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SECRETARY'S REPORT.

To His Excellency Leon Abbett:

GOVERNOR—The State Board of Health herewith has the honor to present to your Excellency and the Legislature its fourteenth report, and with it the twelfth report of the Bureau of Vital Statistics.

It was in 1866 that the first Sanitary Commission made report, so that a quarter of a century will have elapsed when this report is in print. While the first action was prompted by the threatenings of cholera, a still wider scope was in the mind of those who initiated the movement, but the time for a sustaining public opinion had not yet arrived. A fuller report made in 1874 drew more widespread attention to the subject, and in 1877 a State Board of Health was formed. The advance which the retrospect shows is highly encouraging. Public and municipal sanitation began as a defense of the industrial classes against the oppression of disease induced by improper dwellings and surroundings. The interest has extended to those in all conditions of life. The security to the public health and the defense against epidemics is much greater than twenty-five years ago. Popular information as to the care of physical life has greatly increased. At that time we were without such legislation as rendered sanitary administration possible. To-day the State has a code of sanitary laws not excelled by that of any other State. Modes of administration are direct and competent, and Local Boards are on the increase. The relations between sanitary inspection or care and the duties of citizens are better understood. Organization is the first step toward effective administration, and this has been fully secured.

The great defects which still exist in some localities as to administration, can only be removed by greater intelligence and by thorough efficiency on the part of Health Boards and their inspectors. The progress of knowledge has been such, and specimens of successful service and adequate results in the protection of life and health are so numerous, that we are no longer without a science to guide us, or models after which to pattern. Here, for instance, is an example which, while it may show our own shortcomings, also serves to show the method and the value of effective regulation:

"At the International Congress of Hygiene, when Dr. Martin described the wonderful saving of human life achieved by the Sanitary Bureau of Brussels, an ovation was given in honor of its chief director, Dr. Janssens. The death-rate of Brussels has been reduced in a manner that is admirably illustrated by charts recently published. On examining these charts it will be seen that the average death-rate of Brussels from the years 1868 to 1873 was 29.3 per 1,000 of the population, and the zymotic death-rate 4.60 per 1,000. From 1874 to 1876 the Bureau d'Hygiène dealt with an annual average of 757 cases relating to sanitation; 237 insalubrious houses were improved, and 399 premises were disinfected. From 1874 to 1878 the average death-rate fell to 25.7 per 1,000 and the zymotic death-rate to 2.02. From 1877 to 1879 the sanitary authorities had to deal with, on an average, 801 cases. They improved 325 dwellings and disinfected 243 premises, From 1879 to 1883 the average death-rate was 25.3, and the zymotic death-rate 1.58. The average sanitary works from 1883 to 1885 were 1,916; no less than 1,155 dwellings had to carry out sanitary improvements, and 491 premises were disinfected. Finally, from 1886 to 1888 the average number of cases that came under the notice of the Bureau d'Hygiène annually, rose to 2,146. Sanitary works were executed in 1,241 houses, and 367 premises were disinfected. As the work of the sanitary authorities increases, we note a corresponding decrease in the death-rate, and what is still more significant, in the death-rate from zymotic diseases. Thus the average death-rate from 1884 to 1887 was 23.9 per 1,000, and the zymotic rate 1.66; while the death-rate in 1888 was 22.9, and the zymotic rate 1.31. The zymotic death-rate has, therefore, fallen from 4.60 (average of the years 1868–73) to 1.31 in 1888, and the general death-rate from 29.1 to 22.9 in the same period. On the other hand, the number of cases of insalubrity coming under the notice of the sanitary authorities, nuisances removed, sanitary improvements accomplished, or premises disinfected, has increased from the annual average of 757 to 2,146. The Brussels Sanitary Bureau costs 48,000 francs per annum; and if we estimate every life saved at only £40, this outlay in sanitary administration is equal to an investment bringing in an annual interest of 1,400 per cent.

"These excellent results have been achieved by a strict enforcement of the French law of December 14th, 1789, and that of August 16th and 24th, 1790—laws that came into force in Belgium when the French Republican army had triumphed at Jemmapes and Fleurus. The town of Brussels, basing its action on the legislation just mentioned, has drawn up by-laws containing the following clauses:

"'Art. 120. The College of the Bourgmester and Sheriffs is authorized to prohibit the habitation of houses, tenements, &c., that are unclean, where there is not sufficient ventilation, and where the drainage is such as to compromise, in a permanent manner, the public health.'

"If the owner of a property refuses to carry out the sanitary improvements demanded by the Bureau d'Hygiène a report is drawn up by the Local Medical Commission and, after due notice to the inhabitants, the police compel them to evacuate the premises. The legal proceedings that lead to these extreme measures are simple, and rapidly executed. They can give rise to no wearisome contentions, to no expensive litigation. The tenants who are driven out have a right to prosecute their landlord for the inconvenience and disturbance. They demand, and generally obtain, very heavy damages. Consequently, when the landlord sees, after a little resistance, that the sanitary authorities are in earnest, he almost invariably does all that is required. The by-laws relating to the construction of houses clearly describe what should be done by every house-owner. Art. 79 stipulates that every building serving as a place of habitation or of meeting should be provided with closets that have a door or a window opening on to the outer air, and that are so constructed as to in no wise endanger public health. A great number of regulations have been drawn up with regard to the construction, fall, diameter, &c., of the soil and drain-pipes. These coincide with our English principles of domestic drainage. Art. 91 enforces the principle that every drain-pipe must be trapped. The soil-pipe traps or syphons placed within the houses must (Art. 92) have a dip equal to six centimeters (about two inches and a half). But the traps or gullies placed in yards or gardens must have a smaller dip. Consequently, if pressure from the sewers forces the gases through these traps, those in the open air will be the first to yield. If more than one closet communicate with a soil-pipe, to prevent syphonage the soil-pipe must be prolonged to the roof of the house and there left open for ventilation purposes. If any house in Brussels does not conform to these stipulations, an anonymous communication may be addressed to the Bureau d'Hygiène. This will lead to an inquiry and the prompt adoption of the measures necessary to have all defects removed.

"Such, briefly, are the sanitary enactments with regard to the construction of dwellings which have been enforced of late years with much rigor and very excellent results. But this alone has not sufficed to bring about the notable decrease in the death-rate demonstrated by Dr. Janssens' charts. Vaccination (from the calf) has been employed with ever-increasing zeal; and very noteworthy improvements have followed the gratuitous administration of preventive medicine in primary schools. All the children are carefully and medically examined; the feeble are supplied, at public expense, with cod-liver oil and other suitable medicaments.

"Dr. Janssens has also introduced an excellent measure to render disinfection more effective and practical. He has succeeded in obtaining possession of an old Octroi or Customs Post, situated in the center of the broad Boulevard du Midi. This building occupies, at some distance from the busiest part of the town, and yet not too far away, a comparatively isolated position. The public disinfector and his wife live on the premises. On the first floor there are dormitories, carefully ventilated and kept scrupulously clean. Here are conveyed, free of all cost, the families from tenements undergoing the process of disinfection. A good warm bath is given them on admittance, and an excellent breakfast of milk and coffee and bread. They remain in this sanitarium twenty-four or forty-eight hours, according to the time it may take to thoroughly disinfect their homes. The accommodation is generally superior to that afforded in their own dwellings; the beds are beautifully clean and very comfortable, the caretaker kind and sympathetic. The building has a dignified official look; it stands out well in the midst of trees, and seems like a little mansion. Therefore there is no prejudice against the institution. The poor people go there willingly. Care is taken that they should not imagine that they are receiving any charity, but on the contrary they are taught that, by thus facilitating the work of the sanitary authorities, they are performing a duty for the benefit of the public. By methods such as these, by a humane policy which is at once wise and just, the work of sanitation is rendered popular even among the most ignorant."

Just such results are obtainable in all our cities, if proper sanitary government is secured. This State has been fortunate in that it began to give orderly attention to health matters at the time when the great principles of hygiene were asserting their vital relations to the welfare of the citizen, and the necessity for legislative jurisdiction was coming to be realized. In the Departments of Health and Vital Statistics, it has been our aim to keep pace with the advance of the age. While there are yet some great failures in effective local service, it is not because methods have not been well defined, or laws well provided. We still believe that the chief power should be vested in the Local Boards. The State Board centralizes and diffuses knowledge, studies the various problems presented, and by the force of argument, by details of facts and by pointing out failures, aids the local authorities to effective service. As our reports have, from year to year, so fully considered the various facts in evidence, the time has come when it is unnecessary to treat of each sanitary subject separately or in detail. After a brief review of general conditions, we shall this year concentrate the report of the Secretary upon methods of inspection, and so furnish a guide to Health Inspectors.

WATER-SUPPLIES AND SEWERS.

The attention of various localities in this State has, during the past year, been directed to the provision of means for securing a pure water-supply, and to methods for the disposal of sewage as never before. There has come to be with a large number of our citizens a settled conviction that no effort must be spared to secure these conditions of health. Even where there is some apathy upon the part of the general public, there is a valuable constituency that will not remain in or remove to towns where there is inadequate provision in these regards. Hence, not only are our large cities perfecting methods, but such towns as Plainfield, Freehold, Hopewell, Summit and Keyport are busy with these problems. The movement for supplying Newark with pure water is one of far-reaching importance. Details as to it will be furnished hereafter.

This Board, in common with the Geological Board and the Water Commissioners, has always been urgent that the State should manage and control its own water-supplies, and has advised against giving over the control of local water-supplies to companies instead of securing it to the cities themselves. But companies have profited by delays or by the greater ease of forming companies than of convincing cities of their true policy. So, in accepting what has thus been made inevitable, it behooves cities to be very watchful as to the kind of supply, and that by all proper protection of water-sheds, water-ways, reservoirs and pipes, it is kept at a proper standard.

Experience has taught us that it is not always safe to leave it to the companies themselves, even though prominent citizens are doing well with the stock. Boards of Health should know, by proper inspection, the quality and quantity of the water.

In many large cities there is examination of the potable water weekly. Where water is being impounded by dams thrown across valleys, there should be careful study of its effect upon surrounding drainage, lest the people in the vicinity are thus provided with a water-soaked soil, and so with those diseases which dampness and forced vegetable decay engender. We would still urge upon the State the importance of preserving control over its own unappropriated water-supplies in such wise that they shall not be appropriated to the exclusion of regions or of cities to which they ought to be available.

There is also need of State care in preserving the purity of waters. Such States as Massachusetts and Connecticut have made large appropriations for these purposes and given large powers of examination and condemnation to their respective Boards of Health. Similar oversight might be exercised in this State with advantage.

SEWERS.

Where public water-supplies are introduced, it is inevitable that early attention must be given to providing sewers for the removal of soiled liquids. Fortunately, these can be constructed at much less cost than formerly, and the modes for safe disposal of sewage are better understood. But here, too, there is need of the best engineering skill, both in plan and plant, in oversight of construction and in proper administrative care after construction. Sewers may, by neglect, after a time become elongated cesspools, and by deposit and putrescent filth injure the public health.

It is only by systematic oversight that such results can be avoided. A public water-supply and a general system of sewerage are of great advantage to our cities, both as to convenience and health. Only it must be recognized that they require the best directing and overseeing skill, and that Boards of Health, as independent bodies, must give them proper oversight.

STORAGE OF WATER IN RESERVOIRS, WELLS AND CISTERNS.

It is often the case that when a proper source of water-supply has been chosen, afterward proper care is not taken to prevent contamination, or that the stand-pipes, reservoirs or service-pipes are not kept in proper condition. When any stream or driven well is the source, there should be a thorough spring and fall examination to find whether any sources of contamination have arisen since the choice of the source. It not unfrequently happens that new buildings, secret sewer or cesspool-pipes, cattle-yards, or addition of decayed or decaying animal or vegetable matter change the character of a supply for a time or permanently. Stand-pipes and reservoirs also need examination, as well as pipes and house connections. Water, when pure at its source, is sometimes found impure at point of delivery.

It is now generally believed that reservoirs should be protected from the rays of the sun. There have been some recent devices for the cleansing and scraping of the inside of delivery-pipes. In the twelfth report we called attention to changes in the taste of water, caused by plant-growth. On the same important subject we call attention to a paper and discussion thereupon, to be found in the Transactions of the American Society of Civil Engineers, Volume 21, December, 1889. The paper is by George W. Rafter, C.E., on The Fresh-Water Algæ and their Relations to the Purity of Public Water-Supplies. Also to a brief paper by the same writer in this report, as also to one by Engineer Brush, of Hoboken.

These throw much light on questions that frequently present themselves as to the unpleasant taste and smell which sometimes occur in water from sources regarded as pure. Wells need occasional cleansing, and constant guarding against contaminations from the surface or such as may reach them from surrounding buildings or cesspools through the underground. The same is true as to cisterns. We have recently had, from intelligent sources, inquiry as to (*a*) the changes which water undergoes in casks, as at sea; (*b*) the change in the color of rain-water in cisterns, and (*c*) as to the propriety of allowing snow-water to go into cisterns. Prof. C. F. Brackett, President of this Board, has kindly furnished the following brief notes:

"(*a*) There is not the least reason to suppose that if 'pure' water were put in the butts which go to sea, that there would be any change whatever in it; but, as a matter of fact, the water put on shipboard is rarely even approximately pure. It is not unfrequently taken on board from rivers and creeks, the water of which is alleged to be 'fresh,' and that single alleged quality is enough for the sailor. Such water will go through a peculiar process called 'fermentation,' but which really consists in the oxidation of the matters in suspension and in solution. The results of the oxidation are found in the form of a sort of mud on the bottom of the cask.

"(*b*) Rain-water from the roof, especially if it be caught in cisterns before the roof is thoroughly washed, will carry with it more or less of organic matter, which will, by standing, be oxidized, and thus the water will lose the yellowish look which it is apt to have when the first of the storm-water is caught.

"(c) As respects snow, there is something more to be said. There is good reason to think that the process of crystallizing commences in the upper air on the minute surfaces of the dust particles which are always present there. These are organic in character, for the most part. Hence, we have from melted snow the organic matters which serve as nuclei for the crystals, but in addition we have a considerable amount of condensed gaseous matter. Ammonia, nitric acid, carbonic dioxide and all the products of combustion and putrefaction on the earth's surface are constantly either formed in the air (as in the case of nitric acid by lightning) or poured into it. The low temperature in the regions where crystallization is going on favors the condensation of these gases, and so they are brought down with the snow, and, of course, are found in the water which is formed by its melting."

LEAD-POISONING BY WATER-SUPPLIES.

The ill effects of lead on the human system have been so often seriously shown by the lead-colic of painters, and by the lead dissolved in lead pipes in drinking-water, and in connection with water-supplies, that it is important to be aware of this source of contamination. The great embarrassment is, that a water which at one time seems to have no action on lead, will at another time show its presence. It is variously claimed that this power of dissolving lead is due to the lack of dissolved silica, to the presence of acidity in the water, or to the absence of dissolved carbonic acid. It is recognized that hard waters, especially those containing what is known as "temporary hardness," are very rarely possessed of this lead-dissolving power. All soft waters may possibly show this activity in dissolving lead, but especially those containing vegetable matter, which is generally associated with acidity. When lead is found in solution frequently, lead pipes should not be used. Filters of limestone or chalk, or of sand-flint or charcoal, as a rule, diminish or remove the lead. Where there is a public water-supply, and the evidence of lead is persistent, the addition of carbonate of soda has been found efficacious. Five parts of soda to 100,000 parts of water, by weight, is the rule in extreme cases. The expense is about six cents per 1,000 gallons. The following are the directions given by Prof. Percy F. Frankland, as applicable to families: (*a*) That no water should be collected for drinking purposes until after the tap had been allowed to run for such a length of time as will presumably clear the service-pipe, and that the drinking or cooking-water may be collected immediately after a considerable quantity of water has been drawn for other domestic purposes. (*b*) That the filtration of the water through any form of animal charcoal filter practically guarantees its absolute freedom from lead. (*c*) That hot water acts more powerfully on lead than cold, and that, therefore, metal tea-pots and other soldered vessels for holding hot water should be avoided as much as possible.

PASSAIC RIVER DRAINAGE.

Geo. W. Howell, C.E., of the Passaic River Drainage Commission, has kindly furnished this brief statement as to the Passaic river drainage:

The work preparatory to the reclaiming of the Passaic meadows is in active operation. It involves the removal of about 10,000 yards of trap-rock from the bed of the river, just below Beattie's dam, at Little Falls, and about the same amount above the dam; also, 30,000 yards of earth and boulders at Two Bridges, and some 40,000 yards of muck and clay at Pine Brook. In addition to this, the Beattie Manufacturing Company has agreed to lower its dam 20 inches for its entire extent, and also to erect gates in the same, which, when open, will carry a volume of water equivalent to a width of 25 feet and a depth of 16 feet.

These gates are to be opened whenever the water begins to rise from freshet, and to remain open until the river has again resumed its normal condition. This, it is firmly believed, will ensure the prevention of all ordinary freshets over the Passaic meadows.

To obtain the most complete results, however, the land-owners themselves must supplement the work done in the river, by excavating lateral ditches to reach the remoter portions of the wet lands. All work in this direction heretofore has been futile, from the fact that these lateral ditches have had no sufficient outlet.

The Commissioners in charge of this work let the contract, in the summer of 1889, to Alfred B. Nelson, Esq., of New Brunswick, who was engaged on the work for a few months, but who, for good and sufficient reasons, was unable to complete his contract. The Commissioners themselves continued the work for a time, pending negotiations for a new contract.

The scheme has suffered no loss from the closing out of the first contract, further than some unavoidable delay in time.

In August, 1890, the Commissioners let a portion of the work to the Morris & Cumings Dredging Company, of New York city, who have commenced operations, and are progressing in a very satisfactory manner. From the well-known reputation of this company, which is largely engaged in government and municipal work in various parts of the United States, there is every reason to expect that the work they have in hand will be pushed to a speedy and successful termination.

The plans for the gates in the Beattie dam have been decided upon, and they will be erected, and the lowering of the dam will be effected, as soon as the necessary excavations shall have been made.

The present contract will probably be completed early in the coming year, and it is hoped that the work on the upper reaches of the river will be begun before that time, so that some beneficial results may be secured next year.

The expenses of the scheme are to be assessed, after completion, upon the lands benefited. In the meantime, funds are raised for carrying on the work by the sale of Commissioners' bonds, bearing six per cent. interest, and payable in the year 1900. No difficulty has thus far been met in securing necessary funds by the sale of these bonds at par. That they are a thoroughly safe investment, has been amply proved in the case of the Pequest river drainage, in Warren county, a few years ago, where a similar scheme was carried to a successful completion under the same general drainage law.

SEWAGE DISPOSAL.

The question of the final disposal of sewage is one fraught with such weighty consequences as to be well worthy of the frequent consideration given it. While there is abundant evidence that rapid streams, flowing over rocky beds, containing little of vegetable and organic compounds, and having abundance of air, sunlight, animal and plant life, will, in addition to dilution, dispose of large quantities of sewage matter, there are many streams into which too much sewage is cast. The use of small brooks and ditches for such a purpose is indefensible.

There are also many places where sewage must have some other disposal, as with inland towns. Growing importance is being attached to methods of sewage purification, since thus streams can be often relieved of a superabundance of decomposable material, and inland cities can be provided for. So long as it is shown, by careful calculations, that "the sewage of English cities contains only from one to four cents' worth of fertilizing matter per ton, and a ton of Boston sewage about one cent's worth," we need not, in this country, expect much from plans for the utilization of sewage. Where sewage cannot be disposed of, in its crude state, into very large rapidly-flowing streams, the three great plans of dealing with it are by *chemical purification* connected with subsidence, by *irrigation*, and by *intermittent downward filtration*, or by these, to some degree, combined with each other.

I. As to chemical purification in any of its forms, it is expensive, and does not give a perfect effluent. Yet, as urged in previous reports, it is often of great service, as enabling a portion of offensive material to be separated and converted into sludge or compressed cakes, and so permitting the remainder to pass into streams or to be otherwise disposed of. It is not necessary to discuss the more than 450 patented processes, and several of the best, which are not protected by patent. Electrical purification is one of the forms of chemical treatment which has come into more recent use. Chemical treatment is recommended and carried out on a large scale, as in Milwaukee, Providence and East Orange, where, for lack of suitable land area, irrigation or downward filtration would not be feasible. In the Providence report, the expense of intermittent filtration is stated at $28,000 per year, as against $65,000 by chemical precipitation, and yet preference is given to the latter, because of the expense of land, &c. Some of the more recent devices are well noticed, as follows, in an article by Prof. Henry Robinson, of the Mechanical Institute of Civil Engineers, England:

"Mr. William Webster has devised a system of purification of sewage by means of electrolysis, which I have seen in successful operation at the Crossness outfall. The principle consists in breaking up the organic compounds of sewage into their constituent parts, by passing an electric current through iron electrodes, which results in the formation of iron oxides and chlorine. The first produces oxygen and the second produces chloric acid, which destroys organic matter.

A non-oxidizable carbon plate is employed for the positive pole, and iron is used at the negative pole, so that by means of a porous diaphram between, the component parts of the mineral salts are collected. At the non-oxidizable plate a solution of chlorine and oxide of chlorine is produced, and at the negative plate ammonia, soda and potass are formed, which precipitate the magnesium salts and lime in the liquid. A large portion of the solid and dissolved impurities in sewage is thus deposited in the form of sludge. The process, which is one of much scientific and practical interest, is now under investigation by the officials of the county council. Mr. Webster has also arranged an electric filter for the purpose of treating the effluent where a higher degree of purity is required. He applies the electric current to a carbon filter, the carbon being the positive pole; the nascent oxygen produced in the pores of the carbon by the current destroys organic matter in the liquid, and at the same time preserves the filter in a clean state. This system is obviously applicable to the filtration of domestic water. M. Hermite (of electric bleaching notoriety) is employing, at Rouen, a battery of electrolyzers (with anodes of platinum and kathodes of zinc), to produce a deodorizing and disinfecting action upon sewage. He passes the sewage through a battery of this kind containing common sea salt, in the proportion of 70 to 350 grains per gallon.

"Webster's process is intended to take the place of the purification of sewage by chemicals involving three processes, precipitation, oxidation, and disinfection, attended with the disadvantage that if too many chemicals are used fermentation in the river may take place. The principle of the electrolytic system is that the compounds always present in sewage are split up into their constituent parts by the electric current, passed through iron electrodes. At the positive plate chlorine and oxygen are set free, and combine with the water and the iron plate to form acids which act powerfully upon the organic matter. A flocculent precipitate of the impurities in suspension and in solution is formed, which, after being first carried to the surface by the hydrogen generated, gradually settles to the bottom, leaving a perfectly innocuous effluent. The effluent can, indeed, if sufficient electric power be used, be converted into an absolute disinfectant. The plant set up by Mr. Webster, at his own expense, for the purpose of experiment, consists of an engine of 20 horse-power, and a dynamo capable of developing 43 horse-power, together with a wooden shoot fitted with iron electrodes. The sewage is pumped by the engine (which also drives the dynamo) into the shoot, and in traveling along it (shoot) every particle of the sewage is brought into direct contact with the plates or electrodes. The fluid passes from the shoot to the tanks, where the precipitate of suspended matter or sludge, as it is termed, settles at the bottom in about two hours, the effluent being afterwards drained off. The electrodes are made of cast iron, and those in the shoot are divided into twelve sections, which can be connected either in series or in parallel. When once the necessary plant, which can be adapted to any existing tanks, has been set up, the only outlay involved by the process, beyond the ordinary working expenses, is in the renewal of the positive electrodes, for these are acted upon by the acids formed. It is calculated that to treat a flow of ten million gallons of sewage a day, the consumption of iron should not exceed four hundred and seventy tons per annum, while the mechanical power required would be 8 horse-power per three hundred thousand gallons. These calculations are based on London sewage, which is often diluted with rain-water. But where the sewage is stronger, the power employed need not be so great, because the chlorides which form the precipitating agency would be present in greater proportion to the volume. It is estimated that the working cost of the electrolytic process when applied to a large volume of sewage would be about thirteen shillings per million gallons, and that the whole sewage of London might be treated for about thirty-six thousand pounds a year. Taking into account depreciation of plant, interest on capital, &c., the amount would probably be within fifty thousand pounds.

"*Engineering*, at the conclusion of a long and favorable notice of Mr. Webster's electrolytic system, says: 'There is a charming simplicity about Mr. Webster's process. He manufactures his chemicals, to a great extent, out of the sewage itself, and he uses them in the nascent state, when it is well known they are most powerful. Instead of adding five, ten, twelve or fifteen grains per gallon of solid matter, as is now done, he only adds two, and he not only precipitates the matter in suspension, but he also removes some of the organic matter in solution. This latter is an important matter, as it defers the second decomposition so long that the effluent may be carried down to the sea, or oxidized by natural influences, before it can occur. The extent to which the purification can be carried is merely a matter of time, and in hot weather, when the quantity of sewage is reduced and is consequently fouler, it can be allowed to remain for a longer period in the electrolytic bath.'"

Prof. Robinson also details his investigation of the precipitating and filtering materials which are employed at Acton and Hendon by the International Sewage and Water Purification Company. The process consists in first precipitating the bulk of the suspended, and some of the dissolved matters, by means of what is termed "Ferozone" (it was formerly called magnetic ferrous carbon), and in passing the effluent through a filter containing a material named polarite. The essential difference between these two materials is that the precipitating substance (ferozone) which is mixed with the sewage, contains mainly sulphate and magnetic oxide of iron rendered soluble, whereas the filtering substance (polarite) is composed of more than 50 per cent. of magnetic oxide of iron, with silica, lime, alumina, magnesia and carbonaceous matters which are absolutely insoluble. These materials are manufactured from natural deposits which are found in the anthracite coal formation. The main features in this process are as follows: So far as the first part is concerned, the precipitating action is produced without the aid of lime. At Acton, about eight grains per gallon of sewage are employed, and from one to three hours' rest are allowed. Clarification and deodorization are thus effected, and the deposited sludge (when pressed into cakes in the usual way) is found to have a manurial value which leads to its being purchased and used upon land. The next part of the process consists in passing the effluent from the precipitation tanks through a layer of the other substance (polarite), and it is necessary to place above it a stratum of sand or other material (the surface of which requires occasional raking over), to intercept any suspended matter which would clog the pores of the filter and interfere with its action.

The effect of the polarite is singular, and appears to be unchangeable, at least no alteration in its efficiency has been found after fourteen months' use at Acton, according to a report by Sir Henry Roscoe; a longer experience elsewhere is stated to give the same results. This filtering material thus discharges an important function in sewage treatment,.as it serves in lieu of a much larger area of land, or of an artificial filter, such as is often made by alternate strata of burnt clay or alluvial soil. The explanation of the action of polarite is that it liberates from its microscopic pores large volumes of oxygen, which attacks and destroys organic impurities. The magnetic spongy iron which came into use some years ago for purifying water was found to rust and cake; polarite, however, is remarkable for its entire freedom from rusting or caking. The results which I have witnessed lead me to form a favorable opinion of it, both for precipitating sewage and for the further purpose of filtering effluent sewage either from tanks or from sewage farms, when the purification has not reached the required standard.

"Another precipitation system, called the 'Amines' process, has recently attracted attention. The materials employed are certain organic bases, which are found in the chemical group of amines (ammonia compounds) in combination with lime. The effect which is claimed for this is, that the sewage effluent from the process is sterile as regards the presence of living organisms, as the re-agent which is formed by the chemicals is completely destructive to organic life. I have witnessed a trial of the process at the Wimbledon Sewage Works, where herring-brine is used, which is mixed with milk of lime and evolves a soluble gaseous re-agent, having a briny odor. This, when applied to the sewage, produces rapid deodorization and deposition of flocculent matter. Dr. E. Klein, F.R.S., has examined the process and confirms the sterilizing influence of the effluent which is claimed."

II. In the *Irrigating Process*, the sewage is applied in as fresh a state as possible to the land, with a view to cultivation and some profit in farming. There is, of course, filtration through the soil, but it is distinguished from other methods because dependence is placed upon the power of growing vegetation, and the irrigation or application of the sewage is not made subservient to the rules and methods which obtain in the Intermittent Filtration system.

III. *Intermittent Filtration* was introduced by Dr. Frankland, but has undergone many modifications. The reports of the Massachusetts Board of Health, 1888 and 1889, contain much of value as to it because of some valuable experiments conducted at the Experimental Station of the Board. The full report will be completed this year. The two leading new facts which seem to be brought out by these experiments are these:

First. "Sewage can be more efficiently filtered through open sand than through sand covered with soil, and the maximum quantity of sewage can be purified when the upper layers of the filter are composed of open sand through which the sewage will rapidly disappear, and into which the finely-comminuted particles of suspended matter will be drawn by the force of the down-flowing currents. The daily application will sink into such a filter in a few minutes, leaving room for air to enter and come in contact with the thin laminæ of liquid covering the particles of sand. A filter so constructed, it may be remarked, is quite different from those ordinarily used, in which fine sand or loam is placed at the top with coarse material beneath. In constructing filter areas in accordance with the new views which we derive from these experiments, we would, therefore, reverse the old process, using fine material at the bottom and coarse at the top. In a practical way, we would, under ordinary circumstances, strip off the first foot or so of surface-soil and replace it with coarse sand. The additional expense imposed in the construction of the filtration areas by making the upper foot in depth of coarse sand amounts to from $300 to $400 per acre. There comes from this, however, a decided increase in the efficiency of the filtration area, and consequently a given area so prepared will do more in the way of purification than areas not so prepared. This increased efficiency of area leads again to reduction of annual expense, inasmuch as a considerably less number of men are required to attend to 100 acres, the amount estimated in the report. With such filtration areas thoroughly underdrained to the depth of five or six feet, the sewage of 1,000 persons per acre may be efficiently purified with proper management, for all time to come. I say for all time to come, because we now know definitely that the filtration area is not a mere straining arrangement, but that it is, on the contrary, an appliance for cultivating the microbe of nitrification, the recent studies upon nitrification having confirmed the view that the destruction of organic matter by nitrification is a biological process purely, and not, as has been ordinarily considered, a chemical process at all. The experiments show further, that not only is the nitrification due to living organisms, but that the microbes are confined to the surface-soil and are found only rarely three feet below the surface." Such a filtering field is said to be entirely devoid of smell.

The second idea illustrated is, "The fact that there is a relation between the quality of the filtering material and the amount of sewage of a given composition to be applied. Thus, if less than a *proper amount* of sewage is applied to a *given area* of a given material, less perfect purification will be obtained than if the larger quantity which the given material is capable of handling is applied. From whence it clearly results that undoubtedly many of the foreign experiments in this direction have been failures from lack of a clear understanding on the part of the experimenters of the necessity of applying a certain definite amount of sewage to a given area, in order to develop the maximum nitrifying power of the filtering material."

An excellent brief report on these various systems, by Engineer Geo. W. Rafter, of Rochester, N. Y., as made to that city in May, 1890, will well repay perusal.

USE OF THE SPECTROSCOPE FOR DETERMINING WHETHER CESSPOOLS, ETC., CONNECT WITH WELLS.

Prof. L. I. Blake, of Kansas, has been able to detect the presence of sewage in wells by a method which is thus described by him:

"It is familiar to all that a glass prism will separate a ray of sunlight into the seven colors of the spectrum. If the ray comes from a metal which is vaporized in a hot, colorless flame, as in a Bunsen gas flame, the spectrum no longer consists of all the colors, but of one or more bright bands, characterized by their color and position in the spectrum.

"Thus, sodium gives a bright yellow band, which is in the position of the yellow in a Swiss spectrum, while calcium gives two, a red and green band, in their proper places. The spectroscope, which is essentially a glass prism, and a small telescope to observe the spectrum with, can thus detect by their characteristic bands the presence of substances which can be volatilized in a colorless flame.

"Further, there can be no mistake, for no two metals give the same bands. The question arises, can small quantities of the substances in solutions be thus detected? Prof. Schellen asserts the sure and easy determination of sodium, when less than the 180,000,000th part of a grain is present, and of lithium when less than 40,000,000th part of a grain. The delicacy of the spectroscopic tests thus exceeds the chemical. Indeed, by the spectroscope several new metals, as thallium, rubidium, caseium and iridium, have been discovered. For the purpose on hand, then, the spectroscope provides an exceedingly simple method.

"A solution of carbonate or chloride of lithium, an ounce to a quart of water, was poured into the suspected sources of pollution in the neighborhood of a well, and after a week or so some of the well-water was examined in the spectroscope. Lithium gives one bright red band toward the remote red end of the spectrum. It is impossible to mistake it, even if the solution holds less than one part in one million. The sensitiveness of the test is greatly increased by boiling down the water to be examined, say a quart to half an ounce. A platinum wire is dipped into the water thus prepared, and then held in the flame of a Bunsen burner.

"Nine wells were examined, situated back of the blocks on the principal street in Lawrence. These wells are located, as regards stables, out-houses, &c., about as is customary in small cities, and their waters are used quite generally for drinking purposes by the families in the blocks. The test showed direct communication with a privy, thirty feet distant, into one of the wells."

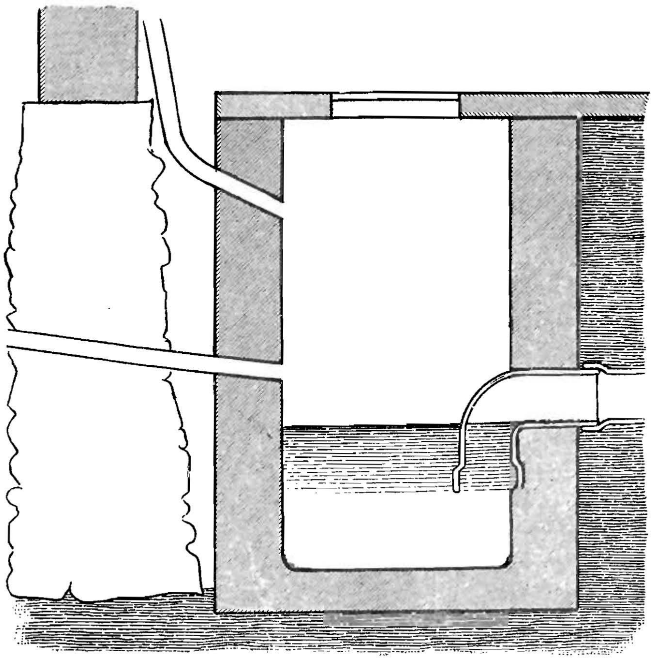
STOPPAGE OF DRAIN-PIPES, GREASE AND GREASE TANKS.

Much risk and annoyance are occasioned by the stoppage of house-pipes, either inside the house or between it and their connection with the cesspool or sewer. Occasionally, in small pipes, this happens from freezing, by reason of the exposure of the outside drain, and a dribbling or intermittent flow. This is rare, and the only remedy is the usual one, of thawing out. Oftener, something gets fast in a small pipe, and so collects around it material which clogs the pipe. Plumbers now have instruments for the dislodgment of small stoppages between traps. Sometimes a strong solution of caustic potash, such as is used in making soap, will dissolve out the obstruction. Often the trap itself has gathering in it sediment that serves to fill up the pipe where the flow is not rapid enough to clear it. Hence, those traps are valuable which have a screw fixture at the bottom, so that the seal can be opened and cleansed. But the most prolific cause of stoppage is the accumulation of grease in the pipes. As to this, and the remedy, we cannot do better than to quote from E. S. Philbrick, C.E., in "American Sanitary Engineering:"

"The grease comes from the washing of dishes in kitchen sinks, which goes down the wastes, mixed with warm water, in a fluid state. It soon becomes chilled in cool weather, and adheres to the sides of the drain, where it accumulates continually, till sometimes filling the pipes for long distances. If the drain has a very rapid descent, the flow of water may sometimes prevent this accumulation, but otherwise some provision is needed for intercepting the grease in a small tank. The nearer this tank is to the sink the better, to guard against the choking of the pipe above the tank. Where the sinks are located against the outer walls of the house, the tank is best placed outside the walls, where the grease can be removed without creating a nuisance in the house. Such a tank is shown in this diagram, built of brick and hydraulic cement, plastered smoothly inside.

"The inlet and outlet-pipes are so located as to each other as that the outflow starts from below when the level of liquid reaches a certain point, and so the grease has time to congeal and separate.

"For small and medium houses, this tank should be at least three feet long on the inside, and about two feet wide, with rounded corners. The outlet should be made with a bent-joint pipe dipping under the water, so that the grease, while floating on the surface, will not be drawn into it. The inlet should be at least six inches higher than the outlet, so as not to be obstructed by the accumulation of grease, which takes place in the form of a thick scum on the water.



It is also best to allow about a foot below the mouth of the outlet in the clear, for the accumulation of sand and other solid matter which is heavier than water. A man-hole cover is placed on the top, through which the grease may be removed as often as occasion may require. The soil-pipes from water-closets should never discharge into this receptacle. It should be so arranged upon the branch leading from the kitchen and pantry sinks only, having its outlet connected with the main drain where convenient. If the sink is not situated near enough to the outside of the house to allow this grease tank to be constructed outside the walls, it can be made in the cellar or basement, of wood, and lined with heavy lead. In such cases the grease does not cool so readily as on the outside, and if the tank is not of a liberal size, the grease is liable to pass through before being separated from the water. Whenever the drains become choked with grease, if the pipe is accessible, it can be cleared by pouring hot water over the outside in a small stream for half an hour or less. This heats up the whole contents, and the softened grease then passes along with the water that is applied outside. But the better way is to catch the grease before it gets into the pipes. If once allowed to coat the inner walls of the drains, much trouble will ensue."

DISINFECTANTS.

Isolation and disinfection continue to be our chief means for preventing the spread of contagious diseases. It is important to remember always that cleanliness in all its details is the one essential before and beyond all else, and that nothing can take its place. We have heretofore in circulars and reports so fully treated of disinfectants, that it is only necessary here to add a few words because of some more recent investigations. The value of fresh-slaked lime and of milk of lime or lime-wash, as noticed in the last report, has been sustained. Heretofore these have been regarded too much as favoring cleanliness without having any special power over lower forms of life or the chemical changes occurring in filth. Sulphate of iron hardly maintains its former asserted value and is being replaced more by sulphate of copper. Carbolic acid, which for a time was partially supplanted by corrosive sublimate, has resumed its former place. A five per cent. solution is an effective disinfectant agent, and it even destroys spores after an exposure of twenty-four hours. Corrosive sublimate, while of great value, is not of so universal application as was at one time contended. By reason of the fact that it coagulates albumen rapidly, it often does not reach a mass of matter, but forms an outer coating. It also suffers decomposition into inert compounds, when mixed with organic acid. It is not as good as chloride of lime for the disinfection of excreta or sputa. As it corrodes metals or amalgamates with them, it cannot long be used in metallic vessels or poured often into lead or other plumbing-pipes. Its effect is much increased by adding to the solution 1 to 1,000, five per cent. of hydrochloric acid, or a little more than its own weight of common salt. If kept long in solution it is decomposed. Its chief use is for application to all floors furniture and clothing, for the disinfection of the hands or to immerse clothing in, which cannot be boiled. Or if soiled clothing has to be retained awhile in the sick room, it can be immersed for one or two hours in a solution of 1 to 1,000. Remember always that it is a poisonous solution, and so never to be in common pitchers, bowls or pails. In Germany, and to some extent in this country, rubbing the walls with pieces from a bread loaf, not too fresh or stale, has been found to remove bacterial germs with much success. The plan is to take, for instance, the end of a loaf just large enough to be conveniently held and rub the cut surface along the wall, the crumbs being caught on a paper spread on the floor and then burned. By paring the crust from time to time a small half loaf will cleanse quite a surface of wall.

Chloride of lime fully retains its value as a disinfectant, but small packages are often adulterated.

SCHOOL HYGIENE.

There has been throughout the State an increase of interest in all that relates to the sanitary care of children in our public schools. Teachers are studying the great sanitary problems involved in education, both in respect to the child in his physical and mental training and the conditions and circumstances by which he is surrounded. One after another, poor school-houses are being replaced by better ones and more care is being exercised in the choice of locality and the control of adjacent buildings. The State Superintendent of Schools is alive to all these interests and has done and is doing much in this department of educational progress. The systematic teaching of hygiene in the higher schools and the frequent instructions of teachers as to it, are having good results. As we have given large space in recent reports to this subject, we only allude to it in our present report, but shall probably, in connection with the State Superintendent of Schools, ere long conduct anew a systematized inquiry into the details of sanitary conditions in the school buildings of the State.

HOSPITALS.

In a previous report we had occasion to note the need of hospitals in general and of cottage hospitals in our smaller cities, both as a means of isolating communicable diseases and to meet the emergencies of accidents. Long Branch, Plainfield, Mt. Holly and Asbury Park illustrate the feasibility of these smaller hospitals, and cities like Montclair, Bloomfield, &c., are considering their needs.

The time has come when a hospital means far more than it once did. Models of plainness and sanitary completeness, with the best of attendance and discipline, with regulated out-door relief, with temporary provision for maternity to those whose home care cannot be adequate, and with a widespread influence as to health and sickness, thrift and morals; such a hospital comes to be a real Hotel Dieu, a bond of hope, a center of consolation, a viaduct between the poor and the rich, a grand heart exchange in which there is practical demonstration that each is and means to be his brother's keeper to that extent which duty and kindliness prompt. It solves many a question as between capital and labor, wealth and want, recklessness and morality. It is said in England that many a cloud is lifted because every Englishman knows that there is a hospital bed ready for him and hospital relief at hand when income fails and when poverty threatens. How beautifully this was recently shown when the collection of Hospital Sunday in London amounted to over $100,000. On the Friday previous, Jonathan Hutchinson, the distinguished President of the Royal College of Surgeons, in a remarkable address, treated both of the value of the hospitals and the remedies now in use to prevent them from such a promiscuous charity as would encourage dependency. He claimed that they constitute at once the right hand of science exerted for the good of man and the most beneficent department of Christian civilization. We have space only to quote as follows:

"Many definitions may be devised for the word 'hospital.' The one which I like best to keep constantly in mind is that of 'an institution for the prevention of orphanage.' Not that all, or nearly all, the maladies treated entail danger to life, nor that all the patients are parents. A large proportion, however, of hospital practice does concern those who have others dependent upon them, and we may suitably recognize degrees of incapacity short of actual death. The loss of a limb or an eye, or a permanent impairment in health, may easily entail on a man's family calamities little short of what would have followed his death. Such a definition helps us, I think, to some adequate conception of the real value of these institutions, and places medical charity in the position which it ought really to occupy—that of the foremost of all forms of beneficence. In no other sphere can so much good be done at so little cost. What is wanted is that medical skill should be well developed, and next, that it should be made accessible to all. Now the good which our hospitals effect is far from being restricted to their own patients. There are the schools in which medical science is cultivated, and from which those go forth who spread its benefits all over the world. We claim that within recent years some diseases have been nearly exterminated, that the ratio of mortality for nearly all has been greatly diminished, and the average duration of human life definitely increased. Let it be clearly understood that we wage no fruitless war with the divine ordinance of death, but rather accept it thankfully, as one which favors the progress of our race and the perennial rejuvenescence of mankind. We are at war, however, with death in its premature and irregular forms; we do wish to prevent and remedy, as far as possible, the disabilities of life, the disqualifications for usefulness in its duties and enjoyment of its happiness; we do wish to prevent orphanhood in all forms and degrees, and to accomplish as far as we may be permitted what has been so beautifully expressed by our poet:

"'To sweep destruction from the day,
And make the chalice of the big round year
Run o'er with gladness.'"

The larger hospitals at Jersey City, Newark, Camden, Orange, and the recent new General Hospital at Paterson, are of great service to the public health. There should be an increase of these facilities in other cities. The following is a list of those at present in New Jersey:

LIST OF HOSPITALS.

The Englewood Hospital	Englewood, N. J.
The Burlington County Hospital	Mt. Holly, N. J.
The Cooper Hospital	Camden, N. J.
St. Michael's Hospital	Newark, N. J.
St. Barnabas Hospital	Newark, N. J.
The German Hospital	Newark, N. J.
The Newark City Hospital	Newark, N. J.
St. Francis Hospital	Jersey City, N. J.
The Jersey City Hospital	Jersey City, N. J.
Christ Hospital	Jersey City, N. J.
The Bayonne Hospital	Bayonne, N. J.
St. Mary's Hospital	Hoboken, N. J.
St. Francis Hospital	Trenton, N. J.
Trenton City Hospital	Trenton, N. J.
John Wells Memorial Hospital	New Brunswick, N. J.
The Monmouth Memorial Hospital	Long Branch, N. J.
St. Joseph's Hospital	Paterson, N. J.
Paterson General Hospital	Paterson, N. J.
Ladies' Hospital	Paterson, N. J.
The Muhlenburg Hospital	Plainfield, N. J.

COMPULSORY NOTIFICATION OF CONTAGIOUS DISEASES.

It has long been a dicussion in the medical profession how far it is the duty of physicians to notify Local Health Boards of the existence of cases of communicable disease. In no regard has the growth of medical opinion as related to the care of public health been more marked. It is now so far conceded, that most physicians respond with readiness, and law is definite and decisive in its penalty for those that neglect. It is enough that if there is a case of small-pox or scarlet fever or diphtheria in a house, sanitary administration and the safety of the people require that the Health Inspector should, early in the case, be made aware of the fact by the physician in attendance. There may be differences of opinion as to what diseases are to be notified, who is to be notified, whether the physician is to be paid for the notification and what is to be done by the health officer thus notified. But these are details which must be settled by law and ordinance. Disapproval of some detail does not affect the necessity of the law. Such has been the progress in this direction in England and Wales, that Parliament in 1889 extended the Infectious Disease Notification act. It is now enforced (March, 1890) in 56 large towns, in 436 urban, 311 rural and 17 port sanitary districts, which represent about three-fourths of the entire population, and is constantly being extended as an indispensable sanitary measure. In many of our American cities similar progress is made, but very much still remains to be done. Notification is of little value unless there is prompt and efficient action by the sanitary authority in preventing spread of the disease. This means the details of sanitary administration, in which so many of our cities are deficient. Our own laws are excellent and recognize it as a special service to be promptly done and to be followed by prompt sanitary methods. We must still urge this as one of the most important methods for preventing the spread of communicable diseases. The recent decision of the Supreme Court of Errors of Connecticut, in the case of the State *vs.* Nathaniel P. Warden (see report of its State Board, 1889), fully presents the grounds of such laws and confirms their constitutionality.

PROPRIETARY MEDICINES.

From time to time our attention as a Board is drawn to the evils arising from the extensive use of patent medicines. While physicians probably gain some pecuniary advantage from the evils resulting from their use, the general public suffers both as to money and health. It is doubtful whether any such combinations have any right to be protected by patent. The prescribing of a medicine presupposes its adaptability to a particular disease as found in the individual for whom the prescription is made. This necessarily assumes that there are both knowledge and experience on the part of the person administering it. So, in fact, if ever protected by patent, it should only be in order that if found of service by those skilled in the science and art of medical practice, its use by them, or with their approval, should bring some reward to the originator of the combination. So far from this, such medicines are generally taken without medical advice, and on testimony which, if thought true on the part of the persons giving it, does not accord with any of the laws of competent clinical evidence. Examination of patented compounds has over and over again shown that, as a rule, they are remarkable only for the absence of boasted qualities and for the smallness of their actual cost in comparison with the amount paid for them. Those who are ailing, or their friends, are too easily influenced by the boasts of the patentee, the certificates appended or results which have no relation to the recovery claimed. Those who, with impartial and classified observation, have sought for the evidence which comes from a sufficient number of authenticated cases are generally able to point to results more or less disastrous. Governments have from time to time legislated upon this subject. Thus, recently (1890) in Italy, laws have been passed for the suppression of the sale of patent medicine.

"No proprietary nostrums may now be offered for sale in that country unless they are favorably passed upon by the Superior Sanitary Council. Over 200 such articles have been rejected, and at a meeting on May 13th every article then before the Council was disallowed, and the grounds of this action were made public, namely, that all these rejected 'specialties' contained remedies which cannot be used with safety except under the direction of a medical man; that many of the articles were actually dangerous, and that many others possessed none of the virtues attributed to them."

France has similar provisions. With the multitudes of patentees and druggists who make money out of this class of medicine, we cannot hope for such relief in the United States. But we can present the fact that the public health is jeoparded by the wholesale use of such medicines, and ask that individuals and the public be more on their guard against them. Besides other evils, there is abundant evidence that some of them contain alcohol in some of its forms, which should not be thus administered. It ranges in quantity from 20 to 40 per cent. It must be said of patent medicines, as a whole, that they are not in the interest of public health.

LOCAL BOARDS—THEIR INSPECTION AND OTHER DUTIES.

We have had occasion heretofore, as we have now, to note the advance that has been made by Local Boards in their administration service and to some degree the advance of the people in provision for and appreciation of their work. So much for the exaltation. But there is a valley of humiliation. We pity the New Jersey Health Officer who is not at times almost cast down by a view of what might be, if only his ideal of excellence were carried out or if the municipality or district would only provide the funds for economic yet broader administration. Let a Board of Health or a few members of Common Council spend a day at the New York Health Office and get details as to its actual work, or hear what its former President and our valued citizen, J. C. Bayles, Ph.D., can tell of its working, and they would at once see that both the work and the provision therefor should be tenfold. Yet we are aware how actively service has been rendered within the pecuniary means provided. Neglect and delay mean lost lives, and all the present evils and entailments of preventable disease.

Require of your Boards of Health exact methods in every way, but require of yourselves that support which their duties demand. Make it possible for the health officer to give up other work and devote his whole time to this great administration. Have politics anywhere else you choose, but do not ask the man in charge of the public health to perform any party service. In this report we furnish a guide to Local Health Inspectors of which extra copies can be secured. It should be in the hands of each Inspector. We also now have the various circulars of our Board in pamphlet form for the special use and reference of Local Boards.

