.....	.....	2	1	1	3
Woodbury	7	2	4	21	13	47	2,298	.....	.....	.....	2	.....	1	.....	.....	.....	2	.....	2	.....	3	2	5	.....	.....	5	.....	4	7
Woolwich	5	9	4	10	12	40	1,974	.....	.....	.....	2	.....	2	.....	1	1	4	.....	5	2	6	.....	5	.....	.....	1	2	2	2
Totals	76	50	38	133	122	427	25,886	16.49	.....	4	10	.....	19	1	3	8	34	4	35	26	24	16	36	2	35	8	.....	33	37

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

HUDSON COUNTY. Population, 187,941. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Bayonne	55	32	19	80	22	208	9,372	22.19	.....	1	15	.....	1	.....	.....	12	32	3	16	18	11	7	11	1	6	1	1	12	15
Guttenberg	13	4	3	12	1	33	1,206	.....	.....	.....	.....	.....	.....	.....	.....	4	6	.....	2	3	2	.....	.....	.....	5	.....	.....	1	5
Harrison	39	17	13	66	17	152	6,898	22.03	.....	5	9	.....	3	1	.....	9	15	1	19	21	7	2	7	.....	.....	4	.....	14	11
Hoboken	208	84	62	283	68	706	31,999	22.13	.....	2	24	.....	12	5	1	23	95	12	65	78	46	25	29	2	37	10	7	44	59
Jersey City	794	473	277	1681	404	3,036	120,722	25.15	.....	37	116	.....	63	45	20	122	425	25	384	240	153	166	157	6	137	61	7	209	209
Kearny	10	4	5	10	6	35	777	.....	.....	.....	.....	.....	.....	1	.....	3	3	.....	3	2	3	.....	1	.....	.....	.....	4	.....	2	1
North Bergen	47	19	6	91	55	218	4,268	.....	.....	5	1	.....	3	.....	.....	1	17	2	12	12	10	16	30	.....	9	3	.....	26	17
Town of Union	43	22	6	45	20	137	5,849	23.42	.....	2	8	.....	1	.....	2	5	32	2	11	8	10	3	9	1	4	3	2	14	8
Union	4	9	4	8	3	28	1,310	.....	.....	3	1	.....	.....	.....	.....	3	3	.....	3	3	1	2	.....	.....	1	.....	.....	3	3
Weehawken	6	3	5	5	6	25	1,102	.....	.....	.....	1	.....	.....	.....	.....	4	3	.....	4	1	1	2	1	1	.....	1	.....	.....	1
West Hoboken	38	19	13	30	11	111	5,441	.....	.....	1	5	.....	5	2	1	10	19	1	8	13	9	2	2	.....	6	1	.....	8	7
Totals	1257	686	413	1711	613	4,689	187,944	24.95	.....	56	180	.....	88	54	24	196	649	46	527	399	253	165	247	12	207	88	18	333	336

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

HUNTERDON COUNTY. Population, 38,570. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Alexandria	....	3	4	3	7	17	1,324	.....	.....	....	....	....	2	....	....	1	1	....	1	....	....	....	....	....	....	....	....	....	1
Bethlehem	3	1	5	14	12	35	2,830	.....	.....	....	....	....	....	....	....	....	1	1	6	....	2	....	....	....	3	3	....	2	3
Clinton borough	2	1	3	4	6	16	842	.....	.....	1	....	....	....	....	....	....	2	....	2	....	2	....	1	....	....	....	....	....	3
Clinton township	4	1	....	4	10	19	2,133	.....	.....	....	....	....	....	....	....	1	....	....	3	....	2	....	2	....	....	....	....	2	1
Delaware	11	2	2	12	16	43	3,092	.....	.....	....	....	....	....	....	....	3	3	....	3	....	2	....	5	1	4	....	2	4	8
East Amwell	2	4	....	6	8	20	1,696	.....	.....	....	....	....	1	....	....	2	....	....	3	1	3	....	4	....	....	2	....	....	....
Franklin	....	1	....	5	5	12	1,338	.....	.....	....	....	....	....	....	....	....	....	....	2	....	2	....	2	2	2	....	....	2	2
Frenchtown	2	2	....	3	6	14	1,039	.....	.....	....	....	....	....	....	....	1	1	1	....	....	1	....	2	2	2	....	1	....	1
High Bridge	5	....	1	10	7	23	2,209	.....	.....	....	....	....	....	....	....	1	....	....	2	....	2	....	4	....	4	....	....	2	5
Holland	3	1	4	1	10	19	1,886	.....	.....	2	....	....	....	....	....	3	....	....	5	1	4	1	1	....	1	....	....	....	....
Kingwood	....	....	1	5	9	15	1,691	.....	.....	....	....	....	....	....	....	....	....	....	....	....	....	....	5	....	....	....	....	....	5
Lambertville	8	1	7	9	14	39	4,183	.....	.....	1	....	1	2	2	....	1	5	....	2	1	....	2	9	....	3	....	....	1	4
Lebanon	7	5	1	12	8	33	2,699	.....	.....	....	....	....	....	....	1	....	4	....	10	....	2	....	2	1	6	1	....	2	3
Raritan	4	4	4	15	23	50	4,188	.....	.....	....	1	....	2	....	....	....	2	2	5	1	3	3	9	2	1	2	....	2	2
Readington	6	3	1	10	15	35	3,103	.....	.....	....	....	....	....	....	....	1	1	....	2	2	2	1	7	....	4	1	....	....	5
Tewksbury	6	2	5	8	5	26	2,108	.....	.....	....	....	....	3	....	....	....	....	1	4	....	2	4	2	1	2	2	....	....	1
Union	1	1	1	1	2	6	1,164	.....	.....	....	....	....	....	....	....	....	1	....	1	....	....	....	....	....	....	....	....	....	....
West Amwell	2	....	....	3	2	7	1,039	.....	.....	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....	....	....	....	....	....
Totals	66	32	39	125	165	429	38,570	11.12	.....	4	2	1	10	2	1	13	22	7	49	15	38	23	65	4	26	12	.....	26	43

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

MERCER COUNTY. Population, 58,061. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Chambersburg	36	27	8	37	14	124	5,437	22.81	.....	2	....	....	7	1	1	7	26	3	8	8	9	2	9	....	3	7	....	7	12
East Windsor	6	....	....	7	7	22	2,271	.....	.....	....	....	....	....	....	....	2	3	....	3	2	2	1	5	1	1	2	....	1	....
*Ewing	7	2	6	34	23	72	2,412	.....	.....	....	....	....	....	....	....	....	3	....	7	2	6	....	1	....	4	2	1	7	6
Hamilton	11	1	5	15	22	67	3,370	.....	.....	1	....	....	....	....	....	3	4	....	5	1	6	....	1	....	1	1	....	5	5
Hopewell	4	4	3	18	25	54	4,462	.....	.....	....	....	....	3	1	....	....	2	....	1	1	5	3	10	....	2	5	3	6	6
Lawrence	....	3	5	5	9	22	3,174	.....	.....	....	....	....	2	....	....	2	1	....	2	3	1	4	....	2	1	1	1	....	....
Millham	10	7	9	8	4	38	.....	.....	.....	1	1	....	2	....	1	12	4	....	1	3	....	5	2	....	....	....	....	2	....
Princeton	9	10	10	16	26	72	4,348	.....	.....	....	1	....	2	....	....	3	9	1	8	4	10	4	9	3	3	1	....	1	7
Trenton	131	119	66	192	107	632	29,910	21.13	.....	3	21	....	33	2	14	61	62	9	44	31	32	18	52	3	24	18	1	51	42
Washington	2	1	....	3	8	14	1,281	.....	.....	....	....	....	....	....	....	....	1	....	2	1	3	....	1	1	....	....	1	2	1
West Windsor	1	....	2	5	8	17	1,396	.....	.....	2	2	....	....	....	....	....	1	....	....	....	4	....	3	....	....	....	....	....	4
Totals	217	174	114	340	253	1,124	58,061	19.36	.....	9	25	.....	49	4	16	90	113	13	76	56	75	31	138	7	40	37	7	83	83

