ELEVENTH ANNUAL REPORT

OF THE

BOARD OF HEALTH

OF THE

STATE OF NEW JERSEY,

AND REPORT OF THE

BUREAU OF VITAL STATISTICS.

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TRENTON, N. J.:
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REPORT OF THE SECRETARY OF THE BOARD.

To His Excellency Robert S. Green:

GOVERNOR—The State Board of Health of New Jersey begs leave to present to Your Excellency its eleventh annual report. The report of the Bureau of Vital Statistics as appended to this report furnishes the details as to the health of localities so far as indicated by statistical returns. In each annual report these can only be tabulated up to the previous first of July. Additional facts as to the health of localities are appended by the annual reports from local Boards, generally received about November 1st. The returns will show some increase over the average of deaths for five years past. Besides the constant tendency to the accumulation of insanitary conditions, fostered by the rapid growth of our cities and the increase of population at the termini of our river systems, our State is constantly exposed to those communicable diseases which are so easily spread where interchange of travel and traffic is so active.

While there have been many local outbreaks of diseases of this class they have in no case reached the proportions of a wide-spread epidemic. Their restriction has in some instances been plainly traceable to the efficiency of local Health Boards.

During the year many of the Boards have profited by important changes made in the health legislation of the State and have adopted ordinances or codes which secure more effective administration.

Our own experience, as that of other states, confirms the judgment so often expressed abroad that a large number of diseases are preventable, that others may be greatly circumscribed in extent and fatality, and that the general comfort and expectancy of life may be largely augmented.

Besides the appeal such conclusions afford from our desire for personal health and happiness and our interest in the general welfare of our people, the material value of health and life is coming to be more highly prized. Sir John Simon, formerly medical health officer of the Local Government Board of England, gives it as his well-established conviction, which is accepted as substantially correct by English writers, that in each year the deaths in England were fully 125,000 more than they would be if existing knowledge of the chief causes of disease as affecting the masses of the population were reasonably well applied.

Sir James Paget, a former President of the International Medical Congress, thinks, from the study of reliable data, that the annual loss of time by sickness for the entire English people is one-fortieth of the work done, or nine days in a year for each man, woman and child between the ages of sixteen and sixty-five years. This would be an annual loss of time by sickness for the whole kingdom of about 20,000 weeks. This at $5 per week is an annual loss of $100,000, not counting cost of sickness.

The preventable deaths that occur from typhoid fever and consumption alone take from the resources of the country more than its entire health administration costs.

Mr. Gladstone, in a recent address at the opening of the drainage works in Herndon, England, said: "There is no greater economy than the saving of human life." Added to the saying of Sir William Jenner, that "The value placed by a community on individual life is one of the great tests of the state of civilization," it affords an additional motive for the most liberal attention to a support of measures for protecting our citizens from the personal, social and financial embarrassments of invalidity, disability and death. This Board, as it reviews the experience of many years, can perceive that something has been done the better to protect our citizens from the avoidable causes of sickness and to appreciate the life and comfort of our people. But as it also sees the possibilities of the future, how a complete sanitary administration extended to every hamlet and city of the State, protecting the people in their persons, in their homes, in their schools and in their places of industrial occupation, would add to lives and population and to the happiness and the resources of the people, it feels that it only has illustrated what the future may accomplish, if only the sentiment of people or legislators is equal to the needs and possibilities of the work. Science and the applications of art, and the knowledge of economical, sanitary construction and administration are far in advance of the actual applications of such knowledge. If to-day the means were afforded to this Board and to the local Boards, to carry out and apply what is proven as to the practicability of life-saving knowledge, we should each year add, for the welfare of our population, hundreds of preserved lives, thousands of effective working days, and material capital and an amount of increased happiness beyond numerical statement. While the Legislature has well responded to appropriations sought, we fear that on our part there has been too much conservatism and too great timidity as to asking that aid in broader methods and more thorough administration, which is justified by all the facts in evidence as to the individual and material advantages of such extension to the State at large. Most of our cities are still far behind in the details of approved sanitary administration and in those financial provisions, therefore, which are necessary for the health and prosperity of the people. In the work of sanitary inspection and advice, and in the general oversight of the health of the people, we find a field of operation which might be largely extended to the great advantage of our citizens. Neglects which involve the health of the growing population and insanitary conditions which affect thousands of operatives, as well as defects in the homes of the people at large, arise, because there is not a general recognition of the limitations they cause upon effective industry and general welfare.

In many cases, too, local Boards, while having a general conception of the situation, need to be urged to greater activity of administration and to be more liberally provided for by their respective constituencies. We herewith draw attention to a few of the subjects that are worthy of special consideration and append thereto special papers and communications.

DRAINAGE FOR HEALTH.

The relation of soil conditions, and especially of the circulation of water in the soil, to the health of those residing near it, is more and more attracting the attention of sanitarians. The climate of a locality has very much to do with health. This is largely influenced by the ground moisture. The observations of Buchanan and Bowdich as to consumption long ago showed this. Much additional information has been collected as to its effect in producing fevers and rheumatism. Besides, there are various forms of gastric and intestinal disturbance dependent on dampness or those quick alternations of temperature that leave wet ground very cold while the surrounding air is heated.

Where drains have been so constructed as to dry large surfaces, the effect on health has been most marked. In cities where sewers are constructed one of the frequent benefits arises from the drying of the soil. Each State and each portion of it needs to be studied as to plans for its drainage.

The first thing is to study thoroughly the geological structure and the localities of drift. It is not sufficient to have a general idea of the trend of the strata. When draining in populous districts, and with reference to health, the underlying condition needs to be as well known as if it were mapped on the surface. Recently, in the location of two cesspools, the fact of a drift deposit was overlooked. The result was that the reliance placed upon the grade of the shale was deceptive and the fall was into the building. We know of another section in which the trap rock has here and there pockets beneath the surface filled with organic matter, causing much ill-health to those who locate on the fair surface. No system of drainage is skillfully laid out unless the sections are thus well described.

Next, the natural water-shed should be well known. Localities which seem favorable as to their soil and general contour may be the natural receivers of great amounts of moisture. They are kept constantly wet by their surroundings. So, in order to dry them, the drainage must be around them rather than upon them. This is generally spoken of as cutting off the springs. It is often more than this and involves the cutting off of rivulets all around. Also, the surface may be so located that the surrounding surface-water needs to be headed off and turned in another direction. It is surprising how often these simple requirements are overlooked. The city builder is not able readily to decide as to the strata or take in the general surroundings. Mistakes are even more common in cities than in the open country. The engineer who knows thoroughly the ground structure and the topography and the history of adjacent water-courses, had made the first step toward a complete system of drainage.

Next comes a knowledge of the amount of rain-fall and the usual time of its disposal. The observing farmer comes thus to know his different spots of land and often adopts wise methods of regulation. There must also be some knowledge of contour and of the relations to light, air and sun heat. A heavily-shaded hill is often wet when a valley well exposed to the sun is dry. The old plan of facing or locating buildings with reference to sun and winds and exposure, rather than to correspond with the direction of the road, was wise. In drainage for building purposes more regard should be had to the effect of the sun in keeping the soil dry. Shade and dampness have great relations to each other.

Observation as to the position of springs, and as to the depth of wells, and the varying height of the water in them, is of service in determining ground water-levels. Where the water in the well rises to a height parallel to the depth of the cellar it is generally a sign of imperfect drainage, unless there is change of strata between the house and the well. The area of fogs also is an indication as to surface moisture.

We also need to consider forests in their relation to moisture as well as to rain-fall. While the preservation of forests has important relation to rain-fall and its distribution, large adjacent forests increase dampness. So the local dryness of soil is often promoted by the removal of forests and the tillage of the ground. Sometimes, however, single trees of large foliage and wide-spreading roots aid in the drying of particular spots. Artificial excavations and embankments make many changes in the underground water-level as well as in general dryness of the surface. Each cellar acts as a drain to the surroundings. Embankments, even when having the attractive name of terraces, often add to the dampness about dwellings. Railroad embankments not infrequently change the water-level of the ground, while the excavations serve as drains. We have known the water-level in small lakes or ponds so changed by the buildings about them as by their dryness in summer to become a menace to health. All such artificial changes are to be taken into consideration, not only in reference to particular buildings, but also in reference to the drainage of broad areas. There also needs to be knowledge of all underground or surface drainage of an artificial kind. Often because no maps have been made or preserved these are lost sight of, and such obstruction takes place as reproduces the condition of things that existed before drainage. Even the contour and topography of the surface, and changes that have been made to govern the flow of surface-water, need to be carefully studied. Nothing is more common than to trust merely to the eye, which is often deceived by the comparison with the surroundings.

We should be more fully aware of what great physical and pecuniary advantages accrue from well-devised systems of drainage, or from local drainage about buildings. Even where there is not enough fall, well-laid drains a little distance away, withdraw some of the water from the vicinity of the house. In draining the grounds for the hospital buildings of Johns Hopkins University, at one point it was found necessary to go through several layers of impervious strata, so as to reach a gravel and sand-bed which was near a stream. By centering the termini of many drain-pipes to this drainage-well a large and wet area was thoroughly dried. Ground drainage has become so perfect an art, and the evils of damp and wet soils to the public health have become so established that every city should give its first consideration to ground drainage. Dry soils have a capacity for disposing of refuse to a degree that is of very great service in crowded localities besides the direct advantages of dryness. Where a house has already been located on a spot where there is a lack of fall, and where the remedies already named cannot avail, an area should be formed around the building, and the cellar wall cemented inside and out, and a cement floor provided. Former reports have given many details as to the modes and results of efficient drainage, but it is important thus to emphasize its necessity and its advantages, and its essential bearing upon the public health.

DISPOSAL OF FOULED LIQUIDS.

So much attention has been given in former reports of this Board to the various methods for the disposal of liquid wastes from houses, that it ought not to be necessary to do much more than to refer to what has been said upon this subject. We have thought best in this report to direct attention more technically to plans and systems as in actual operation in this State. Specimens of the most of these are described by those who have constructed the work. Most of the more approved methods are now more or less in use in the State, and can be personally examined by those who desire to compare methods. It can be said of nearly all methods that their value is *relative*, depending upon adaptation to the locality or the number to whom they are supplied. Even in private homes, where large systems cannot be applied, many improvements are being made. The farmer has learned that deep vaults are not needed, and that it is not only slovenly but hazardous to health to have the out-house the common receptacle of slops, or to have it at all connected with any water-closet in the house. The material thus kept dry is easily disinfected if there is odor, and easily removed and composted. If slops cannot be disposed of on the ground or in trenches between rows of rank-growing crops in the rear of the lot or on the horse-manure heap, frequently enough removed, it is better to trust to a small separate cesspool, not deep, and either arranged for surface soakage with easy access, or made tight by cement, and to be emptied by an odorless excavator. If a hole is made in the ground about six feet by four, or circular, with a depth just sufficient to be below the ordinary frost line, and with rows of agricultural tile extending from its bottom several feet in every direction, it will dispose of a good deal of the ordinary slop and wash and bath waste in its *fresh state*, and so be no hazard. The two great mistakes are to pond such materials in cesspools, where they become harmful, as they would not if used fresh, and in making the holes so deep that nature and vegetation cannot dispose of them. It now seems pretty well established that the process of nitrification is more the natural method of disposal of such wastes than simple oxygenation. This former process is chiefly conducted by the microphytes or micro-organisms which operate only in the upper soil, and not beyond a distance of two or three feet. The depth of such excavation should not be over two feet. Careful covering in the winter will protect from frost, and in summer free access can be had if cleansing or disinfection becomes necessary. The beginning of these branch tile drains should be protected by wire baskets, which may need occasional cleansing. The pit, however, should never be used for water-closet discharges. Where there are no sewers the two most important rules are, not to unite into one receptacle the various liquid and mixed offalings of animal and household life, and not to store any of these liquids so as to undergo changes which are hazardous. In addition to methods long and favorably known in certain localities, various modes of precipitation of sewage are more and more attracting the attention of sanitarians. This is not because the method is new, but because chemistry has acquainted us with new agencies, and mechanical ingenuity now enables us to deal with the precipitant more easily. Thus the Johnson Filter Press and some other similar arrangements enable us to reduce the bulk of this settling or sludge, so as to render it quite dry, and so to compress it as that it may be sold in the form of cakes, which are easily handled and transported. The system is also often combined with others with advantage, as where an effluent becoming too foul for the stream into which it has been passed, is thus made much more clear of organic matter, or is in addition passed upon land for intermittent filtration. In this case much less land answers for the purpose than if the waste, overladen with organic matter, had been directly carried upon it. Even where temporary cesspools seem unavoidable, the use of milk of lime, alum and other precipitants does much to arrest changes and to diminish the risks of injurious effects.

More recently what is known as the Röckner-Rothe method has come into considerable prominence. It is thus described in the *Sanitary Record* (London, April, 1886):

"The process consists in conducting the water into wells, over which the apparatus is erected. This is an iron cylinder, closed above but open below, where its margin dips beneath the surface of the water. A lateral pipe near the top of the cylinder carries off the purified water into an adjoining conduit or reservoir, and the cylinder is surmounted by a pipe connected with an air-pump, by which the air in the cylinder can be exhausted, so that the water rises gradually in its place and at length flows out at the lateral discharge-pipe, when it is only necessary to maintain the pressure constant from day to day. The level of the surface in the pure-water reservoir must be kept a little lower than that of the conduit which brings the foul water to the well, in order that the syphon action may not be reversed, and the lower edge of the cylinder must be lower than the sill of the effluent channel, to allow for variations in the level of the water.

"The height of the cylinder must obviously be less than 30 feet, and 24 feet is found the most convenient; while that of the suction-pipe must be at least 35 feet, in order to avoid the possibility of drawing the water into the air-pump and deranging the whole apparatus.

"The rate at which the water rises in the cylinder depends on the diameter of the latter and on the quantity of water entering the well in a unit of time.

"The outlet-pipe is made larger than the ordinary discharge would require, in order to facilitate the disposal of large volumes of water during heavy rains, but its aperture can be adjusted to circumstances by a sliding valve.

"The rate at which the water rises is usually 2 to 9 millimetres per second, but, being dependent on its specific gravity, varies as the weight of impurities to be removed.

"To maintain the velocity and movements of the water as nearly uniform as possible in every part of the apparatus, the foul water is admitted by a pipe opening at the bottom of the well, which is shaped like an inverted cone. Over and around the mouth of this inlet-pipe is a funnel-shaped louvred wooden frame which divides and distributes the ascending stream.

"While the whole mass of water is slowly rising in the cylinder the heavier suspended particles subside to the bottom of the well, where they act as a filter for the entering water.

"The sludge is removed from time to time by a chain-pump and deposited in an adjacent basin, whence the superfluous water drains back into the well. The floating impurities, greasy matters, &c., are run off periodically by a second and smaller outlet-pipe close to the roof of the cylinder and discharging into a separate tank. Gases rising into the vertical pipe at the summit of the cylinder, are drawn off by the air-pumps, and burned in a furnace.

"The Röckner-Rothe apparatus occupies very little space compared with the ordinary precipitation and subsidence basins. Unlike those processes in which the sewage, &c., stagnant and fermenting for days in the settling tanks, give out pestilential odors, this is devoid of anything approaching to a nuisance, and in the entrance of the water through the bed of sediment deposited on the bottom of the tank, we not only have a form of filtration unknown in other systems, but the water is brought into contact with the chemicals which always tend to sink, without the necessity for agitation, and the motor power required to effect it. Thus the Röckner-Rothe process, with its rapid and simultaneous chemical treatment, subsidence, and filtration, conducted in closed or covered chambers, is free from anything of the nature of a nuisance, and practically without smell.

"The removal of the sludge is the heaviest item in this as in other systems, but might be considerably reduced if a not too costly means could be found for expressing the greater part of the retained water. [This is now found in the filter press processes.] In no process of clarification can chemicals be dispensed with, but for the Röckner-Rothe all are equally applicable.

"As to the expenditure on steam power required, the experience of Essen points to half an hour daily for working the air-pump and three hours for the dredge to each cylinder. No great power is needed, and it is not impossible that the current of water in the culvert might be made available as a motor.

"The sewage of Essen in rainy weather is not more than 18,000 cubic metres, which four cylinders 7 metres high and 4.2 metres wide in wells 5.5 metres deep and wide would be able to treat, reliefs or overflow culverts being provided for heavy storm-waters. The Corporation have arranged with Messrs. Rothe for the erection, free of cost, of one such cylinder, the well and all subsidiary works being undertaken by the local authority. This single cylinder has treated 4,500 cubic metres of sewage daily, yielding three litres of sludge, containing 72 per cent. of moisture, to each cubic metre of sewage.

The total sludge per annum for a daily average of 12,000 cubic metres of sewage would thus be about 13,200 cubic metres. It is too early to judge of the marketable value of the sludge, but it is hoped that it may be found available for agricultural purposes.

"Dr. Kayser estimates the value of 1,000 kilogrammes of sludge with 65.45 per cent. of water at 5*s.*, which would give an annual revenue of £3,250 for 13,000 cubic metres, but Dr. König, of Munster, in view of the difficulty attending the transport of the sludge in its wet state, suggests that it might be dried in the air, without much additional trouble, until the water was reduced to 25 per cent., when it would contain from 0.5 to 0.7 per cent. of nitrogen, 0.7 to 1.0 per cent. of phosphoric acid, and 18 to 24 per cent. of carbonate of lime, with a value of 10*s.* per 1,000 kilogrammes reckoned on the nitrogen and phosphoric acid only.

"Careful estimates of the cost of chemicals, working expenses, and the interest and repayment of the capital sunk give a total of £3,000 per annum, or 1*s.* per head of the population, which is approximately the same as the value assigned to the sludge and precipitate by the chemists König, Kayser, and Brockhoff.

"Dr. Brockhoff remarks the little disposition to putrefaction shown by the effluent, which is explained by the bacterioscopic observations of Dr. Wahl, who found the colonies developed in each cubic centimetre of the original water to range on different days from two to five millions, and those in the effluent from 34 to 178."

The number for May, 1887, adds as follows:

"Numerous analyses have shown no appreciable pollution of the water of rivers into which the effluents of sugar refineries, breweries, and other works have been passed; nor, in the case of Essen, even where sewage has been so treated. Drs. Otto and Beckurts, examining the sour and extremely putrescent waste of the Brunswick brewery after this treatment, found it free from all visible suspended particles —from albumen, sugar, and dextrin—and perfectly stable even under conditions most favorable to fermentive and putrefactive changes. The effluent contained (they report) neither ammonia, sulphates, nitrates, phosphates, nor products of putrefaction; and though it was rich in dissolved organic matters it did not acquire any offensive odor after being kept for long periods in closed or in open vessels. The precipitate, on the other hand, contained so large a proportion of phosphates and nitrogenous organic matters as to promise to be of considerable value as a manure. At Rossla the waste from the beet-sugar works, containing often 50 per cent. of organic solids, was rendered perfectly clear, and free from any tendency to putrefaction.

"We have already (*loc. cit.*) given some account of the apparatus set up at Essen for the treatment of the town sewage, and of the financial and sanitary results. Suffice it here to say that the subsequent success has exceeded the expectations of its promoters; the sale of the sludge for agricultural purposes has, too, gone far towards reducing the very moderate cost of working.

"In an analysis of the Essen sewage by Dr. Kaysser, of Dortmund, the suspended organic matters were found to be reduced from 366 milligrammes per litre to 12.6, the inorganic from 252 to 5.7, and the nitrogen from 155.4 to *nil*, the suspended nitrogen representing in great part the substance of bacteria. The dissolved matters dried at 100° C. from 1,390 to 634, mineral from 756 to 419, organic from 265 to 89, ammonia 42.6 to 11, inorganic nitrogen from 29 to 13, and sulphuretted hydrogen from 10.2 to 0. The lime, of which there were 70 milligrammes in the sewage, amounted to 281 in the effluents, 7 of which were in suspension, and 46 adhering in the solid state to the sides of the vessel, leaving 228 in solution.

"Three samples taken by Dr. Brockhoff of crude and of purified sewage gave, when kept in open glass vessels, results in striking contrast. After four days the former were of a yellow-brown color in active putrefaction, emitting a strong odor of sulphuretted hydrogen and other offensive gases—a condition which, even after filtration, persisted for three weeks, and only abated after the end of the month. They swarmed with bacteria, the great majority of which were spherical, and aggregated in masses, the bacilli being comparatively few and small. There was also a large proportion of fatty and tarry matters and a deposit of blackish slimy matters after the completion of putrefaction, showing the failure of merely mechanical filtration to purify such water.

"The three samples of the effluent, on the other hand, were on receipt, or four days after having been taken, nearly clear, neutral in reaction, with only faint traces of ammonia or sulphuretted hydrogen, and with a slight odor as of fresh urine. Even after standing six weeks in open vessels they remained scarcely altered, and the insignificant deposit consisted mainly of particles of chalk. There were very few bacteria and no fatty or tarry matters: the bacteria, indeed, were not more numerous than in many waters considered potable, and after two months the samples were as fresh, odorless and clear as when first received. Still more recent analyses of the same effluent made in the laboratory at Bonn gave the following results:

"In each 1,000,000 parts by weight of suspended matters—

	Crude Sewage.	Effluent.	Increase or Decrease per cent.
Nitrogen	17.1	4.3	— 75
Carbon	259.1	28.5	— 91
Lime	2.0	38.0	+1,900
Phosphoric acid	2 8	1.5	— 47
Sulphuric acid	2.1	0.0	— 100
Iron oxide and alumina	15.4	0.3	— 100

"In each million of the effluent—

Carbon	152.0	164.9	+ 8
Organic nitrogen	21.2	18.5	— 13
Nascent ammonia	25.2	18.5	— 27
Sulphur	30 8	25.5	— 18
Sulphuric acid	61.7	122.1	+ 97
Phosphoric acid	15.0	1.0	— 94
Chlorine	116.8	128.9	+ 10
Lime	100.0	246.0	+ 146
Magnesia	12.9	7.2	— 45
Iron oxide and alumina	7.6	0.0	— 100
Potash	48.9	53.2	— 10

"The results of keeping were the same as before, the effluent being only slightly clouded for a time, through the deposition of chalk, developing very few bacteria, and emitting no smell worth noticing. Though not absolutely free from sulphuretted hydrogen, it contained none of the sulphides which evolve that gas on exposure to the air, the sulphur recorded in the analyses being wholly in organic combination. The remaining salts, chlorides, sulphates, phosphates, &c., would, indeed, be favorable to the growth of plants, and no fears need be entertained of any injury to meadowlands from irrigation therewith.

"Careful gelatine cultures on Koch's method with the crude sewage, diluted in the proportion of 1 to 100,000 and 1 to 1,000,000, and with the effluent diluted in those of 1 to 1,000 and 1 to 10,000, showed in each cubic centimetre of the former when fresh 1,728,000 colonies, and after four days 12,750,000. Under the same circumstances the effluent showed 108 and 8,200 respectively. In other experiments the mean results after three days were the development in each cubic centimetre of the crude sewage of 2,980,000 colonies, and in two samples of the purified of 198 and 89 respectively.

"Drs. Blasius and Kaysser found that the number of such germs in the sewage differed greatly with the hour of day or night, the water being foulest at 9 A. M., and least so early in the afternoon. The colonies obtained varied accordingly from 1,686,000 to 5,245,000, and in samples of effluents from the same from 34 to 178, though not always in corresponding ratio.

"A very important observation, and one tending to enhance the value of the process, was that the best results were obtained when the apparatus had been some time at work, for until the sludge had accumulated sufficiently to act as a filter the number of colonies was considerable, being within a few hours of starting as high as 130,000 to 160,000."

Chemistry, mechanics and experience are each year adding to our practical knowledge of methods of dealing with the various forms of waste incident to households, factories and all that results from the aggregation of large populations. If only there could be more care on the part of individual householders and more thorough administration, it would be found that science and art are equal to most of the needs of healthful life, and that death-rates and sickness-rates could be greatly diminished. This means that labor would be more successful; the population more vigorous, and the people at large be more prosperous and happy.

THE DISPOSAL OF SEWAGE WITHOUT SEWERS.

It will always happen in rural districts, and in many of the smaller towns and cities, that sewers are not provided. Therefore, dependence will have to be placed upon other means of delivery and disposal of house wastes. This, therefore, becomes a subject by itself, and all the more because of the tendency to provide so many houses with what are called modern conveniences. It is a sad irony upon human progress if these improvements afford us unexpected facilities for getting out of the world by artificial methods. The rule is so firmly established, that we are not to store our waste and live amid or over it, that we cannot be too skillful in devising means of riddance. And it is very important that these be such as can be easily managed, and such as are within the pecuniary reach of the ordinary citizen.

The first great rule as to all refuse lodged within the house, is to get clear of it before it can undergo any process of decomposition. It is one of the most conservative facts in nature that fresh material of any kind, whether it be excretion, refuse or offaling of any kind, is harmless, so far as disease is concerned. Even where a natural, unpleasant odor is imparted, it seems as a provision for notification, before any injurious results can occur. While this is not true as to the skin diseases that are communicable, it is even true of most of the secretions of diseases. If, therefore, no material of the day is allowed to remain in the house by night, and that of the night is removed in the morning, we have a great protection from diseases. The next most general rule is that there should not be mixture of various different products. While we make an exception with some things because of the availability of water as a means of conveyance, the rule mostly holds good. This habit of separation enables us to know in each case just with what we have to deal, and thus we are more likely to deal with it more promptly. We thus have no concealment and call things by their right names and dispose of them accordingly. If the mass accumulates under the general name of an ash-heap, it is quite likely that it will be stored or overlooked as such. The next rule is to make the amount of collection as small as reasonable, and to dispose of as much as practicable by means of fire. We know a prominent health officer who so manages all dust, all peelings, all parts removed from vegetables and various other scraps as with very little trouble to pass them from the dryer to the kitchen fire.

Where there is a bath-tub, the water from it, if there is not a sewer, should not go into a common receptacle. It can be carried by a pipe of its own away from the house and seldom needs a cesspool. If it does, it can be of the most superficial kind. The same is true of the scullery and kitchen wash. If it amounts to much, there should be an outside grease-trap, and then this water, too, may pass to a very superficial and temporary cesspool. Then the product from the inside closets, having a receptacle of its own, will be so reduced in bulk as often to be relieved of its liquids by natural soakage, and so not be troublesome. It is our attempt to dispose of all in one way that generally makes the complication. We have often noted how, in this separate or separating system, even surface disposal causes no embarrassment. The grape vines or the bushes at the foot of the garden, readily care for the richer liquids, or trenches between a few short rows of sowed corn or oats receive so much of the liquids as have any undissolved matters, and they are quickly gone.

Where there is need of any cesspool system, we have lately found that two or three adjacent and superficial ones are far better than the deep vaults that were formerly in use. Since we have come to know that the chemical and biological changes of effete matter are carried on only near the surface, the chief indication is to place the material in reach of the transforming processes of nature. There is a great deal of unnecessary storage of foul liquids in large cesspits.

In an institution of over two hundred persons, we some time since had occasion to provide a simple method of caring for the waste. The edge of some rolling ground far enough from the house was favorable to the digging of a ditch in which, at different points away from each other, the house-pipes could enter. From its lower side frequent underground drains of land tile were extended. These were so provided with small wire baskets, such as are used for water-leaders, as to prevent the entrance of rags, paper, &c. During the winter, the whole was protected from the frost by a covering. We were surprised to find how available was so simple a method. It is very rarely that a lot having a depth of one hundred feet needs a cesspool, if only the methods we have indicated are adopted. We cannot but urge upon householders who possess only so little land to avail themselves of these natural and simple methods of disposal. The only limitation is where the water for drinking has to be obtained from shallow wells. Even then this surface method avails unless the amount of material is great and the depth of lot does not allow a distance from the well of at least fifty feet.

GAS, WATER AND SEWAGE HOUSE-PIPES AND CONNECTIONS.

In the present fitting up of most city and many country houses the various pipe systems play an important part. The gas-pipes, the water-pipes and the soil sewage or waste-pipes are the three principal divisions.

Leakage of gas is a far more frequent cause of air contamination than is generally supposed. The carbonaceous, sulphurous and other gases which are too often mingled with the illuminating-gas cannot but be injurious to the persons who too constantly breathe them. Often there is escape which is not noticed by the residents. The two following directions for securing the perfect fitting of all gas house fixtures have the sanction of so good an authority as Mr. Eassie:

"A gasfitter *who is a gasfitter*, and who understands his business, will never take leave of a house until he has tested the pipes for leakage. Where this trouble is taken, the ordinary practice amongst us is as follows: When the pipes have been laid throughout the house, and the company's main connected to the meter, a temporary burner is fixed to each floor of the house, and the gas is turned on. The gas is now ignited at these trial jets and allowed to burn for some little time. The main is then turned off, and at the same time the exact reading of the index is taken. When the gas left in the pipes has burnt out, the taps of the experimental lights are turned off, and if, after the lapse of an hour or so, the dial of the meter continues to indicate a consumption of gas, it is plain that it somewhere escapes, and the leak is searched for by the sense of smell, &c., and remedied."

Another description of method is as follows:

"Before the gasfitter asks the gas company to make the connection with their main, he sets about proving the pipes. He stops up, with one exception, all the outlets which have been left for brackets and pendants with plugs or with screwed caps. On the one not so stopped he attaches a force-pump, into the interior of which has been put a few drops of sulphuric ether. This pump is now connected with a gauge, and it is then set to work, generally until a high pressure is registered. A high pressure in a gas-pipe at first appears unnecessary, but gasfitters know very well that iron pipes have many latent weaknesses, so to speak—seams just ready to open, pinholes filled with grease, &c., which might not drop out for years, and a good pressure exerted would rip up the one and cause the others to fall out. When the gauge indicates a certain figure, therefore, the pumping ceases, and if the mercury falls, it is evident that there is one or more palpable leaks, which are at once sought for. The escaped ether will guide the fitter to these, and the defaulting pipes are replaced by others. The pumping is now continued, and the same routine recommences. If the mercury still descends and it cannot be detected, even by the sense of smell, the joints are separately lathered over with soap, whereupon the weak places will be indicated by bubbles. These parts are then marked, heated by means of a portable spirit lamp, made for the purpose, and covered over with an approved and durable cement. When the inspector arrives, the pump is once more set in action, and as the pipes are now tight, he has simply to cast an eye upon the gauge, the column of which no longer shows signs of sinking; examine, as before mentioned, how the pipes have been laid, and sign the requisite order."

The imperfection of *water-pipes* is generally discovered by the wetness. But this leakage may be in inaccessible places, and so the ground be kept soaked. Great care should be taken in the original construction, and there should be occasional inspection. Where there is a cistern, too often the overflow-pipe runs to the house soil-pipe, and thus, for most of the time, is a conduit for foul air to the cistern. Where this pipe has a trap, the trap has no water in it, and so is of no service. The effects of lead pipes we have considered heretofore.

Where the closets and other apparatus are directly connected with the water-supply, without an intervening automatic tank, there may be some absorption of the gases of decomposition by the water. Whether so or not will depend much on the cleanliness of pipes and fixtures. Their cleanliness depends mostly on the water-flush and the free access of air, so as to secure currents and circulation. There is also need of occasional inspection and the usual cleansing at the time of house-cleaning. We have yet to see any form of plunger-closet that does not need this occasional cleansing.

The pipes which, with the various attachments, constitute the house sewer system, are those which especially need to be guarded against any leakage or such imperfection in use as will favor the retention within them or on their surfaces of decomposing matter. The first great difficulty with which we have to contend is that of securing such pipes, traps and connections as will prevent any escape of the air of the pipes. This is a far more difficult matter than is generally supposed. A want of uniform thickness in pipes, minute seams, some slight imperfection in joining, the settling of parts of the building, the effects of rust, or the incursions of rats, and the risk which every boss mechanic runs in the unfitness or carelessness of his workman, are all to be taken into consideration. We know that this has led one famous and trusty plumber to say that he believes it impossible to make any house-pipe absolutely air-tight in the house in the ordinary methods of plumbing. The security rather should be that the pipes are made as nearly impervious as possible, are so located as to allow full inspection, and then so aired, flushed and kept as to have no harmful gas in them. The Durham system, as it is called, puts up the house sewer-pipe system entirely independent of the building that contains it, and so seeks to secure safety. It can at least be claimed that great gains in safety of construction have been made, so that inside arrangements, properly located and trapped, are not hazardous.

The use of iron pipes, or of lead, in certain easily-reached connections, the trap under each wash-bowl or other inside convenience, the extension of the soil-pipe through the roof and there open, some opening in this main line where it is to leave the house, are generally accepted. Some would have a trap just beyond this opening, to act as a cut-off from the sewer or cesspool into which the pipe ends, while a few think this unnecessary in well-kept sewers. Some would have the outside opening extended by a pipe to the roof, while others think that this does not secure so good a circulation. But these minor questions do not unsettle the general conclusions as to what constitutes a good system of house sewer-pipes.

There are various laws as to the flow of air, water and sewage through pipes, the effect of shape, change of caliber, of fall of direction, the weight of material, &c., which are not lost sight of by the physicist and the sanitary engineer, however little they may be considered by the ordinary workman. But there never was a time when science and arts and trades were so promptly handmaids of each other. So, progress is being made both by those who have head-craft and hand-craft. The one great evil is that there is so much lack in the numbers of skilled workmen and that the mechanic who knows how to do the work must so often depend for its execution on such unskilled assistants.

Now that so many and various forms of heating apparatus are used, some regard needs to be had to the effect of these upon the health of the household. These pipes, by their length or situation, not unfrequently cause imperfect combustion, and so many coal gases enter the house. Often rust causes holes in the pipes, and so there is poor draught and leakage. Sometimes a house in being heated is made to abound in draughts by the relations of the various heated pipes or surfaces to windows and other natural or artificial openings for the entrance of air. Here, again, there is need that important mechanical principles be understood and that all of the details of work be in the hands of skillful mechanics. Observation leads us to believe that the principles of all house-pipes are becoming better understood each year. So it is likely that this division of house construction will be improving, and all the more so because defects have of late been so fully specified.

LIGHTING-GAS IN ITS RELATIONS TO HEALTH.

In the last report of this Board we were able to furnish a valuable article as to illuminating-gas. While it must long remain as the chief source of light by night in cities, and as its use is so common in houses, it is well to be apprised of all risks. These are not simply those that arise from its profuse escape by reason of negligence in turning it off.

At a meeting of the London Medical Officers of Health in April last, Prof. Corfield read an article on "Outbreaks of Sore Throats Caused by Slight Escapes of Coal-Gas."

We are too apt to attribute anything deleterious in the air of houses to sewer-gas. While so often a source of danger, it is not the only pollution of house-air. Prof. Corfield gave many cases that had happened in his own experience, where relaxed and ulcerated sore throats had occurred in persons sleeping in rooms in which there were defective gas-burners or pipes, but living in houses of which the sanitary condition was otherwise perfect. That the slight escapes of gas were the cause of the sore throats, was proved by the fact that the persons attacked became quite well on the defects in the gas-burners or pipes being remedied, and that no other cases occurred. Mr. W. Blyth referred to cases within his knowledge where headache was attributable to the same cause, and also to the course of water-mains as one of the sources which conveyed it from some adjacent leakage outside of the building. Our own attention has also been drawn to this source of air deterioration. Mr. Rogers Field said that he had found so many cases where offensive smells attributed to defective sewerage were owing to escapes of gas, that it was his practice to have gas-pipes tested where there had been reconstruction of the sewer system of the house. He found the only effectual method of testing the gas-pipes and fittings was to attach a pressure gauge, and then pump air into the pipes. If the gauge stood, then the pipes were sound; if it fell, there was a leakage, which had to be found out and remedied. He gave, among others, a case from an article by Prof. Pettenkofer, on "Poisoning by Lighting-Gas," in which a priest became ill, and was visited by a person who detected an odor of gas, and insisted upon his removal. When this was effected the person who remained in the adjoining room became similarly sick. The explanation of this was that the first patient always kept his room very warm, so that it drew the gas in, whereas on his removal the fire was let out and the windows opened, and then the gas was drawn into the adjacent room. A fracture of the gas-main in the street was discovered, and the cause of all the trouble was removed. Cases like these, and facts stated in our former report as to defects of gas-fixtures and gas-burners, and as to imperfect combustion, should lead all householders to be watchful against these slight leakages, which in time are quite sure to affect the health of those of the family that spend most of the time in the house.

TREES IN THEIR INFLUENCE UPON HEALTH.

In our efforts to combine the beauties of nature with the adornments of art we sometimes lose sight of the indications for health. In the choice of a building site we naturally take into consideration the atmosphere of the locality and all that goes to make up its climate. Attention has recently been directed to our power of modifying the climate of a locality not only in a general way but to that modification we may bring about in the house we dwell in and even in the particular room we occupy. While we can avail ourselves of trees for shade, yet there are multitudes of homes scattered all over the State whose healthfulness there is reason to fear is diminished by the great number or too near proximity of trees. This arises in a great measure from the fact that in order to be of quicker service they are when planted placed too near, and then when growth makes them nearly to touch each other the owner dislikes to cut any of them down. Mr. Charles Roberts, a Fellow of the Royal Chirurgical Society, has recently presented this subject forcibly to the attention of sanitarians. We quote from his valuable article as follows:

"Trees of all kinds exercise a cooling and moistening influence on the atmosphere and soil in which they grow. The extent of these conditions depends on the number of trees and whether they stand alone, in belts, or in forests; on their size, whether tall trees with branchless stems or thickets of underwood; on their species, whether deciduous or evergreen; and on the season of the year. The cooling of the air and soil is due to the evaporation of water by the leaves, which is chiefly drawn from the subsoil—not the surface—by the roots, and to the exclusion of the sun's rays from the ground, trees themselves being little susceptible of receiving and radiating heat. The moisture of the atmosphere and ground about trees is due to the collection by the leaves and branches of a considerable portion of the rainfall, the condensation of aqueous vapor by the leaves, and the obstruction offered by the foliage to evaporation from the ground beneath the trees. The experiments of M. Fautrat show that the leafage of leaf-bearing trees intercepts one-third, and that of pine trees the half of the rainfall, which is afterwards returned to the atmosphere by evaporation. On the other hand, these same leaves and branches restrain the evaporation of the water which reaches the ground, and that evaporation is nearly four times less under a mass of foliage in a forest, and two and one-third times under a mass of pines than in the open. Moreover, trees prevent the circulation of the air by lateral wind currents and produce stagnation. Hence, as Mr. E. J. Symons has truly observed, 'a lovely spot embowered in trees and embraced by hills is usually characterized by a damp, misty, cold and stagnant atmosphere,' a condition of climate which is obviously unfavorable to good health and especially favorable to the development of consumption and rheumatism, our two most prevalent diseases.

"Now, if we examine the surroundings of many of our suburban villas and country houses of the better sort, we shall find them embowered in trees, and subject to all the insanitary climatic conditions just mentioned. The custom almost everywhere prevails of blocking out of view other houses, roads, &c., by belts of trees, often planted on raised mounds of earth, and surrounded by high close walls or palings, from a foolish ambition of seeming to live 'quite in the country.' This is a most unwise proceeding from a sanitary point of view, and should be protested against as strongly by medical men as defective drainage and bad water-supply. Many houses stand under the very drip and shadow of trees, and 'the grounds' of others are inclosed by dense belts of trees and shrubs, which convert them into veritable reservoirs of damp, stagnant air, often loaded with the effluvia of decaying leaves and other garden refuse, a condition of atmosphere very injurious to health, and answerable for much of the neuralgias of a malarious kind, of which we have heard so much lately. A very slight belt of trees suffices to obstruct the lateral circulation of the air, and if the sun be also excluded the natural upward currents are also prevented. As far back as 1695 Lancisi recognized the influence of slight belts of trees in preventing the spread of malaria in Rome, and the cold, damp, stagnant air of spaces inclosed by trees is easily demonstrated by the wet and dry bulb thermometer, or even by the ordinary sensations of the body. A dry garden, on gravel, of three acres in extent in Surrey, surrounded by trees, is generally three or four degrees colder than the open common beyond the trees; and a large pond in a pine wood twenty miles from London afforded skating for ninety consecutive days in the winter of 1885–6, while during the greater part of the time the lakes in the London parks were free from ice.

"The following hints for planting and removing trees may be useful to those persons who have given little attention to the subject. A tree should not stand so near a house that, if it were to fall, it would fall on the house; or in other words, the root should be as far from the house as the height of the tree. Belts of trees may be planted on the north and east aspects of houses, but on the east side the trees should not be so near, nor so high, as to keep the morning sun from the bedroom windows in the shorter days of the year. On the south and west aspects of houses isolated trees only should be permitted, so that there may be free access of the sunshine and the west winds to the house and grounds. High walls and palings on these aspects are also objectionable, and should be replaced by fences, or, better still, open palings, especially about houses which are occupied during the fall of the leaf, and in the winter. Trees for planting near houses should be chosen in the following order: Conifers, birch, acacia, beech, oak, elm, lime and poplar. Pine trees are the best of all trees for this purpose, as they collect the greatest amount of rainfall and permit the freest evaporation from the ground, while their branchless stems offer the least resistance to the lateral circulation of the air. Acacias, oaks and birches are late to burst into leaf, and therefore allow the ground to be warmed by the sun's rays in the early spring. The elm, lime and chestnut are the least desirable kinds of trees to plant near houses, although they are the most common. They come into leaf early and cast their leaves early, so that they exclude the spring sun and do not afford much shade in the hot autumn months, when it is most required.

"Trees are often useful guides to the selection of residences. Numerous trees with rich foliage and a rank undergrowth of ferns or moss indicate a damp, stagnant atmosphere; while abundance of flowers and fruit imply a dry, sunny climate. Children will be healthiest where most flowers grow, and old people will live longest where our common fruits ripen best, as these conditions of vegetation indicate a climate which is least favorable to bronchitis and rheumatism. Pines and their companions, the birches, indicate a dry, rocky, sandy or gravel soil; beeches, a dryish, chalky or gravel soil; elms and limes, a rich and somewhat damp soil; oaks and ashes, a heavy clay soil; and poplars and willows, a low, damp or marshy soil. Many of these trees are found growing together, and it is only when one species predominates in number and vigor that it is truly characteristic of the soil and that portion of the atmosphere in connection with it."

We desire to impress these views upon the attention of those of our citizens who have country or villa homes. Personal experience of these localities, and some facts as to consumption, rheumatism, diphtheria, and as to a general want of tone of system in those who have much indoor life in houses not exposed to wind, sunlight and the free movement of air, have led us to believe that there is much disease and much lowering of health from this cause. As valuable as trees and shade are, air and sunshine are still more valuable. Whatever keeps the ground upon which our houses are built in a damp condition, or provides a foliage so dense as to increase the dampness, is to be regarded as a hazard to health unless it is only temporary. With these cautions, it will not be found difficult so to combine the adornment of trees and shrubbery as not to exclude currents of air, and not dampen the ground by continuous shade.

IF SOME COMMUNICABLE DISEASES DEPEND UPON MICROBES, SHOULD WE BE LESS PARTICULAR AS TO LOCALITIES?

We desire here for the sake of argument to grant that many diseases are caused by the presence of microbes or minute forms of vegetative life as derived from the air or through the agency of food or water. It now becomes important to deal with a conclusion which some might claim to be based upon the admission, viz., that filth or local conditions have nothing to do with the *origin* of communicable diseases, and so the removal of filth is only of secondary importance.

As to this statement we desire in the start to make the clear proposition that the presence of (germs) or microbes in disease does not at all prove that filth or local conditions have nothing to do with the *origin* of communicable diseases, for two reasons—first, because the history of most of the diseases claimed to be microphytic or microbic, so far as we can trace it, shows their origin to have been amid the most pronounced and intolerable filth conditions; second, the chief occurrence, propagation or extension of such diseases is where filth conditions exist.

As to the first, cholera is the best-known example. We are able to assert with great positiveness when and where it began to be. We know of no one who avers for it any other origin than amid the most pronounced conditions of accumulated filth amid the great encampment pilgrimages on the Ganges. Typhus fever and its branch, abdominal typhus or typhoid, have a similar history. Ship fever, jail fever, and tenement-house fever are descriptive enough of places of origin or prevalence. Diphtheria first appears as a distinct disease in 1855, and in the English reports was directly traced to Paris, Bologne, &c., and to the "inscrutable *cabinet* where the light of French refinement never comes; there the throat is assailed by the poisonous distillations that engender disease."

Because a disease that has once occurred afterwards obtains epidemic prevalence, so that the most of the first cases that occur of it in any place are derived therefrom, does not show that the original disease did not originate from insanitary conditions; does not show but that it may still have, exceptionally, such an origin, and does not show that even yet its *prevalence* or extent of outbreak and fatality is not chiefly dependent on such insanitary conditions. In the recent address of Dr. Thorne, of London, on the "Progress of Preventive Medicine During the Victorian Era," he says of typhoid fever that the operation of the infection was traced to channels always operating through the agency of filth, and that working on this line England since 1869 has steadily reduced its death-rate therefrom to 1.7 instead of 3.9 per 10,000. He states scarlet fever, diphtheria, phthisis and cholera as similarly controlled. In advocating the prevention of filth and of all insanitary conditions we have to say that we have never yet heard of the physician or sanitarian who has ever sought to create in the minds of the public the belief that when dirt or filth are removed *all* causes of disease are gone. Who does not know that a perfectly healthy person may catch the small-pox, scarlet fever, or diphtheria? It is not asserted that *all* causes or *all* cases of any communicable disease can be prevented by the removal of insanitary conditions, but it is asserted that amid sanitary conditions far less cases are likely to occur; that single cases which have been caught are not so likely to be malignant, and that the disease is almost certain not to spread into an epidemic. It is for this reason that the leading sanitarians and physicians of the world (while recognizing that a disease may be caught by a healthy person, and so insisting upon isolation) have nevertheless never uttered a word that could be construed into an apology for dirt, filth or insanitary conditions as if they were secondary considerations in our battling against epidemics. On the other hand, they have accepted the dictum of William Farr, who says, "This is a primary rule: place the population in the sanitary conditions found by experience to be most favorable to health. Without this preliminary, all the other measures are futile. Every advance of sanitary art and practical administration has enforced this rule and illustrated its importance."

At the great International Congress of Hygiene just held at Vienna, the discussion on cholera was participated in by many of the most eminent men of Europe. At its conclusion by Professor Max Pettenkofer, of Munich, and Dr. Mosso, of Turin, Shirley Murphy, of London, drew attention to the fact that after various divergent views, "on one point all were agreed, the necessity of enforcing sanitary reform in the towns exposed to infection. This was recognized on all sides as the most effective precaution."

Whatever hypothesis may be indulged in as to "germs" or microbes, the relation of soil, overcrowding and filth to the prevalence, spread and fatality of communicable diseases is among the propositions accepted as a basis in practical sanitation. The facts in evidence as to our power to restrain and control these diseases by means of pure air, light and clean ground and enforced cleanliness, have led to this firm basis of sanitary administration as a mode of preventing epidemics. Minute forms of life perish amid pure air and sunshine and where organic matter in states of unnatural decomposition cannot be found. Sanitation does not merely mean the removal of filth. It means, sometimes, the removal of persons from their surroundings.

It means, always, the securement of pure air, in which minute forms of diseased vegetable life perish. It means light. It means the removal of dampness and of foul particles and gases. It means just what the sanitary inspector means and does when he attempts to put a house or a locality in the best sanitary conditions.

Isolation and enforced cleanliness, with all these included, are the two parallel bars upon which sanitary art is to show its powers of progression. He who neglects the first is sure to have some cases in which disease will occur in healthy persons and amid sanitary surroundings. He who neglects the second will have more. Because isolation cannot always be absolutely perfect, because we are not sure as to all that constitutes the origin of all diseases, and because experience has shown the intimate relations of filth, foul air, foul water and foods, and foul persons and clothing, to the occurrence, the spread and the fatality of disease, we shall succeed in our practical efforts for saving life in proportion as we unite *the most perfect conditions of local sanitation* with all that is feasible in isolation.

THE PERIODS OF COMMUNICABLE DISEASES.

In the diagnosis and management of diseases, and especially in determining the periods of isolation, it becomes important for us to know as accurately as possible the periods natural to each disease. In the investigation, we have two embarrassing facts to contend with. The one is that there is considerable variation. Yet it is possible to ascertain some valuable facts as to the range of this variation.

The other is that so few have kept an accurate record of all the details of a sufficient number of cases from which to deduce a law. This latter deficiency is becoming less, since numerical methods and collective systems of investigation have been more fully adopted. In 1884, Francis Vacher, medical officer of Birkenhead, gathered the statistics and views of very many who in each of the diseases named had recorded the facts. His own careful observations are also given. Dr. Dukes, of Rugby, has also collated various facts. We have for comparison also ascertained the views of several other good authorities. There are no facts that lead us to conclude that the periods of these diseases in our own country differ from those recorded by English authorities. Yet it must be confessed that opinions founded on numerous recorded statistics are scarce. We believe the table as given by Vacher the most valuable, and especially of aid if studied in its details. As to variola or modified small-pox, as the secondary fever is always less, we think that the period of cessation of pyrexia is generally shorter than stated. Whooping-cough is not included in the list. The best evidence we have found would place the length of period of prevalence at six weeks, and have the period of isolation end with the entire absence of cough. It is, however, so variable in the time of its lasting as to be difficult of classification. Measles in its period of continuance seems sometimes affected by the weather. Taking the tables herewith furnished as the best guide, we ask that physicians will carefully note future cases. In some cases as between measles and German measles the diagnosis is aided by the quickness of the rash after first symptoms and by the short risk of communicability. As to eruptive fevers we need some close studies as to whether these are mostly or only communicable during the eruption. In all these diseases, after symptoms and eruption have fully subsided, the needed period for isolation is much shortened by such thorough baths as include cropping of the hair and attention to the nails. Not only some diseases but some persons are more contagious than others.

The following is the table referred to:

VACHER'S TABLE.

DISEASES.	Time from inception to beginning of eruption.	Time from first precursory symptom to beginning of eruption.	Time from beginning of eruption to cessation of pyrexia.	Time from beginning of eruption till patient ceases to be infective.
Small-pox	13 days (range, 7 to 21 days.)	2 days (range, a few hours to 7 days.)	14 days	56 days.
Modified Small-pox	13 days (range, 7 to 21 days.)	2 days (range, a few hours to 7 days.)	14 days	35 days.
Chicken-pox	13 days (range, 4 to 17 days.)	2 days (range, a few hours to 3 days.)	5 days (range, 3 to 7 days.)	17 days.
Measles	14 days (range, 7 to 21 days.)	4 days (range, 1 day to 9 days.)	6 days	27 days.
German Measles	14 days (range, 10 to 20 days.)	1 day (range, *nil* to 3 days.)	7 days	14 days.
Scarlatina	4 days (range, a few hours to 14 days.)	1 day	7 days	49 days.
Diphtheria	5 days (range, 1 day to 14 days.)	2 days (range, a few hours to 4 days.)	14 days	28 days.
Idiopathic Erysipelas	5 days (range, 2 to 14 days.)	1 day	14 days	35 days.
Typhus Fever	19 days (range, a few hours to 28 days.)	7 days (range, 3 to 7 days.)	7 days (range, 7 to 14 days.)	21 days.
Typhoid Fever	21 days (range, 1 day to 28 days)	7 days (range, 7 to 12 days.)	21 days (range, 14 to 23 days.)	28 days.
Mumps	18 days (range, 8 to 25 days.)	4 days	7 days	21 days.

SMALL-POX AND VACCINATION.

At the time of the last report there were some threatening indications that we were likely to have small-pox more prevalent in the State than recently. Several cases did occur, but only in a single district in Atlantic county did it gain much headway. There were also several cases in one family at Colt's Neck, Monmouth county, for the care and guarding of which Dr. James E. Cooper deserves much credit.

The cases in Atlantic county well illustrated the need of well-equipped Boards in sparse country districts, ready to act as soon as any rumor of an outbreak reaches them. By the active attention of this Board and the wise co-operation of the people of the locality, extended spread was prevented.

A warning circular sent to all city Boards of the State led to some active and general vaccination and proved of much service. In our sixth report we set forth in detail all the facts in evidence as to the subject of vaccination. Each year new series of carefully-studied facts emphasize its importance. Some time since the Epidemiological Society of London appointed a committee to report on the evidence which the present state of our knowledge gives as to the conditions affecting the protection afforded by vaccination against death by small-pox of persons contracting the disease. They collected the facts as to about ten thousand cases of the disease. The *London Lancet* of June last refers to it thus:

"Speaking generally, these statistics fully substantiate the opinions previously held as to the protective value of vaccination, but when considered in detail they teach lessons which have not hitherto been fully understood. In previous papers on this subject it has been assumed that the appearances of vaccination marks are not altered as the result of time; the committee, however, have been led to adopt a different view, and the grounds upon which their opinion is based appear to be sufficient to warrant the conclusion at which they have arrived."

The report gives evidence not only that cicatrices differ much at first in their foveation or deeply-pitted appearance, but that they differ in the degree to which such foveation fades or disappears with the lapse of time. Also that the degree of protection bears significant relation to the number, distinctness and permanency of these depressions. The writer goes on to add these important facts:

"The importance of foveation, and especially of permanent foveation, is emphasized; and certainly the kind of vaccination which produces scars of this character is that which should be aimed at.

"In discussing the effect of quantity of scars, the evidence collected by the committee shows the urgent necessity for the production of the larger number of vesicles, and it may be hoped that a perusal of the report will lead every vaccinator not to rest content with a smaller number of vesicles than that recommended by the Local Government Board.

"The period of life at which revaccination should be performed must necessarily depend upon the character of the primary scars; but, under any circumstances, the statistics show that even where vaccination has been well performed a greater interval than fifteen years should not be allowed to elapse between the primary and secondary operation. Indeed, we are reminded of the conclusion of the German Commission, that the duration of the protection afforded by vaccination is on the average ten years.

"The small-pox hospitals have supplied the committee with the most positive evidence as to the immunity from small-pox conferred by revaccination upon attendants on the sick. Of 734 persons thus employed, 79 had previously had small-pox, leaving 655, of whom 10 were not revaccinated; all but these ten persons escaped small-pox, and all these ten were attacked. This should entirely dispose of the oft-repeated but erroneous statement of anti-vaccinationists that small-pox attendants escape disease from the fact that they are recruited from those who have already passed through an attack of small-pox. It is, indeed, impossible to read the evidence adduced on this point without understanding that it is within the power of every person absolutely to protect himself from all attacks of this disease."

We again urge upon all not only the importance of the subject but upon physicians the importance of noting and being guided by the minor details which determine between partial or exhausted or complete protection. The following extract shows how much one risk has been overstated:

On the 23d of August, 1887, in reply to Mr. Picton, Mr. Ritchie on behalf of the Local Government Board, said that:

"The Board are aware of the cases of vaccino-syphilis which are referred to in Mr. Hutchinson's publication. Three out of the six cases referred to in the question as a 'long series' related to single cases, and the most recent of any of the occurrences related took place between ten and eleven years ago. The Board have the authority of Mr. Hutchinson for saying that though he has been diligently on the look-out for similar cases during the ten years' interval, he has failed to meet with any. In his recent work, published this year, on the subject, Mr. Hutchinson says: 'There certainly cannot be any difficulty under ordinary circumstances in procuring vaccinifers which are absolutely free from risk.' Mr. Hutchinson's experience was in these respects entirely confirmatory of that of the Board, which is to the effect that although three-quarters of a million of children have been vaccinated annually for many years past, not a case of the communication of the disease in question by vaccination has come under their observation."

Since the introduction of bovine lymph even this need not occur.

CHOLERA QUARANTINES.

The ravages of cholera in Italy and at points along the Mediterranean, as well as in South America, and our close commercial relations with ports exposed, made it no surprise that some vessels have arrived bringing this disease to the quarantine station of the State of New York. Fortunately there has thus far been no extension of the disease. The importance of better-equipped and better-administered quarantines has been so emphasized by some defects which have been discovered that it is believed new and more thorough precautions will be taken. Our own relation to the chief stations is such that we are fearfully exposed to the evils of any inefficiency of service at these points.

Nor is it cholera alone against which we need to guard. Epidemics of measles, scarlet fever and small-pox are known to have their rise in the same way. The quarantine officer at Stapleton claims that he is helpless in guarding sufficiently against all these. The past year we had an instance of what might easily have been a serious exposure in the case of a vessel not properly detained at New York quarantine which sought entrance at Jersey City, Elizabeth and Perth Amboy. The experience at the latter place with ship fever is another illustration of our exposure. In case of threatening epidemic it is a question whether there should not be examination of all passengers and baggage landed at Jersey City, Hoboken or other of our ports. Indeed, would it not be wise to organize such a service as a preventive rather than wait for the necessity to occur? Besides, this State has such railroad relations that it is perhaps more liable to invasion by transportable contagions than any other State. We respectfully suggest this matter as deserving the early attention of the Legislature. Any contagious disease finding a center and becoming epidemic in Hudson or Camden counties would be a great peril to the sanitary and financial interests of the State.

This Board has kept itself in close correspondence with officers of adjacent States and with local authorities.

REMOVAL OF GARBAGE, REFUSE, ETC.

It is only necessary to have thorough appliances and an orderly administrative system for our cities to insure the removal of all forms of garbage, refuse or decayable matter. While there comes to be a limit to the degree and economy by which such materials can be disposed of in water or on land or as raising the land in the outskirts of cities, there is practically no limit to its destruction by fire. Cremators or incinerators of recent and improved patterns are now in use in England and in some of our American cities, which assure the feasibility of this kind of disposal.

Many of our larger cities should turn their attention to these, as they so much facilitate in the disposal of those substances which cause foul air, bad water and a lowering of vital power as well as fatal disease. We have on hand the details as to these and are ready to give to Health officers full particulars.

DISINFECTING APPARATUS.

No considerable town should now be without some form of stove or furnace for dealing with clothing which may contain the contagion of disease. The most of them are simple in construction and moderate in expense. The Ransom was the form mostly used until recently, when various improvements have been made. The most of these are well described in the report of the Committee on Disinfectants, as found in the twelfth volume of the A. P. H. Association, 1886, pp. 198–228.

THE PASSAIC RIVER.

During the present year very active discussion has been renewed as to the Passaic river. In its upper portion great damage to property and some injury to health have resulted from the overflow caused by obstruction, and especially by the dam at Little Falls. We have had occasion to meet several Boards of Health of the townships concerned, and to examine, both by inspection and careful testimony, the evidences of injury.

If any one thing is proven as to sanitary needs it is that drainage is conducive to health, and that such interference with the natural course of rivers, amid rich lands and large populations, is fraught with the most serious results to the vigor of the people. The facts as to this region have been from time to time set forth in the reports of the State Geologist, and from a sanitary standpoint are fully confirmed by our own observation. We trust that some method will be devised either by the courts or by legislative act for the relief of the people of this large and valuable section of the State. The continued pollution of the Passaic as affecting the water-supply of Newark and Jersey City and parts adjacent, has been closely pressed upon our attention. In a spirit of careful inquiry we have instructed one of the Committee of Chemists of this Board to make some special examinations of a chemical and biological character, while other members of the committee are inquiring into the significance of facts and opinions as heretofore presented. A portion of the report of the committee will be found in this report.

We trust that these and others of our growing cities will have the foresight to command, for the great necessities of the future, the wonderful storage opportunities still within reach, and not leave themselves to be placed in dependency upon more active and far-sighted corporations. If the people are listless as to their interests and opportunities such combinations come to be the necessary substitutes.

THE LEGAL ASPECTS OF THE POLLUTION OF STREAMS.

BY E. S. ATWATER, COUNSELOR-AT-LAW, ELIZABETH, N. J.

The subject of pollution of streams involves questions of practical experience as well as law. Streams of water have been found to be a very convenient means of disposing of refuse and filth. In sparsely-settled countries, this process is one from which little harm is likely to result. As, however, population increases and cities and towns become more numerous and extensive, if this course is still pursued the volume of foreign substances is vastly increased and the pollution of the streams is the result. While the water of the streams is needed for other and more important purposes, yet it is rendered unfit for such purposes, and the greater the need the less fit is the water for use.

To what extent rivers should be used for the purpose of carrying off sewage, is a question of the highest practical importance. We all know that they are availed of for this purpose to a large extent in this State, it being the simplest solution of the sewer question to let them empty into a water-course wherever possible. It would be outside of the scope of this paper to enter into a scientific discussion of the best methods of disposing of sewage. At the same time it is obvious to remark that if a simple and comparatively inexpensive method shall be found of eliminating the solid from the liquid elements of sewage, a long step will have been taken in removing the difficulties of dealing with the question of pollution of streams. Another fruitful source of the pollution of streams is the discharge of the refuse from manufactories, especially those using dyes and chemicals mixed with a considerable quantity of water. There are a large number of factories which find streams a very convenient means of disposing of such discharge, which varies in its pernicious influence according to the size of the factory and the nature of the materials used. Even the rivulets and brooks are sometimes so polluted that they become unfit for use for cattle. My attention has been called to the fact that such a case is now before the State Board of Health. Sometimes it is discovered that far up near the source of a stream there is a foul place which drains into it.

The germs of typhoid fever and other diseases have been carried from such sources into unsuspecting communities, and their origin has only been discovered when sickness and death have led to an examination to find out the cause. This subject is not without suggestiveness when we consider the streams as the abode of fish. It is specially important, however, with reference to furnishing water-supply for man and beast. A distinction is made in the books between the primary and secondary uses of the water of streams. The first refers to the water coming in its natural purity so as to be fit for ordinary domestic purposes, and the second refers to cases where streams have been given over to other uses, such as manufacturing or other purposes, which tend to make the water more or less unfit for domestic use.

It may well be questioned whether the same rules should apply to all streams. In regard to navigable streams, particularly as they approach tide-water, it would seem to be impossible to keep them altogether free from pollution. A stream may be so situated with reference to cities located upon its banks and to factories in close proximity, that any attempt to keep it free from some degree of pollution would be unavailing, especially when it is used for purposes of navigation.

It may well be questioned whether discrimination should not be used in reference to the enacting or application of laws in regard to the pollution of streams, so that streams which have been for a considerable period given over to these secondary uses should be left for such uses, while rules and regulations relating to other streams necessary to the water-supply of cities, towns and villages should be rigidly enforced.

The subject of the pollution of streams has given rise to much litigation, particularly in England where the population is dense and towns are more numerous in proportion to the area than here, and of course the demand for water is greater and the respective rights of parties bordering on streams, owing to their proximity, are likely to clash.

The law on this subject has been stated in our courts:

"Every owner of land through which a stream of water flows is entitled to the use and enjoyment of the water and to have the same flow in its natural and accustomed course, without obstruction, diversion or corruption. The right extends to the quality as well as the quantity of the water. If, therefore, an adjoining proprietor corrupts the water, an action upon the case lies for the injury." Holsman *v.* Boiling Spring Co., 1 McCarter 342.

"No one has the right to pollute or corrupt the waters of a creek, or, if they are already partially polluted, to render them more so. All whose lands border on a stream have the right to have its waters come to them pure and unpolluted." Attorney-General *v.* Steward, 5 C. E. Green 415.

From these statements it will be seen that in the eye of the law, the pollution of a stream of water is a nuisance from which the owner of property along its banks may be protected both by action for the damages suffered and by injunction to prevent the continuance of the nuisance.

As an illustration of how far the courts in England have gone in the direction of protecting parties in their rights in this regard the case of Goldsmid *v.* Tunbridge Wells Improvement Co., L. R., 1 Ch. App. 349, may be cited. In this case the plaintiff was tenant for life of an estate in which was a lake or pond used for watering cattle and in the winter for the supply of ice for domestic purposes. The lake was fed by a brook which ran through the village of Tunbridge Wells. The defendants were commissioners under an act for lighting, cleaning and improving the town of Tunbridge Wells, which gave full powers to drain the town, to make sewers and to turn any drain or sewer into any common ditch or water-course. The sewage of the town was discharged into the brook, and had been so discharged for several years, but the town had been constantly growing, and thus the amount of sewage had been constantly increasing, so that at the time when the action was brought, the water in the plaintiff's lake, which up to within a short period had been fit for domestic uses of all kinds, had become unfit even for the purpose of watering cattle or furnishing ice for domestic use. The court held that the discharge of the sewage of the town into the brook was a violation of the plaintiff's right, and a nuisance, and the defendants were restrained from continuing it.

As between the upper and lower owners of the banks of a stream, the right to foul the water may be acquired by its continuance for twenty years; in other words, by prescription. But this gives no right to increase the pollution. And as against the public no such right can be acquired. In a case in which an action was brought against the defendant for maintaining a dam whereby the water of a stream was set back upon the plaintiff's premises in such manner as to become stagnant, whereby the atmosphere was impregnated with unwholesome vapors which caused sickness, the court said: "There is no such thing as a prescriptive right or any other right to maintain a public nuisance. Admitting that the defendant's dam has been erected and maintained more than twenty years, and that during the whole of that period it has rendered the country unhealthy, such length of time can be no defense to a proceeding on the part of the public to abate it, or an action by an individual for the special damage which he may have sustained from it." Mills *v.* Hall, 9 Wend. (N. Y.) 315, cited in Wood on Nuisances 315.

From these citations it appears that the common law recognizes and enforces the right to have streams of water flow in their natural purity and that it is especially jealous of the rights of the public and is ready to exercise its powers for the abatement of a public nuisance, no matter how long the same may have existed.

The subject of the pollution of streams has received some attention from the Legislature of this State. In the year 1876 an act was passed, entitled "An act to prevent the willful pollution of the waters of any of the creeks, ponds or brooks of the State," to which a supplement was passed in the year 1880. The main features of these acts are that if any person shall throw or cause, or permit to be thrown, any carcass, offal or offensive matter into any reservoir or any creek, pond or brook, the waters of which supply any reservoir for public distribution, or shall connect any water-closet with any sewer, whereby the contents thereof may be conveyed into any such creek, pond or brook, or shall cause or permit any such carcass, offal or offensive matter to be deposited so that the washing or waste therefrom may be conveyed to any creek, pond, brook or reservoir, such person shall be deemed guilty of a misdemeanor and be liable to a fine of $1,000 and imprisonment for two years. The second section of the law requires the prompt burial of any such carcass, offal or other offensive matter at a distance of not less than two hundred feet from such stream or brook under the same penalties as before.

In the year 1884 an act was passed to prevent the discharge or escape of sludge acid into and upon the waters of this State. By this act it is made unlawful for any person or persons, corporation or corporations to permit the discharge or escape, directly or indirectly, of such refuse or residuum resulting from the refining of petroleum, as is commonly called "sludge acid," into or upon any river, stream, water-course, lake, pond or other body of water, or any tidal waters within or bordering upon this State. Any violation of the act is to be deemed a public nuisance and punishable as such. All who have had any experience of the unwholesome character of this acid will agree that the law cannot be too vigorously enforced.

In 1882 a law was passed making it a misdemeanor to pollute, corrupt or render impure the ice in front of the lands of persons having ice-houses upon the waters of this State.

A law of 1885 gives power to Boards of Health of cities to regulate and control the sale of ice therein and to prevent the procurement of ice from any pond, creek or river within the limits of any such city.

The statutes above referred to are, of course, right and proper, and should be enforced. It will hardly be claimed, however, that they afford a complete and adequate protection against the pollution of streams. The protection of the sources of water-supply to meet the wants of the increasing population of this State requires something more than mere penal statutes, however carefully devised. In other words, the necessity of maintaining the purity of the water-supply is so great that *preventive* as well as punitive measures are required, for it is manifestly better, if possible, to prevent foul substances from being thrown into the water than to punish some person after the pollution has taken place.

That there is, within the borders of this State, an ample water-supply for the needs of the people for the present and future, if properly conserved and protected, is a fact which will be admitted without debate. Important questions here arise as to what control, if any, the State shall exercise over these waters, whether it shall in some manner and by some constituted authority maintain a supervision of these waters in the interests of the public health, in the exercise of the police power, or whether it shall, in the exercise of the right of eminent domain, take possession of these waters in the interest of the general public and furnish supplies to communities requiring the same. Of course the exercise of the right of eminent domain implies compensation to private owners, and any such system would involve the payment by the communities benefited. Still further, whether the State should delegate the right to one or more companies or corporations to take possession of these sources of water-supply upon compensating parties whose rights may be affected, with power to build storage reservoirs and aqueducts for the purpose of supplying the communities requiring water. It is not within the scope of this paper to discuss the feasibility or expediency of either of these latter plans. It would seem, however, that if it were finally determined that certain streams and lakes should be set apart for purposes of water-supply, and if they were taken possession of for that purpose, that little difficulty would be found in framing proper regulations by which their purity might be protected. The proper control and distribution of these waters are of vast importance to the welfare and prosperity of the State.

In this State, commissioners were appointed under an act entitled "An act to provide for the appointment of commissioners to determine upon plans for the storage of any of the waters of this State for the purpose of furnishing to cities and towns a joint water-supply," passed in 1882. The object of this act is indicated by its title. The commissioners can only act when applied to by the aldermen or other governing power of a city or town, and their powers are only to make recommendations. When their work in any case has so far proceeded as to be accepted by the cities or towns concerned, an act of the Legislature is required to carry it into effect. The commissioners have presented valuable reports to the Legislature. This act, so far as I am aware, is the only one on our statute-books in any way relating to a general supervision of water-supply. The work of these commissioners is simply advisory.

In this connection it may not be amiss to refer to the question of the title to streams and lakes, &c. This subject has been much considered in the courts throughout the United States and elsewhere, and the same rule does not obtain in all the States. In this State it has been held that "all waters are divided into public waters and private waters. In the former the proprietorship is in the sovereign, *i. e.* the State; in the latter in the individual proprietor. The title of the sovereign being in trust for the use and benefit of the public —the use which includes the right of fishing and of navigation—is common. The title of the individual being personal, is exclusive—

subject only to a servitude to the public for navigation, if the waters are navigable in fact. The test by which to determine whether waters are public or private is the ebb and flow of the tide. Waters in which the tide ebbs and flows, so far only as the sea flows and reflows are public waters, and those in which there is no ebb and flow of tide are private waters." Cobb *v.* Davenport, 3 Vroom 378. In brief, the law appears to be in this State that the riparian owner on the banks of a fresh-water stream owns to the center of the stream. In the case of Society for Establishing Useful Manufactures *v.* Morris Canal Co., Sax. 187, the Chancellor said: "They [the Society] are the riparian proprietors, and upon plain and acknowledged common-law principles they are entitled to the use of the stream. They have in it a property growing out of the ownership of the soil, which is oft-times of more value than the soil itself, and at all times is sacredly regarded by the law. This being the case, they have a right to enjoy it without diminution or alteration." "The right is not confined to the use of so much of the water as may be necessary for their present purposes. They have appropriated to themselves the use of the stream. They have a right to take out the whole of it for the purpose of their manufactories, provided it is again, after being used, restored to the bed of the river for the benefit of those below; and provided, also, that no one having prior rights is thereby injured. Such I take to be the common-law rights of this society, independent of any additional privileges that may be secured to them by their charter." This doctrine was re-affirmed in 1864 in a case reported in 2 C. E. Green. It will be noticed that it is not an absolute property in the water that is referred to here. It is the right to *use* the entire flow of the stream, providing that the water is returned to the stream.

It has seemed to me proper, in order to an understanding of the subject with which we have to deal, to enter somewhat into the question of the title to these fresh-water streams as the same has been set forth in our courts. But it by no means follows that the State has no control over them. And while the riparian owner has the right to the use of these waters, it is, after all, *only* the use. Indeed it has been said that, properly speaking, there is no property in water, only in its use. Washburn on Real Estate, Vol. II., pp. 63 and 65.

Where protection of these waters is necessary for the public health the State may, in the exercise of its police power, maintain a supervision over them to prevent their pollution. The doctrine of the right of the State to exercise jurisdiction and control over this class of streams is laid down in the books. See Wood's Law of Nuisances, § 472. See, also, Carfield *v.* Coryell, 4 Wash. U. S. C. C. Reports 371.

In Massachusetts such supervisory powers are now exercised. In the year 1886 "An act to protect the purity of inland waters" was passed in that State. The State Board of Health was the body entrusted with the carrying out of the provisions of the act. The principal duties of the Board under the act are, in brief:

1. To have the general care and oversight of inland waters.

2. To have the custody of maps, plans, &c., made for this purpose.

3. To recommend legislation and suitable plans for systems of main sewers.

4. To cause examination of the waters of ponds and streams to be made.

5. To recommend measures to prevent the pollution of waters.

6. To conduct experiments on the purification of drainage.

7. To conduct experiments on the disposal of manufacturing refuse.

8. To consult with and advise the authorities of cities and towns, or with others, in reference to water-supply and drainage.

9. To consult with and advise manufacturers with reference to the disposal of manufacturing refuse.

10. To bring to the notice of the Attorney-General all omissions to comply with existing laws.

From the foregoing summary it will be seen that the Massachusetts law confers on the State Board of Health similar duties to those entrusted to the commissioners in this State, in relation to communities seeking a water-supply, and also duties in relation to the pollution of streams and to devising means to prevent such pollution and to obviate its cause. It may be questioned whether it is wise to follow altogether in the line of the Massachusetts law, but the statute is valuable as showing the method of dealing with this subject in another State, where the number of large inland towns, especially the manufacturing places, situate on streams of water, have forced into consideration the necessity of preserving the purity of the waters of these streams, and the necessity of the disposition of sewage and the refuse from factories. Doubtless much may be learned from the experience of that Board in this matter, as the same will be presented in their annual reports from year to year. That similar duties, however, should be entrusted to the State Board of Health in this

State, or some other competent authority, would seem to be a wise policy. In case of streams actually used for furnishing water-supply, and reservoirs also, it would seem that some sort of a patrol or frequent inspection should be maintained, so that where anything is being done to pollute a stream it may be discovered and prevented. The preventive effect of such patrol or inspection would be very great, and has already been exercised in a few instances.

AIR, WATER AND FOOD.

BY EZRA M. HUNT, M.D.

As air, water and food are the materials from which the human structure is sustained, no question can be more important than how we are to obtain these in such purity and so prepared as to be adapted to human needs. It is for this reason that each of these so largely occupies the attention of the sanitarian. Science and art are constantly busy in throwing light upon this question, and experiment and experience are putting to practical test the claimed deductions of science. No one who studies these subjects but that knows that there is progress all along the line. Our greatest difficulty is in securing the practice of all that is known. Even for this, administration is doing much.

As to the air, the first studies have relation to those laws of Nature which determine the climate. The studies of climatology are being pursued with great zeal, and are revealing many of the influences which determine the climate of a given locality. The advantage of this is that we can foretell and so avoid exposure, or that we can to some degree modify, as by choice of site, trees, sunshine, &c. When unable to do this we can make choice of the climate suited to us with more intelligence. The local modification of one's own atmosphere is no longer one of the mere possibilities. It is being utilized in the fitting up of houses in the modes of introducing air and in the general adjustment of surroundings.

So soon as Priestly made his discovery as to the normal constitution of air we had a standard of comparison. By one step after another we have advanced to a knowledge of the various modifications of air and the various causes of impurity. For a long period we were wont to think that carbonic acid, more correctly called carbon dioxide, was the chief source of impurity. But it was found that a much larger proportion of this existed in some air artificially made, which was breathed with comparative ease. So, attention came to be directed to the fact that the new methods of determining the organic matter in air are being employed. (See Marion Talbot, A.M., on the "Determination of Organic Matter in Air."—*Technology Quarterly*, Vol. 1, No. 1.) Organic matter contained in the breath was of much more moment than the carbonic acid in itself considered. In fact, the amount of this has been considered recently as mostly important as an index of the organic matter. But now there is still further progress. The character of the organic matter, both as to quantity and quality, is found to have many variations. So, not only is one odor more significant than another, but where there is no perceptible odor there is variety of contents.

"The progress made in hygienic researches by the application of bacteriological methods has been nowhere better exemplified than in the investigation of air. Dr. Percy Frankland has pursued the subject in this country with much profit, and there has lately appeared in the Philosophical Transactions a paper by Professor Carnelley, Mr. Haldane and Dr. Anderson, of Dundee, which should be carefully studied by sanitarians. The investigations here described consisted in the analysis of the air of dwellings as regards carbonic acid, organic matter and micro-organisms, the carbonic acid being estimated by the method of Pettenkofer, the organic matter by that of Carnelley and Mackie, and the micro-organisms by that of Hesse. As regards dwellings, their inquiry involved a comparison between houses of from one to four rooms and upwards, and the composition of the air within these tenements with that without. As an example we may cite from one of the numerous tables the following figures, which represent the average quantities in one-roomed houses, relatively to those in houses of four rooms and upwards (which are taken as 1): cubic space per person, 0.11; carbonic acid, 2.0; organic matter, 4.4; micro-organisms, 6.7 (bacteria, 6.9; moulds, 3.0). The carbonic acid, organic matter and micro-organisms all diminish in quantity as the cubic space per person increases from 100 to about 1,000 cubic feet; but beyond this capacity there is a slight increase in these impurities, which is attributed to inadequate ventilation of the larger rooms. An instructive comparison is made of mortality statistics with the composition of the air of these dwellings—the death-rate increasing in proportion to the rise in impurity of the air, there being a very rapid increase in the death-rate among young children, and the mean age at death being very greatly lessened. The death-rate from phthisis is lower in those living in one and two-roomed houses than in those living in three rooms, but this anomaly is readily explained when the early mortality of the former from other diseases is considered. Thus the death-rate per 10,000 from (1) diarrhœa, acute bronchitis, broncho-pneumonia and meningitis is—for dwellers in four rooms and upwards 19.6, for those in three rooms 27.6, for those in two rooms 39.7, and those in one room 59.8; from (2) phthisis the rates are respectively 13.0, 27.6, 24.4 and 14.6. The inquiry also showed the effect of impure air in promoting pulmonary disease; and as regards infectious disease the mortality from measles and whooping-cough seemed distinctly connected with the class of house, whilst, contrary to expectation, no such relation held for diphtheria. The memoir also enters fully into the subject of the composition of the air of schools, of mills and factories, and of the Royal Infirmary, Dundee, and proves that the determination of carbonic acid alone is not a sufficient indication of the purity of a sample of air. We can only mention the very exhaustive study of the conditions which influence the excess of organic matter and micro-organisms, and the proofs of the superiority of mechanical over natural ventilation, but may state that the authors give as 'standards of purity' the occurrence of 10 vols. of carbonic acid per 10,000 in the air of dwelling-rooms, and of 13 vols. per 10,000 in that of schools—or an excess over outside air of 6 vols. in the one case, and 9 vols. in the other. These limits should not be exceeded. Nor should the excess of organic matter within the house over that of the air outside be equivalent to more than 2 vols. oxygen per 1,000,000; and the excess of micro-organisms should not be more than 20 per litre. Of these three classes of impurities, the carbonic acid (in the amounts mostly present) is the least deleterious to health, being compensated for by increased frequency of respirations; but the 'organic matter' probably has a great effect in lessening the health and predisposing to disease; whilst micro-organisms, apart from specific infection, may be responsible for broncho-pneumonia, so frequent and fatal a complication of the prevalent bronchial catarrh and other affections. The paper concludes with suggestions of remedies—especially the adoption of mechanical ventilation and improved ventilation by means of open grated windows in landings in block tenements; other recommendations, such as the avoidance of keeping lamps burning at night, the adoption of cleanliness, attention to frequent renewal of air as of more importance than the size of the rooms, and the construction of windows so that they can be freely opened at intervals to allow a good current of air to be sent through the rooms, are such as will commend themselves to everyone."

Besides, we are coming to take cognizance of various admixtures of the gases of decomposition as well as the presence of particles from the animal, vegetable and mineral world, some being in a state of vitality and other parts in a state of more or less decomposition. We shall therefore be able more and more not only to speak of impure air in general, but to characterize the impurities and prevent or neutralize them. This is no doubt the reason why some air not more excessive than some other, in carbonic di-oxide, is found more injurious. The further we get in this line of inquiry the more the evidence accumulates that our schools, our factories, our assembly-rooms and our homes must be studied in relation to the air they contain. Nothing so insidiously and so surely saps vitality as the constant dependence upon improper air. Especially in childhood does it lower vitality and diminish the formative vigor of life, while in adults it embarrasses vital force and shortens the effective work-life of artisans.

Prof. Leeds, at the instance of the Board of Education of Hoboken, has made some examinations of school-room air which have shown such results as have led to a bettering of conditions as shown by subsequent tests. More reliance will have to be placed on mechanical methods. These have been greatly simplified and cheapened. Some of these consist of fans and similar appliances, while others supply air by an air compressor worked by a gas engine, so that fresh air is turned on or off as is gas or water.

It is a great satisfaction that we are not only having dissertations on the evils of foul air but are getting at facts and at practical modes of relief. But it is ever to be remembered that nothing can compensate for a continuous enforced in-door life and that a part of life should be spent out-of-doors, and especially that children must have the benefit of vigorous exercise in the open air. The welfare of the people of the State so much depends upon some knowledge as to the air conditions of health, that under the heads of "Impure Air and Death Rates," "Carbon Dioxide, Organic Matter and Micro-Organisms in Their Relations to Impure Air," and "School-Room Ventilation," we present the following notes and reflections:

IMPURE AIR AND DEATH-RATES.

It has long been accepted as settled that the breathing of impure air is unfriendly to health and life. Yet no question is more frequently discussed than what constitutes unsafe impurity and what are the most serious degradations of pure air. Until recently our chief mode of comparison was to obtain a knowledge of the quantity of carbonic acid (carbon dioxide) by the Pettenkofer method, and accept this as the statement of other impurities. Parkes, and afterward Dr. de Chaumont, had made this a standard. Dr. de Chaumont, putting the quantity in ordinary air at four volumes per 10,000, gives six (6) volumes in 10,000 as the maximum amount where proper ventilation is secured. When it reaches eight in 10,000 he calls it no longer good, and decidedly bad when it reaches ten volumes in 10,000.

So soon as biological studies showed the relations of organic matter and of different varieties of it in different degrees of unstable change, and so soon as the quantity and quality of microphytes or micro-organisms came to have some determinate significance, it was evident that there must be direct study of these factors in forming judgment as to the purity and impurity of air. There has been considerable investigation of these subjects, but we know of none so recent and valuable as the conjoint work of Messrs. Carnelly and Haldane, of University College, Dundee, and that of Dr. Anderson, the medical officer of health of this same city of over 150,000 inhabitants. Their article and the details of their experiments were presented by Sir Henry Roscoe to the Philosophical Transactions of the Royal Society of London, in the summer of 1886. The object was to examine the air of various classes of houses in order to compare the carbon dioxide, the organic matter and the micro-organisms with one another and with the death-rates in these houses. This led to a study of what are ranked among laborers' houses as one-room, two-room and three-room houses; to a comparison of school-rooms as to cubic space and the effects of different methods of ventilation, as also some investigation into the sources of the organic matter and the micro-organisms found. We are at first wisely reminded that the tests which are the best for determining organic matter do not decide its varied kinds, although some of it is far more harmful than other varieties. The number of micro-organisms, also, does not settle questions of quality. For these the Hesse method was used. Without presenting all details, we wish to bring to notice some of the most painstaking and conclusive results.

Several experiments showed that the average of carbonic acid and organic matter was uniformly higher in town than in suburban or country air, the difference being relatively much greater in organic matter than in carbonic acid. The quantity of organic matter, at least in town air, varied within much greater limits than that of carbonic acid.

The influence of day and night, and of open and closed spaces, was also tested. In open places the carbonic acid during the night was less than during the day, as also the organic matter. Of both of these there was more in close than in open places. Micro-organisms as well as organic matter were less at night than during the day. So far as organic matter is concerned this is in part accounted for by the greater stillness of night, so that the organic particles are not set afloat.

In examination of air in houses, one and two and three-roomed houses were examined, and also four-roomed and larger houses, as standards for comparison. Putting these last at one, the two-roomed houses had 1.5 carbonic acid, 1.6 organic matter, and 5.1 micro-organisms, while the one-roomed houses had 2.0 carbonic acid, 4.4 organic matter and 6.7 micro-organisms. The carbonic aid, organic matter and micro-organisms diminished in quantity as the cubic space per person increased from 100 to 1,000 cubic feet. *Beyond* 1,000 cubic feet the micro-organisms showed a slight but distinct increase. The authors suggest the following explanation for the anomaly:

A large bed-room of say 3,000 cubic feet has usually about the same means of ventilation as one of only 1,000 cubic feet. So the air will be changed less frequently in the larger than in the smaller room, and, in the former, portions of the air at least may be more stagnant. If this be true for bed-rooms without special means of ventilation, 1,000 cubic feet of sleeping-space per person is the best. Our authors, by the diligent assistance of the officer of health, were able to study closely the relation of impure air to death-rates.

The extent of the examinations and comparisons is shown by the fact that it embraced a sufficient number of houses to include 3,119 deaths. The conclusions arrived at from the tables have been already given.

Some similar comparisons were made by Kötösi in Buda-Pesth. These showed that of all that died above five years of age the mean age in the best class of houses was 44.2 years, in the middle class 42.2 and in the worst 39.9. The mean age of those who died in the worst-class houses under five years of age was one year and among the rich 1.3 years.

The tables of our authors show the death-rate by phthisis highest in *three-roomed houses*, which they account for by the fact that pulmonary consumption is seldom in the form of tuberculur disease in young life, and in one and two-roomed houses much fewer live to the consumptive age, so as to diminish the material and so make the actual death-rate lower.

As we pass from four-roomed to one-room houses there is much increase in acute bronchitis and broncho-pneumonia, as also in mortality from measles and whooping-cough, both of which depend so much for their mortality upon pulmonary inflammations. This corresponds with the statistics of Kötösi. (Annales d'Hygiene Publique, Vol. XIV., 1885, p. 571.)

There seems some difficulty in accounting for the fact that one-room houses do not show any marked increase of cases of scarlet fever and diphtheria.

Our authors suggest the hypothesis that scarlet fever has no secondary broncho-pneumonia, and so the tissue is not attacked by micro-organisms, as where mucus favors it. It is also claimed that the same is true as to diphtheria except where the specific poison excites the inflammation. We think this apparent anomaly must still be *sub judice*. It does not seem to be peculiar to Dundee, as Kötösi notes the same as to his statistics of Buda-Pesth. It does, however, appear that Dundee had an epidemic of scarlet fever the previous year, and the death-rate was then at least a third greater in one and two-roomed houses.

Another fact that appears is one as to longevity, viz., that there is a much larger proportion of old people living in the better than in the worst class of houses. The paper is a most valuable addition to our experimental knowledge of the effect of foul air on health and life.

CARBON DI-OXIDE, ORGANIC MATTER AND MICRO-ORGANISMS IN THEIR RELATIONS TO IMPURE AIR.

Absolutely pure air, like absolutely pure water, is very scarce. But not less valuable is a knowledge of what it is, if only we determine what and how much are those impurities which render it undesirable for breathing purposes. As to some of these we are able to determine very readily. Thus, sulphurous acid and many other gases soon advertise its unfitness for respiratory purposes. So, certain stenches are so noxious as soon to declare themselves as foreign to the constituency of good air. Dust and perceptible organic or mineral particles of various kinds do not need much consideration to show that they were not meant for the lungs.

So far as close and practical inquiry is concerned we have chiefly to do with three classes of admixtures. These are carbonic acid, organic matter and micro-organisms. Of these the first is most easily considered, because it is a simple and definite chemical gas, whose properties can be accurately defined. We know it to be unfavorable to sustained life. But we also know that in the usual amount of four volumes in 10,000, as it occurs in the atmospheric ocean, it does no possible harm. Indeed, we know that if we could have only the pure nitrogen and oxygen in their air proportions and increase the amount of carbon dioxide up to fifteen volumes per 10,000 we would, in the great open, have no appreciable result. Therefore the determination of the absolute quantity of it in air is not *alone* the criterion of purity. As, however, found in ordinary dwelling-houses and rooms in the summer, in the absence of fires and lights, it is an important study, since in these cases it presents the results of human respiration, in which the amount of it is found to bear relation to a process in which oxygen is also being removed and this non-vitalizing gas substituted in its place, together with organic matter. It is found to bear a pretty definite proportion to the quantity of organic matters in an unstable and decomposable state which are given off by the lungs. When it is kept in mind that expired air contains nearly 440 volumes of carbonic acid per 10,000, and that it is rare to find in close, populated houses more than forty volumes of carbonic acid per 10,000, we see how full of adjustment are the resources of nature. So uniform are the relations and the processes of life and of the diffusion of the respiratory products, that its determination is of great general value as a guide. Those who accept it as such also know how to make allowance for disturbing incidents.

"Organic matter" is a far more general term as applied to certain contents of air, and its presence is oftener fraught with serious consequences. But so much depends upon the kind or quality of organic matter and upon its state of stability or change that these, too, must be fully known. Even our tests mislead us somewhat, for sulphurous acid, if present, and some other compounds, respond to the test and cannot always be recognized as disturbing the result of the test in its specific meaning. So its determination as to rooms and to the usual conditions of what may be called "nostalgia" or home-sickness, in a special sense, is valuable because if produced by human beings we know its deleterious and unstable character and can generally take into consideration dust, mineral matters, combustion, &c., as that may add thereto. No doubt the oxidizable, organic matter expelled, varies in different persons according to health, activity, cleanliness, &c., but here again the average of quantity and quality is quite uniform for classes of dwellers taken together.

Where the organic matter is largely dust, or where the air is stagnant, there will be settling and perhaps continuous oxidation, so that the carbon dioxide will be increased and the organic matter diminished. Where there is active exercise there is increase both of organic matter and of carbon dioxide. Although differences in cleanliness do not seem to affect the amount of organic matter, this is probably because the results of uncleanliness only become apparent by exercise and finds its record during or after it.

Next is our study of *micro-organisms*. While the number has probably some relation to the purity of air, so long as we have not settled the lines between harmless and pathogenic varieties we can only speak of them tentatively and without full knowledge of their significance. Our authors go so far as to say that as regards the influence of the micro-organisms of air, it seems probable that for persons in perfect health the great majority of them are harmless. This opinion is not based on the idea that they have no significance as indicating the purity of air, but on the idea that unless there is much bronchial mucus, the epithelium or cilia of the respiratory passages entangles them and sweeps them out so that they do not reach the air cells.

One of the most interesting points elicited is, that micro-organisms are not given off in the ordinary respiration of healthy persons, or at least not to any appreciable extent. On the contrary, those present in the air appear to stick to the mucous membrane of the nose and larynx and trachea, &c., so that the air passages practically act as filters. Thus, if all are fairly well, the microphytes are those in the room or those from the skin and garments of the persons.

The accompanying record in one-room and two-roomed houses shows at a glance how these micro-organisms are symptomatic, although we cannot fully ascertain as yet all that they signify. The only comparison made as to different forms of micro-organisms was between bacteria and moulds. Moulds come mostly from the outside air. When the air in a room becomes vitiated the bacteria increase largely, while the number of moulds is affected to a relatively much less extent, if at all. The observations and experiments were in all one hundred and seventy-nine.

In summing up the evidence thus obtained as to the vitiation of air from carbon dioxide, organic matter and microphytes, the authors propose the following standards: The upper limit for dwelling-houses (especially in sleeping-rooms) of carbon dioxide is ten volumes per 10,000. Yet when we read that in Portsmouth convict prison

Wilson found all the prisoners in the larger cells healthy when constantly in them with 7.2 volumes of carbon di-oxide, but those out all day and in all night pale and anæmic at 10.4 volumes of carbon di-oxide, ten seems too near the margin for safety.

The amount of organic matter should not be in excess over outside air more than would require 2.0 volumes of oxygen per 1,000,000, and the micro-organisms should not exceed twenty per litre. Although odor is in general some indication as to the organic matter and its character, yet as smell is much influenced by temperature and humidity there may be foul air without odor. As applied to rooms, however, under usual circumstances it does indicate much. How familiar to most physicians is the odor of badly-kept, stuffy houses?

Experiments seemed to show that the accumulations of organic matter which quite uniformly take place in stagnant air, prove far more serious than a pretty high amount of carbonic acid, for which a little more rapid respiration will, for a time, compensate.

The authors believe that frequently in children the stagnant and rapidly-changing organic matters cause convulsions, sudden prostration and collapse. As we are just now having great expectations from the enumeration or census of microphytes it will surprise some to hear the opinion expressed "that for persons in perfect health the great majority of them are harmless."

Among the valuable points suggested as to the purification of air independent of mechanical methods are the following:

Cleanliness of person and dwelling and open air spaces.

Where the rooms are not so proportioned to occupants as to give full air space, frequent change of the air of the room.

Ventilation by diffusion diminishes carbonic dioxide far more than it does organic matter or micro-organisms.

Windows should be made to open above and below, and both sashes should be used as much as possible.

The practice of having a lamp burning all night in bed-rooms in small houses is greatly to be deprecated, as the heat, the organic matter and the carbonic acid aid in the reduction and deterioration of the air.

SCHOOL-ROOM VENTILATION.

Much that relates to the ventilation of school-rooms is embraced in what has been said of ventilation in general, as it is found respectively in houses of various sizes. We here only desire to add a few more points that are more special as to those assembled in close occupancy for shorter periods.

The number of schools examined was 68 different schools and class-rooms, and many of them at different times and under various conditions of ventilation. Of these, 42 were ventilated in the ordinary way, by fire-places, windows, &c. (natural ventilation), and 26 were ventilated by fans, which blew air (plenum, mechanical ventilation) into the rooms. The examinations began December 16th, 1885, and closed April 28th, 1886.

In the rooms mechanically ventilated, air was blown by fans over hot pipes and thence into the several rooms by broad, shallow, upright shafts, opening at a *height of five feet* from the floor. The vitiated air is taken off by shafts, which *open two feet* from the floor and carry the air up into a chamber in the roof. Thence it is discharged through louvre-boarded ventilators, fitted inside with valves, which prevent any possibility of back-draughts.

As a rule, there is an *outlet* shaft at each end of the room, and one or more *inlet* shafts on each side. The air on entering the room thus passes wholly or partially toward the ceiling, and must thence pass downwards to find an exit by the outlet shafts, which open two feet from the floor. The current is intended to sweep the whole room, in this way, while the broad and shallow inlet shafts, through which a large volume of air enters at a low velocity, insure a good distribution of air with as little draught as possible. While by this arrangement there is slight opportunity for organic matters to settle on the floor, yet this is no evil if the rooms are properly swept and cleansed every day. The temperature of the rooms was never over 65°, and the average 55.6°.

The experiments showed that the carbonic acid was three-fifths, the organic matter one-seventh, and the micro-organisms less than one-ninth of what they were in schools ventilated by ordinary methods, while a higher temperature was also maintained where the mechanical ventilation was used. Professors Brazier and Niver, who made determinations of carbonic acid only for four schools in Aberdeen, two being ventilated mechanically, found similar results.

It was found that those attending the average board or public schools for six hours a day had often, before improvements, been subjected to a school-room atmosphere containing, on an average, nearly 19 volumes of carbonic acid per 10,000, and a very large proportion of organic matter, and no less than 155 micro-organisms per litre.

The cubic space per person in schools, unlike that in houses, showed no definite connection with the purity of the air, except as regards the number of micro-organisms. In mechanically-ventilated schools these diminished with an increase of cubic space. Other facts seem to show that cubic space beyond narrow limits is of little account, *if there is not proper adjustment* of ventilation so as to promote constant currents of air.

No comparisons were made between different systems of mechanical ventilation representing both the plenum and exhaust methods. But these carefully-made experiments led our authors to express the view:

1. That most common schools are badly ventilated and that the symptoms ascribed to overpressure are probably largely due to the defective ventilation of schools, and that a sufficiently pure air in schools (without draught) appears to be attainable only by mechanical ventilation. They give as reasons why they believe the plenum method to be better than the exhaust method that (*a*) draughts are more easily avoided, and (*b*) that the great objection to the suction method is that a partial vacuum tends to be produced, which would greatly accelerate the entry of sewer-gas into the room from any defective drains (or other sources of foul air), whereas the "blow-in" method has the positive advantage of producing the opposite effect. (*c*) A more uniform and higher temperature may be attained in winter, and the method is independent of the state of the weather.

A mode of finding carbon dioxide and "A New Method of Estimating the Proportion of Carbon Dioxide in Air," are given as follows by Dr. Cassidy in the Ontario Report of the Woodstock Convention, 1887:

"The estimation of the volume of carbon dioxide gas it contains is at present the only experimental method of judging of the condition of the air in inclosed areas, and therefore it is important, from a sanitary point of view, to possess an easy and rapid means of ascertaining the amount of this gas present in the atmosphere. Several plans have been proposed for this purpose, all of which are based on the milkiness produced by carbon dioxide in a colorless solution of lime or baryta, and therefore on a qualitative appearance, which is not directly connected with the amount of gas actually present. The new apparatus devised by Dr. R. Blockmann possesses the merit of giving quantitative results, and of being so simple in its action that no chemical knowledge is required in order to use it. It is also very cheap. The process is based on the employment of a sufficient volume of the air under trial to saturate by means of the carbon dioxide gas present in it, a given amount of lime-water of a certain strength. In order to recognize the fact of this saturation a few drops of a solution of phenol-phthalein are added to the lime-water until it assumes a visibly red tint. The color remains as long as the liquid continues alkaline, but directly the caustic lime is all converted into the carbonate a very small excess of carbon dioxide is sufficient entirely to destroy all trace of the red tint.

"The apparatus consists of a glass bottle capable of holding 500 c. c. or half a litre, a hollow bent glass tube used in sucking the air out of the bottle, a solution of phenol-phthalein, and a solution of lime-water 1-10 the strength of the volumetric solution, or one in which 1 c. c. of lime-water is equal to one-tenth of a milligram of carbon dioxide.

"The mode of using it is as follows: The bottle is filled with the air to be tested by sucking out the air contained in it through the bent glass tube; $\frac{1}{2}$ oz. of lime-water is poured into the bottle, together with three drops of the solution of phenol-phthalein, and the bottle is then corked and shaken for three or four minutes; if the liquid is still red the bottle is filled a second time with air, corked and shaken as before, and the process is repeated until the color in the liquid vanishes. If the color does not completely fade after any particular filling, but fades immediately on making another filling, we may take the one before the last as the correct reading. Thus, in testing the air at the Brock avenue school, I found that the red tint had nearly vanished at the second filling, and that it disappeared completely on filling the bottle the third time. The amount of carbon dioxide was therefore not more than for two fillings, and but little less, or in round numbers .806. If the color remains for four fillings the air is very good, if it remains for three it is good, if it disappears on the second filling it is on the borders of what sanitarians call bad air, if the color goes on the first filling the air is so impure as to render it wholly unfit to be breathed.

"A table has been prepared, showing the exact quantities of carbon dioxide gas present, in 1,000 volumes of air, as indicated by the results of each filling—from the first to the fourth. Thus—1 filling, 1.61 carbon dioxide per mille; 2 fillings, .806 carbon dioxide per mille; 3 fillings, .537 carbon dioxide per mille; 4 fillings, .400 at 60° Fahrenheit. A correction is not necessary for a temperature over or under 60°, as it would involve no greater difference than a factor in the third decimal place. By increasing the quantity of lime-water the presence of much larger volumes of the gas can be ascertained; thus, with 1 oz. of lime-water a discoloration at the first filling would imply the existence of 3.22 volumes per mille."

The report of Thomas H. McCann, as President of the Board of Education of Hoboken, gives the following tabulated results of examinations made of the schools of that city by Professor A. R. Leeds:

HOBOKEN SCHOOL AIR-TESTS.