VARIOUS LAWS UNDER SUPERVISION OF THE BOARD.

In addition to the general health laws, the various laws to which the Board bears direct or collateral relation are those as to contagious diseases of animals, as to petroleum, to adulteration of foods, drugs, &c., to cemeteries and to sanitary inspection of public institutions. The report as to contagious diseases of animals will be found, as directed by law, in the report of the State Board of Agriculture. The Dairy Commissioner attends chiefly to the law as to adulteration. Questions referred to us by Local Boards receive their due attention. Under the law as to petroleum the quality has much improved and accidents are much less frequent. Because of insufficient inspection service, the examination of institutions has not been largely attended to during the year.

CIRCULAR LXXV.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

HEALTH INSPECTORS' GUIDE,

AS PREPARED AND ARRANGED BY

EZRA M. HUNT, M.D., SECRETARY,

With Sections added, as marked, by Drs. Mitchell, Newton and A. C. Hunt, Sanitary Inspectors.

HEALTH INSPECTORS' GUIDE.

SECTION I.

A Health Inspector is the agent of the Local Board of Health; it is his duty to carry out the instructions of the Board and to inform himself as to all conditions which can, or do, unfavorably affect the health conditions of the city or district to which he is assigned.

NEEDS OF HEALTH INSPECTORS.

I. KNOWLEDGE.—Where the people are fully alive to the necessities of sanitary administration this means a great deal. In England and in some other countries the Health Inspector must have graduated after a course of three or four years of sanitary instruction. He is expected to have some of the varied knowledge which belongs to the architect, the engineer, the builder, the physician and the chemist. We cannot, at present, require such a standard. There must, however, be knowledge of what is meant by good drainage, a healthy house, healthy surroundings, a proper water-supply, proper provisions for the removal of liquid refuse or garbage, healthy conditions of streets and highways, and in general whatever constitutes a nuisance hazardous to the public health. There must also be knowledge of the chief laws under which Boards of Health operate, and especially those parts of the laws which define nuisances and their mode of abatement and the duties of Health Inspectors. Most of these are in the law as found in Chapter LXVIII., Laws of 1887, 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," and especially in Sections 12, 13, 14, 24, 28 and 31 of said law. Circular LX. of this Board contains this law, together with references and directions to it. In the same circular many other collateral laws are referred to. This can be had by any Health Inspector on request by postal. He should also have for reference at home, a file of all the circulars of this Board. The next source of information are the ordinances of the Local Board of Health, which give more concise detail as to requirements and penalties, and as to the nuisances especially to be dealt with, although power to abate a nuisance not named also exists. (See Section 24 of the law referred to.) Both the law and these ordinances should be very familiar to the Health Inspector.

II. Tact.—The Health Inspector must have tact. This also means a great deal. It means, first of all, politeness. However much decision and plainness of speech may be needed at times, courtesy and persuasion are much oftener needed. It is natural for persons to claim supremacy in their own homes and not to regard anything they do or suffer to exist, as a nuisance. A kind explanation of the evil, of the rights of others and of the law often avails. All that prudence, good judgment and firmness mean are to be in exercise. Temper and coarse language are never needed. We have known Inspectors who were resisted at first, come to be valued as of the greatest service to the same individual when nuisances existed or sickness occurred. Where there is forcible resistance, report must be made to the Board or an officer summoned.

III. Faithfulness.—The man who is looking for an easy place should never seek the office of a Health Inspector. It is a steady, busy and responsible work. He must know it is for life and health as well as for pay that he is serving. If the pay is inadequate, he must hope for reward in a sense of duty done, and in such increase as the Health Board generally gives, as soon as it can, where it is able to see good work and good results. Other places may be rightly sought for party service, but for this there must be other tests.

IV. Method.—The Health Inspector needs to be an orderly man. When he inspects a nuisance complained of, he must have clearly before him what he is to find out about it. When he inspects a house, he must finish the cellar before he gets to the highest story, then to recall some important question admitted. To this end he must have his own book of reference and his memorandum-book to put down just what he finds. If he trust to memory he will blunder. His daily report should be submitted or taken down in writing, in order that it may be a record and prevent unnecessary visits. Samples of forms and suggestions are furnished from this office.

INSPECTION OF THE GROUND LOCALITY.

The Inspector of any city or district should at first acquaint himself with the character of the ground or foundations of the city; both as to its natural and artificial conditions. He needs to know the structure for several feet down, whether rock, clay, sand or whether porous, or holding water, and how much of rich soil there is on the top. It is not generally the same all over the district. Note the facts and where the ground is apt to be wet and damp. No ground is fit to build on unless the sub-soil water-level is ten feet below the surface. If not this, it should be under-drained. Wet ground, even where the surface has no water on it, is often a cause of ill health. Drain and fill up wet cellars and basements, and on wet ground have no cellar. Know where all water-pipes, gas-pipes and sewer-pipes are laid, what depth, of what material, where they intersect. Water-pipes often, leak and keep the ground damp. We have seen lines of gas-pipe so leaky at each joint as that a match would cause a flame, and have seen sewer-pipes put down that let out along their course half of the liquid sewage. A leaking sewer-pipe may do other harm if near to a thin or broken water-pipe.

SANITARY MAP.—Urge your city to have a sanitary map. We have specimens of such for Jersey City, Hoboken, Bayonne, Elizabeth, &c., showing kind of soil, of pipes, places of old streams and all underground conditions. In the absence of such you may get many facts as to ground from cellars, &c. Much as to sewers and bends and joinings, and as to gas-pipes and water-pipes from companies. Thus, in general, should the Health Inspector seek to know about the underground, as it will aid much in overcoming some evils. Recently in New York city, an outbreak of disease could be traced by the course of a disused filthy sewer that had been abandoned. If an Inspector will note the ground where holes for any purpose are being dug in it, and the location and condition of pipes when workmen are putting them down or repairing them, he will come to know much as to them. He should keep notes of all facts observed.

SURFACE GROUND OF DISTRICT.

This must be noted as to its soil, whether clayey, gravelly, muddy, naturally wet, &c., and as to the depth of the soil or compost surface before you come to natural ground. Of what kind and in what condition are the pavements? If none, what is the road-bed? Is the surface even or has it places that hold water? Are there any pond holes or stagnant pools? What refuse or foul water is thrown in the street, and where? Are gutters kept so as to carry off surface-water? How is the street swept and how often? Is it watered and when? Has it too many shade trees? Has it elevated railroad, telegraph or electric light wires? Does the street get sunlight?

EXAMPLE OF INSPECTOR'S REFERENCE NOTES ON STREET OR DISTRICT.

Willow street extends from Duane to Grove street, four streets intersect it between these, John, Chestnut, Holly and Bounty streets. Mostly built up—a few vacant lots—some wet—surface of street good grade—well paved—kept poorly—surface ground naturally sterile. After two feet of clay, gas-pipes, and water-pipes and surface-pipes near each other about middle of street—sewer-pipe lowest, about six feet—water-pipes five, gas-pipes four—sewer brick—two feet diameter and foul sides—man-holes or grating at intersecting-pipes of each street—sewer poorly built—connection made under inspection—about one-half of the houses connected—water-pipe connections about one-quarter of the houses. (See Circular LII., Hand-Book.)

INSPECTION OF DWELLINGS AND PREMISES.

An Inspector, in asking permission to inspect private property, should always have either a badge or the city seal, or some writing that will attest his office and his right of inquiry. Unless when asked by the owners, he should never inspect a house except between sunrise and sunset. He should suit himself to the convenience of occupants unless a speedy report is necessary. Any interference should at once be reported to the Board or the assistance of an officer be sought. In such cases, counsel of the Board will direct modes of procedure. It is well for some member of the Board occasionally to accompany the Health Inspector. In any case where free consent is not given, the Inspector should be accompanied by another person. Where cities have adopted a plan of thorough house-to-house inspection, we have never known of any serious difficulty. In case of special inspection, where sickness has occurred, it is well for the attending physician to visit with the Inspector. For this and other reasons, the house inspector should rarely be a practicing physician. For inspecting the yard or premises, it is desirable to have a small diagram dividing into three-feet or five-feet squares, in order to make it easy to mark distances. There is such a diagram in the Inspector's book (Circular LII.), a sample of which is given herewith. First state the distance of any well, cesspool, privy vault or out-building from the house and from each other. Mark the spots on the diagram. If there are wood-sheds or pens of any kind, mark these and their contents. Also any heaps of rubbage, any standing water, or too many shade trees or bushes. Note buildings surrounding premises or cesspools of adjoining property or any other nuisance. Mark their distance from the house. Note all outside pipes of house, such as gutters, and where they empty, and whether there is any vent-pipe or grating, and what these connect with. See if there is a fire-escape or lightning rod and of what kind.

INSTRUCTIONS FOR FILLING OUT RETURN.

Number the Inspection Returns consecutively in the space No......, at head of each blank.

In entry No. 1 (see sample blank) describe the *location* by street and number, or otherwise, *so that it cannot be mistaken.*

No. 2. Give the *full* name of the owner or owners, or tenant.

No. 3. Give the *aggregate* area of all out-houses, sheds, privies, stables, &c., and indicate their positions on the *Plan of the Premises.* (See back of the blank.)

No. 4. If the site of house is *above* level of adjoining land, strike out the words "same as" and "below;" if the same, strike out "above" and "below;" if *below,* strike out the other words. Write in the proper word before the entry "drained before building"—*not* or *tile,* as the case may be. State character of *soil*—gravel, sand, clay, loam, &c.; wet, damp or dry. If *made ground,* state character of filling. Also, state whether the site was *originally* springy, swampy, old water-course, dry ravine, pond, and how roof-water is disposed of.

No. 5. State as to mode of *heating* and *ventilation—painted or papered walls.* If school, assembly-rooms or tenement, state as to *fire-escape.*

No. 6. State whether *yard* is paved—drained—clean—amount and kind of garbage, filth, animals, &c.

No. 7. Describe *ventilation* and *lighting* of cellar or basement. State whether occupied for *living purposes—dry* or *damp*, or at times *water in it*—for what used—note *condition* and *kind* of articles stored, and kind and amount of *refuse, filth*, &c. Condition of rooms in house.

No. 8. Note condition of *sinks*—odor—leakage—traps—waste-pipes. Of *drains*—covered—open—foul—clogged—unventilated. Of *cess-pools*—construction—covered—leaky—full—overflowing.

No. 9. As to *vault*, note construction—leaky—offensive—too full. As to *water-closet*—state whether pan, plunger, hopper or washout, or other—traps—ventilation of soil-pipe—ventilation of room.

No. 10. State whether water used for *drinking and cooking* is cistern, well or hydrant—hard or soft—its general character—whether *sickness* has ever been attributed to it—what probable source of pollution, if any, exists.

No. 11. If more than one family of occupants, letter each. Example: (*a*) *James Guire*, (*b*) —— (*c*) —— (*d*) ——; and give names of head or on memorandum.

No. 12. Note *over-crowding*—occupancy of inner, unventilated rooms, cellar, &c.

Nos. 14, 15 and 16. Inquire especially concerning the following diseases: *Bowel Disorders, Typhoid Fever, Scarlet Fever, Small-Pox, Diphtheria, Measles, Erysipelas, Consumption, Pneumonia.* In No. 14, state how many cases and what diseases are found at date of inspection—*adults, children* and *sexes* specified. In No. 15, the same for the past twelve months. In No. 16, specify the *causes* of any deaths during the past twelve months—giving ages and sexes.

No. 17. Mention any conditions which are *Nuisances*, either public or private—on the premises or adjoining, in street, gutter, sewer. Make suggestions as to the important sanitary *defects* and their *remedy*. If more space is needed for remarks, use a *memorandum* marked same *number* as return, with street and house number also. State facts plainly, but never exaggerate.

See diagram "Plan of Premises," with explanation.

[Sample Blank Filled Out.]

SANITARY INSPECTION OF HOUSE AND PREMISES.

INSPECTION RETURN NO. 1.

See Instructions and Filled Blank. **See Diagram.**

State, *N. J.* County, *Essex.* Township, ... City, *Newark.*

1. Ward, *4th.* Street, } *Spring, E. side, 4th s.* No. *26.*

2. Owner: *John Smith.* *Lessee, 4 tenants.*

3. Size of lot: *25* ft. by *100* ft.; area of lot, *2,500* sq. ft.; covered by house *1,250* sq. ft.; by out-houses *200* sq. ft.

4. Site of house: Level { same as } adjoining land. *Not* drained before building. *Soil, 2 ft. rubbish and clay. Damp. Part of roof-water runs off by leaders on the ground.*

5. Heating and ventilation: *Furnace. No fresh-air box. No* fire-escape.

6. Yard: *Plank walks to out-buildings. Often wet. Garbage and manure heap near stable and pig-pen.* Animals: *1 horse, 1 cow, 2 pigs, poultry.*

7. Age of house: *20* years. Material: *Wood on brick foundation.* Basement or Cellar: *Both. 2 living rooms.* No. of stories: *3.* Light and ventilation *by 4 windows, front and rear. No drainage. Vegetables in one corner. Air stagnant. Not* cemented *and very damp.*

8. Cesspool—Sink—Drain: } *Kitchen sink not trapped—connects by unventilated pipe with covered cesspool, brick laid so as to leak. Cesspool overflows by open drain to alley. No disconnection by air-vent. A drain runs to privy-vault.*

9. Privy-vault: } *Wooden box—no bottom—very offensive. 40 feet from well. Cleaned 2 years since. Too near the well.*

10. Water-supply: *Well-water. Cistern in cellar for laundry use. Too near privy and cesspool (see Diagram).*

....

11. No. of families: } *2.* Names of heads of families: } *1. Mrs. West; 2. Peter McGuire.*

12. No. of occupants: } Adults, *3.* Children, *8.* White, *9.* Colored, *2.* No. Native, *7.* Foreign, *4.*

13. Vaccinal status: Adults vaccinated, *2*; not vaccinated, *1*; Children vaccinated, *6*; not vaccinated, *2*; Had small-pox: Adults, *1*.

14. Sickness now: *1 Child. Cholera infantum. 2 years old.*

15. Sickness during past twelve months: *2 Children, dysentery. 1 Adult, typhoid fever.* United length of time: *2 months.* (*Much sickness in same house previous years.*)

16. Deaths during past twelve months: *1 Child, dysentery. 1 Adult, typhoid fever.*

17. Nuisances and suggestions. (See Memorandum and Diagram attached as to 4, 5, 6, 7, 8, 9, 10, 11, 13, 15, 17.)

....

....

Place and Date: *Atlas, April 4th, 1885.* *Robert Jones*, Inspector.

Sample in Accord with Inspection Return No. 1.

EXPLANATION.

The spaces in the diagram represent areas of five feet square, or a total area of 20,000 square feet—the dimensions of the block being 100 feet by 200 feet.

Taking the bottom line for the front of the lot, indicate by a pencil line the size and shape of the lot—leaving a margin on each side if there be room.

Next, outline the size and location of the house and other buildings.

Then indicate by letters the location of the well (by *W*), cistern (by *C*), privy (by *P*), cesspool (by *Cp*), garbage (by *G*), stable (by *St*), pig-pen (by *Pp*).

Also the course of drain or pipe from the house by a dotted line with the letter (*d*) at the waste-pipe of dotted middle if it is a Drain to cesspool, or by the letter *S* if it be to a Sewer.

Strike out the unnecessary points of the compass. Example: if the house fronts *North*, strike out E. S. W., or if northwest, strike E. and S.

On either side of the outline of the lot indicate location of adjoining buildings, wells, privies, &c., so far as there may be room.

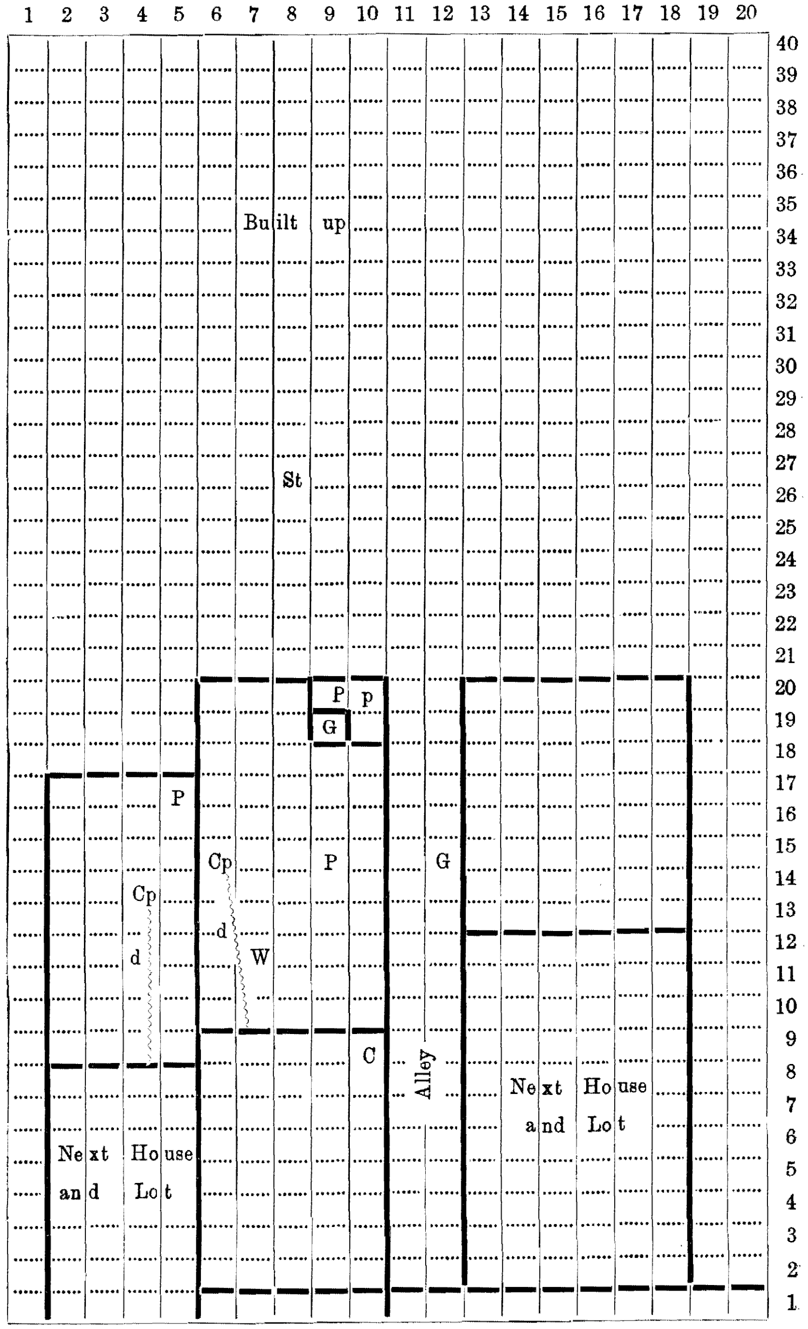
If necessary, the proportions of this Diagram may be increased by estimating the area of each space at ten feet square. If this be done, note the fact.

Part of the Diagram may also be used to show size of rooms, ventilating, heating, &c., if the lettering is explained.

NOTE.—Keep all the sheets as permanent records filed for reference.

OUTLINE ON WHICH TO MARK PLAN OF PREMISES.

South Street.



No. 24. 26

Spring Street.

Front: N. E. S. W.

SAMPLE OF ADDED MEMORANDUM OF INSPECTOR'S RETURN.

Inspection Return No. 1. **26 Spring Street, Newark.**

4. The surface of the lot has the *same level as the surrounding land.* The best that can be done will be to make surface drains to the gutter in the front of the house. Any natural drainage—as by a water-course—with which the lot can be connected, should be utilized by surface drain thereto. This should be kept open and free from any accumulation of filth, garbage, &c.

5. The furnace in cellar is very open jointed and has no fresh-air box. There is much dust from it. Two of the papered walls are in bad condition. There are four tenants and no fire-escape—or double stairs.

6. The yard should be thoroughly cleaned; wet places covered with fresh stone lime; the manure and garbage removed; stable and pig-pen cleaned.

7. The brick cellar is used for storage purposes, and two rooms are occupied as a basement. The cellar should be thoroughly cleaned—the decaying vegetables removed, all refuse and dirt gathered up, and the walls and ceiling whitewashed. If there are any moist places they should be covered with fresh-burned lime, and the windows, front and rear, should be kept open as much as possible to secure fresh air and sunshine. Cistern should be changed from cellar.

8. The kitchen sink connects by an *untrapped waste-pipe,* through a *wooden box-drain,* with a *covered cesspool.* There will, consequently, be a flow of foul air—greater in winter than in summer—from the cesspool into the kitchen, and thence into parts of the house. The waste-pipe should have an **S** trap, and the box drain should be replaced by a metal one, and ventilated by an opening between the house and cesspool. This cesspool *leaches* or leaks, and is too full. It should be emptied, and then made tight by cement—or better still, filled up with clean earth, and a new one made farther away from the well, provided with a ventilating cover. No sewer in this street.

9. The privy vault should be emptied, disinfected, and filled up with clean earth, and a new vault dug farther from the well. If the present one is used after cleansing, the dry-earth system should be adopted.

10. The well, located for convenience about ten feet from the kitchen door, has a leaking cesspool within fifteen feet, and a privy

vault about as near. Its water is *suspected.* Sink drain from kitchen to cesspool runs to near well. Another source of supply should be provided as soon as practicable.

11. The Sanitary Inspector should visit this house frequently and secure thorough house-cleaning.

15. The sickness and death record of this house for the last six years has been so bad that it should have in all details expert sanitary inspection. The plumbing is bad. House scarcely tenantable.

17. *Nuisances* caused by the condition of the *gutter in front of house and of the alley in the rear*, call for immediate attention from the local authorities. The gutter along this street should be cleaned out, and a suitable depth and slope be secured so as to afford proper drainage. The livery stable owner should be notified to abate the nuisance caused by him in the alley.

The Inspector, after pointing out what requires to be done by the owner and occupant, should soon make a re-inspection to see whether the defects and evils have been remedied. If found necessary, formal notice should be served, and compliance should be enforced by such measures as the law provides.

In all this work very much will depend upon the tact, discretion and good judgment of the Inspector.

NOTE.—Sample hand-books to be had on application by postal to E. M. Hunt, Secretary, Trenton, N. J.

CELLAR OR BASEMENT INSPECTION.

No part of the building needs more exact inspection. Here most pipe connections enter or leave the building. (N. B.—The following section will treat of all pipes and fixtures inside of the building and must be studied with this, as everything about the basement or cellar must be examined, as well as all pipes and fixtures, as you proceed upward. For outside connections see another section.) Note the kind of floor, and whether sides are wainscoted. Is there a slate or other damp course where the foundation comes above the ground, so as to prevent transfer of moisture to upper part? How is basement or cellar used? Is it clean, neat and well ventilated? Is it cleansed each spring and fall so that every barrel and box and other contents get out of doors to be cleaned of dust and mould, &c., to be aired and scrubbed when this is needed? Are walls occasionally whitewashed? Are there stationary tubs or is washing done in basement? Has it any pipe openings, sinks or water-closets. What is the ceiling made of? Give depth below ground level, height of ceiling, size and number of rooms, if divided, with number and size of windows. Are walls painted or papered? Are vegetables kept in it? Is there a stove or other heating apparatus? Are there dark closets or pantries? Is milk kept there? Is there a refrigerator? Or where are foods kept? What portion of the area of the lot does the foundation cover? Is the house a tenement-house, *i. e.* meant to accommodate over two families?

FIRST FLOOR.

KITCHEN.—(N. B.—Inquiries as to size, light, walls, windows, sinks, mode of heating and many other points named above apply to this and all other rooms and will be noted by Inspector without need of repetition here.) The condition of closets and of the kitchen sink or scullery needs especial examination. No outlet of liquid waste from the building requires so much care in cleansing and scalding out as this. The kitchen stove or range is of much use in emptying dust-pans or in consuming scraps of various kind. Some ranges now have a special drying-place in which peelings of fruits and vegetables are dried and then used in the fire.

As to other rooms on the first floor, they are to be examined as to heating and ventilation, as to places for the accumulation of dust, as to any sources of foul particles or gases and in general as to all those things which are requisite to cleanliness or good housekeeping. Floors, walls, papering, closets, are all to be examined, especially in case there has been contagious disease.

SECOND FLOOR.

As this is a floor of bed-rooms, bath-room, and appendages, and for closets for keeping of clothing, laundry material, &c., it needs some insight as to these. Stationary wash-basins in bed-rooms are seldom safe, but these and other matters relating to pipes and fixtures will be noted in another section.

THIRD FLOOR.

This floor is generally occupied like the second and therefore needs no special remark. In any thorough or ordered inspection, the attic and store-rooms should be attended to. We have found them stored with old paper, rags, old shoes and clothing and soiled furniture, which, while better there than in occupied rooms, are still out of place and may be the source of evil.

THE SICK-ROOM.

There are always times when some bed-room has to be used for sickness. If this is of a contagious nature or long continued, the Inspector is often called upon to aid in detecting the cause. If so, beside the other close inspection of the house, he needs to make some special inquiries as to this particular room and its contents. How was it occupied previously, and with what sickness, if any? When last thoroughly cleansed? Has it curtains or other receptacles, which would long retain infective dust? Is its paper such as tends to hold dust, or such as may give off particles of arsenic? This is sometimes used in making papers, and so causes disease. Is soiled clothing put in hot water or a disinfecting solution, before removal from the room? How are all secretions or excretions disposed of, and how soon? See for yourself where and how. Know just how many pounds or pints of disinfectants have been used per week, just what they were and how used? Are water and food kept standing in the room, or used by others after the patient? After the room ceases to be occupied by the sick person, it should be thoroughly aired and cleansed, and articles in it, as far as possible, placed out of doors for the time. Walls often need to be whitewashed or wiped. The end of a cut bread loaf is sometimes used to rub down the walls with, because particles on the wall easily adhere to it, and as it crumbles off on paper placed on the floor, these can easily be burned. Recently, in very infectious diseases, it is advised that the room be left closed three or four hours after occupancy, for all organic particles to settle, and then that things be moved out into the open air with as little stir as possible. In some cases they are previously wiped over with a disinfecting solution, like that of corrosive sublimate. (See section on Disinfectants.)

Tenements or buildings with more than two familes, need special care and each part should be examined and described separately, according to its occupancy. Air space, lighting and ventilation must be fully noted.

We have thus outlined a systematic system of inspection. Not that every house, every time, will need all this, but the Inspector should know of a perfect plan, and should, with system, adopt so much as is needed in each case. If trusting only to memory, he will be sure to forget something important. He should report in writing his inspections, and have them placed on file. He should never inspect without his memorandum-book. Sometime it is proper only to report defects found, and when necessary, at once have them corrected. If he is able, without guessing, to correct them, or tell how to correct them, it is well. If not, skilled workmen must be sought, or the person be notified by the Board to put his house in order.

Section II.

INSPECTION OF ALL HOUSE-PIPES AND FIXTURES.

BY HENRY MITCHELL, M.D., SANITARY INSPECTOR.

Plumbing inspection by a Sanitary Inspector is a search for defects in house-drainage systems which may injuriously affect health. It is assumed that in localities where plumbing inspection is officially performed, ordinances will govern the construction of new work and also the repair of work already in use, and that drawings and restrictions of all drainage construction and alterations will be filed in the office of the Local Board of Health. (See Circular LXV.)

INSPECTION OF DRAWINGS AND DESCRIPTIONS FOR NEW WORK.

After eliminating from the plan all features of the proposed construction which are not in conformity with the local ordinances governing house-draining, the Inspector should examine concerning:

I. Waste-Pipes.—Pipes carrying soiled liquids should be made of iron, and be four inches in diameter, except in the case of buildings where a large number of water-closets and other fixtures are attached to one soil-pipe, where a five or six-inch pipe may be required. The local ordinances should authorize the rejection of all tar-coated cast-iron pipe, because the tar coating temporarily fills up pin-holes and cracks, and withstands a pressure test of ten or more pounds per square inch, but in time the tar coating becomes changed, and any cracks or pin-holes which exist will re-appear. Each branch waste-pipe should be as large as the trap to which it is attached, and in no case should it be less than one and a half inches in diameter. It should, if possible, be carried separately to the soil-pipe. The ordinances, or the specifications, should require that all vertical lead waste-pipes shall be securely fastened to boards by lugs and screws, and that horizontal lines be laid upon planks not less than two inches in thickness, to prevent sagging. (See Circular LXV.)

II. THE SIZE OF VENT-PIPES.—Each vent-pipe should be as large as the trap and branch to which it is to furnish air, except in the case of traps which are more than two inches in diameter. A two-inch vent is ample for any trap. When two or more vent-pipes are joined together, the size of the main vent should increase to correspond to the combined area of all branch vents passing into it until a diameter of four inches is reached, when it may continue without further enlargement. The following table will aid in adjusting the increase in size required, for each additional vent:

DIAMETERS OF PIPES.	One and one-half inches.	Two inches.	Two and one half inches.	Three inches.	Three and one-half inches.	Four inches.
One and one-half inches......	2 in.	$2\frac{1}{2}$ in.	3 in.	$3\frac{1}{2}$ in.	4 in.	....
Two inches......................	$2\frac{1}{2}$ in.	3 in.	$3\frac{1}{2}$ in.	4 in.	....	....
Two and one-half inches......	3 in.	$3\frac{1}{2}$ in.	4 in.	....	....	....
Three inches....................	$3\frac{1}{2}$ in.	4 in.	....	....	....	....
Three and one-half inches...	4 in.	....	....	....	....	....
Areas	1.767	3.141	4.938	7.068	9.621	12.566

The size of the combined vent will be found at the intersection of the sizes at the top and left-hand column. If more than two pipes join, their combined area can be ascertained from the figures at the foot of the table, and the size of the appropriate vent can readily be learned. Back airing, or the return of vent-pipes into the soil-pipe, above the highest fixture, is a common practice, but the extension of the combined vent-pipe above the roof is preferable, especially if the soil-pipe is more than forty feet in height. The large cost attending the use of vent-pipes which extend above the roof or return into the soil-pipe, has led to the introduction of various devices which are designed to cheapen the work and serve as substitutes for the more costly appliances. In some situations, particularly in repairs upon old work, where the running of a vent-pipe would be difficult, it seems necessary at present to depend upon some one of these substitutes. The use of mechanical traps for this purpose is referred to elsewhere. The McClellan vent affords protection against siphonage, but it is useless against back pressure. Back pressure, however, can never occur when the trap on the main drain is in good order and the cold-air inlet and the upper terminus of the soil-pipe are unobstructed.

III. SIPHONAGE OF TRAPS is caused either by the rush of water in large volumes down the soil-pipe, creating practically a water-piston which drives out all air in the pipe ahead of it, and pulls out a pipeful of air behind it, or by the suction created by the sudden discharge of large quantities of water through the fixtures to which they are attached. Even when the top of the soil-pipe is without cowl or other obstruction, air will not in all cases enter and fill the pipes as rapidly as it is withdrawn by the descending water-piston, and the seal is therefore sucked out of one or more of the traps on the lower branches, to supply this demand for air which exists within the soil-pipe. If vents from each trap are returned into the soil-pipe, they may not obtain air in sufficient quantity, because of friction in the soil-pipe, at the instant when it is needed to meet the suction on the branches to which they are connected. But if the vents are carried above the roof, they are no longer hampered by scarcity of air at their upper opening, and consequently they become capable of furnishing an abundant supply at all times, thus assisting in filling the soil-pipe behind the descending water, and thereby effectually protecting the seals of their respective traps. The plans should show the relation of the upper terminus of soil, waste and vent-pipes to dormer windows, and to windows in adjoining buildings. Such pipes should not terminate nearer than twenty feet to any window on its own or a higher level. Cowls and return bends are objectionable because they create friction and obstruct the movement of air through the pipe.

IV. TRAPS.—The "S" trap, suitably ventilated, is not surpassed as a barrier to the entrance into the house of drain air by any other of the many patterns which have been offered for this purpose. There are situations, however, in which it is impossible to reach the trap screw if an "S" trap be used (under bath-tubs, for instance), and in these and certain other cases some other form of trap is preferable. It is essential that the trap screw be easily accessible in all "S" traps, not only for the purpose of cleansing and emptying the trap, but because the vent opening in the crown of the trap is liable to become obstructed by soapy liquid, grease, &c., and its removal by a wire, thrust through the trap opening, is occasionally necessary. All traps having movable parts are objectionable because insoluble material adheres to the valve or its resting-place, thus removing the special seal, and their sharp angles offer obstruction to the rapid flow of waste liquid. Detachable parts (as in the bell trap) are liable to be removed and lost. Where an "S" trap cannot be employed, a bottle trap properly shaped, having a smooth round bottom and a large trap screw, is the best substitute. Grease traps should not be permitted inside of dwellings. (For description of grease trap, see page 22 of fourteenth report.) For bath-tubs this trap may be placed beneath the floor, but not under the tub. Thus located, its cap can be removed without difficulty.

V. OFFSETS.—When plans are prepared after the building is erected, offsets are frequently made in the vertical soil-pipe to permit this pipe to be carried into a recess, or to prevent the cutting of a floor beam. Every offset retards the flow of waste liquids, and affords lodgment for obstructions. It is much better to allow the soil-pipe casing to project a few inches into a room than to introduce unnecessary bends in the pipe. The weight of the vertical soil-pipe should be borne by a brick tier or by a projection of the foundation wall, and not by the straps which are placed around each section. Offsets carry the upper portion of the pipe beyond the center of gravity, and the joints at the bend are liable to be opened by the strain upon them. Soil-pipes should not be placed in a recess which is too small to permit thorough calking of the joints. Where a line of iron pipe is joined to another of larger size, the joint should not be made by the use of a reducer, but a "Y" branch should be employed.

VI. THE LOCATION OF CLEAN-OUT OPENINGS.—Brass ferrules with screw caps should be calked into a "Y" branch at every change in direction in the soil-pipe and all other iron waste-pipes. These clean-out openings should be shown on the plans in their relation to all adjoining walls and partitions, and where these structures will interfere with the free use of a cleaning rod, the plan should show the clean-out branch extended to an open space, so that the cleaning implements may be passed from each opening to the next on the pipe line. In long horizontal lines of soil pipe, "Y" branches with clean-out screws should be inserted every twenty or twenty-five feet.

VII. THE GRADING OF THE WASTE AND VENT-PIPES should be shown on the plans or specified in the description. It should be as great as possible and be uniform. All vent-pipes should ascend continuously and be firmly secured, so that no bends shall form traps.

VIII. Reasonable discretion should be used in approving the proposed location of fixtures. They should be grouped together as much as possible, to prevent the running of long lines of nearly horizontal waste-pipe. If fixtures are necessary in a part of the building which is widely separated from the soil-pipe, an additional vertical pipe should be erected. Every such vertical pipe should extend through the roof, and in cases where no soil or excremental matter is discharged into it, such additional vertical pipe need not be more than three inches in diameter. Where only one or two bowls or bath-tubs are connected with it, a two-inch pipe may be permitted. No fixtures should be allowed in dark corners, nor in closed closets. It is unwise to place fixtures in sleeping-rooms. The carrying of waste, vent and water-pipes through ceilings, floors and walls affords ingress for foul air and odors, and traps may be unsealed by evaporation in cases where the use of fixtures is not constant. If drain air does escape into sleeping-rooms, its ill effects are liable to be far more dangerous than would be a similar leakage into well-ventilated and suitably-located bath-rooms. These considerations should lead to the exclusion of fixtures from sleeping-rooms. It is desirable that no woodwork or other absorptive material should be placed about fixtures, and only a minimum of "boxing in" should be permitted. Water-closets require a seat and cover only. Wash trays, sinks and bowls should be opened to the floor; their traps and waste-pipes being exposed to view.

Earthenware and iron bath-tubs need no woodwork about them. It should be required that all water-closets be flushed from cisterns located not less than four feet above the bowl of the closet and never directly from the main supply-pipe. Water-closets without movable parts should be preferred. Washout and short hoppers, made entirely of earthenware, with rim flush, are satisfactory devices, and a choice from among the different patterns of these two types of closets should be based mainly upon (1) the rapidity with which the soil is carried beyond the trap, and (2) the small extent of the surface exposed to fouling. In hopper closets a preliminary flush is necessary to prevent the excreta from adhering to the sides of the bowl. In the washout-closet, all of the features of a good closet are combined. It answers equally well as a urinal, slop-hopper or closet.

See to it that all refrigerators, waste and drip, warning or notice-pipes, and all cellar and area drains discharge over open receivers.

IX. The employment of slop-hoppers and urinals inside of dwellings should be discouraged, but if they are allowed, they should be flushed from cisterns. Slop-hoppers in yards and areas are generally nuisances. They become targets for refuse material which cannot pass through a strainer, and when they are supplied with bell-traps, the drain becomes obstructed by the removal of the bell. They are useless in freezing weather, and the waste they should receive will probably be cast upon the ground.

The plans and descriptions should be in ink, and if the diagrams are not drawn to scale, the distances between given points should be required, showing total length of drain and vents, and of each branch. The diameter of each waste-pipe, vent-pipe and trap should be marked on the drawing.

Section III.

INSPECTION OF NEW WORK.

To prevent repetition, attention will hereby be called to but a few of the features of the work which it is the duty of the Inspector of Plumbing to supervise. The drawings and descriptions having been approved, and notice having been received from the plumber that the work is about to begin, the Inspector should examine the material to be used. He should reject any which is imperfect or which is not in accordance with the requirements of the ordinances and the written description. He should frequently visit the premises as the work progresses, and call the attention of the plumber to any deviation from the plans, before the difficulty of rectifying the error or flaw is increased by further addition or attachments to the parts which must be removed. If the plans permit the joining of two lead waste-pipes, the Inspector should be present when any such joint, or when joints between the crowns of trap and vent-pipes are made, for after the joints are wiped, there is generally no way to learn that the intersecting pipe has not been thrust down into the continuous pipe, causing an obstruction. The continuous pipe should be opened at the point of proposed junction, and the border of the opening coaxed outward and backward, so that the intersecting pipe will rest upon the collar thus formed. In calking about ferrules, it will be found that indentation will be formed in the brass unless the ferrules are heavy. The Inspector should learn that the wooden supports required for lead pipes are securely nailed, and that the clips and screws which hold the pipe, are near enough together to firmly hold the pipe in position. See that floors and timbers do not rest upon the hub of vertical iron pipes. See that the grade of all pipes is as uniform as possible; that the curves or bends in the leadwork are long and regular; that clean-out branches terminate in accessible situations; that the support for the foot of the stack is substantial; that all tile pipe is laid in straight lines, on a firm foundation, and that the interior of each joint is cleaned, by use of a scraper, of all cement which may ooze through when the cement is applied to the socket. The grade of the tile pipes composing the main drain, in no case should be less than one in one hundred. When the interior drainage work is completed and ready for the fixtures, it should be prepared by a plumber for testing. The soil-pipe, branches, traps and vent-pipes should all be in place, and every joint on the sewer side of traps should be finished. Lead caps should then be soldered over the openings on the house side of all traps, and plugs should be inserted at the termini of soil and vent-pipes. The pressure test, which is directed by the local ordinance, should be applied. If the air test is required, the air-pump should be attached by the plumber, to any convenient opening in the pipe system. The pressure should then be raised to five or ten pounds, as the ordinance may provide, and the gauge should stand unchanged for half an hour. The spring gauge usually found attached to plumbers' air-pumps, is often unreliable and sometimes misleading. Every Plumbing Inspector should be provided with a mercury gauge. Its indications are always correct, and its registering column shows the slightest leak. If the gauge shows no escape of air from any portion of the pipe system, the Inspector should prick a hole in the lead cap of one or more traps, or remove one of the plugs, to assure himself that the air pressure extends to all portions of the pipes. If leaks are found, the test should be re-applied, and the plumber notify the Health Department that the work has been made tight. For several reasons air is preferable to water for testing drain-pipes. Air is more convenient and less time is consumed in its employment. Air will escape through small crevices, which water will not pass through. The pressure from air is uniform in every part of the system, but water causes unnecessarily severe pressure in the lower portions of the pipe system, and very little toward the top. Water cannot be used in freezing weather, nor in houses where ceiling or other interior finish would be liable to injury, if leakage should occur. If water is to be used in making the test for leakage, all openings into the pipes, except the highest ones, are to be capped or plugged in the manner already described for testing with air. The pipes are then filled with water by means of a hose or otherwise. The level of the water at the top of the open pipe should be marked, and it should remain without subsiding for two hours. The usefulness of the pressure test is well shown by the fact that, in the examination of over two hundred systems of house-draining in one of the municipalities of New Jersey, not one was found to be tight, when the pressure was first applied. After the testing is finished, and the pipes have been found to be tight, the Inspector should require that the joints between water-closets, in the case of all closets having their traps above the floor, shall be made in his presence. These joints are bad at best, and re-inspection after a few months will probably be needed. They are made by flanging the four-inch lead branch out one or two inches upon the floor, and placing a rubber washer or gasket between the earthenware or iron and the lead. The closet is then fastened to the floor by screws passed through slots or clamps. The supply and vent-pipes help to steady the closet, but the arrangement is unsatisfactory and insecure.

SECTION IV.

INSPECTION OF OLD WORK.

The following suggestions are intended to outline an examination into the safety and efficiency of house-drainage systems which have been in use:

The Inspector should make a diagram of the various floors of the building and mark upon it the pipe lines as he proceeds with his investigation. Sizes and lengths of all waste and vent-pipe should be recorded, and all defects discovered should be noted, together with suggestions for alterations or repairs if any are found to be necessary. Whenever wooden or brick drains or open ditches which convey waste liquids, are found within, beneath or near to the house, they should be reported as nuisances; such drains and all others which permit the escape of their contents into the soil, pollute the ground, air and water, poisoning wells and rendering much of the air which finds entrance into the dwelling, especially in winter, unfit to breathe. If the outfall of a house drain is found to be into a cesspool, the terminus of the drain should never be below the surface of the liquids in the cesspool, for gases which form in the drain will then be forced toward the house. Leakage should be suspected in the case of all cesspools, and they should be reported as nuisances unless they are situated at such a distance from wells and dwellings that the Inspector, knowing the character of the soil, believes that no dangerous contamination will spread from them. Cesspools should be ventilated by an opening at least six inches in diameter. Contaminations of wells by cesspools or other sources of soil pollution may sometimes be demonstrated by freely mingling with the refuse a strong solution of ferrocyanide of potassium. If sub-surface channels of communication exist between cesspool and well, the presence on the well of the potash salt may be learned by the addition of a drop of the solution of perchloride of iron to a little of the suspected water held in a test-tube. The water should be tested daily for a period of two or three weeks. The appearance of a blue color will show that Prussian blue formed by the meeting of the ferrocyanide of potassium with the persulphate of iron. The main drain* is generally found covered with earth, and it is rarely provided, except in recent constructions, with lamp-holes or other openings for observation as to its grade, contents and the condition of its interior. The Inspector has usually to content himself with learning that it is or is not obstructed to a degree which interferes with the quick conveyance of all the liquids which can be conducted into it. This may be done by allowing water to run, full head, from all faucets on the premises, and then observe whether there is overflow from the cold-air inlet or from the lowest fixture. The rapidity of the flow can be learned by pouring into one of the fixtures in the house a pint of a solution of analine red. The faucet should then be opened wide, and the time ensuing before the appearance of the dye in the sewer or cesspool will indicate the velocity. If further examination of the main drain is undertaken it must be uncovered. The joints can then be viewed and leakage detected if fluids are escaping. The uniformity of the grade can be observed, and any depressions from settling or improper construction can be noted. If the material is terra cotta, one or more holes, about two inches in diameter, may be made in the crown of the pipe by the use of a small cold-chisel, to ascertain whether the interior is clean and in good union, and whether the flow is unimpeded. Although the Inspector may not feel warranted in uncovering the whole line of the main drain, except in cases where it is obstructed, he is justified in excavating at the junction of the main drain with the main waste-pipe or soil-pipe, in all cases where this joint is between iron and terra cotta, for at this point leakage is often found. This joint is made with cement and the unequal expansion and contraction of iron and tile

* The main drain is that portion of the draining system of a building which extends from the sewer or cesspool to a point a few feet distant from the foundation wall where it becomes continuous with the soil-pipe or main waste-pipe, which extends to and through the roof. The branches of the soil-pipe are lateral drain pipes to which are attached the traps and fixtures. The fixtures are the bowls, tubs, closets, sinks, urinals, slop hoppers, &c., which receive waste fluid. Soil-pipes as distinguished from waste-pipes are those pipes which receive and convey soil or excremental material from water-closets or urinals.

causes cracks and crevices. The trap on the main drain is usually located a short distance outside of the foundation wall. It is generally provided with a hand-hole which permits an examination of its interior. The outside cold-air inlet should be found entering the drain on the house side of this trap. A match or candle held at the outer terminus of the cold-air inlet should show an inward air current. When a water-closet in the building is discharged, an outward current will temporarily occur if the cold-air inlet is unobstructed. The point at which the drain passes through the foundation wall should be examined, to learn whether settling of the wall has broken or depressed the pipe. In cases where the main waste-pipe or soil-pipe is below the cellar bottom or otherwise concealed, it should be uncovered and every joint exposed to view. All horizontal branches should be examined to learn whether their alignment is true, and gradient sufficient, and to see that no sagging has occurred. The size, course and termination of vents should be observed. The woodwork about all fixtures should be removed sufficiently to permit the Inspector to see and examine all traps. Trap screws should be taken out and the wire passed up into the vent at the crown of the trap, to learn whether it is free from obstruction. If mechanical traps are in use, they should be opened and examined. Traps attached to fixtures which have not been recently used may have lost their seal by evaporation. A candle flame or burning taper held close to the opening in the fixture may show that air is escaping through the trap, but unused traps should not be opened until after they have been subjected to the smoke test. All of the traps in the house should be examined for siphonage. This is done by casting one or more pails of water into each fixture, then applying the smoke test.

An experienced Inspector will often correctly judge when siphonage occurs by listening to the sound when the water leaves the fixtures. Several pails of water thrown in quick succession into the highest fixture, will sometimes unseal one or more of the traps below, even when they withstand the suction produced by pouring water into the fixtures to which they are directly attached. The unsealing of traps may also be detected by removing the trap screws and catching the water contained in them. This water is measured in a graduate, and its quantity is compared with that known to be required for the trap from which it is taken. The apparatus necessary to the application of the smoke test consists of a pump or blower, of fan or bellows, to which a smoke pot is attached by means of a non-compressible rubber hose.

A similar hose leads from the fan and is carried into the cold-air inlet or other convenient opening into the soil-pipe, outside of the house.

A wet cloth serves to make a joint about the hose at the point of its entrance into the drain. Smoke is produced by the burning of tarred paper, and it is driven into the drain until it escapes in large volumes through the top of the soil and vent-pipe. The upper ends of these pipes are then covered by several layers of wet cloth held in place by cord or by a plug. An assistant continues to force smoke into the drain, and the Inspector enters the house and observes whether smoke escapes from the pipe. A water gauge attached to the smoke machine indicates to the operator how much pressure may be applied without unsealing the traps. With a piece of chalk the Inspector should mark the location of all leaks discovered, in order that the plumber may readily proceed in making repairs. All drain and vent-pipe within the house should be uncovered and exposed to view, and every portion examined while the smoke pressure is being applied. The peppermint test is applied as follows: An assistant brings to the building and carries directly to the top of the house, one or two ounces of the oil of peppermint. The oil is placed in a pail partly filled with hot water, and is then poured into the top of the soil-pipe. Several more pails of hot water are then poured in and the tops of the soil and vent-pipes are then closed. The odor of the oil will indicate the presence of leaks. No fixture should be discharged during the test, and the assistant who pours in the oil should stay on the roof until the inspection for leakage is finished. Foul odors in bath-rooms and about urinals, sinks, slop-hoppers, may be due to saturation of woodwork with filth. Safes beneath fixtures are generally ill smelling and dirty, and air entering the house through drip-pipes will probably be malodorous, because of deposits on the interior of the pipe or because its lower terminus is over an ill-smelling sink, or is connected with a waste-pipe. (See section on Disinfectants.)

The kind of water-closets chiefly in use may be designated as follows: Pan closet, Plunger closet, long Hopper, short Hopper and Washout.

The Pan closet is now condemned by all authorities. The pan forms a small cesspool which will always become foul. The other forms known as Plunger closets are various. The side chambers of these always become more or less foul and need cleansing at each house-cleaning. Some of them are lined with porcelain and are much cleaner. Plunger closets are much used and can be kept in order. The long and short hopper and washout are modifications of one method. They are supplied with water by automatic arrangement and are more easily kept in order. The Inspector in examining all closets needs to judge them, not as by this or that maker so much as by the condition in which, after being taken apart, they are found.—SEC'Y.

SECTION V.

HEATING APPARATUS.

Hot-air furnaces should be examined to learn (1) where the warm air is taken from; (2) whether communication exists between the combustion chamber of the furnace and the pure-air flues. The air which is to be distributed through the house should not be taken from a cellar or basement, nor from beneath a porch or other confined space. The flue which conducts it to the furnace should be lined with metal, with soldered joints, otherwise it will admit gases, odors and dust. The outer terminus of this flue should be several feet above the ground level, and it should be covered with wire netting, to prevent the entrance of rats, &c. Its size should not be less than one quarter of the total cross-section of the distributing-pipe. A slide or damper in the fresh-air flue will permit the entrance of air to be regulated in accordance with conditions of wind and temperature. If the fresh-air flue is too small, an in-draft will be created into one or more of the lowest registers. A match flame held over a register will show in-draft, if it exist. Gas leaks from the combustion chamber into the fresh-air compartment, can be shown by placing an old rubber shoe or a quantity of leather scraps upon the hot coals. The odor of burning rubber or leather should not be detected in the room above, if the furnace joints are tight. For direct heating, coils or radiators are placed in the rooms which are to be warmed. Here, it is a warming of the air in the room, the purity of which must be secured by the introduction of outside air.