* Ewing township includes Asylum. See Adult Brain column.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

MIDDLESEX COUNTY. Population, 52,286. Statistical Divisions,	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Cranbury	.....	2	2	4	8	17	1,599	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	3	1	.....	2	1	.....	5	.....	.....	1	2
East Brunswick	8	9	10	13	18	59	3,272	.....	.....	1	1	.....	3	.....	.....	10	2	1	1	3	5	3	4	1	4	1	.....	4	4
Madison	5	1	1	3	1	11	1,762	.....	.....	.....	.....	.....	.....	.....	1	1	1	.....	.....	1	1	1	1	.....	.....	1	.....	.....	4	4
Monroe	1	4	1	3	4	13	3,017	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	1	.....	.....	2	.....	.....	.....	1	1	.....	.....
New Brunswick	81	65	69	109	68	397	17,166	23.13	.....	2	14	.....	7	2	.....	66	51	4	27	28	18	27	21	.....	16	11	2	26	27
North Brunswick	3	2	5	7	7	24	1,251	.....	.....	.....	.....	.....	1	.....	.....	3	1	.....	2	1	1	2	3	.....	1	.....	.....	2	2
Perth Amboy	43	33	19	42	10	150	4,808	.....	.....	2	9	.....	17	1	.....	11	14	3	5	20	3	6	6	.....	5	2	.....	5	9
Piscataway	4	6	6	22	11	48	3,242	.....	.....	.....	2	.....	1	.....	.....	2	2	.....	.....	6	1	3	2	.....	4	2	.....	3	5
Raritan	4	5	5	17	16	47	3,789	.....	.....	.....	2	.....	1	.....	.....	3	8	.....	4	1	7	2	4	.....	4	1	.....	3	4
Sayreville	7	6	1	10	.....	23	1,930	.....	.....	.....	1	.....	.....	4	.....	.....	3	.....	1	2	2	.....	1	.....	.....	.....	.....	3	2
South Amboy	16	14	6	25	15	76	3,648	.....	.....	2	2	.....	1	.....	.....	9	7	1	4	2	4	2	11	.....	5	.....	.....	8	6
South Brunswick	4	4	3	15	14	41	2,803	.....	.....	.....	1	.....	1	.....	.....	1	2	.....	.....	4	1	4	8	.....	2	2	.....	4	5
Woodbridge	14	13	10	18	14	72	4,099	.....	.....	1	2	.....	3	3	.....	2	15	1	13	3	2	4	3	.....	4	2	.....	3	5
Totals	190	162	138	288	186	978	52,286	18.70	.....	8	34	.....	35	10	1	109	110	10	66	67	47	55	66	.....	52	24	3	63	75

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divsions of the State of New Jersey, for the Year ending June 30th, 1884.

MONMOUTH COUNTY. Population, 55,538. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Atlantic	1	4	.....	5	8	18	1,743	.....	.....	1	1	.....	.....	.....	2	.....	1	.....	2	2	2	1	3	.....	1	1	1	3	1
Eatontown	7	2	3	12	12	36	2,642	.....	.....	2	2	.....	.....	.....	.....	.....	4	.....	5	1	1	1	2	.....	2	1	2	6	5
Freehold	12	5	5	29	18	70	4,302	.....	.....	2	1	.....	.....	.....	.....	2	6	.....	6	3	10	3	9	.....	1	1	.....	2	2
Holmdel	4	1	1	1	7	14	1,575	.....	.....	1	.....	.....	.....	.....	.....	.....	1	1	4	1	2	1	2	.....	1	1	.....	2	2
Howell	1	6	.....	15	12	35	3,374	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	6	2	5	.....	1	2	.....	3	3
Manalapan	2	1	2	6	6	17	2,175	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	1	.....	1	3	2	.....	.....	.....	1	.....	.....	1	1
Marlboro	3	2	5	5	6	21	2,193	.....	.....	.....	1	.....	.....	.....	.....	.....	1	3	1	1	2	1	2	.....	1	.....	.....	6	5
Matawan	13	4	6	18	12	53	2,699	.....	.....	2	1	.....	.....	.....	.....	.....	5	.....	7	10	4	5	6	.....	4	2	.....	6	6
Middletown	25	6	3	22	17	74	5,059	.....	.....	.....	.....	.....	.....	1	.....	.....	6	.....	5	10	4	11	11	.....	4	2	.....	2	1
Millstone	4	3	1	4	13	25	2,080	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	3	3	1	4	2	1	.....	4	.....	.....	4	1
Neptune	35	11	8	44	27	125	4,187	.....	.....	2	7	.....	.....	.....	.....	6	18	3	12	9	12	4	13	.....	2	5	.....	4	4
Ocean	29	10	3	24	22	92	6,027	.....	.....	1	.....	.....	.....	.....	1	1	16	.....	10	7	7	12	3	.....	6	2	1	4	7
Raritan	17	8	3	22	13	63	3,891	.....	.....	3	2	.....	2	.....	1	2	7	.....	7	6	7	6	.....	.....	5	1	1	7	4
Shrewsbury	23	11	15	34	26	110	6,526	.....	.....	.....	2	.....	3	.....	.....	3	7	.....	16	7	11	5	8	.....	2	2	.....	9	15
Upper Freehold	11	1	4	9	21	46	3,236	.....	.....	.....	.....	.....	1	.....	1	.....	6	.....	8	1	3	4	5	.....	2	.....	1	2	.....
Wall	15	10	4	10	20	59	3,829	.....	.....	.....	2	.....	.....	.....	.....	1	12	.....	3	6	4	8	5	.....	4	.....	.....	3	.....
Totals	202	85	63	260	240	858	55,538	15.45	.....	16	19	.....	9	3	5	20	93	7	95	59	88	40	71	3	35	15	5	54	66

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

MORRIS COUNTY. POPULATION, 50,861. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.				Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Boonton	11	9	2	16	12	50	2,682	.....	.....	1	2	.....	.....	2	1	1	6	.....	3	2	5	1	3	.....	6	1	1	4	3
Chatham	6	10	6	22	20	64	4,276	.....	.....	.....	2	.....	1	1	1	5	6	.....	3	2	7	5	6	.....	4	3	.....	2	9
Chester	3	4	2	2	10	21	2,337	.....	.....	.....	.....	.....	.....	.....	.....	4	1	.....	4	1	1	1	4	.....	2	1	.....	.....	.....
*Hanover	5	1	6	48	43	103	4,138	.....	.....	1	1	.....	.....	.....	.....	2	2	1	5	1	6	4	57	.....	4	2	2	3	2
Jefferson	5	1	3	5	5	19	1,792	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	6	3	.....	1	2	.....	4	.....	.....	1	2
Mendham	4	4	1	8	10	23	1,526	.....	.....	.....	1	.....	1	.....	.....	.....	1	.....	1	.....	2	.....	3	.....	4	1	.....	2	1
Montville	3	1	1	4	4	14	1,270	.....	.....	2	.....	.....	.....	1	.....	.....	2	1	4	.....	14	18	5	14	.....	5	7	.....	8	19
Morristown	27	17	9	44	42	142	6,837	20.77	.....	.....	3	.....	.....	.....	.....	11	11	1	6	.....	2	1	1	.....	.....	.....	.....	1	1
Mt. Olive	5	3	1	7	5	21	1,982	.....	.....	.....	2	.....	.....	.....	.....	1	2	.....	2	.....	2	1	1	1	1	.....	.....	1	.....
Passaic	5	4	1	4	9	23	1,896	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	8	3	1	3	3	.....	1	.....	.....	.....	.....
Pequannock	9	5	4	7	7	32	2,239	.....	.....	1	1	.....	.....	.....	2	.....	5	1	2	4	2	2	.....	1	3	.....	.....	2	4
Randolph	24	9	13	28	20	94	7,700	.....	.....	4	1	.....	1	.....	.....	5	9	.....	12	10	5	1	11	.....	6	2	.....	6	5
Rockaway	22	17	5	24	19	87	7,366	.....	.....	1	3	.....	1	.....	6	.....	11	.....	20	1	2	4	6	2	2	3	.....	6	4
Roxbury	5	2	2	7	8	24	2,139	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	3	2	3	.....	.....	.....	.....	.....	.....	6	4
Washington	8	.....	4	11	8	31	2,681	.....	.....	.....	1	.....	3	.....	1	.....	.....	1	1	4	3	1	4	1	.....	.....	.....	2	2
Totals	142	87	60	237	222	748	50,861	14.71	.....	10	18	.....	7	4	11	29	57	7	80	47	57	30	115	5	40	21	3	40	57