Date.	SCHOOL NUMBER AND POSITION OF ROOM.	No. of Scholars.	Sex.	Average Age.	Floor Space, Square Feet.	Height of Ceiling.	Capacity in Cubic Feet.
Jan. 18, '87, 11 A. M.	*Public School No. 1. Garden and 3d Sts.*						
	11th Class Room	44	Boys	8	437	10 feet 7 inches.	4676
	10th Class Room	28	Girls	9–10	460	10 " 0 "	4600
	5th Class Room	30	Boys	10–11	446	11 " 0 "	4912
	5th Class Room	32	Girls	11–12	403	11 " 0 "	4428
	14th Class Room	38	Mixed	6	529	11 " 0 "	5819
	Outside air same time	......	....	....	......	....	....
Feb. 14, '87, 11 A. M.	*Public School No. 1.*						
	11th Class Room	47	Boys	8	437	10 feet 7 inches.	4676
	10th Class Room	27	Girls	9–10	460	10 " 0 "	4600
	5th Class Room	30	Boys	10–11	446	11 " 0 "	4912
	5th Class Room	33	Girls	11–12	403	11 " 0 "	4428
	14th Class Room	43	Mixed	6	529	11 " 0 "	5819
	Outside air same time	......	....	....	......	....	....
Feb. 16, '87, 11 A. M.	*Public School No. 2, Garden and 9th Sts.*						
	5th Grade Class Room, south wing, 2d floor, 2d room	38	Girls	11	443	11 feet 0 inches.	4873
	1st Grade Class Room, south wing, 3d floor, 1st room	31	Mixed	15	468	11 " 0 "	5148
	10th Grade Class Room, north wing, 1st floor, 1st room	44	Boys	5½	578	11 " 0 "	6358
	7th Grade Class Room, north wing, 1st floor, rear	48	Boys	9	313	11 " 0 "	3448
	5th Grade Class Room, 2d floor, 1st room	38	Boys	10	548	11 " 0 "	6029
	Outside air same time	......	....	....	......	....	....
Feb. 17, '87, 11:30 A. M.	*Public School No. 3, Adam and 3d Sts.*						
	13th Class Room, south wing, 1st floor, rear	75	Boys	8	457	15 feet 0 inches.	6860
	11th Class Room, north wing, 1st floor, rear	40	Boys	8–9	320	10 " 0 "	3200
	2d Class Room, north wing, 2d floor, rear	25	Girls	11	382	14 " 0 "	5348
	6th Class Room, north wing, top floor	42	Boys	11	444	13 " 0 "	5772
	6th Class Room, north wing, top floor	36	Girls	11	394	14 " 0 "	5523
	Outside air same time	......	....	....	......	....	....
Jan. 25, '87, 11:20 A. M.	*Public School No. 4, Park Avenue.*						
	Class Room No. 2, south side top floor, middle room	28	Girls	14	400	12 feet 0 inches.	4800
11:45 A. M.	Class Room No. 8, northeast room, top floor, High School	33	Mixed	16	729	12 " 0 "	8749
	Class Room No. 5, north side 2d floor, middle room	42	Boys	12	400	15 " 0 "	6000
10:45 A. M.	Class Room No. 4, northeast side 1st floor	50	Boys	8	360	15 " 0 "	5400
10:40 A. M.	Class Room No. 7, southeast side 1st floor	53	Girls	12	460	15 " 0 "	6900

HOBOKEN SCHOOL AIR-TESTS.

Means of Ventilation.	Ventilation at Time Sample Taken.	Temperature, Fahr.	Barometer.	Volumes of CO per 10,000.	Cubic Feet of Space per Scholar.	Remarks.
2 windows	1 open 6 inches at top	60°	......	21.50	106	
6 "	1 " 2 " "	70°	......	18.50	161	
8 "	2 " 4 " "	65°	......	14.20	164	
4 "	Partly open	65°	......	15.40	138	
3 "	1 open 6 inches at top	60°	......	18.50	153	
......	......	30°	......	4.18	......	
2 windows	1 open 6 inches at top	61°	782	28.94	99	
6 "	All closed	65°	782	19.18	170	
4 "	All open 6 inches at top	65°	782	18.44	164	
4 "	1 open 6 inches at top	68°	782	23.20	134	
8 "	1 open 6 in. and 1 12 in. at top	65°	782	14.57	135	
......	......	30°	782	4.20	......	South wind, slight; atmosphere clear.
4 windows	2 open 12 inches at top	75°	760	11.58	128	
3 windows Vent. over door	1 open 18 in., top and bottom Open	78°	760	12.70	166	
6 windows 2 ceiling vents	2 open 12 inches at top Act badly	75°	760	21.11	145	Air of room very close and disagreeable.
4 windows	3 open 3 feet at top	72°	760	15.20	72	
7 windows 2 ceiling vents	3 open 3 feet at top Act badly	76°	760	17.05	158	
......	......	55°	760	4.10	......	No wind; atmosphere hazy and dull.
2 windows	2 open 18 inches at top	73°	762	17.42	91	Air of room unpleasant.
4 small windows	2 " 6 " "	79°	762	19.54	80	Air of room very close and disagreeable.
3 windows 2 door ventilators	3 open 12 inches at top Closed	77°	762	12.34	214	
4 windows 3 vents. nr. ceiling	3 open 6 inches at top Open	77°	762	12.20	137	
4 windows	2 open 6 inches at top	77°	762	8.98	153	
......	......	43°	762	3.60	......	S.W. wind; very fine; cloudless.
2 windows 2 ventilators	1 open 6 inches at top	75°	......	14.78	171	
5 windows 1 door ventilator	2 open 2 feet at top	72°	......	13.50	265	
2 windows 1 ventilator	2 open 3 feet at top	75°	......	10.00	160	
2 windows	2 open 4 feet at top	72°	......	9.50	108	Close.
4 "	Had all just been opened	64°	......	16.00	130	Not close.

HOBOKEN SCHOOL AIR-TESTS.

Date.	School Number and Position of Room.	No. of Scholars.	Sex.	Average Age.	Floor Space, Square Feet.	Height of Ceiling.	Capacity in Cubic Feet.
Feb. 15, '87, 11 A. M.	*Public School No. 4.*						
	Class Room No. 2	24	Girls	14	400	12 feet 0 inches.	4800
	Class Room No. 8	34	Mixed	16	729	12 " 0 "	8749
	Class Room No. 5	38	Boys	12	400	15 " 0 "	6000
	Class Room No. 4	48	Boys	7–8	360	15 " 0 "	5400
	Class Room No. 7	46	Girls	10½	460	15 " 0 "	6900
	Outside air same time	......	......	......	......	......	......
Feb. 21, '87, 11–11:15 A. M.	Annex No. 1, Garden and 2d streets	150	Mixed	6–7	1089	10 ft. 0 in. walls	11434
	Pupils on roll altogether	175	......	......	......	......	......
	Annex No. 3, 2d street near Clinton street	192	Mixed	6–7	1740	10 ft. 6 in. to apex of roof, 25 ft.	30885
	Pupils on roll	200	......	......	......	......	......
	Outside air same time	......	......	......	......	......	......
Feb. 24, '87, 11 A. M.	Another sample of air from 11th Class Room, School No. 1	47	Boys	8	437	10 feet 7 inches.	4676

HOBOKEN SCHOOL AIR-TESTS.

Means of Ventilation.	Ventilation at Time Sample Taken.	Temperature, Fahr.	Barometer.	Volumes of CO per 10,000.	Cubic Feet of Space per Scholar.	Remarks.
2 windows 2 ventilators	1 open 6 inches at top	75°	767	15.41	200	Air close.
5 windows 1 door ventilator	2 open 12 inches at top	80°	767	12.63	257	
2 windows	2 open 5 feet at top	78°	767	11.06	158	
2 "	2 " 4 " "	70°	767	7.014	113	
4 "	2 " 6 inches at top	70°	767	12.12	150	
....	....	45°	767	4.67	......	No wind; atmosphere close, hazy; wet, drizzling rain.
5 windows 1 door	1 open 12 inches at top Frequently open	72°	771	21.21	76	Air close and disagreeable.
....	....	......	......	....	65	
10 windows	3 open 6 inches at top	70°	771	26.11	161	Air very close and very unpleasant.
....	....	......	......	....	154	
....	....	41°	771	3.852	......	North wind, slight; clear; fine.
2 windows	2 open 6 inches at top	70°	775	18.26	99	Outside temperature 42°; fine.

The same report details what is known as the Smead-Dowd system of ventilation. The ventilation methods applied in some of the schools of Hoboken, and especially in the new school building, are well worthy of examination by all cities contemplating changes of former structures, or the erection of new buildings.

These and other facts point to the increased interest being taken in the sanitary condition of school-houses. There is no subject that more involves the health of the people and the welfare of the State.

WATER FOR DRINKING PURPOSES.

The question of the purity of our water-supplies must ever continue to be one of the first importance for the consideration of Health Boards, in their care of the public health. Water is the great purveyor or distributor of the nutrients of the system, as well as the conveyancer of much of the effete material which needs to be removed from the system. Water may contain a great deal of animal, vegetable or mineral matter foreign to its chemical composition, and yet make no appreciable evil impression upon the system. So much depends upon the state which this matter is in; upon the state of the health of the person drinking it and upon what, for the absence of any better term, we must call the resistance or unsusceptibility of some persons, either naturally or by acquirement and toleration, to the predisposing or exciting causes of disease. Because these varying conditions are difficult to define, and often difficult to recognize, we are forced, first of all, to try and place ourselves in a position of safety.

In doing this we appeal to certain axioms. The first of these is that the human system was never meant to receive into it materials in a decayable or putrescent state. While it is happily true that the juices of the stomach have some power to arrest decomposition, and that the system in general has power to overlook many deleterious influences, no one has yet been found to assert that we may go on indefinitely contaminating a water-supply in the confidence that the powers of the system, or the tendency to adjustment and toleration will so far prevail as to make the use of such water of no consequence. If we could not fall back on general principles or the reliability of primary or axiomatic beliefs, cases of specific disease, disturbances of the digestive apparatus and a general lowering of vigor or shortening of life, have given well-grounded evidence of serious results. Evidences have no need to be more complete than those adduced by Dr. Snow, as to the relation of the cholera districts of London in 1849 to water-supply; the numberless established relations of typhoid fever to water-pollution; the dependence of dysenteries, diarrhœas, &c., on impure water and the persuasion of close observers as to the effect of impure water upon general vigor and good health. A specimen of this kind of evidence may be found in Wilson's Hand-book of Hygiene, pp. 169–185.

There are two or three natural ways at which we arrive at the evidence of an impure water-supply. One is, by knowing what is put into the water. As to this, the casual observer may jump too readily at conclusions. It is wonderful what amounts of decayable and putrescible matter may go into a stream, and yet, by solution, by dilution, by aëration and by lower animal and plant life, be so disposed of as to disappear. Yet, as the infusion of any great amount of such matter into potable water-supplies is in the direction of danger, we must be assured by some proper tests that such rectification has taken place. The test of this is now offered to us in three forms. We shall call them the *chemical* tests, the *biological* tests and the *experience* tests.

First of all, it is certain that the chemists give us some very important evidences as to the purity or impurities of water-supplies. In no direction have they been more studious. Such tests as the Permanganate test, the chlorine test, the ammonia or Wanklyn test, the Frankland or combustion test, and the Grandval & Lajoux, Nitrate's test, and scores of modifications or collateral aids, assure us that in this way we get indications as to the character of water-supplies. It is the weakness, still, of the chemical method that it does not inform us much as to the chemical relations of microphytes or minute forms of vegetative life which have so much to do with disease, and especially specific diseases, and that it is not able, accurately, to define differences that may yet exist in waters that have apparently the same chemical composition. There are cases in which, by a chemical standard, a water might be pronounced impure in which, in the absence of knowledge of possible modifying factors, we could not rely on the analysis alone. Yet, there are excesses of evil conditions that in themselves show a water so full of hazard to the population at large as to make the risk too great for general use.

More recently there has come to our aid what is known as the biological determination of water conditions. This is intended to reach such characteristics of water as relate to microphytes or micro-organisms, as these are found to have not only great relation to some diseases, but to the disposal made of organic matter in a mobile state or process of decay. Dr. R. Koch early applied his methods of bacterial test in this direction, and has been followed by a host of capable observers. It seeks to determine the nature and the relative abundance of micro-organisms in different samples of water, as also the conditions under which the colonies multiply or decrease. The papers of Percy F. Frankland, of England, on "The Removal of Micro-Organisms from Water" (Proceedings of the Royal Society, 1885 and 1886), and several other references given in the *Sanitary Record* March 15th, 1887, show how earnestly this method is occupying the attention of chemists and biologists. It would be premature as yet to claim any very determinate results, although much has been found that is valuable for comparison with chemical analyses. Dr. Meade-Bolton, of the Hygienic Institute of Gottingen, who has made valuable tests of several cultured and control methods, thinks that the chemical condition of the water possesses value chiefly as raising suspicion of the presence of pathogenic bacteria. It at least appears that the rapid multiplication of micro-organisms points to a center or source of contamination, and so we may be able to reckon the degree of risk from different contaminations. Also it is shown that "waters which have undergone exhaustive natural filtration, through porous strata, are almost perfectly free from micro-organisms, and so has confirmed the high reputation which such waters enjoy for drinking purposes." They have also shown that certain methods of filtration avail for greatly diminishing the number of the microphytes. Thus, two years' examination of the metropolitan water-supply of London has shown that while the number of micro-organisms present in the unfiltered water is usually very great, amounting occasionally to about 1,000,000 in a cubic centimetre, or 5,000 in a single drop of average size, the same water, after purification by storage and filtration, contains a comparatively very small number, frequently not exceeding 100 in the cubic centimetre. It is thus far evident that the presence of these microphytes has relation to the purity of water-supply. But until we know which of them are nature's provision for neutralizing the intake of sewage, which are pathogenic or disease-breeding, and under what precise circumstances of products, weather, interruption of processes, &c., the danger and death which lurk may spring forth, we cannot make accurate practical deductions from the aggregated numbers of these which are found. This view was emphasized by Dr. Sternberg, in his recent address as President of the A. P. H. Association. But all this increase of knowledge is showing that in the use of such waters we are in the region of great danger. While, for a time, all seem to escape, as do travelers in dangerous regions, and while, when attack comes, we cannot always tell why one is taken and the other left, we do know that the prudent and the wise had better take all precaution. In any doubtful case it is better to have the water boiled and then cooled for drinking.

The next test to be noted is that from experience. It is one of the most important in making up the evidence in the case, and yet, as usually named or conducted, the most vagrant and unreliable of all. It too often has no visible means of support. We can perhaps illustrate it no better than by stating what a physician or other practical man would wish to do if he had all the time and facilities for such an investigation. He would first call to his aid all the preliminary aid that experiment or the experience of the laboratory could give, and know the actual condition of the water used each day. He would perhaps at first select 100 children and give them no other drink for several days, and give it when the stomach was empty, so that it would be more rapidly absorbed. He would choose those who had not become innured to this particular water, and would record the amount taken and what seemed to him to be the results. In the absence of ability to be thus accurate, he would, at least as to a certain number, keep a record each day of the amount of water drank, and would have any apparent effect noted. He would divide them into classes, as to age or health or locality, so that he might be aided by comparisons, and would also for a time have similar classes on water known to be very pure. He would thus note effects at different seasons and different times of the year, and would continue his observations for long periods. He would be on the look-out for specific diseases, such as are believed to result from special micro-organisms in water, and trace any possible connections. Thus he would be gathering *classified experience*, the only kind that is coming to be considered of very much value as amounting to evidence. Even medicine meant originally knowledge by measurement, and that is what the best knowledge of the physician means.

We do not desire to wholly ignore the more general observation of the physician. There is some general and acquired experience such as the local weather prophet has as to the coming day or night, or such as the physicians gather as to the signs and symptoms of certain diseases. But physicians need *themselves* to know that such knowledge has a more substantial basis than *opinions* as to the *causes* of ill-health in cases in which many factors may be operative. It is easier to get some useful experience out of the symptoms of disease so as to aid in treatment than it is to select and define causes. One has expressed it thus: "The analysis of waters which have proved to be decidely *injurious* shows that in general the impurities are numerous, and, on the other hand, not one but several diseases may be either directly produced or indirectly influenced by them. And this difficulty of apportioning to special impurities their special effects is frequently increased by the presence of other causes of disease." Where the death-rate, instead of being but fifteen in 1,000, or, as Chadwick contends, it should not be over ten in 1,000, is between twenty and thirty in 1,000, it is always in order to estimate the facts as to drinking-water. But physicians, like others, unless they have *collected the facts* which make up a real experience as to the part had in causation by various operating influences, had better at once say to the public that they are not expert witnesses here to the same degree as they are in the diagnosis and treatment of disease. In some special outbreak they may be able to separate and identify causes, but cannot be expected in every case of diarrhœa or malaise to estimate the influence of every co-operating cause. It is for this reason and because they are expected to do this, and do not always decline when they are interviewed for opinions, that there is so little of definite agreement of views. Yet no class of men are better satisfied that it is not healthy to drink water shown to be laden with organic matter in a putrescible condition. This is so proven by the principle and law of life and so confirmed by cases of classified experience that illustrate it, that it is not essential to identify the relative effect of the portion being conveyed by any one vehicle. If present, it is its law to produce its effects. By reason of modifying influences there will be in individual exceptions and in varied seasons great variation in results, such as will puzzle those who are impressed by exceptions more than by a prevalent law. But the fact will remain and make its record sometimes in much sickness, sometimes in a sudden outbreak, sometimes and mostly in a general abridgment of vitality or of the length of years. Such is the uniform record of crowded cities as compared with the country. As to water-supply, London is not the only city that has recorded the relation of a diminished death-rate to the introduction of improved water-supply.

OUR STATE NEEDS AS TO WATER-SUPPLY.

In one sense we have no needs. The water-supply of the State is unsurpassed. Its water-sheds almost seem to have been arranged for the supply of great populations. In the cretaceous formation an ocean of underground reservoirs seems to await the up-drawing of the adjacent cities. But there is the sad fact that a large portion of our population seems to have forgotten or sold its birthright. Within an area of about thirty miles about 600,000, or more than one-half of our people reside. The most of them, if they drink water at all, drink that which is unwholesome. Yet the upper basin of the Passaic is near at hand, as well as other water-sheds easy of access. There is no reason why Hudson, Essex and Union counties should not have the best and cheapest water-supply on the continent. The reports of the State Geologist, those of the State Board of Health and the special report of the Commissioners of State Water-Supply have given year after year the abundant facts. The topographical maps of the State illustrate the facilities. In the southern part of the State, Camden, which has similar needs, can also be supplied. The time has come when on a business basis all ancient claims of water-power, when interfering with health, should subside before the greater claims of water for the people. There are substitutes for these *powers*, but no substitutes for water as a drink for man and beast. We can only urge upon the State, as one of the greatest demands for health and as an exercise of the plainest political economy, the appropriation of these vast reservoirs to the use of the people.

FOODS.

While air and water have their nutritive and essential uses, we must look to our third division, that of foods, for the general sustenance of life. In our search for these we seek such articles as are found in the system, or such as the chemistry of digestion can convert into nourishment and force. As to many of them, we also need, by cookery, to present them in such form as will render them most available. It is not our design, in this connection, to trace the relations between the various foods and their adaptations to the human system. The subject has before been treated upon by the Secretary of this Board in the third (1880) report of the Bureau of Labor and Statistics, and in "The Principles of Hygiene."

We desire only at present to draw attention to what is feasible as to the securement of foods in a proper condition for sale. Our first attention is needed as to meats. These form so large a proportion of food-supply that they need to be guarded with care. This is best accomplished where there are public abattoirs, under competent inspection, and when no butcher's meat is offered in the market that has not passed this inspection. Next to this is the value of market inspectors, who have oversight of meat, fish, poultry and all other food materials offered in markets. The inspector needs not only to have honesty and watchfulness, but to have expert knowledge. Even so brief an outline as that of Mr. Vacher, health officer of Birkenhead, near Liverpool, is of great service. Every city should have its market inspector, with power to reject all produce unfit for consumption. The guard against decayed or wilted fruits and stale vegetables is also very important for city populations. Such oversight is much easier made, practically available and efficient, than that sought as to adulterations.

The next important guard of foods is as to milk. It is true that milk is not apt to be offered in a stale state, but because of its so frequent dilution with water it is often less of a food than it appears to be. Even here, we are on the borders between what are called commercial frauds and those which endanger health. But, because it is so essential and constant a food and so often falsified, it may be singled out for special guard.

Where, as in the case of mustard, for instance, or spices, or even of oleomargarine, it never has been shown that there is any serious risk to health, we do not believe it to be an important function of a Health Board to deal with the matter. While fully appreciating the desirability of preventing commercial frauds, this is not the function of health laws. Even if such effort were thought desirable for Health Boards as a co-operation, it is, for many reasons, impracticable for a Health Board to engage in a service in which they are not likely to benefit the public health at all in proportion to the outlay. For them it would be the withdrawal of money from more important spheres of health administration. This Board, therefore, with its use of money for this purpose limited to one thousand dollars, has only sought to deal with such adulterations, or to make inquiry in such directions as would guard against substances which might be hazardous to health. To this end it made full inquiry into the evidence of English authorities, and as to various examinations made in this country. It thus became more apparent how little, practically, the public health was involved in most of the falsifications. Just because they are commercial, the dealers sedulously seek to avoid injurious articles and intend to use those that are inert, or that are, in part, real substitutes. In order that we might more fully trace what might be happening in our own State, examinations were made of various products. The valuable record in the fifth and other reports, and the specimens in our rooms, confirmed the view that inert or similar substances are mostly used, and that the accomplished design is felt upon the pocket and not on the health. Nevertheless, as it is possible that in some cases health may be involved, we shall continue watchfulness and inquiry within proper limits. We are the more able to do this because the pursuit of adulterations as frauds is provided for in a separate service.

OUTLINES OF REPRESENTATIVE SEWER SYSTEMS

AS IN OPERATION IN NEW JERSEY, AS FURNISHED OR COMPILED FROM DESCRIPTIONS BY

J. J. Croes and F. S. Odell, Mem. Am. Soc. C. E., New York City.
Geo. P. Olcott, C.E., Orange, N. J.
C. P. Bassett, C.E., Newark, N. J.
Prof. Chas. McMillan, C.E., Princeton, N. J.

As no subject is more vital to the health of the citizens of the State than that of a right disposal of all waste products which tend to decomposition, we have thought it wise in the present report to pass in review some specimen systems of a few of the more available methods.

If the reader will refer to descriptions of methods contained in former reports by the Secretary and to some special papers contained in former reports, as indexed in this report, it will be found that every method has been reviewed and its salient features and adaptability pointed out.

As improvements are constantly occurring and as new methods are introduced we have for this report selected for prominence four methods devised and executed by engineers of repute and now in operation in this State. We might point to several in addition, but as the next year we hope to give outlines as to all the water-supply and sewerage works in the State, this outline will be found sufficient for the present. In it we have occasion to thank the engineers named, either for furnishing original contributions or for referring to such documents and descriptions as have enabled us to present a brief but sufficiently technical outline of construction and methods.

Leaving out of view for the present the old and valuable system of surface irrigation and the modification of supply so as to give intermittent filtration, we, by examples, pass in review these four systems as in actual operation.

THE DRAINAGE AND SEWERAGE OF THE LAWRENCEVILLE SCHOOL, MERCER COUNTY, N. J.

AS DEVISED BY J. J. CROES, C.E., AND CONSTRUCTED UNDER THE DIRECTION OF F. S. ODELL, C.E.

Where there is not sufficient land available, or where it is easy to pass a classified effluent into a stream, we sometimes have a modification of two or three methods.

Thus, Engineer J. J. Croes, of New York City, has placed an extended system in the High School at Lawrenceville, which avails itself in part of this sub-irrigation or absorption tile system, but also depends upon the discharge of sewage thus purified by passage through a small area of land, into an adjoining brook.

We are permitted to avail ourselves of the following description:

DRAINAGE.

"That portion of the grounds in which the buildings are located is generally dry and needed little subsoil drainage, but it was deemed advisable to lay subsoil drains near the buildings, and in three cases entirely around the foundation walls below the level of the cellar floors, so as to insure their being dry at all times. Subsoil drains were also laid along the drives and walks, and the entire play-ground was underdrained by parallel lines of subsoil drains laid thirty feet apart.

"These subsoil drains are of round agricultural tile, from one and one-quarter to two inches in diameter, and are laid on uniform grades about three feet below the surface, and have their outlet in the nearest road basin.

"To provide for the surface drainage of the drives and grounds, a complete system of drains was laid, following the general direction of the drives, with catch basins opening from the gutters at intervals of about three hundred feet. These drains are of salt-glazed stoneware pipe from six to eight inches in diameter, with joints of Portland cement-mortar. They are laid about three feet six inches below the surface, to true lines and grades, and have their outlet in the brook at the lower portion of the grounds.

"At the time the outfall system was designed it was thought that the large extent of lawn surface on very flat slopes, and the deduction of the roof area from the water-shed, would so materially diminish the discharge from the rainfall, that a capacity of carrying off 100 cubic feet per minute, or about an inch and a half of water on the road surfaces per hour, would be sufficient.

"The experience of the first six months of 1886 showed that this was not sufficient, as the road drains were overtaxed three times during that period, causing pools of water to be formed for over an hour in some depressions of grade, and also causing the water to flow out through a man-hole on the lower level near the engine-house, and flood the boiler-room floor.

"This was undoubtedly partly caused by two departures from the plans for constructing and operating the works.

"*First.* The side drainage of the road in front of the property was not completed according to the plans, and thus a large quantity of water flowed across the road and on the school grounds from an extended slope on the opposite side of the road.

"*Secondly.* The supply from the well having been plentiful, the steam engineer in charge of the boiler-house found it easier to draw all the water from that source than to open and shut the cocks which change the pump suction from the well to the rain-water reservoir, so that the latter was never used and all the roof water was discharged into the road drains at their connection with the outfall pipe.

"But, even if due allowance is made for these irregularities, it is not unlikely that in the case of a heavy rainfall, when the ground on the campus is frozen, the capacity of the outfall would have been found to be too small. A direct connection has therefore been made between the junction of drains at the reservoir overflow-pipe and the pond, by a twelve-inch pipe, making the total capacity of discharge 450 cubic feet a minute. The highway drains opposite to the school property have also been attended to, and the road-water thus diverted from the grounds. So far (March, 1887) this has proved satisfactory in the heaviest rainfalls which have occurred since the pipe was laid, the rain-water reservoir having been used for the purpose for which it was intended, and the roof-water consequently retained in it."

SEWERAGE.

"The necessity of disposing of the sewage within a limited area of the grounds made it imperative that its volume be limited to a minimum, and therefore all surface or subsoil drainage was excluded from the sewers, and disposed of as previously related; then, to insure positive immunity from leaky joints, it was decided to use six-inch cast-iron pipe, with leaded joints, for the sewers.

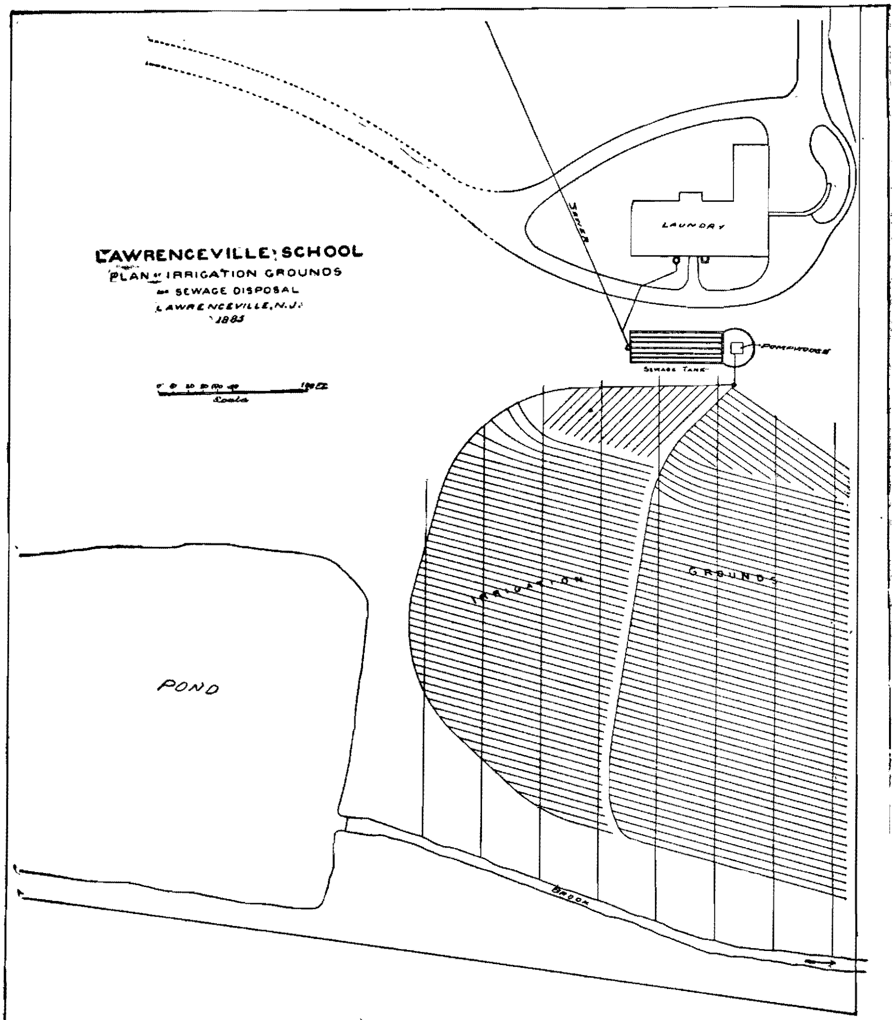
"The pipes were 0.395-inch thick, and weighed twenty-five pounds to the foot. They were coated with coal-tar varnish, as were all the cast-iron pipe used on the grounds.

"There are two branch lines of sewers, with a flushing man-hole at the head of each. The lines of the sewers are selected to serve every building with as short house connections as possible, and all deflections are made by special curved pipe. A man-hole is placed at every change in line or grade, and access is had to the sewer through a tee at the bottom of the man-hole, and also at the junction of house connections with the main line where the Y branch has cast in connection with it a vertical tee, from which a pipe is carried up to the surface of the ground.

"Any man-hole may be used for flushing purposes. The flushing and cleaning are done very effectually by using a 'pill,' or spherical hardwood ball, five and one-half inches in diameter. This has proved more effective than one of smaller size.

"The two branch sewers unite near the rain-water reservoir, and continue to the boiler-house and laundry, near which is placed the sewage tank, in which the solid matter in the sewage is allowed time to deposit itself on the bottom, and the partially clarified liquid is retained until it is desirable to discharge it into the sub-surface tiles.

"The map herewith will give an idea of the general arrangement:"



SEWAGE DISPOSAL SYSTEM.

"The sewage tank is built of brick-work underground, and is in two sections. The first or retaining section is in duplicate, and contains six compartments, three in each set. Each compartment is sixty feet long, about three feet wide and four feet deep.

"The sewage flows into one end of the first compartment, passes along its whole length, and at the other end passes into the second compartment through a quarter-bend pipe, with the mouth turned down below the level of the outlet, to prevent scum on the surface of the liquid from passing over into the second compartment, through which the liquid passes to its further end, and in like manner into the third, at the further end of which it passes over a weir into the receiving chamber, which is circular in form, twenty-five feet in diameter and eight feet deep. From this it is pumped by a pulsometer pump as often as necessary. This chamber is ventilated by a pipe leading into the flue of the boiler-house chimney. It is intended that whenever solids collect in such quantities that the settling compartments require cleaning, the sewage shall be turned into the duplicate set, and the sludge removed from the first.

"It is found that nearly all the solids are deposited very near the entrance in the first compartment, and to cause the deposit to be distributed more evenly over the bottom, the water in the first compartment has been siphoned into the receiving chamber two or three times within the past six months. The rapid subsidence of the water, and the flow of incoming sewage during this operation, distribute the solids over the bottom, and enable the compartment to be used longer without cleaning out than would be the case if this distribution were not made.

"The pulsometer has been so arranged that by attaching a suction-hose, the water in the settling tanks can be pumped out and carried 300 feet through a hose to farm land ploughed to receive it. In January, 1887, the tanks were thus emptied, and the sludge then removed by a farmer to whom it had been sold. There were about 300 cubic feet of sludge removed from the first section of each of the settling tanks.

"The irrigation ground comprises about one and three-quarter acres, in the lower part of the school grounds, between the boiler-house and the brook. It is still further limited in location by the dam and pond on the westerly side, and an adjoining owner on the easterly side. It is the lowest portion of the school property, is naturally wet, and that portion near the brook (before drainage) was swampy. Its selection was a matter of necessity, it being all the land available for this purpose.

"The natural surface of the ground was on a quite uniform slope from the higher portion to the brook, so that very little surface grading was necessary, but its thorough subsoil drainage became of the greatest importance.

"To accomplish this, parallel lines of two-inch round agricultural tile were laid, forty feet apart, discharging into the brook.

"These drains were laid four feet below the surface wherever the elevation of the brook permitted this depth; but, by reason of the elevation of the brook, the lower part of the drains was not deeper than from two to two and one-half feet, and the average depth is not greater than three feet.

"These drains were effective in drying the ground and preparing it to receive the sewage.

"The distributing or sub-surface tiles were laid about eight inches below the surface, in nearly parallel lines five feet apart, on uniform grades of nine to twelve inches in 100 feet.

"They are two inches in diameter and in twelve-inch lengths.

"They are laid on bed pieces of the same material and length, which cover the bottom joints. Smaller pieces cover the top joint, leaving an opening on each side of three-quarters by one-eighth of an inch, out of which the water escapes into the soil.

"The water enters these lines of sub-surface drains from a four-inch carrier leading from a chamber into which the pulsometer discharges, and in which are the two four-inch carrier pipes leading to different parts of the ground, into either of which the sewage can be turned at pleasure and the two sections of the field used alternately.

"A special branch joins the two-inch distributing tile with the four-inch carrier, the two-inch tile being so attached that its bottom is at the same level as that of the carrier from which it branches, so that if but little sewage is flowing in the carrier each line of drain will get its share, those in the upper portion of the field being prevented from surcharge by either flattening the grade or throttling the first section of drain.

"There are about 600 feet of four-inch carrier pipe, and about 20,000 feet of two-inch drains on the one and three-quarter acres of ground.

"The amount of sewage water averages 6,000 gallons a day.

"This is discharged into the irrigation tile eight times a month, or from 20,000 to 25,000 gallons at a time. The discharge from the outfall drains begins very soon after the tile are charged, showing the ground to be very porous.

"No complaint has been made of any offensive odor or fouling of the stream.

"The irrigation ground is not worked to nearly its capacity, as it has been found that the sewage does not flush the tiles fully to the lower extremity of the lines, and while the growth of the grass on the upper end of the lines is luxurious and rapid, the ground over the further end has remained bare or with very scanty vegetation."

The next, which is sometimes called the small-pipe or superficial underground system, is in use considerably in parts of Essex county, and has some special adaptation for private residences and smaller institutions where there are no sewers. It is based upon the idea that it is better to dispose of liquid sewage in the ground near the surface than upon it. To this end, a tract of ground is chosen which is porous and free of water near the surface. If not so by nature or position it is made so by deep and thorough drainage. The ground being found or made suitable, agricultural tile are laid in from five to ten inches from the ground surface, so that, receiving the sewage, it may pass out at the joints and be distributed to the soil. In order, however, to accomplish this fully for long periods of time, it is found necessary not to have the liquid dribbling through the pipes, but to send it through from time to time with some rapidity. This enables the pipes and the ground adjacent to be occupied in the intervening time by air, so necessary for the natural disposal of sewage. The rapidity of motion also causes a flush, and so keeps the pipes in order. To accomplish this purpose, a form of siphon is used, generally in the form known as Field's flush-tank. As Mr. G. P. Olcott, of Orange, has put in a large number of these systems, he has furnished us with this valuable outline of the methods of the administration needed and of circumstances and locations favoring its use.

THE SMALL-PIPE UNDERGROUND INTERMITTENT SYSTEM OF SEWAGE DISPOSAL.

BY GEORGE E. OLCOTT, C.E.

The system of which I am asked to write is variously called the sub-surface irrigation, the small-pipe, the absorption tile and the interrupted, downward filtration system, If called by the latter name, it must not be confounded with the method of surface irrigation generally known as the intermittent downward filtration system. The main features of the system were so well described in December, 1884, by J. W. Pinkham, of Montclair, in a paper read before the New Jersey Sanitary Association, that, by permission, I quote therefrom, and also give from it a few of the references to specimens of the system mostly put in under my direction:

"The method provides for the intermittent distribution of liquid sewage through a system of small unglazed earthen pipes, laid with *open joints*, from eight to sixteen inches below the surface of the ground, having such relation to each other and to the soil in which they are laid, both as regards its density and slope, that the liquid flowing through them will find its way readily into the ground, but be sufficiently retained to reach the whole system of distributing-pipes.

"It is necessary for the success of this system that the ground employed should be drained, either naturally or artificially, so that absorption will take place promptly, and that there should be a *flush tank* discharging its contents through an automatically-acting siphon. There should be such relation between the size of this flush tank and the soakage area, that the whole system of pipes will be filled at one discharge of the tank, and such relation between the whole amount of sewage to be disposed of and the soakage area employed, that the liquid from one discharge of the tank will have become absorbed by the soil into which it is distributed, before a second discharge. To adjust all these requirements perfectly, demands a nice judgment and a skillful hand. The nature of the soil must be taken into consideration. A clayey soil may be too retentive, and a soil composed mostly of sand may be too loose for the perfect working of this system; but, as the area required is small, it would cost but little to add sufficient sand to the former, and sufficient clay to the latter to render it suitable. When organic matter is absorbed into the soil near the surface, as provided for by this system of sub-surface irrigation, coming in contact as it does, in a state of minute subdivision, with the air and condensed oxygen contained in the porous soil, it undergoes a rapid oxidation.

"The change which takes place is in every essential particular equivalent to that of combustion. The organic matter thus treated is just as much destroyed as if it were burnt, and the resulting products are as harmless as the products of combustion of wood or coal. Soil which has been used in this way for many years has been found to be but little changed, the liquid resultants of disintegration having evaporated or become absorbed by the roots of plants, while the solid resultants which remain, but slightly (and not in any essential particular) differ from the original constituents of the soil. Theoretically this system is perfect, but, the question, 'will it work in actual practice?' is legitimate, and is constantly asked. The best answer to the question 'will it work?' is the answer to the question 'has it worked?' The principal object of this paper is to present the testimony of those who have had practical knowledge of this system—of the engineers who have constructed the works, and of the owners of places on which the system has been tried. The word 'tried' has been used intentionally, for no system can be recommended for adoption, however perfect it may be in theory, until it has been subjected to the crucial test of prolonged trial, and it is important to know, not what a system will do under skillful management, but what it will do under the somewhat negligent management which it is likely to receive. A system which requires for its operation the constant supervision of an expert, will fail on account of the impossibility of obtaining such expert supervision. In studying this system at the present time, we are fortunate in being able to form our conclusions concerning its merits, not from the reasonableness of its theory, nor the weight of opinion which supports, but from the testimony of those who have tried it.

"In collecting this testimony, I have been aided by Mr. James C. Bayles and Mr. George P. Olcott, civil engineers of Orange, who have kindly furnished me with the names and addresses of their patrons. To secure the desired information I addressed the following circular to about 60 people who for various lengths of time have employed the sub-surface irrigation system:

"'DEAR SIR:

"'Wishing to collect facts concerning the practical working of the 'Small-pipe System of Inland Sewerage,' and learning that you have had opportunities for observing its operation, and forming an opinion of its merits, I take the liberty of sending to you the enclosed blank, which I will ask you to kindly fill out and forward to me by return mail. Yours, respectfully,

"'J. W. PINKHAM.

"'State:

"' 1. Size of family.

"' 2. Approximate first cost of system.

"' 3. Approximate cost of annual maintenance.

"' 4. Length of time in use.

"' 5. Is system free from nuisance?

"' 6. Is all house waste satisfactorily disposed of?

"' 7. Have stoppages occurred?

"' 8. Is the soakage area underdrained?

"' 9. Is it superficially dry?

"'10. Give any facts which you think may be of service in determining to what extent and under what circumstances this system can be recommended for general use.'

"The answers to these questions I will present to you as they have been received, omitting only the portions which are irrelevant. These answers constitute the testimony which I have collected concerning the practical working of the sub-surface irrigation system for the disposal of house-sewage.

NAME.	Size of family.	Approximate first cost of system.	Approximate cost of annual maintenance.	Length of time in use.	Is system free from nuisance?	Is all house waste satisfactorily disposed of?	Have stoppages occurred?	Is the soakage area underdrained?	Is it superficially dry?	Give any facts which you think may be of service in determining to what extent and under what circumstances can this system be recommended for general use.
C. M. Marvin, Montclair, N. J.	5	$200 00	$10 00	19 months.	Yes	No	No	No	Yes	The women's prison at Sherborn, Mass., uses this method, and there is a large amount of water consumed there. You are probably aware of the particulars in this case. The tanks discharge 15,000 gallons at a time, and they discharge alternately into two sets of drains of 10,000 feet each. At my own house I have had a switch put in the main sewer-pipe, so that I can use 200 feet alternately. By doing this I can distribute the liquid waste more evenly, and have a more uniform growth of grass on the surface of the ground. For in all cases the upper lines of pipe (those nearest the tanks) are apt to receive the larger quantity of waste, although they do not receive more than they can take care of.
Chas. Scheffiin, Plainfield, N. J.	8	....	....	5 years....	Yes	Yes	No	No	Yes	I consider the system in every respect adapted to suburban or any residence having a sufficient area of garden or lawn.
B. I. Tuthill, Montclair, N. J.	7	200 00	....	6 months.	Yes	Yes	No	No	Yes	So long as we have used it it has been very satisfactory, and it seems to be the best system we have tried.
S. C. Burdick, Brick Church, Orange, N. J.	14	1,000 00	10 00	3 years....	Yes	Yes	No	No	Yes	
E. Eaton, No. 19 Mercer St., N. Y.	6	350 00	12 00	6 years....	Yes	Yes	No	No	Yes	I consider this system as satisfactory as any, if not more so.
C. Morgan, Bordentown, N. J.	8	500 00	25 00	2½ years....	Yes	Yes	No	No	Yes	You have the facts above, to which I have nothing to add save the opinion that it is a perfect success.
J. P. Davis, No. 21 Maiden Lane, N. Y.	10	170 00	....	2½ years....	Yes	Yes	No	No	Yes	
J. E. Pulsford, 45 William St., N. Y.	15	400 00	20 00	3 years....	Yes	Yes	Yes	No	Yes	It can be recommended.

NAME.	Size of family.	Approximate first cost of system.	Approximate cost of annual maintenance.	Length of time in use.	Is system free from nuisance?	Is all house waste satisfactorily disposed of?	Have stoppages occurred?	Is the soakage area underdrained?	Is it superficially dry?	Give any facts which you think may be of service in determining to what extent and under what circumstances can this system be recommended for general use.
J. W. Towne, 14[illegible] Nassau St., N. Y.	14	$500 00	$10 00	10 years	Yes	Yes	No	No	Yes	
J. E. Knapp, 24 Pine St., N. Y.	9	250 00	15 00	3 years	Yes	Yes	Yes	No	Yes	
W. F. Havemeyer, 112 Wall St., N. Y.	6	200 00	12 00	3 years	Yes	Yes	No	No	Yes	System is the best devised where there is sufficient room for pipes in dry lawn free from shade. I empty settling tank about twice a year, though it is not absolutely necessary.
Dav. Bingham, New Produce Exchange, N. Y.	12	250 00	....	5 years	Yes	Yes	No	No	Yes	The system I consider perfect, wherever the party adopting it controls sufficient area for adequate distribution of the "small" or distributing pipes.
Ham. Wallis, 48 Wall St., N. Y.	9	350 00	10 00	2 years	Yes	Yes	No	No	Yes	
S. C. Howes, 52 Wall St., N. Y.	8	250 00	25 00	1 year	Yes	No	No	No	Yes	I recommend it freely for general use where conditions and space of ground are favorable. The settling tank needs cleaning out by removing the solid matter twice a year, or oftener, and the ventilation pipes need to be carried high above ridge of dwelling, to prevent any odor being blown down by the winds.
R. C. Browning, 32 Cortlandt St., N. Y.	8	500 00	15 00	4 years	Yes	Yes	No	No	Yes	
B. Shepard, 26 Worth St., N. Y.	7	....	....	5 years	Yes	Yes	No	No	Yes	
Rowland Johnson, 5 Mercer St., N. Y.	8	380 00	10 00	19 months.	Yes	Yes	No	No	Yes	
Saml. Crump, Montclair, N. J.	10	175 00	10 00	3 months.	Yes	Yes	No	No	Yes	

NAME.	Size of family.	Approximate first cost of system.	Approximate cost of annual maintenance.	Length of time in use.	Is system free from nuisance?	Is all house waste satisfactorily disposed of?	Have stoppages occurred?	Is the soakage area underdrained?	Is it superficially dry?	Give any facts which you think may be of service in determining to what extent and under what circumstances can this system be recommended for general use.
E. A. Bradley, Montclair, N. J.	9	$225 00	....	4 years....	Yes	Yes	No	No	Yes	During the last three years there has not been the least trouble with the system.
Francis Speer, 135 Duane St., N. Y.	8	250 00	$20 00	5 years....	Yes	Yes	No	No	Yes	I have my tanks or brick cesspools opened every three months and the solid matter removed and mixed with the manure heap.
John T. Rockwell, 101 Duane St., N. Y.	7	400 00	15 00	2½ years....	Yes	Yes	No	No	Yes	Have two three-inch ventilating pipes extending above the house roof, one inside and the other outside of the house, together ventilating the entire system. The above is my only experience with this method of disposing of house waste. Thus far it is satisfactory.
W. W. Underhill, Montclair, N. J.	12	185 00	....	18 months.	Yes	Yes	No	No	Yes	My experience and knowledge lead me to believe that this system might probably be safely recommended for general use in a town as thickly settled as Montclair; no facts leading to an opposite conclusion have as yet come under my observation.
Henry M. Oddie, 23 Nassau St., N. Y.	9	300 00	12 00	3½ years....	Yes	Yes	Once	Yes	Yes	I can only speak from personal experience, that the system has been very satisfactory.
A. D. Palmer, Brick Church, Orange, N. J.	8	200 00	....	3 years....	Yes	Yes	Yes	No	Yes	I regard the system as fairly successful, and the next best to the small-pipe sewer system.
Charles A. Sterling, 55 Broadway, N. Y.	10	400 00	12 00	1 year......	Yes	Yes	No	No	Yes	I consider the system excellent if properly constructed, and sufficient area on the premises available for the distribution of the sewage. If the work is thoroughly and scientifically done, I would recommend it for general use, but otherwise it (the system) would be worse than useless. I have the system in use on my property, corner E. Park street and Washington, for about four years without any cost for repairs, and now working very satisfactorily.

NAME.	Size of family.	Approximate first cost of system.	Approximate cost of annual maintenance.	Length of time in use.	Is system free from nuisance?	Is all house waste satisfactorily disposed of?	Have stoppages occurred?	Is the soakage area underdrained?	Is it superficially dry?	Give any facts which you think may be of service in determining to what extent and under what circumstances can this system be recommended for general use.
R. C. Ryerson, Caldwell, N. J.	9	$200 00	$10 00	3 years	Yes	Yes	No	No	Yes	
Essex County Penitentiary, Caldwell, N. J.	150	500 00	50 00	4 years	Yes	Yes	No	No	Yes	The distributing pipes were first laid so that fluid from the tanks reached only a portion of the soakage area, and there was, consequently, supersaturation. At present there is no difficulty with the system, and it gives entire satisfaction; 5,000 gallons of water are used daily. Since the introduction of this system there have been no cases of typhoid in the institution; previously there had been cases.
Geo. E. Simpson, Orange, N. J.	12	240 00	15 00	3½ years	Yes	Yes	No	No	Yes	
W. H. Jewett, Montclair, N. J.	4	225 00	10 00	1 year	Yes	Yes	No	No	Yes	I have studied the system and believe there is nothing in the world like it for suburban and country places.
Mrs. G. W. Thorp	5	550 00	12 00	18 months	Yes	Yes	No	No	Yes	I take pleasure in returning the inclosed blanks, filled out as per request of Mr. George P. Olcott, who inserted the system under discussion (with modifications of his own, and with which I suppose you are acquainted) in two of my lots in East Orange. A third place in Main street is in working order, but has not had the test of time as yet. I shall be glad to furnish you with any particulars in regard to these three systems at any time.
J. G. Thorp, Brick Church.	4	450 00	12 00	16 months.	Yes	Yes	No	No	Yes	
Robt. Lane, East Orange, N. J.	6	250 00	12 00	2 years	Yes	Yes	No	No	Yes	
A. W. Greene, 51 Leonard St., N. Y.	10	350 00	12 00	15 months.	Yes	Yes	No	No	Yes	My impressions are so favorable at this time that I would not avail myself of public sewerage if we had it.

NAME.	Size of family.	Approximate first cost of system.	Approximate cost of annual maintenance.	Length of time in use.	Is system free from nuisance?	Is all house waste satisfactorily disposed of?	Have stoppages occurred?	Is the soakage area underdrained?	Is it superficially dry?	Give any facts which you think may be of service in determining to what extent and under what circumstances can this system be recommended for general use.
J. R. Howard, Montclair, N. J.	14	$190 00	....	6 months	Yes	Yes	No	No	Yes	My family has used about 350 gallons of water per diem (to the great grief of the pumper), so that I think the system has been pretty severely tested there. It cannot, however, be fairly judged until we shall have had both winter and summer experience of it, with the full alteration of discharges mentioned in No. 5, since we did have more or less foul odors for some time, where the ground was evidently oversoaked and could not take care of the water.
Orange Memorial Hospital, Orange, N. J.	40	1,000 00	$35 00	2½ years	Yes	Yes	No	No	Yes	Experience in this case shows that underdrainage is indispensable when an area not naturally well drained is expected to take up a large amount of sewage. With good natural drainage and a small amount of sewage to dispose of, the benefits of underdrainage are less apparent, though it is desirable in all cases. The soil is underlaid, at the depth of 18 to 21 inches, by a layer of hardpan, and the soil before the underdraining was continually water-soaked during rains.
Jno. W. Handren, Dunellen, N. J.	8	....	....	3½ years	Yes	Yes	No	No	Yes	I think it is the only system that can be used successfully for inland drainage, and, in my opinion, if it was universally used, we would have less fevers, sore throats and throat diseases of all kinds than we now have.
E. O. Doremus, Newark, N. J.	8	1,000 00	10 00	3 years	Yes	Yes	No	Yes	Yes	

"In order that the negative and affirmative answers in the foregoing table may convey no wrong impression, I desire to say that in the few cases where qualified answers were given, they are represented in the table by a 'yes,' which in the answer was 'yes, to a small extent,' and by a 'no,' which was 'no, not to any extent,' or words of similar import. Without this explanation the tabular statement would be less favorable to the system than were the answers received, which in no case represented that there had been serious difficulty, or that there was dissatisfaction with the system.

"My conclusions, says Dr. Pinkham, are as follows:

"2. The first cost for a family and house of average size is about $200.

"3. The cost of annual maintenance is about $10 for such a house.

"4. The ground selected should be free from shade, and may be either lawn or garden.

"5. By means of this system all liquid sewage from the smallest dwelling-house or the largest institution may be effectually disposed of without nuisance and without peril to health.

"6. This system should take the place of cesspools in all suburban and country places which have sufficient ground for the distributing of pipes."

This description and indorsement entirely accord with my own views after having put in some seventy on this general plan. For the two years since this outline was written I have added several more, and believe they are giving satisfaction in all cases where there has been no mismanagement. It is always to be borne in mind that all details must be carried out both in construction and management. The ground must be properly prepared. The quantity chosen must allow for the amount to be disposed of thereupon. Storm-water must be excluded from the slops, so as not to increase unduly the quantity. The laying of the tile must be such as to insure complete distribution. The absorption is meant to take place at each joint, but if there are additional irregularities, stoppage or accumulation may occur. The pipes allow full circulation of air through them and the adjacent ground, which adds to the oxidation and the rapidity of disposal. The flush tank or siphon which receives the flow from the house is so made that when the liquid rises to a certain height it discharges itself of all its contents, thus securing a general distribution and a scouring of the pipes. Thus they do not get accumulation and stoppage, as they are so sure to do with a very light and inconstant flow. Where the system is properly put in and has some oversight it is surprising how completely all organic matter is disposed of. Cultivation and free croppage help the disposal. Occasionally the pipes and ground need inspection by some one familiar with details. Having long been familiar with various plans of sewage disposal I regard this as having special adaptation where stream-sewers cannot receive the discharge, and as far preferable to cesspools. It returns organic material to its natural consumption in the ground and gives it as food to growing vegetation. While other and more extended systems have their peculiar adaptation for larger populations, this is often available in smaller communities or for individual homes.

The next plan presented deals with sewage by methods of subsidence and chemical purification, then passing it upon land, and finally as a purified effluent into a stream. It brings into prominence a system rapidly coming into use by which the grosser matters are so removed from sewage and compressed as to be transportable, thus leaving an effluent greatly reduced in its proportion of organic matters In order still further to remove any dissolved matter it is then passed over land and so into an adjacent stream. Thus, far less land is needed and the small stream not polluted.

This system has been planted at Long Branch and at East Orange, under the superintendence of C. P. Bassett, C.E., of Newark. We are able to present his own description of one of these methods in detail.

DESCRIPTION OF LONG BRANCH SEWERAGE SYSTEM, AND NOTE AS TO EAST ORANGE SYSTEM.

BY C. P. BASSETT, C.E.

In the fall of 1884 the local health authorities consulted me on the introduction of sewerage in Long Branch. The sanitary condition of the town had attracted the attention of the State Board, who cited the peculiar dangers to which the town, as a health resort, was subjecting itself.

An investigation of the case unearthed obstacles not legitimately in the province of the engineer to surmount. It was found that urgent need existed for efficient removal of sewage, but it appeared that the limits of bonded indebtedness allowable to the Board of Commissioners (the governing body) had been almost reached. Special action, necessary to secure an increase, but dependent on popular vote, would probably have been defeated. It was finally decided to put the matter in the hands of private capital. The necessary legislation was obtained, and a private company incorporated under the State law, to introduce sewers. It was recognized by the promoters of this enterprise that sanitation should not be dependent on the success of a financial investment. To reduce this objection, property-owners were interested to control the company, it being argued that public-spirited men deeply interested in local affairs, could best be entrusted with a matter so intimately related to the health of the city. In the winter of 1885–6 surveys were made and plans perfected. In the following spring, the main portion of the system as now existing, was constructed. The question of the disposition of the sewage was of prime importance. It was stipulated that no objectionable matters should be poured into adjacent waters. The introduction of some process of purification was therefore necessary. It was believed that the requirements for an effluent to be discharged into the ocean might be met by an inexpensive, mechanical filtration. Such a process was introduced, and is cited as the first attempt in this country to treat sewage on a large scale in restricted quarters, surrounded by a compact population, without nuisance.

The topography of the town is simple. A ridge twenty feet above mean tide rolls up from the beach, and falls easily back to a parallel valley 500 to 600 yards from the beach, which averages nine to ten feet above mean tide, throughout the length of the town. The west slope of the valley rises gradually for a fraction of a mile, where it again dips to form a secondary valley. This second ridge is intersected by several streams and depressions. It would have been a simple matter to construct sewers adapted to the needs of the built-up portion of the town, but to design a comprehensive system capable of extension and development to meet the needs of the entire adjacent territory, and conditioned on the location of the works for the treatment of the sewage, was a complex problem of considerable magnitude and required an expense in construction only justified by the demands of the future, and in the making of which the company demonstrated their good faith and determination to meet the needs of the entire community.

The system constructed is the "separate" system. The sewage is collected in vitrified pipes (eight-inch being the minimum) into the main which flows in the principal valley (twenty-four-inch being the maximum), passes through the building where it undergoes the treatment; thence to the tidal chamber, in which it is controlled by automatic valves and discharged on the outgoing tide into the ocean, through a wrought-iron pipe, supported on piles, and extending 200 feet from shore.

Man-holes are placed along the lines at intervals not greater than 300 feet, and at all deviations of alignment or grade, securing control and location of troubles in the pipes. The covers are perforated to secure ventilation, and buckets are to be hung just beneath the cover to catch dirt and sand falling through the holes.

As the sewers are designed to accommodate the maximum flow of the crowded season, the main does not receive cleansing flow during a large portion of the year. Arrangements are made for liberal flushing along the lines, and in some locations the brook can be turned into the sewers.

In the section of the town to which the sewage would gravitate, little available land for treatment-works could be obtained; and the main sewer was necessarily located at so small a height above mean tide that considerations of economy dependent on a gravity outlet, demanded that the shortest line to the ocean be provided. This prevented any lengthy detour of the main sewer to treatment-works and virtually determined their location. A small plot of ground, 100x100 feet, on Long Branch avenue near Second avenue, was finally procured and the works erected there. The building is surrounded close on every side by dwellings and shops. Chemicals (lime, alum, &c.) are mingled with the sewage at its entrance to the works. Together they flow into the receiving tanks, which are constructed in duplicate, of concrete, and receive the sewage alternately, the one being cleaned while the other is in use. The course of the sewage in the tanks, under planks floating on edge, over walls, through submerged arches, as shown in the accompanying sketch, is such that in the thirty-feet flow a large part of the matters in suspension settle with the chemicals into the bottom of the tank; the sewage then enters the series of portable coke filters. Provision is made for four deep, narrow wire cages, sliding in guides and holding different sizes of coke. When the filters are clean a very fair purity is secured, and it is believed that the process is capable of considerable development. The coke when taken from the frames is used as fuel; it could with care be used again as a filter, effecting economy. The flow in the tanks is continuous. Considerable loss of head occurs in the flow through the filters, and when they are in operation the sewage has to be pumped up to the level of the gravity sewer. This is accomplished by a six-inch centrifugal pump, built by the Weber Machine Company, of Lawrence, Massachusetts. When the filters are out the sewage passes through the works by gravity. After sufficient deposit is secured in one of the tanks the flow is diverted to the other, and the water is drawn down in the first tank nearly to the level of the sludge (or deposit); the remaining contents of the tank are then drawn into a wrought-iron sludge-receiver by creating in it a vacuum with a vacuum engine. From this receiver the sludge is forced by compressed air into Johnson's Filter-Press, where the liquids are pressed from the sludge, leaving portable cakes to be used as guano. A by-pass is arranged on the main sewer near the building, so that sewage, in case of accident or emergency and during the winter season, can be made to flow by gravity directly to the tidal chamber, avoiding the works. (The plant of the works is shown opposite page 88.)

The system was ready for use in the summer of 1886. And as soon as it was recognized that it was in successful operation applications for connection were rapidly made. The real test of the system has been made within the past year and the results appear to justify all that has been claimed for it.

It should be remembered that the purification attempted is merely mechanical—a removal of the matters offensive to the senses. That the sewage has been discharged without any complaint, in the midst of the surf-bathing, about 300 yards north of the iron pier, seems sufficient mention of its merits. The system is capable of development, and, as the needs arise, it is intended to extend the mains now laid to Elberon on the south, the upper village on the west and Monmouth Beach on the north.

EAST ORANGE SEWERAGE.

During the past five years special attention has been given by the prosperous inland towns in the State to the consideration of sewage disposal. The lack of available outlets has deterred even some of the more progressive communities from constructing sewerage systems. The removal of sewage in some form or other has in cases become most pressing.

The action of the East Orange authorities in constructing extensive and expensive works to purify their sewage is therefore being watched with no ordinary interest by communities similarly situated.

I have been engaged since May, 1886, as designing and construction engineer on the East Orange sewerage. Twenty-five miles of sewers and the purification works have been constructed and are now ready for operation. It seems proper at this time to merely call attention to the aims of the system, leaving until some future occasion a description of the works, when comments may be made on their operation.

Large concrete tanks holding 200,000 gallons will receive the sewage after the admixture of the chemicals. The effluent from the tanks will be filtered through the soil (twelve acres have been prepared) before discharge into the stream. A high chemical purity will therefore be maintained. This final effluent from the works flows into Second river, a tributary of the Passaic, just below the "in-take" of Newark's water-supply. This dual process of purification is introduced for the first time in this country on a large scale. The process is quite similar to the Coventry works, England, such changes being made in the general plan as were suggested to the writer after a most careful examination of European works and consultation with the English authorities. The latest improvements in filter-pressing machinery have been introduced by S. H. Johnson & Co., of Stratford, England, through their New York house. The present population of East Orange is 12,000.

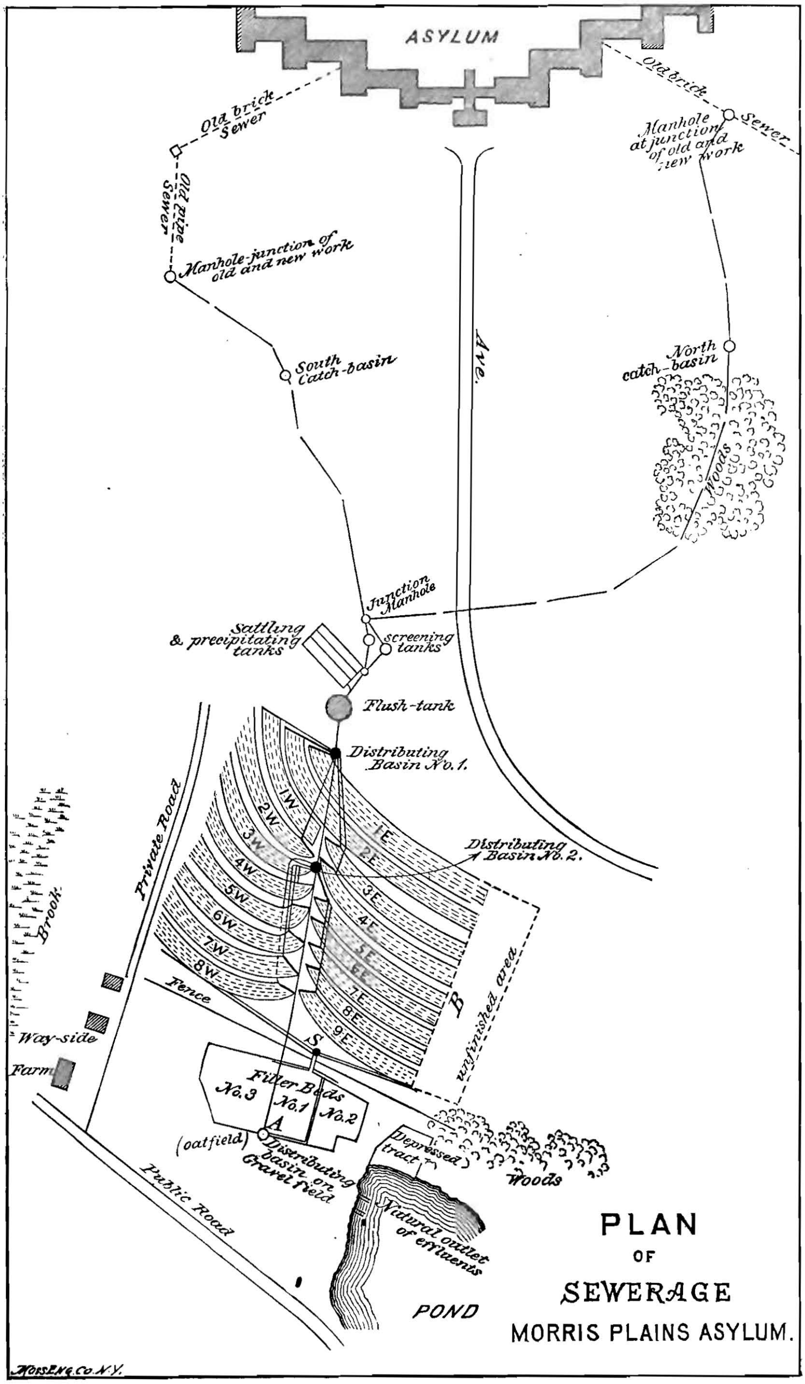
DESCRIPTION OF SEWERAGE SYSTEM AT MORRIS PLAINS.

BY PROF. C. MCMILLAN.

The remaining system which we notice is that which has been planted at *the Asylum at Morris Plains*. It is intended to combine the value of separating screens for the coarser material, subsidence tanks and filtration by a small pipe or absorption tile system and then pass any effluent into a pond or stream adjoining. There is also constructed a long precipitating chamber for use so far as it may be found necessary.

We are authorized to make extracts from a report of it by Prof. McMillan, the Engineer in charge. As the system is not yet completed in all its details, the description is not quite full on every point, but sufficiently so to give an outline showing the plans.

"Starting from the uppermost points, we first reach the N. and S. catch-basins, in which rough screens are intended to arrest bulky foreign matters. They are either raked out by hand or drawn out by the odorless excavator.



PLAN
OF
SEWERAGE
MORRIS PLAINS ASYLUM.

"Next we come to junction man-hole, which simply unites the streams and enables us to shoot the liquid into one or the other of the two screening tanks. The liquids from the screening tanks again unite at a man-hole adjacent to the settling and precipitating tanks, thence the sewage can be run at will to surface, or to these tanks, or directly to the flush tank. The ordinary course will be to the settling tanks, thence to flush tank, and thence out into the absorption tile, or out on the surface of sloping field, or out on the filter-beds direct. Of course, the first destination is the one designed.

"The sloping field is underdrained by tile drains (not shown on sketch) five feet deep, and at present forty feet apart. To complete the drainage, extra drains will have to be interposed so that the deep drains will be twenty feet apart. All these drains, which will be under the ground occupied by the absorption tile, deliver through two six-inch collectors into a man-hole (S on sketch), and thence the effluent can be delivered to either one of the three filter-beds on the gravel-field, or through a side outlet (not shown) into the brook, or through another side outlet on the depressed tract. Of the 120,000 feet of absorption tile in contemplation, we have only succeeded thus far in laying about 98,000 feet.

"On the sketch (page 93), the fine full lines traversing the shading, representing the lay of the absorption tile in the different sections, are the carriers (four-inch glazed pipe). They run under the sections which they pass, until they are within reach of their respective sections, where each one of them is coupled to its particular section. The carriers start always from a basin where, in the first place, the same static head is secured for each carrier, and, secondly, since the carriers have different grades (some of them very steep) the delivery from the basin to each carrier is regulated by a disc-valve.

"It was important to have a uniform static head at each basin. An assistant sent the first one-third of the flush, which is nearly twice as rapid as the last third, through the six carriers, feeding about 35,000 feet of pipe (it is intended that not less than twelve carriers should be exposed to the flushes), and his report was to the effect that it worked completely. Six carriers, instead of twelve, were working for at least half an hour, and not a sign of water at the surface. The flush which was sent into these tiles must have been at least 25,000 gallons.

"There are bends or returns in the lines of carriers for the purpose of economizing ground and to lay the distributing tiles on flat grades. The subdrains are all parallel and terminate in the six-inch collectors, represented by double interdotted lines meeting at S, a man-hole beyond what is shown on the sketch. A section of absorption tile is left out from the sketch, owing to overcrowding the drawing.

"The full black line running directly from the flush tank to the distributing basin A, in the gravel, is the delivery main which has been in use all summer. The distributing basins (Nos. 1 and 2) are built on it, and also a small man-hole near the foot of the slope, which operated as an air-vent during the direct discharge on the filter-beds.

"The flush tank is fifty feet in diameter with a depth of flush of a little more than five feet.

"The settling tanks galleries consist of three chambers, each one hundred feet long, by five feet wide, by four feet deep. The idea is, as far as possible, to receive the sewage in No. 1, thence let it divide over an apron at the rear ends of the tanks into tanks Nos. 2 and 3, thus reducing the flow in Nos. 2 and 3 to one-half of that in No. 1. But, of course, this proportion will be disturbed whenever one of the tanks needs cleaning.

"For precipitation it is proposed to place a hopperful of crude sulph. alumina directly over the mouth of the outlet of the screening tank, and to supplement this at the man-hole lower down and adjacent to the settling tanks by the drip from a hopperful of *lime-water* (not milk of lime). There is considerable natural agitation of the liquid between these two points, and there will be still more on entering tank No. 1. This will not be as thorough as mechanical agitation, but it is thought that it will answer the purpose. The outlets for drawing of liquid for cleaning the tanks are not shown. They are at the rear of the tanks.

"The stop-planks are so arranged that if No. 1 needs cleaning the sewage flows into No. 2, and thence through No. 3. If No. 2 is to be cleaned the course of the liquid is through No. 1 into No. 3. If No. 3 needs cleaning the course is through No. 1 into No. 2. The movement in the tanks is for 150,000 gallons per diem, at the rate of about one-eighth of an inch per second.

"We may find it desirable to use an emulsion of clay. But that can only be determined by experiment.

"The sludge is to be moved in the tanks by a drag scraper worked from end man-holes, and taken out by 'odorless excavators.'

"We have made provision so that if it is ever found advisable to institute a precipitating process, pure and simple, with intermittent filtration, the flush tank can be thrown into the precipitating system, forming the terminal tank.

"1. The sewers are first-class. There is not a better piece of work in the State. The grades are $1\frac{2}{10}$ per cent. and $1\frac{4}{10}$ per cent., but the laying and alignment are very superior.

"2. The screening tanks will do their work fairly well. We will put in duplicate screens so that one can be in place before the other is removed for cleaning. Some slight changes in these may be needed.

"3. The settling tanks are large and the movement through them is as before stated.

"4. The flush tank is excellent and has some special improvements.

"5. The absorption tile has received a very severe test and verified the correctness of calculations. All of it is not in, however, and cannot now be put in before winter, and that which is down will therefore have to be used only moderately, especially because the extra subdrains are not yet in. But it can be used and can take care of every alternate flush, provided the flushes are not more frequent than every twelve hours. Even that will be dealing with 160,000 instead of 150,000 gallons. A good deal of adjustment will be needed where the absorption tile cross newly-made trenches, for the simple reason that we cannot pack filling, in one or two months, during one summer, so that it will not settle further.

"6. The underdrains will be *doubled* in order to secure quick drainage, in wet weather especially.

"7. The entire amount of absorption tile required is simply a matter of judgment after we have fully seen how the field behaves and whether there is need of increase."

The attention of our citizens has during the past year been more fastened upon the conjoint interests of water-supply and sewerage than ever before. It is evident that most of our growing towns are compelled to arrange as to these more fully. Those cities are wise that do not delay too long and that settle upon a method while land is cheap, or that avail themselves of the many recent and economic methods which have been devised. It has been one of the privileges of this Board to co-operate with individuals and Local Boards in presenting the necessity for liberal and complete arrangements for the disposal of sewage. It is encouraging to be able now to point to such systems as those herewith described. It is our hope in the subsequent report so to outline methods and so to present and criticise the various systems in operation in this State as to give aid to our citizens in projecting new plans or in improving those already in use.

EXPOSURES AND DISEASES OF OPERATIVES.

During the past year as far as practicable the Board has continued its inquiry into the condition of workshops and factories and as to the influence of the various trades and occupations upon the lives and health of operatives. Each new inquiry, when made for a long period and with skill, reveals the fact that in many industries the years of productive labor are greatly shortened by sickness and by too early deaths. The system of expert factory inspection pursued in England and in some countries on the continent has plainly shown that very many of these results are largely preventable. This is a part of the service of the Board that could be greatly extended with advantage. Our former reports on this subject have proved of much value, but there is need of something more than advice. The chief report of this year is upon the pottery industry. We have also employed a competent person to examine as to the woolen and cotton factories of the State. It is our intention, as the means are provided, to extend this inquiry to all the important industries of the State.

THE DISEASES OF POTTERS, THEIR CAUSES AND PREVENTION.

BY DAVID WARMAN, M.D.

In the capital city of this State there are located twenty-one potteries, beside two tile factories and twelve china decorating establishments, in which over five thousand men, women and children are employed, and over a million of dollars of capital are invested. Indeed, so large and important has this industry become in Trenton, that this city is popularly known everywhere throughout the United States as the "Staffordshire of America."

An industry that employs so much capital and labor is certainly worthy of more than a passing notice, especially when so many of our fellow-citizens are engaged in an occupation that is generally considered deleterious to life and health.

Unhappily, we cannot disguise the fact that the potters' trade is an unhealthy one. The question is, can it be made less so? We think it can.

Having made careful and minute inquiry into the varied occupations of potters we find that those engaged in this industry are more or less subject to the following diseases, viz.: 1. Potters' asthma and potters' consumption. 2. Lead-poisoning. 3. Rheumatism, acute and chronic, and its allies, lumbago, sciatica and its frequent complications of diseases of the heart, together with variously-placed nerve pains or neuralgia. 4. Disorders of the digestive organs, liver and stomach. 5. Anæmia and bloodlessness, with general debility. Lastly, in case of females, various local derangements and sufferings peculiar to the sex.

In order to show how the above-named diseases are more prone to develop among potters, it will be necessary to point out the manner and kind of work and the character of the materials used in the manufacture of the various kinds of pottery products.

NATURE OF THE OCCUPATION.

The manufacture of earthenware comprises many processes which do not all affect the operatives engaged in them in the same manner or to a like extent. There is also in some of the processes a material difference as regards their influence on health, according to whether the articles manufactured be of earthenware or china. Indeed, in some of the processes, as for example in biscuit-rubbing, the quality of the article diminishes or enhances the probability of the process being injurious to the health of the person engaged in it.

Of the various departments of the manufacture of earthenware several require special notice from the circumstance of their being those to which the prevalence of pulmonary diseases among potters must be ascribed.

The operatives employed in these branches of labor may conveniently be named, from the nature of their labor, *slip-makers*, *mould-makers*, *potters* (properly so called), *turners*, *placers*, *china scourers* and *decorators*.

Slip-makers are the men employed in preparing the clay or material of which earthenware is made. After the several substances of which the clay is composed, such as the different china clays, flint and spar, have been thrown into a tub, or blunger as it is called, and have been ground into a state of comminution, they are mixed and diffused in water so as to form a fluid. This "slip," as it is then called, is pumped out of the blunger and deposited on the face of lawns. When the slip has been passed through the lawns until all impurities are removed it is then run into the presses, where the water is forced out of the clay. The slip-makers are those who attend to the grinding and mixing of the clay, so as to form a dough suitable for handling. This work is often done in damp cellars, the workmen get wet, and it causes more or less rheumatism.

Mould-makers manufacture the plaster of paris moulds upon which the various articles are shaped.

A very little dust is evolved in the process, but a considerable quantity is apt to be raised from the floor by locomotion, and mould-makers are, as a consequence, liable to inhale air more or less charged with fine dust. Exposure to high temperature is not a necessary concomitant of the mould-makers' occupation, but some of the men being of irregular habits, and coming to work late in the day, are obliged to hasten the drying of the moulds by an increase of temperature, and are thus exposed to this additional risk.

Some of the mould-makers' shops are lofty and well ventilated, others quite the reverse. Ill-devised methods of ventilation are apt in this, as in other manufacturing processes, to fail in their design. In one of the mould-makers' shops visited, the men suffered from oppression of the chest, cough and expectoration, which they attributed, and no doubt correctly, to the bad ventilation and inhaling of impalpable dust. The evils contingent upon this branch of the business might be greatly diminished by more care being taken to avoid scattering the plaster over the floor, and by regularly sweeping the latter so as to allow as little of the material as possible to accumulate and be raised in the atmosphere by tramping about. The keeping of the mouth closed and breathing only through the nose, and the occasional cleansing and wetting of the nostrils, by a sponge, are of great service.

Potters.—Under this name are here included the operatives engaged in the following branches of manufacture: flat pressers, or dish, plate and saucer-makers; hollow-ware pressers; throwers, who shape vessels upon the wheel, and sagger-makers, who make the coarse earthenware vessels in which pottery ware is placed for baking.

Flat pressers are those who roll out a piece of dough, which, when of the proper thickness, they shape upon the mould. The material is used in a wet and ductile state, but bits of it get scattered over the floor, and, rapidly drying, are stirred up by the feet of boys and others, who are constantly running about the work-shops. The atmosphere is, therefore, more or less impregnated with a fine dust, clearly observable only when it lodges on a flat surface, or is seen in the sunshine during a bright day.

The quantity of dust varies, of course, according to the cleanliness of the place. Some shops are swept daily, others not so often, and, of course, those employed in the latter are more likely to inhale dust than those in the former.

Dish-makers are less exposed to heat and dust than plate and saucer-makers, the operations of the former being a slower process.

China flat pressers are less exposed to heat, but just as liable to inhale dust as those who work in the commoner material.

Saucer and plate-makers create much dust in giving an edge to them after they have been dried. Intermittent currents of hot and cold air strike the worker, and this, with the dust, is one of the causes of potters' asthma.

Hollow-ware pressers are exposed to much of the same influences as the flat pressers. Both flat and hollow-ware pressers stoop somewhat over their work, in order to make pressure against the moulds. This constrained position produces indigestion and is very monotonous and wearing upon the potters.

Throwers, who shape their work upon a wheel, sit at their employment with the wheel placed directly before them, over which they stoop very much, thereby compressing the chest and interfering with free respiration. They are exposed to dust from the shaking up of debris from the floor, but not to the same high temperature as the flat pressers.

Sagger-makers are those who make the saggers which are to hold the ware to be placed in ovens or kilns. They are subject to great vicissitudes of temperature.

Turners are employed in turning into a complete form the ware produced by throwers. The atmosphere of the turning-shops usually contains a proportion of fine dust, but in smaller quantity than the potters'-shops, properly so called. The turners' branch of the manufacture requires no heat, and the shops are, accordingly, for the most part cooler than those previously described.

Placers or *kilnmen*, are those who pack the ware in saggers, and afterwards place them in the kilns or ovens. Earthenware is surrounded in the saggers with sand, but china with flint-powder. In the process of placing the latter in the saggers a considerable quantity of flint-dust is said sometimes to be dispersed in the atmosphere, when not dampened. Placers are exposed to a high, oppressive temperature and unwholesome atmosphere in drawing the kilns or ovens—that is, in removing the saggers after the ware is baked. The results of such exposure other than inflammations of the chest or elsewhere, are witnessed in the shape of rheumatism and its allies.

The pottery workmen most liable to rheumatic affections are oven-men and kilnmen, who are greatly exposed to heat and strong draughts. If, however, this work be carefully done, the ovens being allowed to cool properly before the saggers are drawn, the danger to health would be greatly diminished.

China-scourers remove the loose flint-powder from the china after it has been baked. This is done, partly by dusting or brushing and partly by rubbing the china with sand-paper, during which process much fine flint-dust is dispersed into the atmosphere about them; a dust which is lighter and floats more obstinately in the air in proportion as the earthen-ware is fine. In the manufacture of the finer sort, the flint-dust is in the form of impalpable powder, that it may not scratch; in that of the inferior sort the flint-powder is coarser, and falls to the ground more rapidly. This dust, inhaled into the lungs of the work-people, is a terrible irritant to the bronchial surface which it invades.

The women and girls (for the occupation is a female one) soon get habitual shortness of breath, with cough and expectoration. Very often they have bleeding from the lungs; sometimes, also, from the nose, and their chronic affection is from time to time accelerated by more acute catarrhal attacks, to which they are particularly subject.

Indeed, the chief sufferers in the manufacture of earthenware are the china-scourers. Comparatively few continue long at the employment. All who do continue at it, sooner or later become asthmatic. Against the danger of this occupation scarcely any provision has been made.

Dippers—who dip the ware into a liquid glaze, containing oxide of lead, borax, Paris white, clay, flint, &c. The sufferers from the action of lead, besides the dippers and those assisting them, are glost-placers, mixers of colors, ground-layers, majolica and other painters, and those who "fettle" ware after it is dipped.

Handlers—who make or fix the handles to jugs, cups, &c., are liable to suffer from the dust and heat of the work-shops when, as often happens, they are associated at work with operatives of some of the classes already described.

Firemen—and the men and boys who carry recently-made ware into the hot or green-houses, as they are sometimes called, places to which certain articles in a wet state are sent to be dried, are exposed to considerable alternations of temperature, and suffer the results.

Decorators.—Under this head are comprised the persons employed in engraving and printing designs to be afterwards transferred on to the ware, besides painters, gilders and burnishers. Not much of the latter, however, is done, except on very fine ware. All these branches of manufacture are of a sedentary kind, and are frequently carried on in ill-ventilated and over-crowded apartments. Sometimes they are over-heated, in consequence of the nearness of the ovens or fires which, in certain processes, are required in order to dry the articles when they have received the designs. Several of these are skilled branches, to which an apprenticeship is served, and many women and girls are found among the journey-women.

In the larger establishments there are often a great many persons collected in the work-rooms of these departments, more especially those in which women and girls are employed, and this over-crowding, combined with imperfect ventilation, often renders such rooms very unwholesome. Even where, as in the better class of potteries, means of ventilation have been provided, the operatives refuse to make use of them, or actually close them up, in order to exclude currents of air, to which pottery operatives, like most others, seem to have a great dislike. This objection might probably be obviated by the adoption of some improved method of ventilation, which should provide for a constant renewal of air in the apartment without sensible draught.

The Influence of the Occupation on Health.

The several processes of the manufacture just described directly or indirectly exercise an injurious influence on the health of the operatives in various ways, such as the respiration of the air more or less charged with fine, irritating dust; exposure to a dry, hot atmosphere, or to a hot, moist atmosphere, or to great vicissitudes of temperature, or the habitually assuming a constrained attitude while at work. China-scourers are in general only exposed to the first of these influences, and theirs is the most pernicious branch of the manufacture. The fine flint-dust diffused through the work-shops and inhaled into the lungs very soon produces discomfort and a sense of oppression in the chest, soon followed by cough and expectoration.

China-scouring is performed by women, few of whom continue long at the occupation. Thirteen years is the longest time that any one person has continuously worked at this branch in *our* potteries. The danger to health varies, as said before, according to the quality of the china. Probably this most dangerous branch of the manufacture might be rendered less injurious to the health of the workers if some arrangement could be adopted for withdrawing the dust from the atmosphere, or perhaps the use of some kind of protection for the mouth, such as a respirator, might serve to exclude the dust from the air passages.

Potters, including under this head flat and hollow-ware pressers and throwers, turners and mould-makers, all suffer, but in a different degree, from inhaling air impregnated with impalpable dust.

Flat-pressers suffer most, turners and mould-makers least from this cause, the former because their work is more rapidly done. The boys and others are continually running backwards and forwards, thus raising the dust from the floor. The latter comparatively little, because there is less locomotion in their work-shops, and therefore less dust in the atmosphere. Flat-pressers are also exposed to another influence productive of bronchial irritation in the respiration of highly-dried hot air, caused by the heat of their work-shops. The evils incidental to these branches of the potters' calling might unquestionably be mitigated by increased cleanliness and improved ventilation, and by the adoption of such arrangements as would tend to moderate the heat of the work-shops.

Throwers suffer partly from the diffusion of impalpable dust through the atmosphere of their shops, but, in their own opinion, still more from stooping over their work, thereby compressing the chest and obstructing respiration. The men differ much as regards stooping, some leaning more over their work than others. The above influences, sooner or later, affect most of the throwers, and some of them rather *early* in life. Slip-makers suffer most from the relaxing influence of the hot, moist atmosphere, and the vicissitudes of temperature to which they are so much exposed.

We find that those engaged in the manipulation of the clay are the chief sufferers from chest diseases; such as throwers, flat and hollow-ware pressers and turners, among males, and china-scourers, among females. This being admitted, the next question is, why do these particular work-people so suffer? The answer beyond all doubt is, from the inhalation of dust. It is necessary to note here that besides the lung affections primarily due to dust, we have among us, also, an excessive prevalence of consumption, associated with tubercular disease. Unhappily, consumption is widely spread among all classes and all trades, and is by no means a special disease of potters. However, its production is favored and its mortality increased, by all causes operating prejudicially upon the lungs. Of such causes the inhalation of dust holds a foremost place, and it is owing to this fact that consumption claims a larger proportion of victims among pottery-workers than among most other artisans.

Habits of the People.

Further, the destructive action of inhaled dust is aggravated by every other condition or circumstance damaging the vitality of the whole body. Such conditions are (1) neglect of cleanliness in shops, in work, in dress and in personal habits; (2) inattention to ventilation, and to the heat and moisture of the air of the work-shop, and (3) intemperance, and irregular living and dissipation.

Granting that a certain measure of dust is unavoidable in the process of manufacture, the conditions damaging to health just enumerated are in the hands of the workmen themselves, and themselves alone, or, in some particulars, in conjunction with their employers. Surely our artisans are quite capable of keeping themselves and their shops clean, of lessening dust and of securing proper ventilation.

Likewise, if they will, they can repress irregularities in the condition and hours of labor, without perpetual oversight. It is to the interests of those employed, and, in a greater or less degree, of employers also, to insure every sanitary advantage, and to avoid irregularities in the work of a factory. As a frequent visitor to potteries, I noticed great room for increased cleanliness and carefulness in work. More clay is spilled about than the processes justify. Shops, their floors, benches and shelves are not brushed and washed as often or as clean as they might be; there is too little sprinkling to keep the dust down; the clothes of the workmen are often of very unsuitable material, not as comely and clean as they might be, and too largely carriers of dust for future inhalation outside the shop.

There is an increasing number of new factories constructed, on more or less improved principles, with new machinery for facilitating and economizing labor, for securing the ventilation and warmth of the shops, and generally for bettering the circumstances and surroundings of the work-people. Nevertheless, much remains to be done, and many shops still exist which are unfit places to labor in, and detrimental to health. Yet the advantages of good shops will be lost to the careless workman.

He is but little better off than in an ill-constructed one, if he pays no attention to ventilation, cleanliness and heating. So, many treat themselves as hot-house plants, and such they become. The consequence is, they fall a prey to every cold current encountered, and lay the seeds of that chronic bronchitis which is the peculiar appurtenance of their trade.

Ventilation is air in motion, so that what of it has been rendered impure by breathing, by exhalations or by the processes of labor, becomes displaced and removed, and thereupon replaced by fresh air from without.

Stagnant air is made worse by heating it. Hence arises one defect of the warming of shops by hot water, hot air or steam-pipes. This mode of heating is rarely combined with proper ventilation, and as a result we have hot, close air, which favors the drying and diffusion of dust through the shop, which is productive of languor among the inmates.

A reference has been made to the ill-adapted clothing worn by too many potters. What is required is suitable light woolen, washing material, made into an easy-fitting garment, which, as a non-conductor, shall keep out both heat and cold from the surface of the body, and at the same time allow free transpiration. To make matters worse many of the workmen will frequently stand in their shirt-sleeves about the door or in the yard and catch the cold which may by-and-by prostrate them with inflammation of the lungs, or with acute rheumatism.

A few words are appropriate respecting two other matters seriously affecting the health of potters, viz., irregular habits of life and intemperance. These directly damage the health and also diminish the powers of resistance of the system to the causes of disease.

In the category of irregular habits we include irregular meals, late hours and sensual excesses. But the abuse of intoxicating drinks stands foremost among the causes destructive of life and health. Yet it rarely stands alone, for generally the several irregular habits referred to are associated with it as consequences. Intoxicating drinks are directly injurious to the lungs when taken in such excess as to utterly load the blood with carbon, for the removal of this element is a principal business of the lungs, and consequently an overdose of it encumbers and embarrasses those organs. They also gorge the liver and damage digestion, with the further result of increasing the embarrassment of the lungs, for in the human body one organ or function is so bound up with another that if one member suffers all the other members suffer with it. You cannot with impunity sin against one organ of the body. You cannot drown your stomach with beer without paying for it in your lungs as well as elsewhere.

Who do medical men find to resist best the unfavorable conditions of his employment and generally live the longest? Why, the man who is prudent and temperate in all things. He may not win the applause of his fellow-workmen, and may be considered mean and wanting in mirth and good fellowship, but he has chosen the better part, and too frequently will witness with pain the break-down of his once jovial acquaintances, the wreck of their health and the premature closing of their career. A very large majority of those on the sick list among the potters of Trenton, with the various forms of potters' diseases, are or have been heavy drinkers of intoxicants.

One of the manufacturers remarked, "Keep drink away from the potters, and you would thereby keep sickness largely away from them."

Indiscretions and Faults in Habits and Modes of Living.

Diet.—Acknowledging as we must do that improper food is a fertile source of sickness with working people, it falls quite within the scope of this paper to say a few words about diet. Observation seems to justify the inference that with many people the diet chosen is that which costs them the least trouble in its preparation.

Cooks are very scarce in our workingmen's homes, and the inventive capacities of our female potters in preparing savory meals are of the feeblest sort. To frizzle a bit of bacon with or without cheese, to brown and dry up over the fire a portion of butchers' meat and to boil a batch of potatoes is a comprehehsive summary of the culinary acquirements exercised by many housewives.

A home-prepared meal such as has been described is assuredly not appetizing, and it is not sufficiently nutritious, nor again is it easily digestible. It wants a great deal of liquid to wash it down, and the fluids chosen are commonly beer and tea, which, when abused, add still further to the toils and troubles of the unfortunate stomach. Besides, such insipid, routine meals call for some articles to give relish, and of these the best patronized are pickles and condiments. Then again, in most of our potteries the operatives eat their noonday meal in the factory. To eat food in any shop is a proceeding fraught with evil. It favors irregular and scratch meals, and hasty and slovenly feeding, with the consequence of damaged digestion and impaired nutrition and vigor. To take meals in shops, where the air is tainted with many breaths, and by the processes carried on, probably also unduly heated, and inevitably pervaded by more or less dust, stands to common sense as being detrimental to health. It likewise encourages idleness and idle gossip. Hence, it is far better for all work-people to quit their shops and get their meals outside. The exit to the open air, the diversion of the mind from the circumstances attaching to their labor, and the exercise enforced by the journey to their homes or elsewhere, are all conditions favorable to digestion. However, some of the workers live remote from the factories and say they are obliged to take the principal meal of the day in the shops.

In many of the large potteries in England a mess-room is attached, conveniently furnished, and having in some instances a kitchen annexed under the management of a trained cook. Such an arrangement presents great advantages to factory operatives, particularly by insuring to them hot, fresh and well-cooked food, with surrounding comforts, cleanliness and warmth.

In a few of the larger establishments here, or where several are located together, we might well wish to see carried out the plan indicated, but where this is impracticable, private adventure might supply the need by individual enterprise.

Sedentary Employment.—This source of ill health is in no wise peculiar to the potter's art. It obtains in the majority of our industrial occupations, and doubtless operates more prejudicially in many of them than in the manufacture of pottery; for example, the milliner and dressmakers' shops. However, its effects among our artisans, particularly those engaged in the finishing departments, and when this is carried on in hot, ill-ventilated and dusty work-shops, are so obvious and so common that sedentary employment in this connection has a claim on our attention, and the diminution or prevention of its baneful results constitutes a worthy object of our study.

In the first place, its effects are more seen among female artisans, inasmuch as they represent a larger proportion of those engaged in sedentary pursuits, and for these obvious reasons the work in the finishing-shops is well adapted to females, and can be done by them at a cheaper rate than by men. It is a kind of work that requires very slight bodily labor, whilst it needs delicate manipulation, and, in the next place, it is in accord with the less active and in-door habits of women.

In what way, then, let us inquire, do sedentary employments damage health? Well, the human machine is furnished with appendages, or limbs, intended for active use. Locomotive organs are designed for locomotion, and it is not the office of our legs to serve for attachments to a chair or stool. That the limbs may be nourished, it is essential that the muscles moving them be kept in activity.

Moreover, that circulation and nutrition of the entire body be maintained, sufficient exercise is requisite. Sedentary occupation implies retarded or sluggish circulation, and languishing digestion and nutrition.

If the circulation be slow, respiration is also slow and less effective; the blood is less perfectly aërated or purified, and therefore every organ supplied by it is a sufferer. Hence, the production of stomach and liver disorders; of various local congestions, and of many general ailments. But the ill-effects of sedentary work are almost always made worse by accompanying conditions; *e. g.*, limited area of shop, imperfect ventilation, dust re-breathed, and heated air and noxious fumes from the processes of work.

Sedentary labor works still greater harm when it encourages resort to alcoholic drinks to stimulate appetite or flagging energy. Every drop taken is a drop too much, and will leave its mark in some damage to the body, especially to the liver and kidneys, and will, withal, augment the very discomforts for the relief of which it is imbibed. The same may be said of pickles and condiments. Stomach and liver disorders rank foremost among the consequences of sedentary work, and they are always aggravated by improper food and drink, and neglect of out-door exercise. The consequences, therefore, of sedentary work, as witnessed every day by observing physicians, may be summed up as follows: Lack of energy, general debility, want of appetite, indigestion, defective blood-making, and, hence, bloodlessness or anæmia, sensitiveness to cold, constipation and a tendency to internal congestions, particularly about the lower parts of the body.

Unnecessary Exposure to Heat, Cold and Wet.—The result of such exposure other than inflammations of the chest or elsewhere, are witnessed in the shape of rheumatism and its allies. The pottery workmen most liable to rheumatic affections are *oven-men* and *kilnmen*, who are greatly exposed to heat and strong draughts. Standing at their work, with a fierce heat in front of them, their backs are at the same time blown upon by rapid currents of cold air, which produce mischievous chills, and too frequently, rheumatism therewith. And to make matters still worse, it is a custom with workmen to throw aside clothes, and in that way further favor the arrest of perspiration and the rapid cooling of the surface of their bodies. They indeed pay dearly for the greater coolness and freedom they gain, and it remains for them to learn that light woolen materials are not only defensive against cold, but against heat also.

Before quitting this subject of rheumatism, let me add that those who once suffer are very likely to suffer again; and, moreover, that to a certain extent they transmit a tendency to it in their offspring.

Further, it is the most common source of heart disease, with dropsy as its sequel. And lastly, it is a malady which finds a specially suitable soil where strong drinks, especially malt liquors, are indulged in, and where dissipation has sapped the health.

Sanitary Condition of Our Potteries.

The potteries are mostly built without any regard to healthfulness of location. Cheapness of site seems to have largely controlled the location of them. There has not been any under-draining of the grounds or their surroundings on which the potteries are erected. Many of the locations are extremely objectionable so far as healthfulness of location and surroundings are concerned. One of them, particularly, is built in the midst of the Swamp, so called, one of the filthiest and most unsanitary parts of the city. The health of the proprietors as well as those employed by them has been seriously damaged by the unhealthy surroundings of this pottery.

Most of the factories have been recently built, and are a great improvement over the old ones. They are all said to be far superior in a sanitary view, to most of the potteries in England. The lighting and ventilation, however, of many of them here might be greatly improved. The portions of the buildings most neglected as to light, are the basements and stairways. There is absolutely no system of ventilation, and what has been attempted is very imperfect.

In very many of the potteries the windows are not hung, and cannot, therefore, be pulled down from the top. This would not be necessary if ventilators were placed above the windows. Indefinite improvements in the direction of cleanliness, and the supply of pure and dustless air to them, are possible.

Whitewashing is not done as often or as thoroughly as it should be. Some have not been whitewashed since built, and as a result dust of all kinds has accumulated on walls and ceilings. Draughts of air blow it about, and of course it is inhaled by the workmen. The shops should be whitewashed at least once a year—better twice.

Water-Closets.

The water-closet accommodations in connection with our potteries are faulty, and many of them were in a filthy condition, as well as remote from the workshops. As a consequence, the work-people are compelled to go a considerable distance from the hot work-shops in the open air, and exposed to storms of rain or snow in winter.

Many of the operatives have contracted severe and fatal colds in this way. This condition of things should be remedied at once. Urinals, at least, should be placed in every work-shop, or contiguous to it, under shelter, so that the workmen would not be obliged to expose themselves, as they now do, whenever they attend to the ordinary calls of nature.

Only one pottery was found with urinals attached to the workshops.

Elevators.

In most of the potteries elevators are in use, but in some the clay is still carried up on the heads of boys and men from the slip-house. This is heavy, straining work, especially when done by boys, and many of them are overworked in this way.

Elevators should be provided in every pottery. Potters, as a class, have rarely room for complaint of overwork. The system prevailing among them is that of piece-work, and therefore the duration of their labor is largely within their own power.

Overwork is a widely-recognized and much-talked-of cause of illness, yet it finds but few victims among those engaged in our potteries.

What preventive measures can be taken against the evils already described?

Prevention.

One other lesson before we leave this subject, on the ills flowing from the inhalation of dust. Keep it out of the lungs, by all means. But, besides this, use every precaution against catching cold, for a cold on the chest, affecting the bronchial tubes, or the lung tissue itself, lends increased activity to the dust that pervades the lungs, and brings about that solidification of those organs which is the chief characteristic of potter's consumption, and the immediate cause of the asthma from which they so greatly suffer.

The composition of the glaze is such that it dries with great rapidity and forms quickly an impalpable powder, most readily detached and diffused through the air. Hence, in a dippers'-shop the work-people themselves, every part of the apartment and all articles about are powdered over white, and when the rays of the sun dart through the air of the shop the fine dust is rendered perceptible to the eye. Now, there are dippers and dippers. There are workmen who carry on the trade for many years, suffering nothing beyond a little colic or constipation, and, it may happen, some derangements of digestion.

On the other hand, there are others who fail within a few months after beginning their employment in a dipping-house. Why is this? Well, it must be granted that some persons are more susceptible to lead-poisoning than others, and, again, that some glazes are more poisonous than others. In one pottery not a single case of lead-poisoning had occurred since the old dippers and potters that came over from England had died. It is also said that the English potters use more lead in their glazes than is used by the manufacturers here. Nevertheless, the principal explanation of the fact is that some men are much cleaner in their work than others, that they use greater precautions, and that they are altogether more considerate of their health.

The primary preventives of lead-poisoning resolve themselves, therefore, into the observance of cleanliness of person, of dress and of the shop. The work-rooms must be well ventilated; excessive heat avoided, because this favors the production and diffusion of dust and renders the perspiring, thirsty workman a readier prey to its absorption. Moreover, to keep down the dust, the shops should be freely sprinkled with water and kept scrupulously clean.

Respirators.

Among the most effective measures against the inhalation of dust is the wearing of respirators so as to cover both the mouth and nose. To be protective they must cover both. No elaborate mechanism is necessary. A piece of wool possesses a marvelous power in filtering the air passing through it from all solid particles.

But as it is not easy or agreeable to plug the mouth and nostrils with wool, we may, as suggested, with little loss of efficiency, substitute some woolen material, and none is more suitable than crape. Of this two or three folds may be attached to a rude frame of bonnet wire, bent across the nose and kept in position by a piece of elastic cord passing around the head over the ears. The wife, or daughter, or sister of any one could soon make such a respirator. This simple instrument, as already stated, would keep the lungs and stomach free from dust, whether of lead, or of clay, or of coal. Some object to a respirator on account of their appearance. But surely health is more valuable than mere appearance or the figure we make before our fellow-men. Another objection is that respirators somewhat embarrass the breathing and keep moisture disagreeably about the mouth. There is some force in this, but it should not weigh against the advantages of the respirator and should count as naught.

There is a respirator known as the Hurd Automatic Respirator, of East Saginaw, Michigan, that is provided with valves and does away with all serious and reasonable objection to the use of respirators.