Indirect heating consists in the passing of air over coils, which are placed in the cellar or basement, and distributing it through sheet-metal flues or registers.

Steam and hot-water heating, when it is accomplished by the indirect method, requires a fresh-air supply, and the Inspector should make the same inquiries, concerning the location and construction of the fresh-air flues, which have been suggested in the case of hot-air furnaces.—H. M.

SECTION VI.

INSPECTION OF SOIL-PIPES, WASTE-PIPES, TRAPS, ETC.

The Inspector, when searching for the source of odors or causes of disease, will often have occasion to follow the soil-pipe from its exit from the building through the basement and on different floors, to see just its condition. If old or of too thin metal, or if cracked slightly or having pin-holes in the metal, it will often leak gas when it does not leak liquid. The soil-pipe should extend, with as few bends as possible, from its point of exit in the basement to two or three feet above the roof. If covered to keep out snow, the cover should be quite above the opening. Usually soil-pipes are four to six inches in diameter, well calked where hub and spigot unite, and having union of side-pipes from each story very carefully made. Waste-pipes should not be more than two inches in diameter. These are generally of lead, and should be fastened to the soil-pipe by the intermediate use of a brass ferrule, calked to the iron pipe and joined by a wiped joint to the lead pipe. All such points of union are to be examined by the Inspector, for leakage. The Inspector must examine carefully, as to the opening at the exit and upon the roof. A trap, as generally used, is simply such a bend or dip in a pipe as will hold enough water to prevent the passage of gas and effluvia. If there is any trap on the soil-pipe at its exit, it should be examined. A trap is generally located close under its fixture. The more common form is what is called the running trap, which is thus merely a bend in the tube or pipe, varied in shape and size, according as the side or connecting pipe is horizontal or vertical, and by the locality of the fixture to which it is related. If the dip of the trap is too great, it is easily emptied of its water seal; if too deep, the more solid matters are not easily carried on, or there is not enough friction and cleansing of surfaces. The usual dip is from one and a half to two inches. The Inspector does not need all the knowledge of the plumber, as to setting of traps and their construction, but does need to know, that much, as to their being empty and consequently diffusing odor, depends upon slant, upon depth, upon mode of construction, and upon vent, to prevent siphonage or air pressure. Of the water-seal traps, the Bell trap, the Bottle trap, the "S" trap, the Adee trap, Cudell's, Putnam's, &c., are common. The most of these can be, or are arranged so as to be unscrewed and examined or cleansed if required. Several of these are constructed by shape or by means of a septum, so as not to be, it is claimed, so liable to siphoning as a simple "S" or curved trap. Some of these are no doubt less liable to siphoning, but as a rule they are not as self-cleansing. Because of some objection made to water-seal traps, there are forms of mechanical traps such as Bowers', Cudell's, Waring's, McClellan's, &c. These, either by means of a rubber or metallic ball, or a check valve, or a quicksilver seal, do not rely upon a water seal and are not so liable to siphoning. It is not necessary to give the Inspector more details, but this much needs to be known in order that he may have an idea of the class of the fixtures, and examine them properly when nuisances are complained of. He should also be able to determine whether any given fixture which is suspected, can have its trap emptied by the rushing of water through the soil-pipe, thus either sucking it out, or in some cases rushing air against it, so as to drive it out, or whether the momentum of the water rushing from the fixture itself, empties them. This latter can only occur with rather shallow traps. Traps are often emptied by the discharge of another fixture on the same branch waste-pipe. Thus if a bath-tub pipe is joined by a wash-basin pipe before it enters the main soil-pipe, the rush of water from the bath-tub frequently empties the trap of the wash-basin. Emptying from rush of water through the main or soil-pipe, does not generally occur where there is opening in the soil-pipe, both at roof and exit, unless fixtures are numerous and close. It is now quite usual to have a small pipe, known as a vent-pipe, extending from the crown of the trap so as to admit air, and thus prevent siphonage. The size of this should not be less than that of the trap. In summer, or when not in use from any cause, water-seal traps lose their seal by evaporation, and so admit sewer gas.—SEC'Y.

AS TO GAS AND WATER-PIPES AND ELECTRIC LIGHTING.

The escape of lighting gas into houses is much more common than is supposed. This occurs in three ways. (*a*) By reason of imperfect outside pipes, the ground near the house becomes saturated with gas and it is drawn in by the greater warmth of the cellar and distributed through the house. (*b*) Or the various pipes passing through the building are too thin or have pin-holes, or are worn by rust or not tightly screwed together. (*c*) Much gas often escapes from imperfect fixtures and burners, and the imperfect combustion of the escaping gas.

Much evil arises from inferior qualities of gas, for while the escape of ordinary gas is injurious, it is still more so if mixed with other more noxious compounds. As to the evil effects of escaping gas we have such testimony as that of Prof. Corfield, in an article on "Outbreaks of Sore Throat, Caused by Slight Escape of Coal Gas," of W. Blyth, as to headache therefrom, and as to its following from outside breaks along water mains into buildings. (See also other cases as given in eleventh report, page 23.) Roger Field says that he has found so many cases where offensive smells were thought to be sewer gas, but owing to escapes of lighting gas, that he has often had old pipes tested. The usual mode of testing new work is as follows:

When the pipes have been laid throughout the house, and the company's main connected with 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 burned out, the taps of the experimental light 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.

A similar method applies to old work. If the Inspector detects gas odor, the case should be reported to the gas company. As the mixture of atmospheric air and gas causes an explosive compound if there is much odor, search should be made in the daytime or only after the most thorough ventilation of the suspected room or vault. The use of a light or match would be dangerous. Gas should never be turned down to a minute flame and so left for the night. Not only may a draft blow it out, but if the pressure of gas is reduced at the works the flame becomes too small. Defective gas fixtures have been known to cause death, but far oftener continuous fouling of the air. The Inspector should, if need be, examine each burner. Their various forms are described on pages 118 to 124 of the tenth report (1886).

The whole of the article therein given contains valuable information for the Health Inspector.

WATER-PIPES.

Water-pipes may, by reason of breakage or small cracks, have constant leakage in obscure places, and so keep the ground damp, wet and unhealthy. Wastage of water beneath or around a house is a much more serious cause of ill health than some imagine. If the pipes are very thin, or have pin-holes, when the water is turned off or a pipe is emptied by other fixtures, foul gases may be absorbed. Both water-pipes and gas-pipes on their outside, where earth is not compact around them, furnish lines or conduits, along which foul gases or sewage may flow if escaping from other sources near where they cross or come in contact.

ELECTRIC-LIGHTING WIRES.

These as introduced into houses are not a source of danger except as they may cause fire. They are never of over 110 volts for incandescent lighting, and therefore there is no danger from shock, as there may be under possible condition from street wire. But if surrounded by woodwork, or if dampness or water in any form reaches the wire, there may result heat enough to cause flame. In all proper introductions of electric wires this is now guarded against by a porcelain duct through which the wire passes into the house, and by a waterproof covering to any wire running in concealed places. Safety-plugs (melting before a wire becomes overheated) are inserted at all branches, and so disconnects before fire can occur. If there is reason to suspect burning, or if for any reason one desires to disconnect, he should get access to this point of entrance and cut the lead connection with a knife.

Section VII.

OUTSIDE PIPES, ETC., OF WATER-SUPPLY AND SEWERAGE.

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

I.

HOW TO INSPECT WATER-SUPPLIES OUTSIDE OF BUILDINGS.

1. As to General Water-Supplies.—The Health Inspector should, each spring and sometimes oftener, make a thorough examination of the water-shed or stream which is the source of supply. If a river, what is the soil near its banks? If there are forests, what is their condition as to vegetable soil? Is the soil of the water-shed rich in animal or vegetable matter? Are fertilizers largely used near the stream, and is there much tilling of the soil? Examine all buildings, sheds or pens for animals of any kind, and all factories near the stream or any town having sewage waste flowing thereto. Know exactly whether any sewage or waste enters the stream anywhere, and if so, what distance from the intake. The stream must be guarded against the entrance of decayable products from its surroundings. The same is true of driven wells as a source of supply, as there is danger if they are in low places, or the surface is surrounded with much decaying matter.

2. Intake.—Notice whether it is near the center of the stream or current, and whether it is properly constructed so as not to have stagnant water or any decaying wood or improper metal about it. Know the character of the sediment or bottom, and take note as to when or how it is cleansed. It is best to have at times the quality of the water at the intake, at the reservoir or stand-pipe, and from faucets in houses, chemically examined and compared.

3. Reservoir or Stand-Pipe.—Examine fully as to construction, cleanliness, amount of water, mode and time of filling, and method of distribution. Guess at nothing and keep note of facts as ascertained. Notice as to any vegetable growth or scum. Is water taken only from one point or many? Is the reservoir protected from sunlight, and from all kinds of decaying matter? Examine the

ground about the reservoir as to its cleanliness. Does the Water or Health Board have a system of examination? Know all details as to machinery of distribution. The following list of questions will serve for a guide as to details of examination:

1. Name of city or town.
2. Population 18—.
3. Date when works were built, and by whom designed. If not all built at one time, state what additions were made and when. (See Plans.)
4. By whom are works owned?
5. Source or sources of water-supply.
6. Area of water-shed supplying such source or sources.
7. General geological and topographical character of the water-shed.
8. Mode of supply, whether by gravity or pumping, and whether distributing reservoir, stand-pipe or tank is used.
9. General description of storage and distributing reservoirs—natural or artificial, how constructed, area of water surface, capacity, character of bottom, amount of shallow flowage, &c.—times of cleansing.
10. Does all water pumped go through the distributing reservoir or tank?
11. What portion of the water pumped goes into the distributing reservoir?
12. Whether or not the water is delivered into the distributing reservoir at one side and drawn out at the other.
13. Number, kind, size and depth of wells used as sources of water-supply.
14. Miles of mains, sizes, taps. Is there a city map of pipes?
15. Number of hydrants.
16. Ordinary pressure.
17. Fire pressure.
18. Are meters used?
19. Describe filter-galleries or basins, and connections, if any, with stream, pond or reservoir.
20. Average daily capacity of works in dry year.
21. Daily average consumption.
22. Number of houses using the water.
23. Is water supplied to any one outside of your town or city?

24. Material of distributing mains.

25. Material of service-pipes. Are they put in under skilled supervision?

26. Does the water-supply receive sewage, drainage from factories (mentioning kind), or other pollutions?

27. If there have been any bad tastes in the water, or excess of vegetable growth, or if the fish have been generally affected, and such occurrences are not fully described in printed reports, please describe the same and the remedy adopted, if any. Send each year, printed report to Inspector.

28. Have analyses of water from the present source been made? By whom? When? If not given in printed reports, please furnish copy of same.

29. Have records of the temperature of the water been taken in the past? If not printed, will you furnish copies if blanks are sent?

30. If you keep records of the temperature of water, please furnish.

31. Do you take samples of water for analysis each month, for information and comparison?

32. To whom shall any correspondence be addressed?

33. Name of person furnishing this information.

The Inspector should know the condition of distributing-pipes, as to rust and internal deposit. Even where the supply is constant, water is turned off for repairs, and the opening of hydrants exhausts some of the pipes. In such cases foul air from outside may be drawn through their defective walls. Some water companies now use a series of tools for scraping and cleansing the inside of pipes, although it is often better to replace them.

INSPECTION OF WELLS AND CISTERNS.

In cities these are too apt to be impure. All wells need occasional inspection. Know the exact condition of every well, as to surrounding soils, as to its stoning or bricking or other form of steining. Sometimes concealed curbs and decaying wood or roots of trees cause impure water. Know when the well has been cleansed. Look carefully as to the form of pump used, as to the curb, as to the protection against animals, foul liquids, &c. Also note carefully the situation of all cesspools and vaults in relation to the well. If cisterns are used, examine details much the same as to wells. Even if not used for drinking-water they may become sources of foul smells. See whether the water is gathered from clean roofs, whether the leader-pipe has an automatic cut-off for the first portion of the rainfall. Also ascertain whether the water is filtered through brick or by any other method. For modes of collecting water for examination or any other inquiry, see Circular LIII. of State Board of Health.

ICE.

The Inspector should from time to time inform himself as to the sources of ice-supply and as to the purity of water as the ice melts and report the same to the Board of Health.

II.

HOW TO INSPECT SEWERS UP TO THE POINT OF THEIR HOUSE CONNECTIONS.

The Health Inspector should first find out whether there is a map of the sewer system showing its construction in detail. On such a map all changes or extensions should be marked. If there is no such plan, urge its importance, and until you can secure it have a descriptive outline of your own as furnished by the Sewer Commissioner. Begin your examination at the outlets of the main sewers. See that they are located so that they are never tide-locked or partially closed by mud or refuse of any kind. As you follow up the lines, note the size, shape and material of each main sewer and of all branches and how parts are joined, by gasket or cement.

Ascertain the grades and whether there is settling. Also points at which sewage or storm-water empties into these sewers; whether there is silt or standing sewage in any part, also the amount and character of inside coating. See if there are man-holes at each change of direction. Examine settling basins. Test, if possible, rapidity of flow. See if any part of the system has been tested to find out how much of a given quantity poured in appears at the outfall. Get at the precise facts as to how branches or connections are made with houses and whether the joining is inspected before being covered. The following list of questions will serve as a guide to the Health Inspector:

1. Name of city or town.
2. Population.
3. Sewers—when built; by whom designed.
4. By whom owned.
5. Is storm-water separated.
6. System of disposal; describe outlets.
7. Sizes of intercepting sewers, of laterals and of house connections.
8. Length of system, miles of pipe.
9. Material and shape of construction.
10. Maximum and minimum grades.
11. How flushed; any other methods of cleansing.
12. Average depth below street.
13. How is subsoil-water dealt with.
14. How is roof-water dealt with.
15. Number of connections, and of buildings not connected.
16. Dry-weather flow of outlet sewer.
17. Have you printed reports.
18. Frequency of man-holes, how many.
19. Is there any other ventilation by shafts, &c.
20. Are sewers deep enough to drain cellars. Are they laid straight from man-hole to man-hole.
21. Are intersections on a level with mains.
22. Does ground-water enter the sewers.

Section VIII.

SCAVENGING STREETS, GARBAGE-REMOVING AND VAULT-CLEANSING.

The word "scavenger" means one who scrapes or cleans, and originally had reference to the thorough cleansing of streets. Street-cleaning is very important to a city. The dirt of the street is made up of various organic materials prone to decay. If kept wet it makes the ground damp and unwholesome; when dry it fills the air with dust, which must enter the lungs and is unfavorable to health. The Inspector should frequently inspect and report upon the condition of streets, alleys, &c. The scraping of streets should mostly be on moonlight nights or before seven o'clock in the morning, otherwise it is a great nuisance. A sprinkled street is better than flying dust. In itself this continuous wetting is not good, but can be much reduced by proper cleansing of streets. Heaps of dirt left for any time should be reported to the Board. If unavoidably left they should be covered over with ground plaster. Gutters should be cleaned out and kept clean for flow of water, oftener if need be than the streets are cleaned. Trees in streets, if causing too much shade, or if liable to fall, must be reported by the Inspector.

Garbage is derived from a word meaning to clear up or make neat. Every city must have a system of garbage removal. All garbage should be removed three times a week in winter and every day in summer. Garbage and ashes should never be mixed, but may be removed by same carts. The garbage collector should report cases of mixture to the Inspector, and he should notify parties by postal. So, householders should notify of any neglect in collecting. Each street should, as near as possible, have its special time, so that the vessels holding the garbage may not be too long upon the sidewalks. Most collecting should be before nine in the morning, and after five o'clock in the afternoon. The Inspector must know where everything is dumped and frequently examine the condition of the place. Bad odors must be reported, and if need be disinfectants used. The dumping should never be deep. Ordinary refuse is much more rapidly disposed of by natural methods if not over two and a half feet in depth. It should not in any one year be spread over the same surface deeper than this. A thin layer (four inches) of dry earth at the end of each year is of service. Dumping-grounds in cities or their suburbs, or in wet places about them, are often nuisances.

CESSPOOL, VAULT AND PRIVY-CLEANSING.

This should always be done by a permit system. The Inspector must see that there is no nuisance in the mode of removal. Disinfectants should be used after the vault is cleansed. There should be a prescribed method, and the Inspector, by an occasional inspection, should know that it is carried out. (See section on Disinfectants.) Some form of odorless apparatus is best for removal. It is possible to do it in the day-time, but much of it may be done at night. The permit should not be a general one only, but the scavenger should report on a certain day each week by letter or in person what places have been cleansed and what disposition was made of material. Blanks may be furnished for this purpose. This whole service, like that of garbage removal, must be closely watched and strictly enforced. Some village streets in townships need this regulation as much as cities. For disinfecting a vault or cesspool, strong milk of lime thrown over the sides and a barrel of it thrown in the bottom will be of much service. This or chloride of lime or corrosive sublimate or sulphur should generally be used after cleansing, and always where there has been typhoid fever. The mode of using sulphur is described hereafter.

Section IX.

DISINFECTION AND DISINFECTANTS.

The Health Inspector will sometimes be called upon to direct as to this. Oftener it should be done by him, and so he should know the best method. First of all let it be understood that nothing can take the place of fresh air, sunshine, cleanliness and good housekeeping. Therefore, if visiting before the room or house can be otherwise disinfected, leave Circular LXIV. or Circular XLIV. of this Board. Study it yourself. For your own special direction we name only four articles, namely, corrosive sublimate, chloride of lime, sulphur and fresh milk of lime made from common unslaked lime.

Corrosive sublimate is prepared by putting one dram to one gallon of hot water, to which a little indigo should be added for coloring, since it is an active poison and might be mistaken for water. The vessel containing it should either be glass or earthen, and some mark or label of poison should be on it. This solution is used for scrubbing or wiping walls, furniture, &c., or washing hands. It is not the best disinfectant for stools or masses of decomposing matter.

CHLORIDE OF LIME.

Dissolve from four to six ounces of best quality in one gallon of water. This is used the same as the former. Much of the chloride of lime in packages is not up to the standard in the amount of chlorine, and so get that of Squibb or of Powers and Weightman. The powder placed in rooms and slightly moistened so as to make a perceptible odor, purifies the air.

SULPHUR.

Fumigation with sulphur is a practical method for disinfecting the house. For this purpose the rooms to be disinfected must be vacated. Heavy clothing, blankets, bedding, and other articles which cannot be treated by washing, should be open and exposed during fumigation. Close the rooms as tightly as possible, place the sulphur in iron pans, supported upon bricks placed in washtubs containing a little water. Set it on fire by coals or with the aid of a tablespoonful of alcohol or saltpeter, and allow the room to remain closed for twelve hours. For a room about ten feet square and ten feet in height of ceiling at least three pounds of sulphur should be used. For larger rooms proportionately increased quantity placed at two or three points, or the following method may be more convenient: Place a metallic pan containing hot ashes on some support in a pan containing hot water, so as to surround it. Let the pan of hot ashes be about six inches deep and fifteen inches in diameter, and place sulphur and saltpeter in a slight depression in the center of the ashes and ignite it; the doors and windows of the room having been tightly closed. The proportions to be used are three pounds of sulphur and three ounces of saltpeter for one thousand cubic feet of air space. (Where there is any special danger from fire, chlorine fumes may be employed instead, by mixing three pounds of pure chloride of lime with three pounds of hydrochloric acid for every one thousand cubic feet of air space.) As the gas is heavier than air there must be thorough closure, especially of the lower part of the room. But this is not all. Sulphur does not act effectively without there is considerable moisture present, which is not the case except in very damp buildings or in very rainy weather, therefore it is necessary beforehand either to wet the surfaces to be disinfected or make the room moist by causing vapor or steam from hot water. This may be done by placing in another part of the room a shallow pan of water upon a kerosene stove well started in advance of lighting the sulphur, or by a pan of boiling water around the ashes and sulphur, as before described. In addition, the floor, ceilings and walls when not papered may be wiped with water or the corrosive sublimate solution. A weak solution of carbonate of soda used after it increases the effect. The house or room should be kept closed for about six hours after the fumigation, and then exposed to free currents of air for twelve hours afterward. After this it is well to strip off the wall papers, or whitewash the walls and ceiling, and wash with soap and hot water the floor, woodwork and such furniture as can be thus cleansed. Additional cleansing of the walls can be made with bread as follows:

The plan is to take the end of a loaf of bread, not too fresh or stale, and rub the cut surface along the wall so that any organic particles, will cling to the bread crumbs, and fall upon paper spread upon the floor, and which can then be gathered and burned. By paring the crust as the work goes on, a small half loaf will cleanse quite a surface of wall.

MILK OF LIME.

Besides the use of whitewash, wherever proper, caustic lime or unslaked lime, or milk of lime, has much power as a disinfectant. This is prepared by slaking one part of pure, freshly-burned lime in four parts of water. This gives a twenty per cent. mixture. This may be diluted by adding a half gallon of water to each pint. It must be freshly prepared, or if kept in a closed vessel it can be used two or three days' old. Strong, recently-made milk of lime or whitewash may be used to disinfect discharges.

The Health Inspector should also read and have ready for reference the two circulars above referred to. (XLIV. and LXIV.) Be thorough, for any imperfect method is only a pretence, a delusion, a snare. After a privy vault has been emptied, it is a good plan to take an empty tomato or fruit can, fill it partly with sulphur and pour over it enough alcohol to set it on fire. The can may be lowered by a wire which has been fastened to it. It should be done about ten o'clock in the morning, and the outbuilding be fastened up for several hours. Then the building should be opened and well aired, the can removed, and examination made as to fire, of which the risk is very small.

SECTION X.

VARIOUS DUTIES IN PROTECTING THE PUBLIC HEALTH, NAMED IN SECTIONS 12 AND 13, CHAP. LXVIII., LAWS OF 1887, ALSO CIRCULAR LX.

We make the following comment and references for Inspectors on the various items referred to in these sections:

I. To aid in the enforcement of the law as to the adulteration of all kinds of food and drinks, and to prevent the sale or exposure for sale of any kind of meat or vegetable that is unwholesome or unfit for food.

The particulars as to this will be found in Circular LIX., as to Food, Drinks, &c. Many cities have a special Inspector for markets, meats, &c. If there is none such, the Health Inspector must carefully attend to it. (See Circular LX. for full directions.)

Unless details of cleanliness are carried out, a market is a constant nuisance and a center for the spread of disease, since so many come to it and carry articles from it to their homes.

II. To define and declare what shall constitute nuisances in lots, streets, docks, wharves, vessels and piers and all public or private places.

Vacant lots must not become dumping-grounds unless under direction, and must be so filled up or drained as not to hold stagnant pools of water. Report to the Board of Health all lots thus out of order. Docks, wharves and piers need to be watched as to garbage, decaying wood and filthy matter that collects in the water about them. Often sewers end near or under them. These should be examined as to their condition and how far they become water or tide-locked. Vessels coming into port often bring disease, and in suspicious cases must be watched as to contents and passengers. Where contagious disease is known to be on board, persons, trunks and goods should not be discharged without consent of the Board of Health. Railroad cars, if causing a nuisance, are included in this section.

III. To prevent the spreading of dangerous epidemics or contagious diseases, and to declare that the same have become epidemic, and to maintain and enforce proper and sufficient quarantine whenever deemed necessary.

Under this section the Health Inspector finding any such diseases must at once exercise his authority and prevent, if need be, egress or ingress until the Board of Health acts. It is often the first case of small-pox or other contagion that causes the damage, and so a health officer by promptness may prevent access of persons, sending out of clothing and other acts which spread disease. Means to be used as to notification of contagious diseases, inspection and disinfection will be ordered by the Board, and how to do these will be noted in the proper place.

IV. To regulate, control and prohibit the keeping or slaughtering of all kinds of animals.

All this is a subject for ordinances. All cattle kept in city yards or stalls should be inspected, as well as all forms of pens. Horse stables and storage-places or heaps of compost from them, need careful inspection. All places for keeping of animals when found in a condition causing nuisance should be dealt with. The question often is as to the reality of the nuisance, and not a special question as to keeping animals. Poultry-keeping may also cause nuisances.

V. To regulate, control and prohibit the accumulation of offal and all decaying or vegetable substances.

"Offal" is that which falls off, as subject to decay. It is often necessary as to animal or vegetable accumulation, to have rules to prevent collection and decay, as well as to compel removal. The Health Inspector must often interfere before the material gives rise to odors.

VI. To prohibit and remove any offensive matters, or abate any nuisance in any public highway, road, street, avenue, alley or other place, public or private, and to cause the removal of the same at the expense of the owner.

The duties of this section are also reached under the general law of nuisances, as well as by special ordinances. If not promptly removed at the expense of the owner or parties in control, the Board of Health must proceed to summary process before a justice. Where no owner is known and the nuisance is on a street or highway, the proper officials must be notified, and may be treated as owners.

VII. To compel the return of all births, deaths and marriages by physicians, midwives, nurses, clergymen, magistrates, undertakers and other persons professionally officiating at such death, birth or marriage.

The Health Inspector, under direction of the Board of Health and Keeper of Vital Statistics, should visit in office hours persons neglecting to make return and report those neglecting the law. He should also examine cemeteries and grave-yards and see whether permits are always required, records of burial kept and bodies buried at the depth required by law.

VIII. To secure the sanitary condition of tenement-houses, jails, prisons and all public buildings.

In addition to what has been said as to house inspection, there should be special inspection of jails, alms-houses and other public buildings, and special report of their condition as often as seems indicated. There should also be special inspection of railroad stations as to their cellars, their closets, their source of water-supply and their general cleanliness.

IX. To regulate, control and prohibit the cleaning of sewers, the dumping of garbage, the filling of sunken lots or marsh lands, and to provide for the filling up of such lots or land.

Health Inspectors must carefully see that the ordinances of the Board as to these are fully carried out, or that any nuisance from these is prevented.

X. (1) To regulate and control the method of construction, the location, the method and manner of emptying or cleaning, and the frequency of cleaning of cesspools and privies.

If cities have vaults all this should be regulated by ordinances. As to methods of carrying them out, see section on Garbage and Scavenger Oversight.

XI. (2) To regulate and control the mode of connection of house drainage and plumbing with outside sewers, cesspools or other receptacles.

This is directed by ordinance or in connection with the Plumbing law. (See Circular LXV.) Often the work of connection is badly done, and a Health Inspector should be notified as to the work and be present when the house system is joined to the outside sewer or cesspool. Rules as to pipes, &c., will be found in sections on Sewers and House-Pipes.

XII. (3) To protect the public water-supply and prevent the pollution of any stream of water or well, the water of which is used for domestic purposes, and to order disuse or closure of any well, the water of which is polluted or detrimental to the public health.

For mode of inspection, see section on Water-Supply. Closure of well, if necessary, must be made by order of the Board of Health.

XIII. (4) To remove persons infected to a suitable place, in case of contagious or infectious disease, where, in the judgment of the Board, such removal is necessary and can be accomplished without any undue risk to the person or persons diseased, and to disinfect the premises when deemed necessary.

This, when necessary, is done by the Health Inspector, under order of the Board of Health. He is generally aided or directed by the attending physician. All such removals require great care both in the interest of the patient and to avoid clothing, &c., causing spread of the disease. A metallic van or ambulance is used in cities.

XIV. (5) To regulate the burial and disinterment of human bodies.

The Health Inspector sees that the law, Chap. XXXIX., Laws of 1888, is carried out. (See especially Section 9, also Circular LXVI.) The condition of cemeteries and grave-yards must be known and the records of burial and depth of covering of bodies inquired into.

NOTE.—The first five items are not specified in the law as to townships, except such as are populous or have a public water-supply. (Chap. LIV., Laws of 1889.) Some of them would be included under other laws.

XV. We add this to draw attention to Section 13 in the law which is intended to include all forms of nuisance not specified in the various items of Section 12, and so give the Health Inspector power as to factories with foul odors or gases, and as to all nuisances not before designated. Details as to all modes of procedure are especially noted in Sections 14, 15, 18, 28 and 29.

SECTION XI.

EXAMINATION OF FOOD, DRUGS AND ILLUMINATING OIL.

AS OUTLINED BY WILLIAM K. NEWTON, M.D., DAIRY COMMISSIONER.

Many sections of our State laws regulating the sale of food, drugs and illuminating oil clearly indicate that it is the duty as well as the privilege of Health Inspectors and members of Local Health Boards to aid in enforcing these laws. (See Circular LIX.) In the case of milk, butter or other foods and drugs a special officer, called the State Dairy Commissioner, has been provided by law to aid the State Board of Health in carrying out the provision of these statutes, but at the same time, Local Health Boards have powers co-ordinate with that officer. "The Newark Health Board, for instance, operates these laws." Health officers can do much towards protecting the people against dangerous and fraudulent foods, and preventing the sale of explosive illuminating oil. Where Local Boards do not wish to assume the responsibility of prosecuting offenders, they may render valuable aid to the State Board of Health and the Dairy Commissioner, by collecting samples and obtaining evidence. The laws provide for a proper examination of articles by experts and chemists, hence Local Boards may not be called upon for expert opinions in these matters without first obtaining a report from an analyst. In order that both the Inspector and the vender or manufacturer of articles of food, drugs and illuminating oils may be thoroughly protected, samples should be carefully collected and proper records kept of steps in the transaction. The following rules governing the collection of samples have the sanction of the State Board, and have been enforced in this State for many years:

1. The Inspector is to buy samples of food or drugs, and to seal each sample in the presence of a witness, if prosecution is intended.

2. The Inspector must affix to each sample a label bearing the number, as authorized for that purpose.

3. Under no circumstances is the Inspector to inform the analyst as to the source of the sample before the analysis shall have been completed.

4. Inspectors are to keep a record of each sample as follows:
   (1) Number of sample.
   (2) Date and time of purchase.
   (3) Name of witness to sealing.
   (4) Name and address of seller.
   (5) Name and address of producer, manufacturer or wholesaler, when known, with marks on original package.
   (6) Name of analyst and date of sending.
   (7) How sent to analyst.

5. If the seller desires a portion of the sample, the Inspector is to deliver it under seal. The duplicate sample left with seller should have a label bearing the same marks as are affixed to the portion taken by the Inspector.

6. The Inspector is to deliver the sample to the analyst, taking his receipt for the same, or he may send it by registered mail, express or special messenger.

7. Samples left with Local Boards of Health by citizens for examination, should be subject to the above rules, and an entry made of the name and address of the person leaving the samples.

In most instances it is preferable to obtain the opinion of an expert or an analyst as to the purity of an article, for it is not expected that all health officers shall be competent to give expert evidence in all cases. The notes given herewith may serve to aid Inspectors and officers in making simple tests, so that they may judge as to the advisability of seeking further advice.

MILK.

The traffic in milk is regulated by "An act to prevent the adulteration and to regulate the sale of milk," approved March 14th, 1882, and the supplements thereto, namely, Chapter XC., Laws of 1884; Chapter CLXXXVI., Laws of 1886; Chapter II., Laws of 1887; Chapter CLXXXV., Laws of 1885. Under the provisions of these laws, Local Boards of Health have power to inspect milk, to prosecute offenders, and to pay to the local authority any penalties that they may collect. A special officer is also appointed to enforce the laws. These laws define adulterated and impure milk, and regulate the sale of the article. Legally, milk is deemed to be adulterated when it does not contain at least twelve per cent. of milk solids, that standard of purity having been adopted because no pure milk from a herd of healthy cows contains a lesser amount of solids. The amount of solids in a sample of milk is ascertained by a proper chemical analysis, the details of which may be learned by consulting the reports of the Milk Inspector, as printed in the reports of the State Board of Health, or in the reports of the State Dairy Commissioner. As the law requires this analysis to be made by certain designated chemists, it is not thought necessary to enter into the particulars of the methods of analysis usually employed. Inspectors may, however, by a few simple tests, easily ascertain whether or not a certain sample is equal to the standard.

Local Health Inspectors should be provided with a standard lactometer, a thermometer and a cream-glass. The lactometer adopted by the State authorities is a simple hydrometer so graduated that the 100° mark on its stem indicates, when placed in milk at a temperature of 60° F., a specific gravity of 1.029. It has been found that no pure milk ever has a lower specific gravity than the one mentioned, hence a sample of milk that would indicate less than that figure or its equivalent, 100° on the lactometer, may be regarded with suspicion.

The most common methods of adulterating milk are by the addition of water and by abstraction of cream, and these may be commonly detected by a proper use of the lactometer. If water is added, the specific gravity of milk is lowered below the standard figure, and if a sample, when tested by the lactometer, shows that such is the case, a sealed specimen should be sent to a chemist for analysis. On the other hand, the abstraction of cream increases the gravity of milk, and this would be indicated by the lactometer registering 116° to 120°. This fact can be proved by the use of the cream-glass. This is a graduated cylinder into which the milk is placed and allowed to stand for twelve hours, at which time the per cent. of cream may be read off. Milk showing less than twelve per cent. of cream may be considered as having been skimmed. In any case the final judgment is to be given to the chemist, to whom is to be sent at least one pint of the Inspector's milk, sealed up in a strong bottle.

FOODS AND DRUGS.

The sale and manufacture of adulterated foods and drugs are prohibited by "An act to prevent the adulteration of food or drugs," approved March 25th, 1881, and the supplement thereto approved March 23d, 1883. (See Circular LIX.) By the provisions of Section 8 of the law, officers of Local Health Boards have the power to inspect any articles of food or drugs, whenever exposed for sale; and if "upon inspection of such food or drugs, the same shall be found to be adulterated within the meaning of the act, the Inspector or officer shall have power and may prohibit the sale of such articles until decision shall be rendered by the court before whom the defendant may be brought."

By further enactments a special officer, the State Dairy Commissioner, is directed to aid the State Board of Health in the enforcement of these acts. The analysis of suspected articles is also provided for by the appointment of chemists to whom samples may be sent. The ordinary commercial adulterations, being commonly harmless, do not interest health officers, except in a casual way, but Health Boards should be prepared to check the sale of articles adulterated with dangerous ingredients, that might cause ill health or prove actually poisonous. In the collection of samples, Inspectors must be governed by the rules given above. When special inspections are demanded, a note should be sent to the Dairy Commissioner, at Trenton, who will immediately detail a proper officer to investigate the articles or trades suspected.

Some special articles of food and drink require constant oversight on the part of health officials, and any reported case of illness or death supposed to be due to these articles, should be investigated without loss of time and while the facts are recent and easily obtained. In all these cases samples of the suspected article should be obtained and put under seal, and notes taken of all the details. The attending physician should also be consulted as to the symptoms. Cases of sudden poisoning are very often reported as due to the ingestion of meat, fish or other animal food, either fresh or canned. In these instances a rigid, exhaustive investigation should be made, samples of the poisonous articles obtained and full notes written up.

There can be no doubt but that beverages drawn through lead pipes or otherwise contaminated with metal, are often the cause of acute or chronic poisoning, hence a constant oversight should be maintained by Inspectors. If the suspected beverages, soda water, carbonated drinks, beer or ale, are drawn from fountains or through pipes, the sample is best taken in the early morning, after the beverage shall have stood in the pipes over night. From two quarts to a gallon of the fluid should be taken and sent to the chemist. In the case of beverages supplied in stoppered bottles, or in siphons, the original bottles should be sent to the analyst.

BUTTER.

A special officer, the Dairy Commissioner, is appointed to enforce the provisions of the various acts adopted to check the sale of imitations of dairy products, hence he should be duly notified of any suspected fraud.

ILLUMINATING OILS.

It is the duty of the local health officers to enforce the provision of the act of 1883, regulating the sale of kerosene and other illuminating oils, and Inspectors should not wait until an accident occurs, but should test all oils offered for sale or used within their jurisdiction. In the case of the explosion of a lamp, a sample of the oil should be obtained immediately and a full record made of all facts relating to the case. The oil tester adopted by this State, under the provisions of the act, is a closed tester, and is known as the New York State Board of Health Oil Tester, and it may be obtained of Eimer & Amend, 201 Third avenue, New York. The following rules are adopted to govern the use of the tester:

"Remove the oil cup and fill the water-bath with cold water up to the mark on the inside. Replace the oil cup, and pour in enough oil to fill it to within one-eighth of an inch of the flange joining the cup and the vapor-chamber above. Care must be taken that the oil does not flow over the flange. Remove all air bubbles with a piece of dry paper. Place the glass cover on the oil cup, and so adjust the thermometer that its bulb shall be just covered by the oil.

"If an alcohol lamp is employed for heating the water-bath, the wick should be carefully trimmed and adjusted to a small flame. A small Bunsen burner may be used in place of the lamp. The rate of heating should be about two degrees per minute, and in no case exceed three degrees.

"As a flash torch, a small gas jet one-quarter inch in length, should be employed. When gas is not at hand, employ a piece of waxed linen twine. The flame in this case, however, should be small.

"When the temperature of the oil has reached 85° F., the testing should commence. To this end insert the torch into the opening in the cover, passing it in at such an angle as to well clear the cover, and to a distance about half-way between the oil and the cover. The motion should be steady and uniform, rapid and without any pause. This should be repeated at every two degrees rise of the thermometer until the temperature has reached 95°, when the lamp should be removed and the testing should be made for each degree of temperature until 100° is reached. After this the lamp may be replaced if necessary, and the testings continued for each two degrees.

"The appearance of a slight bluish flame shows that the flashing point has been reached.

"In every case note the temperature of the oil before introducing the torch. The flame of the torch must not come in contact with the oil.

"The water-bath should be filled with cold water for each separate test, and the oil from a previous test carefully wiped from the oil cup."

Not less than one pint of the oil to be tested should be sent to the examiner. It must be accompanied by the name of the person sending it, and by the name of the person from whom it was obtained.

SECTION XII.

A FEW QUESTIONS AND ANSWERS FOR GUIDANCE OF HEALTH INSPECTORS.

House-fixtures which Connect with Sewers or Outside Pipes.

Q. Of what material should soil-pipes, inside of house, be made?

A. They should be of lead for connection, and of iron for main soil-pipe.

Q. What should be their size?

A. This depends on amount of soiled liquids to be carried, but never more than four inches in diameter for those attached to fixtures. The main pipe, which connects the fixtures, may be from four to eight inches.

Q. What should be the grade of pipes connecting with the outside sewer?

A. A four-inch main drain should, if possible, have a grade or fall of not less than one foot in forty feet; a six-inch drain one foot in sixty, and a nine-inch drain one foot in ninety feet, or in that proportion.

Q. How are the different pipes joined?

A. Either by thread and screw, or by iron ferrules, or by what is known as a wiped joint.

Q. Where do breaks or leakages mostly occur?

A. At joints, or at sudden bends, and sometimes from thinness of metal, or corrosion, or eating through by rats, or by the settling of foundations or timbers.

Q. How can an opening be detected?

A. By air tests, smoke tests, and escape of odors. (See Sections III. and IV., pages 55 and 59.)

Q. What effect has great height of pipes?

A. A sudden fall of water through them may empty a trap.

Q. What is meant by a trap, and what is it for?

A. It is a device for breaking the connection between parts of a pipe, so that gases cannot pass throughout its length.

Q. What evils may arise from traps?

A. Foul matter may get in them and remain, unless tightly made, and so they form a kind of local cesspool. If too many, they interfere with ventilation, since every long line of pipe should have an opening at its beginning and at its ending for the circulation of air.

Q. How may a running or water-seal trap be emptied or unsealed?

A. By evaporation, or the water may be sucked out of it by a sudden fall of water, or anything that causes a vacuum, or may be pushed or driven out of it by a sudden pressure of air upon it.

Q. How can these last two be prevented?

A. Partly by a proper depth of the trap, and by a vent-pipe at the crown of the pipe, or a mechanical trap.

Q. How can evaporation be counteracted?

A. By a slight drip from the faucet, when the various appliances are not in use.

Q. What is a running trap?

A. One made by a bend or dip in the metal of the pipe, so that a small bowl is formed, which holds enough of the passing liquid to make a seal.

Q. How does it furnish a seal, so as to prevent the passage of gas?

A. The water in the trap interposes an obstruction, and although water, standing long in a trap, will contain some gas and permit slight passage, this is not so in its general use.

Q. What other kinds of traps are there?

A. A great many, such as the Bower trap, the McClellan trap, the Adee trap, the Cudell trap, &c.

Q. Why are these sometimes preferred?

A. Because rubber or quicksilver or some other device being used, they do not depend upon the water-seal, or because they admit of easier cleansing.

Q. How can gas pressure be avoided?

A. By openings in the pipe at the roof, and outside the cellar where it leaves the building, and on the house side of any outside trap; also by vent-pipes from each trap where needed.

Q. How can siphoning be avoided?

A. By right construction, which includes proper fall, a not too shallow water-seal, or by vent-pipes from traps, or by use of some form of trap not depending upon water-seal.

Q. What are some of the defects most frequently found in house-pipes?

A. The metal may be so thin as to have minute holes, or the joints are imperfect, or have been broken by settling. There is not enough fall, and the traps are set so as not to have much depth of seal. Sudden bends interfere with flow. Overflows from washstands or cisterns connect with soil-pipes and so when there is no overflow distribute sewer gas. There is imperfect ventilation of inside pipes, or none at all.

Q. What precaution should be taken in connecting house-drains with sewers, in order to prevent foul air from the sewers entering the houses?

A. In connecting house-drains with main sewers, the drain should be properly trapped and ventilated between the juncture with the sewer and the building, and again ventilated at its termination on the roof. These ventilating-pipes being equal in diameter to the size of the drain, and carried up to an elevation above the highest point of the roof of the building, allow a free current of air to pass through the entire drain.

Q. If traps are defective, what is the result?

A. Sewer gas and particles of foul organic matter find their way into houses and into our lungs.

Q. What traps are mostly in use where a water-seal is not depended upon?

A. The Bower trap, the Putnam trap, the McClellan trap and a form of the Cudell trap.

Q. How can soil-pipes be cleansed?

A. By pouring hot water down them and quickly following it with some strong disinfecting solution. For kitchen pipes a hot solution of washing soda dissolves and carries away the grease.

Q. How does the pipe from the kitchen sink often become stopped?

A. By grease and shreds of various kinds. Where there is much grease, if the water is allowed to cool, the grease may be skimmed off, or a grease trap may be used. (See fourteenth report, page 22.)

Q. What is the objection to the Bell trap for kitchen or slop sinks?

A. The inverted cup, or bell, which dips into the annular depression around the upper end of the waste-pipe, causes a slow flow. Around it, crumbs and sand are likely to collect. It thus forms a small cesspool and the water-seal is so slight that it is easily emptied. Some shapes of it are much better than others.

Q. Is it wise to have stationary wash-basins in sleeping-rooms.

A. Not unless of the very best construction and frequently examined.

Q. Why not?

A. Because too often an imperfect or empty trap and the overflow-pipe may let in gas to be inbreathed at night.

Q. Should the pipes of wash-basins, bath-tubs, water-closets, join before entering the main house, soil or drain-pipe?

A. Not usually, since thus siphonage is more likely to occur.

Q. What are the chief varieties of water-closets?

A. The pan-closet, the plunger-closet, the long and short hopper-closet, and the washout-closet.

Q. What is the objection to the pan-closet?

A. The pan forms a kind of local cesspool for foul organic matter.

Q. What is the objection to the plunger-closet?

A. The side reservoir, which contains the plunger, &c., becomes foul, unless taken apart three or four times a year.

Q. What are the advantages of the hopper-closets?

A. They are simpler in construction, and have no place for the detention of foul matter.

Q. What is the advantage of the washout-closet?

A. It holds more water in the bowl.

Q. How should water-closets be supplied with water?

A. Not, as a rule, directly from the water-pipes, since it is claimed that foul gases may be absorbed into the water-supply, but by means of a small tank or water-holder overhead, which should be self-regulating.

Q. How should connection be made between house-pipes and outside cesspool?

A. If cesspool must be used, the pipes to it should be laid in cement. There should be a ventilating opening outside of a trap on the pipe, after it comes out of the house, and the pipe should enter the cesspool above the liquid. The cesspool should never be allowed to get full, and it should be emptied by an odorless apparatus, and fumigated with sulphur after emptying. Any outside water-closet or privy vault should be treated in the same way. No pipe from the house should ever enter any outside privy vault.

Q. Where there are sewers, how should connection of house-pipes be made thereto?

A. Only under the direction of an Inspector, who will see that each joint between the house and sewer is perfect; that the pipe is solidly laid; that the gradient is sufficient, and that it is closely joined where it enters the sewer.

Q. What is meant by alignment?

A. The line of direction, according to the plan.

Q. What is the usual gradient or fall of an outside sewer?

A. It varies from one in one hundred to one in five hundred.

Q. May the grade be too great?

A. Yes; as too heavy a gradient wears the sewers, and at intersections may cause obstruction or a break.

Q. How should the outside sewer be examined?

A. At house connections, where there is obstruction, at man-holes and at the terminus, to see that there is no obstruction to its scouring and thorough emptying.

Q. On what does the velocity of the flow in sewers depend?

A. Chiefly upon grade, but somewhat on size and shape.

Q. What ought to be the rapidity of flow in a sewer of from twelve to twenty-four inches diameter?

A. Not less than two and a half feet per second, and two feet for larger size.

Q. What is the smallest size allowable for any outside sewer-pipes?

A. Latham says nine inches in diameter.

Q. Why ought sewers to be ventilated; what circumstances favor the formation of foul gases in sewers; how can new sewers be constructed so as to prevent, or greatly reduce, the formation of such gases?

A. To prevent the foul gases generated in the sewers, from finding their way into dwellings, and to prevent any accumulation of such gases in the sewer itself.

Bad construction, improper gradients, which allow the sewer to become a sewer of deposit, and not self-cleansing, insufficient flushing, where such gradient cannot be obtained, dead ends, want of ventilation, defective joints, which may allow a leakage from gas mains to enter sewers, and minor causes.

New sewers should be constructed in straight lines from man-hole to man-hole, with a perfect invert, having a uniform fall of sufficient gradient to allow them to be self-cleansing, of such shape as to give the maximum scour with the minimum friction surface, and so ventilated as to make it impossible for sewer gas to generate.

Water-Supply.

Q. What are the points which the Inspector should examine as to inside water fixtures.

A. Whether there is an inside cistern, and if so, whether it is clean and has an overflow not connected with inside soil-pipe. Also the condition of all water-pipes, whether they are connected directly with water-supply to closets; how one faucet or pipe is affected by the opening of another; whether there are any leakages, and whether there is, at times, intermittent supply.

Q. What is meant by intermittent supply?

A. Pipes, both inside and out, may be kept full, which is called a constant water-supply, or water may be turned off or on at its source or the supply may be cut off for a little time by too many discharge openings at other points. Thus the supply intermits and the empty pipe may receive air or foul gases, if these are near.

Q. Are wells or cisterns in cellars allowable?

A. Never.

Q. What should an Inspector examine as to outside wells?

A. Their distance from all buildings, cesspools, &c.; the condition of soil about them; the slope of ground from them; their covering, so that nothing can enter from the top; whether the steining or wall-finish about them for four or five feet down is cemented; their depth and cleanliness, and the condition of the pipe or pump through which the water is drawn out.

Q. Name some common test for water?

A. Heinsch's test is this: Fill a clean pint-bottle three-fourths full of the suspected water and dissolve in the water a half-teaspoonful of granulated white sugar; cork the bottle and place it in a warm place for from twenty-four to forty-eight hours. If the water then has odor or a cloudy or milky color, it should not be used without boiling or further testing. The permanganate test; the chlorine test; the ammonia or Wanklyn test; the Frankland or combustion test; the Kjeldahl test and the biological or Koch test, are used by chemists.

Q. How is the public water-supply to be examined?

A. As to the locality of its connecting-pipes; as to the condition of stand-pipe or reservoir; as to sources of foulness along the course from which the supply comes; as to the crib or place of entrance, and as to the condition of gathering-ground or streams and the surrounding soil.

Garbage Removal, Scavenging, &c.

Q. What is necessary as to garbage removal?

A. That every city should have a general system under careful regulation.

Q. What is the chief evil in cities as to individual premises?

A. That many things are kept upon them that should be promptly removed.

Q. Should the Board of Health ordinances require garbage to be collected free from ashes?

A. They should; and cases of mixture should be at once reported.

Q. How often should garbage be removed?

A. Not less than every other day in summer and twice a week in winter.

Q. Should garbage ever be disposed of within city limits?

A. It should not except it be by burning in close furnaces.

Q. May refuse material be used to fill up low places within city limits?

A. Only if under the direction of an Inspector; there should be no animal matter and no decaying vegetable matter in it; it should not be in heaps, but should be spread to a depth of not over two feet in any one year.

Tenement and Other Houses.

Q. What do we mean by a tenement-house?

A. One containing over two families.

Q. Why do these need especial oversight?

A. Because of the number of inmates, the frequent lack of light and ventilation and the common use of yards, stairs, hallways, &c.

Q. How can an Inspector enforce cleanliness as to these?

A. By reporting them as nuisances and directing as to what changes should be made.

Q. Are rooms sufficiently aired by opening a window?

A. They are not; there should at times be flushing with air, so that walls, corners and every part shall be reached; there is also need of sunlight.

Q. What is the least amount of air space which should be allowed for each person?

A. The minimum of cubic space in a room which should be allowed for each person is as follows: In a school-room, 250 feet; in a dwelling-room occupied all day or all night, 300 feet; in a tenement-house, 400 feet; height of ceiling should be not over 10 feet, with not less than 12 square feet of floor space to each person; thus, a box ten feet high and five feet wide and long represents 250 feet of air; windows should reach as near to the ceiling as possible and the upper sash admit of lowering.