* Hanover township includes Asylum. See Adult Brain column.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

OCEAN COUNTY. POPULATION, 14,455. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH.																			
	Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.				Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal disease.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Berkeley	2	.....	.....	3	3	8	683	.....	.....	.....	1	.....	.....	.....	.....	1	.....	.....	1	.....	.....	.....	1	.....	2	1	.....	.....	.....
Brick	9	8	3	21	14	56	2,990	.....	.....	.....	3	.....	.....	.....	.....	.....	8	.....	10	2	1	2	5	2	4	3	.....	3	8
Dover	7	1	3	10	16	37	2,439	.....	.....	1	.....	.....	1	1	2	.....	.....	.....	3	3	2	.....	7	1	4	1	.....	.....	3
Eagleswood	2	.....	.....	2	4	8	592	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	2	2	1	1	.....	1	1	.....	.....	2
Jackson	4	5	4	.....	8	22	1,803	.....	.....	.....	.....	.....	1	.....	.....	.....	2	.....	2	2	2	1	1	.....	1	.....	2	1	4
Lacey	4	1	.....	6	3	14	814	.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....	3	1	.....	.....	1	.....	4	1	.....	.....	.....
Manchester	5	1	1	4	2	14	1,057	.....	.....	.....	2	.....	.....	.....	.....	.....	1	.....	1	2	.....	.....	1	.....	.....	2	.....	.....	2
Ocean	1	2	1	3	4	11	484	.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	2	.....	2	.....	1	.....	.....	.....	.....	.....	1
Plumstead	9	2	1	8	8	28	1,561	.....	.....	1	.....	.....	.....	.....	1	.....	2	1	3	2	1	2	3	.....	.....	.....	.....	1	3
Stafford	.....	2	2	9	5	19	1,008	.....	.....	.....	1	.....	.....	.....	.....	2	.....	.....	.....	1	1	.....	1	.....	2	1	.....	1	1
Union	1	.....	1	3	4	9	1,024	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	1	1	1	.....	.....	.....	.....	.....	4
Totals	44	22	16	69	71	226	14,455	15.63	.....	2	9	.....	3	1	3	4	16	1	26	14	10	7	21	3	18	10	2	6	26

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

PASSAIC COUNTY. POPULATION, 68,860. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Acquackanonk	3	.....	4	3	5	25	1,781	.....	.....	1	2	.....	.....	.....	.....	3	.....	.....	4	1	1	1	5	.....	2	.....	.....	.....	3
Little Falls	6	2	2	5	3	18	1,404	.....	.....	.....	.....	.....	.....	.....	1	.....	3	.....	1	1	1	1	1	.....	2	1	.....	.....	1
Manchester	2	2	1	3	4	12	1,513	.....	.....	.....	.....	.....	.....	1	.....	.....	1	.....	2	1	2	.....	1	.....	1	.....	.....	1	1
Passaic	41	12	16	56	27	154	6,532	23 58	.....	.....	6	.....	1	1	.....	6	16	.....	22	21	8	5	8	1	9	2	.....	12	18
Paterson	363	280	141	403	250	1,446	51,031	28.33	.....	12	34	.....	68	43	10	82	185	8	155	127	59	75	64	6	61	21	2	121	108
Pompton	.....	1	5	11	6	32	2,251	.....	.....	2	.....	.....	1	1	.....	.....	3	.....	6	5	2	.....	3	.....	2	.....	.....	1	2
Wayne	9	.....	.....	4	3	7	1,757	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	1	.....	.....	.....	.....	2	2
West Milford	6	4	2	7	6	25	2,591	.....	.....	.....	.....	.....	.....	.....	.....	2	1	.....	1	1	3	1	2	.....	.....	1	.....	2	4
Totals	430	301	171	502	304	1,719	68,860	24.96	.....	15	44	.....	70	46	11	90	212	8	193	157	76	83	85	7	77	28	2	139	139

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

SALEM COUNTY. POPULATION, 24,579. Statistical Divisions.	DEATHS AT ALL AGES. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute Rheumatism.	Consumption—male.	Consumption—female.
Alloway	6	2	3	5	12	28	1,917	.....	.....	.....	2	.....	.....	.....	.....	3	1	.....	4	.....	2	2	4	.....	1	1	.....	1	2
Elsinboro	3	3	1	1	3	11	576	.....	.....	.....	.....	.....	.....	1	2	.....	2	.....	1	.....	.....	.....	2	.....	.....	.....	.....	.....	.....
Lower Alloways Creek	5	.....	3	8	7	23	1,373	.....	.....	2	.....	.....	.....	.....	.....	2	3	.....	1	.....	1	2	1	.....	3	1	.....	1	4
Lower Penn's Neck	3	.....	1	6	6	16	1,331	.....	.....	.....	1	.....	.....	1	.....	1	2	.....	.....	.....	1	1	1	.....	1	1	.....	3	.....
Mannington	7	4	3	14	8	37	2,230	.....	.....	2	1	.....	.....	.....	1	.....	5	.....	2	.....	2	3	2	.....	2	1	.....	3	3
Oldmans	4	1	.....	6	6	17	.....	.....	.....	.....	1	.....	1	.....	.....	.....	2	.....	.....	2	2	.....	2	.....	1	.....	.....	.....	.....
Pilesgrove	12	5	10	13	20	60	3 497	.....	.....	.....	5	.....	.....	.....	.....	3	10	1	5	4	1	.....	9	.....	4	1	.....	7	6
Pittsgrove	3	3	4	7	8	25	1,778	.....	.....	.....	2	.....	.....	.....	.....	3	3	.....	2	.....	.....	2	2	.....	1	.....	.....	3	3
Quinton	8	4	1	5	5	23	1,390	.....	.....	.....	.....	.....	.....	1	.....	.....	6	.....	2	1	.....	.....	1	.....	.....	.....	.....	.....	3	3
Salem	23	5	16	21	18	78	5,056	15.43	.....	2	1	1	2	.....	.....	.....	12	2	5	2	4	2	5	.....	7	2	1	6	10
Upper Penn's Neck	13	6	.....	4	10	36	3,361	.....	.....	.....	1	.....	.....	.....	.....	4	8	.....	1	3	3	.....	3	.....	1	.....	.....	3	2
Upper Pittsgrove	3	.....	3	8	8	22	2,073	.....	.....	.....	2	.....	1	1	.....	.....	1	.....	.....	1	1	3	1	.....	1	.....	1	2	2
Totals	90	33	35	101	111	376	24,579	15.30	.....	6	16	1	4	4	3	16	55	3	23	13	17	15	34	.....	22	7	2	32	38