Touching this question, there is yet another point that must be mentioned, viz., the employment of children where lead is used, and particularly in dipping-rooms. Experience has shown that they become victims to the poison more readily than adults. But where such work is assigned to them their parents or their employers should certainly be required to provide protective means against the injuries they are exposed to, and not, as too frequently happens, put these boys and girls to work in most unsuitable clothes, often ragged and besmeared and powdered over with the poisonous glaze, in the absence of aprons and "slops" to protect them. Enough has been said, perhaps, of cleanliness in person, and dress, and work as a safeguard against dust, whether arising from clay or from glazes. But there are auxiliary measures to be taken. What other precautions should be taken, particularly where lead is used? In the first place, as already hinted at, the clothes should be protected when at work by slops and very ample aprons, and in the case of girls and women their long hair should be covered.

All unnecessary flimsy and fluffy articles of dress should be laid aside when at work. Outer garments, such as cloaks, coats and shawls, should be hung up in some apartment outside the work-shop, whilst the shaking and brushing of the protective coverings should be done in the open air, and in such a manner that the dust may be blown from the person. Great cleanliness of the hands and face should be observed. To secure this a lavatory or some sort of washing convenience ought to be found in every factory and within the reach of every work-shop, and for those using lead, nail-brushes and soap.

Flint and Spar Mills.

There are two of these in the city, in which over fifty men are employed. Those employed in these mills are great sufferers from dust, and but few of the men remain at the work longer than two years. The flint is first calcined in kilns and then ground in large cylinders with pebbles. The feldspar is first placed under large stones, or crushers as they are called, and is not calcined. After that, it is placed in the cylinders and ground into a fine state. The dust from this is inhaled by the workmen, and they very soon become asthmatical. In one of the mills they have a fan and dust-pipe, which carry away some of the dust when the cylinders are opened and the screening process goes on. All of the men are compelled to wear respirators, but with all the precautions used the men soon give out.

Conclusions.

Having now given a tolerably-complete review of those unfavorable conditions of labor which, whether accidental or unavoidable, prevail among those engaged in the manufacture of china and earthenware, it must be admitted that the occupation of potters is, by no means, a healthy one.

In making these investigations the writer has had an unusually wide field of observation, owing to a long residence in Trenton (over twenty-three years) and in attendance on many families of the working potters. The information and clinical knowledge thus obtained, as well as a personal inspection of all the potteries in Trenton and vicinity, and careful inquiries made at the time, have impressed themselves on the mind of the writer as laden with issues of the utmost importance to the health and well-being of those engaged in this industry.

The subject has been treated in a critical and practical manner. All the facts as to the perils to health, so far as could be obtained, have been pointed out.

We have departed from the usual custom of giving death-rate and table of statistics, as we have not accurate lists reaching over sufficiently-long periods. A long list of those sick and suffering with the various diseases peculiar to potters, as well as the results of several post-mortems, had been collected and prepared for publication, but we await the accumulation of larger numbers.

The question is a living one, and what the public, those most interested, desire to know, is the cause and prevention of disease among this skillful class of artisans.

To extension of machinery we may also fairly look for amelioration in the various departments of the potters' art, and equally also for the means of upholding our position as manufacturers against foreign rivalry. Nay, more, even with regard to the latter desideratum, the healthfulness of our working potters cannot serve otherwise than as a valuable contributory factor.

In all trades, the minds of those engaged in them are prone to get so engrossed by daily detail, and their methods to acquire so routine a character, that defects in their mode of work pass unnoticed—a kind of indifference or dislike to innovations steals over them, and there ensues a perpetuation of erroneous practices and contracted ideas and aims, inimical to health, progress and prosperity. In such instances, an unprejudiced outsider may spy out prevailing defects, and, though uninitiated in the mysteries of the trade, may render signal service to it by pointing in the direction of reform, and by suggesting modes of proceeding or courses of action calculated to benefit those engaged in the business. It is with this sole object in view that this paper has been written, and if it accomplishes this result the writer will be satisfied.

Recapitulation.

1. That dust, and the liability to inhale it, is the principal cause of potters' asthma and potters' consumption; that the greatest number of sufferers from the above-named diseases occurs among "china scourers."

2. The greatest sufferers from lead-poisoning are dippers, and those assisting them—glost-placers, mixers of colors, ground-layers, majolica and other painters, and those who "fettle" ware after it is dipped.

Dippers rank first, both in respect of numbers attacked and of the severity of attacks; ground-layers are a small body of work-people, but in proportion to their numbers suffer largely; majolica-painting is mostly done by women and girls, and they are sufferers from lead in an undue ratio.

Again, biscuit painters, who use glaze mixed with gum-water or some simple solvent, become affected, as do enamel painters in still rarer instances. Happily for all who work in lead the skin affords a most effective protection against its absorption, consequently very little enters the system through the cutaneous surface.

The lead-poison must find its way principally through channels whereby it will reach absorbent surfaces. These channels exist in the nose and mouth, which conduct it to the lungs and stomach.

3. That the pottery workmen most liable to rheumatic affections are ovenmen and kilnmen, who are greatly exposed to heat and strong draughts. They also suffer much from colds contracted from the sudden checking of the perspiration, which often terminates in acute inflammations of the chest.

4. That those engaged in sedentary occupations suffer most from disorders of the digestive organs, liver and stomach, followed by general debility, defective blood-making, and, hence, bloodlessness, sensitiveness to cold, constipation and a tendency to internal congestions, particularly about the lower parts of the body.

5. The auxiliary causes to be mentioned are neglect of cleanliness in work, in shops, in dress and in personal habits, inattention to ventilation and to the heat and moisture of the workshop, intemperance and irregular living. My observation satisfies me that a large majority of workers in potteries do not remain continuously at the occupation for more than from fifteen to twenty years, and that careful attention to the particulars noted would increase the working-period.

Finally, that the removal of the exciting cause or causes is the only rational means of preventing or interrupting the diseases of potters.

There is no doubt, however, from the reliable information gathered from those who have lived and worked in the potteries of the Old World, as well as from statistics, that pottery operatives in this country are in better health and longer lived than in England. Our climate is drier; the work-shops are mostly new, and more work is done by machinery.

TYPHOID FEVER AT MOUNT HOLLY.

BY E. M. HUNT, M.D.

Early in June the Secretary of the State Board of Health was notified by Dr. R. H. Parsons, of the Local Health Board of Northampton township, and by Dr. Parry, of Mount Holly, that a somewhat unusual amount of sickness was occurring in Mount Holly; that some of the cases were of doubtful diagnosis as between remittent and typhoid fever, but that some of them had all the symptoms of pronounced typhoid fever. In response to this information, on June 6th the Secretary of the Board visited the town and had conference with five or six of its physicians. I was able at that time to get some information as to about sixteen cases, although in some of these the full type of the fever was not declared. There were, however, in some of the cases, the usual distinct symptoms of typhoid fever, so as to leave no doubt in my own mind or in that of the others with whom I consulted, that there was an unusual tendency to this form of fever. We were not delayed in accumulating evidence from eruptions, hemorrhages, &c., as to the full type of the disease. These first cases were carefully inquired into. There was no common source of milk-supply. There was no relation to any single well of water. The cases could not be grouped in any satisfactory way. At least five well-marked cases had occurred before June 1st. There had been one case of typhoid fever some time before, but I failed to find any connection between it and the cases occurring in other parts of the town. The fever did not seem to be localized in any one part of the city. It was natural to look to some general operating cause.

I had especial occasion to make inquiry as to the condition of the water-supply, because I was aware that it was taken from a stream that passed through the village of Smithville, where I knew there had been typhoid fever the summer before. Of this I had received intelligence through Dr. Thornton, of Moorestown, who very wisely had notified me that he had a patient with the fever, whom he was satisfied contracted it there. The place was at once visited that summer, and, under the direction of this Board, the fact corroborated, as well as some conditions found which were unsanitary. These were remedied, and no further cases of fever were reported to us. Dr. Parry was fully familiar with the facts, as he had visited the place on behalf of the State Board this previous year.

Having informed myself of all the facts as to Mount Holly, in company with Dr. R. H. Parsons, of the Board of Health, I went to Smithville. I readily found, from general information and afterward from the physician attending cases there, that there was typhoid fever in the vicinity. I visited the boarding-house where there was at that time one case, it being the wife of the gentleman in charge. She was too sick to be seen, and said to be past recovery, but we were able to have an interview with her husband. We ascertained that she had been sick for about three weeks; that the discharges had been thrown into the house-closet, from which they directly passed by a short pipe into Rancocas creek. The discharges were not received into any disinfecting solution and, although it was said that some disinfectant had been used in the closet, a full inquiry showed that so little of any disinfectant had been purchased or used that, practically, all the material was passing daily into the stream in its natural state. We had the further evidence that there were other closet connections to the stream, and that in general, after heavy rains, other houses on the hill had their contents washed away toward the stream.

There was also, as since discovered, a place near the stream where much fæcal matter accumulated until washed out by rains. There was no very cheerful disposition to aid us to a knowledge of all of the facts, but most of them were ascertained.

The physicians in charge had carefully ordered disinfection, but the orders had not been carried out. Conversation and correspondence with the physician in attendance gave me the following additional facts: The case inquired into and two others in the village of Smithville, began between May 2d and 9th. Two of the cases were in this house. The other case, in a farm-house near by, was taken sick May 9th and died of intestinal hemorrhage May 23d. The two cases in the boarding-house were confined to their beds six and eight weeks respectively and recovered. The discharges were passed daily into Rancocas creek, up to June 7th. While there were some scattered cases, this was the earliest group of cases. Dr. Hollingshead, of Pemberton, attended twenty-three cases outside of Smithville. Of these, two were young men who worked at Smithville, and one a seamstress, who had been at Smithville a week just prior to the first cases. There were three cases in one family, the son being employed at Smithville, although himself not down with the disease.

Six of the twenty-three cases occurred within 1,000 feet of Rancocas creek. Thus, an investigation of cases in Mount Holly, as also some corroborating facts, seemed to show this to be the head-center of the cases. Afterward the cases connected with Smithville, but sick away from there, could easily be the centers for others, and our inquiry therefore made it certain:

I. That there were cases of typhoid fever in Mount Holly.

II. That these cases seemed to have occurred in various parts of the town and not to be connected with a localized cause on any premises.

III. It was certain that Rancocas creek, from which the water-supply of Mount Holly was derived, was receiving at a point about three miles above the in-take, typhoid alvine discharges in abundance, which would have easy conveyance to the crib from which the drinking-water was derived.

Under these circumstances, I at once called together such members of the Local Board as I could command and stated the facts in evidence, and with Dr. Parsons and the Board advised that all water used for drinkng in Mount Holly be boiled. Dr. Parsons took immediate opportunity to promulgate this advice. The physician in charge at Smithville was immediately communicated with and all discharges properly dealt with, and under no circumstances placed in the stream. It is believed that after June 7th, pollution of the water-supply from Smithville was interrupted, and so far as typhoid fever patients were concerned, probably discontinued. From this time the physician of the Local Board, the principal practitioners of Mount Holly, and the Secretary of the State Board, exercised all authority at their command and gave direction as to necessary precautions.

Cases of the fever multiplied quite rapidly from the 1st of June to the 28th, or for about three weeks after this advice was urged.

In order to show the temperature and the drought and sudden rain-fall which are believed to have influenced the time of outbreak at Mount Holly, we give the careful meteorological record of T. J. Beans, at Moorestown, for May, June and July, 1887. This needs to be noted as bearing upon the times of outbreak or increase:

Months, 1887.	Temperature.						
	Mean.	Normal.	Excess or Deficiency.	Max.	Date.	Min.	Date.
May	63.9	60.8	+3.1	86.0	20, 21	46.0	15
June	68.6	70.9	-2.3	91.5	17	56.0	11
July	76.8	75.7	+1.1	98.0	16	68.0	11, 12

Months, 1887.	Precipitation (Rain and Melted Snow).																
	Total Amount.	Normal.	Excess or Deficiency.	Dates on which Rain or Snow fell, and Amounts.													
May	1.89	3.67	-1.78	Date.	6	7	8	9	21	25	26	27	28	29			
				Am't.	.01	.50	.96	.01	.01	.09	.02	.10	.12	.07			
June	6.20	3.82	+2.38	Date.	1	2	3	5	6	7	10	17	18	19	22	23	24
				Am't.	1.83	.04	.42	.12	.08	.43	.27	.07	.08	.13	.07	1.70	.96
July	6.59	4.25	+2.07	Date.	5	6	9	10	16	19	21	22	23	24	25	26	27
				Am't.	.56	.04	.02	.02	.30	.06	.18	.96	.53	1.77	.87	.61	.67

I have had some difficulty in obtaining precise water-supply data as to the beginning period of all cases, but have not been able to find any cases occurring after June in those who drank only boiled water, unless it be the case of one person who nursed another who died of the disease.

In all, there are reported to us about 100 cases in Mount Holly and vicinity. I have particulars as to about fifty. The whole number of deaths returned of typhoid fever was six. We have good reason to believe that many of the cases regarded as remittent were cases of mild typhoid fever, and that up to the time of my first visit, June 6th, several more had become affected with fever and diarrhœa from a common source. Also a few cases showed dysenteric type and were called dysentery. We also have some evidence of the pollution of the Rancocas creek by typhoid fever evacuations above Smithville as late as July 27th.

The Secretary of the Board and Special Inspectors visited Mount Holly as often as seemed necessary. Dr. Parsons and the Secretary were in correspondence and the files of the newspapers of the town will show that there was no concealment of the peril or of the proper means of security.

Up to this time all that was necessary to assert was that the facts in evidence showed that the Mount Holly water-supply had been subjected to a special source of pollution in that the discharges of typhoid fever had been freely deposited in it, and therefore due precaution required its boiling for a time after this pollution had ceased. Since cases of the fever had been scattered over the town and since wells were in use by some households which were near to cesspools, it was also advised that all well-water be boiled until the chief peril seemed past.

While for the time all questions as to the general character of the Mount Holly water-supply were properly in abeyance to the one fact of special contamination, it could not but occur that questions would be raised as to the general character of the supply independent of this special peril.

This led to many discussions, opinions, dissertations and examinations, official, individual, personal and voluntary.

They seemed to supersede the necessity on the part of the Secretary of his offering his services in this particular direction, and because of the partisan feeling prevailing seemed to render it proper that this Board should await any further demand of the local Board for information as to what was to be done to make certain a pure water-supply when the special pollution had ceased and when the precaution of boiling could not so well be maintained as amid the actual prevalence of disease.

The local Board promptly informed itself of some errors as to the locality of the in-take, the times of drawing the supply, the condition of the mains, of dead ends and of the reservoir, and secured attention to these on the part of the company. The company, being a private water company, was not so directly under control as if it had been a public ownership. The experience of the Board certainly revealed some neglects that ought not to occur as to a public water-supply and showed how necessary it is to have a local Board of Health that will make from time to time technical examinations. It is not the first case that has revealed the over-confidence of men of good intent in their own constructions and methods, merely because they have no skilled knowledge and so believe that they are in possession of all the latest improvements or have excelled them.

The condition of what in general we will call the water-works, the dryness of the season before the last of May, the heavy rains following, the amount of vegetable organic matter naturally in the stream, and the addition thereto above the in-take of quantities of typhoid excreta, seem to afford the most natural explanation of this outbreak of typhoid fever at Mount Holly. That there were an unusual number of cases in rural towns adjacent is true, but in most of these cases connection can be traced with Mount Holly or with those who worked at or near Smithville. Where it cannot be there is no other center of communication so likely.

In July, the Secretary of the Board issued the following circular, which was freely distributed:

CIRCULAR.

"The Secretary of the State Board of Health, after consultation with the local Board of Health, begs leave to present the following brief circular letter to the citizens of Mount Holly. It cannot but be recognized that since April 1st there has been an unusual amount of sickness in Mount Holly. From the first, many of the cases of fever have been of a remittent type, without any other distinct symptoms. Several cases of typhoid fever have occurred, although, outside of the city, the number has been greatly overstated. There has also been more cases of bowel affection than usual. More recently several cases of dysentery have occurred. Since about the first of June, when the State Board was made aware of an increase of sickness, we have been in frequent consultation or correspondence with members of the local Board. It had much reason before this to complain of the apathy of the citizens of Mount Holly as to sanitary conditions. The State Board long before had very clearly and forcibly expressed its sense of this want of care. The Board, being a township Board, was less independent of public opinion, and had not been sustained in efforts to secure active and efficient administration. Since the beginning of the sickness the local Board has had better support, and has sought to remedy existing evils.

"At our first examination two things were apparent—first, that there was not proper precaution as to the location of cesspools and the disposal of household wastes, and that there was not any system of sanitary inspection adequate to the proper sanitary guard of such a town. Also, that where wells were used, some of them were not located so as to promise a safe drinking-water.

"A still more serious fact was revealed. The water-supply of the city was receiving freely the discharges of typhoid fever patients about two miles above the reservoir in-take. In heavy rains the wash from several out-houses also entered the stream. The stream itself always abounds in a high amount of vegetable matter, and is not one to which other matters of any kind can be added without great risk. It was on these grounds that the advice was at once given that no water from this source be used without it had first been boiled. Further investigation showed that there was unnecessary foulness at the point of in-take, that flushing of pipes was neglected, and that the condition of the reservoir was not what it should be. While prompt attention was given to some of these defects, there is still room for improvement. Chemical examinations have shown the water-supply still in an unsatisfactory condition.

"While it is not the design of this circular to attempt to decide whether this source of potable water will have to be abandoned, it is the design to insist upon it that it shall not be used without boiling until the local Board shall so authorize. The tendency to sickness, the recent heavy rains and the overflow of the low lands lead us to fear serious consequences from continued sickness, unless every precaution is used. While the number of typhoid cases has steadily diminished since the last of June, other forms of sickness have not, and several cases of dysentery have occurred.

"We believe it incumbent upon every citizen to take unusual precautions against sickness, and to aid in securing the most exact cleanliness of all surroundings. Where there is sickness, disinfectants should be freely used in vessels that receive discharges. A tablespoonful of chloride of lime in a pint of water answers every purpose. This should also be used in any sinks or house-closets connecting with cesspools.

"In all typhoid or dysentery cases, if possible, the excretions should be buried. This Board has arranged with the local Board for a prompt and thorough house-to-house inspection of the town. It is believed that if all aid the local Board, and follow any additional directions they may see fit to give, there will soon be a diminution of sickness and a speedy return to the usual healthfulness of this locality."

So much for the probable origin of the Mount Holly outbreak of typhoid fever. The table, showing the meteorological conditions, kindly furnished by Mr. T. J. Beans, of Moorestown, exhibits how the alternate dryness and wetness favored the outbreak.

As to the Rancocas creek, as a source of water-supply for Mount

Holly, there is need of careful inquiry. Before this occurrence, it may be said to have had a good reputation. It is time that those who study water-supplies regard any of the streams flowing through peaty soils, or abounding in vegetable matters, as sources which are more *liable* to deterioration than others—although it is generally not in their relation to sudden or deadly diseases. Strangers are often affected by such waters, and young persons may have some diarrhœal disturbance. Other supplies are generally desirable, although these are not always to be condemned. A few weeks after the special contamination had ceased, two chemists, Prof. Leeds, Ph.D., of Stevens Institute, Hoboken, and Shippen Wallace, Ph.D., of Burlington, made examinations of the water-supply. The analysis of Prof. Leeds presented chemical and biological conditions, and that of S. Wallace, the chemical only. The first is to be found in the Philadelphia *Medical News* of September 3d, 1887, and the latter was a report made to the Mount Holly company, and contained in the Mount Holly *Journal* of July 25th, 1887.

The respective chemical analyses were made July 7th and July 25th, and are as follows:

I. ABOVE SMITHVILLE.

	Parts per 100,000.	Grains per Gallon.
Free ammonia	0.002	0 0012
Albuminoid ammonia	0.015	0 0087
Oxygen required to oxidize organic matters	1.27	0 70
Chlorine	0.45	0.26
Hardness	3.10	1.80
Total solids	6.30	3.67
Mineral matters	3.30	1.92
Organic and volatile matters	3.00	1.75

II. PUMPING STATION AT MOUNT HOLLY.

	Parts per 100,000.	Grains per Gallon.
Free ammonia	0.006	0.0035
Albuminoid ammonia	0.0155	0.009
Oxygen required to oxidize organic matters	1.10	0.64
Chlorine	0.55	0.32
Hardness	2.20	1.80
Total solids	6 20	3 60
Mineral matters	3.30	1.92
Organic and volatile matters	2.90	1.68

The chemical analysis of the creek-water made for the water company by Shippen Wallace, of Burlington, resulted as follows:

"JULY 25th, 1887.

"*To the Mount Holly Water Company:*

"GENTLEMEN—The following is my report on my analyses of the samples of water received from you:

Total solids, parts	per 100,000		5.4
Loss on ignition,	"	"	3 4
Chlorine,	"	"	0.10
Free ammonia,	"	"	0.005
Albuminoid ammonia,		"	0.032

"The small amount of 'chlorine' would indicate that the water is not contaminated with sewage; but that it is contaminated with organic matter, there is no doubt. This is shown by the great 'loss on ignition,' and while this loss is not always due entirely to the destruction of organic matter, in this particular instance I think it is. It is also shown by the large amount of 'albuminoid ammonia,' which exceeds the limit generally accepted, and which figure, taken alone and with no knowledge of the origin of the water, would unquestionably condemn it."

Prof. Leeds concludes from his analysis that the waters of the creek were at the date of July 9th polluted by sewage at or below Smithville, but not above it. The Professor concludes that by "aëration under pressure, followed by filtration," this water could be "rendered pure, colorless and palatable."

Dr. Wallace, on the other hand, from his analysis, concludes that the "contamination of the water has been caused by decayed *vegetable* matter, derived from sources of the stream, and not from any sewage or animal matter." The outbreak had occurred several weeks before, and early as June 6th had been authenticated as typhoid fever, and as typhoid evacuations were proven to have been received into the water-supply, this contamination had probably ceased over a month before the chemical examinations were made, and new cases ceased mostly to occur after June. We submit that the explanation of this particular outbreak is to be found in the specific contamination rather than in the general conditions, but confirmatory of pollution of some kind. Since, however, after the special pollutions had ceased, these competent authorities claim the water of the Rancocas to be unfit for drinking purposes, either it should be made fit or be abandoned, or the testimony of the experts overthrown.

For, whether we take the view of Prof. Wallace, that "the contamination of the water," as he found it July 25th, "has been caused by decayed *vegetable* matter, derived from sources of the stream, and not from any sewage or animal matter, and sickness may have arisen caused by the decomposition of this vegetable matter," or the view of Prof. Leeds, that, in addition to this vegetable matter, the stream contains "animal matter in the nature of sewage," it is plain that there is sufficient gravity in either of the statements to make the people uncertain as to the quality of the water-supply.

As a result of further examinations and inquiries made in October last, the following note was addressed to the Local Boards of Health of the townships in which Mount Holly and Smithville are located, as also to the water company:

"STATE BOARD OF HEALTH,
"TRENTON, N. J., Nov. 1st, 1887.

"*To the Local Boards of Health of Easthampton and Northampton townships, Burlington county, and to the company supplying Mount Holly with water:*

"GENTLEMEN—I have taken opportunity since the typhoid fever has subsided in Mount Holly to acquaint this Board still further with the sources of pollution to which Rancocas creek has been exposed and to some of which it is still exposed. They involve such risk to the health of these townships as makes it the imperative duty of all concerned not only to apply the general health laws of the State as far as available, but the special law as to the pollution of streams used for a public water-supply. This power rests with these Boards and with the water company, as also with every citizen of these townships. It does not rest with members of this Board not residing in the district, nor has it been conferred upon the State Board by law. But it is nevertheless an imperative duty for us to reiterate these facts. While we are not called upon herein to pronounce judgment as to the possibilites of a pure water-supply from Rancocas creek, we would be recreant to our duty did we not again warn you as to sources of pollution still existing.

"On behalf of this Board,
"Respectfully yours."

We are glad recently to hear that the company are taking active measures to secure an assured purity. This supply will need the careful oversight of all those interested, but we cannot but believe that every effort will be made to provide a supply which chemical and medical and all evidence derived from experience will alike confirm as safe and wholesome.

Incidental to the occurrence of typhoid fever at Smithville, Mount Holly and about Pemberton, we were led to some correspondence as to the tendency to fevers and epidemics in other parts of Burlington county. This was the more important, as it was occasionally asserted that fevers prevailed frequently in the county. This was not substantiated by our inquiries.

There was an outbreak of typhoid fever at St. Mary's Hall, Burlington, in the early winter of 1874. The first case occurred on the 4th of December, and before the 20th of the month there were eighty cases. Sixty remained at the school and recovered. Twenty went home, and of these seven died. The outbreak seemed clearly traceable to a polluted water-supply. The drinking-water was taken from a well or cistern into which it was pumped from the Delaware river. Near the well was a large cesspool, of which the brick and cement had crumbled so as to allow a leakage into the water-supply. Those who drank tea and coffee only, escaped the sickness. Here, therefore, the cause was entirely local. Four years ago there were fifty cases "about" Medford, but of a mild type. There have been occasional localized outbreaks of continued fevers of some form and of dysentery. It is quite noticeable that in this county, pumps or cisterns are frequently located in the wash-house or kitchen-shed, where they are too apt to be exposed to sources of contamination. We have visited many farm-houses at which the care of the drinking-water could be much improved. The same is true in several of the small villages and towns.

ABSTRACTS FROM THE

PAPERS AND DISCUSSIONS OF THE NEW JERSEY SANITARY ASSOCIATION,

SESSION OF 1887.

BY D. C. ENGLISH, M.D.

The thirteenth annual meeting of the New Jersey Sanitary Association was held in the Assembly Room, at the State House, Trenton, commencing Friday morning, October 28th, at 10:45 o'clock. The President, William K. Newton, M.D., of Paterson, in the chair. After the Secretary's Report and the transaction of other items of business, Dr. J. S. Simpson, of Orange, read the first paper on "The Prevention of the Spread of Contagious Diseases through the Schools." After alluding to the difficulty which sanitarians have in prosecuting their work, owing to the ignorance of the people or pure selfishness, he referred to the good the physician may do by taking advantage of every opportunity offered for the instruction of the laity in the laws pertaining to general hygiene and public health. For as the public becomes enlightened they will willingly give us their aid instead of offering resistance. He said that the vital statistics of the State for the past year show that about one death in every nine is due to some contagious disease, and as one death in every eleven is an individual between five and twenty years of age, many of these must be school children. He referred to the great importance, from the data given, of preventing the development of contagious diseases in the schools, and of thoroughly protecting the scholars from contagion after any of these diseases have once developed. At some length the paper described the characteristics of small-pox, chicken-pox, scarlet fever and measles, so common among children. All of them, he claimed, are contagious, and therefore may be carried from one person to another by individuals who have been exposed to the contagion, even though in good health themselves. The poison of the three is extremely tenacious and may remain virulent for a very long time. The speaker thought it was necessary during every outbreak of epidemic of any of this class of diseases that all school children should be carefully watched for any premonitory symptoms sufficiently significant to justify their exclusion from school. The child should not be allowed to return until every symptom of the disease has disappeared and desquamation or dessiccation has been entirely completed. No clothing worn during the sickness should be allowed in the school-house, and all persons exposed to the disease or living in a house where it exists should be forbidden to enter the school until all the cases in the house have fully recovered. The physician in attendance should see that such houses are thoroughly fumigated and disinfected.

As to chicken-pox, the child need only be excluded from school while suffering from it, but in small-pox, vaccination should be required. All children should be vaccinated carefully before admitted to school, as the school laws require. He recommended re-vaccination every five years, and believed it would be well if it were done during every epidemic of the disease.

Diphtheria the speaker considered the most dangerous of all diseases to children. Typhoid fever, whooping-cough and mumps are all diseases that need much care in handling. They are all contagious but typhoid fever. The morbific elements of the latter seem to be innocuous in the fresh state, and only become virulent when allowed to develop into activity by feeding on excreta under favorable conditions. If any of these get into cesspools or sewers they may cause disease when the latter are cleaned out unless the matter is thoroughly disinfected before disposal.

When typhoid fever or diphtheria arises in a school-building, the surroundings, drainage and drinking-water should be most carefully examined and all defects and impurities remedied. He did not believe it necessary to exclude from school, children residing in houses in which typhoid fever cases existed if they themselves were unaffected by the disease. He believed the same rule applied to mumps and whooping-cough, while in diphtheria every child in the home where it existed should be excluded. He also spoke of scholars affected with cutaneous contagious diseases as favus, tinea, scabies and pediculosis; that no scholar should be allowed to attend school while suffering from either of these diseases.

The doctor, in conclusion, advised that dry and elevated sites should be selected for school-houses, where the children may have plenty of fresh air and sunlight; that the buildings should be so constructed as to give large school-rooms, perfect drainage and ventilation, ample play-grounds and plenty of pure drinking-water. This would place the scholars in the best condition to resist the causative influences of disease. Every school-house should be thoroughly inspected in regard to its sanitary surroundings at least once a year and during every epidemic.

Dr. E. M. Hunt, after expressing his appreciation of the paper, said:

"I regard the prevention of the spread of contagious diseases through the schools as involving almost the entire subject of the spread of such diseases, since children are most likely to be affected by them, are most frequently the carriers of them and because their association in schools exposes more persons and families to them than occurs through any other instrumentality. I specify, among others, the following means of prevention:

"All school buildings should have thorough housekeeping. This means that, at the beginning of each vacation, there should be a complete cleansing, under the direction of a committee of ladies; that the building should be looked over thoroughly before the opening of school; that there should be flushing with air, after the close of school each day, and that in many schools there should be dusting, cleansing and whitewashing on one or more Saturdays during a term.

"The teacher should have the name of parents, and, in cases of cities, the numbers of houses represented by pupils. In case any house has in it a case of contagious disease, the physician should be seen by a Trustee or Clerk, and his advice taken as to prohibiting attendance therefrom. If there is any epidemic, the Clerk should visit each house and prohibit attendance where he found cases. We do not favor the closing of schools because of a very few cases, as it is an unnecessary interruption and the idle children are about as apt to congregate as they do in school.

"In case of small-pox, there should be more systematic inquiry as to vaccination, and Trustees should enforce it, without waiting for cases of small-pox to occur.

"Care of cloak-rooms is very important in its relation to contagious diseases. As diphtheria has come into such prominence as a communicable disease, and, as the breath is so much the vehicle of disease, any case of sore throat in a school should at once be noticed and the child allowed to go home. The use of a little borax or potassium chloride, as a gargle, is always a safe precaution.

"It is now known that the sputa of diphtheria, whooping-cough,

&c., often conveys these diseases. Children should never be allowed to spit on the floor in a school-room."

The discussion of the paper was further participated in by Shippen Wallace, Ph.D., of Burlington; Dr. J. P. Davis, of Milltown; Drs. E. M. Hunt and H. G. Wetherill, of Trenton, and James Owen, C. E., of Montclair. The following were some of the points: Children are largely the conveyancers of these contagious diseases. Methods of isolation as one of the most difficult points. Immediate notification to the Inspector as of the greatest importance. Teachers should have rolls of their scholars, where there homes are, and they should ascertain why any pupil is absent from school. Importance of enforced cleanliness, not only in the home but also in the school-room, cloak-room, &c. Spitting about the rooms should be prohibited —spittoons being provided. Contagious ophthalmia was referred to. Tuberculosis is spread through sputa in certain conditions. Instances were given where great difficulty occurred from the ignorance of some physicians, one declaring that diphtheria was not contagious, another that scarlet fever was not contagious. Ignorance of some School Trustees was also cited as one of the difficulties encountered.

POLLUTION OF STREAMS.

E. S. Atwater, counselor-at-law, of Elizabeth, next read a paper on "The Legal Aspects of the Question of the Pollution of Streams." (The paper is to be found, page 37 of this report.)

The discussion of this paper was opened by Dr. E. M. Hunt, Secretary of the State Board of Health. He called attention to the importance of this subject, referring to the experience of the danger from water-contamination in Rahway, Elizabeth and Long Branch during previous years. We should make our aqueduct companies carefully examine from time to time the sources of supply of drinking-water, the reservoirs, pipes, the contaminations along the banks of streams, especially about the point of in-take.

Dr. Gauntt, of Burlington, spoke of the interest in this subject as compared with twenty-five years ago, and dwelt on the need of even greater care in consequence of the increased sources of contamination. He spoke of the water-supply of Philadelphia as urgently needing attention, and closed by expressing the hope that Trenton would not discharge its sewage into the Delaware.

AFTERNOON SESSION.

At 2:30 o'clock the meeting was called to order, and the President announced the next subject, on the "Methods of Sewage Disposal in New Jersey," and introduced C. Phillips Bassett, C.E., of Newark. He described the system at Long Branch, where the outlet is into the ocean, and where great precautions have to be taken in order not to pollute the beach. Engineer Bassett illustrated the working of the plan by diagrams. His description was strictly technical. He said that the system is giving perfect satisfaction and promises to be sufficient for a much larger population than Long Branch now has, even at the height of the summer season. The system is not controlled by the town, but by a company. The town was not in a position to perfect such a system, and therefore the intervention of the company is something to be thankful for, even though sanitarians, as an abstract principle, do not think it well that the sewering of a town should be consigned to a corporation organized only for profit. So far, the Long Branch company have shown no disposition to slight sanitary perfection in their system in order to increase their revenue. This revenue comes from yearly rents paid by householders. Mr. Bassett answered a number of questions proposed by members of the Association.

This system as in operation at Long Branch, was capable of supplying 6,000,000 gallons per day, which would allow 100 gallons per day for each person if the population was 60,000.

George P. Olcott, C.E., of Orange, spoke next, taking as his special topic "The Drainage of Private Houses." He alluded facetiously to the old cesspool walled in with stone and in which the sewage took its place to remain as long as it would. A more modern and scientific mode is the sub-irrigation system introduced into this country by Colonel Waring. Mr. Olcott said that the last thing the builder of a new house thought of, seemed to be the disposal of the sewage; then he wanted a perfect job done for $75 or $100. One of the most objectionable features of house drainage is the water-closet in the cellar, where it is impossible to secure proper ventilation. Mr. Olcott then went into a brief description of the sub-irrigating system, which he said he had seen in successful operation in over a hundred cases. Referring to the evils of the cesspool, as ordinarily constructed, he mentioned the case of a gentleman who told him of the excellence of a cesspool that, though in constant use, had not been cleaned for a number of years. Mr. Olcott expressed surprise, and made an investigation. The result was a discovery that the soil was gravelly, and that the reason that the cesspool didn't ever require cleaning was that the sewage passed off underground, and in the course of its peregrinations passed into a neighbor's well and caused the typhoid fever that afflicted the neighbor's household. In conclusion, the speaker insisted on the necessity of greater care in the disposal of house drainage.

Dr. E. M. Hunt being next called upon, gave an interesting sketch of the methods of sewage disposal at the Lawrenceville School and Morristown Asylum. He believed that we can show as good systems of sewerage, as successful in operation, in New Jersey as can be found anywhere. The discussion was continued by J. C. Pumpelly, Esq., of Morristown, and others.

NEW JERSEY'S NEGLECTED DRAINAGE AREAS.

The President then introduced Prof. George H. Cook, LL.D., State Geologist, who read a lengthy and valuable paper on the "Neglected Drainage Areas in New Jersey, and What Should be Done to Improve Them." The areas to which attention would be called, he said, lie principally in the northern portion of the State. The neglected areas in the middle and southern sections are numerous, but not so extensive in plots. The speaker went on to give a scientific explanation of the defective areas. Coming down to particulars, he spoke of an area running through Somerset, Union, Morris and Essex counties, in which there is so dead a level that stagnant water gathers and promotes fever and other sickness. Near Little Falls an overflow from the Passaic often causes untold injury to crops, because of this same dead level. The overflow has no means of escaping except by evaporation, and that slow process leaves time for fever germs to form. Prof. Cook contended that an improvement could be made in the situation by removing the dam obstructions at Little Falls, and thus effecting proper drainage. Thousands of acres of farm land would be benefited at least $10 an acre, not to speak of the increased healthfulness that would be given to the whole region now under the evil influences of the local miasma. Other extensive areas in the northern section of the State were spoken of, and suggestions were offered as to methods that might be pursued in establishing better drainage for the defective localities. Great Swamp, at the headwaters of the Passaic, came in for attention. The whole region in that section was said to be a constant harvest-field for physicians.

Civil Engineer Howell, of Morristown, speaking on the paper, said there was no insurmountable engineering difficulty in draining the valley of the Passaic, but the financial obstructions did seem to be more than could be overcome. He admitted that a great deal of malaria existed in the neighborhood from decaying vegetables, arising from floods, &c.

Dr. F. Gauntt, Rev. Dr. A. E. Ballard and Civil Engineer J. T. Hilton, of Paterson, participated in the discussion, which was closed by Prof. Cook, who spoke of the faulty law which throws the cost entirely on the parties whose lands are drained, whereas it should be on the entire community, because all would be benefited by the sanitary improvements and the increase in the value of all the land in the neighborhood.

EVENING SESSION.

The evening session was held at 7:30 o'clock. President Newton in the chair. Prayer was offered by Rev. Dr. A. E. Ballard, of Ocean Grove, who, with Prof. Nicholas Murray Butler and Surgeon Smith, of the U. S. Army, were invited to sit as corresponding members. The Secretary then announced the annual address by the President. The President then delivered the address. Subject:

SANITATION MILITANT.

Among the fighting sanitary forces of the State, the first, he said, was the State Board of Health, which he termed the sun of the sanitary system, and defined its powers and duties. The second was the local Boards of Health, whose powers and duties he also defined at length. The voluntary Sanitary Association called forth the lavish praises of the speaker as the third factor in the available sanitary forces. The laws upon the statute-books as they stand satisfied conservative sanitarians, and were far in advance of the average intelligence upon the subject. They would have to remain as they are until the people are educated up to a higher standard. Only such laws as are understood and approved by the people can be enforced. The speaker thought all sanitarians should be thankful that the State Board of Health had always been composed of such faithful men and good sanitarians. No Board, outside of New York, had such control and power as the State Board of Health. "If," said the President, "I can impress upon the local Boards the necessity of selecting good health officers and continuing their terms of office during good behavior, I shall feel repaid for any trouble in preparing this address." He warned the members against expressing positive opinions upon sanitary subjects until a thorough investigation of all facts had been made, instancing a State Board of Health that went so far as to recommend the Legislature to pass a law quarantining consumptives on the theory that the disease was propagated by bacteria. In conclusion, the speaker thanked the Association for the honor conferred by electing him its President.

Upon motion of Dr. H. R. Baldwin, a vote of thanks was unanimously tendered to the President for his very able and instructive address, with the request that a copy be furnished for publication.

(The address has been published in pamphlet form, and copies may be obtained from the Secretary, P. O. Box 87, New Brunswick, N. J.)

The President then introduced the State Superintendent of Public Instruction, Hon. E. O. Chapman, who spoke on the "Length of School Days, Recesses, Competition and Industrial Education." He thought that while each of the four subjects deserved a separate essay, that they were very properly grouped together, as they have a close relation to the health and physical development of the pupils in our public schools. They are the most important questions that are being considered to-day in our school economy. He referred to the criticism that our public schools have been purely intellectual and that the physical development was left to take care of itself, or to be taken care of by others than school officers or teachers, and cited some of the advantages the scholars in our country schools had over those in our city schools in their physical development. The great work of our public schools is to make the future citizens such as the safety of the State requires—reliable, virtuous, self-dependent. If intellectuality can do this then the public school has to do only with the intellect. But the reliable, desirable citizen must have a sound mind in a sound body, and that the modern restraints are not conducive to a healthy physical development we have abundant proof in the pale faces and spare limbs of the children which are to be seen in large numbers in all our towns. He thought it the duty of this and all similar associations to inquire into the causes which produce these defective physiques. Has the length of our school days and terms anything to do with it? It is not a sufficient answer that the school days and terms are no longer than they were forty or fifty years ago, because the conditions have been greatly changed. He believed the so-called discipline enforced in many overcrowded school-rooms and the mental anxiety produced by the constant physical restraint, are such as few strong men could endure for any continued length of time. What is needed in our schools is more relaxation and less restraint.

It is sometimes argued that many children are certainly as well off in the school-room as they are at home, and better off than when they are in the streets; but even with these children, if we seek to improve their condition we should be careful not to substitute one evil for another. As to recesses, the Superintendent said that he seldom went into a school but that he was impressed with the conviction that the first thing the pupils needed was a recess. He had heard of but two reasons for holding the children in the school-room during the entire three hours of the morning session without a recess, or with only a short recess, during which they are not allowed to leave the room. One was lack of time to get through the recitations; the other was that the moral effects of association in the yard are to be feared. To the first he answered that if more frequent relaxation be necessary to preserve the health of the child, no curriculum should be imposed which will interfere with it. To the second he would say, amend the conditions at any cost so that this association shall not produce evil results.

In reference to competition he thought what he had already said applied to some extent. Competition should not be encouraged to such an extent as will interfere with the child's equanimity and happiness in the school. He was sure that many cases of nervous prostration in young people were caused by nervous anxiety, engendered by competitive recitations, examinations and markings. In reference to industrial education he was thoroughly in favor of it as a means for intellectual development. But it may be said of it that it makes this process of intellectual development a pleasant one, and for this reason alone it deserved a hearty welcome in our schools. The work of education *should be* always pleasant; the school-room should be as attractive as the home; no task should be put upon the child that will worry or fret it, if it can be avoided.

Prof. Nicholas Murray Butler, President of the Industrial Education Association, was then introduced, and delivered an able and interesting address on Industrial Education.

We insert the following abstract:

SANITARY SCIENCE AND EDUCATION.

"GENTLEMEN—I desire to express my appreciation of the importance of sanitary science for sound educational doctrine and correct educational practice, and to add my testimony to that of the other gentlemen who are to address you, to the fact that your researches and conclusions are of the greatest practical value to us.

"*Mens sana in corpore sano* is as much to be prayed for now as it was in the time of Juvenal, and we are far better equipped than was the satirist or his contemporaries to work toward that end. The sound mind and the sound body seemed to the Roman to be two distinct and separate things whose conjunction was desirable. We have come to know that the two are so intimately related, indeed so interdependent, as to be practically one thing. Aristotle furnished the educators of antiquity with a psychology upon which to base their praxis. It was a wonderful achievement. But the great modern science of physiology, whose beginnings are to be seen in the discoveries of Servetus, Harvey, Leeuwenhoeck and others, compelled the entire rewriting of that science; and the result is an infinitely more complex and accurate and practical, though less final psychology, than that which was bequeathed to us by the great Stagyrite. This new psychology has taught us how truly vital the dependence of mind on body is. We know, for example, that a decreased or impoverished supply of blood to the brain produces mental inertia and lassitude. We know that an organ develops by exercise, and that the neglect of an organ or its excessive stimulation is alike harmful, no matter whether the organ be mental or physical. We can promptly and surely trace the mental results from unduly intense or too prolonged brain-work, from lack of exercise, and from improper nutrition. We are aware, in like manner, of the bodily results induced by the various emotions and passions, by expectant attention, by concentrated will-power, and other mental phenomena.

"Now, it seems to me that it is just at this point that the sanitarian and the educator join hands. Both having a full understanding of the relation that subsists between mind and body, the former brings the results of his studies to the latter, and formulates them into suggestions and rules for the teacher's guidance. The teacher, in return, adopts these suggestions and rules as parts of his science, and communicates to the sanitarian in due time the effects that follow such adoption. Thus sanitary science is aided in one of its most important applications, and the science of education adds a most valuable chapter to its book.

"Perhaps this co-operation of sanitarian and educator is more ideal than real, but it is nevertheless far more noticeable now than it was twenty-five or even ten years ago. This is proved, if proof be needed, by the fact that instruction in physiology and hygiene, and in the mental and physical effects of stimulants and narcotics, has been generally added to the curriculum of the common school within that period. It is not to be disputed, on the other hand, that much remains to be done. An illustration of this will be found in one of the opening pages of a recent book on the ventilation and warming of school-buildings, by Mr. Morrison, of Kansas City. The author reminds us (p. 18) that 'no subject has been more carefully and intelligently studied than the direct and ultimate effects of improper air on the human system, and that on no subject is there greater unanimity of competent opinion.' School-building goes on, however, year after year, and it goes on in too many cases utterly regardless of whether a child vitiates two cubic feet of air per hour or two thousand cubic feet, whether 62° F. is the better average temperature or 82°, or whether 45 per cent. of saturation is desirable in the atmosphere or 70 per cent. Nevertheless, science and common sense are making headway, and there is every reason to believe that in a few years' time all the school-buildings that are erected, however humble and unpretentious they may be, will be well ventilated and properly heated. * * *

"The educational topics before you are four: (A) the length of school days and terms, (B) recesses, (C) competition, (D) industrial education. I shall pass over the first two in order to say a word about each of the others. These are competition and industrial education. Permit me a few words concerning each.

"Competition may be defined as a common striving for the same end. It involves two or more competitors. As a principle it has long been dominant, not only in business-life, but in the science of economics. It has been prescribed as the proper stimulus for all stagnation, and as the solvent for all difficulties. Of late years, however, a school of economic thinkers has arisen which asserts that unrestricted competition is an evil to humanity and to the State. We are told that it is proved to be demoralizing, destructive, and, as a principle of political economy, inefficient. Have not you sanitarians and have not we teachers reached an analogous conclusion as to competition in our common field? Is not competition, when left to itself, in danger of emphasizing material success at the expense of the disciplinary process? I take it we are all agreed that how a pupil learns is of more importance than what he learns. His faculties are developed and his character formed by the process of learning, far more than they are by the thing learned. The tendency of unrestricted competition is to alter this relation, to exalt the result, and to depreciate the process. This is contrary to the teaching of mental hygiene, and in consequence is to be condemned by sanitarians and educators alike. I say nothing of the pallid faces, the disordered nerves, the sleepless nights, and the loss of appetite that result from competition for competition's sake. Were those results not present, I should still oppose it as an unsound educational principle. Therefore, I repeat, competition must be restricted and kept within reasonable bounds. This topic gives rise to many other fruitful suggestions, but I must pass them by."

Mr. Butler then discussed the subject of industrial education, and added as follows:

"Time will not permit me to follow out this suggestive theme. I will simply state, in conclusion, a few of the reasons why I consider industrial education a matter of importance to sanitarians. In industrial education, properly organized and administered, I claim that we have for the first time a system that trains all the mental faculties, and each at the proper time and in proper proportion. It gives us no abnormal and mechanical memories without judgment and executive ability, no hunched backs without arms and legs. Every faculty is considered, every power is taken into account. The conditions of nineteenth-century life are kept in mind, and the ideally-educated man is not held to be the mediæval recluse or the eighteenth-century English gentleman. Incidentally, industrial education affords a pleasant and healthful alternation of exercise from faculty to faculty. No one is overstrained, no one is allowed to become atrophied and die. Muscular exertion is called in to supplement and relieve mental activity.

"My own belief is that the mere recital of these facts determines the attitude of sanitarians toward the system which permits and causes them. As friends of educational and scientific progress you will approve industrial education, and then as sanitarians you will indorse it as a long step toward the much-to-be-desired *Mens sana in corpore sano.*"

The discussion of these school subjects was continued by Prof. James M. Green, of Long Branch; Dr. Cornelius Shepherd, of Trenton; Prof. J. Madison Watson, of Elizabeth, and Prof. Linsley, of Jersey City.

SATURDAY, October 29th.

The morning session was called to order by the President, when a resolution was adopted inviting the members of the Association to suggest subjects for papers to be read at the next annual meeting, or to prepare papers for that meeting. Such suggestions should be sent to the Secretary (Dr. English, New Brunswick, N. J.) before June 1st, and all papers prepared for the annual meeting should be sent to him for approval by the Executive Council before October 1st, 1888.

After the transaction of routine business, the President introduced Prof. Shippen Wallace, Ph.D., of Burlington, who read a paper on "Poisons in Foods of Animal Origin." Dr. Wallace referred, in opening, to the advance made in the discovery of the cause of disease. Besides outbreaks of typhoid and scarlet fevers, diphtheria and small-pox, we have also others which, while not as fatal, have caused large numbers to be "laid up" for several days, and no name for the sickness has as yet been given it by the physicians. It has been simply said, "It came from eating such and such food." The reason why partaking of food which, to all appearances, was good, should cause illness was not positively known until during the past few years, with the exception, perhaps, of trichinæ.

He cited the cases in Germany from eating sausage of which the mortality, as given by Böhm, was from 23.2 to 54.2 per cent., also the 343 cases with six deaths reported by Müller, in Holland, in 1874; also referring to the high mortality from fish-poisoning among the inhabitants along the Volga. He then spoke of the outbreaks in our own country, arising from eating of cheese, ice cream and oysters, and the drinking of milk. While there was no doubt as to the cause of these various outbreaks, yet the toxic agent was not discovered and isolated, until Prof. V. C. Vaughan found it in some cheese which had caused illness to over 300 persons in 1884. To this agent he gave the name of tyrotoxicon—cheese poison. He also found it in ice cream and oysters which had caused illness. Dr. Wallace said he had found the same agent in some cheese which had caused illness at Riverton, in this State. Dr. Newton had also found it in the milk that caused an outbreak of illness in Long Branch. The reason why this toxic agent should form is not at present fully understood. In the cases of sausage and fish-poisoning it has been supposed that it arises from partial decomposition. The investigation of the Long Branch milk case, and also the case of the seventy people poisoned in Michigan from eating oysters, seems to uphold this same view. What "tyrotoxicon" is, chemically, is at present being investigated, with the strong probability that it will prove to be what chemists term "diazobenzol," Prof. Vaughan having already published a preliminary paper to that effect, in which he says, "We think we are justified in suspecting that tyrotoxicon and diazobenzol are one and the same thing, but it has not heretofore been supposed that such a complex substance is formed during putrefaction." He refers to one of the most important results of the study of this subject—the claim that cholera-infantum is caused by this same agent. Dr. Wallace then proceeds to answer the question, How are we to guard against this new-discovered ill that flesh is heir to?

The observance of proper sanitary rules is referred to, especially *cleanliness*, and the Long Branch milk cases are cited as illustrations. The toxic agent was formed in the milk, owing to the improper management of the same, the milk not being cooled until some hours after milking, and while some might claim that this was not "uncleanly," yet if one should raise the lid of a can in which freshly-milked milk had stood for some time without cooling, the odor would certainly not impress him as being clean. If the milk had been properly cooled, and the so-termed "animal heat" allowed to escape, there can be very little doubt that no sickness would have ensued. Fortunately the sickness produced by this poison has not proven fatal if we except cholera-infantum, yet we should urge on all the need of care and cleanliness, especially in the handling of milk and articles of food in which partial decomposition may easily take place, not noticeable to the sense of taste or smell, and so result in the formation of "poison in foods of animal origin."

Prof. F. A. Wilber, of New Brunswick, then opened the discussion, taking up the points of the paper, citing a number of cases, and giving the results of many of the investigations in this and other countries, but regretted that after all we knew so little about these toxic agents.

Dr. W. K. Newton, of Paterson, spoke of cases from eating canned salmon, lobsters and smoked fish, some of which had come under his own observation.

Dr. E. M. Hunt thought it was very important that we should become acquainted with these poisons. He believed there have been no cases reported in which thoroughly-cooked foods have been eaten with harm.

The discussion was further continued by Dr. D. Benjamin, of Camden; H. B. Baldwin, chemist, of Newark, and Dr. H. G. Wetherill, of Trenton.

Rev. A. E. Ballard, of Ocean Grove, was then introduced, and spoke on the subject of "Home Sanitation."

He first spoke of location, and insisted that the spot chosen for residence should be thoroughly drained, both upon the site and in its surroundings, before anything else is done. Then underneath the entire house a large deep cellar with free ventilation. This cellar should be cemented wherever there is any dampness either in its walls or bottom, and the foundation should reach at least two feet above the surrounding level. The ceilings of the rooms should be high, the walls painted and varnished, and the floors generally without carpets. The best ventilation, he believes, is secured from apertures between the floors and the walls, through which the air might ascend and be liberated through any outlet which might be found most convenient. This, with free ventilation through doors and windows, would secure very largely the best probabilities of healthfulness when these were arranged so as to avoid drafts upon the persons dwelling in the houses. Cleanliness is essential. Only one room at a time should be subjected to the process of house-cleaning, and that one be unoccupied until thoroughly dried, when it could be used and another one cleansed. The strictest attention should be given to dampness and also to any vegetable or other matter, in however small quantity, which may lie carelessly around, "as the processes of death in these things are the incipients of the processes of death in us." Dr. Ballard thought that too much attention could not be paid to the water-supply. If there is the slightest doubt of its purity, both filtration and chemical neutralization should be insisted upon wherever it is necessary to continue the source of supply. The frequent use of fire during all seasons of the year is another element of sanitary success. Even in the summer it is needed to drive out the foul dampness which lingers in the corners of the rooms, in order to the purity of atmosphere which is needed. He believed that for privy closets the

"Hopper" arrangements are the best where there is a sufficient supply of water and where there are public sewers. Where this is not the case, deep cemented vaults, with free use of disinfectants, secured, in his judgment, the best results.

Dr. E. L. B. Godfrey, of Camden, was introduced and delivered an able address on "The Collection and Disposal of Garbage." We make abstract as follows:

As to the collection of garbage, Dr. Godfrey discussed both the contract system and that by which the supervision of the work devolves directly upon the municipal authorities. Under the former system the unfaithfulness of the contractor is a frequent difficulty; with the latter, in order to secure the best results, the work should not be left to committees, nor divided among several city officials, but should be made a separate branch of the street-cleaning service, under the direct control of a superintendent, who is responsible either to the executive, legislative or health authorities. He should be furnished with all the force required and all needful appliances for the work at the expense of the city. In Boston, garbage collected under such management is sold, and the revenue therefrom defrays about one-half the expense of its collection and removal.

In the removal of garbage, laws addressed to both housekeepers and scavengers would materially assist matters. Dry kitchen refuse should be kept apart from liquids of any sort, ashes, tin cans, &c., &c., and placed in galvanized iron or non-absorbent receptacles, with covers, and large enough to hold the accumulation of two or three days. These should be thoroughly cleansed as often as they are emptied, and no reliance should be placed on disinfectants. Removals should be made daily in summer and two or three times a week in winter. Garbage carts should be water-tight, lined with non-absorbent material, and fitted with air-tight covers. Water-tight barrels with covers, placed on trucks, are sometimes used, and have the advantage of being cheaper and more easily handled and cleansed.

Garbage may be disposed of in five ways, as follows:

I. Mixing with ashes and throwing upon vacant lots.
II. Feeding to swine.
III. Making into compost.
IV. Removal to the sea.
V. Burning.

1. The practice of mixing garbage with ashes cannot be too strongly condemned. Garbage and other organic refuse mixed with ashes and rubbish decomposes very slowly. Excavations of land made up years previously of such materials, disclosed organic matter still decomposing, thus making it dangerous to live upon, and carrying deadly poison to neighboring wells and springs. Aside from air and soil contamination, the decomposition of organic refuse may also give rise to the germs of specific disease.

2. Feeding to swine is used to the best advantage in the country, where kitchen and dairy refuse is carried twice a day to the hog-pen. In the city, during hot weather, the condition of the average swill-pail becomes such that the contents are frequently full of living animal matter, thus rendering them utterly unfit for food.

3. Making garbage into compost is one of the least objectionable methods for its disposal, but the large shrinkage makes it less remunerative than would at first sight appear. As a fertilizer, it cannot compete in value with sewage and other similar waste.

4. The removal of garbage to sea is an excellent method for its disposal in cities bordering on the coast, and it is done in New York, Brooklyn and Boston. It is carried off in boats and dumped at a safe distance from land.

5. Burning offers a good solution of the disposal of garbage when it has no marketable value, or cannot be carried out to sea. It should, as far as possible, be burnt in the kitchen stove or range, when this can be done without annoyance to the household, but in summer this method is often impracticable. In Glasgow and Montreal, garbage is removed to depots and there cremated, but there are no appliances for its cremation on a large scale in this country. The cost of such a plant renders the method at first sight objectionable, but without a properly-constructed crematory, it is decidedly obnoxious. Their introduction into large inland cities is only a matter of time. The growth of these cities, the constantly-increasing distance from their business centers to the open country, and the higher standards of cleanliness now being enforced in other directions, are strong arguments in favor of crematories for garbage.

Dr. Hunt followed in advocacy of cremators or incinerators, as they are called, and alluded to the thirty or more in use in England, to the one at Montreal and at Wheeling, at Milwaukee, &c. The one at Pittsburgh seems to be a success.

Rev. Mr. Ballard spoke of their experience in Ocean Grove. They had tried feeding swine with the garbage, and found it impracticable; then burning it, but the odor arising therefrom was so offensive that complaints were numerous; their method of composting did not pay. They had adopted the contract system of having garbage carried away, deposited on land which they had bought some distance from the Grove, and had it covered over.

Dr. T. W. Harvey, of Orange, objected very decidedly to the method adopted by New York City of dumping their garbage in the sea to be washed up upon our Jersey coast. The one proper system, in his judgment, was to cremate it—it was the safest and most rapid way.

J. S. Wetmore, Esq., of Englewood, agreed with Dr. Harvey in objecting to the garbage of New York City being washed back, not only on our coast, but also along the banks of the Hudson.

Rev. Mr. Ballard offered the following resolution:

"*Resolved*, That the attention of the Legislature of New Jersey be called to the dumping of garbage from the city of New York at so short a distance from the New Jersey coast as to allow its return both to the ocean coast and the shores of Hudson river."

The resolution was referred to the Committee on Legislation, with power, and, on motion of Dr. Hunt, it was agreed to have a committee appointed to confer with the New York City Board of Health, or the authorities having the matter in charge.

Dr. Benjamin, First Vice-President, presiding, appointed as the committee, Messrs. Wetmore, Hunt and Ballard.

Dr. E. M. Hunt, Secretary of the State Board of Health, was then called upon and read a paper on "Vital Statistics," which is published in the State report.

The discussion of Dr. Hunt's paper was opened by J. C. Pumpelly, Esq., of Morristown. He commenced by quoting the remarks of Surgeon A. L. Gihon, U. S. N.: "The vital statistics of the future must be something more than mere records of so many births, deaths and marriages. Morbility records must also be furnished."

After referring to cholera, yellow fever and epidemic dysentery, and arguing that insanitary conditions had far more to do with the production of these epidemics than climatic conditions, he spoke of the epidemic of dysentery and the increased number of deaths from diarrhœal diseases among children in Morristown during the past six months. He did not believe, as some physicians affirmed, that they were caused by merely atmospheric influences, "owing to great changes in the temperature," but in most cases to local insanitary conditions, as some of the physicians frankly confessed. There were reported 242 cases of dysentery, twenty cases occurring in one street, in some instances several in one house, and a great number of these were in locations known to be filthy, while for two or three years past there has been some decrease in our general death-rate. Many have failed to notice that the number of deaths from preventable diseases was on the increase, the rate being 2.77. From 1880 to 1885 the mortality rate among infants and children under five years of age, compared with the whole number of deaths, was 26.83; for 1885, it was 25; for 1886, 22.5, while the percentage of deaths of people over sixty for same period averaged 29 per cent., and for 1886, 31.66.

He believed that wherever the proportion of deaths from zymotic diseases to deaths from all causes exceeds 20 per cent., removable causes are present, and that a low death-rate with an excess of deaths from zymotic diseases commonly indicates either that all deaths are not recorded or that the causes are not correctly stated. He believed that there should be published each week as an educational document all the important data obtainable, as to births and the diseases and deaths, keeping with each district in the town, be it high or low ground, clean or dirty, a credit and debit account, which should convey its own moral, and very directly, too.

He would recommend the passage of a law like that in Massachusetts, subjecting the certificate of the cause of death to the examination of the Board of Health of the city or town wherein the death occurred, and thus prevent many mistakes. He spoke of the great importance of the health officer ascertaining the general character of the prevailing diseases, the number and location of cases of the contagious diseases and the number of deaths from each cause, also of a complete record of births and still-births.

In closing, Mr. Pumpelly referred to the great progress made in the collection, compilation and increased study of vital statistics since 1866, when the State Sanitary Committee reported that "these statistics, obtained at large expense, are of little consequence," &c. Now not only the physician, but all classes of men and women are becoming enlightened upon the subject of sanitary science, and thus are more earnest in the study of vital statistics as bearing so directly upon the question of the prevention of disease. He believed that it would be well if our scholars in the high schools were taught to study the comparative death-rates of those engaged in different occupations, and the loss of life and money by the invasion of epidemics.

Dr. E. M. Hunt spoke of the great need of accuracy in our investigation as to the causation of disease, as deceit lies in generalizing. The physician cannot always have time amid a large practice to thoroughly investigate, but these cases ought to be handed over to those whose business as health officers it is to investigate as to the origin of epidemics.

Dr. W. K. Newton did not believe typhoid fever and dysentery always arise from polluted water, as some seem to imagine. We are sometimes apt to jump at conclusions and condemn certain water without sufficient examination. It needed an analytical and unbiased mind to thoroughly investigate the causation of epidemics.

Dr. F. Gauntt spoke of humidity as being the cause of disease in very many cases, and did not attribute everything to local insanitary conditions. Prof. F. A. Wilber thought that one suggestion in Dr. Hunt's paper should be emphasized as of great practical importance; the presentation of practical hygiene and sanitary intelligence to the public mind by graphic representations to the eye, by diagrams, pictures, and plain, simple statements. He believed, especially, in the pictorial presentation showing the effects of the neglect of hygienic or sanitary laws, and that it does far more to impress the truth than technical instruction.

The discussion was continued by Drs. T. W. Harvey, J. Y. Simpson and E. M. Hunt.

The officers were elected for the ensuing year, with Dr. Henry Mitchell as President.

Drs. W. K. Newton, Shippen Wallace and Prof. F. A. Wilber were appointed a committee to represent this Association at the meeting to be held at Washington, D. C., in January, 1888, to consider the question of securing greater purity in our food-supply.

The President appointed as the Committee on Legislation: E. S. Atwater, counselor-at-law, of Elizabeth, chairman; L. B. Ward, C.E., of Jersey City; E. M. Hunt, M.D., and Hon. E. O. Chapman, of Trenton, and G. D. Saltonstall, M.D., of Hoboken.

After the transaction of other business of a routine character, the

President congratulated the Association on the great progress made in sanitary science, and the practical application of it during the last few years. He spoke of the success of this meeting, highly commending the valuable papers presented and the discussions thereon as exceedingly practical. He also congratulated the people of the State that, within her bounds, there was such a body of men, who are willing to give time and money, from purely disinterested motives, in gathering together from year to year, actuated only by their love of humanity as they endeavor to save and prolong human lives and lessen the sufferings of their fellow-men. He believed that the results of these annual gatherings of the New Jersey Sanitary Association had, in these directions, been of incalculable value.

On motion, the Association then adjourned.

REPORT OF PROF. A. R. LEEDS, PH.D.,

UPON THE WATER-SUPPLY OF COMMUNITIES DRAWING THEIR SUPPLY FROM THE PASSAIC WATER-SHED.

GENTLEMEN—For investigations upon this subject, made prior to the present year, I would refer the committee to the various reports of the Aqueduct Board of Newark; the reports of the Jersey City Board of Public Works; the report of the Commissioners upon the North Hudson County Water-Supply; Messrs. Croes and Howell's report on Additional Water-Supply of Newark; and to the reports of the State Commissioners of Water-Supply.

In accordance with your instructions, I have collected and examined, both by chemical and biological methods, a large number of samples taken from various points in the Passaic water-system, and present the results of these analyses herewith.

My first two analyses were made upon samples collected upon the 27th of June, from the Passaic below the Great Falls, in order to determine the character of the water after receiving the sewage of Paterson. No. I. was collected at a point half way between the falls and the gas works. No. II. from a point opposite the gas works.

	I.	II.
	Grains per gallon.	
Free ammonia	0.0011	0.0011
Albuminoid ammonia	0.011	0.013
Required oxygen (*i. e.*, to oxidize organic substances)	0.629	0.635
Chlorine	0.204	0.204
Hardness	1.16	1.34
Total solids	3.73	3.9
	Volume per cent.	
Oxygen	0.545	0.433
Carbon dioxide	0.012	0.049
Nitrogen	1.103	1.056

GELATINE-PEPTONE CULTURES.

No. I., after twenty-three hours, contained 38,160 colonies per cubic centimetre.

No. II., after twenty-one hours, contained 33,120 colonies per cubic centimetre.

These colonies were demonstrated by means of separate microscopic examinations, aided with appropriate staining fluids, to consist of various species of bacteria, bacilli and micrococci, the last named being especially numerous in the second sample. I did not attempt to discriminate the specific forms, because of the uncertainty at present existing as to which species are pathogenic and which are harmless.

Being curious to know how large a number of microbes would be contained in the water of the Hackensack river, which is a country stream uncontaminated by sewage, I obtained a sample of this water and made a like culture at the same time. It yielded 200 colonies per cubic centimetre. Another sample of this Hackensack water I filtered through a half-inch thickness of porous sandstone, and a third portion through a one-eighth thickness of unglazed earthenware. The microbes were altogether removed in the course of these filtrations, the filtered waters exhibiting no colonies in the gelatine-peptone cultures, even after the lapse of a week.

The next inquiry was directed to determine whether a difference in composition, sufficient to be ascertained by chemical analysis, exists between the water taken above the Great Falls (No. III.) and that taken after receiving the sewage of Paterson (No. IV.) The former sample had no taste and smell; the latter was unpleasant in both respects. They were collected on the same day, July 15th.

	III.	IV.
	Grains per gallon.	
Free ammonia	0.0029	0.004
Albuminoid ammonia	0.0087	0.011
Required oxygen	0.32	0.34
Chlorine	0.23	0.23
Hardness	2.30	2.44
Total solids	4.46	4.81

These differences appear small, but such would not be the case were they multiplied into the many million gallons pouring each day over the falls.

These chemical examinations were extended to samples subsequently collected farther down the river:

No. V. Above tailrace leading to the mills at Passaic, July 22d.

No. VI. Below tailrace, July 22d.

No. VII. Steamboat landing at Passaic, July 25th.

These three samples were not so yellow in tint as the two preceding, but were disagreeable in taste and smell, especially No. VI.

	V.	VI.	VII.
	Grains per gallon.		
Free ammonia	0.0052	0.0052	0.0006
Albuminoid ammonia	0.011	0.0099	0.011
Required oxygen	0.29	0.384	0.54
Chlorine	0.35	0.379	Undet.
Hardness	1.89	2.21	1.50
Total solids	4.43	4.54	3.90
	Volume per cent.		
Oxygen	0.436	0.338	0.462
Carbon dioxide	0.180	0.263	0.121
Nitrogen	1.127	1.112	1.095

On the 27th of July a large number of samples were collected in small sterilized flasks, for the purpose of biological examination only. The cultures yielded the numbers of microbes, per cubic centimetre, set down in the following table:

No. VIII.	Faucet at D., L. & W. R. R. station, Newark	50,000
No. IX.	Passaic river at mouth of Second river	60,000
No. X.	" " " Jersey City in-take	45,000
No. XI.	" " midway between X. and XII	39,000
No. XII.	" " at Newark in-take	50,000
No. XIII.	" " " mouth of Third river	60,000
No. XIV.	" " ½ mile above " "	Innumerable.
No. XV.	" " at D., L. & W. R. R. bridge	60,000
No. XVI.	" " " turnpike bridge	80,000

All these numbers are higher than that afforded by a culture of the sample taken at the Passaic steamboat landing, July 25th, which yielded 13,000 microbes per cubic centimetre.

On July 28th, samples Nos. XVII. and XVIII. were collected; the former at the Jersey City, the latter at the Newark in-take, both being devoted to chemical analysis, with the results as follows:

	XVII.	XVIII.
	Grains per gallon.	
Free ammonia	0.004	0.003
Albuminoid ammonia	0.013	0.011
Chlorine	0.20	0.17
Hardness	1.57	1.34
Required oxygen	0.54	0.53
Total solids	3.96	4.08
	Volume per cent.	
Oxygen	0.482	0.351
Carbon dioxide	0.236	0.06
Nitrogen	1.306	0.917

At as early a date after collecting these two samples from the lower Passaic as opportunity would permit (August 1st), I obtained a sample from the upper Passaic. It was collected at the foot of the Little Falls, which are several miles above the Great Falls. A partial analysis afforded:

	XIX.
	Grains per gallon.
Free ammonia	0.C011
Albuminoid ammonia	0.0099
Required oxygen	0.71

This sample was obtained July 29th, and on the same day I obtained other samples for biological examination:

No. XIX.	Passaic river below Little Falls	5,000 colonies.
No. XX.	" " above Great Falls	4,000 "
No. XXI.	" " just below Paterson	Innumerable.
No. XXII.	" " one mile below Paterson	72,000 colonies.
No. XXIII.	" " two miles below Paterson	64,800 "

The foregoing examinations were made upon samples collected during the very hot weather of midsummer. And inasmuch as the character of the water in the Passaic river alters somewhat with the season of the year, it appeared desirable to repeat some of these analyses. Moreover, it was important to compare the composition of the waters in the Passaic river with that in the Pequannock river, which is a mountain tributary, with little, if any, population located along its banks.

Sample No. XXIV., collected below Paterson on the 10th of October, contained 0.02 grains of albuminoid ammonia per gallon, and gave strong reactions for nitrous and nitric acid. It was also remarkably low in its dissolved oxygen, containing only 0.297 volume per hundred.

On October 26th, a sample (No. XXV.) was taken from the tap of the D., L. & W. R. R. station at Newark, and on November 2d, a sample (XXVI.) from the Pequannock river, above Butler.

	XXV.	XXVI.
	Grains per gallon.	
Free ammonia	0.0012	0.0023
Albuminoid ammonia	0.0087	0.0073
Required oxygen	0.29	0.22
Chlorine	0.46	0.38
Hardness	3.38	2.15
Total solids	4.43	3.20
Nitrates	0.06	0.025

These were followed by the chemical and biological examinations of two samples collected November 11th; No. XXVII. from the in-take of the Jersey City pumping station; No. XXVIII. from the faucet of the D. & L. R. R. station at Newark.

	XXVII.	XXVIII.
	Grains per gallon.	
Free ammonia	0.0006	0.0003
Albuminoid ammonia	0.0093	0.0093
Required oxygen	0.37	0.31
Chlorine	0.40	0.44
Hardness	3.38	2.97
Nitrites	0.00011	Trace.
Nitrates	0.048	0.062
Total solids	4.84	5.24
	Volume per cent.	
Oxygen	0.53	0.521
Carbon dioxide	0.162	0.111
Nitrogen	1.504	1.239

Both samples were of a faint yellow tint; that from the Jersey City in-take had a disagreeable taste and peaty smell. Its gelatine-peptone culture yielded 88,000 colonies of microbes per cubic centimetre. The sample from Newark had a somewhat vegetable taste and smell, and yielded 12,200 microbes per cubic centimetre.

The following day, November 12th, three samples were collected at higher points—two being taken with a view of comparing the composition of the river before and after receiving the sewage of Paterson, and a third to compare both of these with a sample taken higher up the river. They were:

No. XXIX., from the Passaic river above the Great Falls.
No. XXX., from the Passaic river below the Great Falls.
No. XXXI., from the Passaic river at Little Falls.

The first and last had but little, if any, taste or smell; that taken from the Passaic after receiving the Paterson sewage was disagreeable in both respects.

	XXIX.	XXX.	XXXI.
	Grains per gallon.		
Free ammonia	0.0029	0.0093	0.018
Albuminoid ammonia	0.0076	0.013	0.012
Required oxygen	0.23	0.39	0.24
Chlorine	0.35	0.44	0.35
Hardness	2.44	2.79	2.68
Nitrites	None.	0.00011	Trace.
Nitrates	0.022	0.036	0.022
Total solids	4.08	4.95	5.07
	Volume per cent.		
Oxygen	0.657	0.46	0.56
Carbon dioxide	0.109	0.19	0.07
Nitrogen	1.365	1.45	1.23

In order that it may not be overlooked, I desire to call attention to the percentage of dissolved oxygen in the sample taken below the Great Falls, as compared with that in the others.

The sample taken below the Great Falls yielded 11,500 colonies of microbes per cubic centimetre; the sample taken from above the Great Falls, 5,760 colonies; that from Little Falls, 4,800 colonies.

These samples were all collected on a Saturday. On the following Monday, November 14th, I collected a sample from the Pequannock river, above Butler. It contained:

	Grains per gallon.
Free ammonia	None.
Albuminoid ammonia	0.0035
Required oxygen	0.19
Chlorine	0.29
Hardness	2.04
Nitrites	None.
Nitrates	None.
Total solids	3.26
	Volume per cent.
Oxygen	0.722
Carbon dioxide	0.024
Nitrogen	1.389

It was colorless and odorless, and of pleasant taste. It yielded seventy microbes per cubic centimetre.

I desire to submit the above facts without comment or suggestion.

SUMMARY OF REPORTS FROM LOCAL BOARDS AND DISTRICT SANITARY INSPECTORS.

REPORTS OF DISTRICT SANITARY INSPECTORS.

During the past year the Board has carried on the work of local inquiry and investigation to a degree never attempted before, and, as it seems to the Board, with very encouraging results.

First of all, there was need to see that, as far as possible, Local Boards had been actually formed in each city and township of the State. Even when formed many of these understand their duties far better by personal explanations to some member, or, if possible, to the whole Board, and are incited to more thorough oversight. Still more there was need that most of the Boards pass ordinances, since the carrying out of the laws under these is much more simple than where a nuisance has to be attacked under general laws and abated by the Board, and afterward an action of debt instituted. While much still remains to be done, more has been accomplished in this direction than in all the years before.

Nuisances are constantly arising in which Local Boards desire to avail themselves of the counsel and co-operation of the State Board, or one of its Inspectors. Also, it is frequently found that an Inspector of this Board, because he is not a resident of the locality and is able to present new facts and arguments, succeeds in securing the voluntary prevention or removal of evils which have been in dispute between individuals and the Local Board.

In the outbreak of local epidemics, the visit of a State Inspector is always of signal advantage, although more needed in villages and smaller towns than in those cities in which there is systematic administration. Yet, we regret to say that in any sudden outbreak, too many of our city Boards of Health do not show administrative activity at the very beginning. Too often they resemble a fire brigade which only shows its best capacities after two or three blocks of houses have been burned. It is sad to have a score die in order to stimulate the health force into working order. Since the inspection system has been established, it is not unusual for Local Boards to ask aid, and thus secure more rapid and efficient measures. It is hardly to be expected that each Board is fully on the alert, but an Inspector who is kept familiar with all the best means to be used, helps to save time and money, sickness and lives.

At first the Board tried a system of County Inspectors. But with two or three exceptions, it was found that physicians who were competent were busy in their own practices, and that while seeking to fulfill their duties to the whole county, they could not, in such a sporadic service, be always on call or keep fully abreast with all the sanitary methods and appliances, and the best application of all the provisions of laws and ordinances in the respective localities.

During the winter months we availed ourselves of the services of Henry Mitchell, M.D., of Monmouth county, and he and A. Clark Hunt, M.D., of Middlesex county, were asked to act as General Inspectors. We have also been assisted by Dr. Mecray, of Cape May county.

Each day's work, and all suggestions made, are reported to a committee of the Board, and also to the Secretary. A special committee aids the Secretary in advisement and direction. To some degree we have extended the work to the examinations of localities, school-houses, work-shops and charitable and penal institutions, to technical examinations and descriptions of sewer and water-works, and it should be extended to many other important sanitary interests of the State.

The following are some brief comments of the Inspectors upon the localities visited, in addition to the full reports from localities which they present to this Board:

NOTES ON DISTRICT INSPECTION.

BY HENRY MITCHELL, M.D., INSPECTOR.

In the southern portion of the State district sanitary inspection has been continued during the past year. In each district visited the detail of operations of the Local Board of Health has been inquired into, and the general and special dangers to the public health in each community and locality have been observed and noted. Such advice and suggestions as seemed appropriate were, in each case, given, and assistance was rendered in inspection of premises and in judging of the degree of danger to health from suspected sources of sickness and in devising means for their removal whenever opportunity offered.

Moderate progress has been made in nearly all incorporated districts in improving the efficiency of the Local Health Boards, but in certain instances no advance has occurred. Township Boards have frequently failed to apply the provisions of the health laws to their localities.

Two obstacles which, more than any others, appear to prevent better and more rapid advance in municipal sanitation, are: 1. The scarcity of practical and earnest sanitarians among the members of Local Boards of Health, and the consequent lack of well-directed guidance for the operations of the Board. 2. The insufficiency of funds with which to obtain the services of capable health officers and to conduct the necessary business pertaining to the health office. Considerable time must necessarily pass before either of these unfavorable conditions can be overcome, for few men who comprehend the immense disadvantage to the State of sickness and premature death, and who also keep themselves acquainted with the means of promoting health and preventing disease, are available either as members of Boards or as employes.

There seems to be little probability that municipal appropriations will at present be generally made sufficient to defray the expense which attends thorough, systematic and effectual sanitary administration.

One of the results of the past two years' service of the State Inspectors has been to establish closer relations of co-operation between the State Board of Health and the Local Boards. Personal acquaintance has been formed with many individual members of Local Boards, and correspondence has been established which affords opportunity for conference concerning unusual cases and emergencies.

One of the best features of the district inspection service is the conveyance to Local Boards, by the State officers, of information and practical instruction concerning the methods of promoting health which have been tried in other districts and found to be successful. By this means the experience of every Local Board is soon made available in all parts of the State, and it becomes possible for each district to keep abreast of its neighbors in sanitary work, and limits the necessity for experiment and the delay which generally attends separate and unaided efforts.

There can now remain no doubt as to the desirability of continuing and extending the aid of the State Board of Health, through its District Inspectors, to Local Boards. Indeed, without this or other stimulus, there is strong probability that the interest now existing in sanitary questions among the members of Local Boards will wane, for they generally feel the need of assistance, and hesitate to attack recognized evils until led by others or driven by the outbreak of disease.

The full details of my inspections in various localities, and of conferences with members of Local Boards, are on file in your office, and do not need to be herewith repeated.

NOTES ON DISTRICT INSPECTION.

BY A. CLARK HUNT, M D., INSPECTOR.

It is almost impossible to give a detailed account of the work which has been done during the past year, hence only an outline is furnished. The effort has been to gain, in the first place, organization where it did not exist. There are still remaining some Boards which have never organized, but the number has been greatly lessened by seeing members of the Boards and drawing their attention to the needs of their townships and villages.

Secondly, re-organization. There were at the beginning of the past year a number of Boards which, although organized, had not carried out many of the detail conditions necessary to make them legal or efficient. There are now but few of these, and during the coming year they will be reached and placed in better condition, if possible.

Third, correcting existing misunderstanding. Many of the Boards have never known their duties and have had very vague ideas as to how work was to be done or any good accomplished. Others have had entirely wrong ideas as to the amount of money at their disposal and how this was to be obtained. In the cities many of the Boards were illegal because of the manner of appointment and the length of time the various members held office. This would certainly lead to endless trouble if legal difficulties arose, and has been corrected in many instances.

The State Board, early in the year, issued a circular on the need and mode of passing a code for the guidance of the several Local Boards and increasing the knowledge of the people as to what nuisances were defined to be and the penalty for continuing them. To get the Boards to adopt such a code has been a very essential part of the work. Upon meeting with the different Boards, it was discovered that many of the existing codes were very indefinite and needed a great deal of changing to make them effective. In the townships many of them have been prevailed upon to pass ordinances, and if only the matter is properly explained, and they are made to understand what can be accomplished, they are found willing to do what they can. The effect of these ordinances when in operation is certainly very satisfactory, and many of the Boards look forward to better results in the future. During the year several factories have been visited to ascertain their sanitary condition, and where there existed dangers from overcrowding and neglect of sanitary laws the facts were brought to the attention of the owners and corrected by them, as also reported to the State Board. Several jails have been visited and, as a rule, were found in good condition, although several minor improvements have been suggested and carried out. There were two notable exceptions to this. The jail at Camden has improved, but is still very much out of repair and needs careful watching. Overcrowding, lack of proper facilities for cleansing the closets, improper ventilation and lack of sanitary conveniences, make it still a very unsatisfactory institution and one not at all complimentary to the city or to those who are responsible for it.

The jail at Flemington was in bad condition, but this is, for the most part, due to faulty construction. As a new jail is to be erected, the freeholders will make but temporary improvements which, under the circumstances, will be sufficient.

Wherever nuisances have been reported, and the co-operation of the State Board requested, the Inspector has visited the place and tried to assist in overcoming the difficulties. Several slaughter-houses have been troublesome, but all the owners of them have readily acquiesced in any suggestions made, and immediate improvement has followed. No one of them rendered a second visit necessary. Nine alms-houses, in different parts of the State, have been visited, and with three exceptions, were in good condition. Now, as to the amount of work done, nearly 200 visits have been made to different places, and the different Boards are getting into the habit of writing for information and asking the Inspector to visit and assist them. As examples of work done, may be cited the formation of Boards at Englewood, North Plainfield, Perth Amboy, Plainfield and others; the renovation of the slaughter-houses at New Brunswick and Gibbsboro, the drainage at Clinton and a number of other instances showing that the effort is having some results which are highly satisfactory. There is much that may be accomplished in a work of this kind, and much to be learned. The different Boards need a great deal of attention and assistance to make them what they should be, and it is only by visitation and becoming more intimate with their conditions and needs that anything can be accomplished. The mere fact that a visit is made to a Board showing what others are doing and that shortcomings are being inquired into, awakens activity and a feeling of their responsibility. It also calls their attention to the laws and to the acquiring of clearer ideas of what should be done. The way some of the Boards wake up to their possibilities of usefulness, is certainly encouraging. The only cause of discouragement lies in the fact that some are listless and careless and do nothing, but there is the belief that with the development of a proper public opinion, this will be corrected. The better people throughout the State are taking the side of proper health measures, and any effort in the direction of securing good health to all its inhabitants; and those who attempt to stay or stop the progress in this direction, must yield sooner or later to a strong public sentiment. There is need that all our public institutions should be more carefully watched as to their sanitary condition. By *irregular* visiting at times when they have not been notified of the coming of an Inspector, many objectionable features may be discovered and obviated.

A detailed report has been made each month, during the past year, to a committee appointed by the Board for that purpose.

During the present year the water-supplies and sewerage system of the different cities and towns, will be investigated. Among the important results that have been attained the past year, is that a more earnest spirit of co-operation between Local Boards and the State Board of Health has been developed. Thus, working in and through each other, very much of good may be accomplished, not only for the Local Boards themselves, but for the citizens who have a right to demand above anything else, that every effort shall be put forth for protection of health, which is admitted to be the greatest of blessings, and most essential to the industries and happiness of the people.

NOTES ON DISTRICT INSPECTION.

BY JAMES MECRAY, JR., M.D.

I herewith hand you report of this district.

The water-supply of this city has been increased and proven a success. As our Local Board will describe it I think it unnecessary for me to do so.

During the heated term (July) there was an unusual amount of bowel troubles, affecting all ages, but not of a severe type, readily yielding to treatment. We have been free from epidemics.

West Cape May had an outbreak of scarlet fever in the spring, several cases proving fatal. The Local Board closed the public schools and soon stamped it out.

Cape May Point had several cases of diphtheria in one house. On visiting the place, found the house filthy, one child dead, another very sick, with the entire family in one room. After separating them, having the house cleaned and disinfected, have had no new cases.

The condition of Holly Beach at our visit, it is unnecessary for me to describe, as it is well known to you. Since then the Board has been re-organized and are doing good work. They have had several of the low places graded and are at work on three others. They report that before another season they hope to have the place in good condition. They are having considerable intermittent fever, but no typhoid. The Board meets every week.

The county jail has been repaired, drained and ventilated, as you suggested.

The greatest nuisance in the county is the alms-house. It was built years ago and has nothing to recommend it except the location, which is all that could be desired. The water-closets are about fifty feet from main building and drain into a surface-ditch which runs about 100 feet from the house. The kitchen slops also drain into the same. The building is used by both sexes—different compartments. The hog-pens are about eighty feet from the house (south) and are kept in good condition. The barn about same distance, one portion of which is used for storage purposes (groceries, &c.)

The main building sets about twelve inches from the ground, giving little or no chance for ventilation. It has been changed by additions until the original construction is doubtful. A cellar is under one portion, which is not properly ventilated. Only one room occupied by the inmates has any conveniences for fire except so-called new part or sick-room, which has at this time two beds in. It is entirely too small for hospital purposes. There are two rooms originally designed as cells. They are now occupied as sleeping-rooms and are seven by seven feet, six feet high; no ventilation. The entire row of rooms on main hall are smaller, ventilated by one very small window, and main hall has no proper ventilation.

The are no rooms to separate inmates suffering from contagious disease; no special wards for males or females. There is not a bath-tub in the place.

The hired help sleep in the attic, which has one small window. It is well ventilated by cracks in roof and sides of building.

The death-rate is very high—1886, average number inmates, tweny-six; deaths, four. 1887 (six months), average number inmates, twenty-three; deaths, three.

The place is nicely kept by Mr. Sayre, the keeper—better than could be expected. In fact, the entire house is a model of inconvenience and should be condemned, and a more suitable one erected.

ABSTRACTS MADE BY THE SECRETARY FROM SOME OF THE REPORTS OF LOCAL BOARDS.

The printed schedule, which is sent in October of each year to the Local Boards of Health, for the annual report required of them by Section 37 of the Law of 1887, is as follows:

Names and post-office address of the members of the Board of Health and of the Health Inspector.

The subjects suggested are as follows:

SCHEDULE OF SUBJECTS FOR REPORT.

A. Location, population and climate.
B. Geology, topography and contour.
C. Water-supply.
D. Drainage and sewerage.
E. Streets and public grounds.
F. Houses and their tenancy.
G. Modes of lighting.
H. Refuse and excreta (how managed).
I. Markets.
J. Diseases of animals.
K. Slaughter houses and abattoirs.
L. Manufactories and trades.
M. Schools and school and other public buildings.
N. Alms house, hospitals and other charities.
O. Police and prisons.
P. Fire guards or escapes.
Q. Cemeteries and burial.
R. Public health laws and regulations.
S. Registration and vital statistics.
T. Quarantine or care over *contagious* diseases, and vaccination.
U. Sanitary expenses.
V. Heat and ventilation for dwellings.
W. Prevalent diseases of the year.

Other subjects may be named under X, Y, Z. The subjects may thus be referred to by the letters.

If the sheet provided is not sufficient, add others, marked with the letters which designate the topic treated.

While some of the subjects have been reported on in previous reports and do not need restatement, most of them call for notice.

All defects at present existing should be carefully reported. Under X it would be well to inform us whether there is any system of house-to-house inspection and whether a record thereof is kept on file.

The number of reports that have been returned this year is more than ever before, and includes all but a very few smaller townships. While some townships are inactive and some so small and healthy as to need but little sanitary activity, there are many others in which excellent work is being done and still more is needed.

While placing on file for reference and for important information all of these reports, for the sake of brevity we only abstract therefrom so much as seems to be especially of general interest or suggestive of local neglects and requirements.

ATLANTIC COUNTY.

ATLANTIC CITY. - *Report from* M. D. YOUNGMAN, M.D., *Sec'y.*

The water-supply during the past summer was ample and of its usual excellent quality, the company having driven a number of wells to increase the supply. This fall they will drive one hundred more wells, in order to have an abundance for next season. The water flows eight miles before reaching the city.

The sewer company are still extending their pipes, and are again at work this fall substituting iron pipe for the terra-cotta pipe placed two years ago, which, in our loose, shifting sand, would not keep jointed. The system received very many commendations during the past season. The company have refused to allow the connections of any more privy-vaults not furnished with patent basins, because of the large amount of refuse in the shape of ashes, carpet, old clothes, bottles, &c., that were constantly thrown in and choked the pipes. Connections are made with the sewer under direct supervision of the Health Inspector.

We had a few cases of the meningeal disease epidemic this fall among horses in this part of the State. All attacked died in from two to eight hours. No treatment was instituted that seemed of any avail; indeed, there was no time for treatment, so rapid was the progress of the disease to a fatal termination.

A handsome new brick school-house, costing $25,000, was, during the summer, erected and fitted with the most modern and approved sanitary appliances and precautions, under the personal supervision of Dr. Edw. A. Reiley, ex-President of the Board of Health, to whom much credit is due.

No child is allowed to enter school without previously having been vaccinated.

Sanitary expenses are provided as per law, the Board submitting its budget to Council, which body allow such proportion as they deem fit. So far, the amounts allowed, over the per capita of five cents secured the Board by act of 1886, have been very satisfactory.

Heating by grates, particularly those having a cold-air flue, introducing a current of cold air from without over the surface of the fire, then to be heated and passed into the room, are coming into quite extensive use, not only in hotels, but in many private houses. These grates are admirable ventilators.

Steam-heating is becoming year by year more popular and generally adopted, together with a general decided improvement in the manner of building houses, as people realize the permanency of the growth of the city and its growing popularity as a winter resort and home.

There were a number of cases of measles early in the spring, mild in character and of short duration.

EGG HARBOR CITY. - *Report from* FRANCIS NORMAN, *Sec'y.*

Eighty-seven notices to abate nuisances on lots and streets have been served during the past year, and nearly all the nuisances have been, or will soon be, abated.

The drainage has been improved lately by cleaning the creeks running through the city. Said creeks will allow the construction of a public bath, which is much desired.

We have a nice school-house, with large, high rooms, but the heating of this building by a hot-air furnace has failed to give satisfaction. A stove is now placed in each school-room. The ventilation of the school-rooms is good.

With the exception of several cases of measles, there has been no epidemic disease. The general health of the city is satisfactory.

EGG HARBOR TOWNSHIP. - *Report from* DR. R. SOOY, *Sec'y.*

We have no refuse nor excreta but what are common to each family, and which are disposed of by themselves, except what is brought into the township from Atlantic City as city slops, fæcal matter and garbage, and used by the farmers for fertilization. We have this year adopted a new code of health ordinances which deals with the question of their disposal and use very satisfactorily, and with the aid of a Health Inspector who believes more in education than coercion, we have accomplished good results without the aid of lawsuits as formerly.

Many horses in this township have died with the so-called cerebro-spinal meningitis. A number of post mortem examinations have been performed, and in no case were the coverings of the brain or cord found to be involved, but the stomach was found to be for a considerable extent entirely denuded of the mucous membrane, and the throat was in most cases involved. The secretions of the stomach were found intensely acid, and an alkaline treatment in a number of cases resulted in recovery.

In our new code we define nuisances and adopted ordinances for the abatement of such. We restrict, direct, regulate the use of garbage of Atlantic City used by the farmers of this township.

Dwellings heated by wood and coal; each having its own system. Several have heaters put in the cellar and heated by hot air. Fire-places nearly all gone out of existence.

Much diarrhœa of a very severe type prevailed during the extremely hot weather which lasted the entire month of July. In some localities it affected children most; in others, the adults suffered most.

Only one or two cases of typhoid fever reported to the Board. One of them was at work again in four or five days. The Board did not quarantine the case.

The Board hereby express the thanks of the people and of themselves for the aid and advice given them by the Board of Health of the State of New Jersey.

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

In some parts of this township—and I suppose under like circumstances the same trouble exists in other townships—there are many houses held for rent which are generally void of sanitary principles.

The water-supply is not cared for, and the tenants are forced, at best, to drink surface-water, and often the "*infusion* of toads," or carry all their drinking-water, sometimes a long distance, from their neighbors'. These tenants, not aware of the evil effects of drinking this water, or if aware, not able to avoid it, often drink it for a long time, though it does "*stink a little*," and hence disease and death are their frequent visitors. I repeat that to which I have before called the attention of the State Board of Health, that no house should be rentable unless it has a sufficient supply of good water, as well as a general compliance with other sanitary principles.

In these houses mentioned under F the out-houses are generally neglected as much and even more so than the water-supply. Generally, not even a trough is supplied to receive the excreta, but they are left on the surface until absorbed by the atmosphere, or washed by the rain into the earth, subjecting those who live near to all the evils resulting therefrom.

I speak thus earnestly on this subject because there is no law except our own township laws that is special on this subject, and it often occurs that these landlords have such influence on the Local Boards as to prevent their execution.

If some laws were enacted that would make their execution beyond the influence of the Local Boards the trouble would be the sooner reached and remedied.

We have had no diseases of animals, except in September last, the so-called cerebro-spinal meningitis reached Mays Landing, and was fatal in three cases. The disease was characterized at first by a general dullness, or malaise. This dullness would continue for several days, all of which time some of the horses were worked in the team, but when in the stable were inclined to rest their heads upon the mangers and lean against the partition, throwing their heads occasionally towards the right side. The pulse at this time was considerably increased in frequency, and the temperature higher than normal. Soon the horse refused to eat and rapidly lost strength, until too weak to stand, it fell in the stall, and lay with its head and neck stretched to its full length, frequently throwing its head around to its right side, and every few minutes striking out with its feet, as though in great agony. During all this time its eyes did not lose their natural luster, nor did the horses seem crazed, as some are reported to have been, except as their intense pain caused them to act so. In one instance a pet horse would winnow and show other signs of affection whenever its master would come near it. The horses died within a day or two after they had become too weak to stand.

I made post-mortem examination of two of these horses, and found the brain and cord with their coverings entirely normal in structure, with no evidence of inflammation at all, and no congestion of the vessels more than would naturally exist after a death of such agony. The heart also was normal. It, however, contained in its cavities some considerable coagula. The lungs were healthy, so with the kidneys. The stomach was partially filled with a yellowish fluid, of a decided acid reaction. The mucous lining of this organ, near the pyloric orifice, extending perhaps half way to the cardiac end, was greatly disorganized; in fact, this part of the stomach was denuded of this lining, and what is worthy of notice, the line of demarcation between the healthy and the unhealthy parts was distinctly marked, as much so as we find it in gangrene or mortification. This marking was not made after death by the fluid in the stomach, because it extended quite around the stomach, and was not confined to its pendent portion. No other markings were found worthy of particular note. With these symptoms and examinations as a data, I could not conclude these cases to be cerebro-spinal meningitis, but rather some disease playing its most conspicuous part on the stomach, and the brain trouble was merely reflex or symptomatic. I will further say that after we commenced treatment for this trouble, thus determined, of a number of cases we treated, we lost but one.

HAMMONTON TOWNSHIP. - - *Report from* A. J. SMITH, *Clerk.*

The most serious things with which we have to contend are two slaughter-houses connected with meat markets, and located right in the center of our town; the owners promise and claim to keep them clean, but it requires more care and expense than they choose to incur. The Inspector claims to have called the attention of the owners to the necessity of keeping things in perfect order and cleanliness, and yet the stench that comes from them at times is sufficient to produce bad results, and many are of the opinion that they should be removed to some more isolated locality. I presume that when some epidemic grows out of and can be directly traced to these places, then our people will rise up and demand their removal. Until some one is hurt no one seems inclined to enter complaint.

We have another nuisance, equally as serious as the above but of shorter duration, and that is of bringing into our town and unloading right in our midst night-soil and garbage, in the shape of manure on open railroad cars. In many cases this appears more dangerous than our slaughter-houses, as the handling from car to wagon brings out the stench, so that at times it is fearful and almost unbearable; and yet our Inspector is of the opinion that the law will not sustain an injunction to prevent the railroad companies from transporting such manures into the center of our town. We are of the opinion that railroad companies should have side-lines, a little away from centers, for the unloading of such stuffs. We have one of the neatest lockups in the State: built this year.

P. S.—One of the above slaughter-houses has removed about one and one-half miles out from center of town.

WEYMOUTH TOWNSHIP. - - *Report from* H. GODFREY.

The Board recognizes the importance of sanitary oversight, and looks after these interests in accord with the law of the State.

BERGEN COUNTY.

ENGLEWOOD TWP. - *Report from* J. HENRY ACKERMAN, *Sec'y.*

Location is good; climate is good and healthy.

Water-supply just finished by the Hackensack Water Company.

Drainage and sewerage are being supplied.

Scarlet fever was the worst disease we have had this year—about forty cases and thirteen deaths.

HARRINGTON TOWNSHIP. *Report from* FREDERICK MORRIS, M.D.

The swampy portions of the township were more than usually overflowed this season, accounting, perhaps, for the evident increase of malarial fever—the fever, however, not being of a severe type. Some residents in the valley through which the West Shore railroad runs in this township complain that the culverts of the embankments are not kept properly open, and in one place are insufficient, causing water to remain all summer in places where water did not lie formerly.

ORVIL TOWNSHIP. - *Report from* CHAS. W. BADEAU, M.D.

For the past year the health of this township has been good. No epidemics have prevailed, and no complaints have been made to the Board.

This is a rural district with a scattered population, and no extensive mills or factories.

RIDGEWOOD TOWNSHIP. - *Report from* WM. E. MALTBIE.

Well used on premises of School District No. 61 reported foul. Inspected it and found it tainted by sewage and cesspool-pipes near by. Ordered use of well to be discontinued and the same to be filled up.

BOROUGH OF RUTHERFORD. *Report from* GEO. P. RICE, *Secretary.*

There are no public grounds or parks. The streets are laid out, and within the past year have commenced to macadamize and curb and gutter. Other improvements are under consideration, and the place is growing very fast.

I cannot say that any particular disease is prevalent here. We are subject to all the troubles that other small towns are. The health of the place generally is good. In conclusion, will state Rutherford is a small town which had, up to about two years ago, lain in a dormant state. For the past two years improvements have gone ahead pretty rapidly and new dwellings are springing up all over. At present the place is growing ahead of the powers of our local authorities. Public improvements are being pushed, and within a very few months we trust to see the town in a thoroughly good sanitary condition. We have practical parties working up the sewerage system, water-supply, &c. I trust that next year's report will include many of these improvements.

BURLINGTON COUNTY.

BEVERLY. - - *Report from* HARRY H. MATSON, *Inspector.*

The water is supplied by wells chiefly. A private water company very recently has introduced water-pipes in the northern part of the township, about Edgewater park. The Delaware river is the stream from which the water is taken.

Drainage is generally good. Malaria not prevalent.

The Board of Health passed a code of laws for the government of the inhabitants of the township, so that all nuisances might be prevented. The Board also appointed an Inspector, and by so doing they have lessened their labors and it has been the means of correcting troubles much sooner than it would have been done otherwise.

BORDENTOWN. - *Report from* WM. H. SHIPPS, M.D.

We get our supply of water from Crosswicks creek; a private company furnish it to the citizens. The number of houses taking the water is 300. It is at times discolored, more particularly after a rain; water hard. The quality of the water is not perceptibly affected by seasons. The reservoirs are cemented, and cleansed as occasion requires. About 100 yards above the point of supply a small stream flows into the creek. This receives the drainage from two shirt factories, one tomato factory and a number of private dwellings in the city. About 300 families depend on wells, and about 100 on cisterns.

The prevailing system of drainage in Bordentown is surface drainage. During the past year a private organization has constructed a sewer on Second street, running north from Crosswicks a distance of 200 yards. Another is now being laid on Crosswicks and Walnut streets, running west of Second street a distance of 300 yards. The former is of terra-cotta pipe, six inches in diameter. The latter of the same material, twelve inches in diameter; this is owned by the city.

Our cellars, for the most part, are dry. There are swamps or low lands on the western and northeastern aspects of the town. Houses in the vicinity of these swamps are affected by malaria in the spring and fall months. Diseases of a malarious nature do not prevail to any considerable extent at any season of the year.