Q. Why does a room require so much air?

A. Because of the amount of cubic feet of air needed in breathing, the necessity of so introducing air as not to cause draught, and because experience shows this to be the least possible amount, and that even more is desirable.

Q. How is the necessity for this amount somewhat modified?

A. By the fact that air is constantly interchanged through cracks, crevices, walls, &c., but not enough to secure ventilation.

Q. What are the most important points to be considered in examining the ventilation of a room?

A. Ascertain whether the window space for light is sufficient, whether windows are made to open top and bottom; if a fireplace and chimney aid in the ventilation; height of room, its dryness or otherwise, and the mode of artificial lighting.

Q. Describe the construction necessary to prevent damp in buildings?

A. The whole site, if wet, to be underdrained, then concreted, the walls to have a ventilated damp-proof course all around, and free circulation of air between the concrete flooring and the wooden flooring of room above. A damp-proof course is usually made by one or more courses of slate or tile on the foundation, after it reaches the level of the ground.

Q. Does illuminating gas injure the air of rooms?

A. Yes, and it is often mistaken for sewer gas.

Q. How are gas-pipes and fittings to be tested?

A. Attach a pressure-gauge and pump air into the pipes; if the gauge stands the pipes are sound, if it falls, there is leakage.

School-Houses.

Q. In examining alms-houses, jails or other public buildings what is the proper method?

A. Use the following questions of one of the circulars* of the State Board, which are also valuable as a guide to examination of most buildings:

1. Building, how located as to elevation and drainage?
2. Size of house?
3. Is it brick or wood?
4. Has it a cellar or basement?
5. If so, state its condition—whether wet, damp, dirty, dark, unventilated, cemented or floored, &c.
6. Size of school-room? Give number, length, breadth and height, that the cubic space may be computed.
7. Is there an entry?
8. Is room wainscoted? Kind of wall?
9. Number of doors? Correct answers to 9 and 10 are necessary to ascertain lighting surface.
10. How many windows?
11. Size of windows and glass?
12. Distance from ceiling?
13. Are the windows to the right or left, behind or in front of the scholars?
14. What is the size of the yard?
15. Is it fenced?
16. Does water ever stand in the yard or beneath the house?
17. Is it well heated, and how? Is there dust? Is water supplied to stove or furnace?

*This circular, with space for answers and remarks, can be had in small book form by every school in the State, by applying to Secretary State Board of Health.

18. Do you register by thermometer? Is temperature even?

19. Is it well ventilated, and how? If by ventilating registers, state whether they are in ceiling overhead, or in flues at bottom or top of room, or both. Also, if there is any provision for allowing fresh air to enter the room?

20. If by windows, have you ways of preventing draught?

21. Are the blackboards placed between the windows? Blackboards, if possible, should be on side where there are no windows, on account of less reflection of light.

22. Are the surfaces in good condition?

23. What is the source of water-supply?

24. If from wells, give depth. Is there any privy-vault, stable, sink-drain or cesspool near? See diagram, page 43, and mark, as nearly as possible, the distance in feet from such sources of pollution.

25. Is the well protected from all surface pollution?

26. Is the condition of the well carefully looked after? (See Circular LIII. of Board, as to water-supply.)

27. Are there two privies belonging to the school-house?

28. How many feet from school-house?

29. Are the buildings kept in good order?

30. Have they vaults?

31. How often cleansed or disinfected?

32. How is it done?

33. Do trustees or others inspect buildings and school monthly? Have you a janitor?

34. If water-closets are in use, in what condition are they kept?

35. Are they always flushed with an abundance of water?

36. Are they odorless?

37. Are there any offensive or dangerous nuisances near the school-house, such as barnyards, slaughter-houses, stagnant pools, &c.?

38. Is the law providing for vaccination attended to?

39. Are pupils from families where infectious or contagious diseases are prevailing excluded from school?

40. Are all the doors hung to swing outward, as the law requires?

41. In what year was the school-house built?

42. Is it a suitable house for the district? If not, state reason why. Has it proper places for hanging garments, hats, &c.?

43. Are seats and desks fitted to the size of the scholars?

44. How many pupils can be comfortably seated in the building? Is any room too crowded?

45. What is thus far the average daily attendance this quarter?

46. How many of your pupils are near-sighted?

47. Have you known pupils to become near-sighted while attending school?

48. Are there curtains, or inside or outside blinds to the windows?

49. How and to what extent is either physiology or hygiene taught?

50. Is there provision for hand and face-washing?

General remarks as to needed improvements.

Send for specimen book of State Board of Health, with questions and diagrams for inspection.

SIMILAR SPECIMEN SCHEDULE OF SANITARY INQUIRY AS TO PUBLIC INSTITUTIONS WITHIN YOUR INSPECTION DISTRICT.

1. Name and post-office address of institution.
2. Name and post-office address of physician.
3. Name and post-office address of chief officer.
4. Location.
5. Are buildings owned by township or county?
6. Area of ground and altitude above sea level.
7. Character of soil.
8. How are grounds improved?
9. General character of buildings and material of construction.
10. Date of erection and cost.
11. Average yearly cost of repairs.
12. Is there an accurate geological map and description?
13. Are there contour maps, topographical maps and a plan and schedule of all underground apparatus or appliance?
14. Have natural water-courses been disturbed?
15. Is there any damming up of water for ponds?
16. Give place, size, depth, character and locality of any springs and wells.
17. Are they opened or closed, and what is the mode of getting water therefrom?
18. Is there any artificial drainage?
19. Size of rooms for bed or sitting-rooms on first floor.
20. Size of rooms for bed or ward-rooms on second floor.
21. Size of rooms for bed or ward-rooms on third floor.

22. What is the finish of walls?
23. Are the rooms wainscoted?
24. How near to ceilings are windows?
25. Are there windows, shutters or blinds?
26. How is admission of sunlight regulated?
27. Is there shade?
28. Does sunlight enter all the rooms?
29. Have you had any accident?
30. Are all children vaccinated?
31. Have all adults been vaccinated within ten years?
32. What facilities have you, besides ordinary house-cleaning, for cleansing and varnishing of furniture and bedsteads, mattresses, &c.?
33. Do you have wood or iron bedsteads?
34. Is there any system by which new suits of outside clothing are furnished to inmates and by which clothing long worn is cleansed by airing or heating?
35. What are the facilities for bathing and washing for inmates?
36. How is laundry work conducted?
37. Are the inmates fed in their rooms, or when able, do they come to a common table?
38. What is the arrangement for drainage?
39. What is the size, shape, thickness, construction and preparation of pipes? How joined?
40. Is there a basement or cellar? Is there an unoccupied attic?
41. How are these ventilated?
42. How much below ground level, and how occupied?
43. Does water ever stand in it?
44. Are walls and floors concrete?
45. Are sewers connected with drains?
46. How?
47. Give the exact fall per foot, and any variations.
48. How are sewers ventilated?
49. Are there grease traps?
50. What is the indoor water-closet arrangement?
51. Are water-closets in projections, or separated by corridors?
52. If there are any sewers or pipes leading from the house, give their size and construction and fall and outlet.
53. Give modes of ventilation, kinds of traps and just where located.

54. What is the outdoor arrangement?
55. How often is the material removed, and by what method?
56. Do fecal and slop material mingle?
57. If separate, are urine and waste-water separate?
58. How is slop-water disposed of?
59. What is the system of flushing or disinfection?
60. If to a cesspool, describe it and where it empties, and how it is cleansed and how often?
61. Is there open ventilation between the cesspool or sewer and the house?
62. If so, give full plan.
63. What is the water-supply?
64. Is it brought on all the floors, and how?
65. How is the water stored?
66. Is there an overflow-pipe? If so, how trapped and joined to what outlet?
67. If in cisterns, how often cleaned?
68. What is their locality?
69. Is provision made for the "washings" of the roof to be carried off first?
70. Of what material is the roof?
71. If no cisterns, how is the roof-water disposed of?
72. If water is got from wells, what are the chances for contamination with sewage or surface drainage?
73. Is there any reason to suspect impure water?
74. What is the system of ventilation?
75. Give full plan.
76. Have there been anemometer or other tests?
77. Is there any provision for changing the air of rooms during cold weather?
78. Have the heating and ventilating appliances been tested in varying conditions of atmosphere?
79. What is the method of heating?
80. Give plan.
81. How many wards or bed-rooms have fire-places?
82. What was the average number in the house last year?
83. What was the expense for maintenance last year?
84. What is the plan of outdoor relief?
85. What was the cost last year?

86. Have you a regular dietary each day?
87. If so, give the dietary each day.
88. Have you any insane paupers?
89. How many are demented or foolish?
90. How many are harmless?
91. Are they, or should they, be separately kept?
92. What are the arrangements for separation of males and females?
93. What are the nursing arrangements?
94. What is the medical attendance?
95. How is it arranged for?
96. How much is paid therefor?
97. How are medicines furnished?
98. Are any disinfectants kept on hand?
99. If so, how used?
100. Inform us what changes are needed in all present arrangements.
101. Physicians will state any facts of interest regarding sickness during past year, or sanitary defects existing.
102. What was the number of deaths, and their causes, last year?
103. Have you any system of employment for inmates?
104. What is the discipline and oversight of attendants?
105. Is any special industry followed?
106. If so, give particulars.
107. Is it profitable, or merely for occupation?
108. How many inmates have tobacco furnished them?
109. How many have opium furnished them?
110. What was the tobacco bill last year?
111. What was the liquor bill?
112. What was the quinine bill?
113. What are the arrangements for schooling children?
114. Are any apprenticed out, and at what age?
115. Are places sought for any not yet apprenticed?
116. What visitation have you that looks into the moral and physical welfare of the inmates? What provision therefor?
117. What provisions are there for amusements or for reading matter for inmates?
118. How many of the inmates were born in dependency?
119. What provision in case of fire?
120. What is the method of lighting?

121. Is any register kept of inmates as to habits, cause of dependence, mental condition, &c.?

122. What is the cubic space per inmate?

123. What are the hospital arrangements?

124. Is there any oversight of or inquiry into the physical condition of inmates?

Specially for Jails.

125. Have any been detained as witnesses in cells during the past year, and how long?

126. What system have you for receiving excretions of the body during the night?

127. What in cases of sickness?

128. What are the chances for sunlight to enter cells and corridors?

129. Are prisoners allowed to smoke and make ablutions in the cells?

130. Cubic space of each cell?

131. What chance for change of air in cells?

132. If prisoners are suddenly taken ill in the night, how may they summon assistance?

133. Size of windows in cells?

134. Size of doors.

135. Amount of sickness and number of deaths yearly?

Q. When an Inspector is in doubt as to what to do, how should he get information?

A. Generally by sending a postal to the State Board for a circular on the subject in hand, or by consulting the reports of the Board, or writing to its Secretary for information.

Copies of this Inspector's Guide may be had by the Secretary of any Local Health Board or by any Health Inspector by postal addressed E. M. HUNT, M.D., SEC'Y,

Trenton, N. J.

THE SEWERAGE AND DRAINAGE OF TRENTON.

BY RUDOLPH HERING, C.E., NEW YORK.

After numerous efforts to establish a system of sewerage and drainage for the city of Trenton, the Common Council adopted a resolution, in the spring of 1884, which instructed the Sanitary Committee to employ an engineer to furnish such plans as, from an economical and sanitary point of view, would be best adapted to the wants of the city. In accordance therewith the author was employed to prepare the required plans.

The conditions presented by the topography of the city, its natural water-courses, and a large river washing its shores, are not unusual. Nor were the nuisances caused by the discharge of all sorts of filth into the brooks passing across vacant lots and under buildings, an unnatural consequence of the prevailing absence of any proper system of filth removal.

The growth of population caused an increase of refuse matter, which was mingled with the greater quantity of water used for domestic purposes. The large bulk of fouled water could not be readily disposed of except by turning it into existing channels and letting gravity carry it away, or, perhaps, where the sub-soil was porous, by letting it soak into the ground. The suspended particles in the first case strand along the rough sides of the gutters or still more uneven beds of the brooks, and in the second case they clog the pores, prevent further filtration and cause foulness of the retained matter.

Petty's run, flowing through the heart of the city, had become very offensive and dangerous to health for these and other reasons. Ill-advised economy had kept this run high near its mouth, simply to save cutting through a barrier of rock, and beyond kept it very shallow and almost level for a long distance through the city. What was the natural result? The increased building and paving caused more and more water to flow off the ground into the brook until it overflowed its old banks at every moderately-heavy rain. There was neither sufficient depth nor descent to properly carry it off. This flooding caused regularly-recurring damages to property, and, by the spreading of the filth washed down, a very undesirable and probably a most unhealthy condition of the locality.

Some sewers were already discharging into Assanpink creek, and therefore threatened to pollute also this water-course, to the injury of the whole city.

In some parts of the city, where the ground is sandy, the sub-soil water level rises above the cellar bottoms, and therefore keeps them wet or under water. If this were clean and pure it would be sufficiently objectionable to require a remedy, but much of this water, when it reaches the cellars, has previously drained cesspools and contains bacteria and organic matter in large quantities, conditions which may readily produce illness among the occupants of the house.

Such were the evils complained of in Trenton, which it was desired to have removed by a properly-devised system of piping, which was to collect and carry away the foul water or sewage, the rain-water and the ground-water. That the desired result can be accomplished in this manner is not only demonstrated by actual experience, but its logical necessity is shown, if we assume that the quick and thorough removal of all organic waste matter from our dwellings and streets, preventing its decomposition at our habitations, destroys certain conditions which are favorable to the spread of zymotic diseases.

The engineering problem resolves itself, therefore, into devising such means as will, first, receive and carry off, with the best velocity attainable, the dirty water from buildings, containing and carrying the kitchen, chamber, laundry, bath-room and closet waste-water and slops; secondly, remove the rain-water from the roofs, yards and streets, so that neither damage is done nor great inconvenience is caused; thirdly, drain the ground to such a depth that the cellars will remain dry during the wettest season.

While the first consideration to be given the matter is a sanitary one, it must be closely followed by the consideration of cost. If too expensive, the most important sanitary works fail to be carried out. It is, therefore, one of the first questions with the engineer to determine how far he can fulfill the above three requirements by a single system of piping. He was at one time urgently requested never to attempt this, because the sanitary advantages would be marred if not destroyed by a combination of sewage and surface-water. This urging came from different quarters. Where the pollution of streams was detrimental to water-supplies, it was necessary that the surface-water, after washing the roads and yards, be as clean as possible when it enters the stream. To mix it also with sewage was considered highly objectionable. The separation of the surface-water and its protection from pollution were therefore quite properly urged (mainly in England) wherever the purity of brooks and rivers was to be preserved.

Where, on the other hand, it was necessary to purify the foul waters, perhaps at a great expense, an increase of bulk, through the admixture of rain-water, should be prevented. A separation of the sewage, and its protection from dilution, was therefore likewise quite properly urged. Thirdly, a fear that a pipe carrying sewage, which was open to receive ground-water, would likewise be open to allow sewage to soak into the ground during periods of drought and low ground-water level, prompted a call for keeping the ground-water separate.

There is much truth in these arguments, and, if stated in the above manner, indeed no objections can be offered. But the advocates of separation generally keep before them only cases where these arguments apply in full force. They forget, or some may possibly ignore, cases where different arguments can be made. For instance, let us take New York City. Here it is not necessary to keep the surface-water pure, because its discharge as a polluted water does not affect the question of water-supply. Nor is it necessary to keep the sewage from being diluted by rains, because the sewage requires no system of treatment before it is carried off and made unobjectionable by the tidal currents of the North and East rivers. And, lastly, no system of sub-soil drainage is required, as the ground-water can be made to discharge at the level of the top of the sewers, and therefore never be subjected to a backflow into the cellars.

In New York, therefore, a separation of rain-water, sewage and soil-water is entirely uncalled for, and no engineer understanding his business would think of advising it, unless there was a sanitary objection to the combination. Much has been written about greater lateral deposits from varying water levels, about the supposed greater foulness of large sewers and about difficulties of ventilation, but analysis of actual conditions, as well as comparing statistics of death-rates, dispels all reasons for preferring separation on sanitary grounds.

In Trenton, the economic question was therefore alone considered in deciding upon the kind of system, and the arrangements which are best suited to the local conditions. It was found that in some parts of the city the combined system, and in others the separate system, with various modifications, were most economical in their respective localities.

The Delaware river is used as a water-supply at a few points in New Jersey and Pennsylvania below the city of Trenton. A small amount of sewage may undoubtedly be discharged into the river without injuriously affecting the cities below; just how much is uncertain. But it is highly probable that the time may come when the sewage of Trenton will require at least partial purification before it is discharged into the river, while at present any expense for this purpose is unnecessary. To accomplish this purification, the sewage should be delivered, if practicable, at a point below the city.

Thus the main conditions affecting the design were given. A suitable outfall was found to be at the city line, where the sewage could be carried out into the current. The sewage is brought to it by an intercepting sewer along the river, beginning at the northwest boundary. A second and third intercepting sewer extends along the north and south side of the Assanpink creek. These three sewers keep all sewage from entering the creek or the river in front of the city.

Each section of the city was considered separately, according to its special conditions. It was found that the separate system, proportioned for the admission of rain-water from roofs, best suited most of the territory. Parts of Chambersburg were provided with the combined system. The sub-soil water was to be carried either into the man-holes of the sewers, or of the drains, as most convenient. The surface-water was designed to discharge as soon as possible, either into the creek, the water-power, the canal or the river, while all the sewage goes to the permanent outfall.

In order to be accessible, the sewers and drains are provided with man-holes, for entrance, at convenient distances. To inspect every part of the system from them, the smaller pipes, which cannot be entered by a man, are laid true to line and grade between the points of access, so that they can be sighted through, when desired, by holding a mirror at an angle of 45 degrees at the bottom of the man-hole, in which the observer stands, and by holding a lamp with a reflector at the next man-hole. All turns, changes in the grade and junctions are therefore made at such points of access. Great care must be taken in forming them, so as to prevent eddies and the retention of foul matter. Much of the foulness of old-fashioned sewers arises from improperly-made junctions. An accompanying clay model, made in your city, was used to show the mechanics the proper manner of forming them.

The slopes of the sewers are such as to give to the sewage, when filling the pipe half full, a velocity of not less than three feet per second, which is a cleansing velocity, and should therefore prevent deposits of any ordinary matter getting into the sewers. The least grade for the smallest sewers in three inches in 100 feet; for the largest sewers, one foot in 1,000 feet.

Usually sewers run much less than half full, and therefore the corresponding minimum velocity would be less than three feet. It is therefore necessary to flush the sewers occasionally, that is, to introduce a sufficient quantity of water which will at least half fill the sewer for a short time, and thus obtain the velocity which is necessary to clean it. The roof-water entering during rains is useful for this purpose, as, unlike the street-water, it is clean, and itself brings no sand and rubbish into the sewers. It is therefore admitted. Special arrangements for flushing from the water-supply mains are provided in the man-holes at the heads of the smaller sewers, because most of the foulness and deposits are likely to occur in them.

The ventilation of the sewers is accomplished through openings in man-hole covers. This matter was the special subject of a paper read before the New Jersey Sanitary Association in 1885, and I will not make further reference to the same.

The least size given to the public sewers is eight inches in diameter. Private sewers connected with the public system are six inches in diameter. The outfall sewer, for the entire city, is five feet nine inches in diameter. The drains, which are confined to rain-water removal, were proportioned to carry the water reaching them during rainfalls of such intensity as it was deemed wise to provide for. The largest sewers, carrying also storm-water, are egg-shaped, and measure four feet two inches by six feet three inches. Up to twenty inches in diameter the sewers are built of vitrified stone-ware pipe. Larger sizes are built of brick.

The works were so designed that they could be built gradually, and thus require a smaller tax upon the community than if all were built at once. Mr. W. L. Anderson, C.E., has been the engineer in charge of the construction from the beginning, and still continues in that capacity.

About six miles of sewers and drains have already been built or are under construction. The long outfall sewer will not be required until the temporary outfall at the mouth of the creek becomes objectionable.

The accompanying map shows the system as designed. The colors indicate where the separate or combined systems were recommended, and also what sewers and drains are built or are now under construction.


PLAN
OF
SEWERAGE
FOR THE
CITY OF TRENTON, N. J.
DESIGNED BY
RUDOLPH HERING,
Civil and Sanitary Engineer.
D CRIPTION.
Sewers for Sew and Storm-water, shown thus
Sewers for Sew only, " "
Drains for Stor ater, " "
Sewers built o ng built, " "
Flush-tanks, " "
Arrows indicate ection of flow,
DELAWARE RIVER
MILL
BURG
RIVERVIEW CEMETERY
TO PERMANENT OUTFALL

SEWERS OF MOUNT HOLLY.

BY ENGINEER GASKILL.

The plans for the sewer system were submitted to Mr. Waring and approved of by him. The sewers were completed in 1888. The township owns the system. The system employed is the so-called separate system. The outlet is into the Rancocas creek at high-water mark. The main is 2,000 feet in length on Mill street, and is ten inches in diameter. The laterals are six and eight inches in diameter. The house connections are five and six-inch pipe. Permits for connection with the sewers are issued by the Township Committee. All connections are made under supervision. A "Y" is placed at every house and vacant lot, with a stopper where it is not needed. The system is three and a quarter miles in length. The pipes are of terra cotta, with both open and cemented joints. The grades run from one in fifty to one in three hundred and fifty. The Fields flush tank, with Colonel Waring's improvement, is used at the heads of the lateral. There are twelve of these used. They are set to flush twice in every twenty-four hours. Each of them discharges 150 gallons at each flush. For the purpose of inspection and determining stoppage, branches are put in every 200 feet. A standing "Y" is inserted at the head of a "T," with the stand-pipe coming to the top of the ground. The average depth of the sewers is five feet upon laterals; in some places it is but two feet, but this is where streets are to be filled in to a fixed grade, and in these places the pipes are concreted for protection against breakage. Some fifty houses have roof-water pipes connected with the sewer. Surface-water, rain-water, &c., is led by drain-tile into Buttonwood run. The flow is not determined. No ventilation is provided. Most of the cellars drain into the sewers in the line. The sewers are laid straight, with even grade. Laterals enter the main at an angle of 45°. The lateral is always the height of the pipe above the main sewer. There is no record of the number of house connections, but it is probably about 300. At this date, January 1st, 1891, it can be said that our sewers give very good satisfaction. The flush-tank system works very efficiently. There has only been one stoppage in our sewers since they were put in. That was at a section of the sewer where they did not all have grease-tanks at the sink connection. We find that grease, if permitted to run into the sewer, will cause a stoppage. All except those who have good natural drainage would not be without the sewers, now that they are in.

DETERIORATION OF WATER IN RESERVOIRS AND CONDUITS,

ITS CAUSES AND MODES OF PREVENTION.

BY CHARLES B. BRUSH, C.E., HOBOKEN.

I.

The subject is a very broad one, and all the phases of it are by no means understood at the present time.

Certain things, however, have been definitely ascertained.

It is a fact that the quality of each water-supply varies at certain seasons, under certain conditions and at different periods. Generally, water is in its best condition in fall and spring, and at its worst condition in midsummer and in midwinter.

In hot, dry, dog-days weather, many streams go through what is known as the purging process. The water becomes dead and lifeless, and if allowed to remain at rest for any considerable length of time, a formation known as algæ appears on the surface. Sometimes these algæ are of a green color, taking the appearance of ferns in the water, and sometimes the formation has the appearance of green paint, which can be skimmed off from the surface. At other times the formation is brownish in color and collects in patches, with brown shreds or stems extending some distance down into the water. Sometimes these algæ give the water a distinct taste and smell, more or less offensive. All formations of algæ, however, are destroyed and disappear as soon as the water is put in motion, either by heavy winds or by running the water off rapidly, especially over a rough and irregular surface. If allowed to remain, the water cures itself, the algæ disappearing after a few weeks and leaving the water again in its normal condition. These algæ always appear more quickly on water that has been filtered, either naturally or artificially. Waters that are obtained from subterranean sources, when stored in reservoirs, rapidly deteriorate.

It may be stated as a general principle that water is delivered in its best condition when taken from a running stream and delivered directly to consumers without coming to rest during its passage.

The popular test of the purity of the water-supply is a pleasant taste and an absence of color.

Distilled water is the purest we can obtain, yet it is flat, tasteless and insipid. The worst sewer contamination and other forms of pollution often occur without discoloring the water at all. As a matter of fact, water that is discolored by sediment is often that water in its best condition, because the sediment is due to the fact that an immense and abnormal volume of water is flowing off from the watersheds, and any pollution that may be in the water is so diluted as to be incapable of harm.

Still, the demand for clear water is so pronounced that it will have to be supplied to consumers. This necessitates reservoirs, with their attending evils. Of course, reservoirs are also required for many other reasons. On small drainage areas water must often be impounded during the wet season, to be delivered during the dry season. Again, it is necessary to store waters at proper elevations so that a supply in times of conflagration and other heavy drafts, may be always at hand, without calling upon the pumps to do an unusual amount of work at certain hours of the day, and very little at other hours.

If, however, the storage of water from any source in reservoirs is greater than twenty to thirty days' supply, the deterioration of the water becomes more or less marked. It is rare that water is stored in distributing reservoirs in our large cities more than ten days' supply, and frequently it amounts to a supply of less than five days.

This deterioration is practically due to stagnation, and stagnation begins to manifest itself as soon as the oxygen in solution of the water becomes less than three-tenths of one per cent. The normal quantity of oxygen in solution in good water is about six-tenths of one per cent., but it runs as high, at times, as nine-tenths of one per cent.

The best means of preventing stagnation in reservoirs that are known to-day consist in keeping the water, if possible, in motion, but where that is impracticable, as is generally the case, I know of no better means than of forcing air into the bottom of the reservoir and keeping the water aërated. The same applies to conduits. In the seasons when the water deteriorates the conduits should be frequently blown off, and on long force mains I have found it very desirable to pump air into the mains and let the water and air mix freely until they are both delivered in the reservoir, taking care, of course, to see that all summits are kept free from harmful accumulations of air by opening air cocks at these points as often as may be necessary.

The offensive taste and smell that accompany algæ are usually those of cucumbers, dead fish, &c. The popular notion is that the deterioration of water is due to animal or vegetable life growing in the reservoir or on the banks of the stream. These are not the causes of the unfortunate condition of the water, but rather the results or effects of that condition.

A reservoir should be treated like an aquarium. There should be a proper balance of animal and vegetable life in order to keep the water pure and wholesome. I have obtained excellent results by stocking my reservoirs with German carp, silver and gold-fish, and, after these have grown large enough, by adding black bass. These fish are scavengers respectively of vegetable and animal matter in the water.

In 1884 we had trouble with algæ in our reservoir at Hoboken. We found that the water while in motion was pure and sweet, but after being allowed to remain at rest it became stagnant and algæ appeared on the surface. The reservoir was shut off, and after two or three weeks the water purged itself and became all right again. In the meantime, the water was pumped past the reservoir directly into the city, and no unpleasant taste or smell was noticed.

In Hackensack the supply was formerly distributed from a reservoir the capacity of which was equal to about thirty days' consumption. Complaints had been made during the hot, dry weather of this algæ difficulty, and it was cured by simply abandoning the reservoir and allowing the water to pass through a tank holding about five thousand gallons, the supply of which was regulated by an automatic float.

In Greenwood Cemetery the water was taken from a permeable stratum about forty feet below the surface of the ground. The water as it was delivered into the reservoir was bright and clear generally, and its appearance was entirely unobjectionable. In the hot, dry weather, however, brown algæ appeared on the surface of the water in patches of about twelve to eighteen inches in diameter, with long fibers reaching to the bottom of the reservoir. I found that by forcing the air into the bottom of the reservoir I could entirely break up this algæ formation, the only question being the amount of air required.

In New Rochelle the greatest care is taken to prevent all forms of pollution to the water-supply; the capacity of the reservoir, however, is about three hundred times the daily draft. At times the offensive taste and smell from water drawn from the lake were quite unpleasant. I found by wasting the water through the bottom, by introducing fountains throughout the town and allowing the water to waste through the mains at the extreme end of the town, that the quality of the supply was greatly improved. Subsequently I introduced air into the delivery main in such a way as to have the air rise through the main into the gate-house at the reservoir, thus forcing all the water delivered through the mains to become fairly charged before it reached the consumers. Since then no further difficulty has been experienced.

DETERIORATION OF WATER IN RESERVOIRS,

ITS CAUSES AND PREVENTION.

BY GEORGE W. RAFTER, MEMBER AM. SOC. CIVIL ENGINEERS.

II.

The subject introduced to your notice by the former paper is one of importance and interest, and it is an encouraging sign of the times that the circumstances affecting the quality of a water-supply are becoming more and more matters for scientific inquiry.

The causes which produce deterioration, sudden or otherwise, of quality in water, either stored in reservoirs or flowing in conduits, have existed from the beginning of time, and, probably, all impounded waters have, on occasion, been more or less affected by them, but it is only since the great multiplication of public water-supplies during the last thirty or forty years, that the troubles herein referred to have been made the subject of any considerable amount of study and investigation, and, even at the present time, while we may say that relatively considerable advances have been made, we are still obliged to conclude that detailed knowledge of the matter is, after all, still in its infancy.

We have, nevertheless, a number of cases which have been rather carefully studied, and in some of which the cause has been fairly determined, while in others, although studied, the reason for the trouble remains uncertain. The following, without being in any sense a complete statement of such cases, may still be taken as embodying a number which are typical.

The water of Lake Cochituate was introduced into Boston in 1848, and in June, 1851, the first recorded trouble with the Boston water occurred. The consumers complained that the water as drawn from the services had a bad taste, and a thorough flushing of the distribution mains throughout the city seems to have been an efficient remedy, leading, apparently, to the conclusion that this early case was chiefly or entirely confined to the conduits and mains.

In the month of October, 1854, a similar trouble again occurred with the Boston water. This was described in a report thereon as "consisting of a marked and peculiar taste, resembling, in the opinion of some, that of fish, but to a great majority of persons, that of cucumbers or some similar vegetable, the taste being sometimes accompanied by a disagreeable smell." An investigation of the matter by Professor E. M. Horsford and Dr. Charles T. Jackson, without clearly defining the origin of the impurity, led to the conclusion that the peculiar taste did not originate in the mains, but rather at the source of the supply, Lake Cochituate; that it was not the result of animal putrefaction, but of vegetable matter in a state of fermentation, and that there was nothing deleterious to health in the water.

In 1876 a similar trouble again occurred in the Boston water, which, however, was apparently confined to the Bradlee basin. An investigation was made by Professors Nichols, Farlow and Burgess, who reported that the water contained no more chemical substances or animal or vegetable than usual, and they were unable to assign any specific cause for the trouble.

In 1881 a similar trouble at Boston was studied by Professor Ira Remsen, of Baltimore. On this occasion the trouble appears to have originated in Farm pond, one of the minor sources of supply to the city, and Professor Remsen claims to have fixed upon a species of fresh-water sponge, the *Spongilla fluviatilis,* as defined in his report, as the cause of the difficulty in this case.

The fresh-water sponge had not been, previous to this time, so far as I am aware, assigned as a specific cause of the various bad tastes and odors which we are now discussing. The fresh-water sponges may be frequently found in rapid-running water, attached to large loose stones, or the underside of timbers. They are also found on water-logged or floating timber and submerged stumps, and many of the species grow in deep water from ten to twenty feet or more below the surface. The different species attain their maturity between July and December, but they may be found at all seasons.

The sponge is an animal which, from its peculiar nature, requires a good deal of food, and it may be said to be constantly feeding. It cannot be considered, when by itself, in a healthy condition, as affecting injuriously the water in which it is growing. After digestion takes place, the excrement in the form of minute pellets, is thrown out, and we may, in a general way, consider the sponge as an instrument by which considerable quantities of organic matter are taken from the waters which it inhabits, a certain amount of which is consumed in the life processes of the sponge, while the balance passes again into the water in the form of the pellets of excrement.

After fresh-water sponges have attained maturity they gradually die down, and we may reasonably expect bad odors, if caused by the sponges at all, in that part of the year when the process of decay is taking place. This conclusion has been verified by experience, as it is in the fall and early winter, just the season of decay of the sponge, that bad tastes and odors, ascribed to it as a cause, have taken place.

The special conditions favorable to the growth of the sponge are, as yet, entirely unknown, except that a sufficiency of food is an indispensable condition. They certainly grow in waters exhibiting considerable variations in temperature, as, for instance, in lakes, near the surface, where in summer the water attains a temperature of 70° F., or more, and they also grow with equal, or even greater luxuriance in the same bodies of water, at such depths as preclude high temperature. They have been found in such bodies of water at depths of fifty feet, where the highest summer temperature never exceeds 55° F.

Some of the species of fresh-water sponges attain considerable size—as, for instance, several inches in length—and the reason why a large body of water may become suddenly affected with bad tastes from this cause, is to be accounted for by their open, porous structure, by virtue of which the sponge, when it once begins to decay, decomposes throughout very rapidly. Mr. Hyatt, of Boston, whose studies in this direction entitle his opinion to the greatest weight, considers that this power of rapid decomposition, due to the open structure, is an important element in the problem.

Passing to experience in other cities, we may next consider the water-supply of the city of New York. The Croton water was affected with disagreeable tastes and odors in August, 1859, and Dr. John Torrey, at the request of the Croton Aqueduct Board, made a study of its cause. The water was found filled with filaments of an alga, which Dr. Torrey was unable to definitely identify, but which he inferred was derived from some species of *Nostoc*.

As the result of his study of the matter, Dr. Torrey reported that "the recent offensive condition of the Croton water was owing to a rapid and abundant growth of a microscopic, conferva-like plant, which abounds in a volatile, odorous principle, soluble to some extent in water."

Early in the spring of 1881, the Croton water was pervaded by an unpleasant taste and odor, and it is stated that a sporadic development of the diatom *Meridion circulare* in the head-waters of the Croton river was the cause of the difficulty. This diatom has a thick gelatinous envelope, and on this occasion is said to have covered every submerged object in the streams to the depth of a quarter of an inch for many miles. In about twenty days after its first appearance, this growth began to break loose, and in a week had entirely disappeared; but following the disappearance of *Meridion* in the upper waters of the Croton, the water, as delivered in New York, began to be pervaded by an unpleasant odor, which it is fair to assume was due to the decomposition of the gelatinous envelope of *Meridion.*

The water-supply of the city of Albany was seriously affected with unpleasant tastes and odors in 1853, 1865, 1872, 1875, and at various times since. The investigations which have been made point to algæ as the cause of the difficulty without, however, specifying the offending form.

At Poughkeepsie, water from the Hudson river is raised to filter beds, and, after filtration, distributed to consumers thoughout the city. This water frequently takes on bad tastes and odors in warm weather, and the cause of this has usually been ascribed to algæ. On one occasion the fresh-water polyzoon, *Pectinatella magnifica,* covered the filter beds, and the breaking up of the gelatinous base, and its consequent diffusion through the water, is stated as the cause.

In 1876 the Hemlock lake water-supply of the city of Rochester was affected with a strong fishy taste and odor, the cause of which was ascribed to algæ, without identification of the particular species producing the trouble. From that time until the fall of 1888, this water-supply, as delivered to the consumers, was entirely free from difficulties of this character. In September, 1888, however, this water suddenly assumed a strong fishy taste and odor, and a study made during the time of the trouble left no doubt as to its being due to the presence of vast quantities of alga, *Volvox globator,* which had developed in such quantity as to give many dozens of its little spheres in a single glass. Botanically, *Volvox globator* pertains to the class

Chlorophyceæ, the order *Protococcoideæ*, and the family *Volvocaceæ*, and one familiar with the classification of the Cryptogams will understand from this that it belongs among the simple forms known as unicellular.

In May, 1889, the Rochester water-supply was again strongly affected by a fishy taste and odor, and a study made at the time showed the objectionable taste and odor to be due to the sporadic development of two diatoms, *Encyonema* and *Cocconema*. Both were present in quantity, not only in the two reservoirs but at the lake itself, and an estimate of the quantity of the jelly-like material which had formed indicated the presence of a number of hundred cubic yards. About the time this mass of foreign material began to decay, very heavy winds prevailed for thirty-six hours, and on their cessation the whole quantity of jelly was found to have been broken up and distributed through the whole body of water, at both lake and reservoirs, whereas before the disturbing action of the heavy winds it was not generally distributed throughout the water.

A study of this case was of considerable interest by reason of the light it threw on the probable origin of those bad tastes and odors in potable water which have apparently been, so far as any evidence that was actually obtained goes to show, entirely unaccompanied by any unusual development of plant life. Had no knowledge been gained of the seat of the difficulty, previous to the heavy winds already referred to, there would have remained no chain of circumstances by which to connect the fishy taste and odor with the vigorous growth of diatoms which was first observed.

In June, 1889, the water-supply of the city of Middletown, Conn., suddenly became infected with a strong fishy taste and odor, and a study by Professor Conn indicated the cause to be an abnormal development of the infusorian *Uroglena volvox*. This form, it may be noted, is an animal, and zoölogically pertains to the sub-kingdom Protozoa, class Flagellata, order Flagellata-Eustomata, and family Chrysomonadidæ. It may be described as a social colony, growing within a sphere-shaped mass of transparent gelatine. The jelly mass, including its contained colony, is, when fully developed, about one-ninetieth of an inch in diameter, though the individual members of the social colonies are much smaller, averaging for length of body about one twelve-hundredth of an inch. Each individual of the colony is united to the central substance of the gelatinous matrix by a slender, thread-like, contractile, posterior prolongation.

Uroglena has been until recently considered as classifying with the Protophyta rather than the Protozoa, but the investigations of Stein and Kent seem to leave no doubt as to its proper place being with the Infusoria rather than the Cryptogams. In any case, both it and *Volvox globator* are very near the border-land between plants and animals, and closely allied, not only in form but the method of development, and *Uroglena*, like *Volvox*, is capable under favorable conditions of multiplying in vast quantity.

Troubles of the kind which we are now discussing have usually occurred in the warm months, but they may occur in the winter, as is illustrated by experience at Springfield, Massachusetts, in January, 1888, when *Dinobrion*, another Infusorian, caused objectionable tastes and odors. *Dinobrion*, like *Uroglena*, pertains to the order Flagellata, and must be considered as also possessing the power of rapid reproduction under favorable conditions.

In addition to this distinct case of unpleasant tastes and odors at Springfield in winter, the water-supply of that city is frequently affected in the same way in summer, the specific cause at this season being, however, certain of the blue-green algæ, or Cyanophyceæ, as, for instance, *Anabœna*, *Clathrocystis* and *Cœlosphœrium*.

Early in the summer of 1886 the water-supply of the city of Jamestown, New York, became exceedingly offensive. Its condition, both as to taste, odor and color, was so bad as to be the subject of the gravest alarm among the citizens of that city. The water-supply of Jamestown was at that time entirely derived from driven wells and was assumed to be one of great natural purity. An investigation finally resulted in the identification of *Crenothrix polyspora*, a minute filliform alga, as the cause of the difficulty. This alga develops in the ground, away from light, and under proper conditions may develop in ground-waters, even while circulating through the mains of a distribution system, in such quantity as to render the purest water disgustingly offensive in taste and odor, of objectionable color, and may even entirely obstruct service-pipes.

The presence of iron in solution seems to be necessary to the existence of *Crenothrix*, as waters which contain iron are found to be especially subject to its visitations.

Previous to its identification at Jamestown, *Crenothrix* had not been definitely identified in water-supplies in this country, although it had been the cause of the most serious trouble at Berlin and other European cities with ground-water supplies.

The foregoing gives a very few of the more interesting cases of marked sudden deterioration which have occurred to some of the large water-supplies of the eastern part of the United States. Such troubles are not, however, confined to any special locality. They are impartially distributed to all parts of the world, and we possess enough definite knowledge to make it safe to say they are usually caused by the development of either protophytic or protozoan forms of life in larger quantities than are normally present in the affected water-supply. When the trouble is entirely confined to the conduits and distribution-pipes, conveying the water from the reservoirs to the consumer, as has been the case in a number of instances, we may conclude that the death and decay of these minute forms, in the conduits and mains, are the chief cause of the difficulty. This also will frequently be the case in reservoirs, although, probably, the little plants and animals may themselves in the living state sometimes contribute unpleasant tastes and odors to the waters containing them.

From the cases cited it further appears, then, that the causes of sudden deterioration of water-supplies which have been observed are fairly well defined, but, as throwing light on the matter of remedy, there still remains to be answered the question as to why do these minute forms of life develop at one time in such vast quantity, and not at another, or why is one water-supply only occasionally affected while with another the difficulty is nearly chronic?

A complete answer to these questions will lead us to consider somewhat profound questions in relation to the reproduction and development of the Protophyta and the Protozoa, and will indeed lead us, figuratively, into rather deep water. The question was, however, ably discussed by Alexander Braun, forty years ago, in his "Rejuvenescence in Nature." Braun takes up the question more especially in its relation to the life and development of plants, and shows that among the Cryptogams, at any rate, there are alternating periods, on the one hand, of moderate reproduction, and, on the other, of extraordinary reproduction; that, during the first period, the life forces of the plant are gradually conserving themselves for the necessarily excessive effort required in the second. There is, therefore, an alternation of generations, the respective periods of which are as yet indeterminate, and we must conclude that the excessive development of minute life, which has characterized water-supplies suffering from bad tastes and odors, is merely a manifestation of one phase of such alternation, but why, in many cases, occurring at irregular intervals, we are, as yet, unable to definitely say.

An explanation of this irregularity of appearance of these troubles may be found in the case of some of the Cryptogams in the consideration that the spores, after a period of activity, enter into a resting state, and only re-awaken to a new life after more or less complete desiccation and resubjection to moisture. It is quite possible in this view that many years may intervene between periods of such disturbances of water-supply by any given Cryptogam.

The foregoing is the merest outline of the causes which operate to produce sudden deterioration of water in conduits and reservoirs; anything like a complete discussion would transgress far beyond the space allotted to the subject at this time.

REMEDIES FOR DETERIORATION OF WATER-SUPPLY FROM THESE CAUSES.

We may now pass to the question of remedy, and, in this direction as in many others, it appears safe to say that usually an ounce of prevention is worth a pound of cure. This old saw, however, cannot be universally applied, for there are certain phases of this matter of deterioration by the presence of minute plant and animal life, to which, as yet, by reason of the impossibility of predicting the appearance of the trouble, we can neither apply an ounce, or a pound, or any other quantity of prevention; we can only devise remedies when the trouble is upon us. As an example of such we may cite *Crenothrix*, the typical cause of the chief or more serious difficulties thus far experienced with ground-water supplies. Our present knowledge of this alga appears to justify saying that ground-waters, which have received a thorough natural filtration before being drawn from the ground, will not be liable to develop an offensive growth of *Crenothrix*. If, however, the conditions are such as to have rendered the natural filtration in complete, there seems to be as yet no known remedy, except artificial sand filtration; this view being largely derived from the experience with *Crenothrix* at Berlin.

Ground-waters containing mineral nitrates are, moreover, subject to excessive growths of green algæ, or brown diatomaceæ, when, after being drawn from the ground, they are stored in open reservoirs with free access of light. Such algæ are incapable of growth in the dark, not only the chlorophyl but the starch, both of which are marked characteristics of the green algæ, requiring light for their development. When, therefore, we find by chemical analysis that a ground-water contains mineral nitrates in appreciable quantities, we may fairly predicate, even before constructing works, that such a supply, if stored in open reservoirs, will be subject to the growth of the green algæ which technically belong to the class Chlorphylceæ. If such waters must be stored at all, it should be either in covered reservoirs, or in tanks entirely without access of light. When for any reason it is inconvenient or impossible to store in covered reservoirs or tanks, the experience of Mr. Brush at Hoboken and at Greenwood Cemetery, indicates that artificial aëration is a practical and efficient remedy, and while, possibly, we are still lacking a sufficient number of applications of artificial aëration to enable us to say definitely that it will prove efficacious on all occasions, we must still grant great credit to Prof. A. R. Leeds, who first suggested it.

In reference to *Crenothrix*, it has been already noted that it possesses the power of vigorous development in the dark, and for this alga we may conclude that covered reservoirs would not prove an efficient remedy. Experience amply justifies this view, as the covering of reservoirs has been found to be without the slightest effect when *Crenothrix* was present.

In the preparation of artificial storage-basins and reservoirs, it has been found, by a large amount of accumulated experience, that too much care cannot be exercised in the way of removal of all top muck, stumps, brush and everything liable to yield organic matter in the process of decomposition after the storage-basin has been filled and water delivered therefrom to consumers. In the first few years of service of a basin, in the construction of which these important prerequisites have been neglected, the water from it will be liable to a series of troubles of the most offensive nature, though there is a modicum of consolation to be derived from the consideration that such troubles, due to neglecting to remove sources of organic contamination, gradually tend to correct themselves. But that such basins are ever really in fit condition for the storage of potable water is somewhat of an open question; certainly their condition never becomes ideal, and I believe it is generally conceded by those who have studied the matter that an engineer is justified in some expenditure to make such basins clean in the beginning.

Storage-basins are frequently many hundred acres in area, and the covering of such areas is impossible by reason of great expense, so that while covering is admitted to be an efficient remedy against the growth of algæ containing chlorophyl, it is impossible to apply it to the case of large storage-basins. For such we may use, however, artificial aëration, mechanical filtration, or else continuous or intermittent filtration through sand. The decision of which is best suited to any given case is, in the present state of our knowledge of this subject, a very difficult matter, though the magnitude of the interests involved would seem to justify a moderate expenditure, in a difficult case, by way of ascertaining, experimentally, just which of the several possible remedies is best suited to the special case.

Herein, however, arises a difficulty. Our municipal authorities are usually people of moderate scientific pretensions, and somewhat too prone to assume that inability on the part of the engineer to solve, off-hand, a difficult question, even though it involves a considerable portion of the field included in zoölogy, cryptogamic botany, special chemistry and physics of water-supplies, and the physics of filtration as a whole, together with the purely engineering problems involved in the design of apparatus fitted to the special case in hand, is, on its face, such evidence of fundamental lack of knowledge, that a recommendation for experimentation is apt to lead to the dismissal of the offending engineer. This astonishing attitude of the general public and of municipal authorities towards these questions of great sanitary importance, is finely brought out by Mr. Brush's experience at Hoboken, an experience that has probably been repeated, in some form, in nearly every town in which serious deteriorations have occurred.

In addition to the several kinds of deterioration which have been already cited as due to the presence of minute plants and animals, we may further mention the case of a stream receiving sewage, and which is also the source of a public water-supply at some point below the inflowing sewage. The proper remedy for this state of affairs is either to keep the sewage out, or if this is impossible, to get the water-supply somewhere else. This may be considered a vigorous statement of this phase of the general subject, and frequently, it is fair to say, it is not only impossible to keep the sewage out, but by reason of the large expense involved, inexpedient to go to an uncontaminated source for a water-supply. In such cases, we should purify the sewage before allowing it to enter the stream, and the method of purification to be adopted will depend largely, or almost entirely, upon the degree of purity of sewage effluent required, this latter depending again upon the degree of proximity of sewage outfall and water-supply intake. When this distance is short and immunity from disease germs is a primary condition, intermittent filtration of the sewage through coarse sand will be likely to produce the most satisfactory results. This intermittent sand filtration of the sewage, supplemented by a mechanical filtration of the water-supply, would give a fairly safe potable water, but at considerable expense, not only in first cost of works, but in annual cost of maintenance and operation. We must not overlook, however, the fact that absolute immunity can hardly be gained by two filterings, and that the possibility always exists for the escape of disease germs and their consequent presence in the water-supply in spite of the double filtration. This fact seems to enforce the proposition that a water-supply should not he taken from a sewage-contaminated stream until, at any rate, the stream has had an opportunity to flow far enough, after receiving the sewage, to allow the natural agencies, which tend to self-purification, to produce their effect, and how far this should be is a difficult question to answer in any given case.

A very marked effect of contamination of the water of a stream by sewage, is the reduction of the amount of dissolved oxygen. As supplying the place of the oxygen that has been used up in the oxidation of the organic matter, and as furnishing a new stock of oxygen to further assist the process of oxidation, artificial aëration may possibly have a place of much more importance than has yet been generally assigned to it.

The very general discussion of the question which is here presented must be considered a skeleton only, and an incomplete one at that, but a rational treatment of the subject requires the statement that a moderate deterioration of a water-supply by reason of the presence of minute animal and vegetable life has not yet, so far as reported, been of any special injury to health, further than the production of diarrhœal troubles and nausea when drunk. A serious deterioration, however, such as occurred at Jamestown by reason of the presence of *Crenothrix*, may carry with it the possibility of injury to the public health, and the presence of large quantities of organic matter undergoing putrefaction, which is the usual accompaniment, may further, in waters subject to sewage contamination, become the source of serious danger. In any case, enough is now known to justify us in saying that we need to know more. The importance to the health of the communities of a complete knowledge of everything affecting water-supplies, is so evident that there seems to be no question as to the desirability of fully informing ourselves about the natural causes of deterioration which are liable to occur to water-supplies.

THE RELATION OF GROUND-WATER TO THE HEALTH OF THE COMMUNITY.

BY COL. GEORGE E. WARING, JR.

Nearly every community, in all countries, lives on a soil which, below a certain depth, is saturated with water. This sometimes very near to the surface, sometimes very deep below it; sometimes nearly quiescent, and sometimes in active movement; sometimes subject to marked rise and fall under the influence of rain and drought, sometimes practically uniform in its elevation. Sometimes it is subject to the action of rising and falling tides, even though its level is considerably higher than that of the tide-water, and the distance somewhat remote.