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

SOMERSET COUNTY. Population, 27,162. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Bedminster	3	1	6	9	7	28	1,812	.....	.....	.....	.....	.....	3	1	.....	.....	1	1	1	1	4	.....	2	.....	.....	.....	1	5	3
Bernards	3	6	8	6	9	33	2,622	.....	.....	.....	1	.....	6	.....	1	4	1	1	4	1	.....	3	4	.....	.....	3	.....	3	1
Branchburg	2	1	2	10	3	18	1,316	.....	.....	.....	1	.....	.....	.....	.....	1	.....	1	1	1	.....	.....	5	.....	.....	1	.....	3	1
Bridgewater	20	7	6	45	26	104	7,997	.....	.....	2	2	.....	.....	.....	.....	1	6	3	6	10	9	2	9	1	3	6	1	2	11
Franklin	6	2	2	18	18	47	3,818	.....	.....	.....	.....	.....	2	.....	.....	1	3	1	3	3	1	3	11	.....	3	1	.....	2	5
Hillsborough	4	2	2	11	23	42	3,248	.....	.....	1	2	.....	.....	.....	.....	.....	1	.....	2	1	6	1	9	.....	4	2	.....	6	.....
Montgomery	3	3	.....	4	18	28	1,928	.....	.....	.....	.....	.....	.....	.....	.....	1	3	1	3	.....	.....	5	2	.....	4	1	1	1	.....
North Plainfield	7	4	2	15	7	35	3,217	.....	.....	.....	1	.....	.....	.....	.....	3	1	.....	3	3	7	2	2	.....	2	.....	.....	2	2
Warren	2	.....	1	7	4	14	1,204	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	1	1	.....	.....	2	2	.....	2	.....	.....	1	2	1
Totals	50	26	29	125	115	348	27,162	12 81	.....	3	7	.....	11	1	1	11	18	9	24	20	27	18	48	1	18	14	3	32	24

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

SUSSEX COUNTY. Population, 23,539. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Andover	1	.....	1	6	4	12	1,150	.....	.....	.....	.....	.....	.....	.....	.....	2	3	.....	2	.....	.....	1	.....	.....	1	3	.....	.....	.....	2
Byram	3	3	2	9	4	21	1,406	.....	.....	1	.....	.....	.....	.....	.....	1	1	.....	2	.....	.....	2	.....	.....	2	1	.....	.....	.....	3
Frankford	6	.....	2	3	16	27	1,682	.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	2	.....	.....	1	.....	.....	1	1	.....	.....	.....	1
Greene	4	.....	.....	4	1	9	727	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	2	.....	.....	2	.....	.....	.....	.....	.....
Hardyston	13	1	1	8	12	35	2,645	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	11	.....	.....	1	.....	.....	1	2	.....	.....	5	3
Hampton	2	.....	.....	7	8	17	895	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	5	1	5	.....	1	1	.....	.....	3
Lafayette	.....	1	1	6	2	10	781	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	.....	.....	1	2	.....	.....	.....	.....
Montague	1	.....	.....	1	.....	2	1,022	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	2	.....	.....	.....	2	3	.....	6	6
Newton	7	2	3	14	11	38	2,513	.....	.....	.....	1	.....	.....	1	.....	.....	2	.....	3	.....	.....	3	3	2	2	2	.....	.....	.....	2
Sandyston	1	.....	2	2	5	11	1,195	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	4	.....	.....	.....	.....	1	.....	.....	.....	.....
Sparta	2	4	2	7	4	19	2,274	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	3	.....	2	2	2	.....	3	.....	.....	1	1	1
Stillwater	2	2	.....	6	5	15	1,502	.....	.....	1	1	.....	.....	.....	.....	.....	1	.....	1	.....	.....	1	1	.....	1	3	.....	.....	2	2
Vernon	3	1	3	8	7	22	1,811	.....	.....	.....	1	.....	.....	1	.....	.....	.....	.....	3	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
Walpack	2	.....	.....	1	.....	5	575	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	2	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....
Wantage	7	.....	6	13	23	50	3,361	.....	.....	.....	2	.....	.....	.....	.....	1	.....	.....	2	1	9	1	5	2	8	2	3	1	4	7
Totals	54	14	23	95	102	293	23,539	12.44	.....	4	7	.....	2	.....	2	8	26	2	43	11	21	9	27	4	23	7	1	23	31

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1884.

UNION COUNTY. Population, 55,571. Statistical Divisions,	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal disease.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male	Consumption—female.
*Clark							353																						
Cranford	3	3	3	6	4	19	1,184									1	6	2	2		1				4				
Elizabeth	164	85	69	177	96	591	28,229	20.93		11	13		22			42	76	6	47	57	42	25	41	1	30	13	1	31	35
Fanwood	1	1	1	4	4	11	1,167													1			4		1			1	2
Linden	3	3	5	11	6	28	1,889						3			2	4		2		5	3	2		2			2	1
New Providence	3	2	5	3	6	20	781						1			1			3	5	2	1			1			1	1
Plainfield	32	10	16	39	35	132	8,125	16.25		1	4		3			11	15		6	10	9	9	18		5		8	10
Railway	23	11	13	31	33	111	6,455	17.19		1	4		3			2	11		11	9	11	4	10	1	3	1	6	8
Springfield	1	1		1	6	9	844										1			1		2	1				2	
Summit	2	4	1	8	9	24	1,910			2	1		1				4	1	1	1	2		1		1	1		3	1
Union	14		4	7	16	41	2,418			1	2					3	6		3		2		4		1			1	3
Westfield	6	4	1	13	11	35	2,216				2						4		3	3	3	1	4		2			3	3
Totals	252	124	118	300	226	1,021	55,571	18.37		16	26		33			62	127	9	78	87	77	45	87	2	50	16	2	58	64

*Clark township too late for tabulation.

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year Ending June 30th, 1884.

WARREN COUNTY. Population, 36,589. Statistical Divisions.	DEATHS AT ALL AGES. Under one.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1880.	Death-rate per 1,000.	Deaths under five in comparison with total deaths.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Diarrheal diseases.	Puerperal.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Erysipelas.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Consumption—male.	Consumption—female.
Allamuchy	1		1	3	1	6	648			1							1		1	1									1
Belvidere	5	1	1	14	11	32	1,773				1					1			7	1								3	2
Blairstown	1	1	2	3	6	13	1,458										1			1		2	1	2		2		3	1
Franklin		1	1	4	9	15	1,529				1		1						1			1							
Frelinghuysen	1			3	3	7	1,012											1	1		1	1	1		1				
Greenwich	2	1	1	4	7	15	2,554												1	1	2		2		2			2	2
Hackettstown	7	6	6	9	8	36	2,502			1	1		2			1	3		4	6	4	2	4	1	2			1	4
Hardwick	1			1	4	6	583														1		1						2
Harmony	1	4	1	6	5	18	1,350										1		2		2		2					1	5
Hope	6		1	2	8	17	1,589										2		3	1	2		3					2	2
Independence			1	2	2	5	1,018				1								1				1						
Knowlton	5		3	6	10	24	1,476				1						1		1	3		3	2		4			1	2
Lopatcong	3	1	1	4	5	14	1,591									1			2	1	2	1	3		1			1	
Mansfield	4		3	9	11	27	1,709											1	1	2	3	1	4		1	3		5	1
Oxford	14	4	9	14	8	51	4,594						1			3	3	1	5	5	5		4		3	3	1	1	2
Pahaquarry	2		2	2	2	8	418												2	2		1					1		2
Phillipsburg	40	16	10	42	22	130	7,181	18.10			4		1			7	16	1	8	14	7	6	12	1	5	3		6	12
Pohatcong	1	3	2	8	6	20					1					2	1		2	2	1	1	3					1	3
Town of Washington	9	5	2	12	4	32	2,142				2					3	5	2	1	2	2	1	2		2	1		1	1
Washington township	1	1	2	4	5	13	1,452												1	1	1					3			
Totals	104	44	49	152	137	489	36,589	13.36		2	12		5			18	36	7	44	44	34	22	50	2	23	17	4	32	45

SYNOPSIS OF VITAL RETURNS AND COMMENTS ON SPECIAL DISEASES.

The records for the statistical year ending June 30th, 1884, as shown by the tables accompanying this report, give an aggregate of 8,968 marriages, 25,263 births, and 21,716 deaths. For the previous year, from July 1st, 1882, to July 1st, 1883, the record showed 9,166 marriages, 24,430 births, and 23,310 deaths. From July 1st, 1881, to July 1st, 1882, the record was 8,837 marriages, 23,108 births, and 25,959 deaths. These represent years in which the returns have been most complete, and are believed to show a reliable decrease in the death-rate of the State.