Cesspools constructed within the last five years are cemented, and contents removed by means of the odorless apparatus.

There is a register kept by the Board of Health as to the number of persons keeping horses, cows, hogs, &c., in the city.

We have no slaughter-houses in the city limits, and do not intend to have.

The ventilation of the school building is by windows and doors, and is by no means the best that could be suggested in a differently constructed building. The heating is by stoves and portable heaters, and is open to several objections both as to amount and quality.

We have an active Board of Health, good health laws and regulations, and insist upon their prompt enforcement.

Vital statistics are carefully kept, and, so far as I can learn, faithfully reported.

BURLINGTON. - *Report from* CHARLES STEWELL, *Inspector.*

The source of water-supply is the Delaware river. It is a public supply, the business of which is transacted by a Board of Water Commissioners appointed by the Common Council.

There is a good system of drainage by Drainage Commissioners; a pumping station at the sluice upon the bank of the Delaware river. It is distinct and entirly separate from sewerage.

One sewer some four squares or blocks in length, the walls thereof of brick laid in cement. The sewerage of this city is not of any magnitude. Houses generally have cellars. Cesspools generally of brick and cemented, with sides for emptying; emptied generally in winter, at night, by men who cart contents outside of city limits for compost. Diphtheria was for a time prevalent.

CHESTERFIELD TOWNSHIP. *Report from* CHARLES B. HOLLOWAY.

The general health of the township has been good during the past year, but at present there are a few cases of the chills in the vicinity of Crosswicks. The water-supply is from wells, springs and cisterns. The water from the wells is generally considered good. Most of the cisterns have filters and not much used for drinking purposes.

As a general thing the drainage is good, there being no swamps or marshy places.

The houses are principally frame, with cellars which are used for storing vegetables, well drained and generally dry; very few occupied by more than one family. Refuse and excreta being disposed of, as is customary among farmers, upon their land. No disease among animals, with the exception of cholera among fowls. Our school-houses are all in good repair and well attended.

CINNAMINSON TOWNSHIP. *Report from* J. D. JANNEY, M.D., *Sec'y.*

Water-supply by wells and cisterns, mainly wells. Water of good quality for drinking. Cisterns used for washing purposes chiefly. I think there are not over five families in the township depending upon cistern-water for drinking, and in those cases filters are used.

Surface-drainage principally. A few families in Riverton, on the river-bank, drain into the Delaware by underground means. Farmers use tile-drain largely where needed.

I know of no basements used for any but cellar purposes. There are very few houses without cellars. Cellars are used largely for the storage of vegetables. I know of no tenement-houses of more than two families, and very few containing over one family.

I know of but few sewers; these drain into cesspools, cemented, and emptied by hand for fertilizing purposes. There are a large number of cemented cesspools under privies in Riverton and Palmyra emptied by hand. Privies in the township are largely without cemented cesspools, and in villages during summer are highly offensive to the inhabitants whose olfactories are sufficiently cultivated to distinguish between good and bad odors. This and pig-pens are matters requiring much attention at the hands of the Health Inspector of our township. Many privies in villages are within fifty feet of the family water-supply—the well. Some farmers persist in placing their cow-yards and pig-pens much too near and westward from the dwelling, allowing the prevailing winds to carry the poisonous effluvia emanating from them to the family.

Miasmatic fevers have prevailed in the township to about the usual extent during the year; very few cases of diphtheria or scarlet fever.

EVESHAM TOWNSHIP. - *Report from* WILLIAM L. BROWN.

No prevalent disease. The Assessor inquires each year as to losses of animals and as to contagious diseases. Has not found any in the township this year.

But one slaughter-house in the township. It has been inspected; not complained of as a nuisance.

LITTLE EGG HARBOR. - *Report from* T. T. PRICE, M.D., *Sec'y.*

Whooping-cough and measles epidemic last spring. No other. Cerebro-spinal meningitis among horses in September.

MANSFIELD TWP. *Report from* DR. D. G. VAN MATER, *Inspector.*

It has been generally healthy here with the exception of measles in February and March and typhoid fever in July and August.

SHAMONG TOWNSHIP. *Report from* J. CLAYTON BUCKAGE, *Sec'y.*

This township is very healthy at the present time. Last January there were six cases of scarlet fever at Atsion. The school was closed and it did not spread. I ordered all the children that had the fever not to attend school for one month. The farmers' horses were taken with a disease and I think about twenty horses died.

SOUTHAMPTON TOWNSHIP. - *Report from* SAMUEL E. BRANSON.

Cesspools mostly open. Refuse is carted out on land. This the Local Board has brought about during the last few years.

We had one case of diphtheria which the Board of Health was called upon to investigate. The township physician and committee met and came to the conclusion the best thing to do was to quarantine the house, which they did. The disease was brought from New York by visiting friends. By the Board taking this case in hand the disease did not spread, although it proved fatal to two children of the family.

CAMDEN COUNTY.

CAMDEN. - *Report from* SEPTIMUS KNIGHT, *Asst. Inspector.*

Water-supply from the Delaware river. Very nearly all houses are supplied from the city water reservoir, with the exception of those in the Eighth ward, which mainly get supply of water from wells.

All houses used for dwellings have cellars, with but few exceptions, those below Second street, in the lower part of city, being very damp, and in many cases not fit for any purpose.

Sewers are used to carry off all surface-water from streets; also to carry off excrement from cesspools and privy-vaults. All cesspools constructed since the 19th of August, 1886, have been required to have wall and bottom built of brick, eight inches in thickness, laid in cement.

All properties abutting on streets in which there is a public sewer are required to place hopper water-closets on premises, and no wells or cesspools are allowed to be constructed on such streets.

We have made this year a rigid inspection of slaughter-houses and have had no complaints of same.

There are marshes extending across the lower part of the Fifth and Sixth wards and into the Eighth, which are supposed to have caused chills and fever, which have been prevalent during the summer in the lower wards of the city. This Board will have the meadows ditched as soon as possible, so as to drain said meadows.

CENTRE TOWNSHIP. - *Report from* JOHN H. JACKSON, *Sec'y.*

The general health of the township for the past year has been remarkably good. Several cases of typhoid fever occurred during the spring and summer, but none of them were fatal. The amount of malarial fever has been less than last year.

The drinking-water is almost universally obtained from wells either dug or driven, but principally from the former.

Our natural facilities for drainage are good and cellars are principally dry.

Human excreta are received in privy wells. The mode of emptying is mixing coal ashes or marl with the contents, and removing a short distance and covering with earth.

There are four public school buildings in the township, and the various Boards have used every precaution to procure good sanitary conditions.

DELAWARE TOWNSHIP. *Report from* W. S. LONG, M.D., *Inspector.*

During the month the Sanitary Inspector has visited the three schools whose districts are entirely within our bounds, and has found the buildings good, with sufficient means for ventilation and not crowded. In School District No. 8 the building has the disadvantage of two windows facing the scholars. The privies are all on the surface, and are not sources of danger. The water is good. I find that thus far no attention has been paid by the clerks to the question of vaccination of teachers and scholars.

At a meeting of the Board on October 18th, 1887, the model code of ordinances as advised by the State Board, was adopted, with the exceptions of Sections 8 and 9.

HADDON TOWNSHIP. - *Report from* J. STOKES COLES, *Secretary.*

Water was introduced into our borough by a private company last spring and summer; there are not many taking it as yet; I suppose some fifteen or twenty have it, and think others soon will. There are always some difficulties in the way—of fault-finding, &c. I will give you the analyses of the Haddonfield water company's water:

	By Prof. Wood, Harvard, Oct. 6th, 1886.	By Dr. J. R. Stevenson, Haddonfield, April 9th, 1887.
Appearance of water	Clear.	Clear.
Degrees of hardness	1.00	2.8
Chlorine (grains per gallon)	0.6	0.6
Solid residue (grains per gallon)	6.4	7.9
Free ammonia (parts per million)	0.004	0.094
Albuminoid (parts per million)	0.1	0.048

The source from which taken may receive some sewage above the point of supply in time of heavy rains, but the supply is arranged so as to drain it very quickly, and the supply is ready for pumping again in an hour or so, soon as the gates are closed. The families mostly depend on wells; some have cisterns.

New buildings mostly, if not all, have cemented cesspools; the most of them are emptied by carting away and using as a fertilizer.

Typhoid and typho-remittent fevers made their appearance in Haddon township the last of summer and in September, and a few cases have been fatal. Five cases of scarlet fever have been reported to the Board of Health during the year, and one death. Thirty-two inspections of properties have been made by the Inspector during the past twelve months. The nuisances consisted of one flowing privy vault, improperly constructed, overflowing cesspools and sink-holes, stagnant pools of rain-water and filled-up gutters, badly-kept pig-pens, rubbish, manure piles, &c.

I should have said that the water supplied during last summer we think an ample supply of good spring-water. It has been delivered through the principal streets by a pipe-line from a stand-pipe at one end of the town. The water is obtained from a reservoir about three-quarters of a mile away. Spring-water, surrounded by a bank and forced up by steam.

STOCKTON TOWNSHIP. - *Report from* EDW. C. PEDIGREE.

The water-supply of this township is chiefly wells. We might say that almost the entire population depend on wells. A few receive their supply from the Merchantville water works.

Sewers we have none. Tile drainage and clearing of swamps and filling up of some low land have done something to improve the sanitary condition and prevent malaria. In the most of the township the cellars are dry.

Cesspools are not as a general thing cemented, and are emptied at the discretion of the owner of premises.

Have no trouble in getting the vital statistics, as there is but little neglect on the part of the people in this respect.

CAPE MAY COUNTY.

ANGLESEA. - - *Report from* F. H. HEWETT, *Secretary.*

Water-supply mainly cisterns, with some wells, the water of the last sometimes, when the springs are low, being slightly discolored. About one-half of inhabitants depend on cisterns, the rest on wells.

Drainage surface with a fall of two-tenths to the hundred feet. There is during the wet season water in many of the cellars.

CAPE MAY CITY. *Report from* F. SIDNEY TOWNSEND, *Sec'y.*

Our water-supply is excellent and is furnished by the city, who own and control the works. A large surface well thirty feet in diameter, twenty-eight feet deep, with thirteen-inch walls from bottom to top, laid in hydraulic cement, reaching the second or lower springs, is our source from which water is supplied. It is free from impurities; is of regular quality and taste. Its location puts it beyond the possibility of sewer or surface contamination, as it is located in the country north of the city, in a sparsely-settled district surrounded by high farming lands that really slope in every direction from the center of the well-site, and as a further safeguard the city purchased five acres of land surrounding the well.

Our geographical location naturally gives good drainage for the soil, but a system of sewers penetrates the heart of the city, affording ample drainage for domestic purposes, perhaps as good as any of the leading cities. So far this year no stoppage of the main sewers has been brought to the notice of the Local Board.

Cesspools built during the year have been constructed in conformity to the law, with cemented sides, and generally cleaned every six months or oftener.

No new or fatal diseases have been observed among our people since last report, excepting during July several cases of acute diarrhœa were treated, both among the resident and visiting population to the sea-shore during this period. No local causes could be ascribed; it was observed at the commencement of an unusually heated term and disappeared with the cooler weather that followed during August. Our resident physicians held it in check and no cases proved fatal from this cause; otherwise the city has been generally healthy.

LOWER TOWNSHIP. - *Report from* WM. C. RUTHERFORD, *Sec'y.*

We have had as a prevalent disease among the children of our township, in the latter part of last winter, scarlet rash or scarlet fever. There were about twenty to thirty cases. There were only two or three deaths. With this exception it has been very healthy. The Board of Health have not been called out to abate any nuisance during the year.

UPPER TOWNSHIP. - *Report from* RANDOLPH MARSHALL, M.D.

The few cases of scarlatina simplex and rubeola were so benign as to require little or no treatment.

A very malignant case of typhoid fever was transported here, February 1st, from Port Richmond, Philadelphia, in a young man twenty-one years of age, attended by apparent perforation of the bowels, the shock lasting forty-eight hours, characterized by profuse colliquative sweats, total unconsciousness, lividity of skin amounting to a distinct purple hue over abdomen, which finally yielded to a large fly-blister and heroic clysters of ammoniated whisky, laudanum and turpentine. After convalescence appeared fairly established, patient suffered an acute attack of meningitis. Was treated with inunctions of iodoform and lanolin to shaven scalp. Internally, iodide of iron, alternated with cod-liver oil mist., with bromide of potassium and aconite, q. s., to regulate convulsions. Patient was out of doors for the first, July 9th, weighing eighty-seven pounds. The following October 1st, he had gained to 145 pounds; the greatest increase of flesh being a gain of twenty-one pounds in eleven days.

A fatal epidemic prevailed amongst the horses of this township. Forty-one head suffered from the disease; of this number only four recovered. The carcasses were all buried by order of Local Board of Health.

WEST CAPE MAY. - *Report from* R. C. HILL, *Secretary.*

The residents of this borough derive their water-supply from wells, surface and tubular. As a rule the water is soft and free from any bad taste. In the vicinity of the meadows and low lands, tubular wells, driven eighteen or twenty feet furnish a good supply of water, clear, cool and with no unpleasant taste or smell.

No safeguard has been provided against fire. If, during windy weather, a fire should break out in our midst, great damage would result.

The health laws suggested by the State Board have been adopted, with necessary ordinances regulating the keeping of swine and carting the slops and depositing the refuse from the neighboring city of Cape May. At the establishment of this Board there was a disposition among some to object to the enforcement of the health laws, but at the present time little trouble is required to regulate such matters.

This Board had no occasion to adopt any special measures in the contagious diseases among children, beyond making necessary suggestions and advising necessary precautions to the families having sickness in their midst.

The only prevalent diseases of the year have been scarlet fever and measles. Several deaths occurred from scarlet fever; none from measles. When it was found the fever was threatening to become prevalent, we at once closed the school, and kept it closed until its violence had abated somewhat.

CUMBERLAND COUNTY.

COMMERCIAL TOWNSHIP. - *Report from* DAVID MCELWEE, *Clerk.*

There are about 1,200 acres of meadow and swamp in the township subject to inundation by tide-water, and there is a prevailing opinion among the inhabitants that the tide-meadows cause the malaria in and around Mauricetown. The hog cholera has broken out afresh again this fall.

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

Our township being situated high, with good surface drainage, we are peculiarly circumstanced as regards conditions for health. No epidemics have visited us during the last year. We have had but few deaths, and those mostly of elderly persons, from causes not dependent on want of proper sanitary regulations. During the months of July and August there was a greater predisposition to bowel affections, such as cholera morbus, diarrhœas and dysenteries, than for several years past, but easily accounted for by the hot summer, accompanied with an excess of moisture, rendering those parts of the body more sensitive to exciting disturbing causes. They were all amenable to treatment, no deaths having occurred. No malaria exists in our section of Cumberland county, as we have but little to produce it. At the same time we find that quinine exerts a very happy influence upon the progress of disease amongst us.

Being an entirely rural district, without any town of any size, we consequently have not those causes of disease that exist in cities and thickly-settled countries.

DOWNE TOWNSHIP. - - *Report from* GEORGE CHANCE.

The natural drainage is fair, but no artificial means have yet been employed.

During the present summer a fatal epidemic of cerebro-spinal meningitis among horses has visited our township, and the disease in every case so far as known has proved fatal.

There are two slaughter-houses in the township and they are generally in a good, healthy condition.

The public health is looked after by the Local Board of Health, who are taking quite an interest in the matter.

Registration and vital statistics are carried out according to law.

Quarantine and care over contagious diseases and vaccination are carried out according to law.

FAIRFIELD. - - *Report from* J. C. APPLEGATE, *Inspector.*

Excreta deposited in out-houses and carted away by farmers and used as fertilizers.

Cerebro-spinal meningitis among horses, and hog cholera.

Various throat affections, pharyngitis, &c., have occurred, accompanied by bronchitis in many cases; also some isolated fever, but mainly those diseases originating from malarial poison. No epidemics during the year.

GREENWICH TWP. - *Report from* SAMUEL P. FITHIAN, *Secretary.*

Owing to the township not being very thickly settled, it has heretofore been impossible to get our Township Committee to see the need of organizing a Township Board of Health. During the past year there has been erected within the village a storehouse in which to store a fertilizer made of the refuse of sturgeon and menhaden, and the offensive odor emanating therefrom became a source of discomfort to persons living or passing in that vicinity; and great complaint coming from the people, the committee at last were willing to organize and adopted the "Health Code." Since its adoption the nuisance has been abated and the people satisfied. Outside of this, there has been no work in particular for the Board to do.

LANDIS TOWNSHIP. - *Report from* GEO. DAVIDSON, *Secretary.*

We have made a house-to-house inspection this year and distributed circulars.

LAWRENCE TOWNSHIP. - *Report from* E. T. BLACKWELL, M.D.

The only manufactory employing many persons is engaged in the canning of tomatoes. It is located at Cedarville, adjacent to Cedar creek. It employs over 100 persons, of whom the most part are women and children.

During the second week in September a complaint was lodged with the Board of Health against this place on account of foul odors which were very obnoxious to near-by inhabitants. A meeting of the Board was held September 17th, and all the members having viewed the surroundings, found a bad condition existing.

As a result of their observations and inquiries the Board unanimously declared the premises unsanitary in several particulars, and a nuisance. The proprietor being invited to the session, was instructed to dig a ditch sufficient to carry off the liquid refuse, to remove that which was more solid from the property, and to allow no further accumulation thereon. He was also directed to furnish proper water-closet accommodations for the help employed, and to keep his place in a cleanly, sanitary condition. As the season was far advanced, and the proprietor expecting to cease operations on this ground after the present year, the agreement, on his part, was only partially carried out. The Board, however, have reason to believe that the principles they have inculcated will influence the methods brought to bear in the construction and arranging of any factory that may hereafter be erected within the boundaries of this health district, and therefore report progress.

There are three school-houses in the township in good sanitary order. The largest and most central is heated by steam. The District Clerk, in taking the census, makes inquiries respecting the vaccination of the children.

MAURICE RIVER TOWNSHIP. - *Report from* S. M. WILSON, M.D.

Allow me to report that the general health of Maurice River township, Cumberland county, has for the past year been above the average. I think there has been a smaller percentage of mortality than usual. The sanitary condition is good, with one or two exceptions, where the Local Health Board has had somewhat of trouble to abate nuisances.

MILLVILLE. - - - *Report from* L. H. HOGATE.

Millville has had a fairly healthy year, there having been 186 deaths from various causes.

The Local Board of Health has been on the alert and has taken every precaution possible against disease. The water-supply of the city is from two sources, water works, owned by a private firm, and wells; the water of the former is soft and comparatively free from iron, that of the latter is pure and sweet generally, owing to the porous character of the soil.

There are no sewers in the city and all the drainage is surface, which is very good, considering the flatness of the country. The city annually expends $5,000 to $6,000 on roads and streets and gives attention to drainage.

The slaughter-houses within the city limits are carefully guarded and are not at all offensive.

Attention is generally given to the lighting and ventilation of school and other public buildings, and much care exercised, especially with the former.

The cemeteries and burying-grounds are kept in excellent condition, and much care is exercised by the manufacturing firms in keeping the cesspools of their tenement-houses in good and clean condition.

There have been no prevalent diseases until during September and October. There have been several deaths from a malignant form of diphtheria.

There has been a great deal of throat trouble, and croup has claimed several victims.

The Local Board was and is vigilant, and adopted measures to prevent the spread of the disease.

ESSEX COUNTY.

BELLEVILLE TOWNSHIP. *Report from* D. M. SKINNER, M.D., *Pres't.*

There is nothing of special interest to report this year, other than that the Board of Health organized early in the spring and appointed an Inspector, who has made an efficient examination of the sanitary condition of the township. That it was needed may be inferred from the fact that as a result of his work fully fifty privy vaults have been thoroughly cleaned, cesspools emptied, and there has been a general cleaning of yards and inclosures.

The summer has been marked by an absence of sickness of all kinds incident to warm weather.

BLOOMFIELD TOWNSHIP. *Report from* WM. H. VAN GIESON, M.D.

The health of this township during the past year has been very good indeed. During the winter and early part of the spring, we had a number of cases of scarlet fever, some of which were of the malignant type, but the number of deaths was very small in proportion to the number of cases. Outside of this, we have had no other contagious diseases. The complaints made to the Board have been regarding drains and cesspools. These nuisances have been in all cases abated at once upon notification to the property-owner or lessee.

CALDWELL TOWNSHIP. - *Report from* GEO. C. BURNETT, *Sec'y.*

Our people have been observant of the laws and regulations in respect to public health, and there has been no complaint. The present year has been one of the most dreaded, as our lands were overflowed about the beginning of July. As the growing grass and vegetation at that time was heavy, it became a great nuisance from decay and rot, producing more or less fever, but not as extensive as was feared.

IRVINGTON. - *Report from* D. S. SMITH, M.D., *Inspector.*

The Board of Trustees of the incorporated village of Irvington, at one of their meetings in May last, appointed a Board of Health. The Board convened, appointed D. S. Smith, M.D., Inspector, and organized under the laws passed by the Legislature at its last session. They passed ordinances and adopted such regulations as they thought requisite to promote the best interests of the public, which have been judiciously and satisfactorily carried out. The sanitary condition of the district over which they have control is all that could be desired, and quite a large amount of accumulated filth has been removed. Owing to the short time of the Board's organization, their report is somewhat brief. We hope in the next to forward you a very complete statistical report. I inclose a proof of the ordinance as passed and acted upon by the Board. It is also printed, in large type, on Bristol board, and circulated freely among the people.

EAST ORANGE TOWNSHIP. *Report from* DR. T. R. CHAMBERS, *Sec'y.*

The water is supplied from three large wells, which continue to furnish an abundant supply of excellent water of medium softness.

The cesspool is about to be superseded by a sewerage system. The pipes will be laid by December throughout the principal parts of the township. It is the small-pipe system, eight inches being the smallest size. The disposal works proper are placed at the lowest part of the township, at its northerly boundary, and consist of fourteen acres of drained land. The building is a very beautiful blue-stone structure, artistically planned and finished; and, when the grounds shall be finished, it will be in the midst of a cultivated park. The disposal system proper is, first, the admixture of chemicals with the sewage as it comes from the town by gravitation, with flushing tanks at suitable places. Secondly, precipitation, for which two sets of tanks are provided. Thirdly, irrigation. Fourthly, downward filtration.

During July and August there were about fifty cases of dysentery in town. Not over a half-dozen died from the dysentery.

LIVINGSTON TOWNSHIP. *Report from* GEO. E. DE CAMP, *Secretary.*

The health in the township has been generally good, except in those parts near the Passaic river, where there has been more or less malaria.

MILLBURN TOWNSHIP. *Report from* ISAIAH WILLIAMS, *Secretary.*

There is nothing new to add about the topography, &c., of this town not contained in my report for 1881. You all see by my report for 1886 the energetic way we dealt that year with minor nuisances. Since then we have had no trouble, it being well understood that we mean *business.* We adopted verbatim and in due form of law the code recommended in your report for townships. I have written to you and mentioned to you personally at Madison the bad effects of impounding of the water by "Factory pond," and the Rahway river, in this township, and of the Scudder pond, in the adjoining township of Springfield.

MONTCLAIR TWP. - *Report from* JAMES S. BROWN, *Inspector.*

A public water-supply has just been introduced and will be in use in a few weeks. The supply is taken from large wells in outlying parts of the township. Hitherto we had our wells in our own yards. Most of these wells are drilled, some are dug.

No system of sewerage, as yet. Tight cesspools are mostly used. These are emptied at regular intervals by odorless excavators, and contents carried away to some appointed place outside the populous portion of the township.

The year has been one of good health. Very few contagious diseases at any time. Perhaps a half-dozen cases of typhoid in the twelve months, and these traced to two wells.

NEWARK. - - *Report from* DAVID L. WALLACE, M.D.

The intercepting sewer which had been in process of construction for the past two years is now completed and has more than demonstrated what was promised of it. It receives the drainage of 7,531 acres, in which area there are 14,422 feet of sewers. The total daily flow for this section of the city is estimated at about 10,000,000 gallons from house drainage. The daily flow from the storm-waters allowed for, would give about 20,000,000 gallons more, so that the maximum amount to be pumped at present will be about 30,000,000 gallons per day. Any increase in the storm-water beyond the 20,000,000 gallons mentioned above is carried on through the trunk sewer beyond the interception and passes to a large canal dug in the meadows, through which it is conveyed to the bay. At a point about 3,000 feet from the pumping station there is a considerable increase in the size of the intercepting sewer, to allow two other branches (which will ultimately be constructed from the other sections of the city) to connect. The sewage and storm-water are then carried to the deposit sewers, where all the solid matters settle to the bottom, to be removed at intervals, man-holes and filth hoists being provided for that purpose. The liquids then pass on into the pump well. From here the sewage passes by four 36-inch suction pipes to as many special pumps. From the pumps the sewage passes through the discharge pipes into the discharge well, and from there into wooden flumes, whence it passes out to Newark bay about 2,000 feet from shore. A complete description of this work with illustrations can be found in the *Sanitary Engineer* of May 7th and 14th of last year, and is worthy of perusal, and an inspection of this system is always open to any one desirous of seeing it.

The work of laying the oblong granite blocks on our streets is still being carried on, some four miles having been laid since last year.

During the year ending October 1st, 1887, in house-to-house inspection alone, 5,487 houses have been inspected, with the finding of 1,142 nuisances. Of these, 1,087 have been abated. In addition to this, 408 cases of defective plumbing and drainage have been rectified.

A health code is now under passage and in a short time will become a law, after which two or three thousand copies will be struck off and published in book form for the guidance of our citizens.

During the year the following condemnations have been made by our Meat Inspectors:

	Number.
Cattle, beef	7
Calves	60
Sheep	46
Hogs	1

Articles condemned in market:

	Pounds.
Beef	1,590
Pork	525
Mutton	575
Veal	305
Sausage	730
Poultry	1,221

Also a large quantity of fruit and vegetables.

Summary of work done during the year:

	Number.
Notices served for the abatement of nuisances	2,257
Abatements	2,065
Notices served for rectifying defective plumbing and drainage	992
Cases rectified	878
Sewer permits granted	1,071
Permits granted for cleaning privy vaults	2,499
Permits granted for cleaning cesspools	588

ORANGE. - - - *Report from* JAMES Y. SIMPSON, M.D.

The water-supply is by the city, and the quality of the water, although for a few weeks not so free from impurities as to be entirely satisfactory, was still a decided improvement over that of former years. These impurities are caused by decaying stumps and other vegetable matter in the reservoir; these being removed a very satisfactory condition of the water may be anticipated.

The water-supply is by a large reservoir which is constructed west of the city and over the mountain. The reservoir is supplied by a small river. The water is remarkably pure, but becomes somewhat contaminated in the summer from vegetable matter in the reservoir. The water reaches the city by gravitation, and is ample for domestic and fire purposes.

Having no sewer we have to trust to cesspools, privy vaults, and local filtration method, for the disposal of our sewage. The emptying of the cesspools and vaults is performed by licensed men only.

GLOUCESTER COUNTY.

GLASSBORO TOWNSHIP. - *Report from* I. ISZARD, *Inspector.*

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

Drainage has been better this year, as the overseer is giving more attention to keeping the drains and all of the gutters leading to them in a cleaner condition. so that there is not so much obstruction to the flow of water. In some parts of the town the cellars are somewhat damp.

Many of the working class are building homes of their own. Nearly all have cellars, used for storage of different things. The farmers have cellars, not connected with the house, for storage of vegetables. We have no tenement-houses built for more than two families

Registration and vital statistics are sent by the physicians of the township to the assessor.

There have been no contagious diseases requiring to be quarantined during the past year. There has been no general vaccination.

HARRISON TOWNSHIP. *Report from* E. E. DE GROFFT, M.D., *Sec'y.*

Our water-supply is obtained principally from wells. There are quite a number of cisterns in the township, but the water is only used for washing. The water from our wells is almost without an exception pure and soft.

Nature has provided for nearly every town in the township a complete drainage system, as our villages are situated so high that after a heavy rainfall the surface-water soon passes into mill-ponds that are in close proximity to the towns; hence we are comparatively free from malaria.

All of the houses have cellars, and many of them are used for the storage of potatoes.

The prevailing disease during the past summer has been dysentery, the physicians of the township having from ten to twelve cases each. In the majority of cases, however, it assumed a mild form.

Hog cholera has been prevailing to an alarming extent during the past year, some farmers losing as many as thirty or forty hogs, or their entire herd, while others have escaped. Even where sanitary or prophylactic means have been employed, the disease seems to have assumed the same intensity, and as yet no remedy has been found to cure or prevent the spread of the malady; and, as there is a possibility of some hogs that are killed for the market being more or less contaminated with the disease, especially where they have been kept in the same pen with those that have died, it is the sense of this Board that the same precautions should be employed by the State Board in hog cholera as in pleuro-pneumonia among cattle, in order to eradicate the evil, as one is as hazardous to the public health as the other.

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

Source of water-supply for drinking purposes entirely from wells from twelve to twenty-five feet deep; water generally hard.

No system of drainage is employed, other than natural water-courses. The usual water-level is such as to secure dry cellars. There is much swamp in township, consisting of cedar swamp and tide marshes. No malaria this year.

No sewers. Cesspools and privy vaults generally open sides and bottom. Some are being made tight, and nearly all new ones are being made tight when built. Contents generally taken out in winter or early spring, and used for fertilizer.

Local Board has adopted a sanitary code, the circulation of which has been of advantage and benefit by calling attention to sanitary matters which would otherwise escape attention.

Returns are made once a month, with few cases of neglect.

Board organized so that when necessary, contagious diseases can be quarantined at once.

Physicians report the best health this year since the Board was organized, four years ago.

Two complaints of nuisances this year, which were abated at once on notice.

SOUTH HARRISON TWP. *Report from* S. F. STANGER, M.D., *Sec'y.*

Our water-supply is obtained from wells and cisterns. It is hard, and during a part of the summer it is very offensive and not fit for drinking. I suppose about one-fourth of the inhabitants receive their supply of water from both wells and cisterns, the remainder from wells and the mill-pond which runs through the village.

As to drainage, it is obtained by running tile from our houses to the near-by streams; otherwise we would have our cellars half full of water, especially when there are heavy rains. We have had some malaria during the year.

Our houses generally have cellars, and are used largely for storage of vegetables. There is no yearly house-to-house inspection.

WASHINGTON TWP. - *Report from* DR. C. B. PHILLIPS, *Inspector.*

During the past year there have been two complaints made to the Board of Health, but upon notice to the owner the nuisances were abated.

The health of the township has been good, there having been no local epidemics of any kind, and but few cases of contagious diseases, and very little malaria.

WOOLWICH. - - - *Report from* DANIEL LIPPINCOTT.

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 a receptacle for all kitchen drainage. The privies do not get the careful attention which is necessary for the best sanitary condition of the localities in which they are situated.

No enforced vaccination of school children. Inhabitants wait until small-pox occurs in some surrounding town or city.

Measles, chicken-pox and malarial troubles have been epidemic throughout the township. Mild in type and no deaths have been brought to my notice. Malarial troubles are on the decrease, although they have sprung into existence quite liberally this fall.

HUDSON COUNTY.

JERSEY CITY. - - *Report from* C. J. ROONEY, Jr., *Clerk.*

The strict requirement of the Board as to the reports, and the prompt and rigid exclusion from the schools of children from infected houses, are having apparently very satisfactory results, especially in the case of scarlet fever. When a disease seems to threaten to become epidemic among the pupils of a school the Board advises the Board of Education to close and cleanse and disinfect the building.

Three school buildings were thus shut up for a time during the year. The Board finds a ready co-operation in these matters on the part of the educational authorities.

Prompt measures of vaccination and isolation certainly prevented the spread of small-pox from the twenty-one cases reported. In several cases the disease was traced to immigrants, and in others was brought from New York.

The Inspectors have caused a great improvement in the methods of cow-keeping throughout the cities, towns and townships.

An establishment for boiling dead animals, long complained of, has been removed to the extremity of Kearny township, in the swamp district, and no new complaints are received.

All the slaughter-houses in Jersey City are now kept in much better shape than formerly; all have been caused to adopt methods of sewerage and cleanliness.

Many sunken lots have been caused to be filled.

HUNTERDON COUNTY.

BETHLEHEM TOWNSHIP. - *Report from* J. S. LINABERRY, M.D.

The water-supply is by springs, bored and dug wells, and cisterns. Drainage and sewerage are accomplished by Nature's work. Refuse and excreta have heretofore been taken care of, so as not to contaminate the air. There are eight school-houses in this township. The water is supplied by cisterns chiefly. We had a scourge of measles last spring, but not of a very malignant type. A few cases were rendered fatal by complications. Otherwise we have had no particular malady, until about three weeks ago. Diphtheria broke out in the West End school, and is of a serious character. The school-house is located near a mill-pond, upon a low, flat piece of ground. The disease from that time presented the unmistakable laryngeal diphtheria, which appeared to resist all remedies.

CLINTON. - - - *Report from* L. B. BAKER, *Inspector.*

No prevalent disease in this borough, with the exception of malaria. The tendency to increase of same is expected in the future.

EAST AMWELL TOWNSHIP. - *Report from* P. C. YOUNG, M.D.

Undoubtedly we have had a larger per cent. of sickness for the year ending October 1st, 1887, than for some years past. The most predominating diseases have been measles and summer diarrhœa. The measles assumed an epidemic during the later months of winter and early spring, extending pretty much throughout the whole township. The cases were comparatively mild, save a few cases which were complicated with pneumonia.

The summer diarrhœa was mild, but persistent in its course. A great many families were affected by it. The cause, I think, was the excessive heat. The general health of the township at present is very good.

HOLLAND TOWNSHIP. - *Report from* F. A. DALRYMPLE.

We have been afflicted with no epidemics, excepting one of measles in the upper end of our township, the corner bordering on the Musconetcong creek and Delaware river. Have had some diphtheria, not epidemic. Malaria continues to complicate most of our diseases. Our drainage is fair. Our Local Board of Health is in good working order. All notices emanating therefrom are respected and attended to.

LAMBERTVILLE. - *Report from* H. B. KITCHIN, *Inspector.*

The people depend principally on cisterns for water-supply. We have about forty wells within city limits; nineteen of which are on the public streets, the balance on private property. We also have a public water-supply, furnished by a private company, which is used by several families. The water is soft. It sometimes has a bad odor in warm weather, and is often discolored after heavy rains, but upon examination it has been found to be pure. The water is supplied by Swan's creek, and no sewage empties into it above supply. The pipes are frequently cleaned.

We have no sewers; the system in use here is surface-drainage. Most of the houses have dry cellars. Very few cases of malaria during past year.

Cesspools with open bottoms are used; they are emptied by a person under the direct charge of the Board, and the contents removed beyond the city limits. Excreta disposed of in a like manner.

No person is allowed to keep hogs without the consent of the Board.

There are no slaughter-houses within the city limits.

Our school buildings are in good sanitary condition; heat and ventilation fair.

No prevalent disease during past year; a few cases of diphtheria and scarlet fever.

Dr. Larison, the President of our Board, recommends that the State Board supply the Local Boards each spring with a circular for distribution.

LEBANON TOWNSHIP. - *Report from* THOS. H. CAREY, *Inspector.*

The Township Committee during the year purchased a "poor-farm," to which all those requiring assistance from the public have been removed. The house was repaired, an addition built, the surroundings put and kept in good sanitary condition, and everything conducive to the health and comfort of the occupants has been done.

Vaccination, as a rule, is looked after by the parents.

The prevalent diseases, outside of common ailments, were scarlet fever, measles, diptheritic complications, membranous croup, typhoid fever and cholera infantum.

Scarlet fever appeared early in the fall and lasted till spring. It was of mild type, and hence easily managed.

Measles broke out during the winter, and did not disappear till late in the spring. It was one of the worst epidemics of this fever that ever visited us. Young and old were alike attacked by it.

Diphtheritic complications were frequently met with, but gave no serious trouble, save in connection with membranous croup.

Several cases of membranous croup occurred. This was by far the worst disease to handle. Almost every case complicated with diphtheria, proved fatal.

Cholera infantum was easily managed, except in the quite young and in the "badly nourished." Very few cases in these two classes survived the attack.

Typhoid fever again paid its annual visit. Junction, as usual, was its objective point, although a few cases occurred outside. In almost every instance it ran a course entirely different from the ordinary type. Malaria or bronchial trouble, and sometimes both, complicated nearly every case.

Considering the nature of the diseases in our midst, our mortality was not so large. No deaths resulted from measles, and but very few from scarlet and typhoid fevers. Several died from membranous croup and from cholera infantum, especially when met with as stated above.

The annual visitation of typhoid at Junction is indisputable evidence that the cause is still in existence. Where it abides is the question. If the germ theory be correct, there is a spot where these germs are propagated.

A few citizens during the summer asked an investigation. No Board of Health being in existence, the matter was taken hold of individually, until the next meeting of the committee. No organization was effected. Having no authority to act, there was, consequently, very little done toward stamping out the trouble. The willingness of the citizens to act in conjunction with us in removing everything that might foster the disease, should stimulate earnest efforts on our part to rid the place of this unwelcome visitor.

RARITAN TOWNSHIP. - *Report from* JOHN H. EWING, M.D.

Last spring, for perhaps two months, we had an extensive epidemic of measles. During August and early September rather a larger number of cases of dysentery and diarrhœa than usual, but few fatal cases. For the rest of the year the amount of sickness has been about as usual.

The township votes for the Health Board $50, and that has been sufficient to meet all expenses.

TOWNSHIP OF TEWKSBURY. - *Report from* C. W. APGAR.

Malarial diseases are frequent, especially in the form of typho-malarial. There have been several cases of this disease in different parts of the township.

Houses generally have cellars, which are used for the storage of vegetables.

There are probably twenty-five houses occupied by more than two families.

There are a great many children that have not been vaccinated.

MERCER COUNTY.

CHAMBERSBURG. - *Report from* JAMES H. TINDALL, *Inspector*.

We have no sewers. We have several cesspools. Some are cemented, while others are built with open bottoms, and are emptied by the scavengers.

Slaughter-houses are regularly visited by the Board and its officers and kept in a clean and healthy condition.

In reference to manufactories harmful to health, the Board has had continual complaints of Oscar Niedt & Co.'s soap manufactory, situated on Broad street. Some people in the locality claim it to be a nuisance, and others claim it is not at all objectionable. The smell arising therefrom is certainly at times very obnoxious. The Board frequently visits the place and prevails upon the owners to keep it as clean as possible, which they do.

The prevalent diseases of the year have been diphtheria and malaria. We have had about twenty cases and about six deaths from diphtheria during the fall.

LAWRENCE TOWNSHIP. - - *Report from* ISAAC B. BAKER.

Know of no nuisances.

Board well organized. Ordinance passed after model of the State Board.

MILLHAM TOWNSHIP. *Report from* JAMES E. CLINTON, *Secretary.*

There is no system of drainage other than the usual water-level, but we have ample facilities for draining the whole of the township. We have a few bad swamps around us, and we tried every reasonable means to have them drained this fall, but it seemed as though our appeals had but little weight. The swamp which I refer to commences in the rear of the Hamilton rubber works, or the southwestern part of the township, and continues on the line of the Pennsylvania railroad, which crosses the boundary line at the Assanpink creek in the eastern part of the township.

Cesspools are coming to be a regular place for sewering into. Some are bricked, with open bottom the same as wells, and many are sewering into wells on streets where they all use city water.

TRENTON. - - *Report from* WILLIAM CLOKE, *Secretary.*

The Board of Health of the city of Trenton has pursued the vigorous and effective administration of sanitary government that has marked its career as organized under the present law. It has maintained a vigilant oversight, and promptly abated all nuisances and sources of foulness that threatened danger to the public health. So far as it has been able, laboring under the serious disadvantages of having no system of sewerage in the city, it has protected and maintained the health of the citizens. The death-rate, however, is larger this year than last, despite the most zealous efforts of the Board and its efficient Health Inspector. Last year it was 14 in the 1,000. This year, from January, 1887, to January, 1888, it is 18.31 in the 1,000, estimating the increase in population since June, 1885, when the last census was taken, at 3,614, or a total of 38,000, which, I think, is likely to be under the real mark. The increase in the death-rate is due to the rapid growth of the city, and the consequent pollution of the air and water by the accumulated waste and earth pollution of a large population, without sewers to carry off and innocuously dispose of such waste.

Before my next report is sent in there is every reason to believe that the city will have at least begun a comprehensive system of sewerage. A plan proposed by Engineer Hering has been adopted. An ordinance has been passed providing for an outfall and certain intersecting sewers, the right of way has been purchased, and the engineers are now preparing the plans and specifications in readiness for advertising for proposals. During the past year the Board abated over a thousand nuisances of various sorts, arrested and collected the penalty from several offenders, and has the city under a thorough system of inspection and government. The Board has just completed the careful preparation of a complete new code, which is very comprehensive and elaborate, covering about all the subjects of sanitary government over which the State law gives Local Boards control. This code has passed its final reading, and is now the law of the city.

WEST WINDSOR TOWNSHIP. - *Report from* JOHN C. YARD.

We have very little to report from this township this year. We have had no complaints made. The health of the people has been very good—no epidemics of any kind. There has been somewhat of malaria in the township. As to animals, from the inquiries I have made there have been very few losses this year, and no prevalent disease amongst them.

WASHINGTON TOWNSHIP. - *Report from* JOHN B. YARD, *Sec'y.*

The health of our township is good. It is a healthy part of the county. No very filthy places in it. Everything that is unhealthy is promptly removed with very little trouble.

MIDDLESEX COUNTY.

NEW BRUNSWICK. - *Report from* A. V. N. BALDWIN, *Secretary.*

The city water-supply has been in a very good condition.

The pressing need of the city is increased sewerage, only about one-fifth of the city being sewered; but even this plan does not meet the approval of the Board of Health, as it empties into a slack-water. The remaining portions of the city have no means by which to get rid of waste water, &c.

The Board of Health, in combination with the citizens, are making an effort to extend an efficient system of sewerage in other portions of the city.

All of the unpaved, and many of the paved streets, are in a bad sanitary condition.

During the past year, ashes, more or less mixed with garbage, have been put upon the unpaved streets, making a condition of things far from salubrious.

The houses are mainly in a fair sanitary condition, and but very few poor tenement-houses exist.

There is not enough care taken in the separation of the garbage from the ashes. The Board has called the attention of the public to this matter, and although there has been some improvement, there is still room for further care.

There have been several cases of pleuro-pneumonia in districts outside of the city during the past year, but owing to the prompt action of the State authorities we hope that the disease has been arrested.

We have no slaughter-houses or abattoirs at present within the city limits.

Our factories are all in a very fair sanitary condition.

During the past year the Board has passed new ordinances defining more clearly nuisances, and providing for their abatement; also ordinances relating to contagious diseases, domestic animals, disposal of offal, vegetable matter, material removed from cover-basins and sewers, ashes, slops and liquid house-water, privy vaults and cesspools, and defining their mode of construction.

A system of house-to-house inspection has been inaugurated by the Board, and will in the future be productive of much good. During the summer the same system of disinfection of the streets as given in the report for 1884 has been carried out.

The expenses of the Board are very small compared with the size of the city, being only $500 per annum. The Board gratefully acknowledges that this sum is now paid directly to the Treasurer of the Board to be used as emergency may require.

During the past year the health of the city has been good. The number of cases of contagious diseases has been less than in a number of years. This has been particularly noticeable in regard to cholera-infantum, there being fewer cases and of a milder type. It would be premature to ascribe this decrease to the disinfection of the streets, as the disease varies with the season; still it is reasonable to inquire how far this result has connection with such sanitary measures.

The number of cases of typhoid fever has been small, notwithstanding the reports of the daily papers.

The Board records with sorrow the loss it has sustained within the past few months in the death of Dr. Thos. L. Janeway, the former Inspector of the Board, who, by his zeal, wisdom and experience was one of its most useful members.

SOUTH AMBOY. - - - *Report from* A. V. APPLEGATE.

Houses generally have cellars, few use basements.

The ground is sandy, so the cellars and basements are always dry.

We have no Health Inspector now. He did not attend to his business, so the Board dismissed him from the work and attend to it themselves.

Water is taken from spring and well, and is good all the year round. No sewer. The town is gradual descent to the bay, 100 feet to the mile. Street is not paved. Laid out on the map by John Perrine, Jr., are two parks.

All public health laws have been strictly enforced by the Board of Health.

WOODBRIDGE TOWNSHIP. *Report from* EPHRAIM CUTTER, *Pres't.*

Cesspools are used to some extent, and generally cemented, and are emptied by the owners of the property.

There has been some disease among horses in the township; supposed to be spinal meningitis.

Slaughter-houses are inspected.

The cemeteries are properly managed and kept in good order.

We adopted a code of ordinances in June last past in relation to the public health, and to prevent nuisances.

Vital statistics are returned regularly by the assessor to the State Board of Health.

There have been no contagious diseases to require any quarantine.

The Board has expended for sanitary purposes during the year the sum of $76.85.

During the year the Board was compelled to institute legal proceedings against the Board of Chosen Freeholders of the county, to compel them to abate a nuisance, consisting of ponds of stagnant water caused by them in the erection of a bridge; but, fortunately, the nuisance was voluntarily abated by them before the suit had proceeded to a final hearing.

MONMOUTH COUNTY.

FREEHOLD TOWNSHIP. - *Report from* W. J. McCLURE, *Secretary.*

During the past season a brick cesspool was built at a reasonable distance from, and to receive the waste water of the well in front of, the court-house, which has proved a decided benefit, as there are no complaints, as formerly, of a foul nuisance, caused by deposits in the gutters on Main street.

In addition to this, the freeholders are about completing a substantial arched culvert across the lower portion of Main street, an improvement which was very much needed, and which will prove an advantage over the previous one, and remedy defects which have heretofore existed.

There has been a general compliance with health ordinances, and nuisances are not suffered to exist after the attention of the Board has been called to them.

MANALAPAN TWP. - *Report from* WM. C. BROWN, *Chairman.*

Surface-drainage and under-drainage. Malaria frequent. Sewerage, earthen pipes; fall, two feet to the hundred; size, two rows ten-inch pipe; outfall, raceway; whole length of sewerage, four hundred feet.

Assessor made inquiry as to diseases of animals, and found no prevalent diseases.

School facilities are kept up to the ordinary standard.

The Board is governed by the law in regard to vaccination.

Diseases of malarial origin are prevalent.

MATAWAN. - - *Report from* RICHARD BEDLE, *Secretary.*

The health of both township and borough is in a reasonably good condition; no epidemic up to this date. As for drainage, ours is a natural one. One or two complaints about stagnant water have been made and the evil has been removed.

MILLSTONE TWP. *Report from* GEORGE M. DAVISON, *Chairman.*

The water is supplied by sunken wells and clear running streams.

There have been no prevalent diseases of man or animal, and but one or two cases of typhoid and malarial fever.

ASBURY PARK. - - *Report from* RANDOLPH ROSS, *Clerk.*

The past year has been unattended by any remarkable occurrence in this borough affecting the general progress of the health-protection movement. Troublesome opposition to the established methods of the Board of Health has ceased to exist, and the public sentiment which now sustains the Board has its strength in the demonstrated value to all residents of efforts to place the borough in a condition of sanitary safety. Aside from routine work of regular inspections and attention to complaints, the examination of wells has been the special undertaking. Samples of water are taken by the Inspector and delivered to the chemist for analysis as fast as the convenience of these officers permits. The samples are gathered from all premises on which a well is in use for domestic purposes, each street being taken in succession. The chemist's results are compared with the Inspector's observations, and when a well is condemned it is permanently closed. Thus far about 25 per cent. of wells examined have been found to be polluted. The Board hopes to examine every well in the borough before the expiration of the present year.

The public supply of water has been abundant during the past year, and its quality is excellent. The number of water takers is now 375. This seems satisfactory, considering that the water-works have been in operation only two years, and that the total number of dwellings in Asbury Park is about 850. The water is taken entirely from artesian flowing wells, about 420 feet deep. Additional pumping capacity has been recently purchased, and no doubt is now felt that the supply will continue to be sufficient. The sewer system is faithfully and unobjectionably attended to, and no trouble or annoyance is experienced on its account. The number of sewer connections is now 679. We are proud to be able to say we have no leaking cesspool in the borough, and only seven of these abominations of any description. The seven which we have are built of brick and cement, and are supposed to be water-tight.

During the early spring a very extensive but mild epidemic of measles occurred in this vicinity. Seventy-seven cases were reported, none of them being fatal. Eleven cases of diphtheria have occurred during the year, and five of these died. There were also six cases of scarlet fever, but no deaths. No typhoid has occurred during the year.

Total number of cases of communicable disease, 94. Total number of deaths from communicable disease, 5.

This Board has caused an examination of the kerosene oil sold by every merchant in the borough (39 samples), and all samples were found to flash above 100°.

During the year we have sent 271 written notices, directing attention to violation of the sanitary code. It is the custom of the Board to offer free vaccination every year, and this was done as usual last January. We now have a record of 671 vaccinations and re-vaccinations, which have been performed gratis by the Board. The Board has thus far received no financial aid whatever from the borough, and a formal and earnest demand has now been made for funds. Three thousand dollars per annum is needed to conduct the operations of the Board, as the following estimate will show:

Executive officer	$1,500
One Inspector, one year	650
Three Assistant Inspectors, two months	300
Counsel fees	200
Clerk	100
Printing	100
Analysis	50
Sundry expenses	100
	$3,000

The street record books are kept corrected, and they are continuing to be the source of ready information for every-day reference. They are condensed histories of conditions and changes on all premises in the borough. We trust that in addition to the present aid given by this record, that a perusal of their pages will stimulate our successors by showing to them our early imperfections, and by enabling them to judge of the benefits of sanitary improvements as to the death-rate.

RED BANK AND SHREWSBURY. *Report from* JOHN H. COOK, *Sec'y.*

A deep well which goes through the marl to the water-bearing sand from Middletown hills, furnishes a public water-supply. This public water is very pure, the well being supplied by the same subterranean stream as that which supplies the artesian wells of Asbury Park, Ocean Grove and other places along the coast.

The country is drained naturally by slopes of land. The town has several short sewers to carry off rainfall.

The streets contain nothing detrimental to health. Refuse is prohibited from being thrown in the streets. The town has no public grounds.

Houses are generally in good sanitary condition. A thorough inspection of all houses within the town was made by Inspector last spring, and all sanitary defects were ordered remedied, and the orders carried out.

Ordinary refuse, paper, dirt and general refuse are carted out of town and thrown in various gullies, &c. Decomposable refuse from grocery stores, excreta, &c., are carted away and used as fertilizer. A little of the refuse from groceries, &c., is thrown in dumping-places where it is desired to have the land filled in.

Contagious diseases are quarantined when in the opinion of physicians it is necessary. No ordinances concerning vaccination, though almost without exception persons within the borough are vaccinated.

The above applies also to the township of Shrewsbury. Red Bank is the main town of the township, the others being minor villages. W. J. Child, Health Registrar of the township, desires me to add this note.

UPPER FREEHOLD. *Report from* H. G. NORTON, M.D., *Inspector.*

The past year has not been marked by any severe epidemics.

Whooping-cough was quite prevalent through the spring and early summer.

A little typhoid fever has shown itself in Imlaystown again this year, but only a few cases, and they of a mild type. As the sanitary condition is the same as before, we think the absence of fever may be due to the unusually wet summer and high springs.

A little diphtheria has broken out in Allentown, but as the physicians there are taking every means to prevent its spreading we do not anticipate any large number of cases.

We have noticed a fatal disease among sheep, seemingly parasitic, for which we gave tartar emetic and turpentine. This caused the sheep to void a great many worms, and cured all sheep so treated; whereas others, not treated and presenting the same symptoms, invariably died.

MORRIS COUNTY.

DOVER. - - - - - *Report from* JOHN S. GIBSON.

Refuse carted away weekly by corporation.

One slaughter-house in town limits, which is about to be removed by order of Board of Health.

RANDOLPH TOWNSHIP. - *Report from* JAMES S. MELICK.

The health of the township for the past year has been good. Measles were quite prevalent during the summer, but not fatal, as few if any deaths resulted from it. A few cases of dysentery; but one death occurred from it, and we had a few fatal cases of diphtheria. The greater part of our township is in the city of Dover, and they have a Board of Health of their own, and you will receive a report from it.

MONTVILLE TOWNSHIP. - - *Report from* ASA T. COOK.

Malarial fever; not as much this year as some years previous.

OCEAN COUNTY.

BRICK TOWNSHIP. - *Report from* HENRY A. BENNETT, M.D.

Upon a careful retrospect the Board of Health in this township are enabled to see wherein it has accomplished much good during the past year.

No epidemic has made raids upon the township, nor any section thereof, for more than two years. Early last spring, the township physician was notified of a case of scarlet fever that had been imported from an adjoining district in Monmouth county into Runyon's school district, in our township. As there was some danger of infection the school was closed for a while, and all danger was thereby averted. A few cases of typhoid fever have been reported; one of these being in Point Pleasant, the others being scattered throughout the rural districts. Diphtheria was introduced into one family, two miles from

Point Pleasant, having been brought there by a fisherman from Seabright. Five members of the family were stricken by the dread disease, one dying. Stringent measures were adopted, and by the co-operation of the attending physician the trouble was stopped.

Since our last report, Lakewood has erected water works that furnish a full and pure supply of water.

At Bay Head, an artesian well has been bored, which at present is yielding an ample supply.

The health matters in the borough of Point Pleasant are very rigidly governed. A very comprehensive code of sanitary rules has been adopted, and is being enforced with care.

It is true that some people oppose, with a certain amount of strength, all efforts to quietly regulate sanitary matters, but it is also true that slowly, but surely, their prejudices are being swept away before the plain results for good which the Board of Health can and does secure.

DOVER TOWNSHIP. - *Report from* EMANUEL H. WILKES.

The year has been one of general healthfulness. We have no contagious diseases, and the health of our people has been generally good. Early in the year we had a fearful scare about the appearance of the typhoid fever, that seemed at first to alarm the entire township, and for a while checked the business of our village. But, although we were troubled with some sixty or seventy cases, yet these cases were so skillfully and successfully treated by our physicians that, of all the cases, only six that have died can be traced directly to the fever. I am happy to say that this scare has had a beneficial effect upon the local officers and the people of the town in general.

The sanitary condition of the village has been wonderfully improved. The old jail has been thoroughly renovated. The old water-closets and pipes have all been torn out and new ones substituted. The drainage of the town has been very much improved, so that all surface-water is carried away by our increased sewerage system, and whatever has seemed to be hurtful to the public health has been removed. [Be sure to lock the door after the horse is stolen.—*Secretary.*]

We append also a special brief report by Dr. R. L. Disbrow as to typhoid fever at Toms River, and in that vicinity.

"TOMS RIVER, N. J., January 28th, 1888.

"In reply to yours of the 11th instant, respecting the typhoid fever at Toms River last spring, I have to inform you that the first cases occurred in the central part of town, but were not confined to any part of town or locality.

"I don't think it was brought to town, and we physicians here were unable to trace it to water or local causes. There were in all about forty cases of fever in and about Toms River. Of this number, nine cases had distinct typhoid symptoms. The other cases were of a remittent and irregular form of fever and scattered through this section. I saw no cases of hemorrhage myself, but learn of three cases, two of which died.

"There were seven deaths in all from fever, and four or five from typhoid fever.

"Dr. Schureman, in speaking of a 'fever essentially typhoid,' has reference to an irregular form of fever that prevails throughout this part of Ocean county, namely, Berkeley and Dover townships.

"We undoubtedly have had during the past year more fever than usual for us.

"I inclose a report of the cases under Dr. Schureman's treatment, which he very kindly made out for me a few days ago. The cases under my treatment and observation were generally similar to those of Dr. Schureman. Very truly,

"R. L. DISBROW."

EAGLESWOOD TOWNSHIP. - - *Report from* C. R. COX, SR.

Our little township has been very healthy for the most part this past year. Some few complaints of nuisances at Beach Haven were made, which were removed on notice by one of the members of the Health Board.

JACKSON TOWNSHIP. - *Report from* CONOVER MATTHEWS, *Sec'y.*

Our land needs but little drainage. There are no places of any size to require sewerage. All the houses are in as comfortable condition as could be expected. Through the township quite a number of children have been vaccinated, but there are no arrangements made to isolate cases of a contagious character. There have been no contagious diseases in our township. There is every indication of good health. Our timber is principally pine; that makes our section healthy.

LACEY TWP. - *Report from* MARCUS KENYON, M.D., *Chairman.*

A set of ordinances was enacted by the Local Board in June, 1887, and they are now in force.

The executive officer of the Local Board is empowered to quarantine or isolate, if required. Vaccination is only partly kept up.

PASSAIC COUNTY.

MANCHESTER TOWNSHIP. *Report from* WM. D. BERDAN, *Sec'y.*

We have health laws and regulations for the township, a copy of which is sent herewith.

As a Health Board we take hold of any contagious disease as soon as it makes its appearance, and stamp it out as quickly as possible. Last February, in the village of Haledon, there was one case of small-pox. We ordered the Haledon school closed at once, and had the doctor go to all the schools in the township, and vaccinate all the children. There was a general vaccination through the whole township. We had the Haledon school fumigated; had the house where small-pox patient was, under quarantine, and as soon as patient was well had the house fumigated, and that was the only case of small-pox we had.

No diseases have prevailed to any extent the past year. There have been two cases of typhoid fever in the township.

PATERSON. - *Report from* WM. K. NEWTON, M.D., *Inspector.*

As to cemeteries and burials we send herewith a report on the cemeteries in the city limits.

The following report embraces all the facts:

In accordance with the resolution adopted July 12th, directing this committee to investigate the burial of human bodies in the cemeteries within the city limits and to report the sanitary bearings of the question, we would report as follows:

There are within the city limits the following cemeteries:

(1) Cedar Lawn Cemetery; (2) the Totowa burying-ground at Totowa and Redwood avenues; (3) the old grave-yard at Water street; (4) the cemeteries at Sandy Hill.

The first we dismissed from consideration, as it is well and properly located, and the superintendence is such as to merit commendation.

The Totowa burying-ground has not yet been investigated.

The old grave-yard at Water street is abandoned and neglected, and no interments have been made there for a number of years. As most of the families there represented have disappeared, or have lost all interest in their departed, it is not probable that any more interments will be made there.

The cemeteries at Sandy Hill, comprising the new and old Catholic, the new and old Presbytertan, the Methodist, Reformed, Baptist and Episcopal, were more thoroughly examined, but special attention was paid to the condition of the Methodist, Reformed and the new Presbyterian, reserving for the future a more detailed examination of the others. A map of these Sandy Hill cemeteries was prepared by the City Surveyor, Mr. Ferguson, by our direction.

At the first meeting of this committee Mr. John Inglis, representing the Cemetery Protective Association of the Methodist Churches, attended and put us in the possession of much valuable information, acting on which the Health Inspector was directed to begin action against certain undertakers for violation of Section 51 of the Sanitary Code in that they did not inter bodies to the depth required by the code. Complaints were accordingly made against Chas. M. Rutan, Wallace Graham, William Massaker and Jacob Odell.

Rutan was convicted on trial, Massaker entered a plea of guilty, Graham was convicted on trial and Odell was discharged by the Recorder because he was not a responsible person, being only a laborer and not answerable for the offense charged.

Our investigation revealed the fact that at least 55 per cent. of all the dead of our city were buried in these Sandy Hill grave-yards, making a total each year of about 700 bodies, not including those brought from Passaic and other towns.

It was ascertained that many of the lots had been sold to undertakers by the owners, they having removed the dead to other cemeteries, and the chief source of trouble was the sale of these lots to undertakers.

The following measurements, made under the direction of the committee, will show how the land has been overcrowded and to what depth burials have been made:

In lots owned by C. M. Rutan bodies were found at the following depths: 14 inches, 19 inches, 26 inches, 24 inches, 30 inches, 17 inches and 12 inches.

In lots owned by A. R. Rutan, 24 inches, 23 inches, 24 inches, 30 inches, 36 inches, 24 inches, 24 inches, 17 inches; body of Harriet E. Paul, 24 inches; 30 inches, 21 inches; body of Kate Houman, 14 inches; 33 inches, 20 inches, 26 inches; body of Henry Rust, 36 inches; 31 inches, 34 inches, 35 inches, 24 inches; body of Elwood Elmore, 34 inches; 29 inches, and varying depths from 12 inches to 40. About forty graves in these plots were measured.

In lots owned by Hiram Gould the following measurements were made: 14 inches, 19 inches, 21 inches; body of Peter Allarton, 36 inches; 36 inches, 34 inches, 24 inches, 18 inches, 36 inches, 36 inches, 14 inches, 18 inches, 24 inches, 16 inches, 16 inches, 16 inches, 14 inches. Other measurements, to the number of thirty, in the lots were made, but none were equal to the requirements of the code.

In the lot of John Slater an adult is buried only 14 inches deep.

In the lots owned by W. H. Massaker the following measurements are recorded: 20 inches, 18 inches, 30 inches; the body of Isaac Kirkham, 24 inches; 32 inches. Other measurements, to the number of fourteen, from 12 to 34 inches.

In one of the lots owned by A. R. Rutan not only has the ground been filled with bodies, but the surface of the plot has been raised about 15 inches above the surrounding ground.

In many instances a very offensive smell came from the shallow graves, and we are informed by the Superintendent that after heavy rain storms the stench is very strong.

The ground in many places is so filled with bodies that there is no room for more, and even the paths and roadways have been invaded and bodies there interred.

The above very superficial investigation will serve to acquaint you with the condition of the Methodist and Reformed cemeteries.

We also found that no system for the collection or examination of burial permits existed at these grave-yards, but that the bodies were interred without any registration by the authorities of the cemeteries, if any such there be. In fact, we learned of many instances where burial had been made at night without the necessary legal permit and without even permission from the lot-owners. In one case the lot-owner was surprised to find his plot occupied by bodies that did not belong to his family.

Your committee would make the following recommendations:

1. The rigid enforcement of the code.
2. The Registrar of Vital Statistics to note on the death certificate the name of the particular ground where interment is to be made, and to refuse a burial permit when such information is withheld.
3. That permits for burial be refused in cemeteries where no authorized person is present there to receive such permit.
4. That all permits granted for interments to all cemeteries, except Cedar Lawn and Holy Sepulchre, be returned to the Registrar properly indorsed, after the burial.
5. That the Registrar report to the Board at each meeting the places of interment where burials have been made and the number at each.

Your committee would desire the privilege of continuing this investigation, to report at the next meeting any further results that they may obtain.

WILLIAM K. NEWTON, *Chairman*,
THEODORE Y. KINNE,
JOHN R. LEAL,
Committee.

SECOND REPORT.

In addition to the measurements mentioned in the previous report the following were found not to be of the proper depth:

Methodist Cemetery.—In one grave the body was only 12 inches deep, in two 18 in., in two 19 in., in two 24 in., in three 26 in., in one 27 in., in one 30 in., in two 36 in., in four 37 in. A very few were found of the lawful depth.

Reformed Cemetery.—One 7½ in., one 14 in., four 15 in., one 16 in., three 18 in., three 19 in., two 20 in., one 9 in., one 12 in., one 23 in., nine 25 in., one 26 in., six 28 in., six 27 in., ten 29 in., seventeen 36 in. Few of lawful depth.

New Presbyterian—One 7 in., one 14 in., four 15 in., one 16 in., three 18 in., three 19 in., two 20 in., one each 21, 22, 23 in., seven 24 in., eleven 30 in., three 31 in., three 32 in., thirty 36 in.

The following were not previously examined:

Old Presbyterian.—One 9 in., one 13 in., two 14 in., four 18 in., six 20 in., ten 24 in., three 25 in., three 26 in., nine between 27 and 36 in. No custodian, and many interments made without authority. At least 20 graves under bushes, trees and brush without mound or other means of identification. Bodies buried without regard to lot boundaries, and with less regard to public decency. The portion abutting on Vine street has been dug away for building purposes, exposing many remains.

Old Catholic Cemetery.—Seldom used, but many interments in recent years not properly made. Graves are found 12 to 34 inches deep. Eleven were found not of proper depth. Several disinterments made and excavations not properly filled. Pieces of coffin cast on the ground add to the disgraceful appearance of the place.

New Catholic Cemetery.—Over sixty measurements, with following results: Four graves 9 inches deep, three 11 in., two 12 in., one 14 in., one 15 in., one 17 in., two 18 in., two 19 in., fourteen 21 in., three 25 in., three 27 in., eight 30 in., nine 35 in., six 36 in. The greater portion of this ground is overcrowded and no more interments should be allowed therein.

Episcopal Cemetery.—About fifty graves examined. Four were only 9 inches deep, two 10 in., two 11 in., three 12 in., three 20 in., seven 22 in., two 23 in., six 30 in., five 34 in., ten 35 to 36 in. In one lot three bodies were only 9 to 12 inches under ground. In one lot containing 128 square feet twenty-six bodies are interred, some not one foot under ground.

Baptist Cemetery.—In very bad condition; fences destroyed, headstones broken and scattered around. Used for a sort of common for the people living in the vicinity, and foot-paths from street to street are worn. Under these paths were found bodies only 12 inches beneath the surface. About twenty-eight graves were examined and the measurements were but a repetition of those given above.

It is difficult to say which cemetery is in the most unsanitary condition, for each seems to rival the others in some one extremely bad feature. A common practice of some undertakers was to sell a grave to two or three persons and to bury one body on top of another. In one case a grave had been sold three times in six years to different persons, each thinking that he had sole use of it. The discovery by a woman that a grave was decorated with flowers not put there by her led to the discovery that her husband had two strangers buried on top of him. In the Reformed and Methodist cemeteries some of the paths and roadways have been invaded by the undertakers and graves have been sold and bodies interred in these paths. One road in the Reformed cemetery has been completely filled with the bodies of infants, many only 9 to 12 inches under ground. In many cases where graves have been made vacant by the removal of the original occupant to another cemetery, the place has been seized and made to do duty for a second time as a place of interment. In many places the bodies have been so tightly wedged together that scarcely any space remains between the coffins. The morals of the community are assailed by these unguarded cemeteries, for they are used as places of resort by night prowlers for immoral purposes, and not only is the health of the people living in the vicinity endangered by the stenches of the superficially buried bodies, but they are also annoyed by the shameless conduct of persons who frequent these grounds at night. The trees and underbrush allowed to grow in these neglected places should be cut away, if not by the lot-owners, then by the city authorities. These facts are mentioned with the hope that the Christian churches that own and are responsible for the condition may be stimulated into activity and be forced by public opinion to apply the proper remedy.

Are the Sandy Hill cemeteries dangerous to the health of the city?

1. For a number of years bodies have been buried with but a thin covering of earth, and as a consequence the dangerous gases from the putrefying

corpses, instead of being absorbed by the earth, as would be the case if the burial was of sufficient depth, are given off to poison the air.

2. Too many bodies have already been interred in a small area. The total area of these cemeteries equals 22.32 acres; of this about 7 acres are taken up by roadways, paths, spaces between lots and unsold lots, leaving about 15 acres available for burial purposes. By a careful computation, based on accurate data, we may state that 20,444 human bodies have already been buried in these 15 acres, and this number is being augmented by some 700 new burials each year. These figures show that at least 1,373 bodies have been interred in each acre of ground, and in some places about 1,654 bodies are in each acre. Now, in the case of the Weehawken cemetery, recently decided by the Chancellor, it was considered a good enough reason for investigation and regulation when less than that number had been buried in an acre of land. The great mass of decaying corpses in these grounds is of itself a positive danger to the health of the city.

3. Another objection to the maintenance of these cemeteries is based on the fact that there is no method of supervision or superintendence. There is no person in attendance to receive burial permits or to see that the laws are properly observed, hence there is no check on illegal interments. It is possible at present for burials and disinterments to be made without permission. For this reason alone we consider the advisability of refusing permits for these places, at least until some authorized person could be placed in charge.

4. There is no protection to those who have acquired title to lots, for their rights are so often invaded.

Taking into consideration all the facts at our disposal we are forced to the conclusion that these Sandy Hill grave-yards are a menace to the health of our people and are in such an unsanitary condition that radical and sweeping measures are required lest the public health be immediately imperiled.

Aside from sanitary considerations, it may be said that the present state of these cemeteries is a burning disgrace to the city, and especially to those Christian churches that are legally responsible for this condition. Were it not that we are more or less influenced by the rights and demands of many honest and respectable lot-owners, who keenly regret the terrible state of affairs, we would advocate the immediate closure of the grounds, and the prohibition of any more burials, but this course we are willing to postpone until some less severe measure is considered.

Who is responsible for the disgraceful condition of these cemeteries? We have intimated that the churches who own ground are directly and legally responsible, and this statement is based on the facts given below and on the opinion of the City Counsel, who has thoroughly investigated the legal bearings of the question. By the terms of the deeds granted to the below-mentioned churches, the land was to be used forever for burial purposes only, and in accepting these deeds the churches assumed full care and custody forever. It may be argued, that where lots have been sold, that all the rights and responsibilities pass to the person accepting the deed. This is only partially true, for the paths, roadways, unoccupied places, the fences and the general condition of the cemetery, as a whole, still remain to the churches granting the deed. This responsibility then, they cannot escape. The small price paid originally for the land, nor the many years that have elapsed since the purchase, cannot release them from their legal and moral obligations. It seems reasonable, then, to look to these churches for the needed relief and to hold them to their obligations.

The deeds granted were in the names of the following churches, and they or their successors must be held to a strict accounting:

1. Trustees of the First Presbyterian Society of Paterson.
2. Trustees of the First Methodist Episcopal Church, now Cross street.
3. Trustees of the First Reformed Dutch Church of Totowa.
4. Trustees of the First Particular Baptist Church, now First Baptist Church.
5. Trustees of St. Paul's Church of Paterson.
6. Trustees of the Roman Catholic St. John's Chapel.

t may be said that the price paid for the land by these corporations was m rely nominal, from $150 to $450 for many acres of ground, and it is reasonable to suppose that no little profit was made by selling burial plots, hence a portion of the receipts should willingly be expended to redeem the grounds from the present bad condition.

The following recommendations are offered, with the suggestion that they are warranted by the above report:

1. The adoption of an ordinance limiting the number of bodies that may be interred in a given space.
2. The present ordinance to be amended so as to conform to the State law.
3. The passage of an ordinance requiring all undertakers and those having charge of burials to make a return to the Board of Health, properly signed by those having charge of the cemetery, that the burial was according to law.
4. It is the opinion of this committee, which is supported by that of the City Counsel, that the churches which received these grounds for city purposes and sold lots therein, are responsible for the general unsanitary condition of the places, and this committee would recommend that it be authorized to go before the next Grand Jury and procure the indictment of these corporations for maintaining a public nuisance.
5. The committee also recommends that this Board apply to the Chancellor for relief in the premises.

T. Y. KINNE,
WM. K. NEWTON,
J. E. LEAL,
Sanitary Committee.

In accordance with these instructions the committee went before the Grand Jury and the following presentment was handed in:

Passaic Oyer and Terminer and General Jail Delivery. September term, A. D. 1887. Passaic county, to wit:

The jurors for the State of New Jersey in and for the body of the county of Passaic, upon their oath, present that the cemeteries and grave-yards situated in the Fourth and Fifth wards of the city of Paterson, in said county, and known as the Sandy Hill cemeteries, are a nuisance, dangerous to the health of the people of said city, an annoyance to the people living in the vicinity of said cemeteries, a menace to the morals of the city and a disgrace to those church societies and corporations owning the grounds and responsible for the shameful condition of affairs there existing. For a number of years bodies have been there buried with a thin and insufficient covering of earth, and as a consequence the dangerous gases from the putrefying corpses are given off to poison the atmosphere. More than 20,000 bodies have already been interred in these grounds, and this number is being increased each year by some 700 new burials. In some of these cemeteries no less than 1,600 bodies have been buried in each acre of ground.

The rights of the lot-owners are not protected, and in many instances bodies have been buried on top of those entitled to a place in lots.

The roadways have been invaded and many bodies buried in them. Beside this, these places have no custodian or keeper. The brush and trees have been allowed to grow without attention, and hence afford places of concealment for the night prowler, the lewd and the lawless.

By the terms of the deeds granted to the below-mentioned churches the trustees are responsible for the disgraceful and dangerous condition of affairs:

Trustees of the First Presbyterian Society.
Trustees of the First Methodist Episcopal Church, Cross street.
Trustees of the First Reformed Dutch Church, Division street.
Trustees of the First Baptist Church.
Trustees of St. Paul's Church.
Trustees of St. John's Roman Catholic Church.

This presentment is made with the hope that these corporations shall apply the proper remedies and thus avoid rigorous prosecution in the future.

This Grand Inquest would also call attention to the fact that many undertakers of this city are responsible for burying the dead an insufficient depth not warranted by law, and among them we may mention the names of Charles M. Rutan, William H. Massaker, Wallace Graham and John F. Smith, which have come to our knowledge.

WILLIAM B. GOURLEY,
Prosecutor of the Pleas.

WILLIAM L. BAMBER,
Foreman.

A true copy.
WM. M. SMITH, *Clerk.*

What action may be taken in the future cannot be now stated.

A new sanitary code was adopted this year, a copy of which has been sent you.

The mortality reports are now made up by the Sanitary Committee.

Scarlet fever has been very prevalent, but the death-rate is low.

SALEM COUNTY.

MANNINGTON TOWNSHIP. *Report from* WM. H. ACTON, *Secretary.*

Water supplied by wells and cisterns, mostly by wells. Few cisterns are used for drinking. Water mostly hard.

There is no system for drainage or sewerage. Cellars, as a general thing, are dry. Few swamps in the township. Malaria is not frequent.

No known disease prevalent. A few cases of swine plague have been brought to notice in the spring, but not as bad as several years previous.

OLDMANS TOWNSHIP. - *Report from* W. ALBERT JUSTICE.

The people depend on wells altogether for water. A good many cellars have water in them in winter and spring, in lower part of township.

Drainage and sewerage is, I think, like it is in most country districts—no expense gone to, and no particular trouble taken to dispose of it; kitchen slops and dish-water generally in back yards, pig-pens, at bottom of lots, and privies, or, when they can be put off no longer, in some hole in the ground, and hauled in some back field. Of course there are exceptions; we have people who are very particular about such things, but they are the minority.

The people have taken great interest in schools within the last fifteen years, and the change in school-houses is surprising; every district in the township is now supplied with a good, comfortable one, and mostly well ventilated.

PILESGROVE TOWNSHIP. - *Report from* C. H. RICHMAN.

Complaint has been made to the Board of Health during this season on account of canning factories throwing refuse in the streams. The matter was reported to the State Board. After inspection by said Board the parties promised to remedy the matter another year.

On account of sickness in the public school last spring, the Local Board thought it advisable to take a sample of the water of well used by the school and forward it to the State Board for analysis, which was reported to be unfit for use. Since then the well has been closed and unused.

UPPER PITTSGROVE TOWNSHIP. *Report from* J. N. GRAY, *Sec'y.*

Water-supply for drinking and stock purposes principally from springs and wells, and for power use from the streams taking their rise within the township.

A natural drainage, as perfect as can anywhere be found, owing to the rolling character of the land.

Swine cholera has prevailed to considerable extent in different localities throughout the township among swine; several farmers having herds of thirty, forty and fifty head, losing all but two or three. No disease among cattle is reported this year.

No epidemics; merely diseases incident to the season. The community remarkably free from any ravaging disease. A few cases of diphtheria in a mild form are noticed.

SOMERSET COUNTY.

BEDMINSTER TOWNSHIP. *Report from* WM. B. SUTPHEN, *Sec'y.*

The health of the township has been good. The Board have had complaints made to them, but of not sufficient importance to require Board meetings. A notice from the Chairman or Secretary has had the desired result.

Our sanitary expenses have consequently been light.

BRIDGEWATER TWP. - *Report from* JOSEPH B. SMITH, *Secretary.*

The water for Somerville and Raritan is furnished by a private company. More than one-half of the houses take it. The water is clear, no iron or other taste; it is soft, and is good at all seasons of the year. No sewage above the point of supply.

There is no system of drainage, only private drains; most of the cellars are dry. No swamps, and very little malaria.

Houses generally have basements or cellars. About forty tenement-houses of more than two families.

There are a number of private drains. About one-half of the houses connect with them. Some cesspools are cemented, and others are built with open bottom or sides. They are emptied with wagons, and the contents are taken and mixed with dry earth and used as fertilizers.

No prevalent diseases among animals this year. Assessor inquires each year as to losses of animals and as to contagious diseases.

A few cases of fever and diphtheria occurred in the township during the last summer.

Our Board has adopted a code, and finds it a great help towards the protection of the health of the people.

HILLSBOROUGH TWP. *Report from* W. H. MERRELL, M.D., *Sec'y.*

As to prevalent diseases, ulcerated quinsy again prevailed extensively last winter. Quite a number of cases of pneumonia also were found.

Through August, summer complaints, comprising diarrhœa, dysentery, cholera infantum, &c., largely existed. Also during the later summer months malaria again visited us. The number of cases was not very large, but more than for the past two years. These were along the river. Often it had been over its banks.

Also, I report several cases of bilious remitting fever. These are now in progress and are running a severe course. In one family it would seem to be contagious. The mother was away in Hunterdon county taking care of a married daughter who had this fever. She came home and in three weeks the fever began to come on. There had up to this time been no fever in that neighborhood. In about two weeks one daughter got down with the fever and in another week a second daughter.

MONTGOMERY TOWNSHIP. *Report from* WILLIAM OPPIE, *Sec'y.*

There has been no disease prevailing as an epidemic during the past year, and the general health of the township is exceedingly good.

The Board of Health has had no complaints for nuisances during the past year.

Our school-houses are in good condition, but I think their ventilation might be improved. We have three slaughter-houses and they are kept in clean condition, and are not a nuisance to the localities in which they are situated.

I would say, further, that the returns of vital statistics, particularly births, have not been as well attended to by some physicians as they should be.

NORTH PLAINFIELD. - *Report from* J. H. CARMAN, M.D.

In submitting the first annual report of the Board of Health of the borough of North Plainfield, I am pleased to state that since its organization, January 17th, 1887, the Board has paved the way to future and important sanitary reform. Though hampered and embarrassed by a want of funds, it has passed a code of health ordinances and sought to interest the population in the all-important subject of sanitation, and, with one or two exceptions, found them appreciative and willing to co-operate in any measures conducive to public health. It has provided, by ordinance, for the protection of the water-supply and for the proper cleansing of cesspools, privies, &c., and the disposal of the contents thereof; has prohibited the maintenance of all nuisances, and, in order to suppress epidemics, requires the reporting of all contagious diseases and the quarantining of the same. The Board is also anxious to establish some system for the removal of garbage, which is sadly needed here, but, with an empty treasury, has not had the pleasure of seeing its desires carried out.

The health of the borough the past year has been very good, the only epidemic being one of measles in the early spring, of a mild type.

There are a few cases of diphtheria here now, which are being quarantined. This record seems remarkable when one considers how closely the water-supply and the cesspools are connected. The water is derived from driven wells, which, with a few exceptions, are rather shallow, and in some cases but a few feet from the cesspools. True, the water in general is of a very good quality, and few diseases, perhaps, have as yet been traced directly to it; but there is a time coming when North Plainfield will awaken from its present dream of safety to the dread reality of disease. Together with her twin sister, Plainfield, this township has long, and perhaps justly, been known as the "Colorado of the East," but unless a change comes o'er the spirit of her council's dreams, she will soon have to yield this proud distinction to some wiser or more fortunate town, and fall in line with other insalubrious places. Statistics prove this to be a salubrious locality, but on the principle that "an ounce of prevention is worth a pound of cure," we are sadly in need of water works which would give us all pure and uncontaminated water, and a system of sewerage to avert the evils the cesspools threaten us with.

WARREN TOWNSHIP. - *Report from* JOEL CODINGTON, *Inspector.*

Springs, wells, and cisterns constitute the whole water-supply. The land is drained by blind ditches. There is no sewerage. The cellars are dry. There are no swamps, and no malaria. Sanitary expenses are paid by Town Committee.

SUSSEX COUNTY.

ANDOVER TOWNSHIP. - *Report from* GREEN C. COOK.

No system of drainage. The village being located on elevated ground, all surface-water from heavy rains, &c., is soon carried off through surface-drains emptying into a live, running stream passing through the village.

The streets and sidewalks are kept clean. Garbage and refuse matter not allowed to accumulate to an extent detrimental to good health.

Houses all have basements or cellars. Where used as cellars they are used for storage of fruits and vegetables during the winter season; all decaying matter removed in early spring, when a general house-cleaning is next in order.

Cesspools and privies are receiving more careful attention in the manner of construction. The manner of constructing the few cesspools that are in existence is being condemned. Such as an excavation a few feet from the dwelling, partially filled with stones; completely covered with earth; no outside means for the escape of the noxious gases therein generated; no trap in the pipe leading from the kitchen sink to the cesspool, consequently the only means of escape for such disease-breeding gases are through the pipe, and discharging into living apartments of the family.

BYRAM TOWNSHIP. - *Report from* C. R. DAVISSON, *Inspector*.

The general water-supply is from springs and wells varying in depth from ten to thirty feet. All the water is more or less impregnated with iron.

Refuse of all kinds is generally used for farm manure.

Public health laws are well observed.

Vital statistics are not promptly returned, and it gives some trouble, but we get them when we notify of neglect.

We have a medical member to look after the sanitary condition of the township.

STILLWATER. - - *Report from* DR. CHARLES V. MOON.

The assessor informs me that he has made diligent inquiry if any cases of disease in animals have occurred during the past year, and he reports none.

The past year has been one of unusual health in the township—strikingly so with that class of diseases we call malarial. The cause, in my judgment, is the unusually heavy rains during the summer, thus keeping the wells, springs and streams full and flushed.

VERNON TOWNSHIP. - - *Report from* H. H. DEKAY.

Unusual good health has prevailed in this township the past year; no epidemic of any kind and no complaint to the Board of Health.

WALPACK TOWNSHIP. - - *Report from* MARTIN HULL.

The health of the people of Walpack township has been good for the past year; no epidemic of any kind, or contagious disease, very little cholera infantum and dysentery. No complaints were made rendering any action of the Board necessary.

Water-supply is derived chiefly from springs and wells, mostly hard water. A few depend on cisterns.

No malaria.

Houses all have cellars, which are largely used to store vegetables. No house is occupied by more than one family.

No slaughter-houses in the township.

WANTAGE TOWNSHIP. - *Report from* NEWMAN HALL, *Clerk.*

Water-supply is chiefly from wells and springs—no public supply. In this village the vaults and wells are situated close together. The wastes from kitchens are thrown on top of the ground, and I cannot see what there is to prevent an outbreak of typhoid fever at some future time.

As to drainage, there is no system. Cellars are generally dry. Extensive swamps along the Wallkill and among the foot-hills of the Blue Ridge in the north of the township, but the chief product of them this year has been myriads of mosquitoes; in fact, the oldest inhabitant never saw the like.

No prevailing disease. There have been no contagious diseases among cattle, unless anthrax is one. There have been a few deaths of cattle from the various forms of this disease.

Slaughter-houses are situated not less than a half mile from the village, and are now not dangerous to health.

UNION COUNTY.

ELIZABETH CITY. *Report from* A. R. REEVE, *Inspector.*

There are thirty-eight miles of sewer, brick and pipe, which empty partly into Newark bay and Staten Island sound and partly into the Elizabeth river, the latter being a temporary outlet only. We have built quite a number of sewers in the past year.

The sewers are almost entirely used. There are very few cess-pools, and we build no more and are doing away with what we have.

Have had considerable diphtheria during past year, but it has almost entirely abated.

The Board of Health is organized under the recent State laws, and a sanitary code adopted and enforced.

Sanitary expenses, $6,000, provided for by city council.

PLAINFIELD. - - *Report from* ANDREW MANNING, M.D.

The general health of the city of Plainfield during the past year has been good. No serious or fatal diseases have been experienced by the people.

A mild and wide-spread epidemic of measles afflicted the city during the winter and spring months, attacking nearly half of the children. Some families were visited a second, and in a few instances, a third time by the disease. In many instances the patients were scarcely sick enough to go to bed. The mortality from this epidemic was very light.

The last few weeks of winter brought with it a few cases of scarlatina, but did not approach an epidemic, not being very general, and only a few deaths are recorded therefrom.

In March one case of small-pox occurred in the very heart of the city, but by strict quarantine and prompt vaccination and re-vaccination no other case happened.

During the first two weeks of August, the weather being very warm, and the humidity of the atmosphere quite considerable, there were many instances of cholera infantum, especially among the poorer classes, and a number of deaths occurred. The mortality, to a great extent, seemed to be confined to those who were better fed.

During the months of September and October a few cases of diphtheria were reported, with two or three deaths.

RAHWAY. - *Report from* CHARLES H. LAMBERT, *Inspector*.

Rahway, Union county, N. J., about nineteen miles from Jersey City in a southerly direction, has an area including some farm land. Ground undulating, with a good natural water-course, viz., the Rahway river, which runs through the city. Population, 6,500. Climate moderately temperate, neither too moist or dry.

Nothing special to report from either a geological or topographical point.

Water-supply abundant, both from our water works and wells. The water works get their principal supply from the Rahway river, the same being filtered before going into the pipes; they also get part of their supply from wells. The works are owned by the city and the service is what is known as the Holly system. About 600 families are water-takers. It is nearly soft. It is discolored (at times only) from refuse dye from the felting mills of Messrs. Taylor & Bloodgood, in Clark township, which also at times gives the water a slight acid reaction. The pipes are cleansed twice a year by blowing out. The river does not receive any sewage above the point of supply only as above mentioned. The balance of our inhabitants depend upon wells. Cisterns are used to some extent, but not for drinking purposes; new ones are not being built to any extent, as our city water is sufficiently soft for washing purposes.

There is very little drainage other than by the sewers. The usual water level is such as in almost every part of our city to secure dry cellars. There is but little malaria in the city, and that appears to be imported from factories, where most of the population work. Our most public streets are provided with sewers and are constructed in such a manner that almost every part of our city receives benefit therefrom. Their grade per 100 feet averages two inches; they have no special ventilation, but should have, if network was complete; they are variable in size, from a five-feet brick to a twelve-inch tile sewer, and they aggregate about five miles in length.

The streets are all graded. We have no public parks.

Houses have generally basements or cellars. Basements are generally occupied. There are but few tenement-houses that have more than two families.

Streets are lighted with electricity, houses with gas and kerosene oil.

Sewers are generally used where available; where cesspools are used they have open bottoms. Refuse from streets is carried to the poor-farm and utilized; other excreta, such as from privies, are taken out of the city at stipulated times and utilized on farms.

We have no public markets.

No diseases of animals have been reported; there is no register kept of persons keeping horses or cows. Pigs are not permitted within the city without permission of the Board of Health, and the Health Inspector sees that stables do not become a nuisance.

Slaughter-houses are conducted in such a manner as not to cause complaint from the nearest neighbors.

There are no new manufactories; what we have are conducted in such a manner as not to be detrimental to health.

Our schools and other public buildings are well built and are in a fine sanitary condition.

Our alms-house is located on a farm on the bank of the Rahway river, is in a good condition and the inmates share in the good, healthy surroundings to their benefit. Our hospital is situated on the same grounds.

Police and prisons. Police; few are necessary. City prison is in a good, healthy condition.

No fire guards or escapes are required, as the houses are built low.

Cemeteries and burials in them are well conducted under the health laws of the State, and the rules and regulations of the common council and our Local Board of Health.

Health laws are regularly enforced by the police reporting infringements to the Health Inspector.

Registration of vital statistics is regularly enforced according to the State laws.

Contagious diseases are required to be reported and strict quarantine enforced. School children are required to be vaccinated by the rules of the Board of Education.

Sanitary expenses are paid by the Health Board, out of a fund that is raised by tax, according to the State laws.

Heat and ventilation of dwellings, chiefly from heaters and stoves.

No special disease prevalent during the year and the mortality very slight.

UNION TOWNSHIP. - *Report from* D. HOBART SAYRE, *Sec'y.*

The water-supply this year has been abundant, owing probably to midsummer rains. Last year in some sections we almost had a water famine.

There has been but little sickness and no prevalent disease. Malaria, quite prevalent last year, has this year been almost unknown. But one complaint was made to us this year, which we at once investigated, and enforced the proper sanitary methods, and the trouble complained of was abated.

The birth and marriage reports come in fairly prompt and full. The death report, owing to the fact that we have no undertaker in the township, and almost all the deaths are certified to by physicians living without the township, and by them given to other assessors and city clerks, fail in some cases to reach this office.

Under the present health law, our expenses have been nothing except such as has been gratuitous by the Board, there being no towns within our limits.

WARREN COUNTY.

HACKETTSTOWN. - - *Report from* THOMAS NOLAN, *Clerk.*

Water-supply is derived from mountain stream; originally a private corporation, but now owned by the borough. It is generally taken, but four or five depend on wells or cisterns. It is discolored after rains or storms. It is not bad at any particular season, only after heavy rains. This could be remedied to a great degree if precautions were taken. Reservoir is seldom cleaned. Pipes are occasionally drawn and washed.

We have no distinct sewerage system. Our cellars are generally dry. We have what is known as Bowers' pond, which has been and is a source of malaria, and the removal of which has been considered by a former Board of Health.

Cesspools are depended upon, and are built with open bottom or sides. Slaughter-houses are generally kept in good sanitary condition.

HOPE TOWNSHIP. - *Report from* A. L. GIBBS, M.D., *Secretary.*

The Board of Health has not been called together during the past year to act upon any complaint. During the months of February, March and April we were visited by an epidemic of measles, mostly of a mild type and none fatal.

Dysentery has been quite prevalent during the summer months, in some cases of quite a malignant type, but no deaths occurred.

Malarial fevers of all varieties have been less frequent with us than in the past ten years.

KNOWLTON TOWNSHIP. *Report from* S. H. JOHNSON, M.D., *Pres't.*

More sickness has prevailed during the past year than there has been for any previous year for some time. Last spring we had an epidemic of measles, with no deaths reported. At the same time we had several cases of pneumonitis, with a few deaths reported.

During the summer intense heat has prevailed. There has been an average higher temperature than for years. The continued rainfalls have filled wells, springs and streams with surface-water, in consequence of which, together with the intense heat, mild dysentery in epidemic form has visited the township. While cases of the disease have been numerous, nevertheless there have been but two deaths resulting in the township, so far as I can learn.

A few cases of scarlet fever of a mild type have been reported.

We have flowing through the village of Delaware a small stream, composed mostly of surface-water, whose route is very circuitous. The waters of this stream are collected from a neighboring hillside. The stream is contaminated near its source by the wash of two barn-yards, while its waters by their flow through the village are further contaminated by the wash of a hog-pen and the drain of two out-houses. This nuisance should be abated. It can be done in two ways, either by the removal of all sources of contamination or by the turning aside of the stream. The latter is the more practicable and would undoubtedly give better results to the villagers.

LOPATCONG TOWNSHIP. *Report from* JEREMIAH YEISLEY, *Sec'y.*

The Board has been called out several times to abate nuisances and in every case was successful without any trouble. The general health in the township has been good. Although there were several cases of diphtheria in the township, it did not become epidemic, and only one case resulted fatally.

PHILLIPSBURG. - *Report from* P. F. BRAKELEY, JR., *Secretary.*

Water is furnished to the town by a local corporation known as the People's Water Company. The pumping station is located about one-half mile outside of the town limits, and is pumped into a reservoir of a two-million gallon capacity. Taken by about 300 families. Not discolored. It has not either a metallic or mineral taste. The works are new, and have only been completed a few months. I have no reason to believe that the water will be any different at any time of the year.

WASHINGTON. - - - *Report from* JOHN CUSHING.

We have nothing different to report from the report of last year. Last February the scarlet fever made its appearance in the school. The Board of Health ordered the school closed and had the entire building fumigated and cleansed. There was no further trouble.

The water is supplied by a private company from a mountain stream. The reservoir is located about three miles from the town, and the water is filtered through eight feet of gravel before it enters the pipes. The water is of a good quality, with a soft, irony taste.

Drainage is not perfect. There is water in a great many cellars in the spring of the year. There is no sewerage except from three large buildings which empty into a small stream. The pipe has a fall of about ten feet to the hundred, but no way of flushing or ventilating.

HEALTH LAWS AND CIRCULARS.

HEALTH LAWS.

In addition to the general consolidated health law of the State, this Board is also placed in relation to several other laws.

Those relating to the diseases of animals have received, as heretofore, our careful attention. They are believed to be of much value to the farmers and to the industrial interests of the State. The special law as to glanders has been duly enforced. Information is given as to other diseases, and, where necessary, investigations are made. Facts as to animal diseases, their relations to human diseases and as to the determination of meat and milk-supply of the markets, fully prove the importance of such a service. We think the time has come when every city should have a careful system of dairy and market inspection. Tuberculosis, swine plague and other frequent diseases prove that there is call for this guard in the interests of public health and for the protection of the people from imposition in purchasing.

Owing to a national law which has been passed as to contagious pleuro-pneumonia, this Board, after having had the approval of your Excellency and of the Attorney-General, has arranged so as to recognize the work and services of the United States Bureau of Animal Industry, but no right of general slaughter has been granted unless the owner consents. The general government now pays for services of veterinarians and for cattle killed, but have constant correspondence and advisement with this Board.

The oleomargarine law and that relating to milk-supply continue to be under the sole jurisdiction of the efficient Dairy Commissioner. In it there is no relation to the Board except as to his own appointment and a report of the work of the year so far as milk inspection is concerned. By the law, the chemists for the examination of milk are named by the Board, but as they nor any of the deputies are responsible to us we think that their appointments should be made by the Commissioner himself or some other authority the Legislature might designate.

In a brief statement made to us as to milk inspection he speaks as follows:

"The work of carrying out the provisions of the act regulating the sale of milk has been prosecuted with greater vigor than heretofore, the force placed at my disposal by the other laws enabling me to render more efficient and thorough services than formerly. As a result the number of cases of adulteration found has exceeded that stated in former reports. The usual routine has been followed and no change has been made in the methods of inspection as described in former reports."

The procedure under the oleomargarine law will be detailed in the Commissioner's report.

The last Legislature also conferred upon the Dairy Commissioner powers as to examinations of foods and drugs and as to the enforcement of the laws as to them. While the Board still has similar powers, the special appropriation makes it proper for us to confine our attention to evidences furnished as to adulterations which directly hazard health, while the care of those specified and commercial frauds falls into other hands. The law as to petroleum and illuminating oils has done much good. Accidents now very seldom occur from the legitimate use of kerosene oils. When these are brought to our attention they are inquired into, and in a few cases dealers in suspected oils have had their products tested. It will probably be necessary the coming year again more fully to test the degree of protection which the law affords.

The laws as to the registration of physicians and as to the returns of vital statistics are looked after as formerly. While there is no call for much additional legislation, it will from time to time occur that defects which the actual application of laws can only reveal will need to be corrected. The present Legislature has already done this.

The most important laws regulating the care of the public health are Chapter LXVIII., Laws of 1887, and the united law as to vital statistics just passed by the Legislature of 1888. While there are other incidental and important laws, these form the basis of the permanent, general and local health administration of the State. The law (Chapter LXVIII.) of 1887 has been published in pamphlet form, together with suggestions and guides as to its applications and references to particular sections by subjects. In Circular LX. before referred to as containing the general health law of the State, we give a few model ordinances which will be found sufficient for townships. They are still to be commended as guides. Where a township is larger, and, as in the case of many, a Health Inspector is needed, one or two additional ordinances in accord with Sections 31 and 36 are needed. Since these ordinances were drawn, the Board of Health of the city of Trenton has had occasion to restate its code. J. Buchanan, counselor-at-law, of Trenton, taking the fourteen specifications of *Section 12 of the State law* as the guide, drew ordinances in the order of these sections. In the Trenton code they are covered as follows:

I. First 5 sections.
II. Sections 6 to 9, inclusive.
III. Sections 10 to 15, inclusive.
IV. Sections 16 to 22, inclusive.
V. Sections 23 to 29, inclusive.
VI. Sections 30 to 32, inclusive.
VII. Sections 33 to 37, inclusive.
VIII. Sections 38 to 39, inclusive.
IX. Sections 40 to 42, inclusive.

These are all equally suited to Local Boards in townships.

Then the other sub-items named in Section 12 of the State law as to cities, are covered as follows:

I. By Sections 52 to 56, inclusive.
II. By Sections 57 to 60, inclusive.
III. By Sections 61 to 64, inclusive.

IV. and V. are so far included in the principles of other sections, as only in very exceptional cases to need additional ordinances.

Sections 65 to 68, inclusive, define the duties of the Health Inspector. (See Section 31 of the State law.)

This code might, if necessary, be slightly condensed, but in subject-matter and in order of statement it ably and fully covers the whole ground, and as to its legal accuracy, has received the approval of other competent legal advisers. We therefore commend it, so far as known, as the best model code in the State, and shall be glad to send a copy thereof to any Local Board desiring it.

The law passed recently as to *Vital Statistics* will be found herewith. It in nowise alters the system that has been in operation for several years past. The restatement was rendered necessary by the number of separate acts, and by some discrepancies that made a part of it liable to legal criticism. The only points in the new vital statistic law that need special notice are: I. That it is the duty of Local Boards to see to its enforcement (Section 15). II. The mode of collecting penalties is made more direct (Section 15). III. It is the *privilege* of Local Boards to supply physicians with stamped envelopes for monthly returns (Section 2). IV. Undertakers, when for their accommodation, obtaining burial permits where they reside, instead of where the death occurred, must provide postage for the clerk to transmit the same to the proper locality; and the keeper of every cemetery shall keep a record of interments (Section 9).

The law has been carefully drawn by Judge Lanning, and it is believed will be found adapted to its design.

The text of the law, with some circulars relating to it, will be found further on in the report of vital statistics.

LAWS OF 1887, RELATING TO PUBLIC HEALTH.

Chapter II.—Supplement to the milk act of March 14th, 1882.

Chapter XIII.—"An act to authorize municipal corporations to contract for a supply of water for public uses."

Chapter XXVII.—Supplement to the water-supply act of March 5th, 1884.

Chapter XXVIII.—Supplement to same act.

Chapter XXXVII.—Supplement to the drainage act of March 24th, 1881.

Chapter LXVIII.—"An act to establish in this state boards of health and a bureau of vital statistics, and to define their respective powers and duties," approved March thirty-first, one thousand eight hundred and eighty-seven.

Chapter CXXVI.—Supplement to the adulteration of foods and drug act of 1881.

Chapter CXLVIII.—"An act providing for sewerage in and by adjoining cities, towns and townships."

Chapter CXLIX.—Supplement to the oleomargarine act of March 22d, 1886.

Chapter CLVII.—Supplement to act of May 5th, 1884.

Chapter CLXX.—Act as to sewers.

Chapter CLXXII.—Supplement to sewer act of March 8th, 1882.

Chapter LXXVII.—Supplement to an act of 1885 as to factories and workshops.

We have already noted the vital statistics act just passed (1888), and to be found in connection with the Report on Vital Statistics. An important act as to the control of building and plumbing in cities, just passed, is herewith printed.

LAWS OF 1888.

CHAPTER LVI.

A supplement to an act entitled "An act to establish in this state boards of health and a bureau of vital statistics, and to define their respective powers and duties," approved March thirty-first, one thousand eight hundred and eighty-seven.