I have said that this water is sometimes nearly quiescent; it is never entirely so. In some form or other, it is receiving additions, and, either by evaporation or by leakage, it is undergoing waste. Following its tendency to maintain its level, waste at any point must be supplied by a flow from other points and an addition at any point must be equalized by a flow toward other points. Sometimes rims of elevated clay or rock maintain in the soil something approaching the conditions produced by a mill-dam, holding the line of saturation at a given elevation, which, however, in this case is rarely a level, because of the tendency to loss by evaporation or leakage at one part more than at another, and because of an inflow from outlying sources. As a rule, rivers are fed chiefly by underground flow. During heavy rains, a portion of the downfall flows off over the surface and goes directly to the river. Most of it enters the ground, raises the level of its water of saturation, forcing it forward toward the nearest drainage line, whether brook, creek or river. Where the flow toward these drainage lines is considerable, the water in the soil is always higher, sometimes materially higher, than the water of the river, save only when the latter shall have been temporarily raised by an inflow of surface-water. It requires a certain amount of extra elevation, or head, to force the water forward toward the river in order to overcome the friction of the particles of earth among which it is flowing. In coarse gravel this difference of head may not amount to much, but as the obstructing particles become finer, increasing the frictional surface and reducing the size of the space through which the water must run, more and more head is required to produce the discharge. If the discharge is into water of permanent level, the depth of the water from the surface at any given point may remain approximately the same, but if the discharge is into a contiguous body of water subject to a strong tidal rise and fall, the elevation of the ground-water for some distance back from the shore will be subject to corresponding fluctuations. Although the level of the ground-water may be some feet higher than the highest high tide, it will fall somewhat as the tide falls and will rise somewhat as the tide rises, even although its lowest surface elevation during low tides may never run so low as the level of the highest tides.

Fifty years ago a knowledge of the laws governing the existence and movement of ground-water had little practical interest save as they related to the digging of wells, unless, indeed, the water rose so high as to invade cellars or to saturate porous foundation walls. Now the case is greatly altered. While we have yet a vast deal to learn as to the sanitary bearings of ground-water, and especially as to the relations of the rise and fall of this water to the production or fostering of certain epidemics, we have learned enough to know that *either in this water or in the ground's breathing space between the surface of the water and the open air, we have to look for some of the most serious dangers that beset us, and that the whole question of sanitary drainage, the purification of sewage and the lessening of malaria must here seek its most important solution.*

Nothing that may be said in a discussion of this sort concerning the character, habits of life and sanitary relation of those microscopic forms of life which now engage so much of the attention of the biologist is to be accepted as a scientific statement; indeed, it is difficult to say where, in the professional pursuit of bacteriology, the line between science and speculation lies. At the same time, enough has been demonstrated to show that certain grave, and in some cases fatal, diseases—the chief scourges of the human race, the sources of suffering, inefficiency and depression, as well as of death—are fostered and transmitted, and are often given epidemic proportions, through the development of microscopic forms of life. If we err at all, we shall err on the safe side in assuming that there is no longer a question as to the relation between these microscopic germs and our most serious diseases. No more than in a discussion as to the origin of these germs are we able to say with scientific accuracy what are the conditions most favorable to their development or to their destruction. But we may safely assume that the water of the soil and the condition of the breathing space above that water may have, and under certain conditions do have, a very marked influence on the character and development of disease-producing organisms and on the opportunities for their reaching and infecting the human subject.

Whether or not all or most of the disease-producing microbes can escape from the soil into the air, under natural conditions, it seems clear that at least the causative microbe of malarial fever does so. The probability is that most of the pathogenic microbes in the soil are conveyed to their field of operation in the human system in drinking-water, sometimes by a flow of polluted ground-water into wells and sometimes by its flow into small streams from which drinking-water is obtained. That infection may be communicated by ground-water has been proved beyond question. The degree to which infection may be carried through a soil of ordinary consistency has not been determined, but the probabilities are that unless there are sand or gravel strata, or rock fissures, carrying the stream faster than it can be filtered, infection will not follow the flow.

Whether or not ground-water containing slight organic impurities can serve as a breeding medium for microbes, has not been determined. That it does form a field for their multiplication when accumulated in wells, there cannot be much doubt. The one undeniable conclusion that must be drawn, a conclusion forming one of the fundamental bases of sanitary hypotheses, is that polluted water in the ground is always liable to produce disease among those living over that ground, whether they breathe its exhalations as drawn into cellars, when the surface is frozen, and the breathing space of the soil becomes a source of the draft of chimneys, or drink water drawn from the subterranean supply. The unquestionable result from this is that there can be no absolute safety short of securing absolute purity of the ground-water, so far as organic matter is concerned. This implies, of course, the purity of the soil itself.

If we discharge filth through leaking sewers, or by soaking from leaching cesspools, or from the deposit of organic wastes or of dead bodies below a certain depth from the surface, we are endangering the purity of the soil itself, and especially of the water flowing through or standing in it. Here lies the most obvious and direct relation between ground-water and the health of the community. The water is probably to be regarded as a field for the multiplication of microbes, and it is surely to be regarded as a means for the transportation of these from one point to another, when its movement is not obstructed by a fine soil of measurably uniform texture. These effects, indeed, belong to elementary knowledge of the subject, and are familiar to all who have given even casual attention to it.

There is one condition, however, which is not so generally understood, but which seems to be clearly established. This is that it makes a very great difference whether the organic matter reaching the soil is introduced into it at or near the surface, or at a considerable depth. A discussion as to what takes place in the decomposition of organic matter under different circumstances is rather delicate ground, but the following may be accepted either as being correct, or as indicating results which are produced by some other process than the one indicated. This theory is that the putrefaction of organic matter and the nitrification of the products of putrefaction are due to specific organisms which have the power to destroy, not only the organic matter itself, but also those specific microbes which produce infection; also that these putrefying and nitrifying organisms can grow and multiply only with a sufficiently free access of air. Searches made for them at various depths seem to have established the fact that while in ordinary soil they are excessively abundant within a few inches of the surface, they are excessively rare at a depth of two feet, and that they disappear entirely at a slightly greater depth. It is probable, however, that they are capable of descending as far as their pabulum can be carried by direct progression from the surface, provided a sufficient supply of air can reach the same depth; so that if we thoroughly underdrain a piece of porous ground and dose it heavily with sewage, the water descending through the soil will deposit its impurities to a greater and greater depth, and, as the condition of saturation ceases, after the temporary application, air from the surface will take the place of the water and establish colonies of microbes at increasing depths.

A practical application of this theory is made in the various forms of sewage irrigation. It is known that if, whether by direct flow at the surface or by escape from pipes laid a short distance below the surface, the application of sewage is not too great, and is sufficiently intermittent, suitable soils become charged with scavenger bacteria at increased depths, and the power of purifying sewage—that is, the population per acre that may be served—is increased proportionately.

This theory, that scavenger bacteria are active only in the upper layers of the soil, answers the question so often asked: "Why, if filth can safely be delivered into pipes lying a few inches under the surface, may it not as safely be delivered into cesspools or filtering-wells leaching into the lower strata of the soil?" Filth delivered at or near the surface is immediately subjected to the action of the scavenger bacteria, and is destroyed by putrefaction and nitrification, as are its infective microbes, while that delivered at a depth where sufficient air is not present is subjected to a decomposition of another and possibly dangerous character, the multiplication of its infective microbes being favored in part, perhaps, by the character of this decomposition and in part by the absence of scavenger bacteria. If, as is altogether probable, as in fact seems to have been clearly demonstrated, ground-water flowing through or near privy-vaults, cesspools and the graves of cemeteries, is liable to infection from the sources indicated, that infection constitutes a menace to all who may become liable to infection from the use of that water as a beverage, and at times, perhaps, by exhalations from it.

It is clear, therefore, that while the water falling from the heavens on the surface of the ground does not, as a rule, carry dangerous elements to the ground-water, and though sewage discharged with proper precautions and with sufficient intermission on to the surface can contribute only a purified addition to the water of the sub-soil, and while both of these processes may be carried on systematically without danger to health, any method of disposing of liquids fouled with organic wastes which delivers them unpurified into the sub-soil, as well as the deposit of the bodies of the dead or of masses of filth at any considerable distance below the surface, is a source of danger constantly to be apprehended.

Whether or not the theory on which this opinion is based is destined to withstand the ultimate investigation of bacteriologists, the results for which it seems to account are confirmed by all experience and observation that have come to the knowledge of sanitarians. The conclusion is not to be doubted that so far as infectious diseases of a zymotic character are concerned, we have nothing to fear from ground-water if we keep it pure, and we have everything to fear if we allow it to become impure. The practical results of this conclusion must be that the greatest attention should be paid to the manner in which we dispose of our liquid wastes. If we are obliged to deposit them in receptacles in the ground, these should be absolutely tight—not probably tight, but as tight as a bottle.

If we convey them from our houses through drains connected with sewers, every portion and every joint of the drains and of the sewers to above the greatest height ever reached by the flow, must be absolutely tight. Drains and sewers are always laid, in our climate, at a depth beyond which the purifying action above referred to ceases, and the same objection exists to the escape of their contents into the ground-water as would attend the delivery of the mouth of the drain in a brook. The communication and contamination may be less direct, but it is equally positive. It is hardly necessary to say that in the construction of house drains and sewers, as ordinarily laid, even with the best materials, and under the best specifications, but with insufficient inspection, leaking joints are not a rare exception, and that, while the great volume of the flow follows the drain to its outlet, its oozings along the route are sufficient to jeopardize the safety of the community.

I would be very far from intimating that it is not generally the wisest course to provide communities with an abundant supply of water delivered into houses, but I can conceive of a condition where this is not necessary for the best sanitary results. In a town where there are no cesspools and no privy-vaults, where there are no interments within the water-shed, where all drains and sewers are so absolutely tight as to insure the ground-water against contamination by sewage, and where no impurity can in any way reach the sub-soil, there seems to be no reason why ground-water may not be perfectly safe for domestic use.

The relations of ground-water to malaria, or fever and ague and neuralgia, are in one sense too well known to need discussion. In another sense, they are too little known for accurate discussion to be possible. We know very well that in the great majority of cases, where malaria attends an undue moisture of the soil, it may be removed, for good and all, by suitable underdrainage. But we know of other cases, as in the dry plains of the Far West, where nothing approaching a swampy condition ever exists, where even a light shower of rain may produce serious malarial conditions. All that can be said positively is that most of us who have a practical interest in malaria, live subject to the undue moisture of soils at the East and not to the arid sources of malaria in the Far West; and that our practical remedy for this scourge is to withdraw the water of saturation to a sufficient depth to prevent the development of the malaria microbe in the surface soil.

MEMORANDUM AS TO LIGHTNING CONDUCTORS.

BY PROF. C. F. BRACKETT, PRESIDENT STATE BOARD OF HEALTH.

In what follows no argument will be offered to show the general utility of lightning conductors. It is assumed as established by theory and confirmed by experience that they may be made to afford a good degree of security against the destructive effects of lightning. The practical questions which will be briefly treated relate to the material to be employed and to the proper insulation. Neither of these questions can be quite so easily answered as was formerly believed, for the advance in electrical science has discovered complicated relations which were quite unknown to Franklin and his contemporaries.

Franklin showed that the lightning flash is of the same general character as the discharge spark of a Leyden jar, and he compared the thunder cloud to one of the coatings of the charged jar and the earth to the other, while the intervening air represented to his mind the glass or non-conducting substance of the jar. He also knew that a charged jar can be quietly discharged by connecting its outer coating to the earth and presenting the pointed end of a metal conductor, also connected to the earth, to the knob. Hence, he concluded that metallic conductors, having their pointed extremities well above the highest portions of a dwelling or other structure, and in good connection with the moist earth, would quietly discharge the impending cloud and so protect the structure from damage.

A plain, continuous iron rod, fulfilling the conditions here mentioned, will no doubt often afford complete protection, yet it is not to be denied that it sometimes happens that notwithstanding the presence of such conductors, buildings are struck. Ships at sea have been struck upon deck, even though the masts were furnished with continuous conductors in good connection with the water. The obvious remedy is to increase the number of conductors, placing them along prominent ridges and at the angles of the structure to be protected. Indeed, the ideal arrangement would be that of a coarse network of conductors, with frequent connection with the earth. A building so protected could hardly be injured in any case which can occur.

In case the building has a metallic roof, much the same end will be reached by connecting the metal covering with the earth. This may be accomplished in many cases by connecting the water conductors with the moist earth, or, better, in case it can be done, with the water-pipes which supply the building.

If the state of affairs were always as simple as that contemplated, where a single cloud and the earth represent the coatings of an immense Leyden jar, a number of continuous conductors, distributed and connected as above, would be all that is required. It is known, however, that the discharge from a Leyden jar, and from a cloud as well, is frequently alternate in character, the alternations or up and down strokes constituting the disturbance amounting to many thousands in a second. When this is the case, any conductor, even of large size, offers great resistance to the electrical movement, and any neighboring conductors will be compelled to take part in the equalization of the electrical stress. This is rendered evident by side-flashes or sparks which accompany the main discharge. These side-flashes are frequently of great intensity, and they constitute a real source of danger. Thus, the human body being an imperfect conductor, one is liable to injury if near a good lightning conductor at the moment of a sudden discharge. So, too, if the conductor pass near water or gas-pipes, side-flashes may occur between them of sufficient intensity to set the woodwork near or through which they pass on fire. To avoid this, such and all other metallic fixtures in the neighborhood of the lightning conductor should be joined to it by means of good metallic connections.

The severest test to which a system of lightning conductors can be put is that which occurs when a cloud already highly charged receives a sudden increase in charge from another in its neighborhood. If the cloud whose charge is thus suddenly raised impend over a building which would otherwise be perfectly protected by its system of lightning conductors, damage may yet occur, for in this case the sudden access thus received determines a stroke which compels all available conducting bodies to take part in the equalization of the electrical stress, and side-flashes are liable to take place which may be destructive in their effects unless all metallic conductors in proximity to the conductors are joined to them by good metallic connections.

The requirements, then, are these: Provide conductors which are pointed at their upper extremities, and which shall reach to and above all prominent portions of the building and along all elevated ridges, and run continuously to the constantly wet earth, there terminating in extended surfaces of good conducting material. The system of water-pipes, if available, answers this purpose excellently. Sharp bends or angles are to be avoided, since lightning has no time to go around a corner. All attempts at insulation by means of glass or other non-conducting material are useless. Simple galvanized iron staples or eyes, which can be driven into the building, are all that is required.

As respects the material, the use of galvanized-iron wire rope or cable is the best, as it is also the cheapest and most convenient to put in place. The fact that copper is a better conductor of a steady current of electricity, such as is supplied by a voltaic battery, is of no importance in the case of a lightning discharge. Indeed, experiment shows that, apart from the matter of cost, iron is better than copper, notwithstanding the fact that for steady currents its resistance is some seven or eight times greater. Its fusion point is much higher, and so it is much less liable to be melted. The diameter need not be more than half an inch.

RELATION OF TRADES AND OCCUPATIONS TO PUBLIC HEALTH.

BY E. M. HUNT, M.D., SECRETARY STATE BOARD OF HEALTH.

Our reports contain many valuable articles and suggestions as to trades and occupations in their relation to the public health. The report of the Bureau of Statistics and Labor last year ably supplemented this by a further consideration of these subjects. Dr. Arlidge, of England, has given a short series of lectures, from which we make the following abstracts:

"Extrinsic or collateral circumstances exercise an influence varying in degree upon manufactures of all kinds. They are—the situation of the factory, whether urban or rural; its site in relation to the soil, climate and surroundings; the accommodation at hand suitable to its workers; the density, the diet, and the habits of the population around; and, in a general way, the moral atmosphere of the locality. Next, as to the factory itself, its construction, ventilation, and warming, and its general arrangements for facility of the work pursued in it. Thirdly, as to the workpeople themselves, their racial character, the ratio of constitutional disease among them, whether attributable to early marriages or to frequent intermarriages, and the position their occupation holds in the social scale. Fourthly, the proportion of young to old among the factory hands, the ratio of the two sexes, the regularity of the work obtained, and the extent of night-work. All these matters exercise more or less effect on the health of those engaged in any occupation over and above the intrinsic circumstances belonging to it, though in very varying degrees.

"Every dirty occupation sooner or later leads to intersticial mischief. The earthy and metallic dusts are more provocative of lung-disablement than organic dusts with the exception of charcoal. Millers and starch-workers suffer from clogging of the air passages rather than parenchymatous changes; workers in horn escaped, probably, because it was an organic material.

"Woods acted as irritants in direct proportion to their density. Ebony and rosewood had a bad name for provoking bronchial troubles, and the latter is believed to produce eczema.

"Dust from mother-of-pearl partook of the worst features of mineral dust, producing the same disorganization and black discolorations as were observed in stone-workers and potters. The dust from cotton was less injurious than that from flax, which also provoked dyspnœa more severe than that caused by any other kind of dust not actually poisonous. The consolidation of lung produced by dust varied in extent; in some cases scattered nodules, in others larger, but still small masses, in others a large portion of a lobe. The indurated portions were mostly very dense, cutting like india-rubber or cartilage, with a slight sensation of grittiness. Nevertheless, at times, washing the cut surface would dislodge the black matter, and bring into view cut sections of bronchi and expose a rough, spotted surface resembling that of a nutmeg.

"Greenhow, Kussmaul, Tardieu and others had shown that the hard, black matter contained much silica, and an analysis of the masses from a potter's lung made for Dr. Arlidge by Professor Church in 1875 gave the composition of the ash as silica 47.78, alumina 18.63, and peroxide of iron 5.5. These results have since been confirmed by other observers.

"There prevail extrinsic causes of ill-health which the law cannot reach. These are to be found in the customs and habits of the work-people themselves; such are their opposition to ventilation. As a rule, in the very same proportion as their heated and close shops require it, so is their repugnance to it. They become like hot-house plants, sensitive to every reduction of temperature, and in constant dread of draughts. Notwithstanding, they are most reckless in exposing themselves outside their factories or shops. They emerge from the highly-heated, debilitating atmosphere of the factory into the open air, often very cold, and in the midst of rain, using the slightest precautions against chills. Another circumstance in the same catalogue is their frequently insufficient and innutritious food; not owing so much to want of means to get better as to an indolent indifference and want of knowledge of cooking and preparing comfortable meals; and, speaking generally, artisans, male and female, but especially the latter, have little perception of the propriety of dress—that is, of dress suitable to their work. But the list must be extended by the inclusion of intemperance in alcoholic liquors. When inquiry is made at a factory as to the health of its workpeople, the masters and managers will, as a rule, observe that the particular labor carried on, if obviously requisite precautions be observed, is by no means unhealthy, and that the well-established fact of undue prevalence of any malady among the hands is attributable not to their work, but to their drinking habits. And, unhappily, this, if not the whole truth, is too large a portion of it.

"Dr. Henry Fernie, of Macclesfield, had furnished the lecturer with statistics regarding 1,642 persons treated as out-patients of the infirmary of that town during the year 1875; of whom 922 were engaged in the silk trade. Of the 1,642, about 5 per cent. were children; but of the entire number, 382 were sufferers from chest diseases—phthisis, bronchitis, asthma, and emphysema; 242 had dyspepsia, 121 were anæmic or generally debilitated; uterine derangements, skin diseases, and cardiac affections each numbered 50; 35 were strumous, 21 had cancer, and the like number epilepsy. The remaining cases were of a surgical character; 55 being syphilitic. In round numbers, therefore, respiratory diseases constituted nearly one-fourth of the whole amount of sickness treated. The death-rate in Macclesfield from phthisis was, in 1874, about 3 per 1,000.

"The next manufacture, continued the lecturer, generating dust of animal constitution is the woolen, including under that term the so-called worsted manufacture, and its many products in wearing apparel. When pure wool is dealt with, the occupation is little less healthy than that of silk working, but its processes are more complex. Those of a preparatory character are the only operations which to any important extent affect health In the first place, the wool as received is picked over, and its different qualities separated. This is the business of 'sorting,' and is chargeable with the most serious consequences when certain wools are employed. After sundry washings wool has to be purified from all dirt and refuse matter by machines, known as willying, scribbling and carding, until by their action it is eventually thrown off in a kind of loose, flattened rope, called a 'sliver.' This now goes to the spinning machines, to be converted into yarn ready for weaving or other purposes. It is anterior to spinning that dangers arise from dust. The mechanical cleansing operations to remove particles of dirt, and loose fibers that cannot be drawn into a 'sliver,' cause much dust. In olden time the carding and other similar machines were open, and the dust necessarily diffused itself through the work-room. At the present day the machines are enclosed and otherwise improved, so that little escapes; and, compared with the dust from like operations with cotton, that of woolen is less injurious, for one reason that it contains no metallic particles such as, it is stated, are found in cotton dust. Besides, the fiber of wool is in itself of an animal and an oily nature, and when running through the spinning machines it is lubricated with oil, whereby the generation of dust is still further obviated. The constant contact of the hands of the workers with the oil is considered by themselves as contributory to health, and woolen spinners contrast favorably with the like class of workers in cotton and linen. Another advantage of wool spinning over cotton is that a high temperature is not required, and that there is no wet spinning.

"Turning to the weaving of wool, this has great sanitary advantages over cotton weaving, for, though the sheds are considerably hotter than the spinning-rooms, yet there is no such excessive temperature as is found in cotton sheds; moreover, the air is not loaded with steam or with dust from sizing, as happens with cotton weaving.

Further, wool dust is less irritating than that from cotton and linen; the animal nature renders it so, whilst its fibers are also tougher as well as longer, and therefore can be drawn out with less breakage and with smaller labor in 'piecing.'

"Dr. Arlidge next referred to the minor industries, such as the manufacture of jute, lace-making, paper-making, cocoanut fiber, wood-turning, flour mills, tobacco manufacture, charcoal dust, bronze-casting and chaff-cutting, all more or less dust-producing businesses. In regard to paper-making, it had, Dr. Arlidge said, been proved that certain imported rags caused disease among sorters and cutters. A peculiar outbreak at Riga was investigated by Schulz, Krannhals, Herrganen, and Radęcki. The prominent symptoms were fever, tremors, dyspnœa, and weak pulse, fatal cases dying in collapse. After death, decomposition occurred early, and pleural and pericardial effusions, with enlargement of the bronchial glands and spleen, were found. M. Krannhals, among other micro-organisms, found a small bacillus which he believed to be identical with the bacillus of malignant œdema (Koch), in the pleural effusion. Millers, again, suffered from cough and shortness of breath—miller's asthma. Major Beadon, in his factory report, 1884, writes that it is quite exceptional to see a person who has worked any time in a flour mill who is not more or less affected as to the respiratory organs, and he quotes from the trade paper called *The Miller* that the average life of millers is only forty-three years."

THE HOMES OF THE PEOPLE—TENEMENT-HOUSES.

BY EZRA M. HUNT, M.D., SECRETARY.

The proper housing of the people is the greatest social and sanitary problem of the age. Decency and cleanliness in the home mean industry, character and health to a far greater extent than is appreciated. Emerson says, "The truest test of civilization is not the census, nor the size of the cities, nor the crops, but the kind of men the country turns out."

Now, the kind of men the country turns out depends pretty much upon physical condition. Crowding and filth in the home mean degradation, thriftlessness, sickness and crime to a degree only realized by those who, by actual and frequent visitation, are familiar with the dwelling-places of the less favored members of society. The Health Officer of Glasgow, speaking of the 75,000 of its inhabitants who live in one or two rooms, says: "These comprise some who are bravely struggling with poverty, and far more who have become bankrupt in character and fortune. They are the nomads of our population. If we could see them in their constant movements from place to place, the sight would resemble nothing so much as that which meets the eye when we lift a stone from an ant's nest. The City Assessor will tell you that they change their locations in hundreds every month." But the change is often from bad to worse. They leave the crowded, filthy abode, only to move into one of the unkempt houses which another has deserted.

Mesnil in his recent work on Hygiene (1890), speaking of some of these in Paris, says: "These unhealthy warrens are such that it is not virtue but heroism alone which can prevent the crowds in them from hating the world which tolerates them." Coming to a higher grade of houses we still find thousands of them defective in light or air space, with no adequate conveniences for cleanliness or the removal of the various forms of dirt or filth, which tend to accumulate in every such house. The housekeeping is bad, not so much from the incompetency of the inmates, but because of the very poor facilities afforded for cleanly decency. It is to be remembered that in all large cities, comparatively few are the owners of the houses they occupy. As a rule, the rented house is not likely to be kept so well as one that is owned. Nor is it true that the houses occupied by owners are always in a healthy condition. By reason of the choice of undrained land for buildings and of imperfect construction, it is often the case that such houses need some oversight, and need to be amenable to such laws as will secure safety, not only against accident, but against the greater perils of preventable diseases.

It is, comparatively, in vain that we expect to secure the sanitary condition of any city, unless we are providing and overseeing plans to secure the sanitary condition of each home. For, besides the necessity to the individual and to the family, there is no other way in which we can educate the people up to a proper standard of care, and so make a public sentiment as important for the government as it is for the citizen. The State and the municipalities need to concentrate attention upon the necessity of securing healthy homes for the people. There is no direction in which the tenant-classes are more helpless in protecting themselves, or in which the enactment and enforcement of sanitary laws need to be more earnestly invoked. For there is no greater deduction from the earnings of wage-workers, and no greater embarrassments to those higher in the pecuniary scale, than such as arise from the levy that discomfort, disease, sickness and death make upon those who suffer from ill-constructed and ill-kept houses. In addition to the accumulated evidence of a score of years, in the last three or four years some very technical and reliable investigations have given us some accurate statistics, and much valuable information on this subject. In a former report we gave some of the facts contained in a valuable paper by Professor Carnelley, and Drs. Haldane and Anderson, of Dundee. See paper on "The Carbonic Acid, Organic Matter and Micro-Organisms in Air, more especially of Dwellings and Schools" (Trans. Royal Society of London, 1887); also see article on "Air, Water and Food," page 47, eleventh report of this Board. Dr. James B. Russell, the distinguished Health Officer of Glasgow, in November, 1888, delivered an address, as President of the Philosophical Society of Glasgow, in which he made a study of the facts which guide towards the amelioration of the condition of the tenement population, as found chiefly in one or two-roomed compartments.

As these facts are illustrative of conditions and tendencies already apparent in Hudson county, in Essex county, in Camden county, and to a smaller degree in some cities outside of these counties, we give some extracts:

"The population of Glasgow in 1885 was 543,295, the number of deaths was 13,439. The distribution of population and the deaths in the inhabited houses, according to their size, is as follows:

	POPULATION.	DEATHS.
One room	134,728	3,636
Two rooms	243,691	6,325
Three rooms	86,956	1,747
Four rooms	32,742	581
Five rooms and upwards	38,647	434
Institutions	6,531	427
Untraced	....	289
Whole city	543,295	13,439

"Let us first consider the proportion of the total population who lived, as contrasted with the proportion of the total deaths which took place, in each size of house. The result is shown in the following table:

	POPULATION.	DEATHS.		
One room	24.7 per cent.	27 per cent., or	2.3	per cent. *above* due proportion.
Two rooms	44.7 "	47 "	2.3	" "
Three rooms	16 "	13 "	3	per cent *below* due proportion.
Four rooms	6.1 "	4.3 "	1.8	" "
Five rooms and upwards	7.1 "	3.3 "	3.8	" "
Institutions	1.4 "	3.2 "		
Untraced	....	2.2 "		

"The result is that those houses contained 70.8 per cent. of the population, and contributed 79.4 per cent. of the deaths, or 8.6 per cent. more than their due proportion; while the remaining 29.2 per cent. of the population, living in houses of three rooms and upwards, contributed only 20.6 per cent. of the deaths, or 8.6 per cent. less than their due proportion.

"Let us next compare the death-rates in these various classes of the population. Leaving out of consideration the deaths which could not be allocated, I find—giving the calculations in round numbers per 1,000 of the population—that, while the general death-rate of the city in 1885 was 25, the death-rate in one-room houses was 27; in two-room houses 26; in three-room houses 20; in four-room houses 18; in houses of five rooms and upwards only 11. But this leaves 716 unallocated deaths unaccounted for. I have, therefore, divided the population into three classes, namely—(1) Those living in one and two rooms, with which I include the inmates of institutions and those unallocated deaths; (2) those living in houses of three and four rooms; and (3) those living in houses of five rooms and upwards. The death-rate in the first class is then found to be 27.74 per 1,000, in the second 19.45, and in the third only 11.23.

"We now turn to the question—What is the comparative incidence of certain classes of disease upon these classes of the population? I take zymotic or infectious diseases; diseases of the lungs, including consumption; diseases special to children under five years of age, such as convulsions and other affections of the brain and nervous system, atrophy or wasting, and premature birth, which are all essentially connected with disordered or defective nutrition; and I have also selected deaths in children from accident and syphilitic disease, a small class, but one pregnant with meaning.* The results are exhibited in another diagram, the height of the columns in which, being on the same scale, will convey to your eyes both the comparative aggregate death-rate in the three grades of houses, and the comparative prevalence among their inhabitants of these classes of disease.

* The following table gives the actual numbers from which the death-rates are calculated:

SIZE OF HOUSE.	Zymotic.	Lungs.	Children.	Accidents, &c.	Others.	Total.
One room	666	1,324	657	63	926	3,636
Two rooms	1,118	2,244	1,138	51	1,774	6,325
Three rooms	228	637	222	10	650	1,747
Four rooms	67	188	59	3	264	581
Five rooms and upwards	44	127	35	....	228	434
Institutions	32	132	24	5	234	427
Untraced	24	90	30	2	143	289
Whole city	2,179	4,742	2,165	134	4,219	13,439

The rates are per 100,000 inhabitants, thus converting the decimals in rates per 1,000 into whole numbers:

	One and two rooms.	Three and four rooms.	Five rooms and upwards.
Zymotic diseases (including diarrhœa)	478	246	114
Acute diseases of the lungs (including consumption)	985	689	328
Nervous diseases and diseases of nutrition of children	480	235	91
Accidents and syphilis in children	32	11	....
Miscellaneous unclassified diseases	799	764	590
All causes	2,774	1,945	1,123

"The general result may be summed up with sufficient accuracy in these numerical expressions. Taking the death-rates in the largest houses as unity, the death-rate from *zymotic diseases* was 2 in medium-sized houses and 4 in the smallest houses; the death-rate from *diseases of the lungs* was 2 in medium-sized houses and 3 in the smallest houses; and from *diseases of nutrition special to children* it was $2\frac{1}{2}$ in medium-sized houses and fully 5 in the smallest houses. There were no deaths from *accident or specific disease* in the large houses; but, taking the death-rate in the medium-sized houses as unity, the death-rate from these causes in the smallest houses was 3.

"I may remind you that the Glasgow Police act confers a discretionary power to regulate the occupation of houses of not more than three rooms, and not exceeding an aggregate capacity of 2,000 cubic feet, exclusive of lobbies and recesses. This is done by fixing tinplate tickets on the outer door, stating the cubic contents, and the proportionate inmates allowed, at the very low rate of 300 cubic feet per adult or two children under eight years. These are called 'ticketed houses' and are all one or two-apartment houses. A system of night inspection over such houses is constantly maintained, and results in prosecution for overcrowding when the legal number is exceeded.

"Edinburg has the following summary method of dealing with unwholesome houses, the steady application of which during the last nine years goes far to account for the almost unexampled improvement which has taken place in the health of Edinburg. I quote from the Edinburg Police act (1879), section 206:

"'206. If the Medical Officer of Health and the Burgh Engineer shall certify in writing to the Magistrates and Council that any house or building, or part of a house or building, is unfit for human habitation, the Magistrates and Council may, by their order, affixed conspicuously upon such house or building, declare that the same is not fit for human habitation, and it shall not, after a date in such order to be specified, be inhabited; and every person who shall, after the date or time mentioned in such order, let or occupy, or continue to let or occupy, or suffer to be occupied, such house or building, or part of such house or building, shall be liable to a penalty not exceeding five pounds, and a further penalty not exceeding forty shillings for every day during which such occupation is continued, provided always that before pronouncing any such order the Magistrates and Council shall call upon the owner to show cause against the said certificate within such reasonable time as they consider proper, and shall give such owner an opportunity of being heard before them, and, if he appear, shall hear him and such evidence as he may adduce; provided, also, that if at any time after such order has been made, the Magistrates and Council shall be satisfied that such house or building, or part of such house or building, has been rendered fit for human habitation, they may revoke the said order, and the same shall thenceforward cease to operate. The Magistrates and Council shall also, at such times as they shall fix, hold open courts for the consideration and disposal of appeals against such certificates, and it shall not be necessary that a majority of the Magistrates and Council be present to constitute such courts."

In 1887 Mr. Noel A. Humphreys, the long and tried assistant of Dr. Farr, and now of Dr. Ogle, in the Registrar-General's office for England and Wales, read a paper before the Royal Statistical Society, calling attention through statistics to the wide variations in mortality among classes, in which much can be traced to unhealthy houses. A similar analysis of figures has also been made by Dr. Grimshaw, Registrar for Ireland, as to the statistics of Dublin. We use the excellent summary of the *London Lancet:*

"The paper of Mr. Noel A. Humphreys, before the Royal Statistical Society, has served a useful purpose in calling attention to the wide variations between the mortality of different social classes.

"The necessity for further and more accurate information on the subject is clearly shown, but our present knowledge warrants the conclusion that the *future of health progress depends mainly upon the successful application of sanitary reform to the homes and manner of living of the working classes.* How far it may be admissible to judge of the effect of class influences upon mortality in England from Dr. Grimshaw's Dublin figures must remain a moot question until similar statistics are prepared for English populations. The fact, however, that the mean duration of life by Ansell's Upper Class Life Table is fifty-three years, instead of forty-four years by the most recent national life table, affords conclusive proof of a far wider difference existing between the rate of mortality of the upper and of the working classes. While, however, it is highly important that the excess of mortality in the artisan and laboring class should not be lost sight of, it is fully as necessary to remember the facts and figures set forth by Mr. Humphreys to prove that high death-rates are not the inevitable and necessary fate of this class. In the absence of any trustworthy English working-class mortality statistics we are obliged to fall back upon the Registrar-General's Occupational Mortality Statistics, which certainly do not justify the sensational assertion of an evening contemporary, that the 'work of the learned professions conduces to life, and that of the artisans to death.' The near approach of the mortality of laborers in agricultural counties and of gardeners to that of the clergy, which between twenty-five years and sixty-five years is represented by 556, as against 1,000 for the mortality of all males, was pointed out in the paper. It is necessary, however, to call attention to the fact that the relative mortality figure for lawyers is 842, and for medical practitioners 1,122; and also to point out that below or between these figures come wheelwrights, 723; carpenters, 820; iron-stone miners, 834; coal-miners, 891; plasterers and whitewashers, 896; shoemakers, 921; bricklayers, masons and builders, 969; blacksmiths, 973. The mortality figure for each of these groups of artisans is below that for all males, and very considerably lower than that for the medical profession, while the mean mortality of all the groups but slightly exceeds that of the legal profession. Whatever may be the explanation of these apparant anomalies, it is at any rate clear that the work of the medical profession can scarcely be said actually or relatively to conduce to long life. It is quite possible to believe that an artisan's life, with actually shorter hours of work and far less mental worry, may in a large proportion of cases be more conducive to longevity than that of the professional man. It is the general and unskilled laborers in towns who suffer most, and who from their numbers tend to raise the mortality of urban populations.

"*The most important political, social, and sanitary problem of the day now urgently calling for solution, is to devise means for preventing the accumulation of unskilled laborers in towns in sanitary condition and surroundings not only fatal to themselves, but a source of real danger to the physical, moral, and social health of the nation.* There can be no doubt that the manner of living of the poorest classes in certain portions of most of our towns constitutes a source of danger to the public health, while we see its result upon themselves and their children in the statistics given in Mr. Humphreys' paper. It is asserted by owners of house-property and by sanitary authorities that they are helpless to control the home surroundings of these classes; but if landlords were held more distinctly responsible for the sanitary condition of their underlet tenements, such a pressure would be put upon the tenants as would teach them the necessity for decent living

In this way a civilizing influence would be brought to bear forcibly upon the class, and the benefit to the public health would soon exercise an appreciable influence upon the death-rate. The effect of such pressure upon the mortality from zymotic disease may be estimated from the variations in the death-rates from these diseases in the various social classes derived from Dr. Grimshaw's figures. We learn that in Dublin, after correction for variations of age distribution, measles mortality was during the three years 1881–83 nearly ten times as fatal in the general-service class as in the professional and independent class; whooping-cough more than four times as fatal; scarlet fever more than twice as fatal; typhus nearly five times as fatal, and diarrhœa nearly three times as fatal. Experience points to the homes of the working classes as the usual generating-ground of most of these zymotic diseases, from which the middle and upper classes derive the infection. With cleaner and healthier homes for the working classes, and with increasing difficulty put in the way of those who are now said to prefer unwholesome surroundings, it would be safe to calculate upon a rapid decline of zymotic mortality in towns. It is beyond doubt that the decline of zymotic mortality in recent years has been one of the most potent factors in the reduction in the death-rate of children.

"Notwithstanding this marked decline of child mortality, the strongest contrasts between the death-rates of different social classes are still found to prevail during the ages of infancy and childhood. Thus, it was pointed out by Mr. Humphreys that the mean annual mortality under five years of age is just five times as great in the general-service class (the class of general laborers below the artisan class) as in the professional and independent class; while at the next age period, five to twenty years, the difference between the mortality of these two classes is very nearly as great. It is true that the rates of mortality in adult life are more than twice as high in the general service as in the professional class, but it is fair to assume that some of this excess of mortality in adult life is rather due to the depreciating constitutional effect of insanitary surroundings and hardships in childhood, than to occupation and the other conditions of adult life. How far the conditions which lead to the terrible waste of life and health among the children of the poor are within control cannot be easily decided. When, however, due note is taken of the marked reduction of working-class mortality, especially among infants and children, in the Peabody and other improved dwellings, undeniable proof is supplied of at least one direction in which effective sanitary checks may be applied to the waste of child life, which we are too apt to regard as inevitable and beyond control."

Of the effect of improved tenement-dwellings in cities, in reducing the death-rate, Alfred T. White, C.E., of Brooklyn (1890), speaks thus:

"Among these efforts, it seems to me the first place unquestionably belongs, equally by its plans, its management, its magnitude and its results, to the Improved Industrial Dwellings Company, of which Sir Sydney H. Waterlow is chairman. This company has now invested over one million pounds sterling, and has, or soon will have, acommodations for 5,300 families in its London buildings. Their plans afford an abundance of direct light and air to every room in the buildings, and furnish all necessary sanitary conveniences separately to every tenant. Their buildings are moreover distinguished by the exterior staircases, usually sunk into the front of the building, though sometimes in the rear, and open to the air, so that there is no common interior shaft, staircase, or hall, and no interior communication whatever from floor to floor. Almost all of these dwellings are let to families with children, and the percentage of children to total population must be higher within these buildings than in the metropolis at large. Because of this and of the greater birth-rate we should expect a higher death-rate in these buildings than the average of London, but the official returns of the Registrar-General prove the contrary. I quote years for which I have reports at hand:

	Death-rate of the Metropolis.	Buildings of the I. I. D. Co.
1875	23 7	15 2
1876	22 3	16.5
1877	23 5	17.2
1883	20.4	15.5
1884	20.3	14.3
To June 30, 1886	20.0	13.7
" " " 1887	19.0	12.5

"Attracted by these figures, at once so instructive and extraordinary, I wrote Mr. James Moore, the Secretary of the company, asking for some details regarding infant mortality, and quote from his reply:

"'I have had the returns of births and deaths for last year abstracted, with the following results:

"'Number of deaths under one year, 88, or 4 per 1,000 of population.

"'Number of deaths from one to five years, 49, or 2.2 per 1,000 of population.

"'This is for the year to the 30th of June last, during which our total death-rate was only 11.2 per 1,000, the birth-rate being 35 per 1,000.'

"The buildings erected in London by the Peabody Trust Fund are built on models more like old-style houses, but with abundant light and air. Their tenants, about 20,000 in number, average somewhat less in weekly earnings than those of the I. I. D. Co. In the buildings erected by the trustees of this fund, the average annual death-rate in six recent years is 0.96 per 1,000 below that of all London.

This would be considered a very large percentage in the saving of life were it not contrasted with the saving of 6.3 per 1,000 in the buildings of the I. I. D. Co. It would seem that the greater saving of these latter is due to the superior plans of construction, and especially to the outside staircase system."

We need not, however, confine ouselves to instances abroad to show how necessary it is that governmental and municipal attention be directed to a care over buildings and house occupancy. The tendency to overcrowding is as manifest in some of our cities as in those of the Old World.

The arrival of vast numbers of immigrants, many of them bringing habits of squalid poverty with them, together with the recognized fact that machinery and the demands of modern labor tend to mass people closely in cities, are rapidly showing their results in the condition of our population as found inside of dwellings. New York City, because of its commercial position and the rapid increase of its island population, was long since forced to give some attention to this matter. The formation of the Citizens' Association in 1864 was chiefly prompted by a general knowledge of evils arising from overcrowding. The valuable report made by this association reveals details which are still too much to the life in many a city tenement. Yet the City Board of Health of New York has steadily worked at this problem, and with some signal results. We cannot do better than refer for our facts to the admirable report on "The Tenement-House Problem in New York," made in 1888, by James C. Bayles, M.E., of Orange, N. J., while he was President of the New York Board of Health. As a result of the revelations of the Citizens' Voluntary Association, in 1866 health measures were adopted that, among other things, gave a general control over tenements. In 1867 "An act for the regulation of tenement and lodging-houses in the cities of New York and Brooklyn" was passed. (Chap. 908, Laws of 1867.) Of this law the report says:

"Every obstacle which cunning ingenuity and the law's proverbial delay could interpose, was resorted to by those who imagined that their incomes from rentals were to be greatly jeopardized. That any power could intervene to regulate the occupancy of these crowded domiciles and reduce the aggregate of their rentals was deemed a very great hardship and an infringement of personal rights. Its constitutionality was even questioned. But in the end, although thus hampered and handicapped, the law was sustained, maintaining that the interests of the individual must yield to the public good."

Much good work was done under its provisions, but it gave great opportunity for delay and evasions. In 1884 a special commission was appointed by the Legislature to investigate and inquire into the character and condition of tenement-houses, lodging-houses and cellars in the city of New York. The thorough report of that commission brought out such facts as led to the Tenement-House act of 1887. (Laws of N. Y., chap. 84, 1887.)

As to the valuable powers conferred, Mr. Bayles speaks thus:

"For the first time in these many years of struggle with the unhygienic conditions of the tenement-house system, has the constituted authority been in a position to adopt and enforce the most radical measures in relation to this class of houses, and there seems to be only one power lacking—which may perhaps be considered too radical for this free country and age—the power to pull down all such houses as are found to be so located and constructed as will not warrant remodeling or reconstruction to bring them into a proper sanitary condition. Rear tenements on the same lot with front tenements, deprived of sufficient light and air for good sanitation, ought to be abolished—or at least disused as domiciles or residences entirely—or only such be allowed as shall be so located and constructed that at both ends or sides there shall be admitted sunlight and a free, unobstructed air space for ventilation for each and every room in the house.

"Under the present laws the Board has the power and jurisdiction to vacate all such houses, and such vacation forces owners to either remove them or use them only for business purposes.

"The enlarged powers of the Board conferred by Chapter 84, Laws of 1887, and increased number of the Sanitary Police, has placed the Board in a position to maintain a constant and unremitting supervision over this class of houses, and to apply to those still found deficient in their sanitary requirements, nearly all of the improvements in the nature of construction for ventilation, lighting and drainage, which are now required in new buildings.

"Under the act, Chapter 450, Laws of 1881, and subsequently amended, the Board adopted, April 31st, 1883, and amended the same October 28th, 1885, and again August 18th, 1887, the 'Rules and Regulations for the Registration of Plumbers and Relating to Plans and Specifications for Plumbing and Drainage,' which give most specific directions, in detail, of the plan of drainage and plumbing as approved by the Board, so that hereafter the defective conditions will be found to be confined to such as naturally occur by lapse of time or wear and tear."

The following are a few of its salutary provisions:

"The New York law of 1887 provides that: 'Whenever it shall be certified to the Board of Health by the Sanitary Superintendent that any tenement-house, or room therein, is so overcrowded that there shall be afforded less than 600 cubic feet of air to each occupant of such building or room, the said Board may, if it deem the same to be wise or necessary, issue an order requiring the number of occupants of such building or room to be reduced so that the inmates thereof shall not exceed one person to each 600 cubic feet of air space in such building or room.'

"The law requires that every tenement-house 'shall have in the roof, at the top of the hall, an adequate and proper ventilator, of a form approved by the Inspector of Buildings.' This requirement is, I think, quite commonly observed, and appears to be a very sensible and efficient one.

"The lighting and ventilation of tenement-houses was made a subject of careful consideration by the Board of Health, resulting in the adoption of the following resolution:

"'*Resolved*, That the regulations of the Board in relation to light and ventilation of new tenement-houses be and are hereby amended as follows:

"'No plan for light and ventilation of a tenement-house with apartments on five or more floors, and having more than twelve rooms on a floor, to be erected on an ordinary city lot, except a corner lot, will be approved by this Board, where more than sixty-five per centum of the lot is to be covered, unless the courts to light and ventilate the interior rooms thereof shall have an area of at least 265 square feet, and where there are to be twelve rooms on a floor, the area of such courts must not be less than 215 square feet.'

"This present plan marks the most desired and greatest improvement in tenement-house construction which has grown out of sanitary legislation and the efforts of the Board of Health since 1879. Instead of dark, unventilated rooms and halls, peculiar to tenement-houses of that date, the rooms in the houses now being built are well lighted and ventilated by courts as large in area as can possibly be required without reducing the size of the rooms to an impracticable degree. In place of the old privy-vault in the yard, the use of which in cold weather was often impossible to the debilitated or sick, every two families are provided with a water-closet on each floor, with suitable arrangements for flushing, and the compartments are well lighted and ventilated. The cellars, formerly noisome, unventilated, unlighted, unpaved and damp, are now provided with windows to the outer air, and the floors are concreted throughout. The old hydrant in the yard, with its unconnected cesspool for receiving house-slops and liquid waste for the whole household, is now abolished, and water is supplied in each apartment, and in connection with suitable kitchen sinks and wash-tubs; and instead of the defective earthen drains, with leaking joints, saturating the adjacent ground, and open joints in waste and soil-pipes—where they were provided in the older houses—and untrapped and unventilated waste-pipes, placing the living-rooms in direct communication with the public sewers, the plumbing system is now up to the highest standard of modern times in every detail, and superior in all essentials to the plumbing and drainage to be found in even the best private houses, except those of the most recent date.

"The law in force at the present time requires that the Board of Health shall cause a careful inspection to be made of every tenement and lodging-house at least twice in each year; and in case of an order having been issued, there is to be a re-inspection within six weeks after the receipt of information that the order has been obeyed."

Other most important provisions are detailed in the law. The way in which this law has been enforced and sustained by the courts, and the great reforms and saving of life which have resulted, are fully attested by the Board and by other evidence.

In 1889 a report on "A Sanitary Inspection of Certain Tenement-House Districts of Boston" was made under the auspices of the Associated Charities Association, by Prof. Dwight Porter, C.E., of Boston. It was found that the densest ward in Boston had an average settlement of about 140 persons to the acre, while Chicago had in its densest ward 86, and New York 430 to the acre. There are eight wards in the city of New York in which the average per acre is higher than the densest ward of Boston. As none of the City Boards of this State have instituted similar examinations with numerical exactness, we are unable to state the density in numbers. But some examination in Jersey City and some knowledge of the density of a few localities in Newark and Paterson show us a density not far behind that of Boston.

The number per acre is not necessarily a test of overcrowding, since some of the regulated apartment-houses accommodate at the rate of over 1,000 to the acre. But as the tenement-house is generally found, it is a practical indication.

The Chicago law extends the tenement-house law to all rented buildings. In Boston a tenement-house is defined to be one occupied by more than three families. In New York a tenement-house is defined to be one occupied by three or more families.

The amount of air space required differs somewhat in the laws of different cities. That of New York has already been quoted. This allows a room of about 8x10, with eight-foot ceiling. Such a room requires thorough and constant ventilation if occupied by only one person. Yet City Boards often accept much less than this and seek to make up for it by light and the constancy of ventilation.

In Boston, an examination of 910 houses showed 360 in an unsatisfactory condition, due allowance being made for much that is unavoidable in the occupancy of tenants of small incomes. The laws of Boston with reference to tenement and lodging-houses contain "certain important provisions regarding the construction, ventilation, lighting, drainage, cleanliness and overcrowding of houses." The recommendations contained in this report are applicable to all growing cities, and are as follows:

"Issuance, at the discretion of the Board of Health, of permits to owners or lessees of tenement and lodging-houses, limiting the number of occupants, as an assistance in checking overcrowding.

"Doing away to the fullest practicable extent with the employment of inner rooms, not communicating directly with the outer air, in existing tenement and lodging-houses, and the adoption of efficient measures to prevent their introduction into new construction. Restrictions for the future regarding the proportion of a lot to be covered by a tenement or lodging-house.

"If cellars and basements are to be allowed to be occupied regularly as dwellings, then they should be required to be made watertight; but it is advised that the occupancy of cellars and basements for sleeping purposes should be prohibited.

"More rigorous enforcement of the law against uncleanliness.

"Provision for the removal of privy-vaults from alleys and courts excepted in the present law on account of not having sewers.

"Sink waste-pipes to be required to be individually trapped.

"The establishing of such detailed regulations as may seem wise concerning house-drainage and plumbing fixtures, and the general supervision of, and discretionary action regarding the same, to be undertaken by the Board of Health.

"Inspecting force of the Board of Health to be increased for the purpose of semi-annual inspection of tenement and lodging-houses.

"Widening of the scope of the tenement-house law, so as to embrace houses of a smaller number of families than is specified in the present law.

"Establishment of open squares in the midst of the tenement-house districts.