For these years the total deaths under five years of age were as follows:

1881–2	10,512
1882–3	8,790
1883–4	7,971
Total	27,273

The following is the aggregate of deaths from zymotic diseases for the last three years in the State, each year being stated separately:

1881–2	7,753
1882–3	5,973
1883–4	5,298
Total	19,024

This gives 38.42, or over one-third of the deaths, as under five years of age, and 26.80, or over one-fourth, from this class of diseases. There is some difference of judgment as to one or two of the diseases to be classed as zymotic. The term means ferment, and was first applied to a class of diseases which were believed to depend upon some form of septic ferment developed under special circumstances. In

these, animal or vegetable decay or putrefaction was believed to give rise to special classes of symptoms, although the accurate chemical conditions which determined whether the disease should be one or the other was not known.

Since some form of vegetative life has come to be recognized as an essential factor in most if not all of these diseases, the former term is not so descriptive. They have been since associated under the names of communicable diseases, or preventable diseases, or filth diseases.

In the present state of our knowledge, it is recognized that the fevers spoken of as remittent or intermittent, typhus, typhoid, and relapsing fever and small-pox, scarlet fever, measles, whooping-cough, croup and diphtheria, erysipelas and diarrhea, as found among our infantile population, are dependent upon local conditions, or upon the conveyance of a contagion. Cholera and yellow fever belong to the same category. Consumption is recognized as largely owing to the local conditions of surroundings or to the diatheses of individuals, and is claimed by some to be communicable. However this may be, it is no doubt to a great degree a preventable disease. Many cases of brain and nervous disease, also, might well be classed as preventable. In the statistical tables as printed we give the causes in the more prominent or specified diseases. Also, for the purpose of showing the proportion of the diseases largely preventable, we associate together the first eight diseases named in the table, and add to it erysipelas, which has come to be regarded as a disease dependent on a specific contagion. In the above enumeration, and in our comparative percentage of so-called zymotic diseases as given in the table, all these are included. Also, typhus fever, which is very rare, but which, when occurring, is distinguished by a dot in the typhoid column of the office record. With the caution that all figures for a single year are approximate indications as to the healthfulness of persons in localities, to be corrected by comparisons with larger numbers over a larger number of years, and by incidental facts which modify their significance, we proceed to note in general some of the more prominent indications and facts as to the prevalence of various diseases. The first notable fact is a variation depending largely upon density of population. This is not only noticeable when we study a county like Hunterdon, with a death-rate of 11.12 per thousand, and compare it with Jersey City and Paterson at 25.15 and 28.33 respectively. Even with this we are to remember that Hunterdon county has a city so large as Lambertville,

which increases its death-rate over that of a county population. Also, that here and there a close street in a small village is also a factor in disease. It would be expected that the crowding of persons and of human habitations would increase the ratio of disease, but such is found to be the case to even a greater degree than general facts and principles would lead us to infer. For, with the direct effect there come, also, indirect or collateral evils, which affect the soil, both as to its drainage and its pollution, which affect both air and water-supply, and which lead to the collection of filth in many ways. Yet where this is realized and compensations are made, it is astonishing how possible it is to overcome the disadvantages, and, in fact, turn them into real advantages. Indeed, this has been so efficiently done in some of the larger English cities as to show that collections of population can be run economically for health, just as the division and classification of labor in large factories or industries often makes the loss far less than it would in a more restricted occupation. Speaking, for instance, of the lowered death-rate of London, Mr. R. Rawlinson, C.E., says: "Since 1848 cesspools have been abolished by tens of thousands, so that London at this day stands sewered, drained, and freed from most of its cesspools, and is in this respect the most fully water-closeted and cleanest great city in the world." Where it becomes esseential to classify work and to put it under expert administration, it is often far better done than if every one is left to do that which is right or wrong in his own sight.

But it must be fully and thoroughly realized that a house is an artificial thing, and that rows of houses filled with people are still more so, and that when we come to herd all classes of people in villages, towns and cities, we must recognize that we are placing them in unnatural conditions. Both nature and art must be so utilized and adjusted as to be compensatory, and then associated life becomes healthy as well as convenient. In accord with the general statement, we find that Bergen, Burlington, Cape May, Hunterdon, Morris, Somerset, Sussex and Warren counties have each a death-rate below fifteen deaths to every thousand inhabitants. These eight counties give an excellent showing for the year, although it should also be compared with that of the previous five years.

It has been claimed that the general death-rate of rural counties ought not to be higher than ten for the thousand in New Jersey. For counties with many towns and few cities of over five thousand popu-

lation, seventeen deaths to the thousand has been stated as an average rate. The counties of Cumberland, Gloucester, Monmouth, Ocean and Salem, although quite rural in their population, come in between fifteen and seventeen death-rate for the thousand. Between seventeen and twenty-one we have Atlantic, Camden, Mercer, Middlesex and Union counties. Atlantic county would not fall in this division but for the large and sudden influx of summer population, and even with this has a larger proportionate number of deaths, because of the invalidity of many that are brought there. The other counties show the quick effect of city populations, especially those of the labor classes.

There are left the counties of Essex, Hudson and Passaic, with a death-rate of 22.17, 24.95 and 24.96, respectively. The death-rate of Hudson as a county is even higher than its death-rate as to its cities, because, in addition to great local disadvantages, these townships have thrust upon them many of the evils of the cities. They are made too much the dumping-places for all that is intolerable in the cities. In the case of North Bergen township, it should be included in the city death-rate, since it contains the almshouse, the penitentiary and the asylum of the county, and because of this has the highest township death-rate in the State. With the addition of cemeteries, odor factories, etc., it is not surprising that the whole county has so high a death-rate.

As we come to note the cities, these, too, differ among themselves as to death-rate, by reason of locality, of density and character of population, of trades and occupations, etc.

The lowest death-rates are those of Salem, 15.43; Plainfield, 16.25, and Rahway, 17.19. A reference to the birth-rates, however, will show that this low death-rate does not fully indicate the relative health of these places since they are defective in birth-rate and child population, and, so, have less of the material most susceptible to disease. Business depression, too, sometimes leads the younger and family classes to move away, while the middle-aged and the old, who have become fixtures, have to stay.

Next to these cities we find Phillipsburg, 18.10; Millville, 18.54; Bridgeton, 18.69; Burlington, 18.93. All these and other localities should be compared with the death-rates of the combined five previous years, as often, for a single year, the variations are from incidental causes.

Next are Bordentown, 19.68; Morristown, 20.77; Elizabeth, 20.93.

Between a death-rate of 21 and 24, other cities take their places in the following order: Trenton, Gloucester City, Orange, Harrison, Hoboken, Bayonne, Camden, Chambersburg, New Brunswick, Passaic and Town of Union.

Above a death-rate of 24 to the 1,000, we find in their order, Newark, Jersey City and Paterson.

We do not include Atlantic City for reasons already given, as, no doubt, but for its summer population its rate would be less by nearly one-half.

In most of our cities it is not yet time for sanitary measures to make themselves felt largely as to the general death-rate, although it should be manifest on some of the more preventable diseases. The cities of Camden, Newark and those of Hudson county, by reason either of Boards of defective powers, or their want of funds, have had no adequate sanitary care. Paterson has only within a year been placed on a basis of sanitary administration. Besides, with the increase of population, as to which our approaching census will inform us, the statement of death-rate for this year is, probably, calculated upon too small a population. It did not seem best to us to apply a table as to approximate population until we had the facts of the semi-decennial census. But, with the facts we have, there is much material for study. Also, it is only by getting the more general facts, and by their study, that we get that analysis which has always been found in the past a valuable guide in studying the health problems of society.

DEATHS UNDER FIVE YEARS IN COMPARISON WITH TOTAL DEATHS.

Of equal, if not greater, significance will be found a study of the comparative deaths under five years of age. These are very properly accepted as showing much as to the vigor of population and influences unfriendly to health. It is to be borne in mind that this column is not the death-rate for each 1,000, but a comparison between the total deaths and the deaths under five years of age. Such an exhibit of the percentage, which these deaths bear to the whole, show how many die at this early age and, also, how many more of such die in close cities and certain populations. It is a very unnatural thing for a child to die. It is only because we come to regard what is common as natural that such a mortality among the young does not at once, in the interests of social life and prosperity, compel a rigid

inquiry into causes. Anything approaching it among domestic animals would pass as a great national calamity.