1. Be it enacted *by the Senate and General Assembly of the State of New Jersey*, That local boards of health, except township boards, shall, in addition to the powers enumerated in the act to which this is a supplement, have power to pass, alter or amend ordinances, and make rules or regulations within their respective jurisdictions:

I. To compel, prescribe, regulate and control the plumbing, ventilation and drainage of all buildings, public and private, and the connection thereof with outside sewers, cesspools or other receptacles, and to require plans for the same, with necessary drawings or descriptions, to be submitted to said boards for inspection and approval, and to require all master and foreman plumbers and all building contractors to register their names and addresses at the office of said board;

II. To secure the sanitary condition of all buildings, public and private.

2. *And be it enacted*, That any such board of health may, by resolution, delegate any portion of its powers to any member of the board or to any officer thereof, to be exercised only when the board is not in session, and any notice by any member of the board, or by any officer thereof, shall be notice by the board, and the person served therewith shall be bound thereby.

3. *And be it enacted*, That the conviction in prosecutions by any local board of health to recover penalties for the violation of the ordinances of said board, shall be in the following or similar form:

STATE OF NEW JERSEY, }
County of } *ss.*

Be it remembered that on this day of . A. D. at in said county, defendant, was, by the Second District Court of the city of N. (or by E. F., a police justice, or as the case is), convicted of violating section of the sanitary code of the Board of Health of the said city of N. (or of an ordinance entitled "An ordinance," &c.), in a summary proceeding, at the suit of the said the Board of Health of the city of N., plaintiff, upon a complaint made by ; and further, that the witnesses in said proceeding who testified for the plaintiff, were (name them), and the witnesses who testified for the defendant were (name them); wherefore, the said court (or police justice, or as the case is) doth hereby give judgment that the plaintiff recover of the defendant dollars penalty and dollars and cents costs of this proceeding.

The said conviction shall be signed by the judge of the district court, police justice or other magistrate, before whom the conviction is had; in case of the infliction of a penalty, the amount of which is increased by the fact that it is for a second or additional violation, the conviction shall state that it appeared that the defendant had been guilty of a previous violation of the same section of said code or ordinance; the costs in prosecutions under the act to which this is a supplement, shall be the same as costs before justices of the peace, police justices or recorders, or in district courts in other civil actions.

4. *And be it enacted,* That any judgment rendered on conviction of a violation of any section of any ordinance or code of any local board of health, by any court having jurisdiction of such proceeding, may be docketed in the court of common pleas, as other judgments recorded in said courts may be, and in the same manner, and such judgment shall, from the time of said docketing in the court of common pleas, operate as a judgment obtained in a suit originally commenced in said court, and satisfaction thereof may be entered in the margin of the docket in the same manner and on the same evidence as is now provided by law in case of judgments rendered in the courts of common pleas; and the execution issued thereon shall be of the same effect as to the property of the defendant, either of a personal or real nature, as if issued on a judgment originally obtained in the court of common pleas upon a suit commenced therein; and after said docketing, no further proceedings shall be had in the said district, police, justice's or recorder's court, in which said judgment was obtained.

Approved February 24th, 1888.

CIRCULARS.

The circulars which have been prepared or re-issued during the present year will be found in this report. We now have a series of these small issues carefully prepared and giving to physicians, to householders, to schools, to operatives and to the public generally the latest opinions and directions as to the prevention and control of disease. They are found of great service, and are largely called for by Local Boards of Health and throughout the State. There will be additions made to these as any special circumstances or new facts may seem to demand.

As they give directions to families and individuals, they should be distributed by Health Inspectors. When there is fear of an epidemic, those relating to small-pox, scarlet fever, diphtheria, &c., and the one directing as to disinfectants should be distributed.

A few additional circulars have been issued the past year. Our list now includes most of the subjects of special interest to citizens. The list, up to No. XXXVI., inclusive, is to be found in the sixth report. Since then the issues have been as follows:

XXXVII. School and Health Circular, No. 3.
XXXVIII. As to exhibition of sanitary and household appliances.
XXXIX. To Local Boards of Health.
XL. As to the health of operatives, No. 1.
XLI. Health counsels for working-people, No. 2.
XLII. As to petroleum, kerosene, &c.
XLIII. As to annual report.
XLIV. Prevention of small-pox, scarlet fever, diphtheria, &c.—as to *vaccination*.
XLV. As to cholera.
XLVI. As to annual report (1884).
XLVII. Prevention of serious injuries to the mind, the eyes, the ears.
XLVIII. As to animals. Infectious pneumo-enteritis, or swine plague.
XLIX. As to animals. Husk, or hoose, and tuberculosis in cattle.
L. Combined circulars as to contagious diseases of animals.
LI. To Local Boards of Health.
LII. Sanitary inspection of houses and premises (inspection plan).
LIII. Pure drinking-water—how to secure it.
LIV. Laws relating to public health (replaced by Circular XL.)
LV. Sanitary survey of school-houses (inspection blank).
LVI. As to annual report.
LVII. To the physicians of the State—as to typhoid fever and diphtheria.
LVIII. Health Laws to 1885 (replaced by Circular LX.)
LVIX. Laws relating to adulteration of food and drugs and to petroleum.
LX. Circular of Health Laws to 1888.

LXI. Care of household wastes.
LXII. Drainage for health.
LXIII. Farmers' homes and their perils.
LXIV. Disinfectants and how to use them.

Beside these, we have sent, as occasion has demanded, circular-letters, as herewith printed.

We are glad to send to individuals, or for distribution by Health Boards, or in schools, any of these circulars, on application by postal.

Reprint is also herewith made of two former circulars, which have been somewhat changed and enlarged.

Circular LX., containing the Health Laws and suggestions relating thereto, is not printed with the report because of its size. It has been sent to all Health Boards and Health Officers, and can be had by any one on request.

CIRCULAR LXI.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

CARE OF HOUSEHOLD WASTES.

WHAT THE HOUSEHOLDER CAN DO WITH IMPURE LIQUIDS AND REFUSE.

In ordinary household life the refuse material for which some outside receptacle or some mode of disposition must be found can be divided into the following classes:

I. Ashes, or what remains from fires.
II. Dust, sweepings and other similar refuse.
III. Wash-water from kitchen and laundry.
IV. Bath-tub and usual wash-bowl water.
V. Secretions or excretions voided from the human intestinal or urinal tract.

We desire to consider the disposition to be made of all these by householders who cannot avail themselves of public sewers.

The first rule is never to mingle any of these by-products of life when mixture can reasonably be avoided.

I. The ash-heap is misused if it becomes a place for deposit or burial of any of these materials. While sifted ashes have an absorbent and some corrective power, if used in heaps in this way they become damp and degenerate into filth-heaps. Wet ashes cause dampness and mouldiness. Hence they are to be kept separate and dry and cleared away occasionally, as convenience and health indicate. At the spring and fall house-cleaning, at least, they should be fully removed.

II. It is a rule, as to all dust, sweepings, &c., that they should be disposed of in the kitchen range or fire. We know of many who carry the use of fire for the disposal of refuse much further. There is now furnished a close pan or heater in which peelings of fruits and vegetables and bits from all culinary operations are so dried as to be cast into the fire and add to the heat. Thus all evil effects from them are avoided.

III. The wash-waters from the kitchen and laundry are always to be looked upon as fouled waters. The soap tends to separate into its original fats, and the greases are especially prone to nauseous decompositions. The kitchen liquids contain much animal matter in the form of shreds of meat or viscera, &c. Many claim that the decompositions from these sources may become as disease-breeding as our ordinary secretions.

IV. Bath-tub and wash-bowl water, while not so impure as some other liquids as representing soap and secretions from the skin, is also to be gotten rid of.

V. The secretions from the digestive tract and its appendages for the first few hours after voidance, are, as a rule, harmless, but soon become a possible source of disease. In sickness changes are more rapid, and the material should be more promptly disinfected or disposed of. This is all the more important because the secretion may have a directly specific character, so as to impart cholera, typhoid fever or other communicable disease.

It is, as a rule, a wrong course to combine these various kinds of refuse, and still worse to convey them to the outside privy vault as a general receptacle. By a little prudence in use and a little industry they are easily disposed of. As a rule, the liquid products from an ordinary family are not enough to do any harm if disposed of on the surface of well-drained ground. Besides the use of some of them about bushes, grapevines or trees, according to their needs, there may be near the foot of the house-lot a series of furrows or deep trenches, made with the spade or hoe, into which these can be thrown alternately. If the ground is clayey it should have been underdrained. Oats or corn sown in rows between the trenches will aid much in taking up the summer excess and in protecting from the sun. We have never known a family embarrassed in the disposal of these liquids if only some such separating and absorbing system was carried out. Different parts of the plot or trenches should be used different days. We know of no record or case where a well over 20 feet deep and 50 feet distant from a plot or trenches thus used for these fresh liquids has ever fallen under suspicion of being affected. This is quite different from ponding in cesspools.

Sometimes bath-tub or wash-bowl water can very well be discharged upon this same land. It amounts to so little on an average per day that it may generally be conveyed by pipes to a trench just deep enough to protect from frost, and covered over in winter. If undrained soils become too wet there is remedy in the use of agricultural tile or in frequently changing the terminal end of the pipe. A few feet of lead pipe at the terminus easily admits of this change.

By *not adding any of these liquids* to the *voided secretions or excretions of the* body we do not have to deal with a quantity which often becomes unmanageable from mere bulk. Where there is separate urine to be emptied from the night vessels, it, too, is easily disposed of in trenches similar to those already noted. Where there is suspicious sickness the discharges should have a separate trench, and so are easily and readily disposed of.

As a rule, the dry and the dry-kept out-house is the best place for voiding intestinal excretions. *It should never be the place for emptying any indoor vessels.* If made with leaders for draught in each of the rear inside corners, beginning below the floor and leading out at the roof, and with a slight grating or perforated bricks in the foundation for ventilation when required, there will seldom be need for the use of any disinfectant. If there is, ordinary land plaster or dry soil or chloride of lime answers an excellent purpose. It is not difficult to keep the mass dry if only there is no addition of rain-water or slops. Thus kept, it is easily disposed of in pails each month or each spring or fall. A kerosene barrel sawed into two tubs is frequently used instead of a superficial brick vault cemented, which is the next arrangement. It is true that some ground is so porous and so acts as a filter that a vault deep enought to be kept cool, and also kept dry, will do for some time without cleansing; but there are risks from water, heat and accumulations.

It is only surprising how little real trouble or risk results from the small amount of refuse incident to household living *if only some system of separation* and disposal is carried out.

It is well worth while to adopt this orderly detail, since we have come to know how frequently families suffer from a general lowering of health or from specific diseases brought about by foul dampness or contaminations of air, water or food by organic particles and refuse. The problem is simple unless we ourselves complicate it by combining the materials unduly, so as to increase bulk or quantity, or by want of system in methods of disposal. If we add gallons of water to decomposing organic matter, we are embarrassed by the great bulk of fouled liquid thus artificially provided. If, instead of speedy disposal, it is stored until it decomposes, the complications and risks are multiplied ten-fold.

There are cases, however, where, notwithstanding the absence of sewers, it is felt to be very desirable to have additional water-closet arrangements within the dwelling-house. It is a false view as to these that we need to avail of the occasional flush of wash-bowl and bath-tubs. These closets have their own water-supply, and even where there are wash-bowls and bath-tubs adjacent they should have their own separate system of pipes and conveyance. The little that is saved by joining pipes, not only increases risk, but often so increases the quantity to be disposed of at the end of the system as to add to expense. They may go to the same point of exit outside the building, but they should be disposed of separately, as before noted.

It is always a good rule to have a man-hole or other opening somewhere in the course of the pipe after it *comes out* from the building, so as to break any direct connection if a cesspool is to be used.

This is often accomplished by having a vent-pipe connecting with the sewer-pipe and going up to the roof of the house. This vent-pipe should go up directly from the outcoming pipe, and so be on the *house side* or inside of the trap which is placed beyond it to intercept any air from the cesspool or sewer. If, however, it is desired also to ventilate the sewer or cesspool, there should also be another vent-pipe near the sewer or cesspool.

Where there is this arrangement for a water-closet in the house, and for the conveyance of its contents to some place on the rear lot, we do not need either a large or a *deep cess-pit.* It should be only deep enough to secure fall and to protect the end of the pipe from frost. A fall of one inch in forty inches for a four-inch pipe, or one inch in sixty inches (five feet) for a six-inch pipe, suffices.

As the needed fall depends upon the size and rapidity of the stream, where there is not active flush, Eliot advises a fall of one-half inch per foot inside of building; Philbrick, one inch in fifty inches; less will do outside.

A cess-pit ten feet long, four feet wide, and three feet deep, suffices for a usual family. Two years since, we had one constructed for a boarding-school in the following manner: A spot was chosen quite distant from the building. The excavation was made so that it could be covered by a simple double slant roof of boards to keep out rain and sunshine, and to be opened when desired. In winter, if need be, it can be still more covered over to protect it from the frost.

The bottom was left without cement and the sides bricked up half way, or about eighteen inches from the bottom. Into this the continuous pipe from the house water-closet terminated on the top row of bricks. The bricks should be cemented on the inside. In between the second and fourth row of bricks, at distances of about eighteen inches apart, all around, let unjointed agricultural drain tile be placed, running in a straight line several feet, according to the nature of the soil. At the mouth of each of these a usual wire basket or leaf-catcher was fitted. Thus, if the liquid rose to those points in the pit, it would be carried off. The pit should be examined from time to time, and in early or late frost be examined and its small contents removed and composted. It is not difficult to give such a structure a thorough cleansing each fall or early in the spring. With proper oversight the method proves very effectual where tight cesspools cannot be used, and where the well is not near.

The deep and hidden cesspool system should be abandoned as far as possible. Where there is too much kitchen or laundry-water for disposal on the surface or in trenches, a similar cesspool may receive this. It should be occasionally examined and any accumulated grease removed. Besides the removal of material for compost, as required, during some part of the fall or winter when the ground is dry, it is well, occasionally, to more thoroughly cleanse the sides of the cesspool, and if need be, stop up the lower end of the house-pipe and pass a disinfecting solution in it until nearly full, and let it stand for a while and then discharge it. This would seldom be necessary, but is easily done if desired.

Nothing has here been said as to inside traps, pipes and fixtures, since the rules as to these are the same as if the contents passed into a public sewer. As so many householders in the country, in villages and in the smaller towns and cities are dependent upon receptacles of home construction, it is believed this outline will serve as a guide. The greatest embarrassment happens from the combination of different kinds of refuse, each of which would be easily disposed of if kept separate.

Where cesspools must be used, it is far better and less expensive to have two or three disconnected ones, not deep, and easily cleansed, built as we have indicated, for each variety of slop, rather than to have one great store-house for a pond of foul liquid. These simple plans may be used by any family that deems it worth while to take the trouble to avoid causes of sickness or of general lack of vigor.

These methods answer for the country and for scattered village houses where neither your own nor your neighbor's well is near, and where the population is not large. But they are not to be considered as applicable to larger towns and cities. So soon as any form of leaking distributing cesspools come to be very near each other we are in danger of polluting both air and soil.

What is practicable for a small population is often hazardous for a crowded population. Health Boards and health authorities, and not the individual, should be the judges when the limit is reached, and when fully-cemented pits and the odorless excavator or sewers are needed.

CIRCULAR LXII.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

DRAINAGE FOR HEALTH.

No question as to any locality is more important than its effect upon the *Health* of its population. Is the section of country which I have chosen for my home favorable to my own health and that of my family? Upon the answer to this more depends than upon any other inquiry we can make as to it. There are no compensations for avoidable sickness or ill health, which secures discomfort, suspends labor, shortens the working period of our years, entails enfeebled constitutions upon our children, or actually destroys life. In the decision of this question we have come to know that we have much to do with the condition of the soil or ground beneath and about us. There must be

DRAINAGE FOR HEALTH.

There are some especial reasons why the citizens of New Jersey need to consider this subject. There is defective drainage in many sections of the State. There are spaces of land in which the soil itself is naturally too retentive of water. There are swamps, marshes and ponds, both natural and artificial. There are cities, as well as separate houses, in various localities, made damp by their surroundings. There is also a tendency to form artificial ponds or lakes for profit or ornament. Our nearness to large cities gives great inducements for manufactories, and inasmuch as water-power, if it can be obtained by ponding the rivers in their courses, is cheaper than steam-power, there is much temptation to secure or assert the privilege of storing water, even in places or localities where such obstruction involves the overflow of large portions of adjacent lands.

Besides numerous smaller areas there are three great tracts in New Jersey in which the need for extensive drainage is justly claimed. The first is the Great Meadows on the Pequest, in Warren county, which has already been so far drained as to give abundant evidence of the advantages alike to agriculture and health.

The second is the Drowned Land of the Walkill, in Sussex county, comprising about 10,000 acres, the drainage of which will depend on the removal of obstructions in Orange county in the State of New York.

The third is the Overflow Land of the Passaic river and its branches, including in all about 20,000 acres.

These wet lands of the Passaic and its branches are wholly within our own domain. The Passaic river and its branches drain an area of 750 square miles above Little Falls. In freshets there is an overflow over twenty miles up the stream in addition to the holding back of water in the subsoil during other or subsequent periods. "There are 11,400 acres in the townships of Caldwell, Livingston, Harrison and Chatham, which are liable to be damaged by freshets, and there is an area of seventy-five square miles, or nearly 50,000 acres, the salubrity of which is affected by insufficient drainage."

Our rainfall is over forty inches a year, against a rainfall of thirty inches in Holland and twenty-six inches on the east coast of England. This means for us a rainfall each year of over 800,000 gallons per acre. Allowing liberally for evaporation from the surface, an average of 900 gallons per acre or 576,000 gallons a square mile each day reaches the stream. When there are heavy rains, if it has not free course there must be overflow and destruction to property, to health, to life.

Even these few examples of undrained lands, and smaller areas well known in various portions of the State, commend to our careful consideration whether or not undrained lands are unhealthy.

By *undrained lands* are meant those which are subject to frequent overflows of water in storms, or such as are too constantly full of water very near the surface. Ground is kept too wet in its soil or upper layers when the water in the soil cannot flow off from it, even though there is no water standing on it. It is all the worse when covered with marshes or ponds, or subject to frequent overflows.

There are at least three ways of proving that ground, in either of these ways saturated with water, cannot be healthy.

The first is that derived from a knowledge of natural processes and the uniform results of their infringement.

The second is that derived from series of facts collected by special skilled observers and the prevailing common sentiment of those who, as medical practitioners, have thorough experience and familiarity with diseases and their apparent causes.

The third is that derived from contrasts between the healthfulness of localities, for many years before and after drainage.

As we study the natural processes of life, or the relations of the ground to its contents, its surroundings and the animal life upon it, we are not without important evidence.

The chemist or physical student of earth and man can prove in his laboratory that water was never intended to be stagnant in the ground near the surface upon which animal life is to exist. He finds that the upper ground or soil is made up of animal and vegetable as well as mineral matter, and that there must be *air and water in circulation* in it in order that plants can be fed, that decomposition can take place in a natural way, and that the atmosphere above it may be such as is fit for breathing. Ground filled to the brim with water cannot have air, and no ground can be healthy without it. The function of water sent into the ground is that of a carrier and distributer, whose business it is to circulate, and in its circulation to be followed by air, which must occupy the porous upper surface of the soil in order that plants may use their food and that animal and vegetable matters always in the soil may not decompose in such ways as chemistry and all science show is sure to produce miasms, and to affect the upper air we breathe.

While the natural decompositions going on in porous soils nourish plant-life and aid human health, the abnormal, putrefactive and irregular decompositions in water-soaked soils are always a risk to human health and life.

It is the respiration of the soil, and this alone, that, by the co-operation of air and water, keeps the upper air and soil clean—the one fit for our respiration and the other for our habitation.

Dr. Russell has illustrated the difference between the healthful processes of drained soil and the unhealthful processes of soaked soils somewhat thus: If we bury a carcass in a porous soil, not too deep, after due time nothing but the bones and denser parts remain, and no perceptible effect is had upon the air about it. But plunge a carcass of the same size in a soil saturated with water, and, instead of a clean and harmless heap of bones, we get a repulsive mass of putridity and offensive organic gases, which impregnate air, water and soil. Just such contrasts occur in the myriad processes going on in the soil. In the one case the water flows to its proper ground level and is followed by air, and those changes take place which feed the plants and purify the surrounding atmosphere. In the other case the vegetable and animal matters accumulate, and, instead of healthful distribution in the soil, they are ready, so soon as a special period of dryness or heat arrives, not to feed plants and animals in the ground, but to hurt or destroy life above it.

It is as easy to prove that such land must be unhealthy as it is to prove any of the facts of experimental science.

Equally unmistakable is the effect on temperature. Excess of moisture, even on lands not evidently wet, is a cause of excessive dews and fogs and of atmospheric impurity. Its evaporation lowers temperature, produces chilliness, and creates or aggravates the injurious changes or fluctuations of temperature by which health is injured. Indeed, the effect on mankind has been so apparent that the unhealthfulness of such localities is proverbial in experience as it is inevitable by the laws of nature. There is no difference of opinion among students of nature's laws as to the insalubrity of undrained and drowned lands.

Our next evidence is derived from the large number of facts collected by careful observers.

Perhaps no one in Europe has so closely studied the effects of soil moisture or of a high and varying water level in undrained localities as Pettenkofer, the distinguished Professor at Munich. He has made special study of various diseases as related to soils, and regards undrained areas filled with organic animal or vegetable matter, not only as essential causes of many common ailments, but as the culture-beds which await the arrival of specific contagions and impart to them their destructive power.

In 1863, under the direction of the Lords of Council of England and its Medical Officer, Dr. George Whitley, a skilled inspector was commissioned to visit and investigate the worst districts of England. Over fifty districts were visited and full report thereupon made in 1864. The details are full of interest as showing the great amount of sickness of various kinds, and out of all proportion to the number of deaths which occurred from the wet conditions of lands.

Dr. Farr, for forty years the Health Statistician of England, in his twelfth report gives statistics carefully prepared, showing the insalubrity of undrained land. Thus, the mortality of Ely, North Witchford, Whittlesey and Wisbeach, in Cambridgeshire, at the mouth of the Nene, was 2.45 per cent., while that of the high parts of Surrey, Sussex, North Devon and Northumberland, was from 1.80 to 1.40 per cent.

In the International Statistical Congress at the Hague (1869) it was shown that drainage had favorably influenced the rate of mortality more than any other one measure.

Dr. George Buchanan, the chief medical officer of the Local Government Board of England, made independent and extended comparisons in several counties of England, and showed that consumption prevailed much more extensively in localities adjacent to overflowed and undrained lands.

In the eight chief towns of Scotland it has been shown that consumption prevails in proportion to dampness of locality.

Dr. Henry I. Browditch, of Boston, in the examination of 45,000 deaths from consumption in Massachusetts for ten years, and in a thorough comparison of 183 townships and many single localities and dwellings, showed most conclusively that the distribution of the disease is very irregular, and that the difference depended mostly on difference in drainage and ground moisture. The proportion of consumptives in 128 wet localities was eighty-eight per cent., and in the dry less than twenty per cent. The wet condition of the soil influenced *all that class of diseases* arising from irregularity of temperature and excessive dampness.

Dr. Edwin Snow, the veteran health officer of Providence, Rhode Island, in the close study of facts as to a pond and extensive swamp in that vicinity, arrives at the following conclusions: (*a*) All those acres of swamp would be dry ground if the water in the pond was kept at its natural level. (*b*) The high water of the pond keeps numerous swampy places and hollows in a swampy condition, and the ground-water in the vicinity so high as to make the soil wet and cellars damp and unhealthy. (*c*) In the swamps thus made, the vegetable growth is luxuriant, and as the water falls and vegetation dies we have the conditions most favorable to the prevalence of fever and ague, of which these conditions are the chief if not the sole cause.

The Chairman of the Section of State Medicine and Public Hygiene, of the American Medical Association, says: "Of all the preventable causes of disease throughout the country, defective drainage is the most prolific."

A careful comparison of the records of the transactions of the State Medical Society of New Jersey for over thirty years, and of the reports of the New Jersey Board of Health for ten years, shows the same kind of evidence as to the effects of undrained lands or of the overflow of lands by reason of artificial obstructions. This view is abundantly supported by the reports of Health Boards of all of the States and of the Province of Ontario in Canada.

It is indisputable that the common sentiment and testimony from experience of general practitioners of medicine supports the more technical and painstaking investigations which have been made. While it is often the case with the individual practitioner, that he has not studied the causes of disease so much as its treatment, or that his knowledge has been fragmentary, or not classified and analyzed, or his experience of one disease not extensive enough for deductions, it is significant when we find, as to the relation of wet and undrained lands to ill health, a consensus of opinion such as exists on no other subject of causation in the entire range of diseases.

Whatever may be the questions raised as to the causes of variations in the prevalence of periodic fevers, their connection with undrained lands and with unnatural decompositions in or upon the soil is the common testimony of the medical profession.

Not less is it recognized that various other diseases are the result of water-soaked soils. We have already cited the evidence as to consumption and lung diseases. It is well known how the liver, the spleen and the blood itself are affected by the malarial influence. Rheumatism, neuralgia and general want of vigor are frequent results to those not afflicted with chills and fever. In this State, in the Bound Brook visitation, the severities and number of the neuralgic attacks were as marked as the chill and fever seizures.

Our third information as to the relations of undrained lands to health is that derived from the contrast in localities before and after drainage plans have been put in operation.

In the twenty-first and twenty-second reports of the Registrar-General of England we have details of the results of extensive drainage of the fens of Ely, of Wisbeach and the valley of the Nene. Comparisons for several years show the death-rate to have been greatly reduced and the hopes of the advocates of extended drainage were more than realized. This fact is all the more important because death-rate alone does not show the actual results. For loss of time by chills and fever and loss of vigor and after-effects are out of all proportion to the absolute death-rate. Thus, Peterborough Hospital in England, in the course of fourteen years had a record of 4,000 malarious cases with very few deaths directly from these. The real record reaches over a large class of diseases and impairments.

Dr. George Whitley, in his report to the Local Government Board of England, says that many districts which had been drained showed a great decrease of disease as compared with former times, and that "the decrease is attributable in very nearly every case mainly to one cause, improved land drainage."

The essay of Ashbel Welch, C.E., on "Subsoil Drainage," contained in the fourth report of this Board (1880), is full of illustrations of the relations of drainage to health. Taking up in detail the returns from twenty-four towns in England, as given by the Chief Medical Officer of England, he compared the death-rates for years before and for years after drainage from those diseases believed to be affected by the stagnation of water in or upon the ground. With admirable analysis he shows that "we are fairly entitled to conclude that drying of the soil had more influence in decreasing the general death-rate than all other causes together. The good done was mainly by the drying effected."

The case of Bound Brook and its mill-dam, as detailed in the fourth report of this Board (1880), is a most convincing illustration. The whole marsh has been drained and there has not since been any re-appearance of the prevalent fevers and intermittent neuralgias.

The facts as to Rahway, before and after the removal of its mill-dams, and the great advantages resulting, were fully attested by all the practicing physicians of that day.

As a result of the drainage of the Great Meadows, on the Pequest, in Warren county, Prof. Cook's report of 1880 says: "The sanitary benefits are, if possible, more marked than the agricultural. Formerly fever and ague and other malarial diseases were very prevalent, in some seasons attacking almost every person. Now sickness is comparatively rare, and in this year, which has been marked by the general prevalence of malarial disorders, there have been very few cases of such sickness anywhere about the Great Meadows."

His last report, 1886, says physicians report that there is no more malarial disease around the meadows than there is on the uplands, and that there are no more fogs in the valley than there are on the hills. This is very different from its former condition, as given in the report of 1877. In it, Drs. Blackwell and Cook, Roe and Hartpence, who have seen much practice in the regions about "The Great Meadows" of Warren county, agree that autumnal fevers and malarial disorders prevailed there much more than in the hilly country round about, and they attributed these to the stagnant water and undrained ground of the meadows.

Dr. Blackwell says: "It appeared to me, while sojourning in the neighborhood and marking the effects of these blighting influences upon the health of the people, that I could perceive in the lessened vigor and robustness of many of the residents the results of the insidious and baleful poison. The outbreak of malaria always occurs when the overflow leaves its sedimentary matter, and the earth itself is soaked with deadly gases and under the full influence of the autumn sun."

November, 1886, Dr. J. S. Cook, of Hackettstown, says: "I think I can truly say there has been a great decrease in the malarial diseases along the course of the Pequest since drainage was accomplished. These diseases are no more prevalent than in any other well-drained county. My own experience and the reports from other physicians confirm me in making this report."

These are but specimens of evidence by the volume which could be drawn from various reports in all the States by those who have closely watched the conditions of health before and after drainage.

What should be the result, in the study of these and similar facts by sanitarians or by Health Boards?

Every householder should be impressed with the need of securing beneath and around his home, ground in which there shall not be stagnant water, but through which there is free circulation of air and water.

Health Boards should see to it that in villages and cities where undrained streets, undrained cellars, sunken lots and the houses themselves interfere with flow of water and its evaporation, the matter of drainage is well enforced. For many a town a subsoil drainage system is more important than a subsoil sewer system.

The making of artificial ponds or reservoirs should be done only under expert advice. Here is a specimen from our last report:

One correspondent, from a township in Sussex county, says: "In several of the rude ponds formed for food fishes recently in this section, by throwing dams across running streams, overflows have been caused, and we have now many outbreaks of fever and ague, something that I had never known before, although I have lived over fifty years in this township." Many a home and some seaside resorts are injured by artificial ponds called lakes, or by some other form of interruption of water-circulation in the soil.

Great effort should be made to secure the drying of swamp and marsh lands where these are under tillage and near the dwellings of the people. Nature has its own way of taking care of undisturbed swamps where there are no accidental or artificial impediments to water-flow. But when land is used for farming or for living upon, it must be drained alike in the interests of agriculture and health.

Where dams are made or ponds formed in the direct course of rivers, so as to cause a constant high-water level in the soil or frequent overflows near dwellings, the people are to unite for their removal as earnestly, as perseveringly, as faithfully as they would unite to maintain a high principle, or to preserve their lives, their liberty and their happiness. It is not merely the interest of those directly adjacent. It is a common interest for a common defense, an appeal to that higher law which should lead us to co-operate with each other and to protect each other in certain inalienable rights of which health and life are chief.

August, 1887.

Copies of this circular and others can be had by addressing postal to E. M. Hunt, M.D., Secretary, Trenton, N. J.

CIRCULAR LXIII.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

FARMERS' HOMES AND THEIR PERILS.

The interests of individuals and of the State at large are greatly involved in the health conditions to be found in the homes of farmers. The country must always be the base of supply for the vitality of our city populations.

The records of disease and especially of epidemics long ago led to the proverb that "cities are the graves of mankind." They at least tend so to be. Careful statistics and the close analysis of facts show that cities would cease to flourish and to maintain successful industries were it not that they are constantly receiving a more vigorous and enduring population from the country districts. More than this, farmers need, for their own success and happiness and that of their families, well-sustained and robust health.

Some take it for granted that the agricultural population will keep well without direction, and that country homes will be healthy just because they are in the country. Such is not the case. With many advantages, they have disadvantages peculiar to themselves, and are often sources of disease. Building sites are too frequently chosen in relation to the size and shape of the farm rather than from their fitness on the basis of health. For convenience the water-supply is placed in the houses, and the various outbuildings are too near it. Errors in management and in the care of personal health occur quite as frequently as they do in cities.

It is the design of this circular to point out the more common mistakes and to present ideas or references as to the best constructions and management.

The home locality should be chosen from regard to soil and surroundings. Unless the water-level in the ground is low, the cellar and the ground around it are likely to be too damp. The level of the water should never rise above three feet below the bottom of the cellar, unless for a very temporary time and after the heaviest rains. If the house is already built and there are signs of cellar dampness, there should be drainage around the building. An area made outside and the cementing of the cellar are among the means of preventing dampness in buildings already constructed. Since the rays of the sun as well as light, generally diffused, aid to dry the ground, close shade trees are to be avoided unless the soil is sufficiently dry and the trees tall, without low branches.

Roof-water should never be allowed to fall around the building, but should either be gathered in cisterns or led off from the door-yard. Cisterns should not be in the cellar.

Sunlight and air should not only have free access around the building, but into it. On pleasant days the whole house needs flushing with air. The cellar should have the same advantages.

Many diseases result from the varying degrees of cold and dampness in a house. A physician of large practice in one of the dairy districts of the State told us that he had kept account of the number of farmers who lost their wives before fifty years of age, and that in that section elderly women as farmers' wives were scarce. The household duties and the care of the dairy led to too much work in cellars and upon damp floors.

Colds, consumption, rheumatism and neuralgia often result from such dampness and sudden changes. Where there is decayable matter we also have diphtheria and measles more severe with children.

WATER-SUPPLY.

The examination of farmers' wells convinces us that very many of them are hazardous. Large numbers are only surface wells, less than twenty feet deep, and exposed to all the evils which may arise from unclean soil. They are often located in sheds, or wash-houses as they are called, and covered with planks. They are sure to receive the drainage or washing about the kitchen or shed. After a few years the products of decay accumulate. There may be a sudden washing of the contents into the well, and an outbreak of typhoid fever or dysentery occurs. If not, there are lesser evils, and at times a lowering of the standard of health from impure water. If it were an active poison, the effects would be soon discovered, but these minor attacks upon vitality are not so easily identified. But special cases and long study of series of cases prove them to be real.

SLOPS.

No one has so good opportunities to dispose of all refuse as the farmer. Much of it can be fed to the swine or other animals. Laundry-water can be disposed of arouud trees or grape-vines. Some can be thrown while fresh upon the stable heap. Where there is a greater quantity, glazed pipes, well cemented, can easily conduct it to trenches in the garden. A cesspool is rarely necessary, but, if required, should be at a distance from the house, and so arranged as to admit of examination and of cleansing when needed.

Yet, with all the simple and safe methods, how often are vessels rinsed about the well, and slops thrown out on the bare ground or some other form of nuisance committed. To the persons themselves this is not a nuisance only because they have become used to it. Even the swill barrel is sometimes so located and so seldom changed or cleaned as to be a nuisance.

OUTBUILDINGS AND YARDS.

For convenience, outbuildings are often located too near the house, or in such relation thereto as that their underdrainage is in the direction of the house. If there is a cellar and the soil favors, there is underdrainage toward the house even where the surface slope of the ground is in another direction. All animal and all vegetable matter, and especially all animal excretions, are decayable or putrescible material, and hazardous to health unless disposed of according to the methods of nature. Fortunately the air and the ground and all growing plants hold themselves in readiness, when allowed so to do, to dispose of these. But, unfortunately, many so far disregard these laws as to allow accumulations or underground connections with soil, with cellar or with water-supply that are always a hazard and sometimes the direct cause of disease and death.

The complete removal in spring and fall is always essential, but it must be remembered that the ground beneath may become so soaked as to be filth-sodden, and thus shut out air and give rise to such vicious decompositions as are not in the ordinary course of proper decay. Fuller details as to "Pure Drinking-Water and How to Secure It," as to "Care of Household Wastes," and as to "Drainage for Health" can be found in Circulars LIII., LXI. and LXII. of this Board, on application by postal.

THE HEATING AND VENTILATION

Of farmers' homes has become a much more complicated matter than formerly, and gives rise to much ill health. The open wood-fire of former days was at least an excellent mode of ventilation. So the early forms of coal stoves made a continuous draught, and, if the draught was good, the gases of the coal were seldom discharged into the breathed air.

The gas-burner stove, while it does not need so frequent filling, and in this respect has advantage, yet, because it does not so constantly demand a draught, does not exchange the air as rapidly as the other forms. Not generally being tight in all its joinings, it often leaks out gas, and when it does is much worse than the older patterns of stoves. The open grate and the open stove are still to be commended, but where these cannot be used the base-burner must be of the *best make* as to its thorough joining, of proper thickness, and must be so frequently cleaned in its inner pipes or flues as not to have its draught impeded by accumulation of ashes. When a stove connects by a register with the bed-room above, it is generally so arranged as that much of the breathed and devitalized air of the sitting-room goes up to the sleeping-room to be breathed over again during the night. That is economy of air, but not of health and life. The stove arrangement shown in Circular XXVIII. of this Board is well adapted for sitting-rooms.

Where furnaces are used by farmers there is still another exposure. Often, vegetables, meats, old boards and boxes, and various other things are kept in the cellar. Both moisture and heat are needed to start fermentation and decomposition. In the cellar of the olden time, whatever might have been its defects or accumulations, there was at least no winter heat, and the process was not so likely to get started. Now the cellar is warm, and if there is any such material in a state prepared for decay it is likely to undergo the process, and so taint the air.

Furnaces are generally provided with a cold-air box, the theory being that no air comes from the cellar except for the draught, while that which flows about the fire-pot of the furnace within its case, and so to the rooms, is the outside air thus warmed. The almost *universal fact* is that some air from the cellar, as well as dust from it and the fire, is also drawn in, and thus we really have cellar air. We have thus, for instance, in parts of the State, detected the sweet potato odor throughout the entire house. Peppermint or other diffusable odor scattered about the cellar is quite sure to be perceived wherever the heat goes. This is but the telltale as to the air we are breathing. While no effort should be spared to make the furnace inclosure tight, it is well to keep the celler so thoroughly clean and aired that its air will do no harm. While, as a rule, house-cleaning is better done in farmers' homes than in the city, the cellar cannot be considered well kept that has not all of its contents—barrels, boxes and all—turned out of doors each year for emptying, airing, scrubbing and assorting.

Ventilation is often a difficult matter in country houses because of the expense of artificial methods. The chimney can always be made valuable for this purpose. If there is a fire-place, even if closed by a fire-board, it allows some upward draught whenever there is warmth in any part of the chimney. Houses should, as far as possible, be built with fire-places, even where they are not to be used for fires. An opening in the chimney near the ceiling, to which a valve fixture is attached, is often of service. For the fires, and even the warm weather, usually cause an upward draught, so that there is little danger of smoke being driven out, while a good amount of foul air is carried off. These may be arranged to work automatically or to admit of closure when desired.

When, on account of draught or cold, it is impracticable to ventilate through an open door or window, it is well to have a movable strip of wood of the same length and thickness as the lower piece of the lower sash, and three or four inches wide, which can be put in just under it. This separates the sashes midway up, and allows a current of air to enter with an upward direction. There are few days or nights that the sitting-room or sleeping-room will not bear this simple arrangement, which any farmer can put in himself. The wood-piece should be made to fit closely, and may have, if need be, a strip of rubber on its upper side. If the window is wide, the board may be cut in two and have an intermediate hinge so as to be a little more easily placed. A wire screen, while letting in air, helps to prevent draught, and so may be of use.

Some such arrangements are much needed in most country houses. For, although there is good air in the open country, in the sitting-room or in other rooms where the family congregates closely, there is often a good deal of vitiated air, which is no better for farmers, their wives or their children, than for other people.

There are some matters as to the *exercise* of farmers, and as to their foods and their habits, that need consideration. While it may seem as unnecessary to advise a farmer as it would be a letter-carrier to take exercise, yet farmers or their children do suffer a certain lack of physical training. By their forms of work, and especially by their sitting postures, more of this class than should become round-shouldered and lack breadth of chest in proportion to their general size. Fatigue, their mode of riding in wagons, and their gathering around the fire or the table at night, incline to this posture. So a dumb-bell exercise or a calisthenic exercise, which expands the chest, is not absurd for farmers' children. At least there is need of attention to form and posture.

Farmers are exposed much to alternations of temperature. It is not only the exposure of market days or the necessity of being out amid varying temperatures, and sometimes in rain and fog. Miasms tend toward the ground as readily about houses on level surroundings as they do about marshes. A man may be at work with impunity in malarious places or impure air in the daytime without harm, yet he and his family suffer at night from tarrying long on the piazza or sleeping in the lower rooms of the house.

The body, also, sometimes suffers other alternations and alterations from undue heating or toasting alongside the comfortable fire at night, or by bed-clothing out of all proportion to the covering of the day. We once knew a farmer who never went close to the fire because he said he liked to learn to be comfortable out of doors as well as in.

Both houses and clothing are our attempts to adjust ourselves to our surroundings, but as nature has already done so much toward adjusting itself to our needs, we are to follow out this idea of adjustment. We may endure tonic coldness, but it is never healthy to remain chilly.

As to *foods and their uses* there are some cautions needed by farmers' families. The ready supply and the ready appetite are often temptations to excess. All the more because there are special periods of abundance. Amid a farming population there are three periods when the farmer's family can be counted on as patrons to the physician or as moderately out of health. These are the house-cleaning period, the ripe-fruit period, and the hog-killing period. All of these are thoroughly consistent with good health, since housework, ripe fruit and pork are all healthful. But excess of work, the over-indulgence, especially of children, in eating fruit to excess and at all hours, and the sudden influx of fat meats three times a day, are not without results.

We are not advocating over-precision of rules, for food is a relative thing, and there are days of toil when four meals are needed as much as three meals on other days. But we have seen too many cases in which the digestive powers and general health of country children have been impaired by the frequent piece-meals and the promiscuous crunching of apples, pears, melons, nuts, &c., at all hours of the day and evening.

Rapid eating, too, is very common at the farmers' table. Eating should be one of the most deliberate, orderly and enjoyable acts of life, and to this end should be the first process of training to which the young are subjected.

The many improvements in apparatus for cookery have put steamed vegetables, broiled, roasted and boiled meats within the reach of most, so that the dyspepsia of middle life once so common among farmers need not now be frequent. While it is recognized that the lives of farmers and their families have a better average than most other lives, when we consider the special advantages of country life, and the additional aids as to hygiene now furnished by science and art, there ought to be a far less number of deaths among the growing families of our farm population, and a greater longevity among heads of families. It is too noticeable that typhoid fever, diphtheria, dysentery and other disorders of the digestive tract frequently occur in well-located farm-houses. The loss of productive labor and of productive character which the country at large sustains by the abbreviated lives of the rural population is greater than that from any other source, just because these are the most valuable lives. The foundations for all kinds of industry must be sought by giving stamina, vigor, endurance and long lives to the country populations. To this end they must take care of their own health and their surroundings, and must be aided by good Health Boards and the diffusion of knowledge. Thus their own happiness and prosperity are promoted, and they and their families add greatly to the best citizenship of the State.

CIRCULAR LXIV.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

DISINFECTANTS, AND HOW TO USE THEM.

TO HOUSEHOLDERS, BOARDS OF HEALTH, CITY AUTHORITIES, ETC.

I. *Look to the Condition of your House.*—Begin at the cellar or basement. Have nothing there that can decay or that causes foul odors. If damp, let in the air or sunlight, or drain the surroundings if needed. Each spring remove from it into the open air all boxes, barrels and everything movable. Thus the entire surface can be examined. Often dirt and mould accumulate on barrels and boxes and they need to be scrubbed. If by cleansing, by whitewash or by repeated airing there is not agreeable air, speedily use some of the disinfectants recommended.

II. *Look to the Kitchen.*—Let all sinks be kept sweet by scrubbing—by hot water poured down each day, or by use of disinfectants if needed. If outside there is an opening to the air, so that the kitchen sink is not the chief air outlet to a cesspool or sewer, so much the better. Be careful that all slops or offaling from the kitchen or laundry work are soon conveyed away, or disinfected at once, and not made to become a part of any heap or mass of impure matter. Cleanness cannot come out of uncleanness. Such things rapidly vitiate air, and discomfort, sickness or death results. Dirty water of any kind is even worse than dry filth. Secure cleanliness if you would secure health.

III. *Have the Dwelling and Sleeping-Rooms well aired each day.*—Closed closets, unshaken bed-clothing, windows open and curtains down, will not secure rooms fit to live in, or sleep in. *Flush* the room with air, and let this, with sweeping and dusting, remove the organic particles which otherwise constantly accumulate and cause foulness. Chamber slops and wash-water are very innocent if cared for within eight hours, but soon after decompose. If there are water-closets or stationary wash-basins in your house, be sure that they are not the foul-air inlets to outside cesspools or sewers. Have good traps, good outside ventilation, good caution as to smells, and use disinfectants for temporary purposes until you can remedy radical defects. Look to unoccupied rooms and the attic, so that all may be dried and well aired, and that you may secure as much coolness and ventilation above you as possible, and not have an unventilated hot-air chamber near the roof.

IV. *Know as far as you can that your Water or Ice-Supply is Pure.*—Use no water from wells where surface soil is foul or where organic matter can reach, or from cisterns exposed to foul air, as water will absorb foulness. Guard against the washing of any utensils about the well. It is, or ought to be, the *safe* in which you store up good water. If the water has any odor while heating in a glass tube, or if it becomes turbid or emits odor on being shaken, after being kept a day in a long glass bottle, half full and corked, at once suspect it. If you must use it, have it boiled, and when cool air it by pouring from one pitcher to another, and use it thus until you can be satisfied as to the purity. (See Circular on Water-Supply.)

V. *See that the Food Supplied for your Family* is in proper condition before cooking, and that it is prepared in a wholesome way. Any food taken to the sick person and not consumed should not be taken by others, but thrown away. So as to water long standing in the room. All dishes, spoons, &c., used in the room should be carefully cleansed either in boiling water or a disinfecting solution.

VI. *Look to the Out-door Part of your Home and see that it is kept in Proper Order—that no waste-water or decomposing matters are thrown upon it.*

If there is a cesspool it must not smell where it is disconnected with the house or has access to the air. If it does, it must be disinfected until radical change can be made. If there is an ordinary outdoor privy have free access of air to it, and exclusion of all slop or rain-water from it. If there is odor from it, use odorless disinfectants until it is corrected. If too foul for use, cover it over with "calx powder," and have under the seats some receptacle, such as the patent pail, or a half-barrel or tub, which can be frequently removed and alternately replaced by another. A privy built above ground, with water-tight receptacle, by the use of dry earth, powdered wood charcoal, dry sifted ashes and occasionally copperas-water, is easily kept neat and clean if cleansed each spring and fall. (See Circular LXI.)

Country homes need inspection and circumspection. Their sanitary care is often greatly neglected by nice people.

VII. *Insist that your Town, if you live in one, has Thorough Sanitary Inspection.* Where persons are housed closely to each other there cannot but be evils from which the community has a right to be protected, and yet from which each one cannot protect himself. There will be householders who, from thoughtlessness, ignorance or poverty, do not secure for themselves or for others the needed sanitary conditions. Society, the public welfare, and the necessary incidents of city life require regulated and definite provisions against all those nuisances which imperil the life and health of the populace.

Insist upon systematic prevention, instead of waiting for that loss which disease always involves when it is artificial or when we are compelled to meet an epidemic hurriedly.

If your authorities do not act, move by voluntary associations, which shall exhibit the facts and so compel action.

There is no waste so great as that of preventable disease, which disables not only the sufferers, but puts a tax on labor, capital and life much more direful than a well-directed expenditure to prevent it. Epidemics are to be dreaded, but our greatest losses are from the ordinary death and sickness-rate which has a permanent base of supply in prevalent insanitary conditions, not prevented, not remedied as they should be and can be. Public health is common wealth. Can you not do something to reduce the tax levy which avoidable diseases impose upon the citizens of your city, township and State? To the degree that sickness or invalidism is unnecessary, it means hard times and ill-content. Every motive of comfort and interest requires that we plan to prevent all those ailments which are within the range and duty of our control.

DISINFECTANTS, AND HOW TO USE THEM.

Drafts of air for all floating foulness;

Dry rubbing for all easily-detached foulness;

Wiping and water scrubbing for all attached foulness. These, in most cases, admit of no effective substitution.

Submersion in boiling water is applicable to the cleansing of all garments, utensils, &c., admitting of such a method; and dry boiling heat or freezing cold will also neutralize all loose infective particles.

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 in each room on an iron plate or 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. Three pounds 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 six hours after the burning has ceased, and then air well four hours before occupying. Clothing and bedding needing disinfection may be hung on lines and left in the room. Soiled clothing may need burning. In contagious diseases all articles used about the sick should be put in boiling water or in some disinfectant solution before removal from the room. Most furniture is not permanently injured, but needs dry wiping and then washing off afterward.

CHLORIDE OF LIME.

A valuable disinfectant, chiefly because, if good, it contains at least 25 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.

When used in solution to receive discharges it should be in the proportion of four ounces to a quart of water, enough being used to cover the material a half hour before emptied. If to be used over the surface of masses of organic material or in privy vaults, it may be mixed with common land plaster in the proportion of one part of the former to eight of the latter.

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.

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. An excellent similar solution is now in the market (Squibb's Chlo. Soda Solution.)

THE METALLIC DISINFECTANTS.

There are several of these.

The Mercuric Chloride, generally called Bi-chloride of Mercury or Corrosive Sublimate, is a most valuable disinfectant. It dissolves in sixteen parts of cold water and about three of boiling water. The addition of equal parts of muriate ammonia makes it as soluble in cold water as in boiling water and does not impair its action. It is inexpensive and effective. It does not color articles placed in it or injure their fibre. If freely used it may cause some colors to run or blankets and flannels to spot. It is safe to handle and harmless unless swallowed. As it is a corrosive poison, it needs to be used by cautious or experienced persons. The usual solution is two drams to a gallon of water. Coloring it with a little indigo prevents mistaking it for water. It may be colored by adding an ounce of sulphate of copper (blue vitriol) to each gallon of water, and this also increases its efficiency.

Solution of corrosive sublimate should not be placed in metal receptacles, but in some form of stone pot. The action of solution of mercuric chloride on lead pipes is corrosive if continued long.

Cupric Sulphate—sulphate of copper (blue vitriol) is used with excellent effect in from five to twenty per cent. solution. One pound to a gallon of water is a usual proportion.

Zinc Chloride—chloride of zinc (butter of zinc) also has valuable disinfecting properties, and can be used in the same proportion as the former.

Sulphate of iron (green vitriol) and sulphate of zinc (white vitriol), while admitted to have value as disinfectants, are claimed by some as not reliable in those cases in which disease is due to or complicated by the presence of specific or pathogenic organism. They are valuable for the disinfection of cesspools, privy vaults, &c. The ferric sulphate, sulphate of iron (copperas), two pounds to a gallon of water, is available.

Carbolic Acid is valuable as an out-door disinfectant, to be added to the sulphate of iron solution or used separately. Because of its own odor we cannot well test its effect in correcting other smells. We should test specimens or use only Squibb's Liquid, No. 1, because sure of its strength, to be diluted by adding from fifty to one hundred parts of water according to the mode of its employment. It is seldom required if the other articles named are properly used. Carbolic acid and chloride of lime must not be used together.

Lime, plaster, charcoal, dry earth, sifted ashes, all of these have value, chiefly to be tested by the rapidity with which they correct odors. Fresh-slacked 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.

Quicklime and ground plaster should not be used where they may be washed into pipes and form lime soap or obstruct by hardening.

In Circulars XLIV. and XLV. are additional suggestions. We append hereto the principal recommendations of the Committee on Disinfectants of the American Public Health Association, 1885–7, as to agents preferred by it and the modes of their use.

FOR EXCRETA.

(*a*.) In the sick-room:

For spore-containing material—

1. Chloride of lime in solution, 4 per cent.
2. Mercuric chloride in solution, 1 : 500. (Colored.)

In the absence of spores—

3. Carbolic acid in solution, 5 per cent.
4. Sulphate of copper in solution, 5 per cent.
5. Chloride of zinc in solution, 10 per cent.

(*b*.) In privy vaults:

Mercuric chloride in solution, 1 : 500.*

(*c*.) For the disinfection and deodorization of the surface of masses of organic material in privy vaults, &c.:

Chloride of lime in powder.†

FOR CLOTHING, BEDDING, ETC.

(*a*.) Soiled under-clothing, bed-linen, &c.:

1. Destruction by fire, if of little value.
2. Boiling for at least half an hour.

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*A concentrated solution containing four ounces of mercuric chloride and one pound of cupric sulphate to the gallon of water is recommended as a *standard solution.* Eight ounces of this solution to a gallon of water will give a dilute solution for the disinfection of excreta, containing about 1 : 500 of mercuric chloride and 1 : 125 of cupric sulphate.

†For this purpose the chloride of lime may be diluted with plaster of paris, or with clean, well-dried sand, in the proportion of one part to nine.

3. Immersion in a solution of mercuric chloride of the strength of 1 : 2,000 for four hours.*

4. Immersion in a two per cent. solution of carbolic acid for four hours.

(*b*.) Outer garments of wool or silk, and similar articles, which would be injured by immersion in boiling water or in a disinfecting solution :

(1.) Exposure to dry heat at a temperature of 110° C. (230° Fahr.) for two hours.

(2.) Fumigation with sulphurous acid gas for at least twelve hours, the clothing being freely exposed, and the gas present in the disinfection chamber in the proportion of four volumes per cent.

(*c*.) Mattresses and blankets soiled by the discharges of the sick :

1. Destruction by fire.

2. Exposure to super-heated steam—25 lbs. pressure—for one hour. (Mattresses to have the cover removed or freely opened).

3. Immersion in boiling water for one hour.

4. Immersion in the blue solution (mercuric chloride and sulphate of copper), two fluid ounces to the gallon of water.

FURNITURE AND ARTICLES OF WOOD, LEATHER AND PORCELAIN.†

W... ...eated, with :

3. Mercuric chloride, 1 : 1,000; recommended only for the hands, or for washing away infectious material from a limited area, not as a bath for the entire surface of the body.

FOR THE DEAD.

Envelope the body in a sheet thoroughly saturated with:

1. Chloride of lime in solution, 4 per cent.
2. Mercuric chloride in solution, 1 : 500.
3. Carbolic acid in solution, 5 per cent.

FOR THE SICK-ROOM AND HOSPITAL WARDS.

(*a*.) While occupied, wash all surfaces with:

1. Mercuric chloride in solution, 1 : 1,000 (the blue solution containing sulphate of copper may be used).
2. Chloride of lime in solution, 1 per cent.
3. Carbolic acid in solution, 2 per cent.

(*b*.) When vacated:

Fumigate with sulphur dioxide for 12 hours, burning 3 pounds of sulphur for every 1,000 cubic feet of air-space in the room; then wash all surfaces with one of the abov

Chloride of Lime (in bulk), 3½ cents per pound; in packages, 6 cents.

Solution of Chlorinated Soda (Labarraque's), 10 cents a pound.

Sulphur Roll, 2½ cents per pound.

Carbolic Acid (No. 1 Squibb's), 30 cents per pound.

CIRCULAR XL. (NEW ISSUE.)

(INDUSTRIAL CIRCULAR NO. I.)

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

HEALTH COUNSELS FOR WORKING-PEOPLE.

In the work of examination into various industries, with a view to determining their effect on the health and vigor of those employed in them, and upon their families, there are many points of inquiry which must be left to the judgment of the examiner.

The design of this circular is to suggest the outline of the work [illegible] as the need of each special industry

(*a*) Confined and foul air.
(*b*) Elevated or variable temperatures.
(*c*) Over-use of certain organs.
(*d*) Constrained positions.
(*e*) Sedentary life.
(*f*) Exposure to accidents.

While there are questions of importance as to cultivation of the soil and as to laborers with no special trades, since fitness of clothing, changes of climate, protection from accident, and cleanliness of the skin throughout, also concern these, yet the most important questions are those that relate to such as follow in-door occupations, or where the character of the labor causes dust and especially irritating substances to be infused into the breathed atmosphere. The conditions as to light, moisture and relative heat are also very important.

As all these are involved in the subjects of (I.) Personal Sanitation, and (II.) Factory and Workshop Sanitation, they are best classified under these.

The principal subjects as to personal sanitation are those of (*a*) frequent cleansing and rubbing of the entire skin, (*b*) good food, (*c*) clothing suited to varying temperature and degrees of moisture, (*d*) the supply of air of proper purity, and (*e*) pure water.

II. Factory and Workshop Sanitation includes the following particulars:

(*a*) The location of buildings and their foundations

The following outline will serve as a guide to observation and inquiry:

I. The sanitary condition of the place of labor; its locality, construction, drainage, facilities for light and air, water, heating, fire-escape, provisions for the removal of all wastage or material injurious to health; its *housekeeping* in the interest of cleanliness and comfort; modes of preventing or of reducing to a minimum all effluvium nuisances; of preventing dust, or so removing it by fans or sprinkling as to diminish its inhalation; modes of protecting from accident by machinery, or from irritating material used in the occupation; modes of supplying a sufficient amount of fresh air without draught, both in summer and winter; also arrangements for washing, dusting, &c., and sanitary inspection.

II. The sanitary conditions of the persons employed in each department; their general habits as to sleep, cleanliness, tobacco and alcoholic drinks; the kind of food and arrangement of meals; how far some head-covering or some overall is used to protect self and clothing from dust; the evidences of good or ill health as afforded by appearances and by the personal testimony of the person or of friends; the effect of the work on heredity, as also whether those whose parents or grandparents have pursued the same occupation inherited a reduced physical stamina; the amount of time lost by sickness; what complaints are most incident to the work; *tables of mortality* showing the actual deaths of those employed, or of those who had left the employment on account of ill health. Give age, sex and cause of death, &c., as in usual certificate.

III. The mode of pursuing the occupation; specifications of its various departments and the evils special to each, and the best methods of protection therefrom, and those actually used; the period or duration of labor. Is it night work alone, or conjoined with day work? are both males and females employed? if so, are all arrangements fitted for proper separation? is there piece-work? what portion of the work is proper for children, and for those of what age, sex or strength, and how long should they be employed in it? constrained or injurious positions in work; what arrangements for change of position or to economize strength and avoid fatigue; the income of various workers, so as to know how far it is a sufficiency without other extra labor or family help; what proportion of the adult workers, either male or female, are married; what the condition of the houses in which workmen live.

It would be impossible in one circular to treat of all these, but competency in the care of factories and workshops, and of those employed in them, requires a recognition of all these, and a good degree of acquaintance with plans and methods that have been devised to secure the best conditions.

What needs most to be known is that nearly every trade and occupation has been well investigated in its relation to disease and to health. Most of the offensive trades and occupations admit of great improvement.

Such a bibliography as that furnished in the second volume of Buck's Hygiene and Public Health shows how much writing, experiment and application have already been secured. Dr. Ballard's reports to the Local Government Board are full of information as to many hazardous occupations.

Thwaite's Treatise on Factories, Workshops and Warehouses (1882) is valuable. The prize essay of George H. Ireland, mechanic, of Springfield, Mass., as published by the American Public Health Association, 1885, is the most recent and important American essay on the subject.

Many valuable articles on various industries will be found in our State Reports. We make the following references thereto:

Report of the New Jersey Sanitary Commission (1886), pp. 9, 11.

Report of the New Jersey Health Commission (1874). Care of Tenements, Arts and Trades, pp. 33–38.

Second Report of the New Jersey State Board of Health (1878). Offensive Trades, p. 12.

Hatting as Affecting the Health of Operatives (Dennis), pp. 67–85.

Third Report (1879). Noxious Trades, pp. 13, 126.

Fifth Report (1881). Smoke Nuisance, p. 23; Operatives' Consumption, pp. 248–50.

Sixth Report (1882). Offensive Trades and Health of Operatives, pp. 18, 24.

Seventh Report (1883). Trades and Occupations (Hunt), pp. 160–170, 35, 129, 271.

Eighth Report (1884). Tenement Houses (Janes), pp. 53–63; Effluvium Nuisances, pp. 17–21; Occupations, p. 292.

Ninth Report (1885). Tenements, pp. 45, 61, 96.

Tenth Report (1886). The Hygiene of Occupations (Stickler, Newton, Davis, Hunt), pp. 157–200.

Eleventh Report (1887). Hygiene of Occupations (Warman), &c.

Copies of this Circular and of Circular (2), Health Counsels for Working-People, and the other Circulars, can be had on application by postal to Ezra M. Hunt, M.D., Secretary.

Trenton, N. J., 1888.

MEDICAL REGISTRY.

By the laws of this State every person practicing medicine or surgery in this State is required to file a medical diploma showing the fact, the date and the place of graduation, or to file a certificate of practice in one locality of at least twenty years. Only a diploma from a chartered medical college, and only the certificates of those who have practiced in one locality in the State, are to be thus filed.

The law is founded upon the right of the public to know that those who claim to have knowledge and skill for the treatment of disease, should be able to show some evidence that they have been educated in so critical and responsible an art. Life and death are its concerns, and the State owes it to itself somehow to protect its citizens from the trifling either of ignorance or presumption, with the health and the lives of those who seek medical aid. Many States require, in addition to this, the approval of some State Examining Board. There seems to be some occasion for this, when we find medical colleges often run as stock corporations for money-making, and professors in them who never could have passed a creditable examination at one of our best medical colleges. While many new and excellent medical men settle in this State, it is becoming noticeable that we are receiving more than our quota from colleges not regarded as well equipped for instruction. While the law does not need to discriminate between the medical sects of practitioners, it does need, alike in the interests of all well-educated physicians, and of the public, to discourage whatever is riskful to the general health of the people. There are no greater perils to the public health than incompetent physicians. Alike in the interests of physicians and patients this registry should be fully insisted upon, and due examination be made of all diplomas registered.

ATLANTIC COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCALITY.
Cohen, F. P W............	Atlantic City......	Mar. —, '81	Academy Baltimore, Balt.
Campbell, Sidney A.......	Mays Landing.....	——— —, '69	Jefferson College, Phila.
Demille, Sherman.........	Jeffries.............	Mar. —, '87	——— ———, Baltimore
Harvey, Chester W........	Atlantic City......	Mar. 1, '75	Columbia College, N Y.
Heilbrunn, Abraham......	Atlantic City......	Aug 26, '57	Berlin University, Germany.
James, Henry Carroll.....	Mays Landing.....	Mar. 8, '87	University of New York.
Nice, Benj H..............	Atlantic City......	Mar. —, '77	Jefferson, Philadelphia, Pa.
Waas, Jacob A......	Hammonton	Mar. 2, '83	Penna. Col. Dental Surgery.
Woods, Robert A..........	Atlantic City......	Feb. 23, '82	Univ. Tennessee, Nashville.
Williams, Edward P......	Atlantic City......	Mar. —, '75	Columbia College, N. Y.

BERGEN COUNTY.

Best, George B............	Englewood	Apr. 15, '87	New York Hom College.
Green, William S.........	Hackensack,........	Mar. 8, '87	Univ. of the City of N. Y.

BURLINGTON COUNTY.

Burchell, John G..........	....	Apr. 27, '65	Eclec. Med. College of Pa.
Carrell, James Henry.....	Palmyra...........	....	
Dunlap, Mary J...........	Burlington	Mar. 11, '86	Pensylvania Med. College.
Follett, William M........	....	Mar. 1, '73	Eclec. Med. College of N. Y.
Fithian, Joel W...........	Burlington	Apr. 5, '87	Jefferson College, Phila.
French, Edward E........	Bordentown	Apr. 7, '87	Hahneman College.
Harris, William H.........	....	....	
James, Henry C..........	....	....	
Siggins, J. J...............	....	Mar. 2, '85	Michigan College of Med.
Vannort, Joseph A........	Palmyra............	Apr. 2, '87	Jefferson Medical College.
Woods, Robert F.........	Mount Holly......	Feb 23, '82	University of Tennessee.

CAMDEN COUNTY.

Woods, R. A...............	Philadelphia, Pa...	Feb. 23, '82	University of Tennessee.
Snyder, Sharps M.........	1126 Broadway ...	Mar. 16, '65	University of Pennsylvania.
Ginner, Samuel G.........	....	——— —, '85	Dundic Univ. of Lewistown.
Tait, Alexander...........	....	Mar. 10, '75	Hahneman.
Hinson, J. M.............	....	Mar 31, '86	Hahneman.
Hall, Henry M............	....	June 23, '60	Castleton, Vermont.
Du Pont, Wilfred..........	....	Mar. 15, '58	Med. Col. of State of S C.
Howell, Aaron............	....	Apr. 5, '87	Jefferson Med Col., Phila.
Fortiner, George R.........	....	Apr. 7, '87	Hahneman Med Col., Phila.
Cooper, C. J..............	....	Feb. 18, '68	Hom. Med. College of Pa.
Bennett, John Knight....	....	Apr. 5, '87	Jefferson Medical College.
Blair, Edmund C.........	....	Feb. 6, '82	Wisconsin Dental College.
Doron, John G............	....	May 2, '87	University of Pennsylvania.
Mercer, Edward W.......	....	Apr. 2, '81	Hahneman.
Burchell, John Gale.......	....	Apr. 27, '65	Eclectic.
Johnstone, Robertus B...	....	Apr. 6, '87	Hahneman.
Turner, Benjamin H.....	....	Mar. 17, '59	Pennsylvania Med. College.
Collins, William T.......	451 Kaighn's Av..	Mar. 7, '57	Jefferson Med. College, Pa.
Lamb, Albert Victor.....	....	Apr. 2 '85	Jefferson Med. College.
Jarrett, Henry............	....	Apr. 5, '87	Jefferson Med. College.

CAMDEN COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCATION.
Edwards, Charles E.		Feb. 26, '70	Penna. Col. of Dental Surg.
Reese, Leolf		Mar. 14, '82	Medico-Chir. College.
Hoverder, J. I.	Atco	Apr. —, '84	Hahn. Med. Col. Phila., Pa.
Dewey, R. P.		June 20, '70	Eclectic Med. College of Pa.

CAPE MAY COUNTY.

Rice, Daniel E.	Philadelphia, Pa.	Apr. 4, '75	Penn Med. Univ. of Phila.

CUMBERLAND COUNTY.

Martin, William Nelson	Vineland	Jan. 1, '70	Eclectic Med. College of Pa., Philadelphia.
Appelgate, John Chew	Fairton	Apr. 5, '87	Jefferson Med. College, Phila.

ESSEX COUNTY.

Brien, Margaret J.		——, '87	Med. Electrician (no diploma, filed certificate).
Bailey, William Otto		Mar. 21, '87	Med. Eclectic College of N.Y.
Belvimger, Marie		Dec. 30, '86	Columbia Col. of Midwifery.
Babbitt, George Edward		June —, '86	Eclectic College of Penna.
Banning, Archibald T.		——, '73	Col. Med. & Surg., Cincinnati.
Bradner, W. K		Oct. 1, '75	Bellevue College, New York.
Damon, S J.		Dec. 26, '76	American Health Col., Cin.
Disbrow, William		Mar. 8, '87	University of New York.
Ludwig, De Ulrichs Carl.		May 12, '86	Ludivico College of Bavaria.
Egerton, Margareta A.		Jan. 24, '81	Erlangen College.
Evarts, Lucy S.		Apr. 6, '86	Med. & Eclectic Col. of N.Y.
English, D. E.		May 16, '82	Col. of Phys. and Surg., N. Y.
Page, Edwards Thomas		Mar. 7, '85	Univ. Med. College, N. Y.
Fitch, Simon Thomas		Mar. —, '67	Bellevue Hosp. Med. College.
Gardette, E. B.		——, '81	Philadelphia Med. College.
Gage, Ruel Stearn		Mar. —, '77	University of New York.
Holper, George		Aug. 4, '86	Royal Bavarian Julius Maximilian University, Wurzburg.
Hayward, Maria Ann		Mar. —, '83	U. S. Med. Col., N. Y. City.
Hahn, Albert Johan		June 25, '85	Dartmouth Medical College.
Hundsen, Harriette L.		——, '87	Hahneman Med. Col., Phila.
Keene, Stephen S		Mar. 26, '35	University of Pennsylvania.
Mattison, John V.		Mar. 27, '46	Col. of Phys. and Surg, N.Y.
Middlebrook, E.		Mar. 27, '81	Col. of Rational Med., Mich.
Meyers, F. L		Mar. 14, '87	Bellevue Hosp. Med. College.
Newmann, Theodore		Feb. 26, '84	University of Buffalo.
O'Reilly, J. H.		Mar. 14, '87	Bellevue Hos. Med Col., N.Y.
Pennington, W		Mar. 9, '66	University of New York.
Potter, Lorenzo Tucker		Mar. 30, '80	Chicago Medical College.
Roy, William Chester		Mar. 28, '87	Eclectic Med. Col, Chicago.
Schwarz, Emanuel		Mar. —, '87	Univ. of the City of N. Y.
Stubbert, James Edward.		Mar. 8, '81	Univ. of City of New York.
Simpson, Cornelia S.		Apr. 3, '83	Med. Col. for Females, N. Y.

ESSEX COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCATION.
Strang, George William...	....	—— —, '85	Collegii Medici Coloolivi Noui Charari.
Tiesler, Eugene............	....	Mar. 19, '87	Eclectic Med. College of N. Y.
Thayer, Alfred T...........	....	Apr. 14, '87	Homœopathic Col. of N. Y.
Vogel, Henrietta...........	....	May 30, '87	Col. of Midwifery of Heidelberg, Germany.
Wait, George Nelson......	....	Mar. 14, '—	Bellevue Hosp. Med. College.
Woods, R. A.	....	Feb. —, '82	Med. Col., Nashville, Tenn.
Washington, Walter Scott	....	Apr. 30, '76	Collegium S.S. Trumtatis apud Torontovenses.
Wittmann Aloisia..........	....	Aug. 30, '79	Royal Imp. Univ. of Prague.

GLOUCESTER COUNTY.

Hunt, Hait E...............	....	....	Eclectic Med. Col. of ——.
Hall, Henry M.............	....	.. ..	The Castleton Med. College.
Iszard, Howard............	Glassboro, N. J....	....	Hahneman Med. Col. Phila.
Diverty, Henry B.........	Woodbury, N. J...	Apr. 5, '87	Jefferson College, Phila.
Snyder, Sharps M	Clarksboro, N. J...	Oct. 6, '87	University of Pennsylvania.
Siggins, John J.............	....	Mar. 2, '87	Michigan Col. of Medicine.

HUDSON COUNTY.

Aldridge, Matilda H......	Jersey City.........	....	Female Medical Academy of City of New York.
Allen, Charles S............	New York..........	....	United Med. Col., New York.
Dean, George W............	New York...........	—— —, '62	Metropolitan Med. College.
Doherty, John William...	....	....	University of Vermont.
Deems, Francis M.........	....	—— —, '68	
Bailey, William Otto......	Newark, N. J......	Mar. 21, '87	N. Y. Eclectic Med. College.
Cox, Stephen................	Jersey City.........	Mar. 2, '87	Medical College of Indiana.
Follette, William Mann ..	Jersey City.........	Mar. 1, '83	Eclectic Medical College of City of New York.
Flower, Richard C.........	....	Apr. 30, '80	Amer. Health College, Cin.
Foerster, Francis...........	New York...........	—— —, '83	Col. of Phys. and Surg., N. Y.
Grinnell, Adaline S........	Jersey City.........	—— —, '85	N. Y. Med. Col. for Women.
Green, Alfred F............	....	Mar. 3, '85	Medical College, Atlanta, Ga.
Geyer, Victor...............	....	....	Freiburg Univ., Germany.
Herzog, Alfred	Hoboken............	Mar. 8, '87	University of New York.
Harding, William L......	....	Mar. 9, '60	University of New York.
Hayward, Maria Ann....	....	Mar. 9, '83	U. S. Med. Col., N. Y. City.
Kaemmerer, Charles	Hoboken............	Mar. 10, '75	University of New York.
Lingshem, Anna M........	....	Dec. 30, '51	Pennsylvania Med. College.
Muttart, Alder C..	....	Mar. 8, '87	Univ. of the City of N. Y.
Meeker, George F	....	Feb. 7, '76	New York Eclectic College.
Newell, Jennie W	....	Apr. 19, '87	Female Medical Academy of City of New York.
Nichols, Harry F..........	Hoboken............	Nov. 3, '87	New York Hom. Med. Col.
Nelden, Andrew L.........	....	May 18, '87	New York Hom. Med. Col.
O'Sullivan, Patrick W...	....	Mar. 8, '87	Univ. of the City of N. Y.
Pyle, William L............	....	May 2, '87	University of Pennsylvania.
Paddock, Nathan J........	....	Mar. 12, '79	University of New York.
Radue, William F.........	....	July 16, '87	University of New York.
Schierholz, E. C. F. G. E.	....	Mar 9, '82	University of New York.
Strong, George W.........	....	Mar. 1, '82	Eclectic Medical, New York.

HUDSON COUNTY—Continued.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCATION.
Snyder, Charles F.		May 18, '87	Hom. Med. Col., New York.
Schindeler, Theodore		Apr. 30, '70	Univ. Griefswold, Germany.
Thomas, Julian P.		Mar. 1, '87	Med. University of Georgia.
Whalley, Thomas		Apr. 80, '55	Royal Col. of Surg., Eng
Giegenhorn, Otto		July 4, '86	Univ. of Berne, Switzerland.

HUNTERDON COUNTY.

Apgar, Francis Asbury	New Germantown.	Mar. 1, '76	Col. of Med., Bellevue Hosp.
Garvin, William D.	Clinton	Apr. 30, '85	Hahneman Med. Col., Phila.
Seip, George W.	Reading, Pa.	Mar. 8, '62	Jefferson Med. Col., Phila.

MERCER COUNTY.

Woods, Robert A.			Tennessee Univ., Nashville.
Bunn, Lucilla L.			Phila. Ins. Electropathical.
Hollingshead, Emily F.			Hom. Hospital College, Cleveland, Ohio.
Kelly, Edward			Baltimore University, Balt.
Brown, Carolus C.			Curators' Col. Medica, Phila.
Latta, Sam'l Whitehill			Pennsylvania Univ., Phila.
Adams, Charles Franklin.			Jefferson Med. Col., Phila.
Worthington, Henry R.			Media College, Phila., Pa.
Burchell, John Gale			Eclectic Med. College, Pa.
King, Joseph H.			Eclectic College, Phila., Pa.
Baily, Edgar C.			Pennsylvania Univ., Phila.

MIDDLESEX COUNTY.

Cronin, Joseph J.	South Amboy	Apr. 2, '85	Jefferson Med. Col., Phila.
Lippincott, Franklin B.	New Brunswick	Mar. 10, '64	Jefferson Medical College.
Shotwell, William S.		Mar. 6, '85	Univ. of the City of N. Y.
Woods, Robert A.		Feb. 23, '82	University of Tennessee.
Whitford, Myron J.		Mar. 2, '83	Ill. Col. of Med. and Surg.

MONMOUTH COUNTY.

Burton, Asher S.		Feb. 25, '87	Philadelphia Dental College.
Baruch, Simon		Mar. 5, '62	University of Virginia.
Baker, George H.		Mar. 3, '86	Medical Col., Albany, N. Y.
Bennett, John W.		Apr. 6, '87	Medical College, Phila.
Cary, Cora E.		Feb. 23, '82	Hahneman Medical College.
Cary, George W.			Affidavit of 20 years' practice.
Chattle, Thomas H		July 15, '86	Vermont University.
Clarkson, Frederick V.		Mar. 2, '76	Col. Phys. and Surg., N. Y.
Dixon, George A.		Mar. 1, '78	Columbia Med. Col., N. Y.
Fuller, Philip H.	Eatontown	July 3, '85	Vermont University.
Griswold, William		Apr. 15, '86	Hom. Med. Col., N. Y.
Swift, Edwin E.		Mar. 13, '80	University of New York.
Scott, George		Mar. 1, '71	Bellevue Medical College.
Worthington, David J.		Mar 10, '66	Jefferson Med. Col., Phila.

MORRIS COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCATION.
Finn, Patrick McC.			Agri University of Vermont.
Flagg J. W.		Nov. —, '80	Columbia College, New York.
Miller John	German Valley	Mar. 6, '86	University of New York.
McFarlane, Andrew H.		Mar. 10, '87	Albany Medical College of Union University.
O'Reilly, John H		Mar. 14, '87	Bellevue Hos. Med. Col., N.Y.
Woodruff, Frank C.			New York Col. Med. Hosp.

OCEAN COUNTY.

Budlong, O. W.	Lakewood	Mar. —, '80	Collegii Georgiopolitani.
Griswold, William	Lakewood	Apr. 15, '86	Novum Ebor. Hom. Med. Col.
Stone, William C.		Mar. 1, '80	Bellevue Hospital Med. Col.
Wood, Robert A.		Feb. 23, '82	Nashville Medical College.

PASSAIC COUNTY.

Alderton, Henry A.		Sept. —, '84	Col. of Phys. and Surg., N.Y.
Agnew, Francis E.	Paterson	May 12, '85	Col. of Phys. and Surg., N. Y.
Atkinson, James W.	Paterson	June 2, '86	Long Island Hosp. College.
Born, Reuben Hill			Bellevue Hosp. Med. Col.
Crooks, James, Jr.	Paterson	May 18, '87	New York Hom. Med. Col.
De Baun, Edwin	Passaic	Apr. 16, '85	New York Hom. Med Col.
Doty, Edward W.	Paterson	June 2, '86	Long Island Hosp. Med. Col.
De Uling Ernestus B.	Paterson	Sept. 10, '62	University of Vienna.
Hopper, C. Percy	Paterson	Mar. 15, '83	Homœopathic Col. of N. Y.
Harrison, J. Charles	Newark	Mar. —, '83	Eclectic Med. Col., Chicago.
Jamison, Alcinous	Paterson	Feb. 11, '78	Fort Wayne, Ind., Med. Col.
McEncroe, J. F.	Paterson	May 12, '87	Col. of Phys. and Surg., N. Y.
Phelps, O. Dodge	Paterson	Mar. 6, '83	U. S. Med. College, N. Y.
Palmer, George M.	Paterson	Mar. 14, '80	Eclectic Med. College, N. Y.
Tuller, Malcolm B.	Paterson	May 10, '73	Hahneman Med. Col., Phila.

SALEM COUNTY.

Bradfute, Campe S.	Alloway	Apr. 5, '87	Jefferson Med. College, Phila.
Chavanne, Henry	Salem	Apr. 5, '87	Jefferson Med. College, Phila.
Cornell, Samuel H.	Moorestown		Affidavit of 20 years' practice.

SOMERSET COUNTY.

[No Medical Diplomas filed in 1887.]

SUSSEX COUNTY.

Morrison, Ephraim	Newton	Mar. 1, '75	Col. of Med., Bellevue Hosp.
Straley, Sidney B.	Andover	Mar. 15, '87	Col. of Phys. and Surg., Balt.

UNION COUNTY.

NAME OF PHYSICIAN.	P. O. ADDRESS.	DATE OF DIPLOMA.	INSTITUTION CONFERRING DIPLOMA AND LOCATION.
Bridgeman, Geo. Herbert	Elizabeth	June 29, '81	Medical School of Harvard Univ. of Massachusetts.
Damon, S. James..........	Elizabeth	Dec. 1, '76	American Health Col., Cin.
Goelch, Augustin H.......	Plainfield	—— —, '74	Bellevue Med. College, N. Y.
Hood, Charles J............	....	....	University of Michigan.
Leary, Joanna Gaston....	Elizabeth	Apr. 30, '87	New York Medical College and Hosp. for Women.
Woodruff, Maria Louisa..	Rahway	Oct. 8, '84	Orange Memorial Hosp., N. J.

WARREN COUNTY.

Albertson, William C......	Belvidere	May 1, '86	University of Pennsylvania.
Albright, John Calvin.....	Springtown..........	Mar. 8, '87	Univ. of City of New York.
Morton, Edward K........	Belvidere	—— —, '84	Col. of Phys. and Surg., N. Y.
Vail, William H............	Blairstown	—— —, '69	Col. of Phys. and Surg., N. Y.
Beatty, Enos Edward B	Stewartsville.......	....	
Cavanaugh, James J., Jr.	Belvidere..	—— —, '84	Bellevue Hos. Med. Col., N. Y.
Eckel, P. Judson..........	Washington	—— —, '87	Pa. Col. of Dental Surgery.
Mattison, John V..........	Washington.........	—— —, '87	Col. of Phys. and Surg., N. Y.

LIST OF PRACTICING PHYSICIANS

IN THE STATE, WITH THEIR LOCALITIES BY COUNTIES AND TOWNSHIPS, AND THEIR P. O. ADDRESS.

In the constant correspondence of this office and the important relations that the medical profession bears to the public health and to the returns of Vital Statistics, it has been found necessary to secure such a registry as enables us to be aware of the localities of medical men. The list is very nearly complete, although it is probable a very few omissions may have occurred. Of any such we will be glad to be informed, or of any errors made. The particular school of practice can be ascertained by reference to the lists of registry in this and former reports. The list does not assert anything as to the individual diplomas, but is such as is furnished from the vicinity. Place of graduation or other particulars are to be found at the offices of the county clerks, as by law every one who, for any time, practices medicine in this State, must *file* a copy of the diploma from a regularly-chartered medical college in the county where the settlement is made, or a certificate of twenty years' practice in one locality.

ATLANTIC COUNTY.

NAME.	P. O. ADDRESS.
TOWN OF ABSECON.	
Edward H. Madden	Absecon.
Talcot P. Waters	"
J. Kay Pitney	"
John R. Flemings	"
ATLANTIC CITY.	
L. H. Armstrong	Atlantic City.
A. W. Baily	" "
Wm. Bennett	" "
Geo. W. Crosby	" "
Rebecca Hallowell	" "
Chester W. Harvey	" "
Phillip Marvel	" "
Mary Miller	" "
John C. Purcell	" "
W. Boardman Reed	" "
Eugene S. Reed	" "
ATLANTIC CITY—*Con'd.*	
Lewis Reed	Atlantic City.
Thos. K. Reed	" "
Edward A. Reiley	" "
John E. Sheppard	" "
Chas. Souder	" "
Lewis R. Souder	" "
M. West	" "
Williard Wright	" "
W. M. Pollard	" "
M. D. Youngman	" "
BUENA VISTA TWP.	
(No physicians reported.)	
EGG HARBOR CITY.	
Theo. H. Boysen	Egg Harbor City.
J. U. Elmer	" " "

ATLANTIC COUNTY—Continued.

NAME.	P. O. ADDRESS.
EGG HARBOR TWP.	
J. H. North	Pleasantville.
G. S. Kirby	"
R. M. Sooy	"
S. C. Edmunds	Linwood.
J. B. Somers	"
Dr. Corson	Bargaintown.
G. De Mills	English Creek.
S. De Mills	" "
GALLOWAY TWP.	
E. M. Harris	Port Republic.
HAMILTON TWP.	
D. B Ingersoll	Mays Landing.
J. H. James	" "
S. A. Campbell	" "
E. C. Hyde	" "

NAME.	P. O. ADDR
TOWN OF HAMMONTON.	
J. W. Snowden	Hammonton.
Edward North	"
Wm. McK. North	"
Jos. H. North, Sr.	"
Geo F. Jahucke	"
Theo. G. Bieling	"
MULLICA TWP.	
H. W. Smith	Elwood.
C. G. Nichols	Green Bank.
Edward North	Hammonton.
WEYMOUTH TWP.	
(No physicians reported.)	

BERGEN COUNTY.

NAME.	P. O. ADDRESS.
ENGLEWOOD TWP.	
Daniel A. Currie	Englewood.
J. W. Terrey	"
John A. Wells	"
Hardey M. Banks	"
D. A. Baldwin	"
P. H. Morris	"
Geo. B. Best	"
FRANKLIN TWP.	
(No physicians reported.)	
HARRINGTON TWP.	
Henry A. Crary	Closter.
Lewis B. Parsell	"
Frederick Morris	Norwood.
HOHOKUS TWP.	
Dr. Elliott	Ramseys.
Chas. P. De Yoe	"
LODI TWP.	
Oliver Soper	Lodi.
Dr. Tygert	Carlstadt.
Dr. Mohn	"
MIDLAND TWP.	
(No physicians reported.)	
NEW BARBADOES TWP.	
Abm. S. Burdett	Hackensack.
David St. John	"
Geo. E. Brown	"
M. E. Russell	"
Charles F Adams	"
Wm. S. Green	"

NAME.	P. O. ADDR
ORVIL TWP.	
Chas. W. Badeau	Allendale.
PALISADE TWP.	
J. J. Haring	Tenafly.
Milton Ternure	"
J. M. Simpson	Schraalenbur
RIDGEFIELD TWP.	
Alexander Clendinen	Fort Lee.
Joseph Hueger	" "
Melancthon S. Ayers	Fair View.
William H. O. Taylor	Ridgefield.
RIDGEWOOD TWP.	
J. De Mund	Ridgewood.
Wm. Francis	"
SADDLE RIVER TWP.	
(No physicians reported.)	
UNION TWP.	
H. H. Hollister	Rutherford.
Jeremiah Phelps	"
Chas. I. Howard	"
A. P. Williams	"
WASHINGTON TWP.	
Henry C. Neer	Park Ridge.
Eugene Jehl	" "
Simeon J. Zabriskie	West Wood.

BURLINGTON COUNTY.

NAME.	P. O. ADDRESS.
BASS RIVER TWP.	
T. T. Price	Tuckerton.
C. Garrabrant	New Gretna.
BEVERLY TWP.	
A. W. Taylor	Beverly.
Edwin C. Town	"
James V. Roberts	"
J. J. Curry	"
BORDENTOWN TOWN & TWP.	
H. H. Longstreet	Bordentown.
Wm. H. Shipps	"
I. D. Young	"
Lewis Jemison	"
Ryerson Waln	"
I. S Gilbert	"
L. D. Tebo	"
J. G. L. Whitehead	"
E. S. French	Fieldsboro.
CITY OF BURLINGTON.	
Franklin Gauntt	Burlington.
J. Howard Pugh	"
Ledyard Van Rensselaer	"
Edward S. Lansing	"
Walter E. Hall.	"
F. Allen Gauntt	"
Joseph Parrish	"
Joseph Shreve	"
E. F. Rink	"
Henry Hollemback	"
CHESTER TWP.	
Samuel C. Thornton	Moorestown.
N. Newlin Stokes	"
J. C. Stroud	"
Frank Stroud	"
Geo. B L. Clay	"
Pusey Wilson	"
Alfred Mattson	"
Joseph Stokes	"
CHESTERFIELD TWP.	
Elias D. Maine	Sykesville.
Charles L. Dey	Crosswicks.
John G. L. Whitehead	"
CINNAMINSON TWP.	
Alex. Marcy	Riverton.
Dr. Hammell	Palmyra.
J. A. Vannort	"
H. B Hall	Riverton.
J. D. Janney	Cinnaminson.
DELRAN TWP.	
Alex. Small	Riverside.
Harry Weiler	"
EASTAMPTON TWP.	
(No physicians reported.)	
EVESHAM TWP.	
P. V. B. Stroud	Marlton.
E. B. Sharp	"

NAME.	P. O. ADDRESS.
FLORENCE TWP.	
Dr. Baker	Florence.
Dr. Calner	Bustleton.
LITTLE EGG HARBOR TWP.	
Theophilus T. Price	Tuckerton.
S. B. Irwin	"
E Miller	"
C. Garrabrant	New Gretna.
LUMBERTON TWP.	
(No physicians reported.)	
MANSFIELD TWP.	
R. H. Page	Columbus.
D. G Van Mater	"
A. C. Haines	"
A. H. Patterson	Georgetown.
W. L. Woodruff	Columbus.
MEDFORD TWP.	
Lewis L. Sharp	Medford.
Richard S. Braddoch	"
Geo. W. Van Derbrer	"
Josiah Reeve	"
MOUNT LAUREL TWP.	
Tolson B. Franklin	Masonville.
NEW HANOVER TWP.	
Amos Shaw	Jacobstown.
NORTHAMPTON TWP.	
Richard E. Brown	Mount Holly.
Walter Ward	" "
Richard Parson	" "
Charles Bispham	" "
Richard Barrington	" "
Willitt W. Whitehead, Jr.	" "
William H. Melcher	" "
William Chamberlin	" "
Samuel Caley	" "
George F. Ralston	" "
Jacob Griggs	" "
William Parry	" "
PEMBERTON TWP.	
Chas. H. Moore	Pemberton.
E. Hollingshead	"
RANDOLPH TWP.	
John C. Carry	Lower Bank.
SHAMONG TWP.	
(No physicians reported.)	
SOUTHAMPTON TWP.	
Alex. Elwell	Vincentown.
John C. Brown	"
SPRINGFIELD TWP.	
(No physicians reported.)	

BURLINGTON COUNTY—Continued.

NAME.	P. O. ADDRESS.
WASHINGTON TWP.	
Charles G. Nichols	Green Bank.
WESTHAMPTON TWP.	
(No physicians reported.)	
WILLINGBORO TWP.	
Franklin T. Haines	Rancocas.
William L. Martin	"
WOODLAND TWP.	
(No physicians reported.)	

CAMDEN COUNTY.

NAME.	P. O. ADDRESS.
CITY OF CAMDEN.	
S. Thompson Banes	Camden.
Philip W. Beale	"
D. Benjamin	"
Howard G. Boniwell	"
Robert Casperson	"
Henry H. Davis	"
N. Davis	"
William A. Davis	"
Thos. P. Dickson	"
A. T. Dobson, Jr.	"
John W. Donges	"
John G. Doran.	"
Wilfred Du Pont	"
Samuel Ginner	"
E. L. B. Godfrey	"
O B. Gross	"
Guilford H. Gunter	"
Lewis Hatton	"
George W. Henry	"
Conrad D. Hoell	"
Aaron Howell	"
Isaac Hugg	"
William H. Ireland	"
Samuel B. Irwin	"
William H. Iszard	"
Wm. S. Jones	"
John F. Leavitt	"
John B Longshore	"
Alexander McAllister	"
Alexander Marcy	"
Alexander Mecray	"
H. F. Palm	"
Dillwyn P. Pancoast	"
Edward W. Piper	"
Wm. R. Powell	"
Sophia Presley	"
Rufus Reed	"
R. W. Richie	"
James M. Ridge	"
George T. Robinson	"
Thomas G. Rowand	"
Clarence M. Schellinger	"
William Shafer	"
Edwin R Smiley	"
Elijah Snitcher	"
S M Snyder	"
James G. Stanton	"
J H. Stanton	"
Daniel Strock	"
F. G. Stroud	"
John W. Sutton	"
H. Genet Taylor	"
R. Given Taylor	"
E. P. Townsend	"
J. Francis Walsh	"
CITY OF CAMDEN—*Con'd.*	
William Warnock	Camden.
J. Orlando White	"
Jesse J. Wills	"
Joseph H. Wills	"
James P. Finlaw	"
Purnell W. Andrews	"
Thomas R. Blackwood	"
Jackson K. Bryant	"
Samuel Carels	"
Clark J. Cooper	"
George R. Fortiner	"
Ida F. Fortiner	"
Niven Fryer	"
A. E. Griffith	"
Erving M. Howard	"
Henry F. Hunt	"
Willis H. Hunt	"
John D. Leckner	"
Melbourne F. Middleton	"
Frederick P. Pfeiffer	"
Silas H. Quint	"
Jennie Rickards	"
Eli R. Tullis	"
George D. Woodward	"
CENTRE TWP.	
(No physicians reported.)	
DELAWARE TWP.	
Elijah B. Woolston	Marlton.
GLOUCESTER CITY.	
James A Wamsley	Gloucester City.
John R. Bennett	" "
Edwin Tomlinson	" "
Duncan W. Blake	" "
Henry A. M. Smith	" "
G W. Du Bois	" "
Walter Gardiner	" "
Richard Gardiner	" "
GLOUCESTER TWP.	
Henry E. Branin	Blackwood.
Joseph E. Hurff	"
HADDON TWP.	
Bowman H. Shivers	Haddonfield.
Charles H. Shivers	"
Theodore S. Williams	"
Frank E. Williams	"
William S. Long	"
Lawrence N. Glover	"
B. H. Turner	"

CAMDEN COUNTY—Continued.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
STOCKTON TWP.		WATERFORD TWP.	
Jerome L. Artz	Cramer Hill.	Daniel M. Stout	Berlin.
H. H. Sheek	" "	William Raleigh	"
WINSLOW TWP.		William Westcot	"
(No physicians reported.)		Robert H. Peacock	"

CAPE MAY COUNTY.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
CAPE MAY CITY.		MIDDLE TWP.—*Con'd.*	
H. F. Kennedy	Cape May City.	Isaac M. Downs	Cape May Court House.
V. M. D. Marcy	" " "	Julius Way	Cape May Court House.
Jas. Mecray, Jr.	" " "	James M. Slaughter	Rio Grande.
E. H. Phillips	" " "	Humphry Swain	Goshen.
DENNIS TWP.		John H. Hand	Cape May Court House.
Eugene Way	Dennisville.	OCEAN CITY.	
George G. Carll	South Dennis.	J. S. Waggoner	Ocean City.
P. M. Way	South Seaville.	UPPER TWP.	
LOWER TWP.		Joseph C. Marshall	Tuckahoe.
Eli B. Wales	Cold Spring.	Benj T. Abbott	"
MIDDLE TWP.		Randolph Marshall	"
John Wiley	Cape May Court House.		
Jonathan Leaming	Cape May Court House.		

CUMBERLAND COUNTY.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
CITY OF BRIDGETON.		FAIRFIELD TWP.	
J. B. Potter	Bridgeton.	J. C. Applegate	Fairton.
T. J. Smith	"	GREENWICH TWP.	
Jos. Sheppard	"	Ephraim Holmes	Greenwich.
Matt. K. Elmer	"	Thomas E. Slathams	"
H. W. Elmer	"	HOPEWELL TWP.	
Jno. H. Moore	"	Charles Dare	Shiloh.
Jacob G. Streets	"	Geo. M. Paullen	"
David R. Streets	"	Geo. Tomlinson	"
T. G. Davis	"	Dr. Tomlinson	Roadstown.
Geo H. Harris	"	John H. Sweeney	Shiloh.
Dr. Huested	"	LANDIS TWP.	
COMMERCIAL TWP.		Chas. R. Wiley	Vineland.
Stetson L. Bacon	Port Norris.	Franklin Lane	"
H. C. Fithian	" "	Edw. H. Bidwell	"
Dr. Bewley	" "	E. R. Fuller	"
George E. Butcher	Mauricetown.	Judson L. Bechs	"
Samuel Butcher	"	Theo. Foote	"
DEERFIELD TWP.		O. H. Adams	"
Charles C. Phillips	Deerfield Street.	Wm. A. English	"
DOWNE TWP.		Richard Dixie	"
Andrew P. Glandon	Newport.	Louis Cooper	"
Chas. T. Hill	Dividing Creek.	Henry Esten	Newfield.
A. H. Judson	" "	A. C. Taylor	Vineland.
		Chas. Brewer	"

CUMBERLAND COUNTY—Continued.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
LAWRENCE TWP.		CITY OF MILLVILLE.	
		W. H. C. Smith	Millville.
Ephraim Bateman	Cedarville.	J. S. Whitaker	"
Walter F. Glanden	"	Wm. L. Newell	"
Enos T. Blackwell	"	J. W. Wade	"
Eleazar Farr	"	T. C. Wheaton	"
		J. C. Wheaton	"
MAURICE RIVER TWP.		C. H. Hubbard	"
J. Howard Willets	Port Elizabeth.	STOE CREEK TWP.	
Stacy Wilson	" "	Joseph Tomlinson	Roadstown.

ESSEX COUNTY.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
BELLEVILLE TWP.		LIVINGSTON TWP.	
		(No physicians reported.)	
A. M. Clark	Belleville.		
D. M. Skinner	"	MILLBURN TWP.	
BLOOMFIELD TWP.		Wellington Campbell, Jr.	Short Hills.
		David E. English	Millburn.
Wm. H. White	Bloomfield.		
Ed. M. Ward	"	MONTCLAIR TWP.	
Chas. H. Bailey	"		
Wm. H. Van Gieson	"	J. J. H. Love	Montclair.
John E. Wilson	"	J. W. Pinkham	"
J. Edward Stubbert	"	Wm. B. Berry	"
Cornelius S. Simpson	"	C. W. Butler	"
		C. H. Shelton	"
CALDWELL TWP.		James S. Brown	"
		CITY OF NEWARK.	
H. B. Whitehorne	Verona.		
H. D. Winans	"		
E. E. Peck	Caldwell.	H. J. Anderson	Newark.
E. R. Laine	"	W. J. Andrews	"
		John S. Adams	"
CLINTON TWP.		Joseph S. Ayres	"
		W. R. Bruyere	"
M. Osborne Christian	Irvington.	E. D. L. Bradin	"
David S. Smith	"	J. D. Brumley	"
Joseph Wade	"	W. S. Baker	"
Joseph Ward	Waverly.	A. K. Baldwin	"
		H. C. Bleyle	"
EAST ORANGE TWP.		R. L. Burrage	"
		Chas. D. Bennett	"
T. R. Chambers	East Orange.	T. H. Baldwin	"
W. B. Graves	" "	Rudolph Braum	"
J. H. Duffield	" "	E. W. Burris	"
W. D. Robinson	" "	Milton Baldwin	"
W. K. Gray	" "	James B. Burnett	"
G. C. Blakelock	" "	Henry L. Coit	"
Ralph Blakelock	" "	J. Henry Clark	"
W. K. Davis	" "	Joseph A. Corwin	"
S. L. Eaton	" "	T. W. Corwin	"
Wilton D. Garrett	" "	H. B. Crane	"
Elizabeth J. T. Gould	" "	M. S. Crane	"
Richardson Gray	" "	A. Coles	"
Thomas N. Gray	" "	W. E. Carroll	"
Mary D. Hussey	" "	Wm. S. Disbrow	"
Anna H. Johnson	" "	Chas. J. Duffy	"
W. G. Mitchell	" "	Laban Dennis	"
Eliza B. Phelps	" "	D. M. Dill	"
A. H. Van Riper	" "	A. C. Dougherty	"
A. Walton	" "	R. G. P. Deiffenbach	"
Dr. Groves	" "	F. M. Day	"
		Anna F. Dressler	"
FRANKLIN TWP.		Daniel Elliott	"
Seffrine Daily	Franklin.	James Elliott	"

ESSEX COUNTY—Continued.