"Widening of narrow streets where practicable.

"Such severity in the laws and their enforcement as shall tend to do away with some of the most objectionable houses now in use.

"Improvement of the sewerage in certain streets where it is now known to be bad."

Chicago has a comprehensive system of tenement-house and factory inspection. As to it Dr. De Wolf, the Commissioner of Health, says: "The character and importance of the work, as the basis for a sound and permanent sanitary advance, and its performance, imperfect as it is, has been largely instrumental in steadily decreasing our death-rate." Since this was written $100,000 has been appropriated for a thorough house-to-house inspection of the entire city. It is needless to multiply instances to show how our most rapidly-growing cities are realizing the necessity of regulating the construction and occupancy of dwellings. Until there are legal enactments which will secure this care over the construction and alteration of dwellings, and especially those offered for rental, all else of sanitary administration will be too much —only the cleansing of the outside, while within are the centers of contagion and disease. It will not do to delay, or to apply the law only to our larger cities. First of all, the right sanitary construction of new buildings must be secured. Some of the most flagrant violations of construction, as to pipes, and as to ventilation, occur in the hotels and boarding-houses of summer resorts, or in towns that have within a few years shown rapid growth. Where alterations are ordered, or are being made, these should have careful supervision. Such cities as Jersey City, Hoboken, Newark, Paterson, Camden and some smaller ones, should have a sanitary survey made which would describe the defects of each house, and then seek to remedy them with as much speed as possible. Laws on these subjects are duly enforced in New York and other cities, and their constitutionality and necessity have been alike demonstrated. This Board some time since had an examination made of some districts in Camden, which led to more active sanitary service in that city. Several years since the attention of Engineer Harrison was attracted to the amount of sickness on the hill near Jersey City. An examination of houses, and a record of cases, which he portrayed upon a map in our possession, well illustrated the connection between dwelling-houses and disease.

We ask that our City Boards of Health give to this subject the attention which so fundamental and essential a part of sanitary science demands. Every city should have its Building Inspector, and our excellent State law as to plumbing should be enforced both in old and new buildings. We ask that the Legislature provide laws and give such authority to Health Boards as will enable them to enforce proper regulations. It is the cause of the laborer, of the wife and the children, of the citizen, of all the people.

Healthy homes are the great need of modern civilization, especially because of the massing of the people in cities. It is not only that we have such micro-photographs of actual conditions as the New York City Board have caused to be taken. A sadder photograph is furnished in experiences and results, which, if less harrowing to the eye, are more serious to the labor, health and morals of society. Let us see to it that sanitary laws are applied in the homes, the school-houses and the workshops of our land, and we will do more to give physical stamina to our people and to elevate the masses than can be done in any other way.

NEW JERSEY SANITARY ASSOCIATION.

REPORT, WITH OUTLINE OF PAPERS AND DISCUSSIONS, SESSION OF 1890.

BY D. C. ENGLISH, M.D., SECRETARY.

The sixteenth annual meeting of the New Jersey Sanitary Association was held in the Assembly Chamber, at the State House, Trenton, commencing Friday afternoon, December 12th, at 2 o'clock. The President, George P. Olcott, C.E., of East Orange, in the chair. Dr. Cornelius Shepherd, of Trenton, chairman of the local committee, then addressed the Association in earnest words of welcome of its members, to the city of Trenton.

He referred to the sacrifices they made in coming together to discuss questions of sanitary science, which are of such great importance to the community—questions which demand much thought and profound research. The field is a large one, and, though in our day there are many workers therein, and very many important facts have been settled, and much reliable data accumulated, there are yet the richest mines to explore and the grandest truths to be discovered. After calling attention to some of the advances in science during the past few years, Dr. Shepherd closed by expressing the hope that the new discovery of Professor Koch might place the scourge of tuberculosis under the control of sanitation.

President Olcott made a brief response, thanking the committee for their warm words of welcome.

THE RELATION OF GROUND-WATER TO THE HEALTH OF THE COMMUNITY.

Col. George E. Waring, C.E., of Newport, R. I., was introduced, and read a paper on "The Relation of Ground-Water to the Health of the Community." (See this report, page 123.)

Prof. P. T. Austen, Ph.D., of New Brunswick, was then introduced to open discussion on Colonel Waring's paper.

He agreed with Colonel Waring in the positions taken in the able paper presented, especially as to the mode of disposal of sewage underground. It was an old saying, and true among ordinary persons, that a thing "out of sight" is "out of mind," and this appears in full force in this matter. Many think, when they put a drain or anything not healthful under ground, that it is all right. The sanitarian knows that that is the time for him to begin work. We know that the products of life produce death unless properly disposed of. The most imminent danger which threatens anyone was from the products of his own life. This fact ought to be brought to the attention of the public, and emphasized in the most simple and impressive way. While we are considering microbes, we should also consider ptomaines, which have much to do with the causation of disease. We should not lose sight of the products of life in water. Impure water is like a powder magazine and the microbes like sparks; when they come together, the disturbance comes. Not only must the microbes be removed from the water, but these little, poisonous, effete products of the lower forms of life in water. The microbes are removable in various ways, but we know little about how to get rid of their products. Here is a great field for investigation. Professor Brigant and others have done much in their investigations to show the great power of these poisons, and doubtless in time we shall understand how to deal with these volatile bases.

He spoke of the prevalence in communities at times of diarrhœal diseases, and questioned how far they are due to microbes and to their products. While recognizing how little we know on these points, we have seen how a small quantity of the ptomaines are capable of creating a great disturbance in the system.

Professor Austen then spoke of the objection so often raised against underground sewage disposal that it is so expensive. Such objections should not be considered. A community should be made to consider the question of responsibility and be compelled to dispose of the sewage in the manner least dangerous to health. Protection to the community should be the first requisite in establishing a sewerage system. In this civilized age the people should be made to realize that it is not enough to simply get it out of sight, but to dispose of all sewage so that it would neither injure themselves or anyone else. They have got so far in these days that they have seen the necessity for sweeping the streets, yet they do not see the greater necessity of so removing all excreta as to prevent its health-destroying effects. There should be some redress for a person or community where the health is menaced through the action of any other person or community. The city on a river bank was situated better than others, but in time the sewage above would affect the city further down the stream. Just how far a running river will dispose of sewage we do not know.

He referred to the large number of cases of typhoid fever evidently communicated by germs carried by water, and believed that a larger amount of disease than is generally supposed was caused by impure ice. He thought we should be more careful where our supply of ice came from, and cited instances where ice was regularly supplied to people from a pond immediately adjoining cemeteries. He did not see why mists that rise from the earth, and also dust, might not carry the germs of disease. We know now that no mechanical filter will remove all the microbes. Professor Smyth has shown that polluted water will go through 150 feet of sand, seem clear and pure, and yet be so polluted still as to be unfit for drinking purposes. He spoke of purifying water by the use of precipitants, so getting rid of organic matter, and then easily filtered and rendered pure. So we may have in nature a chemical force which may be developed to prove very important in water purification.

Professor Austen concluded by referring to and emphasizing at some length Colonel Waring's remarks as to the danger of ground-water. The position taken he regarded as of extreme importance and should be impressed upon the public. Many houses get in an unsanitary condition on account of carelessness in this matter. A series of experiments should, in such cases, always be made that would reveal not only the rise and fall of ground-water, but also the chemical changes which take place in it. Hasty conclusions should not be reached, for he had seen cases of poisoning so far from the source as to seem impossible.

Dr. E. M. Hunt, in discussing the paper, said we must consider water as *pure water,* and as a *menstruum* of organic matter. He thought that as long as water is kept in the ground uncontaminated it is all right, if the water level is kept low, or if the water, when not quite low enough, is kept in circulation. The thing to remember is to keep filth away from the water. Sodden filth is the great danger to humanity. Dryness of soil is a most important matter. The great work of purification goes on near the surface, and if we put a cesspool a few feet deep we are constructing a dangerous menace to the health of the residents, and sooner or later death comes as the result. We should keep the soil pure. All organic matter should be disposed of before getting into the undersoil of our cities. We must so deal with filth as to cause it to be harmless.

Colonel Waring, in closing the discussion, said he had omitted from his paper, inadvertently, one of the most important effects of water in saturated ground, the tendency to the production of tubercular diseases by ground-dampness and saturated soil.

SMOKE TEST FOR HOUSE-DRAINS.

Inspector P. L. Lippincott, of the Asbury Park Board of Health, was introduced and read an interesting and instructive paper on "The Use of Smoke in Testing House-Drains."

The paper was accompanied by apparatus illustrating it.

Dr. Henry Mitchell, of Asbury Park, in opening the discussion, said that only one clause of the plumbing law was in force, and that was in relation to the construction of drains. It was strange that the people did not avail themselves of the protection to their homes which this law afforded them. He spoke of the examination of the old drainage system of Asbury Park, and the many kinds of apparatus suggested for the work, but that none of them proved satisfactory. Then the use of smoke was tried and found to be the most effectual means of accomplishing this purpose. Dr. Mitchell then explained the machine on exhibition, which was used for this purpose.

Dr. Hunt stated that Asbury Park had done what few other places in the State had attempted. The new law had been thoroughly tried, found to be feasible and the system successful. He regarded the securing of safe pipes in our homes as one of the most important sanitary matters demanding our attention.

Dr. John L. Leal, of Paterson, told of the operation of the plumbing law in that city. They had no trouble with the plumbers, but were rather aided by them in every way. Over 1,300 permits had been granted since the law went into effect. They were now engaged in a house-to-house inspection of tenements as to their plumbing, &c.

THE DEATH-RATE OF DIFFERENT LOCALITIES IN NEW JERSEY.

James Owen, C.E., of Montclair, was introduced and read a paper, which showed a great amount of time and care had been expended in the preparation, on "The Death-Rate of Different Localities in New Jersey."

He said that the death-rate throughout New Jersey varied from 10 to 20 per 1,000 each year, and the main cause of the higher figure he traced rather to the conditions under which populations live than to the location of their territory. He quoted the following as the death-rate of 16 cities of the State: Atlantic City, 20.7; Camden, 19.4; Millville, 17.2; Bridgeton, 16.2; Newark, 22.9; Bayonne, 17.2; Jersey City, 22.8; Hoboken, 23.3; Lambertville, 15.5; Trenton, 15.7; New Brunswick, 20; Perth Amboy, 20.5; Passaic, 18.3; Paterson, 21.8; Elizabeth, 19.1; Phillipsburg, 17; making a general average of 19.2.

The death-rate for townships is considerably lower, averaging 10.9 for 21 selected townships, one in each county. The lowest of these is Walpack, in Sussex county, which is 7.7. The highest is Kearny, in Hudson county, being 12.9; North Plainfield, in Somerset, and Hopewell, in Mercer, followiug close after.

That location is not responsible always for the death-rate, is forcibly shown in the city of Newark, where the ward having the lowest rate is right on the edge of the meadows, while wards in what are considered choice locations have rates considerably higher.

East Orange, with a naturally wet soil, but now drained and sewered, has a death-rate of only 11.8, in spite of its bad location. The township of East Orange, he added, was the ideal suburb, as it started with an original location hardly to be commended, but yet brains, intelligence and skill have combined to make a happy result. It is the only community he knew of that drains with a system separate from the sewerage, and its death-rate is 11.8. After treating of the sanitary conditions of farm life, he concluded by suggesting that the Association give close attention to the improvements which suggest themselves for reducing their death-rate in those localities that seem abnormally high.

Dr. E. M. Hunt opened the discussion on this paper. He asked if we were prepared to say that the difference of elevation had nothing to do with the death-rate, or that the statistics given were conclusive evidence of the healthfulness or unhealthfulness of the localities cited. He appreciated the courage of Mr. Owen in taking up so difficult a subject and expending the time its preparation must have cost him, but he thought we should go slow in accepting these comparisons and deductions drawn from the figures given. It was exceedingly difficult to arrive at correct knowledge as to the healthfulness of any given localities, especially in rural districts or small towns. When we have large populations to deal with we can arrive at more satisfactory estimates of healthfulness, but we need even then a series of statistics, extending over several years, to speak authoritatively, as the years vary considerably. There was, in his judgment, no test as to the health of a locality like that of typhoid fever, diarrhœa and diphtheria. These should be taken up and studied carefully.

Dr. Hunt then cited figures showing the progressive history of typhoid fever in Jersey City, Newark, Camden, Trenton and Paterson since 1881.

Dr. Hunt alluded to the increase of population and the water-supply, and said that he knew of no other way to more safely conclude that the water-supply had somewhat to do with the death-rate, than the comparison of these cities. This was better than taking townships for comparison until the figures could be shown, extending over a period of thirty or forty years. He should want to get all the facts possible, but he warned the members of the Association that statistics of death, gathered without taking into consideration the proportion of adult life to child life, and without knowledge of disease as to age, and some special diseases, were not informative.

Prof. J. M. Watson, of Elizabeth, spoke of how misleading statements may be as to the healthfulness of a community, from the number of deaths in any given year. He thought the social condition of the people, their habits, the surroundings of their homes, whether in crowded tenements or in spacious homes, had much to do with the death-rate. He would expect a far greater death-rate in different parts of the same city, *e. g.* in crowded portions, with many saloons, than in less populous sections, where the people are more intelligent, temperate and careful as to their sanitary surroundings.

Recess was taken at 5:30 till 8 o'clock P. M.

EVENING SESSION.

The evening session was opened with prayer by Rev. Dr. J. B. Thompson, of Trenton.

The President, George P. Olcott, C.E., of East Orange, then delivered the annual address, on

SANITATION IN HOUSE CONSTRUCTION.

In the opening remarks of his address, Mr. Olcott spoke of his desire not to present speculative theories, but what had, during his experience of twenty years of actual work as a sanitarian, been demonstrated as correct in practical application, so that he disclaimed any desire to quote English engineers or sanitarians, but would confine his remarks to American practice, "and more particularly to our own little State of New Jersey, within whose borders will be found enough examples to prove what I shall have to say as to house construction. I shall endeavor to build for you, on paper, as near a perfect house, from a sanitary point of view, as possible. The carpenter-work I shall not, however, consider at this time." He divided his subject into three sections—(1) The location; (2) The construction of the cellar; and (3) The plumbing and drainage.

(1) *Location.*—It should be in a well-drained and good locality. Healthfulness should be one of the first considerations. If such a location does cost more, the less healthful and cheaper one will prove the more expensive in the end. "It is much wiser to pay more for your land and less to the doctor." Other considerations are then cited: the distance from the purchaser's place of business, the convenience of the family, &c.

(2) *The Construction of the Cellar.*—Any one can excavate for a cellar, but every one cannot build a cellar in the proper way. The usual practice in doing this is to put around the foundation lines a footing course about six inches deep. This is often left out entirely. On this the wall is built to the grade line with stone, and thence, to the height of the cellar, with brick. In drawing up specifications for this part of the house the material to be used is always named, to wit, stone or brick, good, sharp sand, and lime or cement; but

seldom is anything said as to the proportion of each, or how the mortar shall be made. One case is cited where a friend thought the specifications most complete which read: "The mortar for the building of the cellar shall be of good sand and Portland cement." When asked how he was going to mix his mortar, the answer was: "Why, of Portland cement and sand." But in answer to another question, he could not tell in what proportion. The architect should decide what he considers a good cement mortar. Care should be used in the selection of sand. A small quantity of clay mixed with sand, what is known as "dead sand," will destroy the value of sharp sand. Again, when the footing course has been put in, it is often left without an outlet, and very little care is used in cementing or plastering the outside of the cellar wall. If the house is built in a dry season, no dampness or water may show itself, and the owner thinks he has a perfect cellar; but as soon as a heavy rain comes, he often finds instead that he has one which leaks like a coal sieve, allowing the water to come in through the joints, as well as the dampness. To remedy this, the mason will often tell him that by plastering the inside of the wall he will keep the dampness out. Anyone with ordinary intelligence sees at once that the plastering of the inside of a cellar wall with the water pressure all outside has no value, because if the water is allowed to get into the wall, there being no resistance in the cellar, the cement is bound to fall off.

Mr. Olcott argues that architects should have oversight of the cellar construction, to see that the work is properly done. He illustrated with two cases where he was given contracts to make the cellars dry, within one year after they were built. The owner informed him the cellars were thoroughly drained, &c. The inside walls were plastered with Portland cement, and the cellar bottoms laid in the same material. On uncovering the drains in the first cellar he found that the evident intention of the constructor was that these should leave the front of the cellars and empty into a drain which was deep enough to receive them. Instead of the fall from the extreme rear wall of the cellar to the drain being from the house, it was found to be the other way. The whole system of drainage had to be removed and put in properly. In excavating around the outside walls, which were not plastered, some of the joints in the stone were found to contain very little mortar. The mortar which had been used was probably composed of ten parts sand to one part of cement and one-half part of lime. After the cellar had been properly repaired, and the outside of the walls had had two coats of cement, they being so uneven, and the mortar so poor, that this was necessary, not even dampness got through the work, and this was three years ago. Of course, it is inexpedient to have one person build the cellar, and another the rest of the mason-work. But if owners and architects should determine that this part of house construction must be properly done, they would make contracts with only responsible parties.

Mr. Olcott cited another case of a house built in summer, and occupied by the owner about the middle of September, about which time a severe rain-storm set in, lasting two or three days, at the end of which time the owner found ten inches of water covering the cellar floor. Mr. Olcott was called to investigate; found about the same state of things as in the other case cited, and there was no drainage through the cellar, &c. The defects were corrected, and the cellar had been perfectly dry from that time. If the work had been properly done at first, the second expense in each case would have been saved. It cost much more to remedy these defects than if the work had been properly done in the course of construction.

Mr. Olcott endeavored to show how a cellar can be so constructed as to be perfectly healthy. He believed that as much sickness results from defective work in this part of the house as from the plumbing in other parts of the building. In the first place, levels should be taken to ascertain the elevation, and more especially where the ground is low or the water is near the surface, in order that an outlet can be procured, by which all the water may be removed from around the building. The construction of the cellar may then commence. A footing course six inches deep under the walls, constructed, not as is done in most cases, of stone and lime, should have a pipe, making a clear opening for the water to pass away quickly, and a space around the pipe should be filled in with stone, to permit the water to enter the pipe as fast as it comes near the same. The top of this should be covered with small stone or gravel, so that when the wall is commenced the mortar cannot get through the stone and make this loose covering compact.

On top of this footing course the wall should be commenced. Different localities determine the kind of material for its construction. The usual custom is to make the wall, if of stone, sixteen inches thick, but very often concrete is specified; when so, the best way is to take ordinary field stone and lay them up by hand instead of mixing the stone and mortar as you would concrete for footing courses of large buildings. If the latter kind of wall is built, twelve inches is often enough, thereby saving material. The excavation for the cellar should be made at least from one to two feet larger than the actual cellar itself, and after the work is built to the grade line, the outside should be thoroughly plastered with cement mortar. In some cases Rosendale cement will do for this. Portland cement is better, especially where the ground is wet and soggy, and where a heavy pressure of water will come against the wall. If this is the case, after the cement is well set, a good coat of asphaltum or pitch on the outside of the wall will prevent dampness from striking through. From the grade line to the water-table, either stone or brick can be used, but, of course, in this part of the work the best mortar should be used. The plastering is, however, unnecessary. It is not advisable to build a concrete wall at a season of the year when it will not have time to set or become hard before frost. In the event of the ground being wet, the cellar should be thoroughly drained, across and back, with a fall into the outlet. The whole service should be covered with four inches of good concrete, made of sharp gravel and either one part Rosendale cement to two parts gravel, or one part Portland cement to three parts gravel. The cold-air box to the furnace should always be above the floor, and should be made as tight as possible, allowing nothing but fresh air from the outside to enter the furnace. As to chimneys, it is always better to use flue-pipe than to have an ordinary brick flue, as it is a protection against fire and makes better work.

(3) *Plumbing and Drainage.*—In reference to plumbing, the best fixtures are the cheapest in the end. It is better to cheapen the decoration of the house than the plumbing-work. It is always well to get the best plumber, and he is not always the cheapest one, and it is well to remember that even the best will bear having his work watched and tested. Attention is then called to the arrangement of the kitchen, in which are located the range, boiler and sink, and sometimes the wash-tray. Mr. Olcott condemns strongly the placing of a water-closet and laundry in the cellar. He recommends building the closet upon the rear of the house, next to the kitchen, but with the main building line between it and the place of this fixture. The laundry should be on the first floor; with very little additional

expense it could be built in a room provided for the purpose adjoining the kitchen. Thus steam will be kept out of the main building, and your fixtures will all be above ground, where they belong. Besides, there is often very little chance for good drainage when it is in the cellar, and it will not be necessary to have the pipe leading to the cesspool from three to six feet below the surface of the ground.

The main soil-pipe should run from the outlet through the cellar walls to the highest point of the house. A failure to have the pipe carried above the ridge will permit the gas escaping from it to enter any window which may be located in that part of the building. This pipe should pass through the house its entire length, which will keep it warm, so that it will have an up-current at all times. Mr. Olcott leaves the question open as to whether there should be a trap on this line between the house and sewer or cesspool, as it is a question on which high authorities differ. He would insist that all fixtures should be connected with the main soil-pipe by "Y" branches, and all traps thoroughly ventilated by a separate line of two or three-inch pipe, run as he has described.

In reference to drainage, he is decidedly in favor of the sub surface irrigation system in places which are without a system of public sewers. Mr. Olcott called attention to the able paper read at our annual meeting three years ago, by Dr. J. W. Pinkham, of Montclair, on this system, citing a large number of persons who had it in use, and all reported its successful working. He also called attention to the almost universal use of cesspools in suburban towns and villages, and dwelt upon the great care needed in such cases to guard the drinking-water supply. He concluded his address with some remarks as to the water-supply for the house.

The President then gave an opportunity for members to ask questions concerning house construction.

Principal Green, of the State Schools, asked for the proper formula for concrete.

The President called on Engineer Owen to give his method of mixing it, and he replied: "One part cement, two parts sand, and four or five parts of broken stone or gravel."

Dr. H. Mitchell asked why the cold-air box was placed above the cellar floor.

The President replied that the reason was because it could there better be kept safe and tight, and we were not so sure when it was below the floor that nothing but the cold air from outside would enter the furnace through the air-box.

Upon motion of Dr. Mitchell, a unanimous vote of thanks was extended to the President for his able and practical address.

CLIMATE OF NEW JERSEY.

The State Geologist, John C. Smock, Ph.D., was introduced and read a carefully-prepared paper on "What We do not Know About the Climate of New Jersey."

He told of the great difficulties met by the meteorologist. An examination of the meteorological records showed so unequal a distribution of stations that it is almost impossible to prove any difference which may mark climatic divisions.

The phenomena which relate to sanitary science and the health of the people are of more vital importance than anything else. The health resorts of the State, where are they? What other localities are equally as suitable, or perhaps better, or what can our climate do for our invalids? Where shall the consumptive go? What districts ought those with tendencies to certain diseases avoid? In short, what are healthful locations in the State? These questions come up continually, and the answer ought to be given by the student of climatology. These questions cover a wider range of observation than that read by instruments. And the conditions of the environment are all to be noted. For example, is there anything in the Schooley's Mountain configuration or climate conducive to healthfulness? What can explain the prevalence of malarial diseases north of the terminal moraine line? What is the cause of the Lakewood success? Is Brown's Mills, in the pines, equally beneficial? Has Atlantic City less rainfall and a more equable climate that other of our coast resorts? What advantage has Cape May? These and like questions are asked by the densely-populated cities on each side of the State. Is it not worth our time to begin a more careful investigation and study of our climate, so as to be able to answer intelligently and to help the invalid to save life, as well as to attract people to those localities which can be shown incontestably to be health-giving and in truth health resorts? Our State Weather Service is doing good work, but it cannot command. It can request only, and hence must get its records wherever they can be found. It is a voluntary matter.

Observers should be added at critical points for the study of the climate, and a record of all observations kept for the solving of these important problems.

The President then introduced Director E. W. McGann, of the New Jersey Weather Service. He said that as Professor Smock had presented the subject of the climate of New Jersey from the geological and topographical standpoint in his very able paper, he would briefly present the subject from a purely meteorological point of view, and endeavor to show that climate could only be determined from a long series of observations made from standard instruments properly exposed.

By the climate of a country we understand its conditions relative to all those atmospheric phenomena which influence organized beings. Climate, therefore, depends upon the mean temperature of the year; upon that of each month and day; upon the maximum and minimum temperature; upon the frequency and suddenness of the atmospheric changes; upon the amount of rain and snow; upon the moisture of the air, and the frequency of thunder storms. All these can only be determined by long and careful observation. Instruments have been devised whereby these phenomena may be observed and recorded. The barometer serves as a scale to determine the weight of the atmosphere; the thermometer its temperature; the dry and wet-bulb thermometers its moisture; the pluviometer (rain gauge) the amount of precipitation (rain and melted snow), and the anemoscope and anemometer the direction, velocity and pressure of the winds. All these conditions have nowhere in our State been observed for any length of time, except on our immediate sea-coast by observers of the National Weather Service. True, there are many records of temperature and rainfall, and in a few instances these records cover a long series of years and are of great value, but they are so widely separated as to be of comparatively little value except in the immediate vicinity of the place of observation. Prof. Smock, in his paper on the Climate of New Jersey, published in connection with the report of the State Geologist, frequently refers to the great want of meteorological data in order to more accurately determine by figures the exact climatic changes. He says:

"The valley of the Delaware, from Port Jervis to the Water Gap, experiences high summer temperatures, although we have no records excepting that of Port Jervis, N. Y., at the extreme northern end of the State.

"No meteorological observations are known to have been kept on the Kittatinny or Blue mountain, excepting at the U. S. C. S. station, at Culver's Gap, in Sussex county, where tri-daily observations on temperature were made from August 19th to September 29th, 1881.

"But no conclusions about mean temperature can be drawn from this record."

Speaking of the Highlands, he says:

"It is unfortunate that we have so few meteorological stations in this part of the State, since it would be of great interest and of public importance to show by figures the differences which are here indicated by general statements only. And not only to demonstrate these positions, but to exhibit the features of climate, which make the Highlands so attractive for tourists and for rural homes and retreats, and so comfortable and health-giving to both the natives and also to the invalids who seek strength and health on these hills. And in conclusion it may be said that the study of climate in its sanitary relations is still in its infancy. This is largely due to the *absence of accurate meteorological data* and a general ignorance of the peculiarities of our climate. The study of disease and of climatological conditions must go together. The claims of a suffering humanity call for all the aid which science can give. And it may be found that in our own borders there are many of the peculiar conditions and local features which can be of service not only in prolonging life, but also in restoring health, quite as well as the famous resorts of the South or Far West. The field is an inviting one, and encouraging of success."

Mr. McGann said it was with this object in view—to give every county in the State standards for temperature, rainfall, wind velocity, humidity—that the late Dr. George H. Cook undertook the organization of a State Weather Service in the year 1887. In his circular calling for voluntary observers he said:

"It will lead to a better practice of medicine, when physicians throughout the State can study disease with reliable and accurate meteorological facts by their side, and for sanitary purposes correct meteorological statistics are invaluable to the practitioner in applying preventive remedies for the public good.

"It will lead to the collection of rainfall statistics to enable engineers to better estimate the supply of canals, also the sudden downpours to guard against in laying out sewers in cities. It will lead to a correct knowledge of rainfall over the different water-sheds of the

State, for the purpose of giving data for supplying the water-works of cities, towns and villages.

"It will lead to the forming of reliable meteorological records for use in legal cases.

"It will lead to publishing the temperature of our summer resorts, drawing attention of outside parties to their desirability as summer residences."

Mr. McGann said that our weather service has already accumulated much valuable data which will be of permanent service to the State, especially to this Association, the State Board of Health and to agriculturalists. The physicians will soon have command of reliable meteorological data, when they can study the causation of pneumonia, of cold-weather diseases, such as influenza, tonsilitis, bronchitis, &c.; also, the relation of certain meteorological conditions to diseases of the lungs and air passages. To the engineering profession, the collection of rainfall measurements are of the greatest value, and furnish a rich source of information indispensable in the collection and compilation of data as to the flow of streams and their consequent water-power capacity for supplying the cities and towns of our State for domestic consumption. Such data, too, will lead to a better construction of sewers, and enable us to guard against the heavy downpours and the great damage done by their incapacity to carry off the water, causing it to back into the cellars.

Dr. Henry Mitchell expressed his interest in the subject under discussion. He thought that as sanitarians we should be in favor of the work attempted and contemplated by the weather service, and believed that we did appreciate in a measure the importance of securing meteorological data, but like all such work it is slow in meeting with its just reward. He was convinced that this work was of great value in all departments of sanitary work, and he rejoiced in the signs of progress in it. He called attention to the queries in Prof. Smock's paper, and argued as to the importance of answering them, when so many people are questioning us as to the health resorts of our State, who are seeking health for themselves or their relatives and friends. He asked Prof. Smock if we could get information that would enable us to answer them.

Prof. Smock replied that they could be answered from the standpoint of the geologist, and in his opinion climate should be studied largely from that standpoint. Further study would doubtless enable us to come to a more intelligent and unanimous decision.

Dr. Mitchell thought there should be some inquiry as to what was necessary to make the weather service more efficient, and he suggested that it be referred to the Executive Council.

Dr. H. B. Wetherill, of Trenton, suggested that Prof. Smock continue his investigation of the subject, since the time given him to prepare his paper was so short as to cause him, as he had stated in his paper, to treat the matter hurriedly.

Civil Engineer L. B. Ward, of Jersey City, suggested that the paper and the remarks of Mr. McGann be referred to Prof. Smock, Director McGann and Dr. Hunt, as representing the three departments interested in this matter of climatology—the Geological Survey, the New Jersey Weather Service and the State Board of Health.

After further discussion, Dr. Mitchell moved that the whole matter be referred to the Executive Council, to take such action in instituting inquiry as to climatological facts as they might deem best, and the matter was by unanimous vote so referred.

The meeting then adjourned until Saturday morning.

SECOND MORNING SESSION.

SATURDAY MORNING, December 13th.

The meeting was called to order by President Olcott, at 9:30 o'clock.

STREAM POLLUTION.

C. Phillips Bassett, C.E., of Newark, was introduced, and read a report, as chairman of the committee appointed last year to investigate the subject of Stream Pollution.

The report states that there is no law in this State which deals effectively with the pollution of any potable stream of the State. No classification of the streams of the State had been made. The abilities of the various streams to digest or absorb varying volumes of different impurities has never been ascertained or the determination attempted.

The committee thought that some competent board should be clothed with authority to look after this matter and determine what is necessary and possible under the conditions existing in each locality and to enforce them. It does not appear practical to erect any arbitrary standard of the liquids to be allowed to be discharged into a stream. Fluid impurities emanating from manufactories and from sewer outfalls are so heterogeneous that rigid standards can hardly embrace all that is deleterious without working a hardship to some localities where the pollution is harmless.

As to the effluents from sewage-purification works, the committee think it necessary in some instances to have sewage purified as an essential of the sewerage system. The towns with this difficulty before them hesitate to undertake the work of sewerage because they do not know that an effluent from disposal works can be secured which will be allowed to flow into adjacent streams.

The committee recommended the passage of an act empowering the State Board of Health to act as an arbiter in all matters affecting the pollution of streams and lakes; further, that this Association pass a resolution requesting the State Board of Health to co-operate in the passage of such an act, with provisions for its practical enforcement.

The committee was continued to further investigate the subject, and their recommendations were referred to the Committee on Legislation.

DETERIORATION OF WATER IN RESERVOIRS.

The next paper was then announced, "The Deterioration of Water in Reservoirs and Conduits; Its Causes and Modes of Prevention."

Charles B. Brush, C.E., of Hoboken, was introduced and read the first paper. (See page 107 in this report.)

Mr. George W. Rafter, Civil and Sanitary Engineer, of Rochester, N. Y., was then introduced and read a paper on the same subject. (See, also, page 111, this report.)

Dr. E. M. Hunt asked whether the motion of the water would be sufficient to destroy the algæ without the air.

Mr. Brush replied that a large part of the good effect was due to the motion. If enough motion could be had in any other way, the air would be unnecessary. The air was the most convenient way of getting motion.

Mr. Rafter drew attention to the fact that algæ developed only in *quiet* waters, and hence stagnation is the condition of their fertility. In answer to another question by Dr. Hunt as to the effects of sunlight, he stated that it was natural for the water to receive the sunlight, but at the same time the water should be in motion. Covering reservoirs might keep away the dust and give the water a more sightly appearance, but he also believed it better to have them uncovered in some cases.

Mr. L. B. Ward, of Jersey City, then opened the discussion of the question. He complimented the papers, stating that they were the most able presentation of the subject he had ever listened to. He then spoke of the presence of algæ in the water. Living algæ did not cause any effect on the water deleterious to health. The death of the plant was the cause of all the trouble as to the unpleasantness in the appearance and taste of water. He then spoke of the old theory that the organic matter became oxygenated in the stream by the air, by chemical affinity, and of the better view of students now, that mere contact with oxygen will not improve water. He thought that in any discussion of the deterioration of water, it was better to keep the scientific points of the case in view. It was admitted that the bacilli that swarm in the water are harmless so far as producing disease is concerned, and they do excellent service in the water. Typhoid fever could not be produced by them, but only by the specific germ of the fever. He also spoke of the forcing into bodies of water stored for potable use, atmospheric air, and said that it unquestionably checked the growth of algæ.

Mr. Brush said that he had neglected to call attention to what he regarded as an important matter. In every reservoir there should be animal life. This should be equally prevalent in the water with vegetable life. He would deliberately stock a reservoir under his care with fish. First, he would place carp, then silver-fish, and then black bass. A reservoir should be treated as an aquarium. We should have air, plant and animal life.

Dr. E. M. Hunt acknowledged the great favor to the Association in having such men as Engineers Brush and Rafter discuss this important question before them. Mr. Rafter, he said, had made a national reputation in the study of water. He was glad Mr. Brush could drink water so unpleasant from decayed plant life, and congratulated him that it did him no harm. The medical profession, he said, found that where we get stenchy water into the system sickness often results. The whole study of reservoirs and pipes is of the greatest importance to the public health. He was glad Mr. Ward had raised the point whether it is all a question of oxygenation. The study of this entire subject of water deterioration should be continued by this Association.

PHYSICAL CULTURE.

Prof. Charles H. Raymond, of Lawrenceville, was then introduced, and read an excellent paper on "Gymnastics, Past and Present." He handled the subject in a very thorough manner.

A broad distinction was made between the physical culture of the past and of the present, which so many, in talking on the subject, fail to realize and consequently draw faulty conclusions in judging the present by the past. The gymnasium of the old type was described as square, cheerless, cold; the apparatus a mixture of home-made bars, ladders, trapezes, ropes, wooden horses, rings, &c. We were exceedingly fortunate if we found more. But here, at least, was life, and that given, *ergo*, evolution. Yet, somehow, out of this environment is evolved the physical culture of to-day. One can hardly call the result a survival of the fittest. This term would more significantly apply to the young man whom really some special providence preserved from the ignorance, the overstrain and the accidents which so often characterized the use of the old gymnasium.

Professor Raymond then traced the progress from 1825, when Drs. Beck and Follen, friends and pupils of the famous German, "Father Jahn," introduced gymnastics into America through the Round Hill School, of Northampton, Mass. Before the war, the gymnasiums in our country were few, poorly equipped and managed, and confined almost entirely to colleges. He quoted a recent writer, remarking that he states the case decidedly more mildly than Mr. Blakie, as follows: "Prior to 1860, the authorities of American colleges were indifferent to a necessity of a supervision over the physical well-being of their students, neither providing them with instructions in gymnastics nor facilities for athletic sports." No such condition of affairs exists to-day. Hardly a college of any prominence but that is giving attention to the subject of physical culture. It is compulsory in many of our academies. The public schools are opening their doors to it, and everywhere it is being welcomed as a factor positively needed, not only in our education, but in our civilization as well. The Young Men's Christian Association has connected with it over 340 thriving gymnasiums, besides training schools for teachers, which provide three-year courses. The North American Turnerbund has a normal seminary, from which have graduated 140 well-equipped instructors. There are some 15,000 boys and 6,000 girls in the Turner Schules of the North American Gymnastic Association, who are regularly taught gymnastics by approved German methods. Add to these the innumerable athletic associations, clubs, &c., and some idea can be got of the meaning of physical culture to-day. He cited a single book store in this country which issues a catalogue which contains a list of over five hundred first-class books on the subject.

Professor Raymond then dwelt on the great improvements in methods and system of training as being even more marked. The aims of physical culture are very different from those of twenty-five years ago. The sole object was to develop certain muscles and attain certain dexterity, in order to accomplish certain physical feats, its motto being "To excel." They were consequently patronized by those only who were already strong by nature; the weak boy had no place there, simply because he was weak. Such a system soon emptied the gymnasium. Then colleges began to realize what athletic clubs are just beginning to to-day—first, that all young men could not become, and have no desire to become, specialists; second, that unless they did, there was no adequate provision for their needs; finally, that such training as the strong men, or specialists, were taking, in some cases at least, was of doubtful value. The five-mile walk before breakfast, the all-meat diet and the heavy muscular strain bore fruits, it is true, but in some cases of an unexpected kind.

The Dio Lewis system of light gymnastics was then described as a distinct protest against the exclusiveness of the then existing method in limiting strength to the strongest, against the so-called heavy gymnastics as opposed to light, and against the cultivation of certain sets of muscles. It went much further in maintaining the principle that gymnastics is a part of educational training—that truth has maintained its ground, and been fortified by increased knowledge.

Professor Raymond, after enlarging upon the different eras in physical education, and of the German and Swedish systems of gymnastics, spoke of the so-called American system which is slowly taking form, as partaking of many of the excellencies of other systems and adding others.

One of the first things, he said, to notice about the best methods of to-day is that they begin to recognize the individual needs of the student. "Given a man of good form and sound health, and a method of muscular development is not hard to find; but given this same man of good form plus dyspepsia and heart trouble and a decidedly new factor enters the equation. Now supplant form by deformity—a raised shoulder, a crooked back—or to muscular weakness, or to muscular strength, add debility of nerves or vital organs, old diseases, uneradicated taints of heredity, &c., and how serious the problem becomes." He called attention to the fact that these are just the cases that claim consideration in all methods of advanced physical culture to-day, and, therefore, one of the first things demanded in our gymnasiums is a physical examination, more or less extended. He quoted some very interesting statistics of an examination made of ninety-one young ladies, of the average type of students, attending a well-known and successful academy, which showed the importance of physical examination and of the adaptation of physical culture to meet the needs of the individual case. He believed the great value of physical culture to-day lies in this—that it is getting into the physiologists', psychologists' and doctors' hands, and they are the ones who are making the divisions of recreative, educative and curative gymnastics.

The examination into the individual results in the meeting of these needs by class and individual work, by light and heavy gymnastics, as one of the principles of the new methods. Its sought-for result is health. The applicant to the gymnasium to-day is not merely diagnosed, he is measured and tested. The stethoscope is followed by the calipers and dynonometer. These give you a pretty accurate idea of a man's weak point, and all true systems now aimed to strengthen the weak places, not the strong. This is what he desired to emphasize, and it needs to be, for here is where the greatest practical opposition comes from—the student whose great desire is to excel. He spoke of the use of physical measurements and strength-tests as valuable, by indicating the parts that need development and in furnishing data. Drs. Hitchcock's and Sergent's anthropometric statistics serve to give us the perfect type of man and woman, which, whatever might be their style of beauty, he hoped would be symmetrical.

The value of the two kinds of work, class work and individual work, was next considered at some length. Quoting Dr. Brown—"He who has obtained any amount of knowledge is not truly wise unless he appropriates and can use it for his needs"—he said it applied to the gymnasium as well as to the school-room. The well-trained gymnast does not need to carry around a set of chest weights and a pair of parallel bars to show that he is healthy or strong, or active or well formed, any more than the college man needs to stuff his pockets with Greek books to show that he is cultured. He will evidence the value of his training in every manual act that he performs. The true instructor in the gymnasium is not merely recording the number of times his pupil is pulling his chest weights, but carefully noting how he is doing it. Economy and form are his shibboleths. Is he doing his work easily, gracefully? Does he hold out well? Does he endure? He must take exercises that will tend to this, for endurance is the chief element of all strength. Muscular control was emphasized as the practical side of gymnastics, and that begets confidence. A man who knows what strength he has, who has been trained in the use and economy of it, is not going to approach any test in the same spirit as the untrained man, and so efficiency is added to confidence. All things equal, your rightly-trained gymnast will more quickly acquire skill as a ball player, a violinist, or at any work you put him to, than will his untrained neighbor.

Prof. Raymond, in closing, expressed his confident belief that all he had said in favor of the gymnastic training of to-day would be fully substantiated by a personal visit to any of the best Young Men's Christian Associations, German or college gymnasiums, and supply abundant data to prove how exceedingly valuable are the results.

Dr. E. L. B. Godfrey, of Camden, opened the discussion. He was glad that the subject of physical culture was becoming more popular every day. He first considered the old training system, which was a straining system, and was positively injurious. Those who practice it do not attain a great age. Any system not training the whole body, he argued, was a false one. Examine the base-ball or the foot-ball player who confines himself to this exercise and you will almost invariably find in course of time an irritated heart. He referred to the great variety of systems of physical culture, dwelling on some of the advantages and defects, and held that the system tending to develop the individual according to his needs was the best one. Gradual methods should be begun in childhood, while the body is susceptible. He believed these should be generally introduced in our public schools, under careful instruction, over-exertion being carefully avoided. It might be irksome to the child at first, but it would soon become a habit which he would continue to like. It was not muscular hardness that we want, but muscular adaptability. And he believed if children were trained how to sit, stand and walk, the next generation would be a much healthier one.

Dr. H. G. Wetherill, of Trenton, called attention to the fact that it is not the muscles we want to develop primarily in young children. This should be sought only as a secondary and incidental matter. The great mistake in many gymnasiums is that they made muscular exercise the chief thing. That is not the ideal of to-day.

B. C. Gregory, Supervising Principal of the Trenton Board of Education, who was to have opened the discussion, forwarded a letter to the Secretary regretting his inability to be present. He would have been pleased to discuss the subject of physical culture in relation to its place in a school curriculum. He believes that in the treatment of this subject in the schools there are several errors in conception.

The first error might be somewhat paradoxically stated as the absence of a conception. The exercises used have no meaning—are blindly used—are gathered from various sources—and, for all the teacher knows, may be positively injurious.

Second, the influence of grace and beauty is sometimes made the dominating principle. Music is employed, and rhythm is made an end. He would not say that grace and rhythm are not important, or that they are not proper objects. Granting this, the ascendency of these ends and the practical exclusion of others seem to him a conception of physical culture which leaves out the principal object of such culture, which narrows the culture very sadly. He had found that where the athletic consideration was dominant, there was very little inquiry into the rationale of physical culture.

Third, the athletic craze seemed to him an equal error. The aim here is not to make normal men, but abnormal men. It has been sufficiently demonstrated by statistics that the athlete is not the most healthy man. The error becomes a serious one when children are permitted to exercise as they will in the gymnasium. If the exercise is restricted and directed, it still is vicious (although in less degree), if the design to produce athletes obscures the design to turn out normally-healthy men.

Fourth, a sincere desire is found in some places to not overdo the matter. The exercises are chosen to develop to a healthy degree this or that muscle, but in such cases one or two mistakes seem to be present. There is an absence of what may be called a co-ordination of the exercises—that is, such a disposition of various movements as shall secure a harmonious and not disproportioned development, or the attention is centered on the muscular development and the health of the vital functions overlooked. In many cases two or more of these errors mingle, and the result, though denominated physical culture, has not the first characteristic of culture. It was while his mind had grasped the weaknesses of the prevailing methods (they can hardly be called systems), when he had nothing to substitute for the chaos with which he was familiar, that he became acquainted with the Swedish system. Here, he thought, was a system which at least has a basis in reason. It is logical, coherent and answers the scientific demand which must be made of any system of instruction. To his mind, Ling is the Pestalozzi of physical culture.

SEWERS.

The next paper was announced by the President on "The Sewers of Trenton," by Rudolph Hering, C.E. Prof. Hering having been unavoidably detained, forwarded his paper, which was read by the Secretary. (See page 99, in this report.)

Mr. C. B. Brush, C.E., discussed the paper. He spoke of the wide reputation which Mr. Hering had attained in dealing with sewer questions, and any paper from him was able and worthy of consideration. He objected, however, to so many dead ends on the lateral sewers as Mr. Hering had. His plan would be to connect all the sewers into a continuous system, as water-pipes are laid. Bad gases were likely to collect in these dead ends. Mr. Hering had in his plan done all that could be done to correct this difficulty by the flushing tanks. Of course, the money question had entered into the problem in Trenton. He knew that connecting the sewers cost considerably more, but it was worth all the additional expense.

Dr. E. M. Hunt, who had been expected to open a discussion on "traps," stated that he had prepared considerable data on the subject, but because of pressure for time, he moved that it be referred to the Executive Council, to be taken up next year, which was carried.

Dr. H. G. Wetherill moved that the question next year be enlarged, so as to present the question as to the use of traps or no traps, which was also carried.

OFFICERS AND COMMITTEES.

On motion of Prof. J. M. Green, Mr. J. C. Pumpelly, who had left the State, and is now a resident of New York City, was elected an honorary member of the Association in consideration of the valuable services he had rendered the Association.

Nominations were then presented by the Executive Council for officers for the ensuing year, and they were unanimously elected, as follows:

President	HON. E. O. CHAPMAN	Trenton.
First Vice President	E. L. B. GODFREY, M.D.	Camden.
Second Vice President	C. PHILLIPS BASSETT, C.E.	Newark.
Recording Secretary	SHIPPEN WALLACE, PH.D.	Burlington.
Corresponding Secretary	PROF. J. MADISON WATSON	Elizabeth.
Treasurer	GEORGE W. HOWELL, C.E.	Morristown.

EXECUTIVE COUNCIL (WITH ABOVE-NAMED OFFICERS).

DAVID C. ENGLISH, M.D., *Chairman*	New Brunswick.
PROF CHAS MCMILLAN, C.E.	Princeton.
JUDGE WM. M. LANNING	Trenton.
WILLIAM PIERSON, M.D.	Orange.
BOARDMAN REED, M.D.	Atlantic City.
PROF. P. T. AUSTEN, Ph.D.	New Brunswick.
JAMES OWEN, C.E.	Montclair.
STATE GEOLOGIST J. C. SMOCK, Ph.D.	Trenton.
PROF. A. B POLAND	Jersey City.
EDWARD S ATWATER, ESQ.	Elizabeth.
H. G. WETHERILL, M.D.	Trenton.
D. L. WALLACE, M.D.	Newark.
O. W. BUDLONG M.D.	Lakewood.
G. F. WILBUR, M.D.	Asbury Park.
JOHN L. LEAL, M.D	Paterson.
T. R. CHAMBERS, M D.	East Orange.
A. P. HUNT, M D.	Somerville.
DAVID HARVEY, ESQ.	Asbury Park.
A. CLARK HUNT, M.D.	Metuchen.

The following gentlemen, ex-Presidents and others, who have rendered valuable service to the Association, are Honorary Members of the Council:

Prof. C F. Brackett, M.D., LL.D....Princeton.
L. B. Ward, C.E....Jersey City.
McKee Swift, C.E....New Brunswick.
W. K. Newton, M.D....Paterson.
E M. Hunt, M.D., *Secretary State Board of Health*....Trenton.
James C. Bayles, M.E....Orange.
F. Gauntt, M.D....Burlington.
Prof. James M. Green, *Principal State Normal and Model Schools*..Trenton.
Henry Mitchell, M.D....Asbury Park.
D. Benjamin, M.D....Camden.
G. P. Olcott, C.E....East Orange.

The President announced the following Committee on Legislation:

L. B. Ward, C.E....Jersey City.
Hon. E. O. Chapman....Trenton.
D L. Wallace. M.D....Newark.
H. R. Baldwin, M.D....New Brunswick.
James C. Bayles, M.E....Orange.
E. S. Atwater, Esq....Elizabeth.

SUMMARY OF REPORTS FROM LOCAL BOARDS,

AND LISTS OF MEMBERS AND HEALTH INSPECTORS, WITH ABSTRACTS FROM MOST OF THE REPORTS.

BY THE SECRETARY.

In October in each year, as required by law, a printed schedule of inquiries is sent to each Local Board of Health, also containing a blank for the names and post-office address of members of Local Boards and Sanitary Inspectors. The following is the schedule:

SUBJECTS FOR REPORTS.

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-houses, 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.

If details on some of the subjects named have been furnished in former reports, these do not need to be repeated. But each item should be carefully examined, and full information given under R. It is always best to state what the Board has actually done. Under

W no disease should be reported as having been prevalent, unless the writer knows of at least ten cases. The medical member of the Board should, if possible, give facts as to any epidemic that has occurred, and should note any special needs or defects in sanitary administration.

The following circular, which is of use also to draw the attention of Local Boards to the subjects committed to their care, accompanies each report:

CIRCULAR LXXIV.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

TRENTON, October 1st.

To Local Boards of Health:

Enclosed herewith please find an outline for the Annual Report for the year ending with this date.

In addition to the name and post-office address of each member of the Board, give also the same as to the Sanitary Inspector. The law now requires that each city, town or borough of over two thousand inhabitants shall have a *competent* Sanitary Inspector. In all the larger *townships*, or in those which have villages of several hundred persons, it is provided by law that the State Board may require a Sanitary Inspector to be appointed, if in its judgment such an appointment is needed. In a township, if the Local Board fails to appoint, the State Board appoints the medical member of the Board of Health. Where there is a Township Physician he is not, by virtue of that position, the medical member of the Board of Health, but he or any other physician resident in the township may be appointed.