When we find that over one-third of all deaths, at all ages, are from zymotic diseases or consumption, and that modern hygiene and medical art claim most of these diseases as preventable, we cannot but be led to close attention to causes in order that the material resource which we call population may not be wasted.

When we find that the deaths of children under five years of age in all Hudson county is 41.44 of the entire deaths, and between forty and fifty per cent. in many of the cities, we cannot but look upon young humanity as either the most perishable or the most mismanaged of all live material. As we look for the reason of the loss, it is not far to find.

Dr. George Wilson, in his book on "Healthy Life and Healthy Dwellings," has claimed that "the zymotic death-rate in healthy districts ought not to exceed 4 per 1,000," and Edwin Chadwick, C.E., "that in new localities with healthy dwellings, properly constructed drainage and a pure water-supply, we may reasonably look forward to insuring a death-rate of only 10 per 1,000."

Bad air and wrong feeding are the cause of very many deaths in the early ages. The counties can be profitably compared with each other, as well as the county and city deaths at these ages.

It is wise also to compare the death-rate of some cities with the immediate county in which they are situated. While, for instance, the death-rate of Jersey City, Hoboken, &c., varies but little from that of the county, the death-rate of Camden county, without Camden and Gloucester City, is 15.25; of Passaic county, without Paterson and Passaic, 10.53; of Essex county, without Newark and Orange, 13.63; of Mercer county, without Trenton and Chambersburg, 16.20; of Hudson county, without its cities, 31.90.

If the death-rate of a city is high in proportion to that of the surrounding county, it is all the more significant of manufactured diseases.

The year that we are considering must be regarded as a healthy year for the State. While measles had a wide-spread prevalence in the State, it did not register many deaths. While, as always occurs, some of the various communicable diseases have been epidemic in localities, it cannot be said of any one of them, save measles, that they have been very prevalent. While we have no accurate return of the number of cases of sickness, yet from some inquiry and from general

information we are led to believe that the greater knowledge of methods of isolation and prevention and of the hygienic conditions and surroundings which should be maintained during sickness has caused a decrease in the actual mortality—a smaller percentage of deaths, even where there is not much lessening of the number of cases. Indeed, one of the most hopeful signs in preventive as well as in remedial medicine is that practitioners have come to give to the former more of its relative significance—to include hygiene and prevention as a part of clinical and administrative medicine. We are able to-day to point to health officers and to many of our leading physicians as, in their own experience, in possession of facts which show the practical advantage of control over a large class of diseases by sanitary methods, for which they should receive the highest appreciation by the general public; all the more because their philanthropic and civic or patriotic service has no adequate pecuniary reward.

SPECIAL DISEASES.

In the study of special diseases and their prevalence in the State, physicians are respectfully asked to compare, from year to year, the tables and the synopsis of the diseases as presented in former reports. The tables are combined in the five-year table in the last report, the death-rates and other facts as to which will also be found in this report for purposes of study and comparison. The comments cannot be repeated, but are intended to be made so as, as far as possible, to give an outline of the facts and of the lessons which they convey. It is only by comparisons from year to year that we gain that advantage which in the history of disease is akin to clinical details of individual cases.

Remittent Fever. The average of deaths from this in the last five years, previous to the present year, was 344, showing for this year a lowering of the general average of 144. While there is no soil or telluric disease in which the number of deaths bears so small a proportion to the number who suffer, yet they are an indication of its severity and to no small degree of its prevalence. If there is any one fact established beyond controversy, it is that this disease is dependent upon what may be called artificial interferences with that natural process of decay by which the forces stored in vegetable nature are transferred into other modes of energy. Nature has its own way of con-

ducting the destructive as well as reproductive functions of the vegetable world, and has also many compensatory methods for the errors we make, or that circumstances make as to it. But there is a limit to these compensations. When the equilibrium is destroyed, or when changes and decompositions occur grossly out of the normal methods, the soil, the air, the water become the recipients of organic particles unfriendly to the best vigor of animal life. Those who are compelled to come into such localities, or to partake of the results of such changes, come to have a series of symptoms for which the more specific terms are remittent or intermittent fever. But as there are less declarative symptoms, the term malaria is used in a general way to describe them. While some of these are unmistakable, there are others which are very obscure. This has led to the use of the term malaria in a very loose way by the laity, and even by some physicians. Surely, a general condition of malaise is not to be called malaria unless we are able, technically, to identify the periodic and other concomitants or the type of disturbance, or unless the remedies which seem somewhat specific by their quick response give a kind of crucial test. While there is a difference of susceptibility on the part of individuals, and while there is such a thing as the establishment in some of a toleration of the influence known as acclimatization, we can not be too seriously impressed with the desirability of removing the influence as much as possible. This is done chiefly in three ways: By such drainage as will secure the free movement of air as well as of water through the upper ground; by not suddenly or permanently exposing to heat, ground with organic matter in process of decay without such drainage, tillage and heavy cropping as will dispose of the results by chemical and vital vegetative appropriation instead of diffusing it as irritant material for animal life, and by such use of preventive methods as will protect against the influence.

Of these, the first two are the most essential and radical. What drainage and tillage can do and has done is no longer one of the mysteries of art. If men will neglect this, and if, in addition, they will saturate the soil, impound the water, expose decaying material to moisture and sunshine so as to spread the organic materials through all the inbreathed air, they must not, while quaking with the chill or burning with the fever, or in general ill health because of this bad air called malaria, wonder at the mistake of Providence or the ignorance of doctors. It is only the evil genius of human methods

vigorously applied to the manufacture of disease. It was significantly emphasized a few years since, when a peculiar season and the sudden blighting of vegetation by a July sun precipitated an influence which so fell upon every citizen that not two persons in the community could be found who had not felt the effect, or could accept the challenge to come before the court and testify to their exemption. It led to such changes as greatly mitigated the evil, and, if followed out, will do much to relieve a troublesome stream at Bound Brook.

In the last report we alluded to two facts of more recent impression, viz., that water is more frequently a carrier of this organic or particulate matter into our systems than was formerly supposed, and, next, that heat, as now diffused by furnaces, etc., in houses and in cities, furnishes power of forced and unnatural decomposition to much vegetative matter in winter, and so makes this class of diseases more common in cold weather than formerly.

Typhoid Fever. No doubt is raised as to the relation of this disease to that class of filth which is most liable to accumulate in the household conditions of animal life. It can, perhaps, even more definitely, be called a fecal disease. It would seem that persons of susceptible condition, exposed to certain forms of matter undergoing degrading and unnatural changes, come to receive from it an influence which, in their systems, changes into a specific contagion, and so not only sickens them with a typical fever, but is able, through these secretions, to impart it to others. The only difference of belief is that some claim that no case of this especial type occurs without being transferred from some antecedent case, chiefly if not entirely through the intestinal secretions, while others believe that certain combinations and degradations may take place, such as originated the disease in the individual, or the materials therefor in his surroundings. Those that claim the latter do not deny that the more frequent transmission is by the former. But whichever view is correct, the fact remains of the relation of local and avoidable conditions to this disease. It is preventable, and at present is to be dealt with both with reference to not furnishing, by means of domestic filth, a nest or hatching-place, and so dealing with a patient and all his secretions and surroundings that he shall not be a propagating center. The average of deaths from this disease in the State for the last five years was 564, which was just the number of deaths from it the year previous to the last. This year we had from

it 640 deaths. Of this increase Hudson county had an advance of seventy over the average of five years, and Passaic county of eleven, while some counties are a little less. Essex and Camden show slight advances, and both are too high. In all of the cities of these large counties there cannot be too close attention to the water-supply. Since the close of the last vital year, Camden city shows an increase of typhoid fever.