NAME.	P. O. ADDRESS.
CITY OF NEWARK—*Con'd.*	
Edward Everett	Newark.
D. J. Edwards	“
Emma W. Edwards	“
Frederick Freiss	“
Joseph Fewsmith, Jr.	“
Samuel H. Frazer	“
H. Frankendorff	“
Wm. Glatzmeyer	“
Frank Gruber	“
Robert Gillin	“
H. W. Gedicke	“
Emil Guenther	“
R. S. Gage	“
Susanna Gastner	“
C. W. Hagan	“
John F Hager	“
Joseph H. Hayden	“
Edgar Holden	“
L C. Hollister	“
Ella Haines	“
Edwin J. Howe	“
Jacob Hester	“
P. V. P. Hewlitt	“
Joseph Hedges	“
Herman C. H. Herold	“
W. E. Hitchcock	“
H. C. Hendry	“
Bruno Hood	“
E. P. Iliff	“
Edward Ill	“
S. Wasson Jones	“
W. M. Johnson	“
J. C. Johnson	“
George R. Kent	“
Henry A. Kornemann	“
Harriet L. Knudsen	“
Thomas N. Loweree, Jr.	“
W. F. Lauterborn	“
Frank Lehmacker	“
Chas. F. J. Lehlbach	“
Ernst M Lyon	“
Wm. H. C. Lee	“
George Meeker	“
F. B. Mandeville	“
Wm. H. Martland	“
John R. McDermott	“
Henry Mahr	“
Archibald Mercer	“
M. A. Mills	“
D. D. Mulcahey	“
John R. Mulholdana	“
F. L. Meyer	“
Sarah R. Mead	“
E. D. Neuman	“
V. Nager	“
E. A Osborne	“
J. D. Osborne	“
Chas. H. Osborne	“
George O'Gorman	“
W. N. Pindel	“
J. W Read.	“
John M. Rand	“
Philip Ricord	“
M. N. Robinson	“
H. P. Roden	“
Morton Robinson	“
Wm. R. Robinson	“
Wm. J Rankin, Jr.	“
P. Roth, Jr.	“
S. E. Robertson	“
C. E. Severance	“
R. G. Stanwood	“
Wm A. Smith	“

NAME.	P. O. ADDRESS.
CITY OF NEWARK—*Con'd.*	
Lott Southard	Newark.
Wm Schelling	“
C. A. Schureman	“
D W. Smith	“
Chas W Stickney	“
Fayette Smith	“
Smith & Lyon	“
R M. Sutphen	“
Fred. H. Stevens	“
Edward Sealey	“
Joseph S. Sutphen	“
Ernest Schoeffler	“
D. D. Sweeny	“
Theron G. Sutphen	“
B. H. B. Sleght	“
Nicholas Turtle	“
S. W. Taylor	“
Simon P. Taft	“
Wm. Titus	“
H. H. Tichenor	“
Chas. F. Underwood	“
Geo. A. Van Wagenen	“
Carl Vogler	“
S W. Van Duyne	“
Ira C. Whitehead	“
James H Ward	“
Geo S Ward	“
Leslie D Ward.	“
Wm. S Ward	“
C. S. Whitehead	“
James E. Wrightson	“
D. L. Wallace	“
Arthur Ward	“
Geo. N. Wait.	“
Aaron C. Ward	“
Joseph C. J Young	“
Chas Young	“
Chas. M. Zeh	“
CITY OF ORANGE.	
Frank E. Baker	Orange.
George Bayles	“
J. H. Bradshaw	“
Carl Buttner	“
C. M Conant	“
Thos G Fitch	“
H. P. Gerbert	“
F A. Gile	“
Thos. W. Harvey	“
Wm. H. Holmes	“
Henry Marion	“
S. F. Phelan	“
Wm. Pierson	“
Geo W. Richards	“
J. L. Seward	“
J Y. Simpson	“
Sarah C Spottiswoode	“
Jos. W. Stickler	“
Frank J. Tetreault	“
Wm. P. Vail	“
Stephen Wickes	“
SOUTH ORANGE TWP.	
A. A. Ransom	South Orange.
William J Chandler	“ “
W. Heberton	“ “
Milfred Runyon	“ “
Mahlon H C. Vail	Vailsburg.
Lucy S. Forbes	South Orange.
Phœbe D. Brown	Wilton.
WEST ORANGE TWP.	
B. L. Dodd	Orange.

GLOUCESTER COUNTY.

NAME.	P. O. ADDRESS.
CLAYTON TWP.	
Samuel S. Fisher	Clayton.
Albert Powel	"
H. G. Buckingham	"
Charles Duffelle	"
DEPTFORD TWP.	
(No physicians reported.)	
EAST GREENWICH TWP.	
(No physicians reported.)	
FRANKLIN TWP.	
A. A. Smith	Malaga.
GLASSBORO TWP.	
John Down Heritage	Glassboro.
Thomas Lee	"
Jacob Iszard	"
Meredeth J. Luffbary	"
Seymore Wescoat	"
Howard Iszard	"
GREENWICH TWP.	
E. L. Reeves	Paulsboro.
R. H. Reeves	"
Geo. C. Laws	"
Samuel T. Miller	"
HARRISON TWP.	
E. E. De Groff	Mullica Hill.
John H. Ashcraft	" "
LOGAN TWP.	
Eugene T. Oliphant	Bridgeport.
P. E. Stillwagon	"
MANTUA TWP.	
Albert Trenchard	Mantua.
E. Z. Hillegass	"
Henry D. Carr	Pitman Grove.
MONROE TWP.	
J. Gaunt Edwards	Williamstown.
C. M. Halsey	"
SOUTH HARRISON TWP.	
Samuel F. Stanger	Harrisonville.
WASHINGTON TWP.	
Cyrus B. Philips	Hurffville.
WEST DEPTFORD TWP.	
(No physicians reported.)	
CITY OF WOODBURY.	
Henry C. Clark	Woodbury.
D. R. Gardiner	"
C. G. Abbott	"
Geo. E. Reading	"
H. A. Wilson	"
Wm. A. Glover	"
Wallace McGeorge	"
H. B. Diverty	"
WOOLWICH TWP.	
B. F. Buzby	Swedesboro.
L. F. Halsey	"
J. F. Mustgrave	"

HUDSON COUNTY.

NAME.	P. O. ADDRESS.
H. H. Abernethy	Jersey City.
B. A. Andrew	" "
Wm. H. Ambercrombie	" "
Hugh T. Adams	" "
Geo. F. Appleton	" "
Ulamor Allen	" "
Henry Allers	Harrison.
Clovis Adams	Jersey City.
C. L. G. Anderson	" "
D. R. Atwell	Hoboken.
Matilda H. Aldridge	Jersey City.
Chas. D. Alton	" "
E. P. Buffett	" "
Horace Bowen	" "
J. B. Burdett	" "
Eleazer Bowen	" "
W. E. Bullard	" "
H. M. Brush	Bergen Point.
H. G. Bidwell	Jersey City.
William Briegleb	" "
R. Belmer	" "
C. A. Brown	Hoboken.
I. B. Bucher	Bayonne.
W. C. Buchly	Jersey City.
Louis Baumann	" "
Otto Bosco	Hoboken.
J. S. Briggs	Jersey City.
W. S. Boyd	" "
P. W. Barber	Arlington.
J. J. Bauman	Jersey City.
F. A. Benedict	" "
R. F. Chabert	Hoboken.
James Craig	Jersey City.
C. H. Case	" "
J. E. Culver	" "
W. J. Cadmus	" "
C. B. Converse	" "
Wm. A. Clark	" "
C. W. Cropper	" "
H. H. Cahill	" "
S. W. Clason	Arlington.
D. W. Culver	Jersey City.
A. Hyatt Clark	Arlington.
S. W. Clark	Jersey City.
F. W. Corwin	Bayonne.
B. P. Craig	Jersey City.
A. J. Carpenter	" "
Edward A. Cudlipp	" "
Joseph J. Craven	" "
Wm. A. Durrie	" "

HUDSON COUNTY—Continued.

NAME.	P. O. ADDRESS.
Ephraim De Groff	Town of Union.
N. R. Derby	Bergen Point.
Sarah E. De Hart	Jersey City.
M. F. De Hart	" "
G. K. Dickinson	" "
W. A. Durrie, Jr.	" "
Alexander Dallas	Bayonne.
E. I. Deraismes	Town of Union.
Wm. L. Darlington	Jersey City.
John S. Drain	" "
T. Dwyer	Hoboken.
John W. Doherty	Jersey City.
J. R. Everitt	" "
L. W. Elder	Hoboken.
H. M. Eddy	Jersey City.
Edward Eckardt	Town of Union.
J. A. Exton	Arlington.
E. S. Ettinger	Hoboken.
S. R. Forman	Jersey City.
Wm. R. Fisher	Hoboken.
J. F. Finn	Jersey City.
J. T. Field	Bayonne.
Johannes Faber	Jersey City.
N. Foote	" "
Benj. W. Ferguson	" "
H. G. Fish	Newark.
John H. Finnerty	Jersey City.
R. B. Gilman	" "
L. J. Gordon	" "
J. F. Golding	" "
F. D. Gray	" "
L. V. Guerin	" "
Wm. Griswold	" "
R. W. Gelbach	Hoboken.
L. G. Goode	Jersey City.
Mrs. A. S. Grinnell	" "
Josiah Hornblower	" "
J. W. Hunt	" "
T. R. Hornblower	" "
D. S. Hardenberg	" "
John Hickman	Bayonne.
A. V. Hill	Guttenberg.
A. J. Holcombe	Jersey City.
S. A. Helfer	Hoboken.
W. B. Hatch	Jersey City.
Melissa Hinchman	" "
A. C. Hoffman	" "
C. T. Hetzel	Town of Union.
H. W. A. Haase	Jersey City.
Peter Hoffman	" "
J. P. Henry	" "
H. Jay Holcombe	" "
J. O. Hoffs	Bayonne.
P. Hommell	Jersey City.
C. P. Hopper	New York City.
Hans Haegelsberger	Bayonne.
Dennis I. Healy	"
James Hoffman	Jersey City.
H. E. Hunt	" "
Fredrick Halves	Hoboken.
A. W. Herzog	"
S. A. Hollister	Jersey City.
C. E. Jaeckel	" "
Wm. F. Jones	" "
John Kudlich	Hoboken.
Adolph Kirsten	Jersey City.
John Keating	" "
Wm. T. Keeler	Harrison.
Geo. W. King	Snake Hill.
Wm. T. Kudlich	Hoboken.
C. F. Kyte	Jersey City.
T. Harris Kirk	Hoboken.
O. E. Kopetschny, Sr.	Jersey City.
E. F. Kopetschny	" "
Gertrude B. Kelly	Hoboken.
A. C. Kammerer	"
O. E. Kopetschny, Jr.	Jersey City.
A. A. Lutkins	" "
Mortimer Lampson	" "
John Lochner	" "
Wm. Henry Lewis	Bergen Point.
C. C. Lathrop	Jersey City Hosp.
W. C. Lutkins	" "
H. H. Lynch	" "
E. H. Linnell	Hoboken.
Albert Lignot	Jersey City.
Thomas Lynch	Hoboken.
H. L. Lockwood	Jersey City.
C. A. Limeburner	" "
H. A. Long	" "
F. H. Lutze	Hoboken.
A. J. Loomis	Jersey City.
J. T. Luck	Town of Union.
W. B. La Bau	Hoboken.
E. P. Luce	Bayonne.
T. F. Morris	Jersey City.
L. A. McBride	" "
J. H. McDowell	" "
J. D. McGill	" "
Daniel Murray	" "
T. J. McLaughlin	" "
John Mohns	Town of Union.
C. H. McNeil	Jersey City.
Louis Michel	West Hoboken.
S. V. Morris	Jersey City.
D. M. MacMartin	" " Hosp.
George McNaughton	" "
S. I. Myers	Bayonne.
B. R. Morrow	Jersey City.
David McClellan	West Hoboken.
Edward Rothe	Jersey City Hosp.
V. C. B. Means	" " "
W. J. McDowell	" "
W. V. McKenzle	" "
A. T. Muzzy	" "
J. W. MacMillan	" "
A. C. Muttart	" "
Geo. F. Meeker	Newark.
W. H. Newell	Jersey City.
F. E. Noble	" "
Frank Nichols	Hoboken.
J. L. Nevin	Jersey City.
H. L. Norris	West Hoboken.
R. G. Nolan	Bergen Point.
John J. Nevin	Jersey City.
H. F. Nichols	Hoboken.
Jennie W. Newell	Jersey City.
Andrew L. Nelden	" "
T. C. O'Callaghan	" "
F. Straughn	" "
L. A. Opdyke	" "
John F. O'Grady	" "
Patrick O'Sullivan	" "
E. W. Pyle	" "
J. A. Petrie	" "
R. M. Petrie	" "
J. J. Pendergast	" "
John Pindar	Hoboken.
James Paul	Jersey City.
F. W. Pettigrew	" "
F. G. Payn	Bayonne.
R. W. Peacock	Jersey City.
J. H. Platt	Bayonne.
Geo. F. Pitts	Hoboken.
Gotthold Pape	"
Edw. E. Peek	Jersey City Hosp.
Wm. J. Parker	" "
Henry Peffer	" "

HUDSON COUNTY—Continued.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
C. E. Putnam	Jersey City.	G. E. Steel	Jersey City.
Wm. L. Pyle	" "	Erwin Schierholz	" "
John Pringle	Harrison Township	C. F. Snyder	" "
N. J. Paddock	Jersey City.	John J. Sutton	Bayonne.
I. N. Quimby	" "	George M. Silvers	Jersey City.
D. L. Reeve	" "	Theodore Schindeler	Hoboken.
Walter Rae	" "	George N. Tibbles	Jersey City.
P. Rector	" "	George E Titus	" " Hosp.
C. G. H. Rothe	" "	Paul J. Taylor	Hoboken.
H. E. Rothe	Harrison.	Hans Treskow	New York City.
H. B. Rue	Hoboken.	William H O. Taylor	Town of Union.
Edward Rothe	Jersey City Hosp.	Gustavus F. Theel	
M. C. Redmond	" "	Julian P Thomas	Jersey City.
J. H. Rosenkrans	Hoboken.	A. F. Van Horn	" "
J. W. Reid	Harrison.	J H. Vondy	" "
W. H. Russell	Jersey City.	John D. Van Saun	" "
Thomas C. Rhoads	Weehawken.	John Vanderback	Guttenberg.
Edward C. Rushmore	Jersey City Hosp.	P. Vast	Newark.
W. F. Radue	" "	John Van Vorst, Jr	Jersey City.
S. V. W. Stout	" "	W. W. Varick	" "
M. F. Squire	Harrison.	J J. Van Horne	" "
G. D. Saltonstall	Hoboken.	Hamilton Vreeland	" "
F. C. Selnow	Jersey City.	J. L. Vandeventer	" "
Noah Sanborn	Bayonne.	B. A Watson	" "
H. R. Simmons	Jersey City.	Theodore F. Wolfe	" "
P. M. Senderling	" "	James Wilkinson	" "
Frederick Straughn	" "	F. H. Whittemore	" " Hosp.
H. M. Smith	" "	W. P. Watson	" "
Joseph E. Salter	Bayonne.	George Wilkinson	" "
H. De L. Sherwood	Jersey City.	W. P. Ware	" "
C. A. G. Schuhl	" "	Conrad Wienges	" "
Hugo Senftleben	Hoboken.	John Williams	Arlington.
F. C. Smith	Guttenberg.	Joseph Wolfson	Jersey City.
F. (or J.) Schmidt	Hoboken.	A. W. Warden	Town of Union.
C. I. Simon	"	James E. Weeks	Jersey City.
Frederick Spring	Bergen Point.	C. F. Wolff	Town of Union.
Richard Schlemm	Town of Union.	Mary A. Willis	Jersey City.
E. T. Steadman	Hoboken.	W. S. Wilson	" "
J. L. Sanborn	Jersey City.	H. S. Warwick	" "
H. W. Searing	Arlington.	Thompson Whalley	" "
J. A. Stegmair	Jersey City.	Arthur Ward	Newark.

HUNTERDON COUNTY.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
ALEXANDRIA TWP.		DELAWARE TWP.	
Moses D. Knight	Little York.	Isaac S. Cramer	Sergeantsville.
Henry Race	Pittstown.	Geo. V. Best	Rosemont.
BETHLEHEM TWP.		O. H. Sproul	Stockton.
Thomas E. Hunt	Glen Gardner.	EAST AMWELL TWP.	
Edgar Hunt	" "	C. W. Larison	Ringoes.
Wm. R. Little	Bloomsbury.	John V. Robbins	"
J. M. Linaberry	Bloomsbury and Somerville.	John Sylvaria	"
A. C. Smith	Bloomsbury.	Amos M. Hart	"
Howard Servis	Junction.	P. C. Young	"
Robert Fenwick	"	FRANKLIN TWP.	
CLINTON TWP.		Q. E. Snyder	Quakertown.
W. E Berkaw	Annandale.	BOROUGH OF FRENCHTOWN.	
David P Jackson	Lebanon.	Asher Reiley	Frenchtown.
John F. Grandin	Hamden.	E. K. Deemy	"
S. Vansickel	Clinton.	Wm. F. Finney	"
Wm. Knight	"	Wm. C. Williams	"
W. C. Warrington	"		
A. Jacobus	"		

HUNTERDON COUNTY—Continued.

NAME.	P. O. ADDRESS.
HIGH BRIDGE TWP.	
W. C. Alpaugh	High Bridge.
William Hackett	" "
HOLLAND TWP.	
Geo. T. Ribble	Milford.
J. N. Lowe	"
KINGWOOD TWP.	
E. D. Leidy	Baptisttown.
CITY OF LAMBERTVILLE.	
Wm. Wetherill	Lambertville.
Geo. L. Romine	"
Geo. H. Larison	"
F. W. Larison	"
Peter McGill	"
Edw. W. Closson	"
J. E. Stiles	"
S. Willard Oley	"
A. L. Closson	"
Joseph E. Wells	"
LEBANON TWP.	
Terrance A. H. Heron	Junction.
Thos. H. Carey	Glen Gardner.
RARITAN TWP.	
Wm. H. Schenck	Flemington.
Asbury Parrish	"
Geo. R. Sullivan	"
A. Shannon	"
T. B. J. Burd	"
Geo. R. Rowland	"
John H. Ewing	"
Geo. P. Rex	Reaville.
Eugene Garrison	"
READINGTON TWP.	
J. D. McCauley	Centreville.
Geo. W. Bartow	Three Bridges.
T. A. Skillman	Stanton.
W. W. Purcell	White House Station.
John V. Johnson	White House.
Thomas Johnson	Readington.
Wm. D. Quimby	"
TEWKSBURY TWP.	
H. H. Miller	Mountainville.
Francis A. Apgar	New Germantown.
T. Miller	Califon.
UNION TWP.	
N. B. Boileau	Jutland.
WEST AMWELL TWP.	
(No physicians reported.)	

MERCER COUNTY.

NAME.	P. O. ADDRESS.
CHAMBERSBURG BOROUGH.	
Elmer Barwis	Chambersburg.
R. C. Hutchinson	"
H. B. Costill	"
W. H. G Griffith	"
C. F. Adams	"
W. McD. Struble	"
J. T. Johnston	"
E. W. Johnson	"
H. B. Witte	"
A. Coleman	"
EAST WINDSOR TWP.	
Lloyd Wilbur	Hightstown.
Geo. E. Titus	"
J. P. Johnson	"
EWING TWP.	
John W. Ward	Trenton.
John Kirby	"
HAMILTON TWP.	
Geo. R. Robbins	Hamilton Square.
Dr. White	" "
Dr. Mokey	Crosswicks.
HOPEWELL TWP.	
E. L. Welling	Pennington.
I. Hart	"
Edgar Hart	"
O. G. Sands	Titusville.
E. P. Hawke	Hopewell.
J. A. Miller	"
LAWRENCE TWP.	
Edmund De Witt	Lawrenceville.
MILLHAM TWP.	
Walker G. Macdonald	Millham.
PRINCETON TWP.	
W. J. Lytle	Princeton.
A. K. Macdonald	"
J. H. Wikoff	"
E. H. Bergen	"
O. H. Bartine	"
J. G. Bayles	"
CITY OF TRENTON.	
John Woolverton	Trenton.
Wm. W. L. Phillips	"
Richard R. Rogers	"

MERCER COUNTY—Continued.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
CITY OF TRENTON—*Con'd.*		CITY OF TRENTON—*Con'd.*	
Richard R. Rogers Jr.	Trenton.	Wm. G. McCullough	Trenton.
Cornelius Shepherd	"	Chas. W Gerry	"
David Warman	"	Nelson D. Oliphant	"
Lyman Leavitt	"	John M. Maul	"
Joseph L. Bodine	"	Edward Kelly	"
Wm W Wyckoff	"	C. F. Adams	"
H. Waldburg Coleman	"	H. M. Beatty	"
William Green	"	C. C. Brown	"
J. I. B. Ribble	"	L. L. Bunn	"
William Elmer	"	A. Coleman	"
Thos. H. Mackenzie	"	J. W. Cooper	"
William S. Lalor	"	H. B. Costill	"
Chas. H. Dunham	"	W. H G Griffith	"
William Rice	"	E. E. Hollinshead	"
Wm. A. Clark	"	M. Jenkins	"
Wm. B. Van Duyn	"	E. W. Johnson	"
Robt. C. Hutchinson	"	F. Johnson	"
Henry M. Weeks	"	W. McDonald	"
Alex. M. Steen	"	H. Read	"
Chas. B. Leavitt	"	W. T. Rogers	"
Chas. H. McIlwaine	"	J. H. Satterthwaite	"
Horace G. Wetherill	"	J. W. Stevenson	"
Wm. McD. Struble	"	J. P. Turner	"
Elmer H. Rogers	"	J. D. Tantum	"
Joseph B. Shaw	"	E. Witte	"
Addison H. Dey	"	J. K. Young	"
Frank V. Cantwell	"		
Margaret H. Preston	"	WASHINGTON TWP.	
Frank H Williams	"	Geo. H. Franklin	Windsor.
Jos. C. Boardman	"		
Isaac Cooper	"	WEST WINDSOR TWP.	
A. H. Worthington	"	(No physicians reported.)	

MIDDLESEX COUNTY.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
CRANBURY TWP.		NEW BRUNSWICK—*Con'd.*	
J. C. Holmes	Cranbury.	C. M. Slack	New Brunswick.
H. C. Symmes	"	A. V. N. Baldwin	" "
MADISON TWP.		Fernando Riva	" "
		Adelia Barber	" "
(No physicians reported.)		Irenæus S. Davis	" "
		David Davis	" "
MONROE TWP.		Franklin B. Lippincott	" "
		NORTH BRUNSWICK TWP.	
J. L Snydam	Jamesburg.		
H. D. Zandt	"	I. P. Davis	Milltown.
CITY OF NEW BRUNSWICK.		CITY OF PERTH AMBOY.	
Henry R. Baldwin	New Brunswick.	John G. Wilson	Perth Amboy.
E. H Barber	" "	Edward B. P. Kelly	" "
Staats V. D. Clark	" "	Howard W. Phillips	" "
David C English	" "	Louis S. Blackwell	" "
John Helm	" "	William W. Hubbard	" "
George J. Janeway	" "	E. Arthur Hults	" "
Samuel Long	" "		
J Warren Rice	" "	PISCATAWAY TWP.	
Patrick A Shannon	" "		
John S. Van Marter	" "	William J. Nelson	New Market.
Chas U. Voorhees	" "	D P. Vail	" "
Nicholas Williamson	" "	M. J. Whitford	" "
Edward B Young	" "	Peter W. Brakley	Dunellen.
G. T. Applegate	" "	W. E. Shotwell	"

MIDDLESEX COUNTY—Continued.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
SOUTH AMBOY TWP.		RARITAN TWP.	
Ambrose Treganowen........	South Amboy.	Charles H. Andrus............	Metuchen.
Smith H Lewis..................	" "	Alonzo C. Hunt...	"
Alonzo Freeman................	" "	Frank B. Norton...............	"
L. O. Morgan	" "	WOODBRIDGE TWP.	
August E. Zeitter..............	" "	S. E. Freeman.....................	Woodbridge.
SOUTH BRUNSWICK TWP.		S. P. Harned.......................	"
Edgar Carroll.....................	Dayton.	D. E. Decker....................	"

MONMOUTH COUNTY.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
ATLANTIC TWP.		MIDDLETOWN TWP.—*Con'd.*	
James E. Cooper................	Colts Neck.	Russell G. Andrews............	Atlantic Highlands
EATONTOWN TWP.		G. W. Labaw	Riceville.
W. S. Kimball....................	Eatontown.	George D. Fay..................	Highlands.
W. B. Beach.........................	"	MILLSTONE TWP.	
G. F. Baker.........................	"	W. V. McKenzie.................	Perrineville.
E. M. Beach	West Long Branch.	NEPTUNE TWP.	
E. W. Crater.......................	Ocean Port.	G. F. Wilbur........................	Asbury Park.
FREEHOLD TWP. & VILLAGE.		C. Pemberton....................	" "
D. M. L Forman...............	Freehold.	R A. Tusting.....................	" "
I. S Long.............................	"	J. D. Osborne	Newark.
O. R. Freeman....................	"	T. Knox Morton..................	Asbury Park.
Harry Neafie	"	Wm. H. Ross	New York City.
Wm. W. Burnett.................	"	Henry Mitchell..................	Asbury Park.
Wm. M. Hepburn..............	"	Bruce Skeator......................	" "
HOLMDEL TWP.		Wm. Griswold.....................	" "
Henry G. Cooke.................	Holmdel.	J. A. W. Hetrick.................	" "
HOWELL TWP.		Samuel Johnson..................	Ocean Grove.
Stephen M. Disbrow...........	Farmingdale.	H. S. Des Anges	Asbury Park.
Stephen A. Disbrow...........	"	F. G. Pomeroy.....................	Ocean Grove.
Van M. Disbrow.................	"	J. N Bugle	" "
C. B. Weeks........................	Turkey.	D M. Barr..........................	" "
William R. Kinmouth.......	Farmingdale.	H. S. Kinmouth.................	Asbury Park.
MANALAPAN TWP.		J. B. Hunt..	" "
A. T. Applegate..................	Englishtown.	Samuel Evans.....................	" "
Geo. Hutchinson	"	OCEAN TWP. AND LONG BRANCH.	
MARLBORO TWP.		T. G. Chattle.....	Long Branch.
J. D. Ely.............................	Marlboro.	J. B. Goodnough	" "
MATAWAN TWP.		J O. Green	" "
Cyrus Knecht.....................	Matawan.	H. Heighes	" "
A. J Jackson	"	H. H. Pemberton..............	" "
Philip H. Fuller.................	"	Geo. W. Brown, Jr.	" "
MIDDLETOWN TWP.		Joseph A. Taylor...............	" "
Edward F Taylor...............	Middletown.	John Bennett......................	" "
Wm. F. Patterson..............	Chapel Hill.	Dr. Beach..	West Long Branch.
Daniel D. Hendrickson......	Middletown.	A. H. Smith	New York.
John H. Van Mater............	Atlantic Highlands	R. L Kimball......................	" "
		E. H. Keyes.........................	" "
		R. McKenzie.......	" "
		Joseph Offenbode.............	" "
		T. R. Coe	" "
		RARITAN TWP.	
		J. E. Arrowsmith...............	Keyport.
		W. E. Johnson....................	"
		G. T. Welch........................	"
		D. E. Roberts.....................	"
		E B. Reed..........................	"

MONMOUTH COUNTY—*Continued.*

NAME.	P. O. ADDRESS.
RARITAN TWP.—*Con'd.*	
W. W. Palmer	Keansburg.
W. A. Bevin	Keyport.
SHREWSBURY TWP.	
A. A. Armstrong	Fair Haven.
W. A. Betts	Red Bank.
F. A. Chadwick	" "
J. K. Cheeseman	" "
Thomas A. Curtis	" "
Edward Field	" "
Geo. F. Marsden	" "
James H. Patterson	Shrewsbury.
T. Ridgeway	Red Bank.
J. E. Sayre	" "
Dr. Shafto	Hamilton.
A. F. Trafford	Red Bank.
W. B. Warner	" "
James E. Conover	" "

NAME.	P. O. ADDRESS.
UPPER FREEHOLD.	
H. G. Norton	Imlaystown.
A. Alexander Howell	Allentown.
P. B. Pumyea	"
H. P. Johnson	"
George W. Shaffer	Cream Ridge.
Abel T. Breure	Hornerstown.
WALL TWP.	
A. A. Higgins	Manasquan.
J. B. Wainright	"
B. Laird	"
W. W. Trout	Spring Lake.
C. H. Thompson	Ocean Beach.
R. W. Herbert	Manasquan.
J. F. Davison	Glendda.
W. Kinmouth	Ocean Beach.
A. P. Yelington	Manasquan.

MORRIS COUNTY.

NAME.	P. O. ADDRESS.
BOONTON TWP.	
A. E. Carpenter	Boonton.
J. G. Ryerson	"
J. H. O'Reilly	"
Cuthbert Wigg	"
Mrs. H. C. Woodruff	"
CHATHAM TWP.	
William H. Martin	Madison.
Calvin Anderson	"
S. H. Reed	"
J. N. De Hart	"
W. J. Wolfe	Chatham.
George M. Swain	"
CHESTER TWP.	
Levi W. Case	
Alonzo Green	
Smith E. Hedges	
HANOVER TWP.	
E. P. Cooper	Parsippany.
G. A. Becker	Whippany.
JEFFERSON TWP.	
Leonard Bright	Berkshire Valley.
MENDHAM TWP.	
John S. Stiger	Mendham.
Henry Stiger	"
Geo. S. Degroot	"
MONTVILLE TWP. (No physicians reported.)	
MORRIS TWP. & MORRISTOWN	
P. C. Barker	Morristown.
Stephen Pierson	"
James Douglas	"

NAME.	P. O. ADDRESS.
MORRIS TWP. AND MORRISTOWN—*Con'd.*	
A. A. Lewis	Morristown.
F. W. Owen	"
T. B. Flagler	"
Augustus Becker	"
H. B. Andrews	"
Frank Sanders	"
Joseph R. Hoofman	"
A. Whelacker	"
MOUNT OLIVE TWP.	
J. S. Farrow	Flanders.
Geo. W. Wentworth	"
PASSAIC TWP. (No physicians reported).	
PEQUANNOCK TWP.	
A. A. McWithey	Pompton.
H. B. Day	Butler.
George Silvers	"
C. D. V. Romondt	Pompton Plains.
RANDOLPH TWP.	
Thos. R. Crittenden	Dover.
I. W. Condict	"
Geo. O. Cummins	"
Wm. E. Derry	"
Jos. D. King	"
John Byram	"
R. A. Bennett	"
Mary Ford	"
A. W. Condict	Port Oram.
ROCKAWAY TWP.	
R. C. Lumsden	Rockaway.
J. V. Menagh	"
D. S. Ayers	"
F. W. Flagge	"
J. W. Jackson	"

MORRIS COUNTY—Continued.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
ROXBURY TWP.		WASHINGTON TWP.	
John L. Taylor	Succasunna.	E. C. Willet	German Valley.
John Ricker	"	Levi Farrow	Middle Valley.
H. C. Wiggins	"	John Miller	Stephensburg.
		Peter S. Hann	German Valley.

OCEAN COUNTY.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
BERKELEY TWP.		LACEY TWP.	
(No physicians reported.)		C. R. Van Doren	Forked River.
BRICK TWP.		Marcus Kenyon	" "
J. H. Platt	Lakewood.	MANCHESTER TWP.	
O. W. Budlong	"	(No physicians reported.)	
H. J. Cute	"	OCEAN TWP.	
G. S. Turris	Burrsville.	Edmund Bennett	Barnegat.
H. A. Bennett	Point Pleasant.	PLUMSTED TWP.	
D. H. Mount	Bayhead.	Charles E. Woodard	New Egypt.
DOVER TWP.		John Bruer	" "
Rem. L. Disbrow	Toms River.	C. La Forge	" "
Clarence E. Disbrow	" "	Daniel A. Warren	" "
Irving C. Schureman	" "	STAFFORD TWP.	
John W. Webb	" "	Phineas K. Hilliard	Mannahawkin.
John O. Harra	Island Heights.	UNION TWP.	
EAGLESWOOD TWP.		Edmund Bennett	Barnegat.
Samuel Ashhurst	Beach Haven.		
JACKSON TWP.			
Chas. La Forge	New Egypt.		

PASSAIC COUNTY.

NAME.	P. O. ADDRESS.	NAME.	P. O. ADDRESS.
ACQUACKANONK TWP.		CITY OF PATERSON.	
J. Solatinow	Richfield.	Willhelm C. Dittmar	Paterson.
Morgan Wilcox Ayres	Upper Montclair.	David W. McFarland	"
LITTLE FALLS TWP.		Edward W. Doty	"
Edward A Keeler	Little Falls.	William Heckman	"
Mark Van Winkle	" "	David McNair	"
Henry W. Turbeck	" "	John R. Merrill	"
J. M. R. Gedney	" "	James Crooks	"
MANCHESTER TWP.		James K. Atkinson	"
(No physicians reported.)		Reuben H. Born	"
CITY OF PASSAIC.		Ernestus B. De Uling	"
Richard A. Terhune	Passaic.	C. Percy Hopper	"
Jno. C. Herrick	"	Alcinons Jamison	"
Cornelius Van Riper	"	J. F. McEncroe	"
S. E Armstrong	"	George M. Palmer	"
W. H. Carroll	"	Malcom B. Fuller	"
Chas. A. Church	"	John H. Banta	"
N. C. Ricardo	"	Geo. H. Balleray	"
E. De Baum	"	James S. Bibby	"
		Wm. Blundell	"
		Philander A. Harris	"
		Geo. W. Terriberry	"
		Calvin Terriberry	"
		O. V. Garnett	"

PASSAIC COUNTY—Continued.

NAME.	P. O. ADDRESS.
CITY OF PATERSON—*Con'd.*	
J. Henggler	Paterson.
Walter B Johnson	"
Thomas J. Kane	"
Henry Kip	"
John L. Leal	"
E. S. McClellan	"
S. R. Merrill	"
C. F. W. Meyers	"
Elias J. Marsh	"
Rush Neer	"
Wm. K. Newton	"
T. F. O'Grady	"
Henry Parke	"
J. P. Paxton	"
A. W. Rogers	"
James W. Smith	"
Spencer Van Dalsen	"
C. S. Van Riper	"
Henay Withers	"
W. S. Hurd	"
Oswald Warner	"
T. T. Kinne	"
P. S. Kinne	"
Davis P. Borden	"
John H. Bradsworth	"
W F. Decker	"
Wm. Whitley	"
F. D. Vreeland	"
CITY OF PATERSON—*Con'd.*	
James F. Stewart	Paterson.
M. W. Gillson	"
Geo F. Newcombe	"
F. J. Hepworth	"
F. Bachman	"
S. Cyrus Townsend	"
R. J Seward	"
Frank E. Agnew	"
B C. Magennis	"
Ada Carr	"
A. D. Jousset	"
J. Solatinor	"
POMPTON TWP.	
(No physicians reported.)	
WAYNE TWP.	
J. W. Collins	Pompton.
William S. Colfax	"
WEST MILFORD TWP.	
W. S. Coursin	Oakridge.
Theodore Coursin	"
R G Mains	West Milford.
S. Utter	" "

SALEM COUNTY.

NAME.	P. O. ADDRESS.
ALLOWAY TWP.	
Warren L. Ewens	Alloway.
L. M. Wallace	"
S. B. Camp	"
ELSINBORO TWP.	
(No physicians reported.)	
LOWER ALLOWAYS CREEK TWP.	
Francis B. Harris	Canton
W. Scott Smith	Hancock's Bridge.
LOWER PENNS NECK TWP.	
W. H. James	Pennsville.
MANNINGTON TWP.	
(No physicians reported.)	
OLDMANS TWP.	
James B. Ware	Pedricktown.
Harry Johnson	"
PILESGROVE TWP.	
L. A. D Allen	Woodstown.
Louis Reed	"
Uriah Gilman	"
P. G. Souder	"
Charles Newton	Sharpstown.
Naomi Foster	Woodstown.
Sarah Taylor	"
PITTSGROVE TWP.	
A. B. Woodruff	Elmer.
C. P. Atkinson	Palatine.
J. P. Cheesman	Elmer.
Chas. Robinson	"
QUINTON TWP.	
W. Scott Smith	Quinton.
William Patrick, Jr.	"
CITY OF SALEM.	
Quinton Gibbon	Salem.
Theophilus Patterson	"
Edward Sharp	"
B. A. Waddington	"
Dr. Jackson	"
Dr. Beckel	"
Dr. Bilderback	"
Dr. Sherron	"
Dr. Wiley	"
James Patterson	"
Henry Chevanne	"
UPPER PENNS NECK TWP.	
Mayhew Johnson	Penns Grove.
John H. Groff	" "
John Summerill	" "
Daniel Garrison	" "
David Moore	" "
M. H. Curry	" "
UPPER PITTSGROVE TWP.	
M. J. Paulding	Daretown.

SOMERSET COUNTY.

NAME.	P. O. ADDRESS.
BEDMINSTER TWP.	
J. B. Beekman	Pluckamin.
Edward Perry	Peapack.
Edwin B. Farrell	"
BERNARDS TWP.	
A. F. Voorhies	Baskingridge.
John Dayton	"
R. Van Dorn	Liberty Corner.
Fr. Jones	Baskingridge.
E. M. Steele	Bernardsville,
BRANCHBURG TWP.	
Adonis Nelson	Neshanic Station.
BRIDGEWATER TWP.	
H. G. Wagoner	Somerville.
A. P. Hunt	"
Wm. J. Swinton	"
Wm. B. Mathewson	"
J. F. Williams	"
Arthur Kenney	"
Joseph E. Wright	"
J. P. Hecht	Raritan.
J. F. Berg	North Branch.
J. L. Compton	Bound Brook.
E. E Conover	Martinville.
Edwin T Davis	Bound Brook.
C. P. P. Fisher	" "
B. B. Mathews	" "

NAME.	P. O. ADDRESS.
FRANKLIN TWP.	
Wm. B. Ribble	East Millstone.
Farley Fisher	Middlebush.
G. G. Hoagland	Franklin Park.
HILLSBOROUGH TWP.	
William H. Merrell	South Branch.
George Van Nest	Millstone.
S. O. B. Taylor	"
J. E. Anderson	Neshanic.
MONTGOMERY TWP.	
Wellington B. Searle	Rocky Hill.
Abram B. Mosher	Griggstown.
Jesse S. B. Ribble	Harlingen.
Peter Skillman	"
Lucius D. Tompkins	"
NORTH PLAINFIELD TWP.	
J. H. Carman	Plainfield.
W. E. Mattison	"
WARREN TWP.	
Peter J. Zeglio	Warrenville.

SUSSEX COUNTY.

NAME.	P. O. ADDRESS.
ANDOVER TWP.	
John Miller	Andover.
John C. Clark	"
BYRAM TWP.	
Charles R Nelden	Stanhope.
C. H. Davison	"
FRANKFORD TWP.	
Joseph Hedges	Branchville.
J. C. Price	"
E. A. Dalrymple	"
Eugene Shumo	"
GREEN TWP.	
Sidney B. Straley	Andover.
HAMPTON TWP.	
(No physicians reported.)	
HARDYSTON TWP.	
J. B. Pellet	Hamburgh.
J. P. Couse	"

NAME.	P. O. ADDRESS.
LAFAYETTE TWP.	
John C. Strader	Lafayette.
John L. Allen	"
MONTAGUE TWP.	
(No physicians reported.)	
TOWN OF NEWTON.	
Levi D. Miller	Newton.
Ephraim Morrison	"
Theophilus H. Andress	"
W. Henry Lewis	"
T. George Cusack	"
SANDYSTON TWP.	
James N. Miller	Laytons
Martin Cole	Hainesville.
SPARTA TWP.	
William H. Douglas	Ogdensburgh.
STILLWATER TWP.	
Charles V. Moore	Stillwater.
Joseph H. McCaughen	Swartswood.

SUSSEX COUNTY—Continued.

NAME.	P. O. ADDRESS.
VERNON TWP.	
Carlos Allen	Vernon.
WALPACK TWP.	
Frank Beers	Flathookville.
WANTAGE TWP.	
Alex. Williamson	Deckertown.
H. D. Van Gaesbeck	"
John Moore	"
B. W. Ferguson	Beemerville.
Edgar Potts	Colesville.

UNION COUNTY.

NAME.	P. O. ADDRESS.
CLARK TWP.	
(No physicians reported.)	
CRANFORD TWP.	
Joseph K. McConnell	Cranford.
CITY OF ELIZABETH.	
Anna J. Crouthers	Elizabeth.
Geo. W. Bailey	"
Lewis R. Brown	"
Job S Crane	"
James S. Green	"
Joseph H. Grier	"
E. B. Grier	"
Thos. L. Hough	"
Wm. A. M. Mack	"
Thos. N. McLean	"
W. H. Miller	"
J. B. Morton	"
Victor Mravlag	"
Alonzo Pettit	"
John H. Pickett	"
J. O. Pinneo	"
David Schleimer	"
Thos. Terrill	"
Wm. F. Turner	"
Robert Wescott	"
John Younglove	"
E. R. O'Reilly	"
A. Q. Donovan	"
N. L. Wilson	"
David Miller	"
T. F. Livengood	"
James Wheeler	"
Johanna G Leary	"
Tifft Beckwith	"
Dr. Pierce	"
FANWOOD TWP.	
F. W. Wescott	Fanwood.
A. Coles	"
J. A. Coles	"
LINDEN TWP.	
Henry C. Pierson	Roselle.
NEW PROVIDENCE TWP.	
Abram Morrell Cory	New Providence.
CITY OF PLAINFIELD.	
William C. Boone	Plainfield.
Thomas S. Davis	"
CITY OF PLAINFIELD—*Con'd.*	
George W. Endicott	Plainfield.
Chauncey M. Field	"
J. T. Fritts	"
John F. Griffen	"
E. W. Hedges	"
O. L Jenkins	"
Sarah D. Keeney	"
Monroe B Long	"
H. H. Lowrie	"
Andrew Manning	"
William H. Murray	"
Rebecca P. Page	"
Charles H Penfield	"
Joseph H. Platt	"
John B. Probasco	"
Edward Rushmore	"
Randolph Titsworth	"
Thomas H. Tomlinson	"
CITY OF RAHWAY.	
J. J Daly	Rahway.
D. W. C. Hough	"
H. Page Hough	"
Elihu B Silvers	"
E. J. Westfall	"
W. E. Cladek	"
W. W. Selover	"
Wilber Hodgson	"
F W. Oliver	"
Israel Lukins	"
Charles B. Holmes,	"
Lewis Drake	"
SPRINGFIELD TWP.	
N. C. Jobs	Springfield.
SUMMIT TWP.	
W. H. Risk	Summit.
W. H Lawrence	"
John Burling	"
UNION TWP.	
J. E. Winans	Lyons Farms.
WESTFIELD TWP.	
Joseph B. Harrison	Westfield.
Frederick A. Kinch	"
Frederick A. Kinch, Jr	"
Sherman Cooper.	"
T. V. Smith	"
Wm. H. Morse	"
William Call	"

WARREN COUNTY.

NAME.	P. O. ADDRESS.
ALLAMUCHY TWP.	
Wm. L. Linabury	Allamuchy.
TOWN OF BELVIDERE.	
P. F. Brakeley	Belvidere.
W. H. McGee	"
E. M. Bergen	"
Wm. C. Albertson	"
Comegys Paul	"
P. F. Lefferts	"
BLAIRSTOWN TWP.	
John C. Johnson	Blairstown.
Harry O. Carhart	"
Milton N. Armstrong	"
William H. Vail	"
FRANKLIN TWP.	
S. B. Crisman	Broadway.
S. A. Welch	Asbury.
FRELINGHUYSEN TWP.	
F. Rorbach	Johnsonsburgh.
GREENWICH TWP.	
Enos Beatty	Stewartsville.
P. F. Hulshizer	"
HACKETTSTOWN TWP.	
John S. Cook	Hackettstown.
R. L. Cook	"
A. E. Martin	"
A. C. Vansickle	"
Theo. Crane	"
J. W. Dalrymple	"
HARDWICK TWP.	
(No physicians reported.)	
HARMONY TWP.	
James D. Dewitt	Harmony.
Garner H. Cline	"
HOPE TWP.	
A. L. Gibbs	Hope.
INDEPENDENCE TWP.	
S. W. Rowell	Vienna.
KNOWLTON TWP.	
Samuel H. Johnson	Delaware.
Robert Bond	Knowlton.
LOPATCONG TWP.	
(No physicians reported.)	
MANSFIELD TWP.	
Henry M. Cox	Port Murray.
OXFORD TWP.	
Geo. S. Dearborn	Oxford.
L. B. Hoagland	"
G. O. Lumson	"
Bonn. W. Hoagland	"
PAHAQUARRY TWP.	
(No physicians reported.)	
TOWN OF PHILLIPSBURG.	
J. F. Sheppard	Phillipsburg.
J. M. Reese	"
L. C. Osmun	"
R. S. Stewart	"
James Cavanaugh, Jr.	"
Isaac Barber	"
L. D. Bieber	"
Charles Crevling	"
J. H. Griffith	"
H. O. Carhart	"
H. R. West	"
POHATCONG TWP.	
Nathan Case	Reiglesville.
J. S. Albright	Springtown.
WASHINGTON TWP.	
William Hartpence	Washington.
Joseph Cook	"
F. M. Cook	"
W. M. Baird	"
J. McKinistry	"
William Stites	"
H. S. Funk	Port Colden.

REPORT

OF THE

BUREAU OF VITAL STATISTICS

OF THE

STATE OF NEW JERSEY

FOR THE

Statistical Year from July 1st, 1886, to July 1st, 1887,

WITH CLIMATOLOGY, ETC.

DEPARTMENT OF STATE.

TO HON. HENRY C. KELSEY, SECRETARY OF STATE.

By EZRA M. HUNT, M.D., D.Sc.,

Secretary and Medical Superintendent of Vital Statistics.

REPORT ON VITAL STATISTICS

BY THE MEDICAL SUPERINTENDENT OF VITAL STATISTICS.

INTRODUCTION.

The attention of all City Clerks, Township Assessors and Local Boards of Health is especially called to chapter XXXIX. of Laws of 1888, as to vital statistics, approved February 15th, 1888.

While not altering in any essential particulars the former laws, it, restates and codifies them and makes their execution more direct. The Local Boards are charged with the duty of enforcing it. It is a very important duty. It does not strike the member of a Board of Health who has not studied the matter, that these returns are the foundation of the best health administration. Yet all leading sanitary authorities insist that we must keep a credit and debtor account of the people if we would study sanitary conditions. Marriage tells us of the number of families. Births inform us of the material on hand and the ages, since the effects of susceptibility and exposure are much determined by this. Death tells us of the operation of insanitary forces. The Inspector who knows how to study the items has an important guide to his work. We earnestly call upon Local Boards by information, by urgent personal address to any that are neglectful, and, if need be, by summary proceeding to enforce the law. See, also, section 12 (VII.), chapter LXVIII., Laws of 1887.

We note the changes in the present law:

I. The penalty for neglect of return of marriage, birth or death is made uniform, viz., $20.

II. Section 2 gives authority to all in charge of returns of births to provide and send to each physician twelve prepaid envelopes each year, for the monthly return of births, the expenses to be paid by the usual disbursing officer of the city or township. But the failure of any physician to receive these does not excuse the non-return.

III. Section 3 makes it lawful in cases where there has been sudden death without medical attendance, or where the medical attendant is sick or absent, for another physician to give certificate. This is only meant for extreme and exceptional cases, and the fact of inability to secure from the attendant must be stated on the certificate.

IV. Section 5 allows an undertaker, for his convenience, to procure a permit of burial (where this is required for burial instead of the certificate of death) in the town in which he lives or where the burial is to be made, but as in such cases the city clerk has to mail the certificate of death given him in exchange, to the local assessor, the undertaker is required to pay postage.

V. Section 8 requires the same where the body is to be removed from the State and the undertaker finds it more convenient to get a permit in the town in which he resides, instead of the assessor in whose township the death occurred.

VI. Section 9 is a new section and requires the keeper of every incorporated cemetery to keep a record of interments, open at all proper times to the inspection of Local Boards or of agents of the State Bureau of Vital Statistics. Local Boards should notify each such local cemetery of this law.

VII. Section 15 makes it the duty of the Health Inspector, the Registrar of Vital Statistics and members of the Local Board of Health to enforce the law, and simplifies the mode of recovering the penalty.

In all other respects the act conforms to former acts.

The law is as follows:

CHAPTER XXXIX., LAWS OF 1888.

[Approved February 15th, 1888.]

An Act to secure in this state the certification of marriages, births and deaths, and of the vital facts relating thereto, and to provide for the record thereof.

1. Be it enacted *by the Senate and General Assembly of the State of New Jersey*, That it shall be the duty of every judge of any court of common pleas, justice of the peace, recorder, police justice, mayor, minister of the gospel, and other person who shall, under the authority of any law of this state, solemnize any marriage therein, and the clerk or keeper of the minutes of any religious society before which any marriage shall be solemnized in this state, to transmit to the officer hereinafter designated, within thirty days after such solemnization, a certificate of each and every marriage solemnized by any such minister, magistrate or other person, or before any such religious society, which certificate shall set forth particularly the name, age, parentage, birthplace, occupation and residence of each of the persons married, the time and place of the marriage, the condition of each of the persons married, whether single or widowed, the name of the minister, magistrate or person by whom, or of the religious society before which the marriage was solemnized, and the names and residences of the witnesses; any minister, magistrate or other person, or clerk or keeper of the minutes of any religious society, who shall neglect or fail to transmit such certificate to the officer hereinafter designated, within the time aforesaid, shall be liable to a penalty of twenty dollars.

2. *And be it enacted*, That it shall be the duty of the physician or midwife present at the birth of any child born in this state, and in case there be no physician or midwife present, then of the parents or either of them, to transmit, within thirty days after such birth, to the officer hereinafter designated, a certificate of such birth, which certificate shall set forth particularly, as far as they can be obtained, the day of the month and year of the birth, the township, city or municipality, and the county, in which the birth occurred, the name of each of the parents, the maiden name of the mother, the birthplace, residence and occupation of each of the parents, the sex and color of

the child, the name of the child if it be named, and the name of the attending physician or midwife if any there be; it shall also be the duty of the assessor of every township, and of the clerk or the person acting as registrar of vital statistics in every city, borough, town or other local municipal government, between the first and tenth days of April, in each and every year, to mail to each physician or midwife residing in such township, city, borough, town or other local municipal government, or to supply to every such physician or midwife on application therefor, twelve envelopes of proper size, each with a two-cent postage stamp thereon, to be provided at the expense of the township, city, borough, town or other local municipal government, for the use of said physicians and midwives in transmitting said certificates of birth to the officer hereinafter designated; any physician, midwife or parent whose duty it may be to transmit such certificate as aforesaid, and who shall neglect or fail to perform such duty within the time above limited, shall be liable to a penalty of twenty dollars; and the assessor of any township who shall ascertain that any physician, midwife or parent has neglected or failed to perform such duty as aforesaid, within the time above limited, shall forthwith make and sign a certificate setting forth the particulars hereinabove specified, and shall mark the same with the words "special return," but no such certificate of the assessor and no failure of any assessor, clerk or registrar of vital statistics to mail the envelopes aforesaid, shall release any physician or midwife, or any parent, from the duty of certifying such birth in the manner aforesaid, nor from the penalty incurred by any neglect or failure to certify such birth.

3. *And be it enacted*, That when any person shall die within this state, it shall be the duty of the physician who shall have attended such person during his or her last sickness to furnish to the undertaker, or any member of the family applying therefor, a certificate of such death, which certificate shall set forth particularly, to the best of such physician's knowledge, the name, age, sex, color, nativity, occupation, last place of residence, the township, city or municipality, and the county within which the death occurred, and the cause of death; if no physician shall have attended such deceased person during his or her last sickness, or if the physician who shall have attended such deceased person shall be absent or sick, so that no certificate of death can be obtained from him in time for burial, then and in either of such cases it shall be lawful for any physician to whom

application may be made, after having viewed and examined the dead body, and being satisfied that the deceased person did not come to his or her death by the contrivance, aiding, procuring or other misconduct of any person or persons, to furnish such certificate as aforesaid; in case the attending physician, or the physician applied to as aforesaid, after having consented to act upon such application and viewed and examined the dead body, shall refuse to furnish such certificate as aforesaid, except upon the ground aforesaid, he shall be liable to a penalty of twenty dollars; and if any physician shall refuse to furnish such certificate as aforesaid, upon the ground aforesaid, the same proceedings shall be had as are provided by law for the investigation of the cause of violent, sudden or casual deaths, and the physician or officer who shall conduct such investigation shall furnish such certificate of death as aforesaid.

4. *And be it enacted*, That every certificate of marriage or birth required to be made by the first and second sections of this act shall, in any city, borough, town or other local municipal government, be transmitted to the registrar of vital statistics, if there be such officer, and if not, then to the clerk of the city, borough, town or other municipal government in which such marriage or birth shall occur; and in any township every such certificate shall be transmitted to the assessor of the township in which such marriage or birth shall occur, or if there be no assessor in office, then to the township clerk.

5. *And be it enacted*, That every certificate of death required to be made by the third section of this act, shall, where the death occurs within any city, borough, town or other local municipal government, be delivered to the registrar of vital statistics of such city, borough, town or other local municipal government, if there be such officer, and if there be no such officer, then to the clerk thereof, and said registrar or clerk shall thereupon issue a permit for the burial of the body of the deceased person described in said certificate of death, and shall forthwith give said permit to the person delivering to him the certificate of death, which permit shall be authority for the burial of such body, but the said certificate of death shall be retained, to be disposed of as hereinafter directed; where the death occurs within any township and the burial is to be made in any place in this state not within the limits of any city, borough, town or other municipal government, every certificate of such death which shall be furnished to the undertaker, or other person acting as undertaker, shall of itself

constitute a sufficient authority for such burial; and where the death occurs within any township and the burial is to be made within the limits of any city, borough, town or other local municipal government of this state, every certificate of such death shall be delivered to the assessor of such township, if there be one in office, or if there be no assessor in office, then to the clerk of such township, which assessor or clerk shall thereupon issue a permit for the burial of the body of the deceased person described in such certificate of death, shall give said permit to the person delivering to him the certificate of death, and shall retain the certificate of death, to be disposed of as hereinafter directed; *provided, however*, that when a death shall occur within any city, borough, town or other local municipal government now existing, or which shall hereafter exist, within the limits of any township, then and in such case a permit for burial shall be obtained in the same manner as in other cities, boroughs, towns and local municipal governments; *and provided further*, that when a death shall occur within any township and the burial is to be made within the limits of any city, borough, town or other local municipal government of this state, the certificate of any such death may be delivered, if it be more convenient, by the undertaker or person acting as undertaker, to the registrar of vital statistics, if there be such officer, or if there be no such officer, then to the clerk of the city, borough, town or other local municipal government within which such undertaker or person acting as undertaker may reside, or within which the burial is to be made, but in all such cases it shall be the duty of such undertaker or person acting as undertaker, to deliver with said certificate of death, in writing, to such registrar or clerk, the name and post-office address of the assessor, if there be such officer, and if there be none, then of the clerk of the township in which the death shall have occurred, and also the sum of two cents to pay for postage, and said registrar or clerk shall immediately issue a permit for burial as in other cases and shall immediately transmit such certificate by mail to the assessor or clerk whose name and post-office address shall have been furnished as aforesaid, and for any neglect or failure so to transmit such certificate, such registrar or clerk shall be liable to a penalty of twenty dollars.

6. *And be it enacted*, That in case where, on account of the absence of the registrar of vital statistics or the clerk of any city, borough, town or local municipal government, or for any other sufficient reason,

it may be impossible to obtain from such registrar or clerk a permit in time for burial, it shall be lawful for any judge of the court of common pleas or any justice of the peace of the county in which the death occurred, on presentation of the certificate of death to him, and being satisfied that such certificate is genuine, and that no permit can be obtained in time for burial from the clerk aforesaid, to issue a special permit for burial in the following form: "It being impossible to obtain a burial permit from the registrar of vital statistics or the clerk of the [stating here the name of the city, borough, town or other local municipal government], on account of [stating here the reason], I, a judge of the court of common pleas [or a justice of the peace] of the county of , do hereby grant this special permit for the burial of , whose death has been duly certified to me," which permit shall be dated and signed by such judge or justice; the said judge or justice shall transcribe a copy of said permit upon the back of the certificate of death, shall give the original permit to the person delivering to him the certificate of death, and shall transmit the certificate, with the transcription thereon indorsed, by mail, in an envelope marked "burial permit," to the state bureau of vital statistics, at Trenton; the judge or justice who shall issue any such permit shall be entitled to charge and receive from the person presenting to him such certificate of death the sum of fifteen cents.

7. *And be it enacted*, That in case any person shall die without this state, and his or her body shall be brought into this state for burial, it shall be the duty of the family undertaker or other person conveying such body into this state, to bring therewith, or send beforehand, a certificate of death made by the physician who attended such deceased person during his or her last sickness, setting forth the particulars specified in the third section of this act, or in lieu thereof, a certificate of death, setting forth said particulars, may be obtained from any physician duly authorized to practice medicine within this state, who shall reside within the township, city, borough, town or other local municipal government within which the burial is to be made, and who shall have made proper inquiry as to the facts required to be certified, and satisfied himself as to the same; if the burial of such body shall be made in any township of this state, such certificate as aforesaid shall constitute a sufficient permit for burial; but if the burial shall be made in any city, borough, town or local municipal government of this state, the said certificate shall be delivered to the

registrar or clerk thereof, who shall issue a permit for burial, as in cases where deaths shall occur within the city, borough, town or local municipal government of which such registrar or clerk is an officer.

8. *And be it enacted*, That any undertaker or other person who shall be about to remove from this state the body of any deceased person who shall have died within this state, shall, prior to such removal, obtain a certificate of the death of such person, as required by the third section of this act, and such certificate shall be presented to the assessor of the township in which the death shall have occurred, if there be such officer, or if there be none, then to the clerk thereof, or to the registrar of vital statistics of the city, borough, town or other local municipal government, in which the death shall have occurred, or if there be no such officer, then to the clerk thereof, who shall issue to the person presenting such certificate a general or transit permit, according as the case may require; or, if the death shall have occurred in any township, and it shall be more convenient to present said certificate of death to the clerk of some city, borough, town or other local municipal government, such course may be adopted, but the person presenting such certificate shall, in such case, also furnish said clerk with the name and post-office address of the assessor, if there be such officer, and if there be none, then of the clerk of the township in which the death shall have occurred, and shall also pay to said clerk the sum of two cents, and said clerk shall thereupon issue a general or transit permit as aforesaid, and shall also forthwith transmit said certificate, by mail, to the assessor or clerk, whose name and post-office address shall have been furnished as aforesaid, and for any neglect or failure so to transmit such certificate, said clerk shall be liable to a penalty of twenty dollars.

9. *And be it enacted*, That it shall be the duty of the keeper of every cemetery within this state, owned by any cemetery company organized under any law of this state, to keep a record of all interments made in such cemetery, which record shall include the name of the person interred, last place of residence and the name of the undertaker, or person acting as undertaker; said record shall be a public record and at all times open to the inspection of any persons who, under any of the laws of this state, shall have duties imposed upon them relating to the procurement or tabulation of vital statistics.

10. *And be it enacted*, That it shall be the duty of every undertaker in this state, and of every person acting as undertaker in this state,

to transmit by mail or otherwise to the assessor of the township, or if there be no assessor, then to the clerk of the township, within five days after burial, the certificate of death which he may have received and used as a burial permit in the case of any person who shall have died in such township, or of any person who shall have died out of this state and been buried in such township, and if he shall neglect or fail so to do he shall be liable to a penalty of twenty dollars; and any undertaker, or person acting as undertaker, who shall bury within this state the body of any deceased person without having first received a permit for burial, according to the true intent and meaning of this act, and any clerk who shall sign any permit for burial and deliver the same, or knowingly suffer it to be delivered, to any undertaker or other person, without having first received a certificate of death, according to the true intent and meaning of this act, shall be liable to a penalty of fifty dollars.

11. *And be it enacted,* That any minister of the gospel, magistrate, physician, midwife or other person, who shall knowingly make any false certificate of marriage, birth or death, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be liable to a fine not exceeding one hundred dollars or imprisonment in the county jail for a period not exceeding three months, or both, at the discretion of the court.

12. *And be it enacted,* That it shall be the duty of the assessor and clerk of every township, and of the registrar of vital statistics and the clerk of every city, borough, town or other local municipal government in this state, on or before the fifteenth day of each calendar month, to transmit by mail to the state bureau of vital statistics, at Trenton, in an envelope marked "vital statistics," all the certificates of marriages, births and deaths received by such officer, and of all "special returns" of births made during the preceding month; and every such assessor, registrar or clerk, upon receiving a certificate from the medical superintendent of said bureau of the whole number of certificates of marriages, births and deaths returned as aforesaid, shall be entitled to receive from the proper disbursing officer of the township, city, borough, town or other local municipal government in which such assessor, registrar or clerk shall be an officer, the sum of ten cents for each marriage, birth and death so returned, the receipt for which shall be attached to the said certificate of the said medical superintendent, and no payment shall be made unless such certificate

be produced; and it shall further be the duty of the registrar of vital statistics or the clerk of every city containing thirty thousand inhabitants or over (provided he has been or shall be so directed by the common council or other governing body thereof), before transmitting said certificates to the state bureau of vital statistics, to make a complete record of the marriages, births and deaths occurring in such city, which record shall be a transcript of the names and vital facts appearing upon the certificates of marriages, births and deaths delivered to him as hereinbefore directed; the said record shall be so made up that the marriages, the births and the deaths shall appear in separate and distinct classes, in books of such form as may be approved by the local board of health, and for making such record the said registrar or clerk shall be entitled to receive from the disbursing officer of said city the sum of three cents for each certificate thus recorded, in addition to his other fees and salary.

13. *And be it enacted*, That it shall be the duty of the medical superintendent of said bureau to cause the certificates of marriages, births and deaths received by said bureau pursuant to the provisions of this act, to be alphabetically indexed, and in connection with said index to cause to be transcribed or otherwise recorded from said certificates such of the vital facts appearing thereon as the state bureau of vital statistics may deem necessary and useful; the index to the certificates of marriages, of births and of deaths, with said record of vital facts, shall be kept separate and distinct from one another, and shall further be so arranged as to present in separate and distinct classes the index and record for each county, and for each city, borough, town and other local municipal government containing five thousand inhabitants or over, which index and record thus prepared and classified shall be preserved as a public record in the office of the state bureau of vital statistics, and the original certificates shall be preserved in the archives of the state bureau of vital statistics; any such original certificate, or any copy thereof, certified to be a true copy under the hand of said medical superintendent, shall be received in evidence in any court of this state to prove the facts therein contained.

14. *And be it enacted*, That it shall be the duty of the state bureau of vital statistics to cause to be prepared blank forms of certificates of marriages, births and deaths, and of burial permits, corresponding to the requirements of this act, which forms, together with such sections

of this law and such instructions and explanations thereof as the said bureau may deem useful to persons having duties to perform under this act, shall be printed and supplied in the same manner as the blanks and stationery for the use of the several departments and public offices of the state government are printed and supplied, and shall be distributed from time to time as occasion shall require, by said bureau, amongst the assessors of the townships and the registrars and clerks of the cities, boroughs, towns and other local municipal governments of this state; and it shall be the duty of every such assessor, registrar and clerk to make and keep a complete list, as far as possible, of all ministers, magistrates, physicians, midwives, undertakers and other persons required to perform any duties under this act, and on or about the first day of May of each year to send to each such person a printed copy of such sections of this act and of such instructions and explanations as may be prepared as aforesaid, and also to furnish to each such person, on application, free of charge, a reasonable number of said blank forms as such person may require; and all certificates of marriages, births or deaths shall be made on the printed forms furnished by said bureau, or if they be written shall conform in all respects to said printed forms.

15. *And be it enacted,* That any penalty incurred under any of the provisions of this act, which shall relate to any particular marriage, birth or death, may be recovered with costs in an action upon contract in the name of the local board of health of the township, city, borough, town or other local municipal government, within whose limits such particular marriage, birth or death shall have occurred; and any penalty incurred which shall relate to any particular burial, if the death occur in this state, may be recovered in like manner in the name of the local board of health of the township, city, borough, town or other local municipal government, within whose limits the death shall have occurred, but if the death occur without this state then such penalty shall be recovered with costs in an action upon contract in the name of the local board of health of the township, city, borough, town or other local municipal government within whose limits such burial may have been made; it shall be the duty of any health inspector, registrar of vital statistics or member of any local board of health, who shall know or be informed of any violation of this act, whereby any penalty may have been incurred, to make, under oath or affirmation, a complaint against the person incurring

such violation, setting forth the facts of such violation, and to file such complaint with the clerk of any district court or any justice of the peace, police justice or recorder of the township, city or municipality within which the local board in whose name the suit may be brought shall have jurisdiction, and the clerk of the district court, the justice of the peace, police justice or recorder with whom any complaint shall be filed as aforesaid, setting forth facts sufficient to show that any penalty prescribed by this act has been incurred, is hereby authorized and required to issue process, either in the nature of a summons or warrant, which process, when in the nature of a warrant, shall be returnable forthwith, and when in the nature of a summons shall be returnable in not less than five nor more than fifteen days; on the return of such process, or at any time to which the trial shall have been adjourned, the said court, justice of the peace, police justice or recorder, shall proceed to hear the testimony and to determine and give judgment in the matter without the filing of any pleadings, and if judgment shall be given in favor of the plaintiff, execution shall be forthwith issued against the goods and chattels and person of the defendant for the amount of the penalty with costs; the officers to serve and execute any process of execution issued as aforesaid, shall be the constables of the county, which service and execution shall be made in the same manner and under the same liabilities as prescribed in cases of the service and execution of process and executions by the act entitled "An act constituting courts for the trial of small causes" and the supplements thereto; all moneys recovered in any such action shall be paid to the local board of health in whose name the suit may have been brought, for the uses of such board.

16. *And be it enacted*, That all acts and parts of acts inconsistent with the provisions of this act be and the same are hereby repealed, and that this act shall take effect immediately.

Approved February 15th, 1888.

The attention of all those concerned is especially drawn to the Circular Letters herewith, marked (A), (B) and (C).

CIRCULAR LETTER (A).

STATE OF NEW JERSEY,
BUREAU OF VITAL STATISTICS,
TRENTON.

The necessity of a State record of every marriage, birth and death, the legal rights of those concerned, and the penalties for neglect of returns are such that omission to obey the law may at any time cause you both difficulty and expense. We shall hereafter take it for granted that all know the law. Returns should be made in ink, and care used as to dates. All city clerks and assessors can, at any time, supply blanks or any needed information, or a postal directed "Bureau of Vital Statistics, Trenton, N. J.," will bring reply.

Neglect of returns of birth may, at any time, embarrass as to proof of age, parentage, pensions or other legal inquiries, and also cause a defect in those accounts of population which are kept in the interests of social progress and of the public health.

Neglects as to returns of death often cause the greatest legal complications, and are absolutely necessary to enable us to deal with questions relating to the health of the people and the public welfare.

For the good citizen it is enough that the law requires these returns, while all those who study the great questions relating to population and national progress recognize their indispensable utility.

CIRCULAR LETTER (B).

TRENTON, N. J., March, 1888.

GENERAL CIRCULAR AS TO DUTIES UNDER THE LAWS RELATING TO VITAL RECORDS AND STATISTICS.

To Clergymen, Justices of the Peace, &c.

It is not only a breach of law, subjecting you to penalty, but a risk to the personal rights of individuals to neglect the return, within thirty days, of a marriage certificate to the assessor of the township or city clerk of the city in which the event occurs. Blank forms can be had of the assessor or city clerk, or through postal addressed, "Bureau of Vital Statistics, Trenton, N. J."

To Physicians, &c.

Returns of births are not only required by law, but essential to that right of record which is thus secured to every child. Birth-rates and death-rates are needed for comparisons, in order to know sanitary conditions. The returns to assessor, or city clerk, must be made each month. Your promptness will greatly aid us in comparisons. Blanks can always be had of assessors or city clerks, or through postal addressed, "Bureau of Vital Statistics, State House, Trenton."

N. B.—See law that physicians must have their diplomas on record in office of county clerk. Certified list will be printed.

To Undertakers.

You are aware that the *burial* of any person by you without a permit is contrary to law. A failure to find the record often obscures legal claims, and may subject you hereafter to great risks. Where the *death and burial* are in a township outside of city limits, the certificate of death answers as a permit. Delay to obtain the certificate until after death, and burial without a permit must not occur. All plausible excuses do not answer the one fact that the State ought to and does say that no human being shall be put under ground without a responsible certificate as to cause of death, &c. Assessors, clerks and local boards of health must report any negligence to Bureau of Vital Statistics, Trenton, N. J., or bring action if necessary.

City clerks will please note chapter XXXIX., section 5, Laws of 1888.

To City Clerks and Assessors.

This Bureau has sent notices to secure prompt returns to all physicians, clergymen and undertakers. Under the law, any negligence, with the name and address, must be reported to us. The general law as to vital statistics gives full power, also, to Local Boards. These returns are essential as records, and for the study of local evils, and of the means to protect the life, health and welfare of our population. The full success of some cities and townships shows that local defects in returns are not the fault of the law, but result from negligence or want of judicious oversight.

Order blanks of Bureau of Vital Statistics, Trenton, N. J., *before* you are out, so that none may complain.

CIRCULAR LETTER (C).

The attention of the Medical Superintendent of Vital Statistics has been called to the fact that although returns reach this office they are often made so long after the time provided for by law as to make imperfect the returns for cities for any given week or month, and also so as to seriously delay the indexing at the central office. Still more serious is the fact that *undertakers* have buried *in some cities,* on the certificate of death instead of the permit, and even in a few cases have buried without either, on the promise that they will make the return. While this return is afterward made, so irregular a mode of interment can no longer be tolerated. Recently an investigation showed six burial certificates in the hands of one city undertaker, which he had arranged to send to the city clerk some time after the burials took place. *All undertakers* are now cautioned against any such delays or irregularities under penalty of the law. Boards of Health are requested to at once proceed against such violators of their ordinances. All keepers of cemeteries are warned against allowing burials before presentation of the required permit, or of the certificate of death if the death or proposed place of burial is within city limits. If any case of refusal of burial hereafter occurs, the undertaker will be held responsible, both by the courts and by the friends who suffer by the delay.

E. M. HUNT,

Trenton, March, 1888. *Med. Sup't S. V. S.*

THE PASSAIC RIVER AS RELATED TO WATER-SUPPLY AND DEATH-RATES.

BY E. M. HUNT, M.D.

The question of a pure water-supply is alike one of personal and public health, and of material prosperity. When once it comes to be known that the wells or the reservoirs of any locality cannot supply water fitted for drinking purposes, there is peril to the health of inhabitants, as well as an inducement afforded for them to move away, and for other persons not to settle in that district.

There are two fundamental questions which meet us at the start.

(*a*.) What constitutes a water-supply fitted for drinking purposes?

(*b*.) What are the risks or effects of a supply that does not answer this condition?

We answer the first question as follows:

First of all, it is not required that a water-supply fitted for drinking purposes be absolutely pure. It does not have to answer the chemical definition of pure water. We have a standard of pure water in rain coming down at places (as on the sea) where in its descent it does not encounter any organic matter, but it is not required that only such water be used. By a knowledge of standards, we come to know not only the standard of purity, but what variations are permissible. Thus, as to inorganic matters or such as fire will not destroy, we know, for instance, that a very little lime may be in water without ill effect, and so know the significance of various mineral compounds both as to their kinds and as to their degrees. So we come to know that living animal or living vegetable matter of certain kinds and of certain quantities is not injurious. As to dead vegetable matter we know that its effects depend upon quantity and quality and upon such conditions of heat and moisture and of individuals as may cause it at one time to be neutralized or overcome, and at other times to undergo forms and degrees of decomposition which are riskful or absolutely harmful.

The same is true as to animal matters, which, as a whole, are more hazardous than vegetable matters, but which also vary as to the effects of quality or quantity and as to whether they undergo what may be called natural decompositions or those which are more putrefactive or exceptional. The same is still more true of animal excretions and secretions, which are still more prone to rapid putrefaction or specific changes which incline to produce disease. One thing was long since settled and has never been contradicted, "water-supply should be uncontaminated by sewage. There is no demonstrable safety in a middle course. No one has conclusively shown that it is safe to trust to dilution, storage, agitation, filtration or periods of time, for the complete removal of disease-producing elements, whatever they may be."

The presence of soluble vegetable matter is to be avoided more, however, on account of the unpleasant color and sometimes odor, which is thereby communicated to the water, than from its injury to health. This must not be confounded with vegetable matter in course of decomposition, which is considered to be injurious and at all times to be avoided.

By knowing what pure standards are and by a knowledge of the laws of inorganic and organic materials, of living and of dead matter, and by experiment and experience, we come to formulate rules or to arrive at conclusions as to what is safe or unsafe, what is innocuous and what is harmful. Two things can be said as to the knowledge thus acquired.

(*a.*) Although for a time there may be disagreement as to facts, and although for a long time there may not be agreement as to all details, yet the knowledge thus far secured is as a rule such as commands the general consent and belief of those most capable of knowing and of a sufficient number to justify us in receiving their conclusions rather than accepting the doubts and unbeliefs of those who have never investigated this particular subject.

(*b.*) The cautions and precautions used by such have generally been those that justify us in accepting their views so far as they regard them as determinate.

We therefore, first of all, claim that where the uniform testimony of chemists and of those who have made collateral scientific, technical experimental investigations, affirms that a water-supply is not fit for drinking purposes, this is a kind of testimony to be accepted and not in anywise shaken by the contrary opinion of those who have not and cannot apply any such tests. We do not say this is the only kind of evidence, but it is a kind not to be set aside by any promiscuous, off-hand opinions. The *second evidence* is that derived from actual effects.

As the findings of science and the findings of experience should agree sufficiently often to establish the claims of either, it would be well if always the one could be tested by the other. But if so, the trial must be as exact and as void of sources of error in the one case as in the other. Thus, if we would test by experience, a water the chemist has declared unfit for drinking purposes, as carefully in this human laboratory as he has in his laboratory, we would select a hundred children between one and five years of age in that period of the year in which changes of decayable vegetable and animal matters are most likely to take place, and would give to these children full and frequent doses of this water and watch its physiological effects with the greatest accuracy and make precise record of all facts. It is because of the risk of such experiments to human life, that long ago hundreds of such experiments have not been carried on under conditions that would exclude other more general, exciting or *neutralizing* causes.

It is because of our inability thus to test, that what is called *experience* is so mixed up with other influences that we find it difficult to rely on the general unclassified opinions of physicians who cannot easily collect the evidence in such way as to be able to analyze it. Hence, we find equally competent men (if they can be led to give any opinion), side by side, giving the most diverse opinions as to the effects of this or that food or drink, really because neither, under the circumstances, could have been expected to give any *expert* opinion at all.

To this, however, there may be an exception. When, year after year, the general death-rate or sickness-rate of a place is beyond what is regarded as a fair average, say fifteen per thousand, when it occurs especially at certain ages known to be susceptible to alimentary influences, and when it belongs to species of disease known especially to be related to decomposing and putrefactive changes, there may come to be such cumulative evidence and such exclusion of other factors as afford a large probability as to the cause—enough to be the ground of action. This is all the more conclusive if there are cases where the chemists and others show a bad record as to sickness to have existed, and that it was changed by the withdrawal of one water-supply and the substitution of another.

This is still more strengthened, if certain special and specific diseases can be traced, or have been traced, to the fouling of a water-supply with such exactness as that both the scientific and the chemical investigators agree as to the relation of the drinking-water to the disease.

When any or all of these facts are in evidence, very great consideration is to be given to what is the common consent and common observation and belief of those who, with skill, have made technic *examination* or have, in their *observations*, fulfilled such conditions as make of them skilled observers.

There is another argument that is not to be lost sight of. If a teaspoonful of compost or excrementitious matter of any kind, or a teaspoonful of urine, is put to every pint of water in the water-holder from which I am to drink, the general principle, the common instinct and the general sentiment, which is not sentimental, but derived from experience and observation, and the testimonies of science, are, that such water is not intended for food or drink. It is not that we need so much to look at any one proof, as at the very system basis of life and the organic law of all existence.

Surely, in such a case, the burden of proof that it is harmless is with those who are in contrariety to the principle of nature. The only limitation to this argument is, that there are in the processes of dealing with decomposable material, laws of restoration or neutralization. The operation of these, however, needs to be proven.

But these laws are within the reach of our ken, so that we know whether they have really been brought into operation. If so, we can test and prove it by analysis and by comparisons of the state of the water where, or at the time this material is introduced, and after heat and moisture have affected it, or after the lapse of some time, or after great distances of flow have changed it. We do, fortunately, find that such recovery does take place within certain defined limits and under certain given circumstances. But until this is positively shown to have taken place, the safe rule is, that we are not to drink of that which has been polluted, since such recovery so often fails to take place.

With these facts before us as guides, are we not in a position generally to determine the quality of a water-supply? There are tests of appearance; often of taste and smell, and oftener still of chemistry, and some approximate tests of biology, and too frequently death-rates and sickness-rates and special seizures that show the condition of water-supplies as their most probable explanation—so much so that they are accepted as such by the great majority of those who have most thoroughly fitted themselves for correct judgment and conclusions.

We proceed next to our second question, "What are the risks or effects of a supply that does not answer to the conditions required for a proper quality of drinking-water?"

The answer in part comes from what water is and what it does in the system. Pound for pound it is taken into the system more than food. It permeates and penetrates every part. It so far makes up the bulk of the human system that the body has been defined to be a few pounds of flesh amid six pailfuls of water. Now, first of all, the system will not perceptibly or intensely sicken under ordinary and repeated defilements of water any more than every wrong food or wrong use of it will make a record in ill-health. Nature meets forces of evil with forces of good, and even so far overcomes as to make that which is evil seem often harmless. But there has been expenditure of vital force in the act which had far better been utilized in some other direction. There is wastage of force and of energy in every unnecessary tax upon vitality, recording itself far oftener in a slight reduction of vigor or even in a manifestation of irritated and spasmodic force or temporary ailment, than in an abbreviation of life, which, even when it occurs, does not occur at the beginning or middle or at the time of infliction, but only at the end, when the measure of the imprudence is full. Thus, because the result is not immediate, but records itself too often by making sixty instead of seventy the limit of life, we lose sight of operating causes.

Those who have been close students of this phase of influence have not only convinced themselves but been able to show to others the limiting and disturbing influences of a poor water-supply. The evidence is made quite apparent in the records of the Local Government Board of Great Britain and some of the vital statistics of Dr. Farr. Prof. De Chaumont, in his lectures on "State Medicine" (1875), in detail and by diagrams shows the coincidence of disease with water impurity. Dr. George Wilson, of Leamington, in his Handbook of Hygiene has a valuable chapter on "Impure Water and its Effects on Public Health." The coincidence of severe cholera epidemics with a water-supply proved to be polluted has been shown in numbers of instances beginning with the investigations of Dr. Snow in 1849, and oft repeated up to the fearful supply of Marseilles in its recent cholera visitation. The relations of typhoid fever to water-supply have been constantly illustrated from the time of Murchison to the present. The North Boston case of Dr. Austin Flint, the Plymouth epidemic and some lesser ones that have occurred in our State have sufficiently illustrated this. Of the less specific forms of diarrhœa and dysentery, the case of the Salford jail, where only those were seized who had used the one supply, while all using another escaped, as well as the six outbreaks selected from the government reports, point to the water as the cause. It would require a volume to report the multitudes of cases in which an imperfect water-supply has been reasonably shown to have caused both general and specific maladies. While oftener there are co-operating influences, this one has been sufficiently prominent to have satisfied the general judgment and experience of practitioners as well as of those who in the laboratory have verified their beliefs. These are scattered through the sanitary literature of the past twenty years, while the improvements caused by the introduction of pure supplies like that of Loch Katrine at Glasgow have been verified in many other instances.

THE PASSAIC RIVER AS AN EXAMPLE.

Perhaps this mode of securing evidence, and the reasons for making deductions therefrom, and consequently for securing a better water-supply, cannot be better illustrated than by taking as an example that river in our State on which more than any other dependence is placed for water-supply to large populations.

PASSAIC RIVER AS A WATER-SUPPLY.

We, therefore, proceed to inquire as to what are the evidences as to the fitness or unfitness of Passaic river as a source for drinking water. Our first inquiry is as to its natural fitness. It may be said, in general of all rivers, that inasmuch as they represent to a large degree surface-water and imperfect percolation, and are readily accessible for pollution, that they are not to be looked upon as usually the best sources of public water-supply. So true is this that Dr. Sanders, of London, in an article on the "Purification of Rivers" in the Transactions of the Society of the Medical Officers of Health, 1886–7, says:

"That water-supplies are now throughout the country largely taken from independent sources, and the rivers abandoned for domestic supplies."

Next, there are especial reasons why the Passaic and some rivers similar thereto are to be criticised in choice of water-supply. It is a river which in its upper tributaries and in the impediments interposed by ledges of rock and dams naturally acquires a great deal of vegetable material and sediment. No one who has traced the portion of it above Little Falls that does not know that to a very small degree does it answer the ideal of a mountain stream. The inundations and their deposits, the backward flow of miles, and the small grade of flow at best diminish its self-purifying properties. As we come further down, we find it to be inevitable that large populations must be gathered here and there upon its banks and factories of various industries, and that its course to the sea must be amid great meadow-flats and with no rapidity of flow. So, it is one of those rivers which engineers would not, on general grounds, choose for a supply. Even its use as a general sewer is far more defensible than the use of the lower portions of it for a water-supply.

Next in point is the consideration of the chief sources and the degree of pollution of this river at or near points where it is depended upon for a water-supply.

It is to be remembered that pollutions coming from any city are of varied character and very large amount. To go into an accurate calculation we would need not only to know how much is the excrement of all kinds and the results of all decay from every being, animal or human, but also all that is derived from mineral, animal and vegetable materials that rains sweep into the river and all the waste of all the factories and of every process of decay and the changes it has undergone or can undergo.

The amount of excreta, solid and fluid, of 100,000 people is not overstated at 300,000 pounds every twenty-four hours, or 150 tons per day, or 4,500 tons a month, or 54,750 tons a year. Add to this all decayable and fermentive matter, all laundry and utensil wash, all the pollutions of water as used, all the refuse of slaughter-houses, of factories, of offensive trades and all those complications made by disease and by the storage of foulness and consequent multiplication of risk, and we have an aggregate of befoulment that intuition, primary belief, experience, science and art unite in saying should not go into our pitchers or our drinking-cups or our stomachs. Even with very large dilution and with some diminution through natural processes, it is *too large a hazard* for civilized people if any other water is to be had. When you multiply all this by the hundreds of thousands of *present* and what ought to be prospective populations, there is an urgent case before us for arbitration and verdict. The three embarrassments that are involved are disease, death and financial disaster.

As we turn to the banks of this river below Little Falls, we find at Paterson about 60,000 people besides all other animals and all other sources of befoulment; at Passaic, 9,000; at Newark, 160,000, with a population in Jersey City and suburbs of 200,000, receiving the same supply. With this is to be reckoned some of the scattered populations along the banks, as well as pollutions from Saddle river and the towns along Third river and those along Second river, as well as what is carried up by the tides.

Paterson has about thirty miles of sewers. The flow of Passaic city is to the river, and they are now proposing to build sewers to conduct it more directly.

The Third river bears into the Passaic the refuse of the several factories and of the Morris canal, as well as some of that of the scattered population near it. All this enters about one mile and a quarter above the Newark in-take.

The Second river brings down the sewage of Orange, Bloomfield and other towns and villages in close proximity, and empties about one-quarter of a mile below the Jersey City in-take.

In addition to all this, the sewage of the city of Newark, to a serious degree, is forced up above the Jersey City in-take, and so as also to affect the parts above Newark in-take.

The more the facts have been examined into, the more it appears that the sewage of 250,000 people, with all that it means as to other refuse, garbage, &c., is likely to find its way into the Passaic river. The flow of the Passaic river is stated by Howell & Croes (p. 35) as 126,334,000 gallons per day at Paterson when the streams were low (October, 1878), so that as to the water of Jersey City, one of the chemical experts (Prof. A. R. Leeds) says: "I am within the limit when I state that fifty per cent. or one-half of the organic matter in the Jersey City water during the year 1884, was sewage." More recent analyses have shown increased pollution.

Thus it appears that the Passaic river is forever to receive into its waters a very great amount of impurities of various kinds, and the very grave presumption is that its waters are so greatly mixed with sewage as to be unfit for drinking. But inasmuch as it is admitted that distance of flow has effect in refreshing or cleansing water, attention needs to be given to the fact that as to the Passaic, the pollution is so great in relative quantity, and so much of it takes place in the vicinity from which the supply is drawn, that we could not expect sufficient cleansing from this source. The facts as to the localities of these sewage inflows have already been given.

We now turn to the evidence to be derived from chemical investigations and analyses. We do not here discuss all the criticisms made as to the significance of chemical analysis. It can be said in general that the chemist does not lose sight of other proofs that generally become apparent in the analysis besides that of the proportions of different kinds and states of organic matter.

It must also be said that while it is admitted that chemistry does not show all the badness there may be in water, and does not fully reach certain questions as to specific microbes, it does indicate those conditions without which destructive life is not likely to exist in the water. It can also be said that where water is found to answer chemical tests, it has never been shown to be the cause of disease. Chemical defects in water do not exhibit all its evils; just as is the case with carbonic acid in air. But it has been found to be so indicative as to the presence of organic matter as to be one of those indices which unfailingly puts out a danger signal. Even where there is danger it does not, in telling quantity of foreign matter, or its general quality, tell all as to possible conditions of forced and virulent decompositions. It, therefore, is not the perfect measure of ill effects, which may vary according to freshets, to seasons of the year, to temperature, to humidity, to quality of filth, to exposures, to acclimation, &c.; but it does tell of such hazard as it is unwise for any to take, and such as is sure to become, from time to time, an infliction to some of those exposed thereto.

We therefore ask, What has been the testimony of chemists or engineers as to the character of this Passaic water, and whether their varied testimonies are in general harmony?

The general standard of purity for river waters in the United States, with allowable limits, is as follows:

	GENERAL STANDARD OF PURITY For River Waters in the United States. Highest Upper Limits.) Parts per 100,000.
Free ammonia	0.001 — 0.012
Albuminoid ammonia	0.01 — 0.028
Required oxygen as determined by permanganate	0.35 — 0.50
Required oxygen as determined by silver	(?)
Nitrites [HNO_2]	0.0001 — 0.001
Nitrates [HNO_3]	0.35 — 0.50
Chlorine	0.30 — 1.00
Hardness	5 for soft — 15 for hard.
Total solids	15.00 — 20.00
Oxygen dissolved per liter	(?)

The standard taken for Passaic water, as derived from analyses of its upper waters, by Prof. A. R. Leeds, for 1883, is as follows:

	PASSAIC STANDARD OF PURITY. (From analyses of its Upper Waters for 1883) Parts per 100,000.
Free ammonia	0.005
Albuminoid ammonia	0.015
Required oxygen as determined by permanganate	0.40
Required oxygen as determined by silver	0.32
Nitrites [HNO_2]	Trace.
Nitrates [HNO_3]	0.35
Chlorine	0.35
Hardness	3.00
Total solids	6.00
Oxygen dissolved per liter	5.5 cc.

We believe it is admitted to be a fair standard. Now, the recognitions of pollution, as existing and as increasing in the Passaic river, reach sufficiently far back, and have been attested by a sufficient number of experts to leave us in no doubt as to their general and united judgments.

The Geology of New Jersey, Geo. H. Cook, as published by the Board of Managers of the Geological Survey, 1868, gives an analysis of the Passaic water made in 1851 by Prof. E. N. Horsford, in comparison with the Schuylkill, the Croton, Cochituate and some others; and says the comparison of the relative amounts of solid matters, organic and inorganic which it contains, with those of various other waters in this country used for the supply of cities, shows the Passaic river water to be inferior to the best and superior to some in good repute.

At that time the population of the State was 906,096; of Paterson (1870), 33,579; Passaic below 4,000, and that of Newark, 105,059; that of Jersey City, 82,546.

So late as 1873 a chemical report made by Prof. Henry Wurtz, for the city authorities of Jersey City and Newark, did not show any great deterioration of the water-supply. It must, however, be borne in mind that chemical analysis was less specific at that time than now, and did not so discriminate between the qualities of matter present, and did not so fully know its real significance.

In 1875 the report of the State Geologist speaks thus: "Both Newark and Jersey City get their present supply by pumping water from the Passaic, only a short distance above the former city. This water is of questionable purity. The city of Paterson, with its 33,000 inhabitants, is only thirteen miles above Newark, and all its sewage is discharged into the Passaic, and the country from Paterson to Newark is very thickly settled, and the river receives all its wash and drainage. The sewage of Newark, too, though emptied into the river lower down, is yet carried by the rising tide almost, if not quite, to the pumping works, so that it may help to pollute the water pumped to supply these cities." He also states that the smell of the water in warm weather is against the assumption that its large dilution and length of flow have so oxidized the sewage as to render it safe. In the same report Profs. Henry Wurtz and A. R. Leeds are quoted as believing it still safe for use, while Prof. Cook and Gen. E. L. Viele showed that it was too impure to be safe. (See discussion New Jersey Sanitary Association, 1875, in Second Report, 1878, of New Jersey State Board of Health.) In the meeting of the association, 1877, Prof. Leeds alluded to the makeshifts for the evils of Passaic water-supply, "such as the present plan of a dam across the Passaic at Belleville."

In 1876 analyses of water from the Newark and Jersey City pump works were made at the Geological Survey laboratory at New Brunswick, and compared with water further up. The report in comment thereon says:

"The unusually large amount of volatile and organic matter in the solid substance connected with these waters, together with the knowledge of the sources from whence it is derived, is strongly against its character and desirability for domestic and household use."

In 1876 the anxiety as to the increasing pollutions of the Passaic river led to a meeting in Newark, in the early part of the summer, "to consider the question of water-supply for the cities and towns in the counties of Hudson, Passaic, Essex, Union and parts of Bergen and Middlesex." A committee was appointed to collect information, and the aid of the Managers of the Geological Survey was invoked. The State Geologist's Report for that year, beside much other valuable information on the subject, says: "The present supply for Newark and Jersey City is drawn from the Passaic near Belleville. This stream receives the sewage from Paterson, a city of nearly 40,000 inhabitants." It then alludes to the higher flow of the tide by reason of the clearance of the channel by the United States government. Analyses of the Passaic water at various points are given. The report alludes to recent great improvements in the chemical analysis of water. While careful in its deductions it points to the correspondence of results with known facts as to the increasing pollutions, and sums up thus: "Water contaminated by filth and sewage, however offensive it may be, is not always, or even generally, *poisonous*. But it is never safe to be used for domestic purposes. In hot weather the organic matters in it decompose rapidly, producing new and unwholesome substances, which are frequently the causes of sickness and death. Diseases, such as typhoid fever, cholera, &c., are conveyed by drinking-water to an extraordinary extent, and exposure to air and oxidation destroys them very slowly. Even freezing does not always destroy organic poisons in water."

The report of 1878 again recurs to the subject, and concludes thus: "At Belleville the sewage from Newark and the salt water from the bay are liable to come up with the flood-tide and pollute the water, and at all times the sewage and manufacturers' waste from Paterson and Dundee run into and mix with the pure river water. On account of these sources of impurity, uneasiness and distrust are continually expressed in regard to the quality of water from this part of the river. And this has led to many inquiries for an available supply of unquestioned purity." Attention is then directed to various and abundant sources. The report says an attempt to secure it is "altogether feasible and economical and cannot be begun too soon."

In the following year (March, 1879) we get valuable information on this subject from a special report made to the Newark Aqueduct Board by J. J. R. Croes, C.E., and George W. Howell, C.E., in compliance with a resolution of said Board, passed June 5th, 1878, "to ascertain the relative cost and value of various schemes for furnishing an additional supply of water to Newark." While it was not the chief design of this expert committee to set forth facts as to the present character of the water-supply, the fact of its appointment showed the sense of the need, while the facts they present as to the area of population to be provided for still further urged its importance. In this report they accept the fact that the sewage pollution is known to occur, and say that "the result of the careful investigations on this subject, which have for many years been in progress in Europe and America, is expressed in the common assent of all authorities that water-supplies should be uncontaminated by sewage. In addition to the population already noted, they point to the various serious pollutions from certain specified manufactures. For instance, in the various woolen factories, the grease and dirt removed from the wool is about one-third of the weight of the wool treated. As to a mill-race at Paterson receiving the discharge from several factories, they say: "The effect of the impurities discharged into the race was very apparent at its outlet into the river. The water issuing from it was full of foul-looking matter in suspension, and offensive to both sight and smell. It was apparently much more offensive than that issuing from the main sewer of Paterson, close by." Thus, one after another, they recount the sources of pollution, especially those from factories as existing at that time. It is still true, as quoted by them, that "among the numerous processes for the cleansing of polluted water with which we have been acquainted, there is not one which is sufficiently effective to warrant the use for drinking-water of water which has once been contaminated with sewage or other similar noxious animal matters." Satisfied of the necessity of some other source of supply, they then with great care present the various sources from which an abundant and satisfactory supply can be secured.

Just about this time the project of driven wells came into great prominence, and Newark hoped that it had solved the problem of water-supply without resort to any of the proposed supplies from the more northern portion of the State.

Thus, the Geological Report for 1880 says: "The Newark Aqueduct Company is drawing a large part of the water-supply for that city from driven wells in the vicinity of their pump works on the Passaic river flat, a mile north of Belleville. A published report puts the quantity daily pumped from them at 5,000,000 gallons, and the quality of the water is satisfactory." But as this was merely Passaic water drawn off along the shore, and as the quantity was not maintained, it did not afford the hoped-for relief. When, in 1882, the patentee of these wells asked for a financial consideration, they were abandoned. Besides the watchful inquiry maintained by the Newark Aqueduct Board and some chemical examinations made from time to time, in 1881 it secured the services of Prof. A. R. Leeds as chemist to the Board. It evidently did this determined while having no other source of supply to keep itself informed of the varying qualities of the water and as determined to leave no means untried to guard this supply so long as it had to be depended upon by the people of Newark and vicinity. Prof. Leeds' first report was made to what was then termed "The Board of Inspection of the Pollution of the Passaic River and its Tributaries."

In his first report, November, 1881, Prof. Leeds gave large consideration to the oxidation and purification of the water in its thirteen miles' flow from Paterson, and concludes that the pollution of the water used for the supply of Jersey City and Newark was derived mainly from the sewage of Newark, which was carried up the stream with the salt water at every flood tide and carried directly in front of the pumping works of both cities. He speaks of it as a "tolerably wholesome drinking-water." He concludes that the evil effects from Paterson do not require action as urgently as the impurities introduced lower down; that if these were kept out a great improvement would be noted, and that it is imperative to keep back the up-tide. Nevertheless, a sanitary patrol of the upper stream was wisely exercised.

In his second report, December 27th, 1882, the chief additional point brought out is the varying condition of the water at different times, since from the December previous a system of regular monthly analyses had obtained. In "February and March the water arrived at its condition of greatest purity." From "September to October of the present year the water rapidly deteriorated and reached its worst point in the latter month." It is spoken of as in that month having attained "a lamentable degree of impurity." He attributes this to a prolonged drought in the autumn of 1881, so that "even up to the month of December the water had not returned to nearly as satisfactory a condition as it was on June 20th, 1881." After attaining its maximum purity in the months of February and March, "the water remained of excellent quality until the month of May, when the water had so far deteriorated as to contain 0.0245 parts per 100,000 albuminoid ammonia, and passed from the category of pure to that of impure waters. The deterioration in the Jersey City water was still more rapid and decided." In November and December Newark water had again passed into the category of pure water. The poorer character of the Jersey City water is attributed chiefly to the fact that it receives more of the tidal sewage. It did not recover until December. The report, while as apologetic as possible, is true to its figures. These facts no doubt had their influence upon the appointment by the Legislature of 1883, of a State Water-Supply Commission, which it is well known had its origin from the interest felt in a new water-supply for Jersey City and other localities dependent upon the Passaic. Their duty was "to determine upon plans for the storage of any of the waters of this State for the purpose of furnishing to cities and towns a joint water-supply." This commission did not, therefore, devote itself to inquiries into pollutions, although it became more and more informed as to them in its investigations. The first and second reports related mainly to legal questions and the importance of maintaining the natural water rights of the State. The third report, March, 1884, first dealt with plans in outline. It showed the present needs of about 500,000 people, and the call for a daily supply of 37,331,296 gallons, as well as the prospective demand and present rates of increase. They presented various sources, giving preference to the Pequannock source, and showing its economy and feasibility. In the meantime, the third annual report of Prof. A. R. Leeds to the Board of Inspection of the Newark Aqueduct Board, was rendered December 30th, 1883.

The monthly chemical analyses had been continued.

In January of that year the water was pronounced of excellent quality. "This excellence was attained only once during the entire year, falling below the standard in February, and remaining so. The samples taken at the office of the Jersey City Board of Works and at Avondale were in January better than those of Newark, and afterward showed a similar lowering of quality. There was a sudden deterioration in February, attributed to the closure by ice, and varying during the summer, reached its maximum in October. The defilement of the Passaic just below Paterson was then greater than the pollution at the Newark in-take, showing that there had been oxidizing and counteracting influences, but not enough to purify the water.

In March, April, May and June comparisons of Newark and Jersey City water showed that the influence of the Newark sewage reached only as far up the river as the Jersey City in-take, so that the quality of water was not owing to tide, but to the sewage coming down the river. The sewage brought up by the tide always affected the Jersey City in-take most, except in one month of great drought and lowness (September, 1881).

Although always below the standard, except in January, the water is claimed as better than previous years, credit therefor being given to the measures adopted by the Joint Board of Pollution, to restrict and prevent the contamination of the stream. Yet, with all this, it is admitted not to be satisfactory. In his report for 1884, Prof Cook again urges the great importance of securing a supply, "only sixteen miles distant, at an elevation which would carry it to the top of every house in the area sought to be supplied, and sufficient for a population of 2,000,000."

The report of the Newark Aqueduct Board for 1884 claims some slight improvement as compared with 1883, which is thought to have resulted from the various efforts of the Board. But it shows no diminution in the amount of pollution at Paterson, Passaic or Dundee, and claims but the same proportion of one-third, and two-thirds of pollution as coming from the upper river and from the Newark sewage. It is then proposed to make the Passaic water satisfactory—

1. By requiring manufacturers and communities to subject their sewage to such a degree of purification as would return the effluent water to the Passaic, with at least 50 per cent. of its organic impurities removed.

2. By relying on the power inherent in a flowing stream to purify itself after a sufficient number of miles of flow.

3. By constructing at the pumping stations themselves, apparatus for purification.

The first of these has never been put in operation. The second of these had already been shown far from being adequate. The third is a method that has, as yet, not been generally adopted. The whole report of the Board for 1884, while recognizing the water-supply not to be satisfactory, "regards the question of a new water-supply for the cities of Newark and Jersey City as one, the discussion of which would be futile, and so holds out a hope of recovering a polluted stream by various devices." The Geological Report for the same year, on the other hand, urges a new supply as the only resort, and the Report of the Water Commission shows its great economic and practical feasibility. Before this, the Report of the State Board of Health had been emphatic as to the needs. Besides allusions and facts as to water-supply in previous reports, in 1882 it had said: "The two largest cities of the State, and much of the thickly-settled surrounding country, derive their supply of water from a stream defiled by the emptyings of manufactories and sewers for miles above the point at which it is drawn. This condition of affairs must continue to grow worse, since the natural growth of the communities increases alike the demand for pure water and the contamination of that upon which they depend."

The report of 1883 again alludes (page 11) to these needs, while the report of 1884 speaks as follows:

"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 than our own State. But if there is neglect of sanitary care, and especially of 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 anywise 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."

We should all along have referred to the annual reports of the Board of Public Works of Jersey City, were it not that the references already made include these, since in 1881 a Joint Inspection Board with Newark had been formed, and it contains often the same reports as are included in the Aqueduct Board. The organization was effected October 27th, 1881, and so sanguine were the members that on December 31st of the same year, the Chief Engineer of Jersey City says: "Their work has shown very satisfactory results, and I fully believe that if the methods they have adopted be faithfully carried out, the river will, in a few years, have returned to its original state of purity, and that both Jersey City and Newark will have the best, purest and most abundant source of water-supply of any city within 500 miles of us."

The reports made show that as a rule the supply from the Jersey City in-take was inferior to that from the Newark in-take, which was claimed to be owing to the greater supply to it of Newark sewage by the inflowing tide.