Under the schedules of subjects for report, in the case of cities and townships which have had Boards of Health and reported in previous years, it will not be necessary to repeat as to *A*, *B*, *E*, *G*, *I*, *O* and *P*, as most of the facts are on file.

In every case of report from a township, the name of any city, town or borough *in it* which has a separate Health Board should be given.

Under *A*, in the case of all cities, towns or boroughs, it is desirable to give the number of acres included in the incorporation and population per acre if known.

Under *C*, state exact source of water-supply, and when introduced. If a public supply, is it by the city or a private company? How many houses take it? Is the water ever discolored? Has it an iron or other taste? Is it hard or soft? Is it bad at any one season of the year? Are reservoirs or water-pipes cleaned? Does the source or stream from which it is taken receive any sewage above the point of supply? If from a stream, is there any examination made each year, or oftener, as to modes of pollution? Any other facts as to source, quantity or quality. How many depend on wells? How many on cisterns? Has the Health Board a list of houses that do not use the public water-supply?

D. As to drainage, state whether any system of drainage for the ground is used as distinct from sewerage. Is the usual water-level such as to secure dry cellars? If there are swamps near you, or malaria is frequent, give particulars.

As to *sewers*, state their construction, their grade or fall per one hundred feet, their size, their outfall, their flushing and ventilation, and whole length, and when introduced.

F. State whether houses generally have basements or cellars. If a city, whether the basements are occupied; if country, whether largely used for storage of vegetables. How many tenement-houses of more than two families? Is there a yearly house-to-house inspection?

H. State how far sewers are used, and what proportion of houses connect with them. Does your record show this? If cesspools, state whether they are cemented, or whether built with open bottom or sides. How are they emptied? What is done with the contents?

J. State any known or prevalent disease this year, and what month. Does the Assessor inquire each year as to losses of animals, and as to contagious diseases? If a city, is there a register of all persons keeping horses, cows, hogs, &c.?

K. Are slaughter-houses inspected, so as not to be a nuisance to neighbors?

L. Mention any new manufactories, and any nuisances from any factories.

R. Has your Board passed ordinances?

S. State who neglect returns and their post-office address.

Look carefully at each heading and state what you know.

Under *W*, do not put down a disease as prevalent unless you have personally known of at least ten cases. Under *X*, state what your Board has done the past year, and any sanitary investigations and improvements. Often the Physician of the Board should make out or aid in the report, and add such suggestions as occur to him; but let there be no delay to make return during October. We must trust chiefly to the Assessor, the Physician and the Inspector to keep the other members of the Board acquainted with health conditions, and with the rights and duties of the Board. Any neglects reported to us will be inquired into. Refer to Circulars XXXIX. and LX., and to Book of Circulars, for further information. Have on hand, also, Inspectors' Guide (Circular LXXV.), as furnished by State Board. Your Board should each fall look carefully over all health conditions, as the winter is a good time for the cleansing of outbuildings and much other sanitary work.

We send occasionally, blanks for lists of physicians or undertakers, to be carefully corrected and promptly returned to this office. Cross off any deceased or removed, or who have ceased to practice. Add all new ones who have settled for practice within the city or township for which you make return. *Give name and post-office address plainly,* and only those residing in your city or township.

Keep informed as to the laws, and distribute the various reports and circulars of the Board. One or more members of your Local Board should attend the Annual Fall Meeting of the New Jersey Sanitary Association. Local Boards now have nearly or quite all necessary power. Even in small and very healthy townships, the Local Board should confer at the time the Township Committee meets, and keep so informed as to prevent nuisances or deal with any outbreak of epidemic. On receipt of postal, a copy of laws and references, or other circulars, is sent to each member of the Local Board whose post-office address is given.

Let the schedule, carefully filled out, be mailed to us in envelope herewith sent, not later than November 1st.

E. M. HUNT, M.D.,
Secretary.

We do not find it necessary to publish all of each report, and even those from which we publish nothing are of value for reference in the office. Our space permits us only to select such parts as are new, or as are of special interest to the locality and to this Board. Reports are in general promptly received, but a few Boards are dilatory, or seem to regard the report as a formality. We regard them as so important that we must insist upon exact conformity to the law. Those who will examine the abstracts will not fail to get valuable information, and have opportunity to compare the work and methods of the various Boards.

We are not able to give always the names of all members of Boards, and sometimes, when they have not been formally organized, we give the names of the Township Committee and Assessors, who are members, and are responsible for local health conditions.

ATLANTIC COUNTY.

ABSECON.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Jeremiah Hand, D. Henry Bates, Towers Townsend, James W. Lee. E. H. Madden, M.D., Hea'th Inspector.

ATLANTIC CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joseph H. Borton, Atlantic City; George W. Sheppard, Atlantic City; Edward S. Lee, Atlantic City; Henry S. Scull, Atlantic City; Dr. E. L. Reed, Atlantic City; Jacob H. Leedom, Atlantic City; Julius Cotz, Atlantic City.

We have nothing of importance to report, except the increase of population to 12,000, and, following the advice of the State Board, have urged parties to connect with the sewer. We have connected in the past twelve months 481 hotels and cottages through the sewers.

(Signed), LEWIS REED, JR.,
Health Inspector.

BUENA VISTA.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George B. Cake, Buena Vista P. O.; Ernest A. Pierce, J. H. Smith, Richland; Charles J. Michaels, John Faux.

EGG HARBOR CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Schwinghammer, Egg Harbor City; Frank Herr, Egg Harbor City; George F. Breder, Egg Harbor City; Lawrence Berchtold, Egg Harbor City.

The present water-supply is still procured from open wells, which are rapidly decreasing and driven wells taking their place. Wholesome water is generally found at depths varying from 20 to 40 feet. The City Council has cleansed, within the last few months, the open public drain, thereby insuring the rapid drainage of all surplus water.

The public streets and grounds are well kept.

For the past year we have been remarkably exempt from diseases of animals.

Complaint was made against a slaughter-house during the summer, but the nuisance was abated upon notice.

The City Prison is poorly patronized—namely, from one or two arrests and for lodging of tramps. It is well provided with beds and cleanly kept. La Grippe during the past winter existed in some degree. Two persons in one family succumbed to it. Three cases of diphtheria were reported—one case of typhoid pneumonia; recovered.

(Signed), V. P. HOFFMAN,
Clerk.

EGG HARBOR TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John J. Corson, Bargaintown; Samuel A. Smith, English Creek; John C. Fifield, Bakersville; William H. Leeds, Bakersville; Samuel C. Edmunds, M.D., Linwood.

The Board of Health of Egg Harbor township met in Bargaintown Hall, June, 1890, and organized. The Board took steps to restrict the handling of garbage in the township, except in such manner as is not detrimental to public health. Permits were issued to four persons for handling garbage. Meetings were held regularly on the first Monday of each month. The physician of the Board stated that the general health of the inhabitants had been good for the past year.

(Signed), W. H. LEEDS,
Secretary.

GALLOWAY TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John W. Johnson, Port Republic; Somers T. Higby, Leeds Point; Lardner Scull, Leeds Point; E. A. Higbee, Leeds Point (Sec'y). E. H. Madden, M.D., Absecon, Health Inspector.

HAMILTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. V. Beckett, Mays Landing; D. E. Iszard, Mays Landing; James Blasdale, Mays Landing; L. W. Cranmer, Mays Landing; Charles S. Abbott, Mays Landing; H. C. James, M.D., Mays Landing.

The water-supply is mostly from wells, and, with very few exceptions, is very good, with no bad taste at any season of the year. No prevalent diseases. There have been only two complaints during the year made to the Board, and in each case the causes of complaint were abated.

(Signed), H. C. JAMES, M.D.,
Health Inspector.

HAMMONTON.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Charles Woodnutt, Hammonton; James P. Patten, Hammonton; James H. Seely, Hammonton; A. J. Smith, Hammonton. Edward North, M.D., Health Inspector, Hammonton.

Nothing has been done this year. There is nothing to report as different from other years. Our town has been free from any epidemic. We consider our locality a very healthful one.

(Signed), A. J. SMITH,
Clerk of Board.

MULLICA TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Theodore Weeks, Green Bank; Charles Saalaman, Egg Harbor City; George Huntsman, Pleasant Mills.

(Signed), W. S. MILLER,
Assessor.

WEYMOUTH TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

David H. Gandy, Tuckahoe; Anderson Campbell, Tuckahoe; Anderson Bourgeois, Estelville; W. H. Campbell, English Creek.

PLEASANTVILLE BOROUGH.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Hon. William J. Newell, President; Richard M. Sooy, M.D., Secretary; Richard Risley, Richard I. Risley, Isaac Andrews. Joseph M. North, Jr., M.D., Health Inspector. All P. O. address Pleasantville.

Pleasantville Borough was formerly the upper part of Egg Harbor township. The borough was formed in 1889. It contains four square miles, all flat upland, with a sandy soil and a number of gravel-beds of the best quality. The roads are mostly of gravel. We had no Local Board of Health until this year, when one was organized and a code of health ordinances adopted. Our borough is noted for its healthfulness. We have had no epidemic of any kind for over fifteen years, with the exception of La Grippe, which existed in all parts of the country. We have occasionally an isolated case of typhoid fever. Every case of specific disease is immediately quarantined by the Board of Health. Malaria is not known to originate here, all cases being traced to importation. Our water-supply is from wells, varying from ten to thirty feet in depth. Some cesspools are cemented, but the majority are not. Situated as we are, we have no sewers and no system of drainage. There are no industries likely to cause a nuisance. The garbage of Atlantic City is brought here in tight wagons and in scows by the farmers and truckers, who use it as a fertilizer and as a food for swine. Our code is very strict as to the use of this garbage. The people, with some exceptions, feel kindly toward the Board of Health, and recognize its usefulness. Our Inspector attends strictly to duty and reports weekly to the Board, which meets every Friday evening.

(Signed), RICHARD M. SOOY, M.D.,
Secretary.

BOROUGH OF SOMERS POINT.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Frederick Stuth, Somers Point; Allen Atkinson, Somers Point; Joseph H. Somers, Somers Point; William H. Keats, Somers Point; John Townsend, Somers Point.

Report the same as last year. Sanitary expenses about $10. No prevalent disease.

(Signed), N. D. VAUGHAN,
Borough Clerk.

BERGEN COUNTY.

ENGLEWOOD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Abram Tallman, Englewood; James Harris, Englewood; Henry J. Brinckerhoff, Englewood; Hardy M. Banks, M.D., Englewood. Gilbert W. Chamberlain, Secretary. John J. Post, Health Inspector.

It has been a constant effort of the Board of Health to remove pipe laid many years ago for purposes of cellar-draining. They have been perverted into sewer uses, thereby endangering public health. Their efforts have been quite successful. Owners and tenants of houses are regularly visited by the Health Inspector, who reports any violation of health ordinances, which are very infrequent. No diseases of animals reported during the year. Great care is taken in the ventilating arrangement of the public school-houses, and the sewerage of the same vigilantly looked after. The Englewood Hospital Association have recently erected a building, and are now in full operation. The health expenses are about $300 a year. There have been no prevalent diseases during the year. In other respects report is similar to that of former years.

(Signed), G. W. CHAMBERLAIN,
Secretary.

FRANKLIN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Uriah Quackenbush, Chairman, Wyckoff; Albert Lozier, Campgaw; John Ramsey, Oakland; John W. Ackerman, Secretary, Oakland. Dr. E. W. Hamilton, Oakland, Health Inspector.

The water-supply is from wells and cisterns. Drainage is natural and no sewers. Dwelling-houses are chiefly frame, and mostly occupied by one family. There are five cemeteries within the limits of the township. The Board has not been organized but four months, so the sanitary work has not been very heavy. The Inspector has once been called upon in regard to a nuisance, and found very little cause for complaint.

(Signed), JOHN W. ACKERMAN,
Secretary.

HARRINGTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Charles L. Du Bois, Palisade; Richard B. Harring, Tappan; Isaac Kipp, Closter; C. N. Durie, Assessor, Closter. L. B. Parcell, Closter, Health Inspector.

HOHOKUS TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William Murray, Assessor, Ramseys; William Thurston, Ramseys; Lewis H. May, Inspector, Ramseys; John Ackerman, Ramseys; C. P. De Yoe, Ramseys.

Our Board has not been called upon for any action during the past year. Report the same as last year.

(Signed), C. P. DE YOE,
Physician.

LODI.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Burke, Chairman, Lodi; Alfred Kruger, Carlstadt; Henry Stromeyer, Little Ferry. Dr. Tygert, Health Inspector, Carlstadt; John Van Bussum, Secretary, Hasbrouck Heights.

Every effort has been made to watch over the health of the people of the township. No disease prevalent among animals. Six schoolhouses in the township in good condition. Public health laws and regulations are altogether under the Township Board of Health. The Board supervises contagious diseases, and vaccination is generally practiced. Good water is obtained from wells and cisterns. There is no system of drainage but natural. Malaria is not frequent. There have been no prevalent diseases this year.

(Signed), JOHN VAN BUSSUM,
Secretary.

MIDLAND TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

James Taplin, Maywood, Chairman; A. J. Bogert, Riveredge; C. T. Zabriskie, Ridgewood; Nicholas Hopper, Assessor, Ridgewood.

We have no change to make from our report of last year.

ORVIL TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Bernard O. Blenis, Saddle River; G. B. Smith, Waldurck; O. M. Jennings, Saddle River. Charles W. Badeau, M.D., Health Inspector.

HACKENSACK.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. S. C. Wells, President, Hackensack; C. E. Eckerson, Treasurer; D. G. Jeffers, Secretary, Hackensack; B. B. Barkman, Hackensack; J. A. Romine, Hackensack; Dr. C. F. Adams, Hackensack; Dr. C. H. White, Hackensack. M. W. Heath, Hackensack, Health Inspector.

In regard to water, the report is the same as that of last year. The Hackensack creek runs along the west side of the village and empties into the river. This small creek is used near its outlet as an open sewer, and the question of abating this nuisance has received the attention of the Board for several years past. Our suit against the Bergen County Board of Freeholders, to compel them to discontinue using the creek for this purpose, was decided against us; our appeal from this decision will be argued shortly before the Court of Appeals. The tenement-houses, occupied principally by Italians, many of whom are employed in the silk mill, have been carefully watched by our Inspector during the past year to correct unhealthful practices. The sewers are generally used in houses contiguous to them. Cesspools are required by our ordinances to be laid up with brick and cement, and to be water-tight. We are considering the advisability of adopting an ordinance regulating the business of cleaning cesspools and privy-vaults by licensed scavengers, in accordance with the laws of 1889. There is one small slaughter-house, which is regularly inspected. Our schools are excellently managed. The Hackensack Hospital is doing a good service.

(Signed), D. G. JEFFERS,
Secretary.

PALISADE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Alfred Jarvis, Tenafly; John H. Anderson, Schraalenburgh; C. J. Westervelt, Schraalenburgh; John H. Huyler, Tenafly.

RIDGEFIELD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joseph Schlosser, Jr., Fort Lee; John C. Abbott, Fort Lee, Treasurer; John H. Mannix, Fort Lee, Secretary; John S. Edsall, Leonia; Alexander Clendenin, M.D., Fort Lee, Inspector.

The conditions as to health have been substantially the same as last year. It has been unusually healthy. No contagious diseases, with the exception of a few cases of diphtheria; no fatal results, and quickly suppressed.

(Signed), JOHN H. MANNIX,
Secretary.

RIDGEWOOD.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. A. Marinus, Ridgewood; M. T. Richardson, Treasurer, Ridgewood; Edward Ackerson, Ridgewood; Thomas Terhune, Assessor, Ridgewood.

We are pleased to report that the past year has been remarkably free from epidemics of any kind, and the health of the township has been exceptionally good.

(Signed), JOHN TERHUNE,
Secretary.

SADDLE RIVER TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Henry A. Hopper, Fair Lawn; Peter Alyea, Dundee Lake; Albert Conklin, Garfield; Isaac A. Hopper, Fair Lawn.

UNION TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

V. E. Downer, President, Lyndhurst; D J. Brown, Lyndhurst; John T. Kehoe, Lyndhurst; Dr. Treatwein, Health Inspector, Lyndhurst; A. H. Davison, Secretary, Kingsland.

During the past year there have been several complaints made to the Board of Health, but upon notice to owners the nuisances were abated. There have been no local epidemics of any kind, but few contagious diseases, and very little malaria.

(Signed), ALEX. DAVISON,
Secretary.

WASHINGTON.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William Ackerman, Park Ridge; Garret Herring, Hillsdale; John O. Humphrey Westwood; John H. Wortendyke, Paskack, Assessor.

The health of the township has been good during the past year, and free from epidemic.

BURLINGTON COUNTY.

BASS RIVER.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John W. Harris, H. E. French, Charles H. Cramer, M. W. Adams. Dr. C. Garabrandt, Health Inspector.

Water is obtained from driven and dug wells, ranging from ten to twenty feet in depth. Care is always exercised when we have in our midst contagious diseases. Those dying from such diseases are buried from the house in which they died, and the public warned, &c. The matter of vaccination is neglected, except when we hear of small-pox being somewhere within the radius of twenty miles.

BEVERLY CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

A. W. Taylor, Beverly, President; F. B. Soby, Beverly, Secretary; C. F. Richardson, Beverly, Inspector; J. A. Payne, Beverly; Hugh Ely, Beverly; Joseph Simons, Beverly; J. Currie, Beverly.

The drainage is of the surface, with some agitation of the sewerage question. Houses are mostly frame and are generally occupied by the owners; grounds are well kept. Farmers collect kitchen refuse and carry it to the outskirts of the city. The city laws forbid the keeping of swine within its limits. No slaughtering done in the city limits. Health laws are generally lived up to; the Board of Health inspecting and enforcing all requisites to the sanitary condition of the city. No contagious disease or epidemic.

(Signed), DR. B. F. SOBY,
Secretary.

BORDENTOWN.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. B. Woodward, President, Bordentown; Clinton Mendenhall, Vice President, Bordentown; William H. Shipps, Secretary, Bordentown; William McFarland, Treasurer, Bordentown; Hugh Newell, Bordentown; Frederick G. Wiese, Bordentown; Dr. J. B. Young, Bordentown. H. N. Jobes, Health Inspector, Bordentown.

BURLINGTON CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Robert W. Waln, President, Burlington; J. H. Lukens, Burlington; Edward S. Lansing, M.D., Burlington; William H. Kimball, Burlington; Shippen Wallace, Secretary, Burlington. Charles Stowell, Health Inspector.

The water-supply is taken from the Delaware river, and is quite pure, from a chemical standpoint. This is confirmed by the fact that we are troubled with but little enteric disease. We fear, however, that when the sewerage of Trenton is completed we may not be so free. We have no unusual amount of sickness. There have been several cases of scarlet fever and diphtheria, but no epidemic. When this Board was originally appointed, we found a large number of swine within the city limits. By moving slowly we have succeeded in driving them out, and those who used to criticise the action of the Board severely, do not hesitate now in approving its action. There is no doubt but that the sanitary condition of the city has been improved by the action of the Board, and while there has been no particular diminution in the death-rate there has been a marked improvement in cleanliness. In other respects our report is similar to that of former years.

(Signed), SHIPPEN WALLACE,
Secretary.

CHESTER TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. Joseph Stokes, Moorestown; Joseph Sullivan, Moorestown; George Brock, Moorestown; Edward Perkins, Moorestown; James W. McCrea, Maple Shade.

There has been but one complaint during the year, and that in reference to the Moorestown Canning Factory. The Board of Health has carefully looked after it.

CHESTERFIELD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John F. Rogers, Crosswicks; George H. Warner, Chesterfield; T. W. Ridgeway, Chesterfield; Charles B. Halloway, Chesterfield.

Water-supply is from wells entirely and is pure. There have been no prevalent diseases.

(Signed), JOHN F. ROGERS,
Chairman.

CINNAMINSON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William R. Lippincott, Cinnaminson; Edward G. Ogden, Riverton; Isaac Evaul, Palmyra; Timothy Morton, Parry. J. B. Janney, Cinnaminson, Health Inspector.

There is a water company's system at Riverton and Palmyra, with an extension to the village of Cinnaminson. The water of the system is excellent, soft and pure, coming from a large spring near Riverton. The water is never discolored, and has no iron or other taste. The well-water of the township is good. There is no system of drainage, except surface, in the township. Malarial fevers have not prevailed to much extent during the present autumn. In Riverton and Palmyra many of the cesspools are cemented complete, and are emptied by carting the contents to land needing to be fertilized. Many more are holes dug in the earth, open at the bottom and sides, and are highly objectionable and under the protest of the Health Inspector. I have directed that all such should cease to exist. Water-tight boxes are used for water-closet reservoirs, which can be drawn out and thoroughly cleansed. We require this to be done every three months, and also require the deodorization twice a week. I know of no prevalent diseases. We have had a year of health and prosperity in our township. The public health laws and regulations are reasonably well observed by the inhabitants of the township, and people are coming to appreciate their value. There have been no contagious diseases, excepting a few cases of measles, during the year, and these of a mild character. All children are required to be vaccinated who attend school. The Board of Health of this township organized early last spring. It then ordered a notice printed to the inhabitants requiring compliance with certain sanitary regulations. We believe that such notice did much good, the people showing a decided disposition to respect the wishes of the Board as therein expressed. The Health Inspector has made numerous visits of inspection to scenes of irregularity and conferred frequently with other members of the Board, and much useful work has been done. We mean to be alive to the establishment of the best possible sanitary conditions in our township.

(Signed), J. D. JANNEY, M.D.,
Health Inspector.

DELRAN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Volz, Riverside; Henry Erech, Riverside; G. E. Conrow, Moorestown.

EASTAMPTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George W. Frazier, Smithville; Isaac Uncles, Smithville; Joseph Parker, Mt. Holly; George W. Craig, Smithville.

The township is in a more healthy condition than during the two former years.

EVESHAM TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Richard H. Leeds, Marlton; David T. Ballinger, Marlton; John T. Mitchell, Evesborough; P. V. B. Stroud, M.D., Marlton; William L. Brown, Marlton.

Nothing new to report. The Physician reports the health of the township as good. No prevalent diseases. The Assessor has not heard of any contagious disease among animals. There are two slaughter-houses in Marlton, but there has been no complaint of their being a nuisance, as they are kept in good order.

FLORENCE.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Kale, Florence; John Peacock, Florence; Robert Cottom, Florence; Joseph West, Florence; Charles A. Baker, M.D., Florence.

Repeated efforts have been made by our Board to have the water-closets in Foundry Town cemented, and the contents removed at stated intervals, but thus far we have been unsuccessful. Already some wells have thus been contaminated, and many meetings have been held concerning this, and a committee appointed to notify the owners. Promises have been made to remedy the nuisance, but unless done soon the Board propose to do it themselves according to the law. Malarial troubles prevailed here during the spring and fall. This fall there have been a few severe cases. Typical typhoid fever is almost unknown here.

(Signed), CHARLES A. BAKER, M.D.

LITTLE EGG HARBOR TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

There is nothing new to report this year. We have had no epidemic disease.

(Signed), F. T. PRICE,
Secretary of the Board.

MANSFIELD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Benjamin Warren, Bordentown; William A. Townsend, Columbus; David Sharp, Columbus; E. A. Ingling, Columbus; D. G. Van Marter, M.D., Columbus.

There have been no prevalent diseases during the past year, since the epidemic of La Grippe last winter. Summer diseases of children have not existed in any degree. There have been quite a number of cases of typhoid and typhoid-malarial fever this fall, not traceable to any local cause. The Board has ordered two or three places cleaned, where the refuse was not removed, and had it remedied.

MEDFORD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

E. H. Kirkbride, Medford; H. L Garwood, Medford; J. Reeve, M.D., Medford; Charles H. Kirby, Medford.

There is nothing new to report for the past year.

(Signed), J. REEVE,
Health Inspector.

NEW HANOVER TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Thomas Platt, Wrightstown; L. D. Woodward, Cookstown; William Poinsett, Jacobstown; Benjamin Remine, Secretary, Wrightstown.

The general health of the inhabitants has been good, and our locality has been free from epidemic.

NORTHAMPTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William P. Melcher, M.D., Mt. Holly; Joseph C. Kingdom, Mt. Holly; John B. Longstreet, Mt. Holly; George H. Branson, Inspector, Mt. Holly; Samuel A. Atkinson, Mt. Holly.

The Board has met frequently and ordered all nuisances abated which were reported by the Inspector. The condition and health of the town have been very good, and are at present. There is nothing further to report.

(Signed), GEORGE H. BRANSON,
Inspector.

PEMBERTON.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joseph L. Budd, Pemberton; A. H. Fort, Pemberton; J. M. Smith, Brown's Mills; William K. Budd, Pemberton, Assessor.

RANDOLPH TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. V. Cavileer, Lower Bank; C. C. Adams, Lower Bank; James A. Gale, Wading River; William Johnson, Lower Bank.

SOUTHAMPTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

C. H. Haines, John W. Haines, Charles L. Rogers, J. C. Brown, M.D.; Charles G. Naylor, Assessor, Vincetown, N. J.

The Board has not been called upon this year.

(Signed), CHARLES G. NAYLOR,
Assessor.

SPRINGFIELD.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

David Stockton, Jobstown; Samuel E. Monroe, Jobstown; Isaac King, Jacksonville; Dr. Van Marter, Columbus; B. W. Hampton, Jobstown.

WASHINGTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

G. Voss, Green Bank; G. Wright, Batsto; F. Miner, Green Bank; W. E. Koster, Green Bank, Assessor.

WESTHAMPTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

C. F. Newline, Mt. Holly; Japhet Dean, Mt. Holly; S. Haines, Rancocas; Dr. Martin, Rancocas.

WILLINGBORO TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Alexander Thompson, Rancocas; Oliver Parry, Beverly; Samuel Stokes, Beverly; J. M. Stokes, Rancocas.

WOODLAND.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John A. Bozarth, Vincentown; John S. Haines, Woodmansie; Samuel Lee, Shamong.

CAMDEN COUNTY.

CAMDEN CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George F. Hammon, President, 20 South Third street; Herman W. Miller, Eighth and Mt. Vernon streets; Thad. P. Verney, City Hall; John W. Donges, M.D., 1801 Broadway; Charles Watson, 432 Federal street; George R. Fortner, 517 Cooper street; Frank B. Delaplaine, 1011 Locust street. Eugene B. Roberts, Health Inspector.

Water-supply from the Delaware river (see former reports). All persons are required to connect with public sewers when one passes through the street upon which they reside. Cellars near the river front are either damp or have water in them. There have been no diseases among animals with the exception of one case of glanders in a horse, which was immediately killed upon order of the Board. Slaughter-houses are inspected at frequent intervals and are now in very good condition. The city has two well-managed hospitals and also a dispensary, which is of great service. Typhoid fever, scarlet fever and diphtheria have been the most prevalent diseases of the year.

(Signed), EUGENE B. ROBERTS,
Health Inspector.

CENTRE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Ezra C. Bell, Mt. Ephraim; Joseph M. Haines, Mt. Ephraim; David A. Shreve, Haddonfield; J. H. Jackson, Magnolia. William B. Jennings, Haddonfield, Health Inspector.

The health of the township has not been as good generally as it was last year, owing to the prevalence of La Grippe, measles and cholera infantum. The Board of Health's attention was called to two cases of glanders, which were promptly quarantined.

(Signed), J. H. JACKSON,
Secretary.

DELAWARE.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John H. Meridith, Haddonfield; Joseph G. Evans, Haddonfield; William Graff, Ellisburg, Assessor; William T. Lippincott, Moorestown. William B. Jennings, M.D., Haddonfield, Health Inspector.

The drinking-water is supplied principally from wells and a few springs, and the supply is pure and wholesome. The majority of the inhabitants during the epidemic of influenza suffered from the disease, and two cases proved fatal. Measles were prevalent during the fall and early winter. A code for the preservation of health was adopted October 18th, 1887.

GLOUCESTER CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. J. A. Walmsley, H. M. Harley, Dr. D. W. Blake, E. J. Steer, Patrick Mealey, William A. Ginz; D. F. Lane, Secretary. Dr. John K. Bennett, Inspector.

City Council have had four wells driven at a depth of sixty-five feet around the banks of the reservoir at pumping station. The water from said wells has been submitted, together with the water of the regular water-supply, to Dr. Leffman, of Philadelphia, for examination, with the intention of ascertaining whether a supply can be obtained from the driven wells which will be pure and abundant. Since the last report some $20,000 have been expended on sewers and inlets, which have so far given entire satisfaction. The improved drainage seems to have lessened in a marked degree the malaria in the city. (Signed), DANIEL F. LANE,

Secretary.

GLOUCESTER TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George Brewer, Blackwood; J. B. Sickler, Chew's Landing; Charles Jenkins, Lindenwold; Joseph Hurff, M.D., Blackwood; Joseph S. Stewart, Chew's Landing.

The general health of the township has been good the past year. We have had no contagious disease.

HADDON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Stoy, Westmont; R. T. Collings, Collingswood; Samuel Wood, Haddonfield; George T. Haines, Haddonfield. Dr. William B. Jennings, Haddonfield, Health Inspector.

STOCKTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George W. Molineaux, Cramer Hill; Charles Pedigree, Fish House; W. Mercer, Pensaukin; H. K. Leddinger, Cramer Hill; J. A. George, M.D., North Cramer Hill.

WATERFORD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

B. W. Bennett, Berlin; William Haines, Milford; Jacob Bates, Berlin; W. D. Walton, Gibbsboro; W. Norcross, Berlin.

WINSLOW TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

H. M. Jewett, Winslow; Elias Russell, Sicklerville; Charles Albright, Elm; William G. Burdsall, Wilton P. O.

CAPE MAY COUNTY.

CAPE MAY CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

E. H. Phillips, M.D., W. F. Cassidy, Charles Foster, W. Essen, Joseph Hand. George Young, Health Inspector.

The water-supply comes from wells about half a mile north of the city. It is always clear and pure the year round. Sewers are generally used. Cesspools are being done away with. There have been no prevailing diseases during the year, except La Grippe.

(Signed), W. F. CASSIDY,
Secretary.

DENNIS TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John F. Goff, East Creek; Edmund W. James, Dennisville; Remington Corson, South Seaville; Morris Warwick, Dennisville. Eugene Way, M.D., Dennisville, Health Inspector.

LOWER TOWNSHIP

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Stephen W. Weeks, Cold Spring; William L. Cummings, Fishing Creek; William C. Town, Cold Spring; William C. Rutherford, Cold Spring.

MIDDLE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Samuel E. Douglas, Cape May Court House; Townsend W. Garretson, Cape May Court House; Howard C. Buck, Rio Grande; Isaac M. Downs, M.D., Cape May Court House; S. H. Townsend, Burleigh.

The health of the people of the township for the past year has been exceedingly good. We have had no deaths from any contagious disease. There have been a few cases of typhoid fever, the direct cause being drinking water from unclean wells. No deaths have occurred, however. The members of the Board are on the lookout to see that all dead animals are promptly removed and all nuisances abated.

(Signed), S. H. TOWNSEND,
Secretary.

OCEAN CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. S. Wagner, M.D., George S. Ware, Peter Murdock, Sr., Jacob Stellman, Samuel Schurch.

The sanitary condition of Ocean City has been very satisfactory.

UPPER TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

B. E. Smith, Tuckahoe; Griffin Corson, Petersburgh; S. Corson, Seaville; R. S. Robinson, Tuckahoe; Randolph Marshall, M.D., Tuckahoe.

CUMBERLAND COUNTY.

BRIDGETON CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

M. W. Applegate, J. R. Elwell, S. W. Wells, J. R. C. Thompson, M.D., James H. Powell, P. K. Reeves, W. H. McGear.

The water-supply is obtained from the mill-pond. No system of drainage or sewerage. Streets are well laid out, but not kept in good condition. We have a system of garbage collection adopted by the Board of Health, which issues license to the garbage collectors and night scavengers. There are no diseases prevailing in the city. The public health is fair. The law and regulations adopted by the Board are beginning to be advantageously felt. The physicians are requested to report and isolate all cases of contagious disease. The Board has been the means of awakening the city authority in regard to adopting a system of sewerage, and we think that the sanitary condition of the city has improved. The water-works are owned by the city. About two-thirds of the houses are supplied therefrom, and during heavy rains it is very much discolored. The drainage from the streets in the north of the city empties into the pond. Also the drainage from a canning factory. The Board is endeavoring to secure a change in the character of the water-supply. The slaughter-houses in the city are carefully looked after by the Inspector.

(Signed), S. W. WELLS,
Secretary.

COMMERCIAL TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Seth Bowen, Mauricetown; Henry C. Mayhew, Mauricetown; E. J. Cook, Port Norris; George E. Butcher, Mauricetown.

DEERFIELD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Elijah R. Parven, Deerfield; Phineas Hires, Deerfield; Joseph Golder, Deerfield; Henry M. Dare, Rosenhayn; Charles C. Phillips, M.D., Deerfield.

Our water-supply is principally from wells. We have one slaughter-house in our midst, but manage to use such precautions as to prevent it from bringing disease or causing unpleasantness. Taking all things into consideration the township has been as healthy as in any previous year, and the Local Board of Health will do all they can to keep it in such a condition.

DOWNE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Edward D. Fleetwood, Dividing Creek; T. Husted, Newport; Reuben H. Leaming, Newport; Dr. A. P. Glanden, Newport; Sheppard Campbell, Newport; Charles E. Gaskill, Newport.

FAIRFIELD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

E. O. Davis, Fairton; Mark Westcott, Fairton; J. H. Elmer, Fairton; Harry Bainford, Fairton.

Fairfield township lies west of Lawrence, south of Bridgeton and east of the Cohansey river, with a population of about 1,200. The soil is spongy and porous. The surface is quite level, sloping gradually toward the river. The land is sufficiently high to secure dry cellars. The water-supply is entirely from wells. Drainage is natural. No destructive diseases of animals have been reported, except in two or three cases with hogs. Diseases of almost every description have visited the township during the year. There have been about a dozen cases of scarlet fever. Refuse and excreta of all kinds are removed according to proper methods. Near by is an extensive beef-packing establishment and a slaughter-house in connection therewith, but all are kept in first-class condition, and nothing unfavorable can be reported as to them.

GREENWICH TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Samuel R. Mills, Greenwich; William P. Test, Greenwich; Samuel M. Watson, Greenwich; John N. Glaspell, Greenwich.

The general health of the township has been good.

LANDIS TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Judson L. Beck, M.D., Vineland; William W. Whiting, Vineland; James Chance, Vineland; Samuel Woolford, Newfield; George Davidson, Vineland.

The health in the township has been good. The Board has given special attention to slaughter-houses during the year.

LAWRENCE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Henry S. Garrison, Cedarville; H. O. Newcomb, Cedarville; L. D. Paynter, Cedarville; Charles G. Foster, Cedarville. Ephraim Bateman, M.D., Health Inspector.

Considerable attention is paid to ventilation, and we are fast learning that health and comfort are the result of letting impure air out and fresh air in. There has been considerable sickness during the past year. Early in the year we had our proportion of La Grippe. The disease was general, but we were fortunate in having but one death that was directly traceable to this malady. We have had no typhoid fever or diphtheria. During the month of June and early in July we had a number of dysenteric cases, scattered promiscuously, but yielding readily to treatment. There were fewer cases of summer troubles among children than is usual. During the late summer and early fall rheumatic affections have prevailed. There seems to be a growing tendency to this form of disease.

(Signed), EPHRAIM BATEMAN, M.D.,
Secretary.

MAURICE RIVER.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Henry H. Spruce, Heislerville; Samuel Russell, Leesburg; J. W. Vanaman, Port Elizabeth.

MILLVILLE.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Edwin Conover, T. C. Wheaton, Richard Radcliffe, Samuel Misskelley, Silas C. Smith, L. H. Hogate.

During the year no epidemics have appeared within our borders, and the Local Board of Health think the city in a cleanly condition at this date—even more so than at the same time last year. During the year nearly 1,000 feet of six-inch sewer has been laid, giving accommodations to public and private houses. In the main, our drainage is surface-drainage, which is not what we need, but, under the circumstances, is all we can get. The Board of Health has been unusually active during the year, and has taken every precaution to prevent the accumulation of filth or offensive matter in the city. It is now engaged in the cleaning of a private alley, which is in a frightful condition, the owner of which, so far, refuses to clean it. The

Board proposes to make a test case of the matter, and insist upon a proper regard for the health and comfort of the citizens. It has also notified the owner of a slaughter-house in the heart of the city to have the same removed by May 1st, and we propose to make a test case of that also, as we have an ordinance governing such matters. The Board of Health feels fairly satisfied with its year's work, but does not propose to allow its ardor to cool during the coming winter.

(Signed), L. H. HOGATE,
Secretary.

STOE CREEK TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Charles B. Bowen, Shiloh; Edward H. Sheppard, Roadstown; David Ogden, Greenwich; Joseph Tomlinson, Roadstown; Ephraim Mulford, Roadstown.

ESSEX COUNTY.

BELLEVILLE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John F. Wisschusen, Belleville; Richard Scaine, Belleville; Martin Malague, Belleville; Patrick McCoy, Belleville; William Connelly, Belleville; D. M. Skinner, M.D., Belleville. James Dieghan, Belleville, Health Inspector.

There is nothing to add to former reports. No prevalent diseases during the year.

(Signed), D. M. SKINNER.

BLOOMFIELD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR

Theodore H. Ward, Bloomfield; Lewis Cockefeier, Bloomfield; A. Van Gieson, Brookdale; C. L. Seibert, Bloomfield; S. P. Gilbert, Bloomfield; E. A. Raner, Bloomfield; Charles H. Halfpenny, Bloomfield; Samuel H. Baxter, Secretary, Bloomfield; Dr. E. M. Ward, Bloomfield. William B. Corby, Bloomfield, Health Inspector.

With the exception of the all-prevailing La Grippe of last winter, the township has enjoyed unusual freedom from sickness.

CALDWELL.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Stephen Van Order, Caldwell; George C. Burnett, Caldwell; Wm. Condit, Verona; M. Jenkins, Cedar Grove; Samuel Dye, Fairfield; G. M. Canfield, Caldwell.

CLINTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Jacob M. Fisher, Waverly Park; W. H. Goldsmith, Lyons Farms; Lewis E. Voorhees, Irvington; William F. Keegan, Manhattan Park; David G. Knight, Irvington; Abram Voorhees, Irvington; M. O. Christian, M.D., Irvington.

A few minor nuisances have been abated, and the general health has been above the average.

EAST ORANGE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

G. E. P. Howard, President; William Condit, Assessor; Dr. T. R. Chambers, Richard Coyne, A. H. Ryan, T. A. Nott, D. Wilson, H. E. Jepson, D. S. Rice, A. Hibbins, W. C. Schmidt. Henry Blaurock, Health Inspector. P. O. of all, East Orange.

A large pipe-drainage system has been placed in one of the valleys of the town, and another section, where wet cellars are the rule, will, sooner or later, be likewise drained. What were swamps have been filled with fresh earth. This territory is the region which cries out for drainage, but is unfortunately situated so low that the question is a difficult one. Since the northerly part was drained and the mill-dams removed, malaria, which was found in very house, has disappeared, and the now healthy place is being built up. Our sewer system continues to give the highest satisfaction, and there are now about 1,100 connections. Twenty-five cases of diphtheria have been reported since our last report, and the same number of scarlet fever. The Board of Health, in several instances, has caused changes in the plumbing, but to ascertain the origin of this disease baffles us.

(Signed), T. R. CHAMBERS, M.D.,
Secretary.

FRANKLIN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. G. B. Philhower, Amzi Coeyman, R. W. Booth, J. Freeman, J. Searles, H. Hockstrasser, Joseph Foster. P. O. address of all, Nutley.

LIVINGSTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

David Flynn, Livingston; Lambert Smith, Livingston; William Deycks, Livingston; P. S. Meeker, Roseland; B. W. Dickerson, Chatham. George E. De Camp, Roseland, Assessor.

The health of the township has been generally good. There has been less malarial fever this year than for the past few years, as the lowlands have not been under water the past summer as often as the two years previous.

(Signed), GEORGE E. DE CAMP,
Assessor.

MILLBURN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. H. Smith, Millburn, Secretary; Isaiah Williams, Millburn, Assessor.

At present we have under consideration, and hope soon to accomplish, the more thorough drainage of our township.

MONTCLAIR.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. H. Wilson, Isaac Denby, George Inness, Jr., Warren S. Taylor, Morgan W. Ayres, M.D., James S. Brown, M.D.; Robert B. Harris, Secretary. R. P. Francis, M.D., Health Inspector. P. O. address of all, Montclair.

During the past fiscal year nothing has occurred worthy of publication. There has been no epidemic of any kind, and the general health of the town has been excellent.

(Signed), RICHARD P. FRANCIS, M.D.,
Inspector.

NEWARK.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Hon. Joseph E. Haines, President; Alexander H. Johnson, Tyler Parmly, Henry R. Baker, Dr. F. B. Mandeville, Dr. C. M. Zeh, Dr. H. C. Herold, D. S. Sargent, William B. Guild. P. O. address of all, Newark.

The work of building storage reservoirs for the new water-supply and the laying of pipes is progressing rapidly, and there is no doubt but that the new water-supply will be ready for use sometime in the year 1892. During the past few months numerous ordinances have been passed by our Common Council for the paving of our dirt streets, and the work on a large number will start shortly. Oblong granite blocks and sheet asphalt will be chiefly used. During the past year our market, the Center Market, as it is called, has been remodeled. The old buildings have been torn away and a new and elegant structure erected. In addition to this, we have a large market-place adjoining for the use of hucksters. Altogether, it is a credit to our city. The Freeholders are now erecting a new wing to the county jail; this has long been needed, our old institution being a very poor affair. After the new wing is done I believe it is their intention to remodel the interior of the old building. We now have our plumbing code in force, and at the next meeting of the Board it is the intention to appoint a Plumbing Inspector, so that by January 1st, 1891, it will be in full working order. During the past year the Board took into consideration the advisability of placarding houses in cases of contagious disease, and decided to enforce the same in all cases of small-pox, diphtheria, scarlet fever and membraneous croup. Regarding cases of the above-named diseases, while we still have them all with us, with the exception of small-pox, they are very much less in number than they were at the time of my last report.

(Signed), DAVID L. WALLACE, M.D.,
Health Inspector.

ORANGE CITY.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Henry H. Truman, Augustus Eichhorn, John T. Platt, Francis Tetreault, M.D., Stephen Collins. Charles Buttner, M.D, Health Inspector and Secretary. P. O. address of all, Orange.

There is as yet no artificial system of drainage or sewerage in our city, but everything is ready as soon as three-fifths of the property-holders will have petitioned the Common Council to construct the works. There have been no diseases of animals in our city for the last few years, of a contagious character. The Board does not as yet keep a record of horses and other animals, but intends to do so shortly. The city is supplied with one hospital and two dispensaries. These institutions are all well managed. We are at present considering the erection of a crematory for the proper disposal of refuse from vaults and cesspools. We have this year adopted a supplement to the sanitary code, ordering the placarding of houses where contagious diseases exist, keeping children from school while there may be any danger, and the fumigation of every house infected. All this to be under the direction and supervision of the Health Inspector. The past wet summer, coupled with our filth-saturated soil, has caused an epidemic of diphtheria, some twenty-five cases of which were fatal. We closed the schools in the affected district, fumigated the school-houses, and have the epidemic now well under control.

(Signed), CHARLES BUTTNER,
Health Inspector.

SOUTH ORANGE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Alexander Mellville, South Orange; Hugh Conlon, South Orange; Charles H. Beach, South Orange; J. G. Aschenbach, Manhattan Park; Michael McEntee, Vailsburg; Thomas C. Baker, Secretary, Maplewood. Dr. A. A. Ransom, Health Inspector.

Very few complaints have been received, and these were looked after immediately.

(Signed), T. C. BAKER,
Secretary.

WEST ORANGE TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. C. Van Wagner, West Orange; Frederick Cummings, Orange Valley; Frederick W. Shrump, Pleasantdale; Anthony Klyng, West Orange; James Pierce, West Orange; Dr. James M. Maghee, West Orange; Levi Van Buskirk, Assessor, Orange Valley. Ellis M. Brady, Health Inspector, West Orange.

There is nothing of importance to report this year. No unusual amount of sickness.

GLOUCESTER COUNTY.

CLAYTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

W. A. Williamson, Clayton; S. C. Newkirk, Clayton; Thomas McClure, Unionville; Samuel S. Fisler, M.D., Clayton; A. D. Silver, Clayton.

CLAYTON BOROUGH.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

D. Wilson Moore, Chairman; George M. Thomson, Secretary; H. G. Buckingham, M.D., Inspector; R. M. Warner and George W. Page. P. O. address of all, Clayton.

The health of Clayton Borough has been unusually good during the past year. The supply of water is from wells. The Board of Health has looked sharply after hog-pens and stables, and compelled refuse and drains to be put as far away as possible from wells.

(Signed), H. G. BUCKINGHAM,
Inspector.

DEPTFORD TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Charles L. Pierson, Woodbury; E. P. Stewart, Westville; Joseph Noblit, Wenonah; William C. Cattell, Wenonah, Assessor.

FRANKLIN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Samuel Lowder, Newfield; Wm. Tyler, Newfield; Chas. D. Smith, Franklinville; A. A. Smith, M.D., Malaga; Joshua C. Richman, Malaga.

GLASSBORO TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William H. Beckett, Thomas C. Allen, Benjamin M. Fennill, Samuel S. Parks. P. O. address of all, Glassboro.

I am happy to state that the health of this township is generally good. Unfortunately our Township Committee failed to organize as a Board of Health during the past year, as they were unwilling to appropriate $50 to pay for an Inspector, so there is no one to look after the health of the town.

(Signed,) SAMUEL S. PARKS,
Assessor.

GREENWICH TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joseph L. Devault, R. A. Gester, H. W. Miller, Jacob Ballinger. P. O. address of all, Paulsboro.

HARRISON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

A. S. Clark, Ewan's Mills; J. G. Foster, Jefferson; Eli Heritage, Richwood; Christopher Knisell, Mullica Hill; E. E. De Groff, M.D., Secretary, Mullica Hill.

Our water-supply is principally from wells, and is soft and pure. Our houses are in good sanitary condition, and there are no tenement-houses. The only disease that we have learned of among animals is hog cholera, some farmers losing their entire herd. The slaughter-house in our town is always kept in a very cleanly condition. There have been no epidemics in this township this year, with the exception of La Grippe during the winter. We have requested the Board to pass a health ordinance, but they refuse to take any action in the matter. The Board, however, has regular meetings twice a year.

(Signed), E. E. DE GROFF, M.D.,
Secretary.

LOGAN TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Kirby, President, Bridgeport; J. Clark Helms, Secretary, Repaupo; Hance Helms, Bridgeport; Joseph Beckett, Bridgeport. E. T. Oliphant, M.D., Bridgeport, Health Inspector.

Our water-supply is entirely from wells, varying from fourteen to twenty-five feet in depth. Cistern-water used for washing purposes only. There have been no prevalent diseases during the year.

(Signed), DR. E. T. OLIPHANT,
Inspector.

MANTUA TOWNSHIP.

ST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Charles H. Ferris, Pitman Grove; John H. Sharp, Barnsboro; Franklin Denn, Mantua; J. Mason Tomlin, Barnsboro. E. Z. Hillegass, M.D., Mantua, Health Inspector.

Our supply of water is derived chiefly from wells. No discoloration of the water; tasteless, hard and satisfactory throughout the year. We have no sewers. Our cesspools are built with open bottoms, and are emptied in winter and contents used for fertilizing purposes. No known or prevalent disease existing. We have one slaughter-house situated in the center of our town (Mantua), which is inspected, but is without a doubt the greatest nuisance existing in our township, and should be moved out of the town limits by all means. The public health laws and regulations are in proper shape. The law in reference to vital statistics is strictly enforced.

(Signed), E. Z. HILLEGASS,
Health Inspector.

MONROE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. B. Sickler, H. K. Bugbee, D. S. Champion, J. Gaunt Edwards, M.D., John W. McClure. P. O. address of all, Williamstown.

The Board adopted the code of laws, with a few exceptions, as recommended by the State Board of Health. The necessary visitations were made by the Local Board, and all complaints brought to their notice duly investigated at once. No epidemics of any kind have prevailed. Since the Board took measures for the more perfect drainage of the property formerly known as the Ricker property, no complaint has been made by any person living in that vicinity, and the drainage has been successful. The natural drainage of one portion of the town is obstructed by the Williamstown and Delaware River railroad crossing the water-course.

(Signed), JOHN W. McCLURE.

SOUTH HARRISON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George Horner, Alfred Lippincott, Joseph Cheesman. P. O. address of all, Harrisonville.

There has been no need for any action upon the part of the Board.

WASHINGTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Thomas W. Hurff, Hurffville; Evan Davis, Hurffville; Frank Allen, Hurffville; Dr. C. B. Phillips, Hurffville; Charles Nicholson, Turnerville.

The health of our township is reasonably good. As for drainage, it is by natural methods. One or two complaints have been made to the Board, but a notice to the proper parties has had the desired result.

(Signed), C. B. PHILLIPS, M.D.

WEST DEPTFORD TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joseph A. Mcore, Woodbury; John C. Budd, Woodbury; Dr. H. A. Wilson, Woodbury, Inspector; Mark Clement, Woodbury; A. P. Ramdo, Thoroughfare.

There is very little to report. There are two slaughter-houses in our district, one of which has caused complaint, but the owner has promised to abate the nuisance.

WOODBURY CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Thomas P. Smith, President; William M. Carter, Secretary; George K. Carroll, Treasurer; Charles Walton, John C. Tatum. Wallace McGeorge, M D., Health Inspector. P. O. address of all, Woodbury.