While only one of the zymotic or filth-fermenting diseases, its index finger is never to be lost sight of by the local sanitarian. As it does not often occur in persons past fifty years of age, we ask of physicians a close statement of symptoms in the "remarks" where, in older age, the fever is plainly of this type. Of the 640 deaths, 431 were in cities of over 5,000. While this shows an excessive ratio in cities, it also shows that it largely prevails in towns, villages and rural localities.

Small-pox. This year, like the last, has shown very few deaths from this disease. It is the leading preventable disease, since, with the facilities of arm-to-arm and of bovine vaccination, there is no good reason why any case should ever occur in the State, unless it be in a person not susceptible to vaccination. Many old physicians will tell you that they have never found such a one. While we have good reason to believe that vaccination is much more common than formerly, it is to be remembered that the vaccination of the past does not protect the annual birth-crop. Parents must feel themselves charged with the duty of protecting their children in the first year of infantile life. Teachers and school trustees should insist upon it that all pupils be vaccinated. Both the State school and public health laws provide for this. Its importance and the facts in evidence are fully presented in former reports and in circulars of this Board.

Scarlet Fever. The deaths from scarlet fever this year have been two hundred and twenty-four less than the average for the last five years previous. It is still the dreaded disease of the household. Such signal instances come to us as to the prevention of its spread by isolation, by care and by the precautions of the attending physician, that we feel the mortality from it should be greatly diminished. In the hands of competent attendants, the first case is more likely to die than the rest, for the reason that it is not apt to be taken in hand so promptly, or to have as good hygienic conditions as the rest. As it is a

disease, so far as at present known, always derived from a previous case, too much precaution cannot be taken as to exposure thereto. We find in our records many cases of adult death therefrom. Because of the relation which the scarf-skin as well as the breath has thereto, it is more diffusable and longer transmissible than most of the contagions. Its transmission by means of milk purchased from families where the disease exists, is plainly proven. Cats or other small animals convey the disease. Physicians need care as to the return of children to schools, nor in case of death is it officious in them to advise as to the conduct of the funeral in the interests of health.

Measles numbered seventy-four deaths above the average of the last five years previous. Of the whole number of deaths (one hundred and eighty-nine), one hundred and fifty-three occurred in the counties of Essex, Hudson and Passaic; one hundred and thirty-six in the cities of Newark (forty-eight), Jersey City (forty-five) and Paterson (forty-three), and one hundred and fifty-two in all in cities. It is a disease, so far as we can judge from our tables, as frequent in the country as in cities, and one which no section fully escapes. But it is noticeable that it is much more fatal in cities than in the country, and chiefly so from the bad air and the complication of pulmonary disease which occur. In too many instances where it does not cause death it initiates an impairment of the breathing organs, and leads to bronchitis, consumption or other forms of lung lesion. The decrease of its occurrence and of mortality therefrom depends largely upon prevention, isolation and the best hygienic conditions.

Whooping-Cough. The same remarks apply measurably to this disease, which, although having a spasmodic element, is essentially a bronchial disease. It numbered in all 116 deaths, or seventy-five less than the average of the previous five years. It, too, has a special city fatality, seventy-two out of the 116 deaths having been in cities of over 5,000 inhabitants. Conditions of atmosphere and of exposure, as well as of foul air and imperfect care, have much to do with its fatality. The physician should early mark out a line of management, even where no continuous attendance is needed. Since we have come to know that the expulsive breath and the sputa, whether fresh or dried, bear close relations to the communication of the disease, it is not so often transmitted as formerly.

Croup and Diphtheria. The cases of death therefrom for the last year were in all 1,027, or 117 less than the five-year average. But even yet the record is much more than that of small-pox, scarlet fever, measles and whooping-cough combined. This is all the more significant, since many of the deaths from scarlet fever are noted as having secondary diphtheritic complications. Even allowing for those who would class the sudden cases of croup as distinct from diphtheria, it leaves a number of deaths from this disease that may well attract our most serious attention. In the fourth report, (1880, pp. 7–13,) we sought to outline the chief evidence as to the character of this disease. While long ago recognized as a sequel in measles, scarlet fever, and some other ailments, it is within about thirty years that it has come to have more distinct consideration. From the fact that, unlike the eruptive diseases, one attack does not serve to prevent another, it continues to be, even more than these, the dread of households. It has, in some respects, a history and a progress quite different from other communicable diseases.

A prominent medical authority has recently sought to emphasize the fact that its milder forms often occur unnoticed, or so mild as not to confine to the house, and that thus it arises from conveyance much oftener than is supposed. There are certainly forms of follicular or diphtheritic sore throat that either convey the disease or put the local mucous membrane in a condition susceptible to its implantation. But multitudes of cases are on record in which there seems to have been no reasonable explanation except that of *de novo* or spontaneous origin by certain co-operations of filth, dampness and heat. There is no disease to which the principles of isolation, of watchfulness, and of prompt treatment, need to be more sedulously applied. It is even probable that antecedent treatment limits or prevents the disease. Those physicians who are watchful of throat conditions, and who deal most promptly with the first symptoms, are the most successful after the first case which has often made too much progress before its gravity is suspected. It is rarely that there is not some local change in the appearance of the throat before there are any constitutional symptoms. Always where diphtheria is prevailing an examination of the throat is desirable, since the first symptoms are without pain or other marked manifestation. It is believed by most that the early use of remedies, both topically and internally, are very certain to abort the disease in its early stages. The confidence that our ablest practitioners have in

grappling with the disease, if only they can regulate homes and surroundings and see patients at the earliest moment, is the best evidence that the duration of its death-rate is within the reach of preventive and restorative sanitation.

Diarrheal Diseases. The deaths by diarrheal disease, as stated in the statistical column, include only deaths between one month and twenty years of age. Diarrheas of the first month are so often incidental that they should not enter the general classification, while those of older life are properly ranged with digestive and intestinal diseases. A large proportion of the deaths from diarrhea are under five years of age. The average of the five previous years was 2,353, while the number of this year was 2,462. Comparison between the rural and the city counties, and between these counties and their cities, are the strongest evidence of how far such deaths are the results of artificial causes. One thousand seven hundred and twelve of the deaths were in cities of over five thousand, although the population is nearly equally divided between these and the portion of the State not thus included. There is a similar excess of death-rate of children under one month in such cities. The excesses are most marked in Jersey City, Newark and Paterson. Ill care, improper food, bad air and bad water have this special way of telling their tale. So evident has this become, even to the eye of a general charity, that fresh air funds have been provided by a spontaneous gratuity. The death-rate is thus lowered by the better food and better air of the open country. Even the changes of a day are often found to record marked improvement.

The worry of mothers, impure milk, and with older children the promiscuous use of table food, has much to do with this increase. But the general conditions of city life, and the fact that the working and more dependent populations are not able to leave cities permanently for the summer months, makes this great mortality. If the death-rates from infantile diarrhea were reckoned on the basis of the actual summer population of our cities, it would be much larger. If the methods adopted by New York City, Boston and a few other cities in the care of the infant population for the summer months is correct, that of Jersey City, Newark and Paterson are very defective. It deserves to be noted that the Health Board and Health Inspector of Paterson so far recognized this that they have already devised methods of prevention. We earnestly urge on all local city Health Boards to

study their statistics in reference to ward and neighborhood conditions, and to seek that knowledge of tenement and other house conditions which is essential to the proper care of civic life.

Dysentery. This is not made a separate column in our printed tables, but is marked by a dot, so as to distinguish it on the office sheets. It has prevailed more this year than during any previous year since the facts have been systematically obtained. One hundred and eighty-eight cases in all are reported. It is especially noticed in Burlington, Essex, Gloucester, Hudson, Passaic and Warren counties. In the vicinity of Williamstown it was so prevalent as to lead to active inquiries and arrangements for prevention by the Board of Health. There were, however, few deaths in that county. Before this, the vicinity of Mount Holly has had more than its share of the disease. It is believed to be traceable to polluted wells, much more than is generally appreciated. Special conditions of heat and moisture and malarial influences have much to do with its prevalence. Physicians and others should carefully examine as to water-supply and other sanitary conditions where cases occur. Also as to its possible communicability to others through the discharges. The disinfection of the discharges and their disposal in ground distant from wells, rather than in the common privy, is always desirable when possible.