The report of the Aqueduct Board for 1885 notices the fact that the subject of a new water-supply is being agitated, but says, The Board has taken no action in the matter, as the initiatory steps should be taken by the citizens and taxpayers. During the year Prof. Leeds secured samples as before, representing the Newark and Jersey City supplies, and such as were needed for comparisons. This report gives the technical details without comments as to increasing purity. The only additional fact of special import here is that of presenting "percentages of oxygen, as indicating by their relative deficiency the amount of oxygen which has been used up in the course of oxidizing the organic impurities present. For example, the water taken from the Newark reservoir, at Chatham street, July 6th, contained only 3.17 cubic centimetres of oxygen per litre. The carbon dioxide (carbonic acid) had increased to the enormous amount of 4.77 cubic centimetres, and even with this great increase of the gaseous products of oxygen the total volume of gases in solution was only 19.81 cubic centimetres." This not only showed the immense sewage pollution, and the activity of effort on the part of natural chemical processes, but their too great failure, and that with this there was the most urgent need for additional purification. It was this that led Prof. Leeds still further to urge the process of artificial aëration under pressure and apparatus therefor, as named in a former report. He thus proposed to supply the normal percentage of oxygen. This report is especially interesting from the fact that its urgent proposal is a yielding of the hope of securing purity by prevention of pollution from sewers or factories or from the upper stream and the incoming tides. While, of course, not abandoning these as co-operative, the urgency of this system of artificial aëration is the proof that all these other methods would still furnish Newark and Jersey City with a water-supply so below a proper standard as to require this mechanical restoration, and without which it was too polluted for drinking purposes. During this year the State Geological and Health Reports continued to urge the need of more attention to water-supplies, Boards of Trade discussed the subject, and the newspapers abounded with facts and opinions. No evidence, however, was found to show that the Passaic had become a reliable source of drinking-water. Instead of this, the pollution was increasing. Our next source of expert information is that derived from the reports of Prof. Peter T. Austen and Prof. F. A. Wilbur, covering most of the year 1886 but not rendered until May, 1887.

An additional report was made by the same chemists December 31st, 1887. As they are not accessible like the former reports heretofore alluded to, never having been printed by "The Joint Board on the Pollution of the Passaic River," we give them in full:

REPORT ON THE POLLUTION OF THE PASSAIC RIVER AND ITS TRIBUTARIES.

BY PETER T. AUSTEN, PH.D., F.C.S., AND FRANCIS A. WILBUR, M.S.

RUTGERS COLLEGE,
(NEW JERSEY SCIENTIFIC SCHOOL),
NEW BRUNSWICK, N. J., May 31st, 1887.

To the Honorable the Joint Board on the Pollution of the Passaic River:

GENTLEMEN—We submit herewith our report as chemists to the Board on Pollution, from the date of our appointment to May 31st, 1887.

Collection of Samples.

At the beginning of each month, four samples of Passaic water were collected as follows: one from the Newark in-take, one from the office of the Newark Aqueduct Board, one from the Jersey City in-take and one from the office of the Board of Public Works, at Jersey City. The samples were collected and forwarded to us, according to our instructions, by Inspector Thomas A. Leake.

Analytical Determinations.

The analytical determinations usually made in drinking-water are as follows: suspended matter, total solids, chlorides, free ammonia, albuminoid ammonia, nitrates, nitrites, oxygen required to oxidize organic matter, and dissolved gases.

We shall explain briefly the meaning of these determinations. It is, of course, not possible in so limited a space to elucidate many of the refinements of water analysis, or even to draw attention to the many inferences that may be made from the analytical results. Such a report would soon expand into a treatise on water analysis, and would be manifestly unadapted to what is here required.

Suspended Matter.

The turbidity of a water is owing, as a rule, to the presence of fine particles of solid matters in suspension—that is, not dissolved, but swimming about in the water. This suspended matter may be clay, mud, finely-comminuted parts of leaves or other debris, or, indeed, of ground-up remains of any substances which are insoluble in the water and which, by any means, may be carried into it. Often these particles are of a remarkable degree of fineness, in which case the water may take several months to settle clear. This suspended matter, as a rule, is not deleterious, except in so far as it makes the water offensive to the sense of sight. What influence clay, mud and other suspended matter may have on the human system it is not easy to say, but there is no doubt that the presence of a turbidity makes the water offensive to the eye. It may be stated, once for all, that water is drunk because it is water, and that the presence of all extraneous matter, except dissolved gases, which make it more palatable, is unnecessary and, so far as possible, to be avoided. The purer a water is, not only as to organic matter, but also as to inorganic matter, the better adapted is it for drinking.

Total Solids.

This determination shows the entire amount of solid matter obtained by evaporating to dryness a known volume of the filtered water. It is usually expressed in grains per gallon. No fixed limits can be given, as waters vary greatly. It is now thought that the less solids a water contains in solution the better adapted it is for drinking purposes. The total solids should be as low as possible. The following statement of Prof. Charles Mayr expresses the latest opinion on the matter:

"Those who have never drunk pure water do not realize what an effect such water has upon the kidneys; its effect is better than that of acetates, nitrates, opiates or alcohol, and for people with tendency to kidney diseases or dropsy there is no better drug than pure water. Of the thousands of chemical compounds and waste products found in the human system many require pure water for their solution and elimination; and water so overloaded with salts as average well-water will not work satisfactorily."

Chlorides.

All sewage, particularly urine, contains a large amount of sodium chloride (common salt), and therefore water which is contaminated by sewage will have an undue amount of chlorides present. This determination has great value in showing the probable presence or absence of sewage contaminations in cases where the influx of tide-water is not to be feared, or where there is not known to be a large amount of chlorides in the soil.

Albuminoid Ammonia.

Experimental science has established the fact that a large number of diseases are communicated from one person to another by means of minute organisms known as microbes, bacteria, bacilli, micrococci, &c., or, more popularly, as germs. The exact description of these minute organisms, as well as an explanation of their modes of development and reproduction, formation of spores, &c., interesting and important as they are, would carry us beyond the limits of this report. The various parts of the human organism afford these seeds of disease a fertile spot in which to take up their abode and grow. The diseased state of a patient is, then, in many cases merely the functional disorders arising from the presence and development of certain other forms of life at his expense. These disturbances may arise from the mechanical irritation resulting from the presence of the organisms, and also from the poisonous action of the substances produced by their growth, their excreta, if the term is permissible. It is a struggle for existence, a survival of the ones best adapted to the conditions about them. If the patient dies the disease organisms are triumphant, if he recovers they are vanquished. In many cases it is a bitter fight and a long time may elapse before one can tell which will win.

To consider the details of this subject would lead us far away from the matter in hand, for we wish to simply explain the relations of disease to water-supply. The communicability of disease, as in cases of small-pox, scarlet fever, diphtheria, &c., is well understood by the public. The germs of these diseases come in contact with the proper membranes and proceed at once to develop and cause the specific functional disturbances known as the diseases. We have good evidence to show that diseases can also be communicated by water, if the water contain their germs. These germs, like all forms of organisms, require nutriment for their growth and development, and their most necessary food is albuminous matter.

When the remains of animal and plant life, excreta and many manufacturing wastes are allowed to remain in water it becomes polluted by substances which belong to the classes of albumens and gelatines, and which, for the sake of convenience, are called albuminoid matter. These substances are distinguished by the ease with which they decompose or putrefy, producing in so doing ammonia, nitrites, nitrates and nitrogenous organic substances, depending on the nature, extent and duration of the decomposition. These albuminoid matters constitute the principal food of the myriads of germs which exist in water, and which will grow and reproduce with almost inconceivable rapidity, if provided with a sufficient quantity of nutriment. Some of these minute forms of life (bacteria, bacilli, micrococci, &c.), as has been explained, are disease germs (pathogenic microbes), while others have no harmful effect, so far as we know, upon the drinkers of the water.

There are myriads of these harmless microbes which act as scavengers, and consume the albuminoid matters in water, thus purifying it. It is to their work that we are indebted for much of the self-purification of water.

These disease germs and nitrogenous organic substances may cause disease in persons drinking the water containing them. In themselves, the albuminoid matters may not be poisonous, or even deleterious, as they are, without doubt, digested as any other similar matters. But their presence in any considerable amount renders the water capable of supporting germ-life, and hence it requires but the impregnation with the proper disease-germs to become in an extremely short space of time filled with countless swarms of these organisms, and thus be in a condition to convey and impart diseases with frightful efficacy. A polluted water may, then, so far as its relations to germ-life are concerned, resemble a powder-magazine, not unsafe until a spark happens to fall into it. Thus, in the town of Plymouth, Pa., the water of the reservoir, which was not in a good condition as to freedom from organic impurity, became impregnated by the excreta of a typhoid patient, and hundreds of cases of typhoid developed among those who drank the water. A similar case occurred on a smaller scale in the village of Lausanne, in Switzerland, the water-supply becoming impregnated by the dejecta of a typhoid patient and imparting the disease to many persons who drank the water. Numerous cases of a similar nature could be cited as to the danger from contaminated wells. In fact, it is safe to say that, as a rule, all wells in cities are unsafe, or at least should never be used for potable purposes until proved safe by the most searching analysis. On the other hand, if a water is free from germ-life nutriment, any germs that may get into it, will find it difficult to thrive, and will be more liable to be destroyed by the numerous agencies that are continually exerted to effect their destruction.

The nitrogenous organic substances which result from the putrefaction and decomposition of albuminoid substances are often extremely poisonous. Many of these substances belong to the class of alkaloids known as "ptomaines," or cadaveric alkaloids, the name being given more particularly to certain substances which are formed during the putrefaction of dead bodies. Some of these ptomaines are found in the excreta, and are the normal results of life. Others are produced as a result of disease. These substances, when present in water, may produce bowel-troubles and other functional disorders, if not specific diseases, in those who drink the water. Thus, substances have been obtained by the distillation of city well-waters that produced severe bowel complaints. A great number of cases could be cited in which the introduction of sewage into drinking-water has caused disease. The liquid in which the cholera bacillus has been found contains a poison which, when properly applied, produced a disorder which is, or greatly resembles, cholera. The discovery of the alkaloid formed in stale milk, tyrotoxicon (though now thought to be diazobenzene), shows the probable cause of the prevalence of cholera infantum and "summer complaint."

There are numerous fresh-water plants, as algæ, sponges, lilies, &c., as well as parts of land plants, leaves, buds, &c., which, when putrefying in water, may increase the albuminoid ammonia, and thus cause the water to assume a dangerous receptivity for disease germs, aside from any specifically deleterious action that the products of the decomposition may themselves exert. The death and decay of myriads of animalculæ and microscopic eggs may produce a decided increase in the amount of albuminoid matter.

The determination known as "albuminoid ammonia" represents the amount of ammonia that can be obtained from the albuminoid matters present in the water. It depends upon the fact that albuminoid substances, when heated with an alkaline solution of potassium permanganate, are decomposed and give off nitrogen as ammonia. As a general rule, chemists consider that the less albuminoid ammonia a water contains the better is the water. The presence of 0.10 parts of albuminoid ammonia per million is looked upon as a very suspicious sign, and when the amount reaches 0.15 parts per million, it is usual to condemn the water, especially if the nitrates and nitrites are present, indicating that fermentation is, or has been, active.

Free Ammonia.

Free ammonia is ammonia existing already formed in the water. It may be free, or combined as ammonia salts. When unaccompanied by any considerable amount of albuminoid ammonia, free ammonia indicates the presence of some manufacturing waste or recent addition of rain, snow, &c., or inorganic substances containing ammonia salts, and is of no particular importance. When accompanied by albuminoid ammonia, it indicates that some of the albuminoid ammonia has decomposed, and the water must then be examined with care. When accompanied by albuminoid ammonia and high chlorides, it indicates pollution by urine.

Nitrites and Nitrates.

When albuminoid matters are oxidized they form nitrites, and when further oxidized, the nitrites pass into nitrates. Certain minute organisms have also the power to reduce nitrates back to nitrites and ammonia. If albuminoid matters are absent, nitrates and nitrites indicate that the organic matters have all been oxidized. Their presence may or may not be of importance, depending on the location and source of the water and upon the nature and amounts of the other constituents. As a rule nitrites are supposed to indicate that the oxidation of the organic matter is imperfect and recent. Their presence is, therefore, a danger signal. When nitrates or nitrites are detected in any quantity a searching examination should always be made, not alone of the water, but of its source and surroundings.

Hardness.

Water containing salts of lime and magnesia does not at first yield a lather with soap, but "kills" the soap. Such water is called "hard." If the lime and magnesia are present in the form of carbonates, they are thrown down when the water is boiled, since the carbonic acid gas which, when dissolved in the water, imparts to it the property to dissolve the carbonates of lime and magnesia, is driven off by the boiling. The dissolving agent being thus removed, the carbonates of lime and magnesia precipitate, and the water is rendered softer. Advantage is taken of this in the preliminary heating of water before its introduction into steam boilers. Hardness which is removed by boiling is called "temporary" hardness.* If the hardness consists of sulphates or chlorides of lime and magnesia or of any other salts or substances which kill soap and are not removed by boiling, the hardness is called "permanent."

Hardness is usually expressed by stating the number of grains per gallon of carbonate of lime (chalk) or substances equivalent in soap-killing power, that are contained in a gallon of the water. The effect of the hardness of water in increasing the cost of using it may be best estimated by calculating that each degree of hardness causes the "destruction of twelve pounds of the best hard soap by every 10,000 gallons of water."

The effect of a considerable amount of lime and magnesia salts on the human system is not constant, since entirely opposite effects are produced in different people. Some medical writers catalogue a long list of ailments as caused by the use of hard waters. There seems, however, to be no doubt but that the solvent action of water and its power to remove the wastes of the human organism increase with its freedom from mineral substances in solution. Hence the less the hardness, the better adapted will it be for drink. As before stated, the opinion is growing now very rapidly that water is drank for the sake of the water in it, and not for anything else. Modern scientific investigation indicates that in proportion as the amount of pure water supplied to a community increases, there is corresponding, but far greater, decrease in the death-rate, the disease factor and the cost of living and manufacturing. While with the increase in the supply of pure water increases also in a most surprisingly rapid manner, the thrift, morality and degree of civilization. The amount of water used per head by the inhabitants of a community is a very fair index of its state of civilization. It is a matter of regret that so much timidity is evinced in dealing with questions of water-supply. There are many thousands of deaths in cities that might be prevented by an improvement in the quality of the water. The death-rate of the United States at present is estimated to be over 100,000 per year too high.

Oxygen Required to Oxidize Organic Matter.

This determination indicates relatively the amount of very easily oxidizable organic matter present in a water. Alone, it does not possess a very definite interpretation, but in conjunction with the other determinations, it is of value in forming an opinion as to the conditions of the water. In time, it may be possible to give determination a greater importance, especially if, in any way by its use, we shall become able to tell the difference between living and dead organic matter.

Dissolved Gases.

All natural waters dissolve from the air certain amounts of oxygen and nitrogen gases. If the water is perfectly free from organic matter the ratio of dissolved gases would not alter very much, but if organic matter is present, more or less of the oxygen is consumed in oxidizing and destroying it. This consumption of oxygen may be direct, or it may be brought about through the agency of minute organisms which require oxygen for their existence and which in turn feed upon the organic matter. The nitrogen which is dissolved in the water does not suffer much change, but the oxygen, from the causes just explained, fluctuates to a marked extent. As one of the principal products of the exidation of organic matter is carbonic acid, water in which organic matter has suffered oxidation usually shows an increased amount of dissolved carbonic acid gas and a decreased amount of dissolved oxygen. A water may, therefore, be bright and sparkling and still be anything but pure. The higher the content of dissolved oxygen and lower that of dissolved carbonic acid gas the better water is to be considered.

Color.

The opinion of chemists concerning the conditions indicated by the color of a water are well expressed by Dr. Fox as follows:

"It is helpful in forming an opinion as to the quality of a water to pay a certain regard to its color, although apart from other indications of its conditions, no reliance should be placed on this test. Speaking generally, it may be said that waters of great purity exhibit a bluish hue, that waters polluted by filth have various shades of a straw or brownish tint, deeper in proportion to the amount which they contain, whilst peaty waters generally display a nutty-brown color. To this rule there are many exceptions. A water may possess a strong brown or yellowish tint and yet be free from filth, *e. g.* some peaty waters, and waters containing iron. Certain artesian waters of great purity have a straw tint. The Loch Katrine water, which supplies the city of Glasgow, displays a color apparent to every one. On the other hand, some waters that are as devoid of color as distilled water, and exhibit great brilliancy, are found to be polluted with a large amount of animal filth. A water may be almost colorless and yet exhibit on analysis much vegetable matter, *e. g.* the water-supply of Bournemouth. A water may be colorless and still contain peat, for white peat is occasionally met with which is a form of incompletely carbonized vegetable matter. Practically, however, peaty waters present various shades of a brownish olive-green color, if the peaty matter is in larger quantity, through a nutty-brown to a coffee color, when the peat is old and abundant." And again: "Thousands are still to be found who believe that if a water is bright and clear, and not unpleasant to the taste, it must be good, whilst it has been proved over and over again that such a water may be polluted with unspeakable filth, and that an excessive brilliancy of a water is a suspicious sign."

Analyses of the Passaic Water.

The accompanying table (1) shows the results of our analyses of the samples of Passaic water sent us.

[NOTE.—Table not printed but results here given.—SEC'Y.]

Many interesting deductions can be made from these figures. We shall, however, mention only a few of the more practically important ones. The total solids show a steady decrease from October to May. The reason of this is that the volume of water in the Passaic increases steadily during this period. In April the total solids in Jersey City ran 2.5 grains per gallon; in Newark 3.4 grains per gallon. In this respect the water was very satisfactory. The volume in the river is on the decrease from April through the summer, and hence from that date till fall, a steady increase in the amount of total solids is to be expected. If the summer is a dry one, the amount will reach a high figure, because the waste and sewage, if anything, increase, while the volume of the river greatly decreases.

The same may be said for the hardness, the increase and decrease following quite closely the curve of the total solids.

The determination of the chlorides is of little value in the case of the Passaic water, as chlorides can come from tide-water and manufacturing wastes as well as from sewage.

In June the albuminoid ammonia in the water of Newark, and in February the water of both Newark and Jersey City fell below 0.15 parts per million, which is regarded as the beginning of the danger limit. At all other times the amount of albuminoid ammonia has been above this amount, the highest figure, so far, being reached by the Jersey City water in December. This amount, 0.3 per million, if occurring in a well-water, would have condemned it at once. Should a sample of water submitted to us for analysis by a Board of Health have given us this amount we should have reported it as absolutely unfit for use and dangerous in the extreme.

The continual presence of nitrites in the water, with the exception of the month of February, shows that oxidation of the organic matter is taking place. The amount of dissolved oxygen was higher in winter, as the organic matter is not so easily oxidized as in the summer. As the amount of dissolved oxygen decreased in the summer, the amount of dissolved carbonic acid, which results from the oxidation of the organic matter, will increase.

Our opinion, based upon the mass of analytical data herewith presented, is, that during the greater part of the year the water of the Passaic, which is used to supply the reservoirs of Newark and Jersey City, and which is supplied to the inhabitants of those cities, is contaminated by filth, sewage and manufacturing waste and is unfit for drinking purposes. In the summer the water reaches a degree of pollution which makes its use dangerous beyond a doubt. Should the water during these months become impregnated with the seeds of typhoid, cholera or other zymotic diseases, the most disastrous results may be expected.

We have no doubt that the use of a purer water in the cities of Newark and Jersey City would be attended by a most marked decrease in the death-rate, especially that of children.

Pollutions of the Passaic.

Acting under the instruction of the Board of Pollution, samples of a number of the manufacturing wastes which are discharged into the Passaic were collected by Inspector Leake and submitted to us for analysis. Before expressing our opinion on these samples we wish to explain* the more important principles which are involved in the pollution of water, and also the meaning of certain words often used in this connection.

In an act approved February 27th, 1883, and quoted in the circular issued by the Joint Board on Pollution of the Passaic River and its Tributaries, it is made a criminal offense to throw, or cause to be thrown, or permit to be thrown into the waters of any creek, pond or brook of this State, the waters of which are used to supply any aqueduct or reservoir for distribution for public use, any offensive matter whatever calculated to render said waters impure.

To avoid repetition in the consideration of each sample of water it will be best to draw attention to certain important properties which a water should possess to render it acceptable for drinking, household and manufacturing purposes, and conversely to certain properties which will render it unfit for uses for which the water-supply of a city is intended.

For drinking purposes a water should be clear, that is, free from all suspended matter, such as clay, mud, fragments of leaves, sedi-

*A portion of this report on the pollution of the Passaic was made to the Joint Board on Pollution, during *the fall of 1886*.

mentary matter, &c. Even though such matter be not in itself poisonous, or even to any extent appreciably detrimental to health, it will still be offensive to the eye, and the presence of such impurities will detract from the enjoyment attendant on its use. So, also, in the bath, the water should appear pellucid and inviting, and any matter which in any way prevents it from being so is offensive.

The water should contain a sufficiency of dissolved gases, especially oxygen gas. A water not containing sufficient dissolved gases will taste flat, and thus be offensive to the sense of taste.

The water should be free from any marked taste other than the agreeable sensation imparted by a pure and sparkling water. Any taste that a water may possess will offend the sense of taste and will render the water unpalatable to many people.

The water should be free from any color, which, although such coloration may in certain cases be not deemed detrimental to health, is most certainly offensive to the eye, and will excite a feeling of repulsion rather than of agreeable expectation. Such a coloration also causes in the minds of many persons, especially among the uneducated, feelings of alarm as to the safety of the water.

The water should be free from any odor, since the presence of a recognizable odor offends the sense of smell as well as at once awakens feelings of alarm among the people. Nor should it, on standing, develop any unpleasant odor, since it will then also become offensive.

The water should be as free as possible from mineral matter, since its presence in any considerable amount may cause the water to produce certain specific physiological effects and thus render it offensive to the public health. Organic matter in any amount should also be absent, since it may, aside from exerting any physiological effects, afford nutriment and means of development for numerous species of lower organisms, both vegetable and animal, many of which, such, for instance, as the pathological bacteria, or disease germs, may cause the water to become the means of spreading disease and thus endanger the public health and increase the death-rate.

Any substance which, when added to a drinking-water, causes the water to offend the senses of sight, smell or taste, or which makes the water unhealthy or dangerous to drink, is offensive matter, and will render the water less pure, or impure.

In relation to the uses of water for household purposes, the addition to the water intended for these purposes, washing, the preparation of food, &c., [of any thing] which in any way is detrimental to its adaptability to these uses, is offensive matter and will make the water impure. Not alone will it render the water impure, but it may, in case the hardness is increased, cause an increase in the expenses of housekeeping, as, for instance, in the increased use of soap, which will be brought about by an increase in the hardness.

Again, the addition of any matter which may increase the hardness of the water, or which may increase the amount of total dissolved solids, will cause the water to form scale in boilers more rapidly, and thus not only compel a greater use of fuel by those who use steam, but will also shorten the lives of the boilers, thus adding to the cost, and will also increase the dangers attendant on their use. Any substances which, when added to a water, will render it less adapted for use in steam boilers, is an offensive substance.

Further, any substance which, when added to a water, renders it less adapted for use in the household or in manufacturing, will increase the cost of living or manufacturing in the cases of some or many of the inhabitants of the city, and thus to a lesser or greater extent will eventually injure the prosperity of the town by decreasing the amount of capital available for enterprise or investment. Any matter in any way causing or bringing about these results we may consider offensive.

It is also to be noted as a fact that must not be overlooked that the water of the Passaic which is used in Newark and Jersey City is judged by certain forms of chemical analysis. It is hence evident that any matter which, when present in the water-supply, is condemned by the analysis, must also be condemned if found present in the water entering the Passaic, and that wastes, &c., containing constituents which will cause the water-supply to be adjudged impure must be condemned as offensive.

The question may arise as to how to deal with waste waters discharged into the Passaic, which, while not so pure as the river water, are still not so impure in any individual case as to excite apprehension. If only one such case occurred no great danger might be feared, but when a number of such waters enter the river, the effect of them all will become very appreciable. In this case strict impartiality is the only safeguard, and the total evil should be abolished by abolishing each and every cause of it. No matter of any kind should be allowed to enter the Passaic within the limits prescribed by law, which in any way renders the water less adapted for potable, household and manufacturing purposes by the inhabitants of Newark and Jersey City.

In accordance with the views above set forth we express our opinions on the samples submitted to us for examination as follows: (Table 2.)

[NOTE.—Not printed herewith, but results as stated by the chemists herewith given.—SEC'Y.]

No. 1. (C1023) Condemned on account of high total solids, high hardness and high albuminoid ammonia.

No. 2. (C1024) Condemned on account of high albuminoid ammonia. Inspection showed the water to be polluted by privy drainage. On standing, acquired an offensive odor.

No. 3. (C1025) Condemned on account of high total solids and high albuminoid ammonia. On standing, acquired an offensive odor.

No. 4. (C1026) Condemned on account of high hardness and high albuminoid ammonia. On standing, acquired an offensive odor.

No. 5. (C1027) Condemned on account of high total solids, high hardness, high albuminoid ammonia and presence of color.

No. 6. (C1028) Shows the effect of the waste discharging into the creek, in high total solids, high albuminoid ammonia and color.

No. 7. (C1029) Condemned on account of high total solids, high albuminoid ammonia, and the presence of taste, odor and suspended organic matter.

No. 8. (C1030) Condemned on account of high total solids, high albuminoid ammonia, and presence of taste, odor, color and suspended organic matter.

No. 9. (C1031) Condemned on account of high total solids, high albuminoid ammonia, and presence of color, taste, and organic matter in suspension. On standing, acquired an offensive odor.

No. 10. (C1032) Condemned on account of high total solids, high hardness, high albuminoid ammonia and the presence of brick-red suspended matter. On standing, developed an offensive odor of sulphuretted hydrogen.

11. (C1033) Condemned on account of high total solids and high albuminoid ammonia. It has also a perceptible woody taste.

No. 12. (C1034) Not condemned.

No. 13. (C1045) Condemned on account of high total solids, high hardness, high albuminoid ammonia and color. On standing, acquired an offensive odor and condition.

No. 14. (C1046) Condemned on account of high total solids, high hardness, high albuminoid ammonia and color. On standing, acquired an offensive odor and passed into an offensive condition.

No. 15. (C1047) Condemned. A thick, turbid liquid with an excrementitious odor. Appeared to be sewage. The ammonia determinations were made in the liquid after settling.

No. 16. (C1048) Condemned on account of high albuminoid ammonia, high hardness and high total solids.

No. 17. (C1049) Condemned on account of high albuminoid ammonia. When received, possessed an offensive odor and contained decomposing organic matter.

No. 20. (C1052) Condemned on account of high total solids, high hardness, high albuminoid ammonia. On standing, acquired an offensive odor.

No. 24. (C1058) Condemned on account of high total solids, high albuminoid ammonia and high suspended matter.

No. 25. (C1083) Condemned on account of high suspended matter, high albuminoid ammonia. On standing, acquired odor.

No. 26. (C1084) Condemned on account of high total solids, high suspended matter, high albuminoid ammonia and color. On standing, acquired an offensive odor.

No. 27. (C1085) Condemned on account of high total solids, high albuminoid ammonia and color. On standing, acquired an offensive odor.

No. 28. (C1086) Condemned on account of high total albuminoid ammonia and color. On standing, acquired an offensive odor.

No. 29. (C1087) Condemned on account of high albuminoid ammonia, high hardness, high total solids and large amount of matter in suspension. On standing, acquired an offensive odor.

No. 31. (C1089) High total solids, otherwise not objectionable.

No. 38. (C1120) Condemned on account of high albuminoid ammonia, high total solids and turbidity.

No. —. (C1138) Condemned on account of high total solids, high albuminoid ammonia, suspended matter and color. On standing, acquired an offensive odor.

In addition to the great quantities of manufacturing wastes that are emptied into the Passaic above the in-takes, and which pollute the water, another serious source of filth is introduced by the sewage of Newark and the manufacturing wastes which are emptied into the

Passaic below the in-take, and which may at times be carried up to and beyond the in-takes by the tides. How far up the contamination of the Passaic by the Newark sewage extends, we have not yet determined with exactness, but there is every reason to believe that at times it exerts a very decided polluting effect on the waters supplied to Newark and Jersey City.

If, as it has been recently stated, the Jersey City water contains more Newark sewage than the Newark water, it is not clear why the Jersey City water does not run higher in chlorides than the Newark water. But pronounced differences such as might be expected have not yet been detected.

An analysis of the sewage from the Fourth avenue sewer is appended to show the nature of typical sewage.

No. 30. (C1088) Table 2.

[NOTE.—Table not printed.—SEC'Y.]

(II.)

REPORT ON THE POLLUTION OF THE PASSAIC RIVER.

BY PETER T. AUSTEN, PH.D., F.C.S., AND FRANCIS A. WILBUR, M.S.

RUTGERS COLLEGE,
(NEW JERSEY STATE SCIENTIFIC SCHOOL),
December 31st, 1887.

To the Honorable the Joint Board on the Pollution of the Passaic River:

GENTLEMEN—We submit herewith our report as chemists to the Board on Pollution from June 1st to December 31st, 1887. (Table 3).

[NOTE.—The chemists thus state its result.—SEC'Y.]

The samples have been collected and analyzed as described in our first report. The water supplied to Newark and Jersey City during the months of June, July, August, September, October, November and December has been steadily bad. In July it was extremely filthy. It was hoped that the condition of the water would improve during November and December, as an improvement was noticeable in October, but the hope was not fulfilled, and the water became worse instead of better. The condition of the water does not vary very much. As stated in our first report, it is filthy from the great amount of impurities poured into it. It shows a slow but still perceptibly steady increase of pollution. We can only reiterate our condemnation of the water for drinking purposes. It is utterly unfit for use, and no time should be lost in procuring a purer supply. There is no doubt but that the introduction of a pure water-supply into the cities of Newark and Jersey City will be marked by a decrease in the death-rate.

[NOTE.—Thus ends the last report.—SEC'Y.]

It will be noticed that the chemical analyses and the language of both these reports are more and more decided against these waters as a source of drinking-supply.

The report as rendered December 31st, 1887, is of the most pronounced character and cannot be read with placid unconcern by any one who regards the preservation of human life as a personal and general concern. The supplies for both cities are so bad that the chemists do not seek, as before, to rate their relative unfitness. During this same year, a number of the citizens of Jersey City, in their own interest and that of their locality, sought again the opinion of Prof. Leeds. This was given in reply to a series of questions now published in pamphlet form. The answers thereto recount the sources of pollution of the Passaic river under seven heads, and show their continued increase, and that the water flowing into the in-take of the Jersey City pumping station each day, contains a great weight of sewage. In reply to the question, Is the water at present supplied to Newark and Jersey City, dangerous to health? he begins by saying: "This is as though I were asked, Is drinking sewage dangerous to health? I believe it to be not merely dangerous, but so fatal that thousands of people are killed by sewage-drinking every year." Of this he gives various illustrations from authorities. He adds: "Nor is its virulence restricted to the production of typhoid fever only, for typho-malarial and other zymotic diseases frequently have the same origin. During a greater part of the year much of that general malaise and debility which large numbers of people suffer from is partly attributable to the cumulative action of the sewage-polluted drinking-water upon their systems."

Does it not seem that thus we have an amount of competent testimony extending through series of years, resulting from hundreds of analyses of different years and different seasons and by numbers of competent chemists, all agreeing as to the hazardous character of this water and as to its increasing befoulment?

During the present year, this Board saw fit also to cause a new series of chemical examinations to be made, with the primal object, however, of associating them with *bacteriological* examinations, so as to see how far these fortified or disputed the conclusions arrived at by physical and chemical examinations.

This additional examination, so far as its bacteriological addition is concerned, is made with the admission that the distinction between the pathogenic and conservative or microphytic life is not so accurately made out as to enable us to determine the full significance of numbers. But as it is conceded by many that the quantity of bacteria has relation to the quantity of decaying and putrescent organic matter present, it was thought proper to secure such an analysis. The chemical and biological examinations, as made by Prof. Leeds and as given in the report (see pages 151–6), are in the direction of confirming former examinations, and show the large amount of this minute life at places where pollution is shown by the chemical examinations.

In view of all the evidence which we have thus presented we submit that by all the methods available in physical and expert examination and testimony, the Passaic water, as at present delivered to Newark and Jersey City, is too much mingled with sewage for its use as a public water-supply to be approved or defended.

Those, however, who are disposed fairly to consider the matter and to give weight to the opinions of those who are believed to have arrived at sound conclusions, ask such questions as these: If all this is true why do not more people sicken and die? Why are not physicians more fully agreed as to the dangerous effects? These are allied and proper questions, and may as well be met together.

First of all, it is not true that poor water records all its effects in perceptible ill-health. Here are some of the reasons why it does not:

Such water is not at all times equally impure. By reason of abundant rains the dilution often varies in the Passaic in proportions of one to six, so that from this alone there is great variation in the quantity of organic matter contained. It also varies from the character of the sewage, from difference in suspension or solution, and from difference of humidity and temperature. Our study of the chemical statements shows that sometimes in one month it could be pronounced "drinkable," and in another month "lamentably polluted," and from causes beyond local control. Susceptibility of persons also varies.

Hence, there would necessarily be great variation in effects even if these could be discerned. But all that any one is called upon to show is that the conditions are those of great liability and that there is a hazard unsafe to health or life.

Again, when there are real effects the systems of most persons are so far resistful as that no immediate effects or no effects that can be by any method of exclusion asserted, are recorded. So long as there is not such a specific result as typhoid fever or dysentery, or malarial fever, or prostrating diarrhœa, there may be multitudes of minor and depressing results without the possibility of record. That such results do occur is the common consensus of opinion of practitioners who have closely studied localities afflicted with a very poor water-supply or those who have been able to compare the conditions in the same city when it had a poor supply and afterward a good one.

We have already referred to the fact that physicians do not have it in their power in most cases to discern all the influences that have been in operation to cause many diseases. Yet it has been our experience that those physicians who are careful observers and have given their careful judgments all recognize that water which by the usual tests is found to be quite uniformly impure is not fit for a public water-supply, because of its results in the impairment of individual health. We have had occasion to find that physicians are often misquoted and that some passing remark comes to be assumed as a settled conviction.

But is it not true that we have reason to believe that the water used in Newark and Jersey City has had an effect greatly to add to death and sickness-rates? When we compare with the average death-rate of the State for the past nine years, we find an excess in Newark and Jersey City of such a proportion to each thousand of inhabitants, as means the loss of hundreds of lives. Besides, in this we are comparing in the aggregate with a general death-rate which is in itself higher in some localities, probably because of conditions of water-supply similar to these cities. No one claims that there should be a death-rate anywhere in this State of over fifteen per thousand, and theoretical calculations even reduce the normal rate to twelve per thousand.

Our first five years of death record, from July 1st, 1878, to July 1st, 1883, gave a total death-rate for the State of 19.43 per 1,000, that for Jersey City being 24.27 and that for Newark, 23.52, these being the two highest death-rates in the State.

When we come to inquire as to deaths of children and deaths from typhoid fever and from diarrhœal diseases, under two years of age, we find 6,625 children under five years of age died in this period in Newark, and 6,636 in Jersey City, or in all, 13,261. Total deaths at these ages for the State, being 27,704. In other words, these two cities with their 257,230 inhabitants had nearly one-half as many deaths at these ages as the rest of the State had with its 873,887 inhabitants. Is not that an arousing fact? It is also to be borne in mind that even at this we are comparing with a State record which includes parts of Hudson county, Camden and a few other considerable populations also known to have a poor water-supply. A proper comparison would be with other populous cities having a good water-supply, if we had enough of such large cities.

These two cities, with a little over one-fifth of the population of the State, lost from typhoid fever, 361+374=735 out of the 2,818, and from diarrhœal diseases, under twenty, 1,774+1,574=3,348 out of 11,768. There is here very marked excess of proportion. Since digestive and intestinal diseases of adults, and consumption and other diseases are greatly affected by a poor water-supply, it would be fair also, if we knew the proportion, to attribute the large excess in these diseases, to some degree, to poor water. But the figures already presented are enough to show that something very evenly and persistently secures to these cities a very high death-rate of these ages and from these diseases, such as would put the water-supply under suspicion more than any one known operating cause.

We now turn to the record for the past five years, viz., from July 1st, 1883, to July 1st, 1887.

For the first of these years we have as follows: Total death-rate for the State, 19.20 per 1,000. For all cities over 5,000 inhabitants 23.59; the death-rate of Jersey City being 25.15 and that of Newark 24.70. In this comparison Atlantic City should be counted out, because its own statistics show that its high death-rate is entirely owing to infants brought there, that soon die in the summer. Paterson, also, has several operating causes besides water which tend to give it a very high death-rate, and so far as factory influence is concerned, even beyond Jersey City or Newark. So, also, as to Jersey City, it is to be remembered that other parts of Hudson county having a high death-rate and using the same water, increase the significance of the per cent. This more than balances the underestimate of the population which occurs in these two years.

The number of children that died under five years of age was 7,971, of which 1,267+1,339=2,606 who died in these two cities. Here, again, there is much excess, especially when we remember that the comparison is made with a total including Camden, Hoboken and Paterson. Newark and Jersey City, representing about one-fifth of the entire population of the State, lost by typhoid fever 116 and 87 respectively, or 203 against 640 for the whole State.

From diarrhœal diseases under twenty years of age we have 425+402=927, out of a total for the State of 2,462.

The statistical year from July 1st, 1884, to July 1st, 1885, is reckoned upon the census of 1885, being 1,278,033 for the State, 153,513 for Jersey City and 152,988 for Newark, or a total of 306,501 for the two cities.

In this year the number of children who died under five years of age in the State was 9,120, of which Jersey City lost 1,542 and Newark 1,543, or a total of 3,085, or nearly one-third of those lost at these ages for the whole State. Here is a noticeable and somewhat remarkable increase of deaths during the year. It is well worthy of note that coincident with it was an unusually unfavorable condition of the water-supply, beginning in February and continuing until October. (See Prof. Leeds' report.)

This year typhoid fever caused 642 deaths in the State, of which Jersey City records 100 and Newark 94, or 194 in all. Of diarrhœal diseases under twenty years of age, the record for the State was 2,845, of which Jersey City had 375 and Newark 443=818.

From July, 1885, to July, 1886, the total death-rate for the State was 17.80 per 1,000, that of Jersey City being 22.02 and that ot Newark 23.94. The total city death-rate for that year for the State was 20.63.

The number of children that died nnder five years of age was 8,537 for the State, of which 1,489 died in Jersey City and 1,448 in Newark, or 2,937 in the two cities. The deaths from typhoid fever for the State were 545, of which Jersey City had 88 and Newark 85, or 173 in all. The deaths from diarrhœal diseases, under twenty, for the State, were 2,664, of which Jersey City had 407 and Newark 369, or 776 in all. The proportions, although not so large, are still quite excessive, as the year was one of unusual health. Alongside of this, examine the deaths from other diseases.

From July, 1886, to July, 1887, the total death-rate for the State was 19.04 per 1,000, that of Jersey City being 24.01 and that of Newark, 24.40. The total city death-rate for the year was 22.24 per 1,000.

The number of children that died in the State, under five years of age, was 9,245, of which 1,636 died in Jersey City and 1,474 in Newark, or 3,110 in both. The deaths from typhoid fever for the State were 522, of which Jersey City had 81 and Newark 84, or 165 in all. The deaths from diarrhœal diseases for the State were 2,694, of which Jersey City had 456 and Newark 446, or 902 in all, being over one-third of the number for the whole State.

No one can take up this series of results for nine years past and add to it the facts as to mortality from adult intestinal diseases, from consumption and from general impairment of vigor and abbreviation of the natural working period of life, without being impressed with the view that there is some pervasive and widely-operating cause that produces an excessive death-rate in those cities, and that this excess is especially manifest in ages and diseases which we would expect to be affected by an imperfect water-supply. We know that the contestant on either side can present points which would increase the significance of these figures, or which would plausibly but not really minimize their significance. But we believe that no one versed in the expert study of physical, chemical and statistical signs, as they bear upon the study of population, or who will, with impartial judgment, review the facts presented, but that will be led to conclude that the water-supply, as derived from Passaic river, is under the gravest suspicion in this record of child-slaughter, and is severely on trial with heavy testimony against it. We do not declare the supply to be worse than that furnished to Philadelphia, Camden and several other cities in this country. But we cannot but present the unanimous conviction of this Board, of various other State Boards, of numerous chemists, physicians and observing civilians, that the drinking-water at present furnished to large populations in Jersey City, Newark and some adjacent towns is not such as meets a public demand; is not such as a State, whose duty it is to conserve the highest health interests of its people, can approve. The figures given are in accord with such belief.

We claim for Hudson county ordinary advantages for health, if only it has or secures health administration and structural provision for its sanitary necessities. We claim for Essex county some of the most inviting advantages of location to be found anywhere. We look upon this portion of New Jersey as fitted for prospective and rapid increase of population to a degree second to no part of this State, or adjoining States, if only there are broad views of the relations of health to prosperity, and of the duty of recognizing pure water and protection from preventable diseases as, alike, the right of humanity, of labor and of citizenship. There has been wonderful growth in spite of those drawbacks, and there would be far greater if they were removed.

We have purposely avoided the expression of mere opinions. We have not argued the short-sightedness of present methods. We have not, in the presence of the abundant evidence on the subject, thought it necessary to draw attention to any particular sources of supply, or to magnify the easy possibilities of securing a water-supply and storage second to none in this country. But we have thought it timely and imperative upon us to thus review some of the facts in evidence and thus to seek to impress upon the people of these cities, and upon the State, the great demand there is for a better water-supply for sections so close together, and representing nearly half of the whole population of the State. We have only allowed facts to speak for themselves.

The tortuous but noble Passaic reaches some of the most delightful and populous regions of the State. It has other sufficient uses besides those of inundation for the country and sewer-holding water-supply for the towns.

Just now the combined efforts of the managers of the Geological Survey, of the State Board of Health and of local committees seem likely to succeed in such arrangements at Little Falls as will relieve the overflowed lands and add tens of thousands of dollars and numbers of lives to that district. We believe that a more notable increase of values, of health and of life will follow when this river ceases to be used for the conjoint purposes of sewerage and water-supply, and when the hundreds of thousands living near its banks will avail themselves of those provisions which nature has made for a pure, accessible and abundant supply. When that is secured, an impetus will be given to the growth of those cities and the surrounding districts such as will gladden the hearts of the people, for it will not only mean increase of wealth, but increase of health and preservation of life, thus adding to the comfort, industry and happiness of our citizens and conferring a blessing on the whole State.

CLIMATOLOGICAL OBSERVATIONS AND RECORDS.

As heretofore, we present, as far as possible, climatological observations and records from several portions of the State. It will be recalled that these were originally chosen to represent the distinct geological and soil formations of the State, in order that there might be a comparison of diseases with reference to locality. It was not important that the location be continuously at one point, but that it be not so far removed as to cause much variation, and that it be upon the same formation as the one first chosen.

The localities, as designated in the sixth report, 1882, were—

I. Newton, Sussex county, to represent the Kittatinny valley, and the sandstone, slate and adjacent rock.

II. Paterson, to represent some slight variations for the same general district. But the two together stand for the azoic and paleozoic formations of northern New Jersey.

III. Newark represents the eastern part of the red sandstone section.

IV. New Brunswick, Princeton and Trenton represent the more western red sandstone sections.

V. Freehold, while not very far from the same section, amid the sand and clay marls, represents the upper cretaceous formation.

VI. The more recent or tertiary formations of sand or clay and the climate, as varied by its inland position, is well represented by Vineland.

VII. Atlantic City or Cape May, on a similar sandy formation, stands for our more southern Atlantic coast.

VIII. Sandy Hook or Middletown has served to represent the northern Atlantic coast with the mingling of sand and clay marls and its cretaceous formations.

It will be noticed that we have been compelled, from time to time, to change the precise point of record, but not to any disturbing extent.

This year, owing to the lamented death of Miss E. Foster, the excellent observer at Newton, the details of the table are not so complete. The signal service has also made some important changes in its localities.

We have thought best this year to give the record of New York city as the nearest available indicator for the discontinued record of Sandy Hook, and also to add the record of Philadelphia. The Board is now in consultation with the detailed officer of the Signal Corps, in order to so combine these tables for series of years and so to equate any omissions as to have them as perfect as possible for use in larger comparisons. We are, as before, indebted to the several observers whose names are given.

STATION, NEWTON, N. J.

Latitude, 41° 2′ N.; Longitude, 74° 43′ W. Height of Barometer Cistern above Sea Level, 660 feet.

OBSERVERS, MISS E. FOSTER and MR. FOSTER.

	BAROMETER. Reduced to 32°.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (days of).	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1886.												
July	....	....	....	96.9	51.2	73.2	63.0	S. W.	3.84	....	11	10
August	....	....	....	89.8	47.8	70.0	....	S. W.	4.14	....	8	2
September	....	....	....	84.8	41.0	64.9	....	S. W.	1.76	....	8	4
October	....	....	....	76.6	26.0	53.3	63.0	S. W.	2.85	....	10	8
November	....	....	....	69.2	21.0	42.8	57.1	N. W.	6.24	....	9	7
December	....	....	....	49.2	8.0	26.4	60.1	N. W.	3.60	....	15	11
1887.												
January	....	....	....	54.0	0.7	25.2	64.7	S. W.	4.55	....	11	11
February	....	....	....	57.0	9.5	30.5	....	N. W.	....	....	....	......
March	....	....	....	52.0	13.0	31.2	....	N. W.	....	....	....	13
April	....	....	....	74.0	23.0	46.6	....	N. W.	....	....	....	12
May	....	....	....	95.0	42.0	66.2	....	N. E., S. W.	1.23	....	4	7
June	....	....	....	95.0	44.0	69.7	....	S. W.	4.25	....	9	12
For the year	....	....	....	96.9	0.7	50.0	....	S. W.	†32.46	....	‡120	97

* Including melted snow. † Ten months. ‡ Estimated.

STATION, PATERSON, N. J.

Latitude, 40° 55′ N.; Longitude, 74° 11′ W. Height of Barometer Cistern above Sea Level, 142 feet.

OBSERVER, WILLIAM FERGASON, CITY SURVEYOR.

	BAROMETER. Reduced to 32°.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (days of).	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1886.												
July	......	......	......	84	66	73.	......	......	4.90	......	9	......
August	......	......	......	85	61	71.	......	......	2.34	......	6	......
September	......	......	......	71	61	69.	......	......	1.05	......	5	......
October	......	......	......	66	46	55.	......	......	3.01	......	6	......
November	......	......	......	50	35	40.	......	......	3.85	......	8	......
December	......	......	......	40	17	28.	......	......	1.83	6	12	......
1887.												
January	......	......	......	60	40	28.75	......	......	3.96	4	13	......
February	......	......	......	63	16	33.	......	......	6.24	5	10	......
March	......	......	......	50	19	29.	......	......	2.11	2	8	......
April	......	......	......	79	28	45.	......	......	2.05	3	8	......
May	......	......	......	85	48	63.75	......	......	4.38	......	6	......
June	......	......	......	89	56	81.	......	......	5.96	......	11	......
For the year	......	......	......	89	16	51.4	......	......	41.68	20	102	......

* Including melted snow.

STATION, NEW YORK CITY, N. Y.

Latitude, 40° 43′ N.; Longitude, 74° 0′ W. Height of Barometer Cistern above Sea Level, 168 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	BAROMETER. Reduced to 32°.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (days of).	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1886.												
July	30.081	29.572	29.785	90.5	60.0	72.9	70.	S.	2.57	......	10	6
August	30.169	29.442	29.818	87.7	57.8	71.0	72.	S.	1.18	......	6	3
September	30.267	29.547	29.965	85.9	50.5	67.1	74.	S.	1.79	......	7	7
October	30.352	29.620	30.000	82.5	34.6	56.5	70.	N. N. E.	3.90	......	7	8
November	30.263	29.310	29.837	72.7	28.6	45.3	69.	N. W.	4.61	1	9	8
December	30.408	29.272	29.949	54.2	14.0	30.8	75.	N. E.	3.73	8	13	10
1887.												
January	30.468	29.240	29.868	62.6	6.0	30.1	71.	N. W.	4.19	4	11	11
February	30.757	29.085	30.026	63.0	16.6	33.7	68.	N. W.	5.26	14	16	12
March	30.598	29.032	29.757	49.6	16.3	34.3	61.	N. W.	3.51	8	10	9
April	30.505	29.023	29.820	80.3	25.8	47.7	56.	N. W.	3.67	3	12	7
May	30.16	29.41	29.886	87.5	47.2	62.9	64.	S. E.	0.99	......	5	5
June	30.14	29.46	29.826	90.1	51.3	68.2	70.	S. E.	7.70	......	11	6
For the year	30.757	29.023	29.878	90.5	6.0	51.7	68.3	N. W.	43 10	38	117	92

* Including melted snow.

STATION, NEWARK, N. J.

Latitude, 40° 44′ N.; Longitude, 74° 10′ W. Height of Barometer Cistern above Sea Level, 53 feet.

OBSERVER, F. W. RICORD.

	BAROMETER. Reduced to 32°.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (days of).	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1886.												
July	30.250	29.760	29.972	91	69.	75.43	....	N.E., N.W.	4.780	....	8	7
August	30 320	29 670	29.984	90	55.	73.33	....	N.W., S.W.	1.570	....	5	4
September	30.430	29.720	30.134	86	50.	68.73	....	N.E., N.W.	1.630	....	6	8
October	30.520	29 810	30.169	78	36.	57.93	....	N.E., N.W.	2.910	....	4	10
November	30.430	29.490	30.000	66	27.	44.96	....	N.W., S.W.	4.860	3	5	9
December	30.540	29.490	30.121	52	14.	29.35	....	N.W., S.W.	4.250	8	7	17
1887.												
January	30.590	29.470	29.897	60	5.50	28.84	....	N.W., S W.	3.630	5	9	14
February	30.960	29 320	30.220	63	16.	33.50	....	N E., N.W.	5.430	7	10	15
March	30.750	29.270	29.276	50	17:	34.21	....	N.E., N.W.	3.620	7	6	17
April	30.650	29.200	29.994	80	30.	48.18	....	N.E., N.W.	3.120	3	7	13
May	30.310	29.630	30.057	88	46.	65 30	....	N E., S.E.	.580	....	4	10
June	30.350	29.700	30.027	92	50.	69 70	....	N.E., S.E.	7.000	....	10	10
For the year	30 960	29 200	29.938	91	5.5	52.46	....	N E., N.W.	43 38	33	81	134

* Including melted snow.

STATION, NEW BRUNSWICK, N. J.

Latitude, 40° 29′ N.; Longitude, 74° 27′ W. Height of Barometer Cistern above Sea Level, 115 feet.

OBSERVER, GEO. H. COOK.

	BAROMETER. Reduced to 32°.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (days of).	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1886.												
July	....	....	....	93.0	51.0	72.3	....	....	4.26	....	10	11
August	....	....	....	90.0	49 0	70.2	....	....	2.51	....	5	5
September	....	....	....	91.0	44.0	66.0	....	....	1.23	....	8	7
October	....	....	....	78.8	24.0	54 7	....	....	2.28	....	7	8
November	....	....	....	75.0	20.5	43.1	....	....	3.98	....	8	8
December	....	....	....	49.0	6.0	26.9	....	....	3.30	....	15	14
1887.												
January	....	....	....	59.6	1.5	27.2	....	....	4.44	....	12	12
February	....	....	....	62.0	10.0	32.1	....	....	5.65	....	17	16
March	....	....	....	50.5	16 0	33.3	....	....	3.23	....	11	14
April	....	....	....	82.5	25.0	47 1	....	....	3.04	....	9	12
May	....	....	....	86.5	39.0	62.5	....	....	1.11	....	7	7
June	....	....	....	90.5	47.0	68.0	....	....	5.98	....	11	12
For the year.	....	....	....	93.0	1.5	50.3	....	....	41.01	....	120	126

* Including melted snow.

STATION, BEVERLY, N. J.

Latitude, 40° 31′ N.; Longitude, 74° 59′ W. Height of Barometer Cistern above Sea Level, 40 feet.

OBSERVER, C. F. RICHARDSON.

	Barometer. Reduced to 32°.			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (days of).	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1886.												
July	30.59	30.04	30.22	92	59.	73.5	76.9	S. W.	5 55	....	15	11
August	30.61	29 95	30.24	92	56.	71.63	78.2	N. W.	2.15	....	6	14
September	30.60	30.01	30.35	88	36.	67.7	77.5	N. W.	1.29	....	8	11
October	30.64	29.94	30 32	80	29.	55.9	76.2	N. E.	2.86	....	5	10
November	30.47	29.61	30.12	71	22.	43 8	73.8	W.	4.04	....	9	11
December	30.45	29.65	30.14	53	6.5	28.2	81.8	N. E.	3.35	....	12	16
1887.												
January	30 52	29.65	30.08	63	4.	28.9	74.5	N. W.	2.30	....	10	13
February	30.75	29.63	30.25	67	15.	34.9	80.5	N. W.	4.99	....	14	11
March	30.76	29.46	30.04	55	21.	34.5	72.1	N. W.	3.25	....	12	14
April	30.72	29.54	30.15	83	29.	48.0	63.8	N. W.	2.60	....	12	16
May	30.51	29 89	30.27	87	52.	65.2	71.0	N. E.	1.50	....	8	15
June	30.55	29.99	30.27	94	56.	70.0	73.4	S. W.	5 64	....	13	12
For the year.	30.76	29.46	30.20	94	4.0	51.8	75.0	N. W.	40.52	....	124	154

* Including melted snow.

STATION, PHILADELPHIA, PA.

Latitude, 39° 57′ N.; Longitude, 75° 9′ W. Height of Barometer Cistern above Sea Level, 117 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	Barometer. Reduced to 32°.			Thermometer.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (days of).	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1886.												
July	30.145	29.622	29.831	93.8	59.3	74.6	73.	S.	4.23	....	12	8
August	30.217	29.520	29.870	91.8	56.1	73.2	77.	S.	1.38	....	6	7
September	30.316	29.599	30.020	90.6	51.2	69.2	70.	S.	1.20	....	9	8
October	30.424	29.698	30.060	83.7	36.8	58.2	67.	N. W.	1.89	....	6	8
November	30.352	29.378	30.028	72.7	26.9	46.5	61.	N. W.	3.91	1	10	8
December	30.479	29.338	30.020	55.3	12.9	31.0	71.	N. W.	3.09	5	12	10
1887.												
January	30.538	29.303	29 947	65.6	8.1	31.5	69.	N. W.	3 23	8	13	7
February	30.823	29.252	30.107	65.6	18.0	36.1	77.	N. W.	4 43	8	17	12
March	30.632	29.192	29.855	54.5	21.8	36.4	64.	N. W.	2.59	10	14	10
April	30.549	29.142	29.897	84.2	27.8	49.8	58.	N. W.	2.00	3	11	8
May	30.22	29.49	29.936	87.9	48.7	66 7	63.	E.	0.62	....	8	6
June	30.22	29.56	29.905	93.1	53.2	70.9	67.	E.	6.81	....	12	7
For the year.	30.823	29.142	29.956	93.8	8 1	53.7	68.1	N. W.	35 38	35	130	99

* Including melted snow.

STATION, VINELAND, N. J.

Latitude, 39° 29′ N.; Longitude, 75° 1′ W. Height of Barometer Cistern above Sea Level, 105 feet.

OBSERVER, O. H. ADAMS, M.D.

	BAROMETER. Reduced to 32°.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (days of).	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1886.												
July	30.114	29.651	29.853	91	56	75.67	82.88	N.E.,S.W.	6.467	....	10	7
August	30.218	29.571	29.842	90	58	72.98	84.15	S.W.,N.E.	4.523	....	7	5
September	30.272	29.741	29.943	86	52	68.17	78.01	S.W.,N.E.	1.243	....	4	4
October	30.380	29.751	30.066	77	34	57.06	77.75	N.E.,S.W.	2.885	....	6	7
November	30.241	29.456	29.895	68	24	44.14	75.94	S. W.	3.798	....	6	7
December	30.426	29.543	30.037	58	10	30.86	70.29	N. E.	3.763	4	12	12
1887.												
January	30.482	29.505	29.980	64	6	32.00	74.86	N. W.	3.126	2	8	10
February	30.703	29.503	30.148	67	14	37.51	77.77	N. E.	3.939	....	8	11
March	30.287	29.421	29.876	56	18	37.93	72.79	N. W.	2.563	....	6	9
April	30.486	29.564	30.011	69	18	51.47	70.50	N.W., N.E.	4.066	1	7	11
May	30.202	29.525	29.911	84	43	67.24	70.65	N.E.,S.W.	2 358	....	4	5
June	30.289	29.609	29.948	92	45	70.70	74.75	N.E.,S.W.	6.251	....	8	6
For the year.	30.703	29.421	29.959	92	6	53.64	75.86	S. W.	44.982	7	86	94

* Including melted snow.

STATION, ATLANTIC CITY, N. J.

Latitude, 39° 22′ N.; Longitude, 74° 25′ W. Height of Barometer Cistern above Sea Level, 13 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	BAROMETER. Reduced to 32°.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (days of).	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1886.												
July	30.258	29.728	29.945	86.1	58.3	72.1	86	S. W.	4.73	....	9	7
August	30.313	29.579	29.952	86.5	55.3	71.4	84	S. W.	3.58	....	11	8
September	30.414	29.753	30.127	85.6	49.8	68.5	82	E. S.W.	0.89	....	9	4
October	30.512	29.808	30.161	73.9	36.2	58.1	82	N. W.	8.16	....	7	7
November	30.461	29.502	30.032	65.0	24.4	46.7	78	W. N.W.	3.45	....	9	6
December	30.565	29.510	30.115	51.4	13.7	33.2	85	N. W.	3.93	5	14	10
1887.												
January	30.640	29.424	30.056	49.4	7.0	31.4	82	S. W.	3.50	1	9	8
February	30.947	29.343	30.214	57.8	16.7	36.6	83	S. W.	4.17	4	15	6
March	30.742	29.153	29.953	56.2	18.4	35.6	80	N. W.	2.94	8	14	6
April	30.651	29.246	30.006	84.0	26.6	46.3	83	N. W.	2.85	3	13	6
May	30.33	29.62	30.055	73.3	46.7	59.1	85	S.	1.61	....	8	3
June	30.32	29.67	30.02	95.1	53.7	66.1	84	S. S. W.	4.21	....	10	7
For the year.	30.947	29.153	30.051	95.1	7.0	52.1	83	S. W.	44.02	21	128	78

* Including melted snow.

NOTE.—In the ninth report, owing to the discontinuance of the Signal Station Records at Cape May, we were unable to give the whole of the year. We this year, in addition to the tables for 1885–1886 therein given, print also the record of Atlantic City for that year.

STATION, ATLANTIC CITY, N. J., 1885–6.

Latitude, 39° 22′ N.; Longitude, 74° 25′ W. Height of Barometer Cistern above Sea Level, 13 feet.

OBSERVER, U. S. SIGNAL SERVICE.

	BAROMETER. Reduced to 32°.			THERMOMETER.			Mean Humidity.	Prevailing Wind.	Rain (inches).*	Snow (days of).	Days when Precipitation equaled 0.01.	Cloudy Days.
	Max.	Min.	Mean.	Max.	Min.	Mean.						
1885.												
July	30.199	29.650	29.946	90.9	56.8	73.4	87.	S.	4.45	....	6	1
August	30.271	29.664	29.970	89.3	48.8	73.1	83.	S.	4.50	....	13	4
September	30.389	29.425	30.074	80.6	44.0	64.7	80.	N. E.	1.59	....	6	3
October	30.326	29.104	30.014	73.9	33.6	55.8	86.	S.	2.94	1	11	5
November	30.361	29.562	29.944	64.7	26.8	46.4	83.	W.	6.84	2	14	9
December	30.738	29.279	30.025	53.3	12.5	36.9	82.	W.	4.29	1	9	5
1886.												
January	30.808	28.799	30.041	52.8	2.1	29.7	83.	N. W.	3.17	4	14	7
February	30.504	29.275	30.070	50.3	-2.3	29.9	79.	N. W.	4.92	5	7	7
March	30.461	29.262	29.931	67.5	10.6	38.1	78.	N. W.	3.40	3	10	4
April	30.530	29.402	30.100	83.4	28.4	48.0	82.	E.	1.86	....	6	5
May	30.363	29.511	29.922	74.9	40.5	56.0	82.	S. W.	4.15	....	20	11
June	30.318	29.510	29.977	82.0	50.3	65.7	83.	S. E.	2.56	....	10	6
For the year	30.808	28.799	30.001	90.9	-2.3	51.5	82.3	S. W. & S.	44.67	16	126	67

* Including melted snow.

NUMBER OF MARRIAGES, BIRTHS AND DEATHS BY TOWNSHIPS AND COUNTIES, AND TOTALS FOR THE STATE.

FOR THE YEAR ENDING JUNE 30, 1887.

ATLANTIC COUNTY.

	M.	B.	D.
Absecon	5	13	16
Atlantic City	165	231	214
Buena Vista	3	14	10
Egg Harbor City	16	47	20
Egg Harbor Township	52	94	62
Galloway	4	42	44
Hamilton	9	39	26
Hammonton	27	65	33
Mullica	3	18	8
Weymouth	1	15	9
	285	578	442

BERGEN COUNTY.

	M.	B.	D.
Englewood	34	72	89
Franklin	9	29	32
Harrington	17	49	33
Hohokus	4	41	42
Lodi	24	106	58
Midland	3	23	36
New Barbadoes	45	130	115
Orvil	9	15	17
Palisade	16	40	28
Ridgefield	30	69	61
Ridgewood	8	19	25
Saddle River	2	30	15
Union	11	60	66
Washington	12	52	46
	224	735	663

BURLINGTON COUNTY.

	M.	B.	D.
Bass Biver	8	27	13
Beverly	31	51	46
Bordentown	55	130	78
Burlington	93	126	133
Chester	26	64	53
Chesterfield	9	21	21
Cinnaminson	12	59	34
Delran.	5	30	37
Eastampton	1	10	7
Evesham	3	26	28
Florence	8	55	29
Little Egg Harbor	11	32	22
Lumberton	1	19	5
Mansfield	11	37	24
Medford	6	30	37
Mount Laurel	1	18	13
New Hanover	17	56	36
Northampton	43	105	111
Pemberton	7	47	67
Randolph	2	13	3
Shamong	2	9	17
Southampton	6	39	16
Springfield	3	30	26
Washington	...	10	2
Westampton	...	7	9
Willingboro	7	7	9
Woodland	...	...	4
	368	1,058	880

CAMDEN COUNTY.

	M.	B.	D.
Camden	4,730	928	1,079
Centre	5	40	31
Delaware	2	18	16
Gloucester City	56	132	137
Gloucester	19	78	77
Haddon	39	95	57
Stockton	36	94	89
Waterford	12	49	31
Winslow	13	41	31
	4,912	1,475	1,548

CAPE MAY COUNTY.

	M.	B.	D.
Cape May City	18	39	44
Dennis	14	53	24
Lower	12	45	31
Middle	20	53	52
Upper	17	22	23
	81	212	174

CUMBERLAND COUNTY.

	M.	B.	D.
Bridgeton	92	274	163
Commercial	16	57	13
Deerfield	19	24	11
Downe	11	38	18
Fairfield	9	40	11
Greenwich	6	23	26
Hopewell	7	36	20
Landis	76	171	115
Lawrence	...	32	29
Maurice River	12	62	33
Millville	97	279	146
Stoe Creek	...	27	6
	345	1,063	591

ESSEX COUNTY.

	M.	B.	D.
Belleville	27	59	73
Bloomfield	64	167	99
Caldwell	21	26	28
Clinton	13	50	42
East Orange	74	177	126
Franklin	1	19	8
Livingston	9	16	20
Millburn	11	44	28
Montclair	22	54	45
Newark	1,468	4,540	3,734
Orange	149	468	332
South Orange	19	67	38
West Orange	7	68	42
	1,885	5,755	4,615

GLOUCESTER COUNTY.

	M.	B.	D.
Clayton	21	64	45
Deptford	5	38	18
East Greenwich	15	25	37
Franklin	8	62	39
Glassboro	24	74	46
Greenwich	8	47	19
Harrison	14	38	30
Logan	6	34	15
Mantua	14	25	24
Monroe	18	31	34
South Harrison	2	18	8
Washington	6	22	16
West Deptford	1	26	23
Woodbury	45	84	50
Woolwich	15	59	39
	202	647	443

HUDSON COUNTY.

	M.	B.	D.
Bayonne	99	298	303
Guttenberg	19	46	33
Harrison	27	249	182
Hoboken	418	1,173	916
Jersey City	1,212	2,566	3,686
Kearny	8	81	70
North Bergen	15	60	201
Town of Union	124	264	191
Union	14	69	32
Weehawken	3	28	44
West Hoboken	57	226	141
	1,996	5,060	5,799

HUNTERDON COUNTY.

	M.	B.	D.
Alexandria	7	23	13
Bethlehem	14	40	43
Clinton	25	59	28
Delaware	30	39	28
East Amwell	9	26	25
Franklin	9	26	9
Frenchtown	25	21	15
High Bridge	15	23	14
Holland	24	13	20
Kingwood	9	27	24
Lambertville	62	86	63
Lebanon	26	57	52
Raritan	37	57	57
Readington	39	43	38
Tewksbury	15	36	16
Union	5	10	16
West Amwell	3	18	20
	354	604	481

MERCER COUNTY.

	M.	B.	D.
Chambersburg	100	172	178
East Windsor	23	40	39
Ewing	10	19	81
Hamilton	16	32	62
Hopewell	31	69	60
Lawrence	4	23	27
Millham	11	77	57
Princeton	34	70	66
Trenton	549	532	612
Washington	4	12	14
West Windsor	11	14	19
	793	1,060	1,215

MIDDLESEX COUNTY.

	M.	B.	D.
Cranbury	19	34	25
East Brunswick	27	77	40
Madison	...	21	13
Monroe	15	41	38
New Brunswick	145	386	350
North Brunswick	17	22	20
Perth Amboy	61	176	150
Piscataway	21	54	34
Raritan	16	55	45
Sayreville	8	14	12
South Amboy	14	100	60
South Brunswick	10	45	37
Woodbridge	20	82	70
	373	1,107	889

MONMOUTH COUNTY.

	M.	B.	D.
Atlantic	7	18	19
Eatontown	9	23	35
Freehold	46	79	86
Holmdel	7	26	15
Howell	18	44	42
Long Branch	59	141	72
Manalapan	14	40	27
Marlboro	4	23	35
Matawan	24	68	71
Middletown	28	89	81
Millstone	14	32	28
Neptune	81	89	122
Ocean	12	32	49
Raritan	32	112	75
Shrewsbury	88	133	136
Upper Freehold	28	87	57
Wall	43	87	75
	514	1,123	1,025

MORRIS COUNTY.

	M.	B.	D.
Boonton	26	38	59
Chatham	33	83	65
Chester	15	70	30
Hanover	19	58	124
Jefferson	4	8	27
Mendham	10	28	24
Montville	6	9	11
Morristown	53	153	119
Mount Olive	6	30	16
Passaic	12	20	25
Pequannock	11	56	26
Randolph	55	145	106
Rockaway	24	104	107
Roxbury	17	70	57
Washington	22	65	20
	313	937	816

OCEAN COUNTY.

	M.	B.	D.
Berkeley	1	18	10
Brick	34	62	57
Dover	35	51	36
Eagleswood	9	9	9
Jackson	12	37	20
Lacey	5	13	12
Manchester	7	24	19
Ocean	...	8	9
Plumsted	6	24	23
Stafford	5	4	5
Union	16	27	11
	130	277	211

PASSAIC COUNTY.

	M.	B.	D.
Acquackanonk	8	29	17
Little Falls	16	39	29
Manchester	...	28	16
Passaic	99	288	190
Paterson	708	1,839	1,402
Pompton	15	35	32
Wayne	2	30	16
West Milford	12	28	29
	860	2,316	1,731

SALEM COUNTY.

	M.	B.	D.
Alloway	3	19	21
Elsinboro	1	2	5
Lower Alloways Creek	7	8	14
Lower Penns Neck	...	15	13
Mannington	3	28	33
Oldmans	14	31	10
Pilesgrove	26	49	67
Pittsgrove	12	67	27
Quinton	3	33	9
Salem	76	104	89
Upper Penns Neck	25	41	31
Upper Pittsgrove	4	19	21
	174	416	340

SOMERSET COUNTY.

	M.	B.	D.
Bedminster	12	33	26
Bernards	13	48	40
Branchburg	4	16	19
Bridgewater	81	137	159
Franklin	17	58	52
Hillsborough	16	22	45
Montgomery	12	29	29
North Plainfield	25	89	48
Warren	7	14	18
	187	446	436

SUSSEX COUNTY.

	M.	B.	D.
Andover	10	16	19
Byram	16	32	11
Frankford	9	27	26
Green	6	12	11
Hampton	3	6	15
Hardyston	26	6	31
Lafayette	7	6	16
Montague	6	12	15
Newton	31	37	22
Sandyston	11	19	21
Sparta	8	9	19
Stillwater	15	26	19
Vernon	11	25	15
Walpack	6	9	4
Wantage	26	46	52
	191	288	296

UNION COUNTY.

	M.	B.	D.
Clark	...	3	6
Cranford	...	2	2
Elizabeth	242	885	717
Fanwood	1	19	12
Linden	7	20	31
New Providence	1	9	11
Plainfield	88	169	153
Rahway	51	126	116
Springfield	9	17	21
Summit	17	55	43
Union	5	32	28
Westfield	19	55	50
	440	1,392	1,190

WARREN COUNTY.

	M.	B.	D.
Allamuchy	...	9	5
Belvidere	50	32	22
Blairstown	13	28	21
Franklin	4	20	20
Frelinghuysen	4	21	7
Greenwich	5	13	15
Hackettstown	24	41	29
Hardwick	...	8	8
Harmony	10	23	18
Hope	12	42	20
Independence	6	20	8
Knowlton	90	31	21
Lopatcong	2	30	30
Mansfield	7	16	28
Oxford	24	120	71
Pahaquarry	1	2	2
Phillipsburg	492	210	155
Pohatcong	8	27	26
Washington	37	98	40
	789	791	546

TOTALS OF MARRIAGES, BIRTHS AND DEATHS FOR ALL THE COUNTIES.

	M.	B.	D.
Atlantic	285	578	442
Bergen	224	735	663
Burlington	368	1,058	880
Camden	4,912	1,475	1,548
Cape May	81	212	174
Cumberland	345	1,063	591
Essex	1,885	5,755	4,615
Gloucester	202	647	443
Hudson	1,996	5,060	5,799
Hunterdon	354	604	481
Mercer	793	1,060	1,215
Middlesex	373	1,107	889
Monmouth	514	1,123	1,025
Morris	313	937	816
Ocean	130	277	211
Passaic	860	2,316	1,731
Salem	174	416	340
Somerset	187	446	436
Sussex	191	288	296
Union	440	1,392	1,190
Warren	789	791	546
	15,416	27,340	24,331

SPECIAL COMPARISON OF DEATH-RATES

AND OF DEATHS FROM SEVERAL DISEASES AND AT DIFFERENT AGES, AS SHOWING THE CONTRAST BETWEEN CITIES AND COUNTRY DISTRICTS.

The degree to which disease is preventable and the extent to which the average of human life may be prolonged, deserve to rank as one of the discoveries of the present age—as an epoch from which we are to reckon great progress in the art of preserving life.

Yet, like many discoveries, it has as yet only partial application. Its significance and its possibilities need to be enforced by various illustrations.

We first attempt to show it by numerical statements and comparisons. We tell the least number dying in the most healthy places and the greatest number in the most sickly places, and increase the significance of the figures by details as to the ages and the diseases; when, for instance, we find that in one district only 15 die yearly out of each 1,000 inhabitants and in another place 30 in 1,000, we cannot but see the contrast and begin to wonder whether the higher death-rate cannot be reduced. We cannot but see that it is dependent upon causes operating in the one place that are not operative in the other.

Even the figures do not convey the whole idea. We seem to forget that in populations of 100,000, the difference between the 15 per 1,000 in one locality and the 30 in another means the loss of just 1,500 lives.

The most impressive lesson would be to place the 1,500 excess of dead bodies in a row and then have some of them recognized as our friends, our relatives, as members of our own families. We then, perchance, would bestir ourselves more for the prevention of this excess. In order to impress these facts of statistics we have selected one of our cities, representing about 150,000 inhabitants, and four of our rural counties having no cities in them, representing about 100,-

000 people, so that allowance can easily be made for the third more in the city. We do not select the one city because of its excess over other cities, for some of our own exceed it. The counties are only a fair representation of our country districts.

We take the three years crossing the census of 1885, and reckon this series of years in order to avoid any error arising from the greater mortality of some one season or year, or error from dealing with too small numbers.

By five different tables we seek to show the facts in various phases and combination so as to admit of individual and comparative study and so illustrate and impress the general result.

In order to aid those who are more impressed by graphic delineations or by the eye more than by mere figures, we add in their proper places two diagrams, the one showing the mean annual comparative death-rates between the city and the counties at corresponding ages, and the other a comparison as to prominent or selected causes of death. These, together, show not only the excesses of number in the city, but at what age the excesses have occurred, and also in what classes of disease the relative excess of cities is most marked. The diagrams also show the principal diseases in relation to each other. The tables and the delineations together, can also be studied in many other directions.

The combinations of the tables have been made with the aid of the electrical combining machine invented by H. Hollerith, M.E., of Washington, D. C., and we are also indebted to him for assistance in the graphic comparisons.

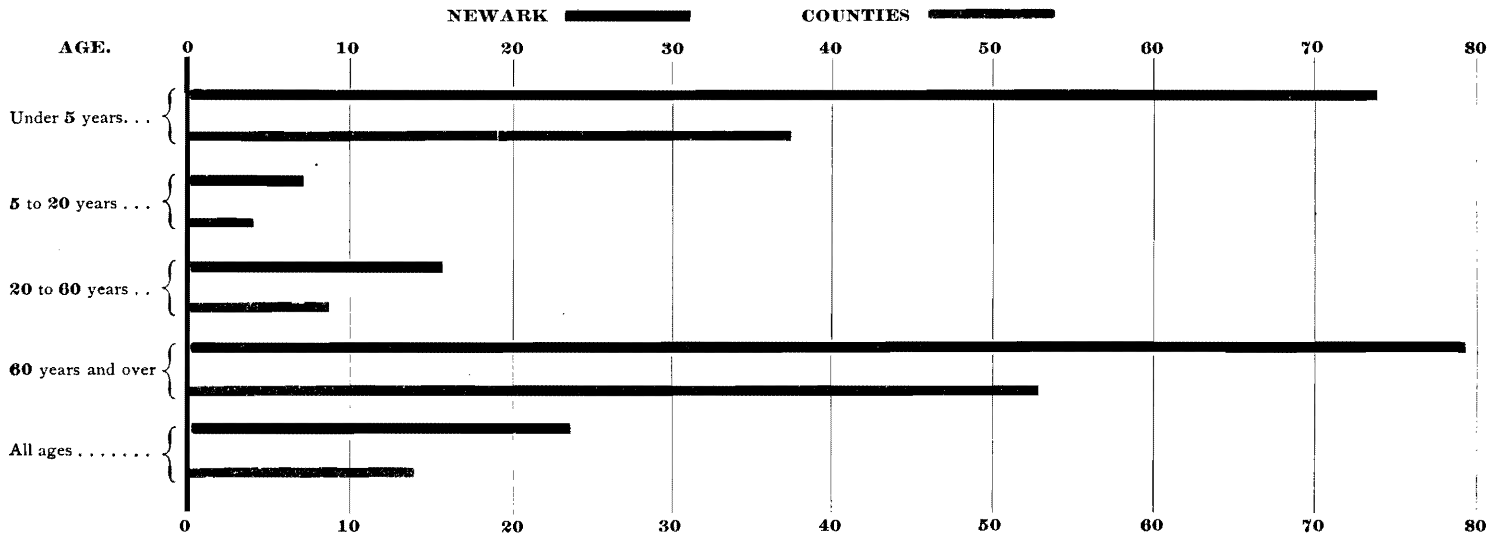
It is not claimed that these comparisons might not be slightly modified by absolutely correct returns or by comparisons of larger populations over a longer period of time. But the worker in statistics is constantly surprised to see how errors balance each other or can be allowed for, or how, in large calculations, they drop out as inconsiderable factors. The facts stated in general, so far from being exaggerated, lack fullness of statement, for populations are oftener overestimated than underestimated, and while no more deaths are recorded than occur, it cannot be assumed that absolutely all are secured. Besides, these deaths stand for multitudes of sicknesses of those who have not died, and for loss of comfort and of capital as well as of life. Newark, in comparison with many other cities, is not conspicuous for its death-rate, and we have found it convenient to use

DIAGRAM SHOWING THE MEAN ANNUAL DEATH-RATE

At certain ages per 1,000 of population at corresponding ages

For the City of Newark, as compared with Cape May, Gloucester, Hunterdon and Somerset Counties,

For three years from July 1st, 1883, to July 1st, 1886.



it all the more complacently because it is astir in grappling with its sanitary problems, and is showing a vigor of sanitary administration which promises to keep abreast of its wonderful capacities for increase.

The following table shows the total mortality for the city of Newark, and for the counties of Cape May, Gloucester, Hunterdon and Somerset, for the three years from July 1st, 1883, to July 1st, 1886:

	Newark.	Counties.
Total mortality, three years	10,779	4,386
Total population, census 1885	152,988	103,192
Mean annual death-rate per 1,000	23.49	14.17

To represent their mean annual death-rates graphically, we have the accompanying diagram. (See opposite page.)

If the rate of mortality in the counties had been the same as that for the city of Newark, we would have had a total mortality for the three years of 7,271, as against 4,386, the actual mortality in the counties during this period. Or if we apply the death-rate of the counties to the population of Newark we should have a total mortality for the three years of only 6,503, instead of the actual mortality of 10,779.

The distribution of the mortality with reference to age is shown in the following table, which gives the actual mortality and the percentage of the total mortality, at each age-period for the three years for the city of Newark and for the four counties:

AGE.	ACTUAL MORTALITY.		PERCENTAGE OF TOTAL MORTALITY.	
	Newark.	Counties.	Newark.	Counties.
Under one month	722	251	6.70	5.72
One month to one year	1,892	556	17.55	12.68
One to five years	1,717	406	15.93	9.26
Five to ten years	516	154	4.79	3.51
Ten to twenty years	501	227	4.65	5.17
Twenty to thirty years	971	342	9.01	7.80
Thirty to forty years	950	289	8.81	6.59
Forty to fifty years	883	299	8.19	6.82
Fifty to sixty years	814	329	7.55	7.50
Sixty to seventy years	827	488	7.67	11.12
Seventy to eighty years	607	603	5.63	13.75
Eighty years and over	347	409	3.22	9.33
Unknown	32	33	.30	.75
All ages	10,779	4,386	100.00	100.00

The actual living population in the city of Newark and in the counties at certain age-periods, according to the census of 1885, and the percentage of the total at each age-period, are given in the following table:

AGE.	POPULATION.		PERCENTAGE OF TOTAL MORTALITY.	
	Newark.	Counties.	Newark.	Counties.
Under five years	19,610	10,887	12.82	10.55
Five to twenty years	47,643	32,769	31.14	31.76
Twenty to sixty years	78,229	50,070	51.13	48.52
Sixty years and over	7,506	9,466	4.91	9.17
Total	152,988	103,192	100.00	100.00

The following table gives the total mortality for the three years, for Newark and for the counties, for corresponding age-periods. Those of unknown age have been distributed in proportion to those of known ages:

AGE.	Newark.	Counties.
Under five years	4,344	1,222
Five to twenty years	1,020	384
Twenty to sixty years	3,629	1,269
Sixty years and over	1,786	1,511
All ages	10,779	4,386

From these figures we get the *mean annual death-rate* per 1,000 living population *at each age-period*, as follows:

AGE.	DEATH-RATE PER 1,000.	
	Newark.	Counties.
Under five years	73.84	37.41
Five to twenty years	7.14	3.91
Twenty to sixty years	15.46	8.45
Sixty years and over	79.32	53.20
All ages	23.49	14.17

The following table shows the mortality, exclusive of infants under one month of age, and the percentage of the total mortality from each cause for the three years for the city of Newark and for the counties:

CAUSES.	ACTUAL MORTALITY.		PERCENTAGE.	
	Newark.	Counties.	Newark.	Counties.
Remittent fever	99	53	.99	1.28
Typhoid fever	283	92	2.81	2.23
Small-pox	1	......	.01	......
Scarlet fever	162	81	1.61	1.96
Measles	80	8	.79	.19
Whooping-cough	77	44	.76	1.06
Croup and diphtheria	884	142	8.79	3.43
Erysipelas	35	19	.35	.46
Diarrhœal diseases	1,205	385	11.98	9.31
Consumption	1,594	667	15.85	16.13
Acute lung diseases	1,240	389	12.33	9.41
Brain and nervous diseases of children	940	257	9.35	6.22
Diseases of heart and circulation	635	326	6.32	7.89
Urinary diseases	409	160	4.07	3.87
Adult brain and spinal diseases	726	523	7.22	12.65
Digestive and intestinal diseases	541	314	5.38	7.59
Cancer	257	135	2.55	3.26
Acute rheumatism	11	19	.11	.46
Puerperal	116	54	1.15	1.31
Accident	397	206	3.95	4.98
Not classified	196	91	1.95	2.20
Unknown	169	170	1.68	4.11
All causes	10,057	4,135	100.00	100.00

The following tables show in detail all the relations between cause, sex and age for the mortality of the city of Newark and of the four counties:

MORTALITY IN THE CITY OF NEWARK FOR THREE YEARS FROM JULY 1ST, 1883, TO JULY 1ST, 1886, ACCORDING TO CAUSE, SEX AND AGE (EXCLUSIVE OF INFANTS UNDER ONE MONTH OF AGE).

Cause.	Sex.	AGE. One month and under one year.	One to five years.	Five to ten years.	Ten to twenty years.	Twenty to thirty years.	Thirty to forty years.	Forty to fifty years.	Fifty to sixty years.	Sixty to seventy years.	Seventy to eighty years.	Eighty years and over.	Not specified.	Total.
Remittent fever	Males	4	13	2	4	2	7	5	3	2	2	1	.....	45
	Females	5	10	4	3	9	9	4	3	1	2	4	.....	54
	Totals	9	23	6	7	11	16	9	6	3	4	5	.....	99
Typhoid fever	Males	3	2	7	30	50	26	16	9	6	6	.....	2	157
	Females	1	2	11	30	31	21	14	5	4	6	1	.....	126
	Totals	4	4	18	60	81	47	30	14	10	12	1	2	283
Small-pox	Males	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
	Females	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Totals	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Scarlet fever	Males	4	61	13	3	1	1	.....	.....	.....	.....	.....	.....	83
	Females	3	44	31	1	.....	.....	.....	.....	.....	.....	.....	.....	79
	Totals	7	105	44	4	1	1	.....	.....	.....	.....	.....	.....	162
Measles	Males	7	28	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	38
	Females	7	28	6	.....	.....	1	.....	.....	.....	.....	.....	.....	42
	Totals	14	56	9	.....	.....	1	.....	.....	.....	.....	.....	.....	80
Whooping-cough	Males	19	14	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	34
	Females	25	14	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	43
	Totals	44	28	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	77
Croup and diphtheria	Males	30	303	96	13	3	1	.....	1	1	.....	.....	1	449
	Females	38	261	114	19	3	.....	2	.....	1	.....	.....	1	434
	Unknown	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
	Totals	63	564	211	32	6	1	2	1	2	.....	.....	2	884
Erysipelas	Males	5	2	.....	1	1	2	5	1	3	2	1	.....	23
	Females	2	2	.....	2	.....	.....	.....	.....	2	2	2	.....	12
	Totals	7	4	.....	3	1	2	5	1	5	4	3	.....	35
Diarrhœal diseases	Males	505	119	12	26	.....	.....	.....	.....	.....	.....	.....	.....	662
	Females	405	107	12	16	.....	.....	.....	.....	.....	.....	.....	.....	540
	Unknown	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
	Totals	913	226	24	42	.....	.....	.....	.....	.....	.....	.....	.....	1,205

MORTALITY IN THE CITY OF NEWARK—*Continued.*

CAUSE.	SEX.	AGE. One month and under one year.	One to five years.	Five to ten years.	Ten to twenty years.	Twenty to thirty years.	Thirty to forty years.	Forty to fifty years.	Fifty to sixty years.	Sixty to seventy years.	Seventy to eighty years.	Eighty years and over.	Not specified.	Total.
Consumption	Males	6	11	5	66	267	196	144	86	70	25	12	1	889
	Females	11	4	7	79	200	152	100	52	53	35	9	3	705
	Totals	17	15	12	145	467	348	244	138	123	60	21	4	1,594
Acute lung diseases	Males	148	148	27	14	44	63	84	66	50	31	17	1	693
	Females	114	113	20	17	26	36	42	49	68	39	23	.....	547
	Totals	262	261	47	31	70	99	126	115	118	70	40	1	1,240
Brain and nervous diseases of children	Males	230	205	46	22	.....	.....	.....	.....	.....	.....	.....	.....	503
	Females	220	159	37	19	.....	.....	.....	.....	.....	.....	.....	.....	485
	Unknown	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
	Totals	450	366	83	41	.....	.....	.....	.....	.....	.....	.....	.....	940
Diseases of heart and circulation	Males	8	5	7	23	28	49	44	57	57	49	13	.....	340
	Females	4	5	10	29	24	24	30	52	50	42	22	3	295
	Totals	12	10	17	52	52	73	74	109	107	91	35	3	635
Urinary diseases	Males	3	10	6	9	21	32	35	34	37	38	14	.....	239
	Females	1	3	3	12	19	21	29	27	29	15	11	.....	170
	Totals	4	13	9	21	40	53	64	61	66	53	25	.....	409
Adult brain and spinal diseases	Males	.....	.....	.....	.....	26	46	48	78	87	65	30	2	382
	Females	.....	.....	.....	.....	21	31	51	56	62	78	41	4	344
	Totals	.....	.....	.....	.....	47	77	99	134	149	143	71	6	726
Digestive and intestinal diseases	Males	.....	.....	.....	.....	26	34	42	44	57	28	17	2	250
	Females	.....	.....	.....	.....	26	45	40	49	62	46	23	.....	291
	Totals	.....	.....	.....	.....	52	79	82	93	119	74	40	2	541
Cancer	Males	.....	1	.....	.....	2	7	20	20	25	15	6	.....	96
	Females	.....	.....	.....	.....	2	16	32	50	39	19	3	.....	161
	Totals	.....	1	.....	.....	4	23	52	70	64	34	9	.....	257
Acute rheumatism	Males	1	.....	.....	.....	.....	.....	1	.....	1	1	.....	.....	4
	Females	.....	.....	.....	.....	.....	1	1	.....	3	2	.....	.....	7
	Totals	1	.....	.....	.....	.....	1	2	.....	4	3	.....	.....	11
Puerperal	Males	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Females	.....	.....	.....	7	57	39	8	.....	3	.....	.....	2	116
	Totals	.....	.....	.....	7	57	39	8	.....	3	.....	.....	2	116

MORTALITY IN THE CITY OF NEWARK—*Continued.*

CAUSE.	SEX.	AGE. One month and under one year.	One to five years.	Five to ten years.	Ten to twenty years.	Twenty to thirty years.	Thirty to forty years.	Forty to fifty years.	Fifty to sixty years.	Sixty to seventy years.	Seventy to eighty years.	Eighty years and over.	Not specified.	Total.
Accident	Males	7	15	20	40	56	51	56	44	15	7	3	7	321
	Females	5	12	6	6	10	8	8	7	7	......	6	......	75
	Unknown	......	1	......	......	......	......	......	......	......	......	......	......	1
	Totals	12	28	26	46	66	59	64	51	22	7	9	7	397
Not classified	Males	32	4	4	4	8	15	12	10	6	7	4	2	108
	Females	22	4	1	4	6	14	5	6	11	7	7	1	88
	Totals	54	8	5	8	14	29	17	16	17	14	11	3	196
Unknown	Males	15	4	......	......	1	......	3	2	7	17	27	......	76
	Females	4	......	......	2	1	2	2	3	8	21	50	......	93
	Totals	19	4	......	2	2	2	5	5	15	38	77	......	169
All causes	Males	864	769	266	245	435	420	368	359	403	314	202	14	4,659
	Females	1025	945	249	256	536	530	515	455	424	293	145	18	5,391
	Unknown	3	3	1	......	......	......	......	......	......	......	......	......	7
	Totals	1892	1717	516	501	971	950	883	814	827	607	347	32	10,057

proposed, which may be added ... may seem to demand. Where the inquiry is as to classes . any specified department, the usual division is—

I. Cultivators of the soil.
II. Active mechanics out of doors.
III. Active mechanics in shops.
IV. Inactive mechanics in shops.
V. Laborers—no special trades.

For inquiry into special occupations, the following points are to be thought of:

I. Occupations; deleterious by reason of (*A*) the inhalation of Dust, or (*B*) the production of (*a*) Irritating, (*b*) Poisonous, (*c*) Offensive Vapors and Gases, or (*C*) by the Absorption of Irritants through the Skin.

II. Occupations that involve exposure by reason of—

...ure of the buildings.

The proper protection of machinery.

(*d*) Washing or bathing arrangements.

(*e*) Heating apparatus and regulation.

(*f*) Safety arrangements for all steam boilers or generators and their connecting pipes.

(*g*) Ventilation and ventilating appliances.

(*h*) Special apparatus to remove steam, dust and gases.

(*i*) Natural and artificial lighting.

(*j*) Fire alarm and prevention apparatus, and fire-escapes.

(*k*) Removal of all waste products.

(*l*) Potable or drinking-water.

(*m*) Water or other closet arrangements.

(*n*) General housekeeping and periodical cleansing.

(*o*) Social and recreative regulations, with a view to health and its necessary moral aids.

TOTAL MORTALITY IN CAPE MAY, GLOUCESTER, HUNTERDON AND SOMERSET COUNTIES FOR THREE YEARS FROM JULY 1ST, 1883, TO JULY 1ST, 1886, ACCORDING TO CAUSE, SEX AND AGE (EXCLUSIVE OF INFANTS UNDER ONE MONTH OF AGE).

CAUSE.	SEX.	AGE.												
		One month and under one year.	One to five years.	Five to ten years.	Ten to twenty years.	Twenty to thirty years.	Thirty to forty years.	Forty to fifty years.	Fifty to sixty years.	Sixty to seventy years.	Seventy to eighty years.	Eighty years and over.	Unknown.	Total.
Remittent fever	Males	1	3	1	2	3	1	1	2	4	.....	3	.....	21
	Females	4	7	.....	2	3	2	3	1	5	5	.....	.....	32
	Totals	5	10	1	4	6	3	4	3	9	5	3	.....	53
Typhoid fever	Males	.....	1	3	8	15	5	5	2	4	4	2	.....	49
	Females	.....	3	2	9	9	4	4	2	5	2	1	2	43
	Totals	.....	4	5	17	24	9	9	4	9	6	3	2	92
Small-pox	Males	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
	Females	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
	Totals	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
Scarlet fever	Males	2	21	9	3	1	1	.....	1	.....	.....	.....	1	39
	Females	3	12	14	9	3	1	.....	.....	.....	.....	.....	.....	42
	Totals	5	33	23	12	4	2	.....	1	.....	.....	.....	1	81
Measles	Males	1	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	3
	Females	1	2	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	5
	Totals	2	3	.....	2	.....	.....	.....	.....	.....	.....	1	.....	8
Whooping-cough	Males	14	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	21
	Females	13	8	1	1	.....	.....	.....	.....	.....	.....	.....	.....	23
	Totals	27	15	1	1	.....	.....	.....	.....	.....	.....	.....	.....	44
Croup and diphtheria	Males	12	31	20	5	2	.....	.....	.....	.....	.....	.....	.....	70
	Females	3	23	20	9	2	2	1	2	.....	.....	.....	.....	72
	Totals	15	64	40	14	4	2	1	2	.....	.....	.....	.....	142
Erysipelas	Males	2	1	.....	.....	1	1	.....	1	2	2	2	.....	12
	Females	2	.....	.....	.....	.....	.....	.....	1	.....	1	3	.....	7
	Totals	4	1	.....	.....	1	1	.....	2	2	3	5	.....	19
Diarrhœal diseases	Males	143	46	7	6	.....	.....	.....	.....	.....	.....	.....	.....	202
	Females	115	38	11	19	.....	.....	.....	.....	.....	.....	.....	.....	183
	Totals	258	84	18	25	.....	.....	.....	.....	.....	.....	.....	.....	385

TOTAL MORTALITY IN CAPE MAY, GLOUCESTER, HUNTERDON AND SOMERSET COUNTIES—*Continued.*

CAUSE.	SEX.	AGE.												
		One month and under one year.	One to five years.	Five to ten years.	Ten to twenty years.	Twenty to thirty years.	Thirty to forty years.	Forty to fifty years.	Fifty to sixty years.	Sixty to seventy years.	Seventy to eighty years.	Eighty years and over.	Unknown.	Total.
Consumption	Males	14	9	5	22	83	51	38	35	29	25	3	2	316
	Females	7	7	2	39	83	77	41	30	27	25	10	3	351
	Totals	21	16	7	61	166	128	79	65	56	50	13	5	667
Acute lung diseases	Males	41	28	8	4	7	10	14	14	22	23	20	1	192
	Females	28	35	2	6	5	7	11	19	22	40	22	......	197
	Totals	69	63	10	10	12	17	25	33	44	63	42	1	389
Brain and nervous diseases of children	Males	67	39	14	15	......	......	......	......	......	......	......	......	135
	Females	43	51	14	14	......	......	......	......	......	......	......	......	122
	Totals	110	90	28	29	......	......	......	......	......	......	......	......	257
Diseases of heart and circulation	Males	3	1	3	6	2	6	14	16	30	49	29	1	160
	Females	3	1	1	5	4	11	13	23	31	45	28	1	166
	Totals	6	2	4	11	6	17	27	39	61	94	57	2	326
Urinary diseases	Males	1	1	......	3	3	3	7	17	24	31	10	......	100
	Females	1	2	3	5	7	5	7	4	8	12	5	1	60
	Totals	2	3	3	8	10	8	14	21	32	43	15	1	160
Adult brain and spinal diseases	Males	......	......	......	......	8	7	19	23	52	87	43	1	240
	Females	......	......	......	......	13	13	20	22	63	82	69	1	283
	Totals	......	......	......	......	21	20	39	45	115	169	112	2	523
Digestive and intestinal diseases	Males	......	......	......	......	7	12	7	22	47	28	16	2	141
	Females	......	......	......	......	18	8	18	24	40	37	25	3	173
	Totals	......	......	......	......	25	20	25	46	87	65	41	5	314
Cancer	Males	......	......	......	......	......	3	8	9	13	9	6	......	48
	Females	......	......	......	......	1	4	22	22	16	17	4	1	87
	Totals	......	......	......	......	1	7	30	31	29	26	10	1	135
Acute rheumatism	Males	......	......	......	1	1	1	......	2	1	3	2	......	11
	Females	......	......	......	......	......	1	......	2	2	2	1	......	8
	Totals	......	......	......	1	1	2	......	4	3	5	3	......	19
Puerperal	Males	......	......	......	......	......	......	......	......	......	......	......	......	....
	Females	......	......	......	4	19	17	6	4	3	1	......	......	54
	Totals	......	......	......	4	19	17	6	4	3	1	......	......	54

TOTAL MORTALITY IN CAPE MAY, GLOUCESTER, HUNTERDON AND SOMERSET COUNTIES—*Continued.*

CAUSE.	SEX.	AGE.												Total.
		One month and under one year.	One to five years.	Five to ten years.	Ten to twenty years.	Twenty to thirty years.	Thirty to forty years.	Forty to fifty years.	Fifty to sixty years.	Sixty to seventy years.	Seventy to eighty years.	Eighty years and over.	Unknown.	
Accident	Males	3	6	10	20	26	23	21	17	20	8	2	10	166
	Females	1	4	......	4	4	2	4	2	2	7	10	......	40
	Totals	4	10	10	24	30	25	25	19	22	15	12	10	206
Not classified	Males	14	6	2	......	5	7	5	5	7	4	1	1	57
	Females	4	......	......	4	5	3	7	3	......	4	3	1	34
	Totals	18	6	2	4	10	10	12	8	7	8	4	2	91
Unknown	Males	8	......	......	......	......	......	......	1	4	24	32	......	69
	Females	1	2	2	......	2	1	3	1	5	26	56	1	100
	Unknown	1	......	......	......	......	......	......	......	......	......	......	......	1
	Totals	10	2	2	......	2	1	3	2	9	50	88	1	170
All causes	Males	326	201	82	95	164	131	139	167	259	297	172	19	2,052
	Females	229	205	72	132	178	158	160	162	229	306	237	14	2,082
	Unknown	1	......	......	......	......	......	...	......	......	......	......	......	1
	Totals	556	406	154	227	342	289	299	329	488	603	409	33	4,135

(See the diagram illustrating these results graphically, on opposite page.)

The comparison of the death-rates per 10,000 inhabitants from each cause for the counties and for Newark is shown in the following table. In computing the death-rates for the different causes the infants under one month of age were not included:

CAUSES.	MEAN ANNUAL DEATH-RATE PER 10,000 TOTAL POPULATION.	
	Newark.	Counties.
Remittent fever	2.16	1.71
Typhoid fever	6.17	2.97
Small-pox	.02	....
Scarlet fever	3.53	2.62
Measles	1.74	.26
Whooping-cough	1.68	1.42
Croup and diphtheria	19.26	4.59
Erysipelas	.76	.61
Diarrhœal diseases	26.25	12.44
Consumption	34.73	21.55
Acute lung diseases	27.02	12.56
Brain and nervous diseases of children	20.48	8.30
Diseases of heart and circulation	13.84	10.53
Urinary diseases	8.91	5.17
Adult brain and spinal diseases	15.82	16.89
Digestive and intestinal diseases	11.79	10.14
Cancer	5.60	4.36
Acute rheumatism	.24	.61
Puerperal	2.53	1.75
Accident	8.65	6.66
Not classified	4.27	2.94
Unknown	3.68	5.49
All causes	219.13	133.57
Infants under one month	15.73	8.11
Total mortality	234.86	141.68

Washing, several times ...

1. Solution of mercuric chloride 1 : 1,000. (The blue . four ounces to the gallon of water, may be used).

2. Solution of chloride of lime, 1 per cent.

3. Solution of carbolic acid, 2 per cent.

FOR THE PERSON.

The hands and general surface of the body of attendants, of the sick, and of convalescents at the time of their discharge from hospital:

1. Solution of chlorinated soda diluted with nine parts of water (1 : 10).

2. Carbolic acid, two per cent. solution.

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* The blue solution containing sulphate of copper, diluted by adding two ounces of the concentrated solution to a gallon of water, may be used for this purpose.

† For articles of metal use Solution No. 3.

... of the above-mentioned disinfecting solu-
...d afterward with soap and hot water; finally throw open
..ors and windows and ventilate freely.

N. B.—The only reason why the death-rate of your city or your township is over 15 to the 1,000, or why the sickness and invalid-rate is a large multiple of this, is because the population suffers from nuisances which cause or increase the mortality from preventable diseases.

PRESENT WHOLESALE PRICES OF DISINFECTANTS.

Mercuric Chloride (Corrosive Sublimate), 70 cents per pound.
Sulphate of Iron (Copperas, Green Vitriol), 1½ cents per pound.
Sulphate of Copper (Blue Vitriol), 6 cents per pound.
Sulphate of Zinc (White Vitriol), 4½ cents.
Fifty per cent. solution Chloride of Zinc, 25 cents per pound.

RETURNS OF DEATHS FROM ALL CAUSES.

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, 1887—By Counties.

COUNTIES. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1885.	Death-rate per 1,000.	Death-rate per 1,000, without cities of over 5,000.	Deaths under five in each 100, or comparison of these with total deaths	Comparative number of deaths in each 100 from chief preventable diseases.	PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	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.	Erysipelas.	Diarrhoeal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic	133	37	38	123	111	442	22,356	15.30	15.68	38 46	22 62	3	8	1	2	6	4	11	4	61	38	40	22	23	39	15	29	23	11	1	4	26
Bergen	140	77	70	189	187	663	39,880	16.62	....	32.73	24.89	14	20	...	21	4	8	30	4	64	48	41	61	45	53	25	60	35	11	7	8	42
Burlington	171	87	78	213	295	880	57,558	15.29	15.20	29.32	20.45	7	28	...	6	6	13	40	5	75	53	57	83	44	69	28	106	57	24	8	6	30
Camden	432	209	160	462	277	1,548	76,685	20.19	18.62	41.41	26.36	14	64	..	16	12	11	94	...	197	99	133	140	126	71	53	127	76	25	6	13	72
Cape May	30	15	14	41	68	174	10,744	16.20	.....	25.86	20.11	2	......	...	8	1	3	4	1	16	11	8	18	5	10	4	31	14	8	1	2	8
Cumberland	148	67	46	174	154	591	41,982	14.08	12.21	36.38	20.47	3	12	...	4	4	6	22	5	65	55	63	47	37	46	21	40	34	17	7	5	17
Essex	1132	649	354	1616	851	4,615	213,764	21.59	12.05	38.59	23.47	24	101	2	42	78	24	277	14	521	469	315	480	395	315	210	344	197	125	19	50	170
Gloucester	99	57	22	120	142	443	27,603	16.05	....	35.21	18.74	......	9	...	2	1	5	21	3	42	33	36	39	31	32	10	44	36	17	2	2	18
Hudson	1572	1040	521	1959	686	5,799	240,342	24.13	25.02	45.04	28.37	63	118	1	30	52	31	547	22	781	408	357	719	543	282	177	294	260	104	24	57	250
Hunterdon	82	40	35	125	195	481	37,420	12.85	....	25.36	18.30	6	7	...	14	6	......	19	...	36	36	40	36	18	45	18	73	32	19	3	8	20
Mercer	284	162	91	370	292	1,215	66,785	18.19	17.81	36.71	21.15	8	24	...	12	54	9	41	9	100	99	77	137	83	71	44	125	58	34	8	19	51
Middlesex	216	98	79	250	230	889	56,180	15.82	12.31	35.32	23.85	11	16	...	7	9	10	41	3	115	76	66	82	74	53	38	67	38	20	6	11	49
Monmouth	236	119	106	288	270	1,025	62,324	16.45	16 67	34 63	24.88	10	18	...	2	8	20	82	2	113	68	87	93	44	66	26	84	83	29	8	14	46
Morris	143	83	69	287	230	816	50,675	16.10	16.63	27 70	16.42	7	16	...	7	11	5	29	6	53	52	60	85	43	54	27	127	61	20	6	10	51
Ocean	35	24	20	76	52	211	15,586	13 54	....	27.96	22.27	3	10	...	......	4	......	11	1	18	24	20	12	12	14	7	22	16	4	1	6	8
Passaic	341	286	150	540	296	1,731	83,374	20.76	11.80	42.00	22.41	11	30	...	17	11	20	115	5	179	139	119	210	176	101	65	124	76	29	5	15	71
Salem	77	30	32	78	115	340	25,373	13.40	12.64	31.47	19.71	1	10	...	.....	....	......	12	2	42	28	35	31	16	23	13	36	19	10	4	3	10
Somerset	63	41	46	111	169	436	27,425	15.90	....	23.85	19.95	3	5	...	23	9	1	17	2	27	20	45	43	16	30	24	56	31	11	1	3	20
Sussex	47	31	14	83	114	296	22,401	13.21	....	26.35	13.85	4	3	...	2	2	2	2	2	24	25	21	49	8	31	6	42	18	10	......	5	6
Union	278	172	123	336	267	1,190	61,839	19.24	14.63	37.82	24.45	20	17	...	16	10	5	93	3	127	84	92	121	99	87	44	84	44	31	10	15	59
Warren	90	72	59	150	166	546	37,737	14.47	13.18	29.67	19 41	3	6	1	24	8	4	19	3	38	45	31	49	48	38	18	51	34	15	5	7	27
*Totals	5819	3396	2130	7621	5167	24,331	1,278,033	19.04	15.15	38.00	23 81	217	522	5	255	296	181	1527	96	2694	1910	1743	2557	1886	1530	873	1966	1242	574	132	263	1051

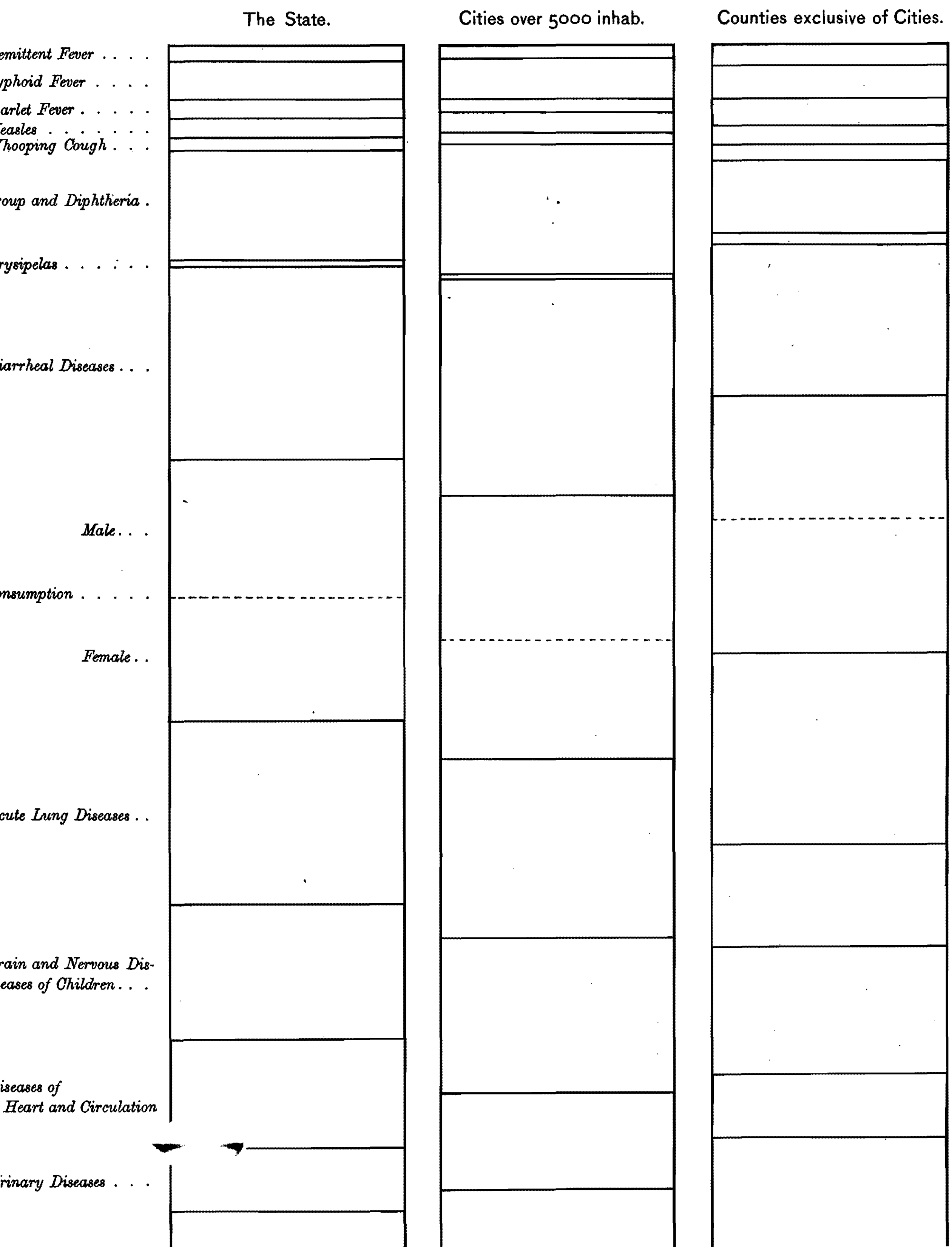
*Of those dying under one year, 1,714 died under one month, of which 1,162 died in the larger cities. Of those dying under one year, 4,121 died in the larger cities. Of the 9,245 that died under five years, 6,574 died in the larger cities. Total death-rate from Consumption for the State, as compared with total deaths, 15.01, the deaths being 2,361 in cities, and 1,292 outside. 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. The number of deaths before 20, in proportion to the rest, are much more informatory as to local causes affecting health than the total deaths. See, also, the number dying from the communicable diseases.

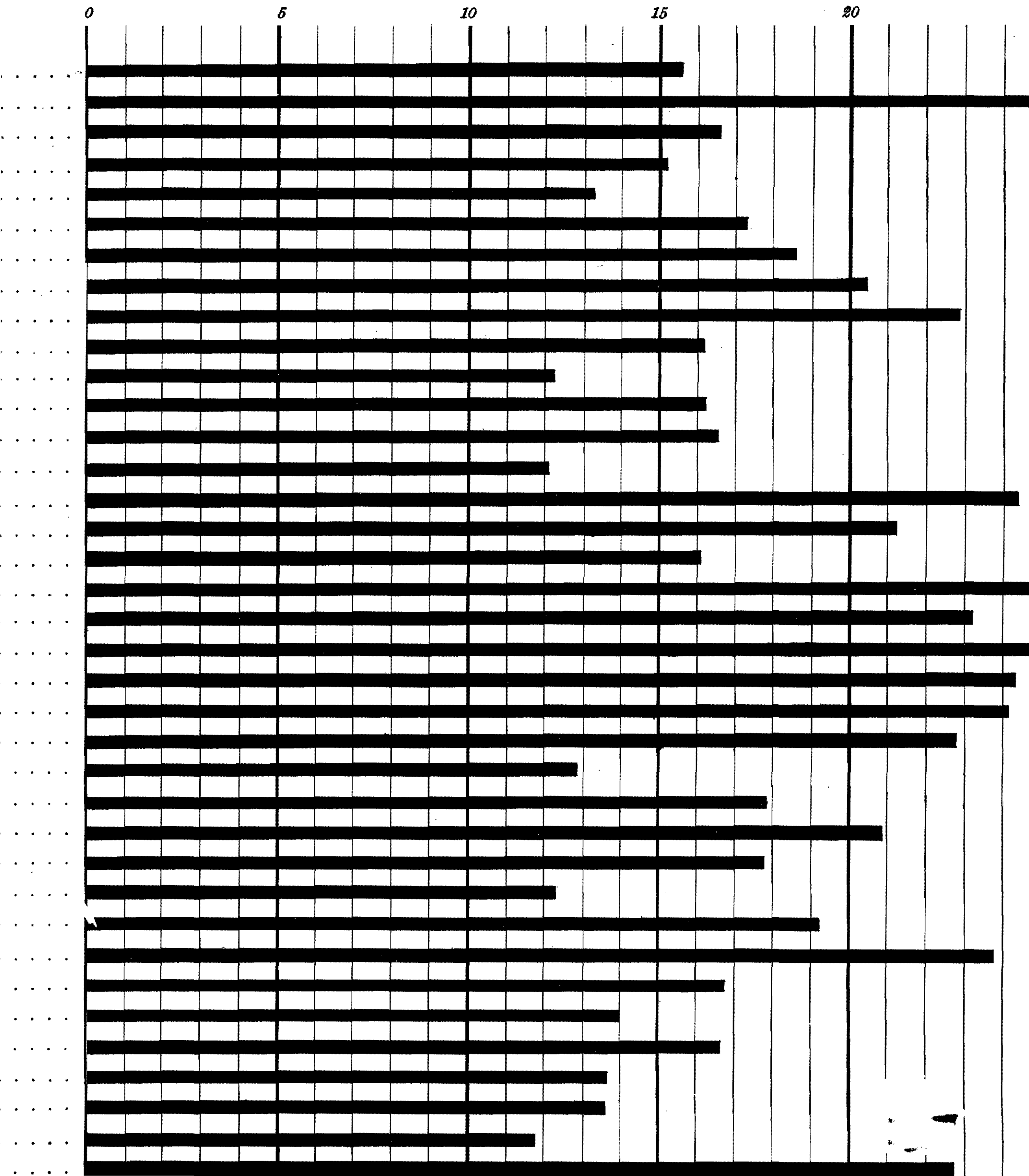
Return of Deaths from all Causes and Certain Specified Diseases, in the Cities of the State of New Jersey, of over 5,000 Population, for the Year ending June 30th, 1887.

CITIES HAVING OVER 5,000 POPULATION. 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 1885.	Death-rate per 1,000.	Deaths under five in each 100, or comparison of these with total deaths.	Comparative number of deaths in each 100 from chief preventable diseases.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhoeal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic County.																															
Atlantic City	77	20	16	68	33	216	7,942	27.20	44.91	22.69	......	2	...	2	1	2	4	...	38	22	16	7	15	20	10	16	6	2	1	3	13
Burlington County.																															
Bordentown	15	3	3	33	24	78	5,857	13.32	23.08	6.41	2	1	...	......	....	1	......	...	1	10	6	1	4	6	4	9	8	1	2	1	4
Burlington	27	22	13	36	34	133	7,690	17.30	36.84	32.33	1	2	...	......	1	......	23	...	16	12	5	10	3	10	5	10	5	5	1	1	5
Camden County.																															
Camden City	307	141	120	327	178	1079	52,884	20.40	41.52	25.67	11	50	...	10	10	8	58	...	130	66	94	109	92	51	38	80	48	16	3	8	52
Gloucester City	44	24	13	42	14	137	5,966	22.96	49.64	35.77	......	4	...	2	....	1	15	...	27	14	9	6	10	6	3	10	1	4	.....	1	5
Cumberland County.																															
Bridgeton	48	19	8	47	40	163	10,065	16.19	41.10	17.79	......	3	...	1	....	3	4	3	15	18	20	10	11	13	4	8	9	3	......	2	7
Millville	30	25	15	42	34	146	8,824	16.55	37.67	28.77	2	4	...	......	4	2	9	...	21	13	21	9	7	9	4	9	9	5	2	....	4
Essex County.																															
Newark	948	526	274	1334	645	3734	152,988	24.40	39.48	23.67	17	84	2	21	54	21	226	13	446	392	257	380	339	246	165	271	157	91	11	40	142
Orange	72	52	25	133	47	332	15,231	21.14	37.35	24.10	......	10	...	8	13	1	16	1	31	35	21	45	16	26	12	20	11	10	5	4	13
Hudson County.																															
Bayonne	89	82	31	83	17	303	13,080	23.16	56.44	32.67	4	2	...	3	4	2	45	1	38	14	11	54	33	8	4	10	8	5	2	1	21
Harrison	54	35	23	50	20	182	6,806	26.74	48.90	34.07	8	5	...	......	2	3	25	...	19	14	15	9	22	2	6	8	5	4	3	2	7
Hoboken	280	147	87	317	82	916	37,721	24.28	46.62	31.33	8	16	...	5	5	4	76	8	165	62	56	83	80	50	33	31	40	22	6	10	37
Jersey City	948	688	322	1264	449	3686	153,513	24.01	44.38	27.94	34	81	...	21	33	18	380	7	456	260	228	489	337	174	109	190	176	59	13	46	160
Town of Union	75	16	12	65	23	191	8,398	22.74	47.64	26.18	1	2	...	......	1	1	5	...	40	15	12	31	20	12	3	9	8	3	......	4	3
Mercer County.																															
Chambersburg	49	25	14	60	28	178	8,542	20.84	41.57	20.79	2	2	...	2	13	1	4	1	12	15	12	21	16	9	8	9	7	3	1	5	9
Trenton	165	98	46	177	118	612	34,386	17.80	42.97	25.93	2	17	...	6	32	7	31	4	60	51	34	74	42	32	23	47	25	15	4	9	15
Middlesex County.																															
New Brunswick	92	32	34	103	82	350	18,258	19.17	35.43	26.00	2	10	...	2	3	3	11	2	58	30	29	29	28	24	16	23	12	15	3	5	14
Perth Amboy	50	20	15	44	17	150	6,311	23.77	46.67	31.33	4	......	...	4	1	1	13	...	24	14	7	12	18	5	2	11	3	1	1	....	10
Monmouth County.																															
Long Branch	19	8	7	23	15	72	5,140	14.00	37.50	31.94	......	4	...	......	....	2	3	...	14	2	2	2	4	7	1	9	3	2	1	3	1
Morris County.																															
Morristown	23	11	8	46	29	119	8,760	13.58	28.57	23.53	3	3	...	......	...	1	3	...	18	14	10	9	5	2	1	14	14	3	1	1	3
Passaic County.																															
Passaic City	50	39	25	51	25	190	8,326	22.82	46.84	31.05	1	9	...	......	2	1	27	1	18	16	10	16	22	6	6	13	7	1	2	1	10
Paterson	358	231	111	445	240	1402	63,273	22.33	42.01	21.68	7	20	...	12	7	18	84	4	152	115	102	175	147	83	55	98	59	25	3	13	52
Salem County.																															
Salem City	22	9	5	22	31	89	5,516	16.13	34.83	13.48	......	2	...	......	....	......	......	...	10	10	8	7	3	5	5	8	8	5	......	1	4
Union County.																															
Elizabeth	187	107	77	197	147	717	32,119	22.32	41.00	26.22	9	7	...	2	2	2	80	3	83	45	55	68	72	43	21	44	32	17	3	6	40
Plainfield	38	30	14	36	25	153	8,913	17.17	44.44	30.72	4	2	...	11	3	......	2	...	25	8	7	18	11	12	9	9	6	3	4	1	5
Rahway	21	16	11	36	31	116	6,861	16.91	31.90	12.93	2	1	...	1	1	2	3	...	5	15	11	14	7	16	5	10	2	2	......	1	3
Warren County.																															
Phillipsburg	36	24	25	42	28	155	8,058	19.24	38.71	25.81	1	6	1	7	....	2	7	...	16	12	9	12	16	5	5	8	14	4	......	3	7
Totals	4124	2450	1354	5123	2456	15,597	701,428	22.24	42.46	25.88	125	349	3	120	192	107	1154	48	1938	1294	1067	1600	1380	882	557	984	683	326	72	172	646

Table showing the Percentage of the Total Mortality at each Age-Period in State of New Jersey. All Counties, Exclusive of Cities, and Certain Specified Cities, and all other Cities.

	The State.	Cities.	Counties, exclusive of Cities.	Newark.	Jersey City.	Paterson.	Camden.	All other Cities.
Under one year	24.04	19.75	26.44	25.39	25.72	25.53	28.45	27.44
One to five	13.96	10.83	15.71	14.09	18.66	16.48	13.07	15.17
Five to twenty	8.75	8.88	8.68	7.34	8.74	7.92	11.12	9.25
Twenty to sixty	31.33	28.64	32.84	35.73	34.29	31.74	30.30	30.78
Sixty and over	21.24	31.04	15.75	17.27	12.18	17.12	16.50	16.57
Unknown	.68	.86	.58	.18	.41	1.21	.56	.79
Totals	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00


The State.
Cities over 5000 inhab.
Counties exclusive of Cities.
emittent Fever
yphoid Fever
arlet Fever
easles
hooping Cough
oup and Diphtheria
rysipelas
iarrheal Diseases
Male
nsumption
Female
cute Lung Diseases
rain and Nervous Diseases of Children
iseases of Heart and Circulation
rinary Diseases


0
5
10
15
20

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, 1887.

ATLANTIC COUNTY. POPULATION, 22,356. Statistical Divisions.	DEATHS AT ALL AGES.								PRINCIPAL CAUSES OF DEATH.																					
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1885.	Death-rate per 1,000.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Absecon	7	......	1	3	5	16	567	......	......	1	......	......	......	......	......	......	4	2	1	1	......	3	......	......	......	......	......	......	1
*Atlantic City	77	20	16	68	33	214	7,942	27.20	......	3	......	2	1	2	4	......	38	22	16	7	15	20	10	16	6	2	1	3	13
Buena Vista	1	1	3	2	3	10	1,016	......	......	......	......	......	......	1	......	......	1	3	1	......	1	......	......	......	1	1	......	......	1
Egg Harbor City	4	2	1	9	4	20	1,317	......	......	1	......	......	2	......	......	1	2	4	1	1	1	1	......	1	3	......	......	......	......
Egg Harbor Township	16	5	4	17	20	62	3,919	......	1	......	......	......	1	......	3	......	6	5	4	6	1	6	1	7	4	3	......	......	5
Galloway	6	5	5	10	18	44	2,153	......	2	3	1	......	......	1	2	2	2	......	4	5	1	1	3	4	3	1	......	1	3
Hamilton	7	2	5	5	7	26	1,484	......	......	......	......	......	......	......	......	......	4	2	4	1	2	2	......	......	3	1	......	......	1
Hammonton	11	2	3	6	11	33	2,525	......	......	......	......	......	2	......	2	1	3	......	5	......	1	5	......	......	1	2	......	......	2
Mullica	......	......	......	2	6	8	807	......	......	......	......	......	......	......	......	......	......	......	2	......	......	1	......	......	2	1	......	......	......
Weymouth	4	......	......	1	4	9	626	......	......	......	......	......	......	......	......	......	1	......	2	1	1	......	1	1	......	......	......	......	......
Totals	133	37	38	123	111	442	22,356	15.30	3	8	1	2	6	4	11	4	61	38	40	22	23	39	15	29	23	11	1	4	26

* 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 record.

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, 1887.

BERGEN COUNTY. POPULATION, 39,880. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	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.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Englewood	16	17	16	25	13	89	4,429	......	1	2	......	16	......	1	1	......	10	4	7	9	6	9	2	6	4	2	1	2	3
Franklin	10	1	7	2	12	32	2,194	......	1	1	......	......	......	1	3	......	4	3	1	3	3	2	1	3	2	......	......	......	......
Harrington	6	5	3	12	17	33	2,604	......	3	......	......	......	......	......	1	1	2	2	2	5	2	4	1	3	2	......	......	1	2
Hohokus	5	5	2	13	17	42	2,898	......	1	2	......	......	......	......	......	......	1	3	2	5	5	4	2	5	1	1	......	1	5
Lodi	18	7	8	14	11	58	4,347	......	1	1	......	......	2	1	6	......	8	4	3	3	4	5	......	4	4	1	......	......	2
Midland	3	1	5	9	17	36	1,617	......	......	1	......	......	......	......	2	......	2	3	1	6	......	2	3	3	4	1	1	......	4
New Barbadoes	26	12	9	37	29	115	4,983	......	1	8	......	......	......	4	7	1	11	10	9	7	5	10	4	12	3	4	1	2	4
Orvil	2	......	1	5	9	17	......	......	......	......	......	......	......	......	......	......	......	2	1	5	1	3	......	2	1	......	......	......	2
Palisade	5	4	3	7	8	28	2,333	......	......	2	......	......	......	......	1	......	2	1	2	2	3	2	1	5	1	......	......	2	2
Ridgefield	12	10	7	19	13	61	4,487	......	1	1	......	4	......	1	3	......	7	5	5	3	6	3	2	2	1	......	2	......	8
Ridgewood	8	......	2	6	9	25	1,776	......	1	......	......	......	......	......	1	1	2	1	2	2	1	2	2	4	1	......	......	......	2
Saddle River	6	3	1	......	4	15	1,584	......	1	......	......	......	......	......	2	1	6	1	......	......	......	1	......	......	1	......	......	......	......
Union	16	6	2	29	11	66	3,914	......	......	......	......	1	1	......	2	......	4	7	4	8	6	4	5	5	7	1	1	......	2
Washington	7	6	4	11	17	46	2,714	......	3	2	......	......	1	......	1	......	5	2	2	3	3	2	2	6	3	1	1	......	6
Totals	140	77	70	189	187	663	39,880	16.62	14	20	......	21	4	8	30	4	64	48	41	61	45	53	25	60	35	11	7	8	42

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, 1887.

BURLINGTON COUNTY. POPULATION, 57,558. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	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.	Erysipelas.	Diarrhœal diseases.	Consumption—male	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bass River	4	1	2	3	3	13	905	......	......	......	......	......	......	......	......	......	2	1	1	1	......	1	2	1	1	......	......	......	1
Beverly	7	7	5	13	14	46	3,356	......	......	2	......	......	......	......	......	......	8	1	2	6	3	6	3	4	4	......	......	......	3
Bordentown	15	3	3	33	24	78	5,857	13.32	2	1	......	......	......	1	......	......	1	10	6	1	4	6	4	9	8	1	2	1	4
Burlington	27	22	13	36	34	133	7,690	17.30	1	2	......	......	1	......	23	......	16	12	5	10	3	10	5	10	5	5	1	1	5
Chester	7	5	7	15	19	53	3,071	......	......	1	......	......	......	......	1	1	4	......	4	6	4	4	1	8	5	2	......	2	1
Chesterfield	2	......	2	9	8	21	1,453	......	......	1	......	1	......	......	......	......	......	......	3	2	1	1	......	4	2	......	1	1	1
Cinnaminson	8	2	2	11	9	34	2,640	......	......	3	......	......	......	......	1	......	6	2	2	3	......	4	......	2	3	1	......	......	1
Delran	11	3	4	6	13	37	1,932	......	......	......	......	......	......	1	......	......	4	2	1	3	7	3	1	4	1	1	......	......	......
Eastampton	......	......	1	3	3	7	655	......	......	1	......	......	......	......	......	1	......	......	1	......	......	1	......	2	......	......	......	......	1
Evesham	5	6	1	10	6	28	1,556	......	1	2	......	......	......	......	3	......	4	6	1	2	2	......	......	1	2	......	......	......	1
Florence	8	3	1	5	12	29	1,582	......	......	......	......	......	......	......	3	......	1	1	2	5	3	......	3	4	3	......	1	......	......
Little Egg Harbor	2	1	5	5	9	22	1,885	......	......	......	......	......	1	......	......	......	2	......	4	2	1	3	......	5	1	......	......	......	2
Lumberton	3	1	......	......	1	5	1,735	......	......	......	......	......	......	......	1	......	1	......	......	......	......	......	......	1	......	......	......	......	......
Mansfield	3	2	1	8	10	24	1,715	......	......	4	......	......	......	1	......	......	3	2	1	2	1	1	1	3	4	......	1	......	......
Medford	5	4	7	6	15	37	2,064	......	......	......	......	......	......	3	2	......	1	1	1	8	5	3	1	5	2	......	1	......	2
Mount Laurel	4	1	......	......	8	13	1,781	......	......	1	......	......	......	......	......	......	3	......	......	2	1	1	......	1	1	2	......	......	......
New Hanover	9	2	1	7	17	36	2,235	......	......	2	......	......	......	5	......	......	2	1	3	4	......	2	......	8	2	2	......	......	......
Northampton	21	14	12	32	31	111	5,006	......	......	4	......	2	3	......	6	......	7	5	10	7	4	13	1	16	5	4	1	......	4
Pemberton	10	2	3	17	34	67	2,944	......	1	2	......	......	......	......	......	......	5	3	5	9	1	4	1	12	4	3	......	1	1
Randolph	......	......	1	......	2	3	365	......	......	......	......	......	......	......	......	1	......	......	......	1	......	......	......	......	1	......	......	......	......
Shamong	2	3	1	5	6	17	933	......	......	......	......	......	......	......	......	......	1	2	1	5	1	......	1	......	......	......	......	......	2
Southampton	4	1	......	9	2	16	2,263	......	1	1	......	......	......	1	......	1	......	1	2	......	......	2	1	......	1	1	......	......	......
Springfield	10	1	2	6	7	26	1,884	......	1	1	......	......	......	1	......	......	1	3	......	3	2	2	1	2	2	1	......	......	......
Washington	......	......	......	1	1	2	333	......	......	......	......	......	1	......	......	......	......	......	......	......	......	......	1	......	......	......	......	......	......
Westampton	3	......	1	3	2	9	688	......	......	......	......	......	......	......	......	......	1	......	2	1	1	......	......	3	......	......	......	......	1
Willingboro	......	2	1	1	5	9	725	......	......	......	......	......	......	......	......	1	1	......	......	......	......	2	1	1	......	1	......	......	......
Woodland	1	1	2	......	......	4	305	......	......	......	......	3	......	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......
Totals	171	87	78	243	295	880	57,558	15.29	7	28	......	6	6	13	40	5	75	53	57	83	44	69	28	106	57	24	8	6	30

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, 1887.

CAMDEN COUNTY. POPULATION, 76,685. 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 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Camden City	307	141	120	327	178	1,079	52,884	20.40	11	50	......	10	10	8	58	......	130	66	94	109	92	51	38	80	48	16	3	8	52
Centre	10	4	3	9	5	31	1,723	......	......	......	......	......	......	......	......	......	7	2	2	4	3	4	1	1	2	......	......	1	......
Delaware	4	1	3	4	4	16	1,572	......	......	1	......	......	......	......	2	......	2	1	2	1	1	1	1	4	......	......	......	......	......
Gloucester City	44	24	13	42	14	137	5,966	22.96	......	4	......	2	......	1	15	......	27	14	9	6	10	6	3	10	1	4	......	1	5
Gloucester	12	8	4	27	25	77	2,542	......	1	......	......	......	1	......	2	......	8	8	11	4	1	3	2	12	8	2	1	2	3
Haddon	9	7	5	16	20	57	3,270	......	1	3	......	1	1	......	3	......	3	2	3	8	5	3	4	5	9	1	......	......	1
Stockton	25	15	11	21	16	89	4,450	......	1	5	......	1	......	......	9	......	11	2	5	6	9	1	4	6	6	1	1	1	8
Waterford	13	2	......	7	9	31	2,098	......	......	1	......	......	......	......	1	......	5	3	2	1	3	2	......	4	......	1	1	......	1
Winslow	8	7	1	9	6	31	2,180	......	......	......	......	2	......	2	4	......	4	1	5	1	2	......	......	5	2	......	......	......	2
Totals	432	209	160	462	277	1,548	76,685	20.19	14	64	......	16	12	11	94	......	197	99	133	140	126	71	53	127	76	25	6	13	72

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, 1887.

CAPE MAY COUNTY. POPULATION, 10,744. 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 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Cape May City	8	4	4	14	13	44	1,610	....	......	......	......	1	......	2	3	......	3	1	1	2	1	3	2	10	1	1	......	......	5
Dennis	5	......	3	9	7	24	2,328	....	......	......	......	......	......	......	......	......	......	1	3	4	1	......	......	5	3	2	......	2	......
Lower	5	7	3	4	12	31	2,026	....	......	......	......	7	1	......	......	......	4	2	......	2	......	2	1	4	3	1	1	......	1
Middle	10	2	2	16	22	52	2,605	....	2	......	......	......	......	......	1	......	7	4	3	8	1	2	......	11	5	3	......	......	1
Upper	2	2	2	1	14	23	2,175	....	......	......	......	......	......	1	......	1	2	3	1	2	2	3	1	1	2	1	......	......	1
Totals	30	15	14	44	68	174	10,744	16.20	2	......	......	8	1	3	4	1	16	11	8	18	5	10	4	31	14	8	1	2	8

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, 1887.

CUMBERLAND COUNTY. Population, 41,982. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	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.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bridgeton	48	19	8	47	40	163	10,065	16.19	......	3	......	1	......	3	4	3	15	18	20	10	11	13	4	8	9	3	......	2	7
Commercial	4	......	1	5	3	13	2,541	....	......	1	......	......	......	......	......	......	1	2	2	1	1	3	1	......	......	......	......	......	......
Deerfield	2	......	1	2	6	11	1,632	....	......	......	......	......	......	......	......	1	......	1	1	4	......	......	2	1	......	1	......	......	......
Downe	6	......	3	6	3	18	1,860	....	......	1	......	......	......	......	......	......	5	......	1	3	......	1	1	1	1	1	2	......	......
Fairfield	2	2	......	5	2	11	1,612	....	......	1	......	......	......	......	......	......	2	3	1	1	......	......	......	1	......	1	......	......	......
Greenwich	6	3	2	7	8	26	1,267	....	......	......	......	......	......	......	......	......	5	2	1	2	1	3	2	3	2	1	......	1	1
Hopewell	3	2	3	5	7	20	1,794	....	......	1	......	......	......	......	2	......	......	1	1	2	1	1	......	2	1	......	......	......	1
Landis	32	8	8	38	28	115	7,021	....	1	1	......	2	......	1	5	......	10	9	6	6	11	12	6	7	8	4	2	2	3
Lawrence	5	3	1	11	9	29	1,728	....	......	......	......	......	......	......	1	......	2	1	7	4	2	......	......	5	3	......	1	......	......
Maurice River	10	4	2	3	14	33	2,562	....	......	......	......	1	......	......	......	1	4	3	1	5	2	4	......	3	1	1	......	......	1
Millville	30	25	15	42	34	146	8,821	16.55	2	4	......	......	4	2	9	......	21	13	21	9	7	9	4	9	9	5	2	......	4
Stoe Creek	......	1	2	3	......	6	1,073	....	......	......	......	......	......	......	1	......	......	2	1	......	1	......	1	......	......	......	......	......	......
Totals	148	67	46	174	154	591	41,982	14.08	3	12	......	4	4	6	22	5	65	55	63	47	37	46	21	40	34	17	7	5	17

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, 1887.

ESSEX COUNTY. POPULATION, 213,764. Statistical Divisions.	DEATHS AT ALL AGES.								PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1885.	Death-rate per 1,000.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Belleville	16	12	4	19	21	73	3,285	......	3	......	......	......	4	......	......	......	7	6	8	11	7	6	3	6	3	1	1	......	2
Bloomfield	22	14	14	28	21	99	6,502	......	......	......	......	10	......	......	4	......	4	5	6	4	11	9	8	10	7	4	1	1	3
Caldwell	5	3	1	5	14	28	3,336	......	......	2	......	......	......	......	1	......	2	1	......	3	1	5	3	1	3	1	......	1	1
Clinton	5	2	4	15	16	42	2,830	......	2	1	......	......	......	......	3	......	1	4	3	3	......	4	3	9	2	2	......	2	1
East Orange	30	15	15	34	31	126	10,328	......	1	3	......	3	3	1	14	......	13	9	6	15	8	10	4	9	4	6	1	1	......
Franklin	2	1	1	2	2	8	1,602	......	......	......	......	......	......	......	......	......	3	2	......	......	......	......	......	......	2	......	......	......	1
Livingston	2	3	3	2	10	20	1,275	......	......	......	......	......	......	1	......	......	2	1	3	2	2	......	1	4	2	......	......	......	......
Millburn	1	2	4	8	13	28	2,023	......	......	1	......	......	1	......	4	......	1	3	3	3	......	1	3	5	......	......	......	......	3
Montclair	13	9	5	12	6	45	6,327	......	1	......	......	......	......	......	8	......	5	2	......	5	7	3	4	2	3	3	......	......	......
Newark	948	526	274	1334	645	3734	152,988	21.40	17	84	2	21	54	21	226	13	446	392	257	380	339	246	165	271	157	91	11	40	142
Orange	72	52	25	133	47	332	15,231	21.14	......	10	......	8	13	1	16	1	31	35	21	45	16	26	12	20	11	10	5	4	13
South Orange	8	6	1	10	12	38	4,225	......	......	......	......	......	1	......	......	......	2	4	5	5	2	4	1	5	......	......	......	......	2
West Orange	8	4	3	14	13	42	3,812	......	......	......	......	......	2	......	1	......	4	5	3	4	2	1	3	2	3	7	......	1	2
Totals	1132	649	351	1616	851	4615	213,764	21.59	24	101	2	42	78	24	277	14	521	469	315	480	395	315	210	344	197	125	19	50	170

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, 1887.

GLOUCESTER COUNTY. POPULATION, 27,603. Statistical Divisions.	DEATHS AT ALL AGES.								PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1885.	Death-rate per 1,000.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhoeal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Clayton	8	9	8	11	9	45	2,399	......	......	1	......	1	......	......	4	......	5	3	5	1	5	1	1	3	5	1	......	......	3
Deptford	3	3	1	5	6	18	1,744	......	......	......	......	......	......	......	1	......	......	1	2	2	3	......	......	3	3	......	......	......	......
East Greenwich	9	3	......	10	15	37	1,233	......	......	......	......	......	......	2	1	1	3	2	2	2	3	5	1	4	2	......	1	......	2
Franklin	9	6	2	7	15	39	2,362	......	......	......	......	......	......	2	2	......	3	6	1	7	......	1	......	3	3	2	1	......	1
Glassboro	14	9	1	13	8	46	2,377	......	......	1	......	......	......	1	5	......	7	5	2	2	6	1	......	4	4	......	......	......	1
Greenwich	4	2	1	4	8	19	1,729	......	......	2	......	......	......	......	......	......	2	......	3	5	1	1	......	2	1	1	......	......	1
Harrison	4	3	......	7	16	30	1,637	......	......	1	......	......	......	......	1	......	5	1	2	2	......	4	2	5	2	1	......	......	2
Logan	1	1	......	7	6	15	1,653	......	......	......	......	......	......	......	......	......	......	......	2	1	......	2	......	1	3	3	......	1	......
Mantua	4	1	1	7	10	24	1,624	......	......	1	......	......	......	......	1	......	......	2	2	......	1	5	......	3	3	......	......	1	......
Monroe	10	7	3	7	7	34	1,950	......	......	1	......	......	......	......	......	......	4	2	4	2	4	1	1	1	3	4	......	......	1
South Harrison	......	1	......	5	2	8	1,091	......	......	1	......	......	......	......	......	......	......	1	2	1	1	......	......	1	1	......	......	......	......
Washington	5	2	......	3	6	16	1,265	......	......	......	......	......	......	......	......	1	1	1	......	2	1	1	1	2	1	2	......	......	......
West Deptford	6	3	......	7	6	23	1,305	......	......	1	......	1	......	......	2	......	3	2	2	......	2	1	1	1	1	......	......	......	2
Woodbury	14	4	1	18	13	50	3,278	......	......	......	......	......	......	......	1	1	6	5	5	4	4	3	2	8	2	......	......	......	4
Woolwich	8	3	4	9	15	39	2,046	......	......	......	......	......	1	......	3	......	3	2	2	8	......	6	1	3	2	3	......	......	1
Totals	99	57	22	120	142	443	27,603	16.05	......	9	......	2	1	5	21	3	42	33	36	39	31	32	10	44	36	17	2	2	18

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, 1887.

HUDSON COUNTY. POPULATION, 240,342. 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 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bayonne	89	82	31	83	17	303	13,080	23.16	4	2	......	3	4	2	45	1	38	14	11	54	33	8	4	10	8	5	2	1	21
Guttenberg	10	6	3	9	5	33	1,615	....	1	1	......	1	......	1	......	......	5	4	......	3	4	2	1	......	2	......	......	......	2
Harrison	54	35	23	50	20	182	6,806	26.74	8	5	......	......	2	3	25	......	19	14	15	9	22	2	6	8	5	4	3	2	7
Hoboken	280	147	87	317	82	916	37,721	24.28	8	16	......	5	5	4	76	8	165	62	56	83	80	50	33	31	40	22	6	10	37
Jersey City	948	688	322	1264	449	3,686	153,513	24.01	34	81	......	21	33	18	380	7	456	260	228	489	337	174	109	190	176	59	13	36	160
Kearny	20	4	8	28	9	70	3,338	....	4	1	......	......	2	......	2	......	8	5	6	13	3	2	......	6	2	......	......	2	7
North Bergen	33	25	14	81	48	201	5,459	....	2	3	1	......	......	1	5	2	16	18	14	16	13	15	15	26	14	5	......	2	6
Town of Union	75	16	12	65	23	191	8,398	22.74	1	2	......	......	1	1	5	......	40	15	12	31	20	12	3	9	8	3	......	4	3
Union	7	6	6	11	2	32	1,781	....	......	2	......	......	1	......	2	......	4	3	3	3	5	3	......	2	......	2	......	......	1
Weehawken	14	6	6	13	4	44	1,469	....	......	2	......	......	1	......	1	......	2	2	5	3	9	1	1	5	......	1	......	......	5
West Hoboken	42	25	9	38	27	141	7,162	....	1	3	......	......	3	1	6	4	28	11	7	15	17	13	5	7	5	3	......	......	1
Totals	1572	1040	521	1959	686	5,799	240,342	24.13	63	118	1	30	52	31	547	22	731	408	357	719	543	282	177	294	260	104	24	57	250

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, 1887.

HUNTERDON COUNTY. POPULATION, 37,420. 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 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Alexandria	2	....	.....	4	7	13	1,235	....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	1	3	1	2	2	.....	.....	.....	1
Bethlehem	9	9	3	12	10	43	2,780	....	.....	1	.....	1	2	.....	5	.....	4	4	3	2	2	2	.....	9	1	2	.....	1	1
Clinton	5	3	2	8	9	28	2,900	....	1	.....	.....	2	.....	.....	2	.....	3	4	2	1	1	4	.....	3	1	.....	.....	1	1
Delaware	4	1	.....	6	17	28	3,092	....	.....	.....	.....	.....	.....	.....	.....	.....	2	2	3	2	.....	3	1	5	1	.....	1	2	.....
East Amwell	2	.....	.....	8	15	25	1,549	....	1	1	.....	.....	.....	.....	.....	.....	.....	2	1	1	.....	2	4	8	2	.....	.....	.....	.....
Franklin	2	.....	1	2	3	9	1,387	....	.....	1	.....	.....	.....	.....	.....	.....	2	1	.....	.....	.....	.....	.....	2	1	.....	.....	.....	.....
Frenchtown	1	1	.....	4	9	15	1,066	....	.....	.....	.....	.....	.....	.....	1	.....	1	1	1	4	.....	.....	.....	3	1	.....	1	.....	.....
High Bridge	3	2	1	3	5	14	2,024	....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	1	4	.....	2	.....	2	.....	.....	1
Holland	2	3	1	6	7	20	1,867	....	.....	.....	.....	1	.....	.....	1	.....	1	2	1	3	.....	.....	2	3	3	.....	.....	1	.....
Kingwood	4	.....	1	5	14	24	1,482	....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	2	1	.....	3	1	2	3	3	.....	1	3
Lambertville	12	5	5	19	21	63	4,067	....	2	1	.....	.....	.....	.....	3	.....	4	7	6	7	6	2	2	8	5	3	.....	.....	3
Lebanon	9	11	9	10	13	52	2,816	....	1	1	.....	8	2	.....	5	.....	4	2	4	4	1	5	3	4	1	1	.....	.....	3
Raritan	10	2	5	16	24	57	3,978	....	.....	.....	.....	1	2	.....	.....	.....	7	5	8	3	1	5	1	9	3	3	.....	.....	4
Readington	7	2	2	9	18	38	2,940	....	1	1	.....	1	.....	.....	1	.....	1	2	3	3	1	4	1	9	4	1	.....	.....	1
Tewksbury	5	.....	2	2	7	16	2,081	....	.....	.....	.....	.....	.....	.....	.....	.....	2	1	1	2	1	2	1	2	1	1	.....	1	1
Union	2	1	2	4	7	16	1,195	....	.....	.....	.....	.....	.....	.....	.....	.....	1	2	3	.....	2	2	1	.....	2	1	.....	.....	1
West Amwell	3	.....	1	7	9	20	960	....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	2	2	1	4	.....	2	1	2	1	1	.....
Totals	82	40	35	125	195	481	37,420	12.85	6	7	.....	14	6	.....	19	.....	36	36	40	36	18	45	18	73	32	19	3	8	20

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, 1887.

MERCER COUNTY. POPULATION, 66,785. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	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.	Erysipelas.	Diarrhoeal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Chambersburg	49	25	14	60	28	178	8,542	20.84	2	2	......	2	13	1	4	1	12	15	12	21	16	9	8	9	7	3	1	5	9
East Windsor	5	7	1	14	10	39	2,568	......	......	......	......	......	1	......	1	2	2	3	3	4	5	2	1	5	3	3	......	1	......
Ewing	9	1	7	37	26	81	2,489	......	......	......	......	2	......	......	......	2	4	6	7	2	1	3	2	32	3	1	......	1	7
Hamilton	11	7	7	16	21	62	3,420	......	3	1	......	......	1	......	1	......	4	3	5	5	3	5	1	5	5	3	......	1	8
Hopewell	7	1	5	18	29	60	4,367	......	......	2	......	1	......	......	......	......	2	5	6	11	2	4	1	11	5	1	......	1	3
Lawrence	3	2	1	10	11	27	1,589	......	1	......	......	1	......	......	......	......	......	......	2	1	2	2	......	10	......	1	1	......	4
Millham	23	11	3	15	5	57	2,338	......	......	1	......	......	6	1	......	......	7	3	1	9	9	5	2	1	2	1	......	....	3
Princeton	8	7	9	17	25	66	4,577	......	......	1	......	......	1	......	4	......	6	8	4	6	3	5	5	2	7	2	1	1	1
Trenton	165	98	46	177	118	612	34,386	17.80	2	17	......	6	32	7	31	4	60	51	34	74	42	32	23	47	25	15	4	9	15
Washington	3	....	....	4	7	14	1,196	......	......	......	......	......	......	......	......	......	2	3	1	......	......	......	1	2	......	3	1	......	......
West Windsor	1	3	1	2	12	19	1,313	......	......	......	......	......	......	......	......	......	1	2	2	4	......	4	......	1	1	1	......	......	1
Totals	284	162	94	370	292	1,215	66,785	18.19	8	24	......	12	54	9	41	9	100	99	77	137	83	71	44	125	58	34	8	19	51

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, 1887.

MIDDLESEX COUNTY. Population, 56,180. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	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.	Erysipelas.	Diarrhoeal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Cranbury	2	......	......	8	14	25	1,569	....	2	......	......	......	......	......	......	......	1	6	......	3	......	1	2	2	5	......	......	......	2
East Brunswick	5	3	3	12	16	40	3,697	....	1	5	......	......	......	......	1	......	3	2	3	5	2	4	3	4	3	......	......	......	......
Madison	......	3	2	4	4	13	1,519	....	......	......	......	......	......	......	......	......	2	1	4	2	......	......	1	......	1	......	......	......	......
Monroe	6	7	4	5	11	33	3,199	....	......	......	......	......	......	1	3	......	3	3	4	3	3	2	1	3	1	1	......	......	2
New Brunswick	92	32	34	103	82	350	18,258	19.17	2	10	......	2	3	3	11	2	58	30	29	29	28	24	16	23	12	15	3	5	14
North Brunswick	2	......	2	6	8	20	1,272	....	......	......	......	......	......	......	......	......	......	3	1	2	......	......	1	2	2	1	......	2	2
Perth Amboy	50	20	15	44	17	150	6,311	23.77	4	......	......	4	1	1	13	......	24	14	7	12	18	5	2	11	3	1	1	......	10
Piscataway	8	6	3	6	11	34	3,155	....	......	......	......	......	1	1	......	......	4	3	......	4	3	1	4	2	3	......	1	......	1
Raritan	6	3	6	15	14	45	3,656	....	......	1	......	......	2	......	2	......	2	1	3	2	2	4	6	6	1	......	1	2	5
Sayreville	5	3	......	2	2	12	2,549	....	1	......	......	1	......	......	2	......	1	......	......	1	3	......	......	......	......	......	......	......	1
South Amboy	23	9	2	16	10	60	4 054	....	......	......	......	......	2	......	4	......	9	3	5	5	8	2	1	6	4	1	......	1	2
South Brunswick	4	2	1	11	19	37	2,714	....	1	......	......	......	......	......	......	1	3	3	4	5	2	4	1	2	1	1	......	1	2
Woodbridge	13	10	7	18	22	70	4,227	....	......	......	......	......	......	4	5	......	5	7	6	9	5	6	......	6	2	......	......	......	8
Totals	216	98	79	250	230	889	56,180	15.82	11	16	......	7	9	10	41	3	115	76	66	82	74	53	38	67	38	20	6	11	49

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, 1887.

MONMOUTH COUNTY. Population, 62,324. 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 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic	4	1	1	6	7	19	1,656	.....	1	.....	.....	1	.....	.....	1	.....	.....	3	2	1	1	2	.....	1	2	1	.....	.....	.....
Eatontown	10	3	5	4	13	35	2,812	.....	.....	.....	.....	.....	.....	.....	3	.....	2	5	2	8	1	2	1	2	2	.....	.....	1	.....
Freehold	26	11	5	15	27	86	4,494	.....	3	1	.....	.....	.....	8	6	.....	8	5	3	9	4	5	2	7	5	2	1	1	1
Holmdel	2	.....	2	5	6	15	1,640	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	2	3	3	1	1	.....	.....	1	.....	.....	.....	2
Howell	6	4	3	15	14	42	3,308	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	7	2	3	3	3	2	5	7	1	.....	1	.....
Long Branch	19	8	7	23	15	72	5,140	14.00	.....	4	.....	.....	.....	2	3	.....	14	2	2	2	4	7	1	9	3	2	1	3	1
Manalapan	6	1	.....	7	13	27	2,143	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	3	.....	4	.....	2	.....	4	4	1	.....	.....	2
Marlboro	4	5	5	9	12	35	2,089	.....	1	.....	.....	.....	.....	1	6	.....	2	6	3	1	1	2	.....	2	7	.....	.....	.....	1
Matawan	18	14	7	17	15	71	2,756	.....	1	.....	.....	.....	1	.....	5	2	12	3	7	5	3	5	4	3	10	2	.....	1	.....
Middletown	15	9	11	22	23	81	5,802	.....	.....	3	.....	.....	.....	.....	5	.....	6	7	7	15	4	7	1	8	2	3	1	.....	1
Millstone	10	4	4	4	5	28	1,917	.....	1	.....	.....	.....	.....	4	3	.....	3	.....	3	2	2	2	1	.....	2	.....	.....	.....	1
Neptune	23	16	17	42	23	122	6,421	.....	1	1	.....	.....	3	.....	17	.....	14	5	11	6	5	4	3	14	12	7	3	1	5
Ocean	12	5	7	16	9	49	2,400	.....	.....	.....	.....	1	.....	.....	5	.....	2	.....	7	5	.....	3	2	4	.....	1	.....	.....	12
Raritan	25	7	4	25	14	75	4,238	.....	.....	3	.....	.....	.....	.....	3	.....	14	5	7	9	6	1	1	5	3	4	.....	1	3
Shrewsbury	28	18	16	43	31	136	7,558	.....	1	3	.....	.....	2	.....	19	.....	15	8	17	8	4	6	2	10	9	3	.....	2	9
Upper Freehold	10	5	6	16	20	57	3,130	.....	.....	2	.....	.....	2	2	.....	.....	6	4	4	6	1	5	3	4	8	2	.....	2	2
Wall	18	8	6	19	23	75	4,820	.....	1	1	.....	.....	.....	1	5	.....	9	3	7	6	4	9	3	6	6	.....	2	1	6
Totals	236	119	106	288	270	1,025	62,324	16.45	10	18	.....	2	8	20	82	2	113	68	87	93	44	66	26	84	83	29	8	14	46

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, 1887.

MORRIS COUNTY. Population, 50,675. Statistical Divisions.	DEATHS AT ALL AGES.								PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1885.	Death-rate per 1,000.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Boonton	6	3	4	26	19	59	2,732	......	2	1	......	3	......	......	......	......	3	4	6	4	......	2	2	10	8	3	1	2	5
Chatham	13	6	8	20	18	65	4,291	......	......	3	......	......	......	1	3	......	6	8	4	5	4	7	3	5	1	4	2	......	1
Chester	7	6	5	4	8	30	2,510	......	......	......	......	......	2	1	3	......	1	3	2	8	2	2	1	2	1	......	......	1	......
Hanover	8	7	5	58	46	124	4,459	......	......	1	......	1	......	......	3	......	1	3	7	7	6	6	7	61	6	4	......	......	......
Jefferson	3	5	3	9	7	27	1,559	......	......	1	......	......	......	......	......	......	2	1	2	10	......	3	2	3	2	......	......	......	1
Mendham	3	......	1	6	14	21	1,431	......	......	......	......	......	......	......	......	......	......	1	5	3	......	5	......	......	3	2	......	......	......
Montville	3	......	......	2	6	11	1,225	......	......	......	......	......	......	......	......	......	......	......	......	......	1	1	1	2	2	2	......	......	......
Morristown	23	11	8	46	29	119	8,760	13.58	3	3	......	......	......	1	3	......	18	14	10	9	5	2	1	14	14	3	1	1	3
Mount Olive	3	1	1	6	5	16	2,005	......	......	1	......	......	......	......	1	......	1	1	1	......	......	1	......	1	1	......	......	1	2
Passaic	3	2	5	5	10	25	1,716	......	......	2	......	......	......	......	......	......	3	4	1	3	2	2	2	3	1	......	......	......	......
Pequannock	6	3	3	5	9	26	2,625	......	......	......	......	......	......	......	3	......	1	1	2	......	6	1	2	4	1	......	......	......	2
Randolph	30	11	8	31	25	106	7,045	......	1	1	......	......	1	1	6	2	6	1	5	18	8	12	3	10	8	1	2	......	4
Rockaway	23	20	8	38	18	107	5,573	......	1	2	......	2	6	1	2	3	9	8	12	12	5	3	2	6	10	1	......	4	10
Roxbury	7	5	9	26	10	57	2,184	......	......	......	......	1	2	......	4	1	......	1	3	3	3	4	1	5	2	......	......	......	22
Washington	5	3	1	5	6	20	2,560	......	......	1	......	......	......	......	1	......	2	2	......	3	1	3	......	1	1	......	......	1	1
Totals	143	83	69	287	230	816	50,675	16.10	7	16	......	7	11	5	29	6	53	52	60	85	43	54	27	127	61	20	6	10	51

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, 1887.

OCEAN COUNTY. Population, 15,586. Statistical Divisions.	DEATHS AT ALL AGES.								PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	One to five.	Five to twenty	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1885.	Death-rate per 1,000.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Berkeley	4	......	......	4	2	10	714	......	......	1	......	......	......	......	......	......	2	2	......	......	1	2	......	1	......	......	......	......	......
Brick	9	5	5	19	16	57	3,974	......	1	4	......	......	......	......	2	......	4	5	4	4	2	6	1	7	6	......	1	3	3
Dover	6	4	5	16	5	36	2,594	......	......	5	......	......	......	......	1	......	3	5	3	2	3	1	1	3	2	1	......	1	......
Eagleswood	1	......	......	3	5	9	681	......	......	......	......	......	......	......	......	......	......	2	......	1	......	......	2	2	......	......	......	......	1
Jackson	3	4	2	6	5	20	1,763	......	1	......	......	......	......	......	......	1	4	2	1	3	......	......	......	2	4	1	......	......	......
Lacey	......	3	4	4	1	12	746	......	......	......	......	......	4	......	......	......	......	1	......	......	2	......	1	......	1	......	......	1	1
Manchester	4	7	1	4	2	19	1,098	......	......	......	......	......	......	......	7	......	2	1	2	1	2	1	......	1	......	......	......	......	1
Ocean	2	......	2	3	2	9	541	......	......	......	......	......	......	......	......	......	......	2	......	......	1	1	1	......	1	......	......	......	1
Plumstead	5	......	......	9	9	23	1,546	......	1	......	......	......	......	......	1	......	2	2	5	1	1	2	1	3	......	2	......	1	......
Stafford	......	......	1	2	2	5	1,026	......	......	......	......	......	......	......	......	......	......	1	2	......	......	......	......	2	......	......	......	......	......
Union	1	1	......	6	3	11	1,083	......	......	......	......	......	......	......	......	......	1	1	3	......	......	1	......	1	2	......	......	......	1
Totals	35	24	20	76	52	211	15,586	13.54	3	10	......	......	4	......	11	1	18	24	20	12	12	14	7	22	16	4	1	6	8

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, 1887.

PASSAIC COUNTY. POPULATION, 83,374. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	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.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Acquackanonk	3	2	3	7	2	17	2,038	......	......	......	......	......	......	......	3	......	1	2	1	2	......	1	......	......	3	......	......	1	1
Little Falls	9	4	1	13	2	29	1,701	......	2	......	......	1	2	......	......	......	4	1	1	3	......	2	......	3	3	......	......	......	......
Mauchester	6	......	1	2	7	16	1,639	......	......	......	......	......	......	......	......	......	......	......	......	2	1	3	2	......	1	3	......	......	......
Passaic City	50	39	25	51	35	190	8,326	22.82	1	9	......	......	2	1	27	1	18	16	10	16	22	6	6	13	7	1	2	1	10
Paterson	358	231	111	445	240	1,402	63,273	22.33	7	20	......	12	7	18	84	4	152	115	102	175	147	83	55	98	59	25	3	13	52
Pompton	8	3	4	10	6	32	2,109	......	1	......	......	4	......	......	1	......	2	3	2	5	1	4	......	3	2	......	......	......	2
Wayne	2	3	2	7	2	16	1,866	......	......	......	......	......	......	......	......	......	2	......	1	2	4	......	......	2	1	......	......	......	4
West Milford	5	4	3	5	12	29	2,422	......	......	1	......	......	......	1	......	......	......	2	2	5	1	2	2	5	......	......	......	......	2
Totals	441	286	150	540	296	1,731	83,374	20.76	11	30	......	17	11	20	115	5	179	139	119	210	176	101	65	124	76	29	5	15	71

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, 1887.

SALEM COUNTY. Population, 25,373. 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 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Alloway	6	....	1	5	9	21	1,749	....	....	....	....	....	....	....	2	....	2	....	1	2	1	2	1	1	3	2	1	....	1
Elsinboro	2	....	1	....	1	5	571	....	....	....	....	....	....	....	....	....	....	....	1	....	1	1	....	1	....	....	....	....	....
Lower Alloways Creek	3	....	2	4	5	14	1,365	....	....	1	....	....	....	....	....	1	1	....	....	2	....	1	....	1	1	....	1	....	2
Lower Penns Neck	4	1	5	....	3	13	1,408	....	....	....	....	....	....	....	4	....	1	....	....	4	1	....	....	....	1	....	....	....	....
Mannington	6	5	4	9	7	33	2,161	....	....	2	....	....	....	....	1	....	6	2	4	5	2	2	2	5	....	....	....	....	....
Oldmans	....	1	4	3	2	10	1,463	....	....	1	....	....	....	....	1	....	1	1	3	1	....	....	....	....	1	....	1	....	....
Pilesgrove	15	8	3	12	27	67	3,397	....	1	1	....	....	....	....	....	1	11	8	8	5	3	4	....	11	1	2	1	....	....
Pittsgrove	4	2	1	5	14	27	2,135	....	....	1	....	....	....	....	....	....	2	1	3	2	1	2	3	2	2	....	....	....	1
Quinton	5	1	....	3	....	9	1,460	....	....	....	....	....	....	....	....	....	5	1	1	....	....	1	....	1	....	....	....	....	....
Salem City	22	9	5	22	31	89	5,516	16.13	....	2	....	....	....	....	....	....	10	10	8	7	3	5	5	8	8	5	....	1	4
Upper Penns Neck	6	2	3	8	10	31	2,216	....	....	2	....	....	....	....	4	....	2	2	4	2	2	4	1	2	2	1	....	....	1
Upper Pittsgrove	4	1	3	7	6	21	1,932	....	....	....	....	....	....	....	....	....	1	3	2	1	2	1	1	4	....	....	....	2	1
Totals	77	30	32	78	115	340	25,373	13.40	1	10	....	....	....	....	12	2	42	28	35	31	16	23	13	36	19	10	4	3	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, 1887.

SOMERSET COUNTY. Population, 27,425. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	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.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bedminster	1	2	4	8	11	26	1,769	......	......	......	......	1	1	......	......	......	4	1	3	3	1	......	1	3	5	......	......	......	1
Bernards	1	3	6	14	15	40	2,504	......	......	......	......	......	......	......	......	......	......	1	7	8	2	1	4	7	4	1	......	2	1
Branchburg	......	......	3	3	13	19	1,177	......	......	......	......	......	2	......	......	......	......	......	......	1	1	1	3	5	1	......	......	......	3
Bridgewater	28	27	20	37	45	159	8,454	......	1	2	......	22	3	1	15	......	10	7	11	8	7	9	8	19	10	5	......	1	4
Franklin	10	1	4	13	24	52	3,720	......	1	......	......	......	......	......	1	......	3	1	7	5	......	4	4	5	2	1	......	......	6
Hillsborough	5	4	4	11	20	45	3,151	......	1	1	......	......	2	......	......	1	5	2	3	6	2	2	2	4	2	2	......	......	4
Montgomery	3	......	1	7	18	29	1,800	......	......	......	......	......	......	......	......	......	......	3	4	3	1	4	......	6	2	1	......	......	1
North Plainfield	10	2	4	14	17	48	3,728	......	......	2	......	......	1	......	......	1	4	4	6	5	......	6	2	7	5	......	1	......	......
Warren	5	2	......	4	6	18	1,122	......	......	......	......	......	......	......	1	......	1	1	4	4	2	3	......	......	......	1	......	......	......
Totals	63	41	46	111	169	436	27,425	15.90	3	5	......	23	9	1	17	2	27	20	45	43	16	30	24	56	31	11	1	3	20

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, 1887.

SUSSEX COUNTY. POPULATION, 22,401. Statistical Divisions.	DEATHS AT ALL AGES.								PRINCIPAL CAUSES OF DEATH.																				
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including undefined.	Population, census of 1885.	Death-rate per 1,000.	Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Andover	1	1	3	6	8	19	1,014	......	......	......	......	......	......	......	......	......	......	3	2	2	1	5	......	2	2	1	......	......	......
Byram	3	3	1	3	1	11	1,242	......	......	......	......	......	1	......	......	......	1	1	1	2	......	2	......	......	......	......	......	......	1
Frankford	6	2	......	7	9	26	1,495	......	......	......	......	......	......	......	......	......	4	......	4	2	2	4	......	3	2	1	......	......	......
Greene	2	2	......	4	3	11	704	......	......	......	......	......	......	......	......	......	2	2	......	1	1	......	......	3	1	......	......	1	......
Hampton	2	1	2	7	2	15	938	......	......	1	......	......	......	......	......	1	1	1	2	......	1	1	......	2	1	......	......	1	......
Hardyston	7	6	3	5	9	31	2,500	......	3	......	......	2	......	1	......	......	2	2	1	6	......	1	......	3	2	2	......	......	2
Lafayette	2	1	1	5	7	16	816	......	......	......	......	......	......	......	......	......	......	1	2	3	......	3	1	2	......	......	......	......	......
Montague	3	......	1	5	6	15	900	......	......	......	......	......	......	......	1	......	1	......	3	......	......	1	2	2	1	......	......	......	......
Newton	4	3	1	8	6	22	2,648	......	......	1	......	......	1	......	1	......	5	3	2	1	1	1	......	3	......	2	......	......	1
Sandyston	3	3	......	3	11	21	1,092	......	......	......	......	......	......	......	......	......	1	3	1	6	......	1	1	3	2	2	......	......	......
Sparta	1	2	1	6	9	19	1,901	......	......	......	......	......	......	......	......	......	2	1	2	4	......	3	......	4	1	......	......	......	1
Stillwater	4	......	......	4	11	19	1,366	......	......	......	......	......	......	......	......	1	......	1	......	6	1	1	......	2	3	1	......	1	......
Vernon	2	2	1	4	6	15	1,855	......	......	......	......	......	......	......	......	......	2	4	......	4	......	1	1	2	......	......	......	......	......
Walpack	......	1	......	1	2	4	553	......	......	......	......	......	......	......	......	......	......	......	......	2	......	1	......	......	......	......	......	......	......
Wantage	7	4	......	15	24	52	3,377	......	1	1	......	......	......	1	......	......	3	3	1	10	1	6	1	11	3	1	......	2	1
Totals	47	31	14	83	114	296	22,401	13.21	4	3	......	2	2	2	2	2	24	25	21	49	8	31	6	42	18	10	......	5	6

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, 1887.

UNION COUNTY. POPULATION, 61,839. 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 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhoeal diseases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Clark	2	1	......	2	1	6	363	....	......	......	......	......	......	......	......	......	......	......	1	......	1	......	1	......	1	......	......	......	1
Cranford	......	......	......	1	1	2	1,251	....	......	......	......	......	......	......	......	......	......	......	......	1	......	......	......	1	......	......	......	......	......
Elizabeth	187	107	77	197	147	717	32,119	22.32	9	7	......	2	2	2	80	3	83	45	55	68	72	43	21	44	32	17	3	6	40
Fanwood	4	1	......	3	4	12	1,210	....	1	......	......	......	......	......	......	......	1	1	......	1	......	1	......	2	......	......	......	......	2
Linden	4	2	1	11	13	31	1,971	....	1	1	......	......	......	......	2	......	2	1	4	5	1	4	1	2	......	1	......	1	3
New Providence	1	2	3	1	4	11	824	....	......	......	......	2	......	......	1	......	1	......	1	1	1	1	......	1	......	1	......	......	......
Plainfield	38	30	14	36	25	153	8,913	17.17	4	2	......	11	3	......	2	......	25	8	7	18	11	12	9	9	6	3	4	1	5
Rahway	21	16	11	36	31	116	6,861	16.91	2	1	......	1	1	2	3	......	5	15	11	14	7	16	5	10	2	2	......	1	3
Springfield	3	4	4	5	5	21	847	....	......	1	......	......	1	1	......	......	2	......	3	1	1	......	1	3	1	3	2	......	1
Summit	6	3	3	16	15	43	2,539	....	2	......	......	......	......	......	1	......	1	7	4	8	3	4	2	3	1	......	......	1	1
Union	4	1	3	8	12	28	2,589	....	1	1	......	......	1	......	2	......	3	2	1	1	......	3	1	4	1	......	......	2	2
Westfield	8	5	7	20	9	50	2,352	....	......	4	......	......	2	......	2	......	4	5	5	3	2	3	3	5	......	4	1	3	1
Totals	278	172	123	336	267	1,190	61,839	19.24	20	17	......	16	10	5	93	3	127	84	92	121	99	87	44	84	44	31	10	15	59

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, 1887.

WARREN COUNTY. Population, 37,737. 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 1885.	Death-rate per 1,000.	PRINCIPAL CAUSES OF DEATH. Remittent fever, &c.	Typhoid fever.	Small-pox.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal diseases.	Consumption—male	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation.	Urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Allamuchy			1		2	5	787								3					1			1						
Belvidere		4	2	4	10	22	1,814		1			1		1	3			1	1	6		2		1		3			
Blairstown	3	2	3	6	7	21	1,590							1				3	2	2	3	1		4	1	1			
Franklin	2	5	2	6	5	20	1,382					1	1		1		4	1	1		2		1	3	1			1	3
Frelinghuysen				4	3	7	964												1			3			1	1			1
Greenwich	1	2	2	3	7	15	920					1				1	1	1		2	1	2		4	1				1
Hackettstown	3	2		10	14	29	2,645										1	3	4	2	2	4	1	3	2		1	1	2
Hardwick		1		2	5	8	520								1			2			2		1						
Harmony	2	1	4	7	4	18	1,256						1				2	3	2	2	3		2	1	1				1
Hope	2	4		7	6	20	1,548								1	1	3	1	1	5				3					1
Independence			1	3	4	8	1,134											1	1	1		2		2	1				
Knowlton	4	1		7	9	21	1,456						1				1	3	1	3	1	2		2	1	2			
Lopatcong	5	6	2	8	9	30	1,725					1	1		1		2	5	2	3	2	2		3	1		1	1	2
Mansfield	5	3	3	5	12	28	1,600					6					1		1		1	5	1	5	2				1
Oxford	16	10	7	19	15	71	4,382		1			4	2		2	1	4	7	2	5	8	7	3	5	4	1			4
Pahaquarry			1	1		2	351					1											1						
Phillipsburg	36	24	25	42	28	155	8,058	19.24	1	6	1	7		2	7		16	12	9	12	16	5	5	8	14	4		3	7
Pohatcong	3	4	2	7	10	26	1,567					1	2				1		1	2	2	1		2	3	2	2	1	3
Washington	8	3	4	9	16	40	4,038					1					2	2	2	3	5	2	2	5	1	1	1		1
Totals	90	72	59	150	166	546	37,737	14.47	3	6	1	24	8	4	19	3	38	45	31	49	48	38	18	51	34	15	5	7	27

SYNOPSIS OF VITAL RETURNS AND COMMENTS ON SPECIAL DISEASES.

The records for the statistical year ending June 30th, 1887, as shown by the accompanying tables, give an aggregate of 15,416 marriages, 27,340 births and 24,331 deaths, of which number as to marriages 4,332 are recognized as relating to couples who came to this State to be married.

The following outline presents the comparative numbers for several years:

Average for five years ending June 30th, 1883:

Marriages	8,539
Births	24,281
Deaths	21,981

Number in the year ending June 30th, 1884:

Marriages	8,968
Births	25,263
Deaths	21,716

In the year ending June 30th, 1885, to be reckoned on an increased population of 146,917:

Marriages	8,989
Births	24,077
Deaths	23,807

Year ending June 30th, 1886:

Marriages	12,351
Births	25,497
Deaths	22,734

Year ending June 30th, 1887:

Marriages	15,416
Births	27,340
Deaths	24,331

Population by the census of 1885:

Cities of over 5,000 inhabitants	701,428
Rest of State	576,605
Total	1,278,033

ESTIMATION OF POPULATION.

Some questions always arise as to the modes of reckoning increase of population in our American cities and States. Abroad there is little occasion to consider the effects of immigration. Here it so varies with localities, and especially in cities, that no general law of sufficiently definite application can be announced. As we have a quinquennial census, we have an advantage over Great Britain, and most of European States, and do not so much need an estimated population.

Where estimates are made, the chief bases have been as follows: First, a study of the ratio of increase between each period of census, and an especial noting of the rate of increase of the most recent decennial or quinquennial returns. Second, a counting of the number of new houses and an estimate of the increase of the number of families assumed to average five members each. If the kind of houses is also tabulated, this reckoning is made more correct. Considering it fundamental to have a correct quinquennial census, and to have the number of persons, the number of houses and the number of families in each locality, the Superintendent of Vital Statistics early placed himself in conference with the Department of State on this subject. The response given, both by the Secretary of State and the Legislature, favored a bill that secured a census the most satisfactory ever taken in this State, and probably more accurate than that of any other State. As this census comes midway in the quinquennial tables of those years from 1883 to 1888, and as the U. S. census came also intermediate in our first quinquennial tables, death-rates calculated for either of these periods on this basis are more approximate than any of the English death-rates calculated upon estimated populations. After full consideration, we believed it to be advisable for the State Bureau not to attempt intermediate estimated populations for each locality, leaving the localities themselves to show any diminished death-rate on a reckoning of their present population. As we have reviewed the tables and heard in some cases the overestimates of population used to minimize the death-rate, we are satisfied that our quinquennial and decennial tables will not be found to overstate the *pro rata* of deaths. Local officers are more likely to be correct in the estimated populations of any one year, although it would be well for them to state the exact basis of the estimate, also to remember that there will always be a few deaths, especially of very young children, that escape record. Also that owing to the great flight of city population from cities a part of the year, some deaths that should be credited at home are recorded elsewhere.

AGE AT DEATH.

Next in importance to the number of deaths and in some respects of even greater significance, is the age at which death occurs. In the next report we will have occasion to trace these comparisons through many years. For the present year we find that of the 24,331 deaths occurring, 5,849 were under one year of age, 3,396 were between one and five years of age, and 2,130 more did not reach the age of twenty, while 155 are undefined. Of those under one year, 1,714 died under one month. In addition, the still-birth return, which is always imperfect, would add 1,571.

Thus, at the lowest statement, 11,375 children did not reach adult life. If every family loses one-half of the children born into it, does not this present an aggregate of sorrow, of suffering and of loss of life to the State which ought to make the effort to preserve child-life more persistent? As all of the families did not lose at this rate some must have lost at a much greater rate. How artificial many of these deaths are is shown by the fact that the families in Hunterdon county (8,571) lost only 157 children under twenty years, while the 48,135 families in Hudson county lost 3,133, and this in a single year.

If the deaths in families in Hunterdon county had been in proportion to the deaths in families in Hudson county, 558 children would have been lost instead of 157 children. In other words, had Hunterdon county, instead of its usual experience, had the usual experience of Hudson county, the contrast with the ordinary mortality in Hunterdon would have been so great that the whole county would have recognized its people as suffering from a fearful scourge, and as deaths always stand for a large amount of sickness in those that recover, it would have been recognized that a wide-spread calamity had fallen upon the county. Yet our compact city populations and thickly-settled suburbs get so used to this sort of thing as to regard it as a necessity. Let those who, like Malthus, are troubled with fears of overpopulation, and who desire to limit increase in their own families, move to the least favored sections, but let all others either live in the best country districts or else see to it that their whole influence is upon the side of municipal sanitary reform.

It is to be remembered, too, that we are now only drawing the contrast of the deaths of those under twenty years of age. The number who died in Hunterdon county older than twenty years was 320, while in Hudson county it was 2,695. Thus, among adults at the same rate, there would have been 480 deaths. The excess is enough here, yet not so great, because so much of the material for death had departed in early life.

We do not single out Hunterdon county on the one hand or Hudson on the other, because they are so very much different from some other counties, but only because they show a sharp contrast which is to a large degree apparent in other counties, and especially as between those which have not large cities in them. As the population of the counties with cities increases faster than those who have none, some deduction is to be made for the difference of relative increase.

FEEDING OF CHILDREN.

When we consider that a large percentage of all persons born die under five years of age, and also that the mortality between five and fifteen is not inconsiderable, it well becomes us to study closely the causes of this early mortality. However natural death may be in advanced age, it is unnatural in childhood. So true is this, that the rate of mortality among the young is a more accurate test of the effect of preventable disease than is the general death-rate. When we come to analyze the causes of this mortality we find as the chief, bad heredity, bad food, bad drink and bad air. The heredity is difficult of remedy, but yet it is found that such is the tendency, even of inherited diseases, to limitation, that many weakly born, if placed under the best hygienic conditions, are able to surmount inherited tendencies. The evils arising from wrong food and drink are especially prominent. These find their registry not merely in the various forms of bowel trouble, but also in the large class of nervous diseases which result from intestinal irritation.

For infants there have been many devices of food and many attempts to imitate the mother's milk. None of them have equaled nature's supply. For the first half year, at least, as a rule, sole reliance is to be placed upon the mother's milk.

Where other food has to be used it should be fresh cow's milk mixed with an equal quantity of warm water, and some salt and a little sugar should be added. No preserved milk can take the place of fresh milk. The law of natural desire for food is the only law as to frequency, but unfortunately even infants early come to have substitutes for instinct and the cry is not always the criterion. Hence, we are to study such indications as have led good authorities to say that "infants should be fed at regular intervals, and if they vomit after taking milk they should be fed on smaller quantities given at shorter intervals." As a rule, for the first month the feeding should be every two hours, gradually increasing the interval to three, and at four months to four hours. After children begin to have teeth there is an indication for such solid food as stale bread and potatoes, with a little butter. Great evil is believed to come to children from the time of weaning, or even before, up to the time of three to six years of age, from the habit of feeding at the family table, and of supplying them with all the varieties of food furnished. The English custom is wholly different from this, and even if it were not, the variety on the table is far less.

A careful medical observer, who has studied the young population of tenement-houses, claims that children suffer far more from these mixed foods than from poor milk. Children who drink much water are very apt to be affected thereby. Water that has been boiled and then cooled and poured from one pitcher to another, so as to have more air through it, is much better for children than other drinks. Milk and cocoa are best if the design is to combine food and drink. In cities or other localities, where there is any doubt as to the purity of water, children should always have water which has been boiled.

The effect of foul air on children is never to be lost sight of. Their very littleness brings them into the closest range of atmosphere, and they are often weakly because supplied with foul air. We are convinced that those who have the care of children can very much diminish infant mortality by attention to the food and the air-supply for children. Valuable articles in former reports have given directions as to artificial foods, as well as shown how imperfect many of them are. If only the well-known principles as to foods and drinks and their uses for children were applied, the serious death-rate among them could be much diminished.

SPECIAL DISEASES.

The study and comparison of the various special diseases which cause death are even more important than any statement of aggregate numbers.

In some cases where the disease is local and belongs to that division which has been characteristically termed "Filth Diseases," we are pointed directly to local causes of disease and death. Even where the individual has good surroundings, we also often trace out the foul locality, or the special contamination or exposure by which the earlier cases were caused and from which they received their epidemic momentum and activity.

In other cases, such as that of measles and some other of the eruptive diseases, we are able to account for the fatality by the extreme dampness of the season, or of the locality, or at least to study the effects of climatological conditions.

The year has been a remarkable one in the prevalence of several of the more communicable diseases. As to measles, we doubt whether, in any one year, there has ever before been such a wide-spread seizure. It was epidemic in every county of the State, except Salem county, and in almost every portion of every county. Some of the cities showed a large mortality therefrom. Scarlet fever and diphtheria have largely prevailed. In fact, although the deaths from communicable diseases have been numerous, we are led to believe that the number of seizures has been in still larger proportions than heretofore to the number of deaths. The cases have illustrated, as never before, the value of Boards of Health and of sanitary inspectors, who at once put in operation methods of strict isolation as well as give attention to sanitary conditions and surroundings. We could mention localities in which this prompt method of procedure has caused a very limited epidemic, while in other places the neglect has added scores to the number of cases and to the number of deaths. There was a time when an outbreak even of the eruptive diseases was often, by the little natural communication had with other places, confined to narrow limits. But now, in New Jersey, at least, the railroad goes almost everywhere. The people are constantly passing from place to place. Reliance upon the old methods will not avail. We are sure to have epidemics, from time to time, far more destructive than formerly, unless we anticipate these conditions and provide to prevent such universal spread.

We have been fortunate that, although cholera appeared at the New York quarantine under threatening circumstances, it did not get foothold in the country. Some revelations, however, made as to our dependence as a State upon the methods in use at that quarantine, emphasize the importance of some more exact local care in our own behalf. It would be well if each ship arriving at the various docks in Hudson county, were critically examined on arrival, and if all the points at which customs are collected were more rigidly guarded.

REMITTENT FEVER.

The total of deaths from this cause for the official year is 217, instead of 243 for the year ending June 30th, 1886, and 209 for the year ending June 30th, 1885. The chief excess is in Hudson county, which has 63 deaths from this cause. Cape May county is the only one not recording a single death. There is considerable variation in the counties when studied over a series of years. This mortality, with all the varied forms of malaria, chills and fever and intermittent neuralgias which occur at the same time, continues to point to local causes of the disease. While discussions will continue as to what may be the specific cause of this class of diseases, the places in which its activity is manifested are those where heat and moisture and the exposure of great quantities of vegetable organic matter to forced, excessive or unnatural decomposition cause deterioration or pollution of the air. Thorough drainage, the unobstructed flow of water-courses, where there cannot be dams without overflow or damage, and such culture as will utilize the products of decay, are still our most available preventives. It is now well recognized that in many cases it is not so easy as formerly to draw the line between fevers dependent on marsh miasm or vegetable decomposition and such as are modified by the accumulation of population.

Hence, we have the term Typho-Malarial, as also the admission that other fevers are modified in their type by heaps of filth, by cess-pools or by other surroundings.

Our laws are now very favorable to the carrying out of local or general drainage plans. There are portions of the State greatly in need of a liberal policy in this behalf. Physicians can aid much in popular sentiment as to these matters and in thus securing greater health for the people.

TYPHOID FEVER.

The aggregate deaths from this cause for the year number 522, as against 545 for the previous year, and 642 for the year ending June 30th, 1885. It is considerably below the general average for the past nine years. The causes of the disease are better understood, and where sanitary administration is good there is diminution of its frequency.

The epidemics at Mount Holly and at Toms River were quite extensive.

There is no disease that is more fully recognized as preventable. Yet it is a form of fever that is sure to occur wherever there are close populations, unless there is a correct and efficient system of sanitary administration. Our experience during the past year shows how frequent is its occurrence and how thoroughly the attention of all Local Boards needs to be directed to its prevention. While it is chiefly through the medium of water-supply and by contamination thereof by the excreta that the disease is propagated, it is not tenable that this is the only possible mode of conveyance. Prof. Brouardel, of Paris, in his recent able paper before the Sixth International Congress of Hygiene, at Vienna, says: "I am not prepared to say that typhoid can never arise merely from foul air. In a family of nine living on identically the same food a son alone contracted typhoid fever. It was found that under his room window there was an open soil-pipe. In another family precisely the same incident occurred, and this among my own patients and quite recently. Nevertheless, water is the more general cause of the disease."

It is also true that there is some confusion as to the character of some fevers that have distinctly typhoid symptoms. So, some are disposed to entertain views as to modifications of type and even of lesions, and speak of adynamic, cesspool and mongrel fevers. But the imperative lesson is to run no risk with water-supplies, to take the most exact and prompt care of all excreta and to secure the most perfect sanitary conditions possible.

SMALL-POX.

Five deaths are reported for the past year as against four of the previous year. There have been many more cases in the State, but fewer were fatal and the disease was not permitted to extend. We have had no large mortality since 1881–2, when 367 deaths occurred from this cause. Prompt vaccination has prevented epidemic extension.

We have in another connection noted some lessons we are being taught as to the details of vaccination and the need of re-vaccination. But every new investigation confirms the sovereign value of this preventive when used with skill and when repeated according to indications.

SCARLET FEVER.

The deaths from scarlet fever for the past official year, were 255, which, although 33 more than the former year, was not over one-half the average for the last eight years. We believe more careful isolation and details of cleanliness have much to do with this diminution. At our last writing some light was apparently being thrown upon the origin of this disease. Power and Klein, two observers for the Local Government Board of Great Britain, seemed to have shown that it was a disease that sometimes occurred in the bovine species, and was transmitted from this source. Professors Brown and Crookshanks have since conducted similar examinations, and contend that the disease is cow-pox and not scarlatina. It is probable that further examinations will settle the vexed question. Dr. McVail, of England, and some others, have claimed that the excretions of scarlet fever patients are to be dealt with like those from typhoid fever, as they seem in some instances to have been the conveyancers of the disease. So serious and extensive are the ravages of this disease, that every effort for isolation should be used, and malignancy prevented or counteracted by all the details of enforced cleanliness. Parents should be cautioned not to send their children to school when having any form of sore throat, or any sudden eruption, unless some physician asserts the non-specific character. There should always be an understanding between Local Boards and School Trustees, so that children from families or houses in which there is contagious disease should not be allowed to attend, unless duly authorized.

MEASLES.

We have already alluded to the prevalence of this disease in the State for the past year. The great increase of death-rate records the result. The deaths were 296, against a record of 88 deaths in 1885–6; 135 for 1884–5; 187 for 1883–4, and an average of 115 for the five years previous thereto.

It was frequently noted that the type of the affection was unusually severe. Not a few deaths occurred from bronchial and pneumonic complications after the danger seemed past.

The contagion was in some cases so active that good observers claim that in one case a second attack occurred within a month, and that in another case it was coincident with varicella. A few cases of recurrence after long intervals are also noticed. It is, however, very rare that any of the eruptive diseases occur a second time. While the fatality from measles in proportion to the number attacked, seldom or never reaches in this country the degree reached in Great Britain, it is nevertheless an affection which too often leaves the pulmonary tissue susceptible to the inroads of consumption or bronchitis.

WHOOPING-COUGH.

Whooping-cough records 181 deaths. This is below the number in 1885–6 (274), and just the same as that for 1884–5. It was considerably above the general average, and shows relation to weather, localities and exposure. While not a deadly disease, its protracted nature and the violence of the attack often result in brain or pulmonary diseases. As a result not a few die from convulsions, or capillary bronchitis. The view is confirmed that the dried sputa from this disease may be the medium of contagion. It is a disease the severity of which is much modified by the avoidance of undue exposure, and by the use of medicines which control nervous systems and mitigate the severity of the cough.

DIPHTHERIA AND CROUP.

This continues to be the most devastating enemy to child-life. The fact that one attack does not protect from another, and that not infrequently adults are attacked, makes it all the more formidable. Both clinicians and pathologists are giving to its study the most careful attention.

One thousand five hundred and twenty-seven deaths are reported from this cause. The record of 1885–6 was 1,303; for 1884–5, 1,496; for 1883–4, 1,027, or for the five years ending June 30th, 1883, 1,144. The fatality is beyond that of any one year, the nearest approach thereto being in 1881–2, with its record of 1,472 deaths.

It has long been a question what are the precise relations of membraneous croup to that form of diphtheria which now occurs as apparently a specific disease. Very many good authorities regard them as manifestations of one and the same disease. In many cases the symptoms are so identical that distinction cannot be made even in a secondary way. Prof. Virchow has endeavored to outline the difference between the tracheal membrane of croup and the membrane of diphtheria. He calls the former a fibrinous membrane on the surface of the trachea, and the latter a necrotic surface, which, when separating, does so, not by a process of exfoliation but by ulceration. He claims that the false membrane of croup can be separated like a cast, without leaving a raw surface. Where the membrane of croup penetrates the lung it is a croupous process, while that of diphtheria is a necrotic layer penetrating the tissues. Yet he admits that where the diphtheritic process is superficial it is attended with fibrinous exudation, so that where it is thus superficial the two processes are identical. This necrotic tendency he attribntes to the presence of small granules, which he regards as parasitic organisms, although he formerly regarded them as exudation granules. It is in these that the infection resides and from these it acquires its specific character. These distinctions are not as yet authenticated, but if real there is no difference in the initial exudation. The important question is under what circumstances the process becomes necrotic. If parasitic, it is all the more evident that treatment should very early be directed to local as well as to constitutional conditions. It can confidently be said that the great danger from diphtheria is from the insidious nature of the attack—the concentration of the poison. All experienced physicians now know that if they can grapple with a case at the very first manifestation of the disease they are likely to be successful. Too often, there is a large patch in the throat and the constitution has become involved from the local effect before there is treatment. It is possible both to put on the throat and into the blood medicines which interfere with the infective and destructive processes. Every physician is aware of instances where failure to isolate and concentration of the poison have caused direful results. A case occurred to us thus: a servant fourteen years of age, employed in a family where a fatal case of diphtheria had occurred, had a small deposit on the tonsil. She insisted on going to her home, some two or three miles distant. There had been no diphtheria in that neighborhood. It was very cold weather, and the father, mother and four other children all occupied, by day and night, one close room. Within seven days all but the father and the mother were dead of the disease. No other case occurred in that section. Our great power over the disease is in the use of disinfectants and in early preventive and isolating methods. With these thoroughly followed out, the number of cases of death therefrom in the State could be reduced to a very small proportion of the present loss. Where an outbreak occurs in a family before isolation could be secured, so long ago as 1877, the Secretary of this Board advocated the prophylactic use of potassium chloride and iron and quinine, as also a daily examination of the throats of the other children before seeing the sick one. While these views, often since presented, have led to some valuable results, they have not met with general adoption. A recent debate before the New York Academy of Medicine has helped to show that in this and some other diseases individual prophylaxis will yet come to be regarded as one of the most efficient methods of preventing the spread and fatality of the disease.

ERYSIPELAS.

Erysipelas is charged with 96 deaths, which is below the record of last year (111), but not below the general average. While many forms of erythema or other eruptions or surface congestions are sometimes spoken of as erysipelatous, there is no doubt that true erysipelas is a specific and communicable disease. It is at once to be met as such. All the more caution is needed because of its strange tendency to seize upon parturient women and to show itself in the form of puerperal fever. Physicians attending cases of erysipelas have come to recognize this risk. A recent case in Vienna illustrated the opposite infection.

Dr. Pritzil, the chief assistant of Prof. Braun's Clinic, acquired infection from a patient with puerperal fever, and erysipelas of the face ensued, which proved fatal. Besides the cases returned as erysipelas, some of the non-traumatic deaths returned as from pyæmia or septicæmia are no doubt the results of the same specific poison.

DIARRHŒAL DISEASES.

Two thousand six hundred and ninety-four deaths is the record of this cause of mortality among the younger population. The mortality for 1885–6 is recorded as 2,664; the number 1,938 occurring in cities shows how much more operative are local than constitutional causes. Under this head fall all deaths from diseases of the digestive apparatus from one month to 20 years. Not a few of those occurring under one month are returned as diarrhœal, but developmental and hereditary influences so largely predominate as to make it proper not to include these, and so we do not. Improper food, impure water, exposures to extreme heat and to sudden changes of temperature and humidity are mostly the exciting causes of these affections. The use of artificial foods and the tendency to rear children without the maternal milk, add much to the mortality. Where artificial foods are necessary great attention should be given to their choice. While the well-advertised claims of scores of preparations may easily confuse some, chemistry and medical investigation and experience have quite clearly designated the choices to be made.

CONSUMPTION.

Three thousand six hundred and fifty-three deaths from this cause is the record of the past year. While we are to remember the increase of population, and especially in cities, there is more than a corresponding increase in this special malady. In the last nine years, 28,470 persons have died of this one disease. The number the previous year was 3,205. It is not surprising that lung diseases in general, and consumption in particular, make a large record amid the causes of death. Besides the unquestionable influence of heredity, the increase of indoor industries, many of them providing, in addition, irritating dusts, and the crowding of our people into cities, cannot but add to this form of disease. The knowledge of any family tendency or the want of vigorous development, far oftener than it does, should influence or control the decision as to place of residence or the vocation to be chosen. The possibilities of prevention are far more significant than the records of cure. The very fact that tubercles are most frequently found in that portion of the lungs the least penetrated by air, and in persons who show the least of physical vigor, evidently point us to the need of full respiration and increased muscular and general bodily activity.

It will yet come to be understood that no influx of foreign population can substitute the need for a strong, healthy, home-reared race. In the absence of the military methods so common in the old world, we need, in our systems of instruction, to give full consideration to physical education. While the industrial school can aid in this, there must also be the recognition of physical training and culture as an absolute necessity if we would secure a vigorous population. So much of the future physical and productive life depends upon physical habits and vigor acquired in the first fifteen years, that it behooves us especially to see to it that such lung power is secured as will make this the means of aiding in the upbuilding of the entire physical frame-work. In the former report we illustrated the effects of one industry on consumption. The facts stated in the report this year as to some diseases of potters, furnish another illustration in the same direction.

ACUTE LUNG DISEASES.

Pneumonia, bronchitis and other forms of lung or pleuritic affections destroyed 2,557 lives the past official year. The record of 1885–6 was 2,300 and of 1884–5, 2,566.

While cold is a tonic, in a variable climate such as ours, and in the very diverse relations of locality to woods, to sea-shore, to rivers and lakes and to sand plains and to high altitudes, much attention needs to be given, either to the avoidance of exposure to sudden changes or to such food, clothing and management as will adjust us to changing conditions. It can be said of very many attacks of acute lung disease that, had there not been some ignorance, carelessness or imprudence, the seizure might have been avoided and the life preserved. For not only the weak are thus attacked, but frequently the most hardy or robust. Those are especially liable who, having become unconsciously depressed by the close air of the factory or the home, are suddenly exposed either to severe cold or great humidity.

The power of resistance afforded by good clothing, and still more by the good natural heat which food and exercise afford, is never to be lost sight of.

BRAIN AND NERVOUS DISEASES OF CHILDREN.

The record of 1,886 deaths from this cause as against 1,774 and 1,791 in the two previous years is not an increase more than in proportion to the increase of population, yet it is a large destruction of child-life.

The greater number of these occurring in the cities than in the country is especially noticeable. There is nothing more appalling in our modern civilization than the fearful increase in disturbances of the brain and of the nervous system. Whether exhibited by direct derangement or imperfect mental vigor or in all the protean forms of nervous invalidity, it betokens radical disturbance of vital parts, such as unfits for the stern struggle in life or entails imperfect vigor of will and self-control upon offspring.

There is no class of diseases that more needs to be studied with a view to their prevention, since they are so often the result of errors in food and sleep and regulated activity in which the home and the school-room are large factors.

DISEASES OF THE HEART AND CIRCULATION.

The record of 1,530 is quite uniform with that of the three previous years, but an increase over the average of our first quinquennial period.

It is much more difficult than formerly to lead a quiet and peaceable life. While diseases of the heart and circulation are not so common from acute diseases as formerly, cases from overstrain, fatigue, nervous excitement and unrest are more frequent. While the medical art succeeds often in prolonging the lives of those who have some serious impairment of the organs of circulation, it is seldom that full compensation for an organic lesion is secured. Even some of the modern gymnastics and the violent open-air games have been injurious in their effects on the heart and its connecting vessels. Tobacco undoubtedly disturbs heart action to a hazardous degree in many habitual smokers. Any impairment of a vital organ is so much a limitation upon the activities of life, that all the causes leading to profound disturbance of circulation need to be avoided. The use of alcoholic drinks has record here as well as in diseases of the digestive organs.

RENAL AND URINARY DISEASES.

Eight hundred and seventy-three deaths are recorded from these causes. This is a little below the average for the last three years, but higher than the general average. It is a class of diseases not hereditary and nearly all artificial. An examination of ages will show that they occur in the active period of life and shorten many a valuable life.

The minute capillary circulation of the kidneys and the important functions they perform in separating effete materials from the blood, make the preservation of their entire capacity of the utmost importance. The amount of solids eliminated with the urine is equal to the separated material voided by the alimentary canal. Alcohol and various other irritating substances aid in producing these congestions, which, too often, give rise to local inflammations, suspending important functions. There are no blood purifiers to compare with the liver and the kidneys, and if allowed to do their natural work they are equal to the cleansing. It is chiefly because of abuses beginning in our improper use of drinks and of foods that they so often fail.

ADULT BRAIN AND SPINAL DISEASES.

The returns for this year show 1,966, the record for the former year being 1,932. The constant and almost uniform increase in this class of diseases points to some broadly-operating cause.

While so many perish in early life from some form of affection of the nervous system, about an equal number die after twenty years of age of the various affections classed under this head. They are often the index of the accumulated results arising from overstrain or from a neglect of the natural laws of health.

The severest forms are represented in the records of asylums and in the increasing number of their inmates, but these make only a small proportion of those who, by some form of paralysis, or by headaches, nervous prostration and general nervous incapacity, are restricted in the full and effective use of labor and of life.

ADULT DIGESTIVE AND INTESTINAL DISEASES.

The returns for the year record 1,242 deaths from these diseases. The previous year gave us a return of 1,213, which was a decided increase on former years. A large number of these deaths, as the result of errors in food and life, might be classed as preventable.

If only the people would avail themselves of the great increase of knowledge as to foods and the laws of their digestion, there ought to be a large diminution of this class of diseases. In no department of medical study has there been more advance than in Dietetics, and what may be called the Therapeutic uses of food. Nourishment can be secured, and yet one part of the digestive apparatus rested while the other is employed. Debilitated organs have thus the opportunity for recuperation. Even foods and liquids can be chosen that are so nearly digested as to be quite ready for absorption. While the range of natural foods is large, it is often of importance to be able to vary supply according to the ability of the various organs occupied in the digestive process.

CANCER.

Five hundred and seventy-four deaths are returned from this cause, as against a record of 546 for the former year.

The various forms which cancer assumes, and in some cases the difficulty of diagnosis, cause some variation in the record of this disease. Yet, a comparison of statistics, both here and abroad, seems to indicate an increase of this malignant ailment. It seems quite probable that abnormal growths, at first benign in their character, may, by peculiar failures of the system, or by local irritations, take on a malignant type. Whenever any skin-irritation or any form of abnormal growth occurs, there is a natural tendency to deal with it. The first attention is very often unskillful. It is always well to remember that wrong treatment is worse than no treatment at all, and to seek, if need be, only skilled advice. Many good authorities regard it as at first of local origin. The *Lancet* thus comments on a recent lecture by Virchow:

"Virchow evidently attaches no importance to the reported discovery of a cancer bacillus, nor does he think that the discovery of a cancer micro-organism is necessary to explain the known facts of the disease.

He is strongly in favor of its local origin, and, firm in this belief, he entertains the hope that some means will yet be found of eradicating the disease in its early stage, when it is purely local. Whether this is to be by surgical interference or by the action of some drug he is not prepared to say; but he sees nothing in the nature of malignant tumors in their early stage to render them impossible of cure by the art of the physician, and he urges surgeons not to be too sceptical of the possibility of curing cancer by drugs."

ACUTE RHEUMATISM.

The record of 132 deaths from this cause is a somewhat surprising number, since the previous average has been but about sixty. Our record as to it is somewhat embarrassed by the fact that certificates do not always record the relations between it and acute pericarditis. As it tends to attack all fibrous and ligamentous tissue, as well as to invade joints and heart structure, it always, in its acute forms, needs prompt treatment. The forms of ache, myalgia, neuralgia and stiffness of muscles, usually massed under the name of chronic rheumatism, need more attention. They betoken some form of malnutrition or degeneration of tissue, and, besides the discomfort, result in much curtailment of working power. Generally they call for active treatment, as well as for such habits of rest, exercise and clothing as will aid in heat and force-production.

PUERPERAL DISEASES.

Two hundred and sixty-three deaths occurred from these, while the record for the previous year was 257, both of which are a little above our general average. We include under this head all deaths of women in child-bed or from non-malignant diseases directly connected with the reproductive system. Of these the most serious and fatal is puerperal fever. There is no such disease as autogenetic puerperal fever. The infection is from without. It has strange relations to scarlet fever, erysipelas, &c., besides its probable occurrence as a result of surrounding conditions. It is no longer doubted that it is conveyed by nurses or by careless physicians. (See article on "Antiseptic Obstetrics," *Philadelphia Medical News*, March 5th, 1887.) Let us, then, look upon puerperal fever as one of the preventable diseases, and see to it that the precious lives of mothers are not sacrificed by careless and insanitary management. No causes of death are sadder, since often these losses mean the orphanage of children and the cutting off of useful lives in early or middle life. Antiseptics are more freely used in order to guard against the introduction of the disease from without. But to these must be added all the most scrupulous details of excellent sanitary management.

ACCIDENTS.

The returns of deaths by accident are 1,051. There is a steady increase of these. The various forms of accident deserve the careful attention of all who seek to guard human life from unnecessary risks. Most accidents are the results of ignorance, unskillfulness or carelessness. The coroner's jury wisely inquires into details, but does not frequently enough trace out all the facts. These deaths are generally of those who give promise of long life, and not unfrequently of those whose exposures are due to special physical vigor, activity or courage.

We draw the attention of all, and especially of physicians, to a careful review of the facts which our statistics reveal, as also to the great opportunities now afforded for the study of methods of preventing disease as well as of treating it. Each year more and more furnishes the evidence that the true physician is diligent not only in alleviating human disease and suffering but in seeking to prevent it. Thus he adds to a high vocation the highest privilege of the citizen and of the philanthropist and does what he can to benefit his fellow-man.

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NOTE.—All Boards will please give attention to the Vital Statistics Law as explained, pages 301 and 302, and all but Township Boards, to the Plumbing Law, page 231, which goes into operation July 4th, 1888. Specimen regulations will be printed previously.

N. B.—On page 6, lines 12 and 13, reckoned on American proportions, read for "20,000," twenty million weeks, and for "$100,000," one hundred million.

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