Erysipelas does not record a large death-rate. But because of its frequent occurrence, of its occasional malignant character and its relation to puerperal fever, it deserves the close attention of clinicians and vital statisticians. The deaths from it for the five years previous to this, were within eighteen of those from measles. It is no longer in doubt that it has a specific contagion, under some circumstances communicable, and so is to be dealt with as is this class of ailments. J. Burden Sanderson, in his Pathology of the Infective Processes, says of it that it "originated from a focus of infection." A contagion has been inserted or otherwise came into existence in the tissue of the affected part. The effect seems to be not that of general septic change, but dependent upon micrococci. Whether the disease is, therefore, an implanted one, or whether it has come about from some degraded condition of the blood or tissue, may not always be certain. But the possibility of others contracting it, of its conveyable character, of its becoming a malignant epidemic, and of its affecting those who are in a puerperal or traumatic condition of susceptibility, is ever to be borne in mind.

Puerperal losses differ but little from the average of former years. These are so serious to families and so often leave children in dependent orphanage, that too much protection cannot be given to mothers from the avoidable perils of maternity. That erysipelas, scarlet fever and suppurating wounds are sometimes a danger at such periods, is admitted. That there is also peril from unskilled attendance, cannot be denied. It is doubtful whether those who have no diplomas in midwifery should be allowed to offer their services in this capacity. While every facility of choice, consistent with safety should be afforded, most governments, in their economy of human life, have thought proper to require some test of fitness. Others provide retreats for those who need attendance and have not property or home conveniences.

Consumption, which is so dependent in very many cases upon avoidable causes, for the last three years has the following statistics of deaths:

	Males.	Females.	Total.
1881–82	1,696	1,779	3,475
1882–83	1,527	1,594	3,121
1883–84	1,557	1,658	3,215
Total			9,811

Thus it causes about one-seventh of the whole number of deaths. But as few die of consumption under five years of age, and as its chief havoc is with grown life and during the productive and industrial period of life, it is more significant than the mere numbers would indicate. About twenty-three per cent. of all adult deaths are from this disease. The deaths therefrom this year have been a little beyond the average for the last five years. It will be noted that the number of deaths of females from it is uniformly a little beyond those of males, the excess for three years being 251.

Consumption stands for a large amount of preventable disease. While it comes by inheritance, it comes still oftener as a direct result of occupation, of unventilated houses, school-houses and work-shops, and of unwholesome food and of imperfect care in many ways. It also has much to do with dampness of soil and of houses, with sudden changes of temperature and with a sedentary life. Former reports

furnish some important details as to this disease. While the number of deaths recorded therefrom in the five years previous in the State is 15,077, the number in cities over 5,000 is 9,072. For the last year, of the whole number, 3,215, the number in cities of over 5,000 was 1,996. It is on the increase as a disease of city life, and is a warning index of the deterioration of population. It is also to be borne in mind that pneumonia and chronic bronchitis cause very many deaths and are also largely attributable to local conditions.

Acute Lung Diseases. The record of these for five years previous to this year was 11,864, of which 7,130 were in cities of over 5,000 inhabitants. For the last year the deaths therefrom were 2,174, of which 1,416 were in the cities. Pneumonia is so prevalent and fatal in some winters or parts of seasons as to have led some to regard it as at times having some specific cause. It certainly shows much more tendency at some times than at others to assume a typhoid character.

The agency of foul air in causing pneumonia is no longer doubted. When an audience rushes out from an ill-ventilated and crowded assembly room into the open air, it is not simply that there is a sudden change of temperature. The circulatory system of the lungs and the vaso-motor nerve supply of its tens of thousands of minute vessels is seriously affected and depressed by such infliction. The healthy and unembarrassed lung rapidly adjusts itself to changes of temperature, if not too intense. But if by bad air you paralyze the power of adjustment, the depression is increased, or if there is reaction it is in the direction of congestion. We would therefore emphasize the fact that acute lung diseases are not less dependent upon the depressing influences of befouled air than upon thermometrical and barometrical changes.

Brain and Nervous Diseases of Children. In the last five years previous, 8,609 children, or persons under twenty years of age, died of this class of diseases, of which 5,905 were deaths in cities of over 5,000 inhabitants. For the last year the number was 1,598, of which 1,110 were in the larger cities. While it is impossible to state how many of these are preventable, we do know that wrong food, the neglect of first symptoms, and the pressure of school life have much to do with the multiplication of such diseases. A recent circular of this Board, (XLVII.,) cautions parents as to early attention to first

symptoms. The number of deaths does not fully measure the extent, for many brain and nervous ailments in after life have their origin in neglect or mistakes during the growing age.

Diseases of Heart and Circulation. Five thousand five hundred and seventy-five was the number of deaths from this class for the five years previous to the last, of which 2,906 were in cities. For the last year there were 1,324 deaths from this cause in all, of which 746 were in cities. It will be noticed that the excess in cities over the country is not so large in proportion as from several other diseases. Rheumatism is a very potent factor in the causation of heart disease. It is as common in the country as in the cities, by reason of greater exposure. Many farmers have to trace heart disease to attacks of rheumatism which have gradually impaired the valves of the heart. In most cases of death returned as acute rheumatism, the immediate cause of death has been pericarditis or other interference with the heart and circulation. Hereafter, in the printed table, acute rheumatism will appear in the heart column, and be distinguished as usual on the office tables. The deaths from it for the five previous years were 318, of which 154 were in cities. This year it numbered 62 deaths, of which 28 were in cities.

Urinary Diseases. Distinction between urinary and kidney diseases are marked in our office records. The whole number of deaths for the five years previous was 3,199, of which 1,804 were in cities; for the last year 892, of which 558 were in cities. This marks some increase. There is some reason to believe that the freer use of condiments and of burning catsup, as well as alcohol, have a serious effect on the complicated circulation of the kidney. This is all the more serious since many cases of adult brain disease are secondary and dependent upon some form of renal inflammation or failure in function.

Adult Brain and Spinal Diseases. These for the five previous years have numbered 7,247 deaths, of which 3,447 were in cities. The last year numbers 1,664 deaths from this cause, of which 806 were in the larger cities. Paralysis and apoplexy are often diseases of very robust as well as of overtaxed life. The causes which give rise to this class of diseases are various. The energy of business, the active rush, the hurried methods of the age greatly tend to overcome deliberation and

add to the wear and tear of human life. Such diseases increase out of their due proportion, and many fall victims to long paralysis or to death sooner than would occur in the quiet walks of life. Caution and precaution, due self-control and skilled advice would postpone for many a too early breaking down of nerve and mental forces.

Digestive and Intestinal Disease. When it is remembered that this column includes no one under twenty years of age in our enumeration, the deaths of 4,789 in five years from these causes (2,455 being in cities), or of 1,075 the last year (607 being in cities), shows that large numbers succumb to errors in diet, such as are not sudden in their results. Very many formed and endowed for a life of seventy years, have their days shortened by errors which finally wear out the powers of digestion. Rules as to good food, exercise and the management and self-control of the appetite deserve to be carefully studied by all who would ward off the later failures of life-power. With such the power to secure and use up the right food after the middle period of life is the determining consideration as to whether the life can be prolonged to old age.

Cancer. For five years previous our returns record 2,115 deaths, of which 1,127 were in cities. For the past year there were 484 deaths, of which 288 were in the larger cities. It is a disease which as to its causes and pathology is having close study, but which as yet fails to be reached by preventive methods.

A review of these causes of death furnishes us with many indications as to preventable disease, and the proper care of population. When it is remembered that careful statistics based on life insurance and other facts as to disease, have shown that for every death there are on an average two persons sick the year round, or as Lyon Playfair calculates it, there are for every unnecessary death twenty-eight cases of unnecessary sickness, we cannot but come to some realization of what a tax on happiness, on industrial energy, and on all life, avoidable deaths and avoidable sickness are, and redouble our energies to restrain the wastes of avoidable disease, to remove its burdens, and so add to human health and happiness.

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