Beyond investigating complaints and abating nuisances, the Board has devoted much attention to the question of sewering, and endeavored to interest council and citizens in this important question. Our President, Mr. Smith, after corresponding with many persons who had experience in such matters, finally laid the correspondence and suggestions he had received before the Board, and urged it to take immediate action. It was decided to invite Col. George E. Waring, Jr., the sanitary expert, to visit Woodbury, and give us his views and suggestions as to the best methods to be employed to secure good drainage and the removal of foul waters and sewage. After a thorough inspection of the city, accompanied by the entire Board, Mr. Waring submitted his views as to the proper method to be pursued. A schedule was then prepared by the Board, and the outlines of a plan of sewerage for the city was recommended to the Common Council. They also submitted Col. Waring's report, and the report of Henry R. Russell, who had made a survey of the city in 1879, and in his written report expressed his views on the system of sewerage. Col. Waring approved the plan of Mr. Russell with some modification, which later experience in this work had proved advisable. The Council, as yet, have taken no active measures in reference to this matter. A copy of the reports that have been made upon the sewerage of the city, has been printed for the information of our taxpayers and citizens.

We have been free from disease in a marked degree. Your Inspector has never known a time when less sickness has existed in our city. Many more persons are using city water than formerly. The water is discolored at times, probably from earth in the pipe; it is soft, but last spring and winter had an earthy taste. Since the reservoirs were cleansed this trouble has disappeared. The Board of Health has ordered all dead ends to be flushed twice a week.

(Signed), WALLACE MCGEORGE, M.D.,
Health Inspector.

WOOLWICH TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Moore, President; Charles P. Batten, Howard V. Locke, Samuel Avis, Secretary. Benjamin F. Buzby, M.D., Health Inspector. P. O. address of all, Swedesboro.

With the exception of La Grippe, which was prevalent here last winter, there have been no epidemics, and it has been unusually healthy. The Board of Health met in the spring and adopted the same code of ordinances as last year. There have been a few complaints of nuisances, which were abated at once upon the responsible parties being notified by the Board.

(Signed), SAMUEL AVIS,
Secretary.

HUDSON COUNTY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Leonard J. Gordon, M.D., President; Charles B. Converse, M.D., C. Holmes McNeil, M.D.; H. W. Winfield, Counsel; C. J. Rooney, Jr., Clerk. P. O. address of all, Jersey City.

There has not been any unusual prevalence of disease during the year ending July 30th, 1890. A large number of complaints have been made to the Board in cases affecting the health or comfort of citizens, and there has been a prompt response by the Board, with most satisfactory results. The filling with garbage and sewer refuse of certain low-lying tracts of Jersey City and Hoboken was stopped in some cases upon mere request; in others, by invoking the aid of Council or Grand Jury. The improvement of the Mill creek district of Jersey City received much attention of the Board at various times. The proper Board was urged to so continue Grand street and other sewers as to relieve the creek of much of the sewage that it now carries. Encroachments of persons along its banks were stopped, thereby insuring a freer flow of its contents. The drainage of School No. 6 was examined by the Sanitary Engineer of the Board, Mr. F. H. Earle. In accordance with his finding, this Board recommended to the Board of Education the drainage of the school, and it was put in good condition. Many complaints were received against the at times powerful stenches coming from the westward, from the Hackensack river section. The matter was taken up by the Board and an inspection made of all the establishments. It was found necessary to make a house-to-house investigation of all the dwellings on a certain line on the west slope of the ridge that runs through the county, in order to find, if possible, a person who would identify the source of the composite odor that at times made life a burden. It was not possible to find a single one out of hundreds of persons who were interrogated who could give such evidence. The rendering establishment of the Messrs. Garret Brothers, in the Hackensack river section, was found, by personal inspection of the whole Board, to be unmistakably a great nuisance. The idea of forcibly removing the plant and buildings was discussed and laid aside, and the owners directed to remove the establishment. Unless this is done, recourse to compulsion of some nature will be had. The vast pile of manure adjoining the tracks of the Pennsylvania Railroad Company at the same place was found by the Board to be a nuisance of a most unmistakable character. Chancery proceedings were begun and carried to a termination without, however, resulting in the removal of the nuisance, the Chancellor holding that suit must be brought by a citizen, in his private capacity as such, alleging personal damage and tracing it to a certain cause. Strange as it may seem, such testimony seems not to be forthcoming. Many complaints of the existence of stagnant water in various portions of Jersey City, Hoboken and North Bergen township have been entertained, and relief afforded by having land raised to proper level and by drains. All the manure dealers whose manure deposits on Jersey avenue from Fourteenth street north made the air malodorous have been induced to seek other and less objectionable localities. By direction of President Gordon, several consignments to Jersey City stock-yards of "lump-jawed" cattle were confiscated and destroyed, and the meat rendered unedible. Suit was threatened by the owners, but not brought. Notice was given to the consignors in the West, and probably no animals thus afflicted will again be sent to this point. Diplomas coming from the New Jersey College of Medicine and Surgery of Jersey City were refused recognition by the Board, on the ground that the college was not organized legally. Suit has been brought by the college to compel such recognition, and is still pending. The practice of scavengers to distribute along certain streets and roadways in Jersey City, Hoboken, North Bergen, &c., the contents of their wagons, has been almost entirely abolished. In one of the schools the odor from the closets in the basement was carried through the hot-air shafts into some of the study-rooms. The Board sent its plumber and succeeded in remedying the cause of the nuisance. An inspection was made of all the city schools, and the defects discovered were reported to the Board of Education, and will no doubt be corrected at an early date. The Board is about to erect a house for contagious diseases other than small-pox, the very pressing need of which has been often felt. Numbers of petitions have been received and attended to. Among others, one asking the Board to certify to the Board of Aldermen the urgent need of a sewer in St. Paul avenue, Jersey City, from Central to Oakland avenue. This was done by the Board and the case is before the Board of Aldermen. In addition to the prominent cases decided above, which come easily to mind, there have been countless inspections of minor matters. Sewers have been made clean, repaired, extended, &c.; suits have been brought and generally won, under the supervision of C. H. Winfield, Esq., counsel, and all of the routine work of the Board has been carried on. Children have been protected at school by the exclusion of those who might carry contagion.

The following cases of contagious diseases, among others, have been reported:

	Membrane Croup.	Diphtheria.	Scarlet Fever.
Jersey City	68	775	361
Hoboken	25	289	98
Bayonne	5	27	64
Harrison	4	11	62

	Membrane Croup.	Diphtheria.	Scarlet Fever.
Town of Union	15	48	7
West Hoboken	9	57	7
Guttenberg	1	11	24
North Bergen	......	12	2
Kearny	1	7	3
Union Township	......	4	3
Weehawken	......	3	......
Total	128	1,244	611

(Signed), C. J. ROONEY, JR., Clerk.

HUNTERDON COUNTY.

ALEXANDRIA TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George W. Weller, Mt. Pleasant; B. L. Alpaugh, Little York; E. H. Opdyke, Everittstown; Joseph P. Stout, Everittstown. M. D. Knight, M.D., Little York, Health Inspector.

The state of health of this township is very good. With the exception of a few cases of the measles and whooping-cough, there have been no prevalent diseases. There are no stagnant ponds in the township.

(Signed), JOSEPH P. STOUT, Assessor.

BETHLEHEM TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

T. T. Hoffman, Bloomsbury; Joseph Mayberry, Junction; Stewart Roenbaugh, Norton; John C. Dalrymple, Pattenburg. J. H. Lindabury, M.D., Health Inspector.

CLINTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Willard E. Berkaw, M D., Annandale; Bergen B. Berkaw, Annandale; John C. Cramer, Annandale; Jacob S. Hulsizer, Annandale; John H. Knox, Lebanon.

Water-supply derived altogether from either wells, cisterns or springs. Drainage and sewerage are nothing, except as the natural position of the land permits. Houses have mostly cellars, and during the winter season are largely used for the storage of vegetables. There are no tenement-houses in the township. Excreta are deposited mostly in cesspools, very few of which have cemented sides. Said cesspools are emptied by removal of contents, or filled with lime and new cesspools made. Slaughter-houses are generally located away from towns, and the Board have received no complaint in reference to them. Diseases during the past year have been only those which prevail usually every year, except a marked prevalence of pneumonia during the spring, and the existence of La Grippe, with which the majority of the people were attacked. The Board organized in the spring of 1890, as required by law, and have been called upon twice during the summer season in regard to complaints against cesspools. These complaints were investigated and remedied as far as possible.

(Signed), BERGEN B. BERKAW,
Secretary.

CLINTON BOROUGH.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

C. Wolverton, J. R. Kline, M. Gerhart, J. W. Garrison, E. Runyon. P. O. address of all, Clinton.

No prevalent diseases have existed during the year. Slaughter-houses are inspected to prevent nuisance to neighbors. A suit is pending in reference to one at present. The chief work of the Board, during the past year, has been in the line of inspection. All complaints have been successfully acted upon with the exception of the slaughter-house case, which is now under consideration.

(Signed), J. R. KLINE,
Health Inspector.

DELAWARE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joseph C. Reading, Sergeantsville; Joseph Servis, Sergeantsville; John Shearwood, Stockton; Nelson Lambert, Sergeantsville; George N. Best, M.D., Rosemont.

The water-supply is mostly from springs and wells. All schools and school buildings are now in first-class condition. The past year has been remarkably free from epidemics of any kind.

(Signed), JOSEPH C. READING,
Assessor.

EAST AMWELL TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joseph Van Marter, Reaville; Van Doren Lacy, Ringoes; Levi Holcombe, Ringoes; Theodore Craft, Wertsville. P. C. Young, M.D., Ringoes, Health Inspector.

The general health of the township is good. Like all others, it has been invaded with an epidemic of influenza.

(Signed), P. C. YOUNG, M.D.,
Health Inspector.

FRANKLIN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William J. Case, Pittstown; John A. Snarer, Cherryville; Jeremiah K. Robinson, Quakertown; Dr. Q. E. Snyder, Quakertown; George W. Snyder, Quakertown.

There have been no complaints before this Board; therefore, it has done nothing more than to organize. There have been no prevalent diseases during the past year.

(Signed), GEORGE W. SNYDER,
Secretary.

FRENCHTOWN.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

A. B. Nash, M.D., George F. Bloom, Robert McIntyre, Thomas Able. P. O. address of all, Frenchtown.

Our annual report will not vary from that of last year.

(Signed), O. R. KUGLER,
Secretary.

HIGH BRIDGE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Stephen Apgar, Cokesbury; George Rinehart, Cokesbury; O. Aller, High Bridge; John R. Apgar, High Bridge; W. C. Alpaugh, M.D., High Bridge.

We have a natural slope, which makes our drainage good. Between High Bridge and Annandale, along the C. R. R., it is swampy, and there is a great deal of malaria. There is a small swamp near the High Bridge school-house, which should be drained. In other respects our report does not differ from that of last year.

(Signed), W. C. ALPAUGH, M.D.

HOLLAND TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Bellis, Riegelsville; John Weider, Finesville; Gordon Shaffer, Milford; Mathias Wean, Mt. Pleasant; George T. Ribble, M.D., Milford.

KINGWOOD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Augustus Fields, Baptisttown; E. D. Lidey, M.D., Baptisttown; William G. Briggs, Kingwood; George Kugler, Tumble.

Since my last report we have had quite an epidemic of La Grippe for about three months, commencing the first of January. Scarcely anyone escaped. In the month of August there were several cases of dysentery, and other bowel complaints. With these exceptions the health of the township has been good.

(Signed), GEORGE E. DALRYMPLE,
Secretary.

LAMBERTVILLE.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Gervas Ely, President; W. H. Wilmot, Clerk; Dr. G. H. Larison, John C. Sine, William Lyman, Henry B. Kitchen. John L. Coryell, Health Inspector. P. O. address of all, Lambertville.

Water-supply as in former reports. The town has been unusually healthy, and there has been little for the Board to do.

(Signed), GERVAS ELY,
President.

LEBANON TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Jacob Hipp, Glen Gardner; Joseph Fritts, Glen Gardner; Andrew C. Cregar, Califon; A. S. Banghart, Glen Gardner.

RARITAN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Andrew J. Green, William Thatcher, George W. Fulper, Wilson B. Moore; John H. Ewing, M.D., President. P. O. address of all, Flemington, N. J.

Nothing of importance to report, with the exception of the epidemic of La Grippe during the past spring.

(Signed), JOHN H. EWING, M.D.,
President.

READINGTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George W. Cole, Pleasant Run; Peter S. Latqurette, Pleasant Run; James Lane, Readington; M. W. Purcell, M.D., White House Station; D. T. Stryker, White House Station.

Some few complaints of nuisances have been received, which have been acted upon and removed by the Local Board of Health. There have been one or two cases of typhoid fever, which, fortunately, were not fatal. (Signed), DAVID T. STRYKER,
Secretary.

TEWKSBURY TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

David C. Farley, Mountainville; Abraham H. Alpaugh, Cokesbury; Harmon Sutton, Califon; William J. Moore, New Germantown; Dr. Henry H. Miller, Mountainville.

The health of this township has been exceptionally good for the past year. Refuse is properly cared for. Our public schools are well ventilated, and are all that can be desired, in a health point of view.

(Signed), DR. H. H. MILLER,
Inspector.

UNION TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joseph H. Exton, High Bridge; H. A. Dalrymple, Pattenburg; E. R. Robinson, Jutland; N. B Boileau, M.D., Jutland; Morris Stockton, Pattenburg.

The medical member of the Board states that the health of the township is at present good. No contagious diseases of any kind have existed during the year. Our Board is well organized. There have been but two cases before the Board, and these have been properly attended to.

(Signed), MORRIS STOCKTON,
Secretary.

WEST AMWELL TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Charles H. Drake, Joseph Lee, Lemuel Phillips, George H. Larison, M.D. P. O. address of all, Lambertville.

There is nothing of importance to report, except the influenza epidemic in the spring.

MERCER COUNTY.

EAST WINDSOR TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

D. H. Cunningham, Levi C. Updike, John D. Whittick, W. D. Wear. P. O. address of all, Hightstown, N. J.

EWING TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

James M. Force, Trenton; James F. Herbert, Trenton; John R. Hendrickson, Ewingville; George L. Howell, Trenton Junction.

HAMILTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George R. Robbins, M.D., Hamilton Square; Joshua Lell, Trenton; Richard Hunt, Trenton; John Kirby, Yardville; William H. Blake, Allentown.

Water-supply from wells and springs. Public health laws are well enforced.

HIGHTSTOWN.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Charles Manlove, David Cole, W. Joseph Warwick, T. Walker Pullen. P. O. address of all, Hightstown.

HOPEWELL TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Wesley Case, Lambertville; James Bergen, Pennington; Israel Howell, Hopewell; William D. Hill, Moore; E. L. Welling, M.D., Pennington.

LAWRENCE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. E. De Witt, Lawrenceville; Asa H. Bainbridge, Lawrenceville; Samuel H. Van Cleve, Lawrenceville; Clark Flock, Lawrence Station; James W. Phillips, Trenton.

PRINCETON BOROUGH.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. E. H. Bergen, Prof. H. B. Cornwall, A. L. Rowland, Prof. Magie, J. D. Wolfe, James K. Brown, C. H. A. Zapf. P. O. address of all, Princeton.

No epidemics during the year. Board of Health meets every two weeks. Complaints of every nature have received prompt attention.

PRINCETON TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Henry B. Bayles, Henry E. Hale, Edward G. Warren, William B. Gibby. Dr. E. H. Bergen, Health Inspector.

TRENTON.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

G. D. W. Vroom, President; William Cloke, Secretary; Thomas S. Chambers, Treasurer; Dr. C. Shepherd, Carroll Robbins, Albert Clayton, William Hewitt. Alfred W. Packer, Health Inspector. P. O. address of all, Trenton.

The transactions of the Board for the past year have been of a highly satisfactory character. Its work has been performed with thoroughness and efficiency. A careful and ceaseless oversight has been maintained over the sanitary condition of the city, and every nuisance that has been discovered has been abated. There was an outbreak of small-pox during the year among some children in a family of Hungarians. The victims were promptly taken to the small-pox hospital outside of the city, where they were given the best of care and medical attendance. The house in which the cases occurred was strictly quarantined and all the inmates vaccinated. By prompt and vigorous measures, the outbreak was confined to the persons originally attacked, and the patients themselves were soon convalescent. There has been completed within a few weeks a large iron tank, as an annex to the reservoir. It is 37 feet in height and 70 feet in diameter, with a capacity of 1,065,170 gallons. It is intended to supply the Seventh ward with water, relieving the reservoir from just so much pressure and drain. It will increase the pressure to the rest of the city, which was becoming rather feeble in consequence of the rapid growth of the city. The total capacity of the Trenton works is over 10,000,000 gallons a day, and the consumption averages about 3,500,000 a day. The quality of our water-supply is excellent, and the average death and sickness-rates would undoubtedly be sensibly lowered if in universal use. A number of people in some sections of the city still cling to the use of well and spring-water, even where the city water is accessible. All such doubtful sources of supply are being analyzed by the Board as rapidly as practicable, and all wells that are shown to be dangerous are closed. Probably a dozen such sources of bad water-supply have been closed during the past year. The Hering system of sewerage has been extended during the year with considerable energy and public spirit. The use of sewers is found to be of such convenience, value and economy, as compared with the old cesspool system, that people are applying for their construction in every direction. There is reason to believe that before the close of another year the system will be extended to the annexed district of Chambersburg, as contemplated in the original plan, and as provided for therein. The indispensable preliminary to the introduction of sewers in this district will be the construction of the main outlet sewers of the entire system down Lamberton street, to the river, below Riverview Cemetery. Steps to this end are now being taken. The construction of sewers in Trenton is not only proceeding with healthy rapidity, but under a system of competent and faithful supervision that secures the best results. No city in the country will have better sewers than Trenton when they are in full operation through the main outlet. [For full description of the sewers of Trenton, see article by Mr. Hering, C.E., in this report, and map.] Since last year's report, the Board has lost, by death, its excellent and energetic Inspector, James H. McGuire, but has been fortunate in securing a most competent and faithful successor in Alfred W. Packer. It is for this reason that I am unable this year to present a detailed statistical statement of the work accomplished by the Board during the year.

(Signed), WILLIAM CLOKE,
Secretary.

WASHINGTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William Coleman, Windsor; Forman Hutchinson, Windsor; Harrison Yard, Robbinsville; George A. Silver, M. D.; J. B. Yard, Assessor.

There has been very little sickness in the township during the year.

WEST WINDSOR.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Jacob R. Wicoff, Dutch Neck; Symmes Bergen, Dutch Neck; William J. Tindall, Edinburg; J. Judson Allen, Lawrence Station; Dr. G. H. Franklin, Hightstown.

MIDDLESEX COUNTY.

CRANBURY TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

S. Johnes Chamberlain, Alexander S. Stults, Alexander Mason, Sylvanus Grover Henry C. Symmes. P. O. address of all, Cranbury.

EAST BRUNSWICK TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John O. Cozzens, Spottswood; John H. Wade, Assessor, South River; Conrad Kohlhepp, Milltown; John H. Perdun, Milltown; S M. Disbrow, M. D., Physician, Old Bridge; David Sewiss, Clerk, South River.

MONROE TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Samuel Butcher, Chairman, Hightstown; S. C. Young, Jamesburg; James Bodine, Prospect Plains.

NEW BRUNSWICK CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. Henry R. Baldwin, Dr. C. H. Voorhees; Dr. P. T. Austen, Ph.D., H. B. Willis, Dr. P. A. Shannon, H. V. Cook. Dr. A. Van Nest Baldwin, Health Inspector. P. O. address of all, New Brunswick.

The Board of Health of the City of New Brunswick herewith submits its annual report for the year ending September 30th, A. D. 1890.

In reviewing the year's work, we are glad to report the remarkable healthfulness of our city, a blessing largely due, we think, to the efficiency of our improved health appliances, and the vigilance and prompt action of the department.

Regular meetings of the Board have been held twice each month, during June, July, August and September, and once a month during the other portions of the year. These meetings, usually well attended, have been of a strictly business character.

WATER-SUPPLY.

There has been no material change in the water-supply. The filtration of the water by the Hyatt process has been discussed, but nothing definite has been done.

Well-water is still used in various parts of the town, although in a number of instances it has not been found to be in a safe condition.

DISINFECTION.

Following the plan of last year, the streets and gutters have been systematically disinfected with a dilute solution of bromine during the summer months.

The solution used was made by dissolving two pounds of bromine in one hundred gallons of water. The excellent effects of this disinfectant have been marked. A number of places, usually very objectionable, have been kept sweet. The almost entire absence of cholera infantum during this and the preceding summer, may perhaps be due to some extent to the continual and thorough disinfecting.

REFUSE AND EXCRETA.

There has been no improvement in the method of disposal of these wastes, except in so far as the enforcement of the new ordinances prescribing the manner of constructing privies and cesspools has compelled builders to put in tight and safe structures. There are, however, many old box-privies and leaking cesspools in the city, which are more or less dangerous to the public health. It is hoped that in time these may be eliminated and well-constructed ones built in their place.

LEGAL PROCEDURE.

Health ordinances, with suitable penalties, based upon the act creating the Board, have been passed and successfully enforced.

The legal procedure adopted by the Board has been founded upon the health statutes and the Supreme Court adjudications.

The following is the method of procedure, from the filing of a complaint to the final determination:

After a complaint has been properly made on a prepared blank, which is obtainable at the drug stores of the city, it is presented to the Inspector in person, or to him through any member of the Board.

The Inspector, upon receiving the complaint, views the premises designated in said complaint, and makes a written report of all the facts and conditions appertaining to the alleged nuisance. If, upon examination, he finds a nuisance to exist, he designates the section of the ordinance violated, and the condition and circumstances which justify the complaint, and serves a notice upon the party chargeable with maintaining said nuisance to abate or remove the same within a specified time. The time specified in said notice varies, according to the nature of the nuisance. If the responsible party or parties fail to comply with the Inspector's notice, the Inspector reports the failure to the Board for instruction. The Board, after consideration of the facts, orders a notice to be served, at once, upon the delinquent to appear before the Board, either forthwith or within a specified time, to show cause why he or she should not be compelled to remove or abate the alleged nuisance at his or her expense. If the alleged nuisance is not abated before the return of said notice, or if the delinquent fails to appear at the return of said notice, the Board enters into a full consideration of all the facts and circumstances in the case, in precisely the same manner as if the delinquent were present or represented, and, if the facts reveal a nuisance within the jurisdiction of the Board, a final decision is rendered, declaring a nuisance to exist detrimental to public health and dangerous to life, according to the facts presented in the case.

A copy of this decision is served upon the delinquent, ordering him or her to abate said nuisance forthwith or within a specified time, according to the nature of the nuisance. Upon receiving a report of non-compliance, the Board institutes an action against said delinquent for the enforcement of the penalty incurred by the violation of the ordinance, or to recover the amount expended by the Board in abating or removing said nuisance.

This mode of procedure has not failed to produce the desired results.

No contagious or prevalent diseases among animals have been reported during the past year. The physicians of this city are still very neglectful in reporting contagious diseases occurring in their respective practices. The physicians can offer no adequate excuse for failure in thus complying with the law, as this Board furnishes, upon application, blanks together with stamped and directed envelopes for the purpose of reporting contagious diseases. We are very loath to report the fact that in both typhoid fever and diphtheria the deaths from these diseases exceed the number of cases reported.

This state of things is to be greatly deplored, as it interferes seriously with the work which the Board can do in both quarantining and disinfection. The Board of Education has, at the request of this Board, refused admission to the public schools of those children who reside in houses where contagious diseases exist, until a certificate is received from the attending physician, stating that all danger of contagion has passed. This Board will make every effort to ascertain those who are neglectful in thus reporting, and will enforce the law in all cases.

Scarlet fever has been the most prevalent disease of the year, one hundred and fifteen (115) cases having been reported to this date, but only ten (10) deaths, showing the type to have been very mild.

Measles has been smaller in number of cases than is past years, only four (4) cases being reported and no deaths.

Typhoid fever has been mild and the number of cases smaller than last year, seven (7) being reported.

Diphtheria has been of a mild type, the number of cases reported being only twenty-seven (27).

We can, therefore, report the health of our city as very good for the year, and if the Board can have the reports of cases of contagious diseases made promptly, we think the statistics can be made even better.

(Signed), A. VAN NEST BALDWIN,
Secretary.

NORTH BRUNSWICK TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Charles Snediker, Milltown; Dr. F. E. Riva, Milltown; John H. Bodine, Franklin Park; H. E. B. Dennison, New Brunswick; E Allison, New Brunswick.

The Board of Health of the borough has attended to the removal of all excreta and material dangerous to health.

PISCATAWAY TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Firman R. Walker, New Market; Simeon R. Dayton, New Market; Alvah Gray, Dunellen; A. S. Coriell, New Market; W. J. Nelson, M D, New Market.

There has been nothing particular to require the attention of our Board during the past season.

(Signed), W. J. NELSON, M.D.

RARITAN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joseph L. Moss, Sr., Luther Tappan, Alfred Mundy, A. Clark Hunt, M.D. P. O. address of all, Metuchen.

There is nothing of special interest to report.

(Signed), THEO. A. WOOD.

SOUTH AMBOY.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dan C. Chase, President; John Scully, Stephen Martin, James H. Gordon, John H. Green, Patrick Campion, Ward C. Perrine, Edward McDonough. P. O. address of all, South Amboy.

Nothing special to report except the filling up of several mud-holes, and looking after the general health condition of the borough.

SOUTH BRUNSWICK.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

A. D. Britton, Chairman, Plainsboro; Geo. W. Mount, Monmouth Junction; D. C. Griggs, Dayton; Edgar Carroll, M.D., Dayton; F. G. Stevenson, Dayton; G. D. Van Deweer, Dayton.

The Local Board has had but little to do this year. There were some few complaints, which have been duly attended to. There have been no prevalent diseases during the year.

WOODBRIDGE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Lockwood, Jonas H. Coddington, Albert D. Brown, Dr. Samuel P. Harned, Simeon G Phillips. P. O. address of all, Woodbridge.

The Sanitary Board has not been called upon to take any measures of importance, as few nuisances have been reported. The town and township have been healthy during the year.

(Signed), A. D. BROWN,
Secretary.

MONMOUTH COUNTY.

ATLANTIC TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Samuel T. Vanderveer, Colts Neck; John T. Haight, Colts Neck; L. Schanck, Holmdel.

ATLANTIC HIGHLANDS.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Rev. E. C. Curtis, President; John B. Swan, James H. Leonard, Dr. H. A. Clark, Dr. George. D. Fay, Dr. J. H. Van Marter, Jacob T. Stout. John B. Sawn, Health Inspector. P. O. address of all, Atlantic Highlands.

Our Board has almost totally suppressed all nuisances; compelled the building of water-tight cesspools; allowed no accumulation of garbage; arranged for the purchase and use of an odorless excavating machine, so that the town has been kept in excellent condition. All low lands and stagnant pools have been filled up.

(Signed), J. H. LEONARD,
Secretary.

BELMAR.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

James S. Huyler, William L. Kinmouth, M.D., Charles S. Wolverton, Neil H. Miller, Rev. John W. Morris, Joab Titus, Wm. M. Bergen. Charles S. Wolverton, Health Inspector. P. O. address of all, Belmar.

Driven wells are used for water-supply. The town is partly sewered. No diseases of animals. A sanitary code is in operation. Excreta are removed regularly. Cesspools are mostly tightly cemented.

(Signed), M. H. MILLER,
Clerk.

EATONTOWN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR

E. W. Crater, M.D., Oceanport; J. W. Johnston, Eatontown; J. E. Corlies, Oceanport.

Wells and cisterns are used for drinking-water supply. In this village (Oceanport), I think there are perhaps a half-dozen houses with dry cellars; the balance have cellars flooded from three to twelve months each year. The most popular cesspool is a barrel bored full of holes and sunk just below the level of the ground, which is covered with a tight board cover. These are cleaned out occasionally. As a rule our township is very healthy, and, barring tubercular diseases, the death-rate very small. Typical filth diseases, enteric fever, diphtheria, &c., are rare.

(Signed), E. W. Crater, M.D.

FREEHOLD.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR

John Bawden, A. C. Hart, O. R. Freeman, M.D , J. O. Burke, Jr , John Enright. W. J. McClure, Health Inspector. All of Freehold.

The work of inspection is continued, and objectionable localities are carefully watched, improvements and remedies suggested and complied with, and there is no occasion for a resort to summary measures. One house-well was found to be polluted. The Board ordered that the water be not used for any purpose. The town authorities have commenced work looking toward a public water-supply. Wells have been sunk, seven in all, on the same property where a well was sunk by Prof. Cook in 1856, and has continued to flow ever since. Pipes are being laid, and it is hoped that there will in time be an abundant supply of pure water suitable for all purposes. Our town has been exempt from epidemics and contagious diseases, attributable in part to the depositing of all garbage and refuse matter on premises purchased by the town for the reception of such material, and beyond the town limits.

(Signed), W. J. McClure,
Health Inspector.

HOLMDEL TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William Morrell, Hazlet; Vandike Polhemus, Holmdel; James Hoff, Holmdel; Aaron Longstreet, Assessor. Dr. H. G. Cook, Holmdel, Inspector.

HOWELL TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Jacob Lutz, Farmingdale; Charles Donahay, Turkey; Charles P. Lafetra, Farmingdale; James H. Butcher, Turkey; Stephen A. Disbrow, M.D., Farmingdale.

Our Health Board has been active and earnest in the performance of its duties, although not having any cases of a very bad nature to contend with. Several small nuisances have been cleared up without much trouble, which, unattended to, might have been a source of danger. We have had regular meetings during the summer.

(Signed), JAMES H. BUTCHER.

KEYPORT.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Sylvanus Lee, C. H. Hamilton, M.D., E. V. Petteys, Benjamin Smith, D. E. Roberts, M.D. James M. Walling, Health Inspector. P. O. address of all, Keyport.

LONG BRANCH CITY

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George W. Brown, M.D., President; E. B. Blaisdell, James P. Connelly, Joseph W. Taylor, Levi G. Bliss, W. W. Silkworth, Charles Morris. P. O. address of all, Long Branch.

The water company has large filters at the pumping-station. The water is never discolored since using these filters. The public health has been unusually good during the year. The sanitary code has been adopted by this Board. In other respects, the report does not differ from that of last year.

MANALAPAN TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William C. Brown, Freehold; William H. Reid, Tennent; David L. Applegate, Tennent; Samuel C. Brown, Englishtown; A. T. Applegate, M.D., Englishtown.

Report similar to that of last year.

MARLBORO.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Peter C. Vanderveer, Wickatunk; William Carson, Holmdel; William C. Hulse, Marlboro.

MATAWAN TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Charles Close, J. F. Lisk, Thomas Peterson, B. C. Mealio. P. O. address of all, Matawan.

This township has natural drainage, the village being situated between two creeks. The township is healthy. We seldom hear of a case of malaria and have had no cases of contagious diseases. We have but one sewer and that empties into the creek.

(Signed), B. C. MEALIO,
Assessor.

MIDDLETOWN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Jacob Swan, Atlantic Highlands; John H. Van Marter, M D , Atlantic Highlands; George Morford, New Monmouth; R. S. Snyder, Middletown; H. A. Hendrickson, M.D., Atlantic Highlands.

The report of last year covers pretty much all the features of the present year. The houses generally have dry cellars. Malarial fevers, during the past summer, have not increased. The sanitary condition is excellent. We have had an epidemic of measles. Attention is called to the danger we of the rural districts are subject to by allowing dogs to run at large both day and night, and thus rendering the citizens liable to be bitten by those suffering from hydrophobia.

(Signed), H A. HENDRICKSON.

MILLSTONE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Albert Thompson, Clarksburg; R. Ely, Ely; Tunis Conover, Perrineville.

The supply of water is excellent, and it is obtained from springs and wells. Dwellings are of a healthy character. School-houses are, as a rule, not built on good hygienic principles A few cases of diseases among horses were reported, but these were isolated by the owners and no epidemic prevailed. During August and September an epidemic of dengue was reported by Dr. Price, of Upper Freehold township. About twenty cases were reported, with no deaths. In summing up we would say that the sanitary condition of the township is good. The people recognize more fully than ever the importance of pure air and water and clean surroundings, in the maintenance of good health.

(Signed), GEO. J. ELY,
Secretary.

NEPTUNE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

S. H. Kirkbride, Asbury Park; Jeremiah Newman, Asbury Park; Dr. Williamson, Asbury Park; Lewis Raneir, Ocean Grove; L. E. Watson, Asbury Park.

We have a good deal of trouble about drainage. The ground back of Asbury Park and Ocean Grove is low, and there are no sewers. We try and make every one put in a cemented vault and cesspools. The vaults and cesspools are emptied by pumps, and cleaned by men engaged in that occupation. We have some malaria, but not as much as last year. Reports from Ocean Grove and Asbury Park have heretofore been full.

(Signed), L. E. WATSON,
Clerk.

OCEAN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Levi Irwin, Thos. R. Woolley, Howard A. Brindley, George W. Brown, Jr., M.D. P. O. address of all, Long Branch.

UPPER FREEHOLD.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

C. C. Wicoff, Allentown; J. S. Dawes, Imlaystown; E. A. Hires, Imlaystown; William Quicksell, Hornerstown; F. C. Price, M.D., Imlaystown.

Influenza became epidemic here about Christmas, 1889, and remained with us until April, 1890. Seven cases of scarlet fever occurred during January and February. Typhoid fever has not been reported thus far this year, which is better than for several years. Our Board of Health has had three meetings this year. Several places in the township reported as unhygienic, have been visited by the Board and cleanliness secured.

SHREWSBURY TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William Bordman, Oceanic; W. T. Parker, Little Silver; John M. Keough, Red Bank; Charles Parson, Red Bank; Thomas P. Brown, Red Bank; Albert C. Harrison, Red Bank. Nelson Little, Red Bank, Inspector.

Last June the Township Board was thoroughly re-organized, and since that date the people of the township feel confident that everything that might be detrimental to their health will be looked after. Every member of the Board considers it to be his duty to see that each place within the township is in a sanitary condition. The Board had printed a sanitary code, with rules and regulations. Also, an article on the care of household wastes and the use of disinfectants. A copy of each of these articles was sent to every family living within the township, with the suggestion that they be carefully perused. Every complaint sent to the Board was at once attended to. There has been a house-to-house inspection, and the sanitary condition not being satisfactory in some cases, an order was at once sent that it should be made so. The wells and streams were all examined, either by the Inspector or some member of the Board. No water or any garbage was permitted to remain upon the road nor around the premises of any public or private dwelling. Cesspools are used by a great number of our residents. The drainage is much better than it has been for years. Every slaughter-house is carefully inspected, and strict orders given that each shall be kept in good sanitary condition. A copy of our sanitary code has been mailed you.

(Signed), THOMAS P. BROWN,
Assessor.

WALL TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

A. A. Higgins, M D., Manasquan; James A. Algor, New Bedford; Mr. Brannin; Henry Wainwright, Manasquan. John M. Allen, Manasquan, Inspector.

The Township Health Board was re-organized early in the spring. Dr. Henry Mitchell was present and gave some valuable advice. Since that time the Board has met regularly once a month. A few cases reported of nuisances were abated as soon as the Inspector visited the premises. The township has been very healthy. A few cases of dysentery have been reported.

(Signed), JOHN M. ALLEN,
Inspector.

MORRIS COUNTY.

BOONTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Ellis G. Myers, Horace Ford, Thomas Byard, G. D. Crane, Joseph Stevenson. All of Boonton.

The health condition of the town is excellent.

CHATHAM TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dayton Baldwin, New Providence; George McDougal, Chatham; Eugeme Hopping, Chatham; Edward P. Miller, Chatham.

CHESTER TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Charles M. Patrey, Charles H. Ming, John W. Kelsey, William E. Young. W. A. Green, M.D., Health Inspector. P. O. address of all, Chester.

Three or four complaints in regard to nuisances were brought to our attention, and abated immediately when so ordered. Last spring and summer, in the southern part of the township, there were a good many cases of hog cholera, which proved fatal in most all instances. During the month of December, 1889, and January and February of this year, we had in the township about four hundred cases of La Grippe. During the spring months we had a few cases of scarlet fever of a mild form. We have had also a few cases of sporadic diphtheria of a mild nature, which readily yielded to treatment.

(Signed), W. A. GREEN, M.D.,
Health Inspector.

HANOVER TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Marcus Dixon, Pine Brook; Walter Mitchell, Whippany; George W. Bates, Morris Plains; Dr. E. P. Cooper, Troy Hills; Joseph Bastedo, Boonton.

JEFFERSON TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Jacob Tallman, Oak Ridge; D. M. Duffy, Woodport; Charles Jennings, Milton; Dr. Utter, Woodport.

Water-supply is from wells and springs. In the vicinity of iron mines families are supplied from the mines. Water is good throughout the entire season. Drainage is natural and cellars dry. But few cases of malaria have been heard of lately. There have been no prevalent diseases. Schools are in good condition, but in one or more districts the school buildings are somewhat dilapidated.

(Signed), A. J. FRETZ.

MADISON BOROUGH.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. C. Anderson, Henry M. Sacks, Dr. O. N. Vandewater, William T. Brown, Samuel Brandt. P. O. address of all, Madison.

Madison Borough was incorporated last year. Madison is very healthfully situated, and has a natural drainage. We are actively engaged in laying water-mains for a public water-supply, $60,000 having been appropriated for that purpose. The supply is from an open well about thirty feet in diameter, and is pumped to a stand-pipe at a high elevation. Analysis of the water is here appended:

Appearance	Clear and colorless.
Odor	None.
Taste	None.
Chlorine in chlorides	0.5248 grains in U. S. gallon.
Equivalent to sodium chloride	0.8642
Phosphates	Trace.
Nitrites	None.
Nitrogen in nitrates and nitrites	0.0946
Free ammonia	0.0017
Albuminoid ammonia	0.0029
Hardnesss equivalent to carbonate of lime before boiling	5.9518
After boiling	2.6483
Organic and volatile matter	1.4579
Mineral matter	7.6979
Total solids, at 240° Fah	9.1558

The method adopted by the Board of personally calling attention to nuisances complained of has proved very effective, all our requests being cheerfully complied with.

(Signed), HENRY M. SACKS,
Secretary.

MENDHAM TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

M. Robinson, Mendham; J. W. Swackhammer, Mendham; F. H. Garabrant, Brookside. Dr. J. S. Stiger, Mendham, Health Inspector.

MONTVILLE.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Garret B. Jacobus, Glen View; John Husk, Jr., Montville; Walter A. Young, Pine Brook.

MORRIS TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Thomas F. Clifford, William H. Mesler, E. L. Durling, Dr. J. B. Risk. P. O. address of all, Morristown.

The water-supply is from the Morris Aqueduct Company's plant. There is no chance for the source of supply to become contaminated. Some of the wealthy residents in the township, outside of the city, have water pumped from springs to private reservoirs. Morristown proper has no sewerage, but relies upon cesspools. There is no marsh near this township. Malaria is not frequent. Alleged disagreeable odors were coming from a fat-rendering establishment and were investigated.

MOUNT OLIVE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George A. Smith, Drakestown; Benjamin A. Howell, Flanders; Samuel S. Wills, Stanhope; Dr. Charles N. Miller, Flanders; Enos G. Budd, Budd's Lake.

Vital statistic returns come in slowly, but are forwarded as soon as received. No contagious diseases reported. Health of the township good. Our Board has been called to look at the drainage of the Forrest House, Budd's Lake, and, after fully examining, has decided that changes should be made to secure better drainage of waste-water and a proper fixing up of closets and cesspools, and that the waste-water should not be run into the lake.

(Signed), B. A. Howell.

PASSAIC TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Andrew Bird, Long Hill; Jacob Ogden, New Vernon; Frank Miller, New Vernon.

Our township enjoys a good degree of health, has good water, and no particular disease is prevalent.

(Signed), Oscar Lindsly,
Assessor.

RANDOLPH TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Briant Headen, Dover; John Douney, Port Oram; James Carroll, Mt. Freedom; J. Hance, Dover.

The Health Board of this township has never organized, so there is no report to make.

ROCKAWAY TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

James B. Tonking, Mt. Hope; Augustus Munson, Hibernia; Edward Fox, Rockaway; John Finnegan, Mt. Hope.

Water-supply from wells and cisterns exclusively. No system of drainage distinct from sewerage. We have no system of sewerage in any part of the township. We have, as a rule, dry cellars. Cesspools are nearly all built with open bottoms. There is no system for the disposal of refuse and excreta, except what is used by the farmers as manure. There have been no prevailing diseases during the past year. Sanitary conditions of slaughter-houses in the township are as good as could be expected. There are ten school-houses, all in good condition; four of them being heated by steam and the rest by wood and coal. A record is kept of marriages, births and deaths, in books kept for that purpose.

(Signed), JOHN FINNEGAN,
Assessor.

ROXBURY TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Richard C. Applegit, Stanhope; D. Judson Cook, Drakesville; John T. Lawrence, Kenvil; John L. Taylor, M.D., Succasunna; John A. Honnell, Assessor.

WASHINGTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

F. M. Stephens, German Valley; E. C. Willet, M.D., German Valley; W. N. Swackhammer, Middle Valley; Philip Schuyler, Naughright; Henry Wiley, Drakestown.

OCEAN COUNTY.

BAY HEAD.

Our report is similar to that of previous years.

(Signed), WILLIAM R. GULICK,
Assessor.

BERKELEY TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Henry Williams, C. Lawrence, Thomas Harvey, George Evernham. P. O. address of all, Bayville.

BRICK TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. O. W. Budlong, Lakewood; I. V. Hall, Lakewood; Wm. A. Longstreet, West Point Pleasant; C. C. Pearce, Burrsville; H. E. Havens, Burrsville.

Nothing of importance to report. The general health of the township is exceptionally good. No contagious diseases known.

(Signed), H. E. HAVENS,
Assessor.

DOVER TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

R. B. Gowdy, J. I. McKelvey, John Tilton, A. W. Irons. P. O. address of all, Toms River.

EAGLESWOOD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Robert Engle, Beach Haven; J. F. Jones, West Creek; Clarence Seaman, West Creek; Dr. Samuel Ashurst, Beach Haven; S. P. Cramer, West Creek.

There have been no changes in the way of sanitary improvement. Health generally good; no prevailing diseases. Drainage natural.

(Signed), S. P. CRAMER,
Assessor.

JACKSON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joseph T. Clayton, Jacksonville; Johnson Bills, Vanhiseville; John W. Jamison, Cassville. C. M. Thorn, Health Inspector.

LACY TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

B. F. Holmes, A. G. Wilburt, Garret Stout, B. F. Mathews. P. O. address of all, Forked River.

But little has been done by the Board except passing a printed code of ordinances adopted May, 1890. The water-supply is from wells, in some places from running streams. As a rule the water is good. Some people are very careless about the refuse from fish and other products of the bay. In some cases the refuse is left exposed on the ground. In others it is thrown in the stream. This should be prohibited. More than three-fourths of the people are vaccinated. It is very essential that the public be warned of the dangers by which they are surrounded. Much can be done by the proper distribution of circulars.

(Signed), B. F. MATHEWS.

MANCHESTER TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Chas. Heaveland, Wm. Montgomery, Michael McCallion and T. Dowd. P. O. address of all, Manchester.

Report similar to that of last year.

(Signed), T. DOWD, JR., Assessor.

OCEAN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William Gray, Wykoff Letts, William B. Wilkin, J. H. Wilkin. P. O. address not given.

PLUMSTEAD.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. William T. McMillan, John H. Davis, Edgar C. Horner, Scott C. Choeffey, Aaron S. Bronson. P. O. address of all, New Egypt.

Water-supply is from wells throughout the township. Water is generally good. The Assessor each year makes general inquiry as to contagious diseases. This township has been remarkably free from any contagious diseases the past year, excepting a few cases of diphtheria and typhoid fever, most of which were in or near the town. They were not due to any causes which were not within the power of the Board to remove.

(Signed), W. T. MCMILLAN, M.D.

STAFFORD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Letts, Manahawkin; Charles H. Cranmer, Manahawkin; Lewis A. Cranmer, Mayetta; S. G. Hazelton, Manahawkin.

UNION TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. Edmund, Joseph A. Pharo, John Predmore, Ira S. Cranmer, Emmon R. Wills. P. O. address of all, Barnegat.

We have good drainage; the township is in a healthy condition, and we have no sickness of any account.

PASSAIC COUNTY.

ACQUACKANNONK.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. H. Merseles, Clifton; D. H. Schoomaker, Richfield; N. Fredericks, Lyndhurst; C. H. Hemmenny, Clifton.

LITTLE FALLS TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Squire Radcliffe, Eugene Shire, John Speight, Walter Bott. Edward A. Keeler, M.D , Health Inspector. P. O. address of all, Little Falls.

There have been no epidemics during the year except La Grippe.

MANCHESTER TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. Cyrus R. Townsend, Paterson; D. W. Warren, Hawthorne; R. E. Doremus, Totowa; John Rinehardt, Paterson; Andrew J. Hooper, Paterson.

The water-supply is from wells; drainage is natural; no sewerage of any kind in the township. There are no houses occupied by more than two families. Refuse is mostly used for fertilizing. There are four cemeteries in the township. We are guided by the circulars received from the State Board. Where there are contagious diseases, there are notices put on the houses to that effect.

(Signed), ANDREW J. HOPPER,
Secretary.

PASSAIC CITY.

NAMES AND POST-OFFICES ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. F. H. Rice, Dr. William H. Carroll, Daniel Demarest, Michael King, Levi Aldous, John Adams. William Henry, Inspector. P. O. address of all, Passaic.

This city is now supplied with first-class water taken from the Passaic river, above Paterson, and is claimed to be as good as any in the State. It is supplied by a private company. About one-half of the houses take it. The source does not receive any sewerage above point of supply. The pipes are cleaned regularly. The whole city is now being sewered by the Waring pipe-sewer system. The streets and public grounds are kept in good order. When sewers are completed, which will be in about a month, the refuse and excreta will all be turned into them. Slaughter-houses are regularly inspected, so as not to become a nuisance. All the mills of the city are provided with fire-escapes. We have a set of ordinances defining nuisances, and a sanitary code similar to the one now in use in Paterson is the one under consideration. The vaccination of school children has been well attended to. The most prevalent diseases of the year were cholera infantum and consumption.

(Signed), JOHN ADAMS,
Secretary.

PATERSON.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

T. Y. Kinnie, M.D., James Mills, B. C. McGennis, M.D., P. H. Harris, F. E. Agnew, M.D., John T. Pollitt. John L. Leal, M.D., Health Inspector. P. O. address of all, Paterson.

During the last year about six miles of sewers were built. One large trunk-sewer was built to drain the Totowa section, which has suffered greatly in the past from insufficient drainage. The streets are entirely lighted by gas. All privies and cesspools are cleaned by licensed scavengers, on permits issued by this Board. Their contents are carted out of the city to a dumping-ground owned by the scavengers, where they are mixed with ashes and used as a fertilizer. A new system of disposing of the garbage was adopted last May, and is now in use. Previous to that time, garbage, ashes and other household refuse were mixed together, collected by the street department, and dumped upon vacant ground in the city. Our Board has been fighting this system for years, and last spring succeeded in inducing the Board of Aldermen to take action. A committee was appointed, composed of a member of the Board of Aldermen, a member of the Board of Health, a member of the County Medical Society, the City Physician, and the Health Officer, to investigate the different methods in use in this country for the disposal of garbage in a sanitary manner, and to report to the Board of Aldermen as to which would best answer the purposes of our city. This committee carefully investigated the claims of all the systems of any prominence, both by means of reports and correspondence, and by personal inspection. The result was that after full consideration the committee reported in favor of the Merz system by a unanimous vote. Their report was adopted at once by the Board of Aldermen, and a contract made with the Merz Company to collect all garbage, ashes and household refuse, to dispose of the garbage by means of their assistance, and of the ashes and other refuse in a manner satisfactory to the Board of Health. This contract went into effect October 1st, 1890, and it is a source of great satisfaction to our Board that at last it seems that the greatest sanitary evil we have had to encounter seems in a fair way to be abolished. Careful inspection of all markets is made, and all meats and vegetables unfit for use are condemned and removed. Since our last report the Board of Education has put a proper system of ventilation in another school building, and improved the sanitary condition of several more. This Board has refused to license any more slaughter-houses within the city limits, though the two which were licensed seven years ago are allowed to continue under careful inspection. A large addition to the county jail has been made during the year under the careful supervision of this Board, and the plumbing and ventilation are as nearly perfect as practicable. During the last year we made another attempt to abolish the nuisance and the menace of the Sandy Hill Cemetery. We passed an ordinance forbidding all sale or transfer of land for burial purposes within certain limits. Also, forbidding the interment of any body within said limits, unless the body of a deceased member of the family of a lot-owner. This does away with the promiscuous burial of paupers and others by undertakers who have secured possession of land in these cemeteries. Its utility may readily be seen when it is stated that since it became a law the burials in those cemeteries have diminished at the rate of sixty per cent. One of the churches owning the ground, on account of the loss of income from the sale of burial lots in these overcrowded cemeteries in the heart of the city, has taken the ordinance to the Supreme Court, where it will doubtless be argued this winter. During the last year we have had more than our average number of deaths from phthisis pulmonalis, pneumonia and diphtheria. Diphtheria has been very prevalent during this fall, and has been of a specially fatal character. Since August 1st we have had 87 cases. Of those 87 cases, 62 were in what we called the Sandy Hill Section, a district comprising about one-sixth of the area of our city. This district is the worst, from a sanitary point of view, of any district in the city. Its sewers are entirely inadequate for the drainage of the section, and during every rain-storm of any severity, streets and cellars are flooded and sewers choked up. It is to the bad drainage that we attribute this epidemic. As a measure of relief this Board has recommended to the Board of Aldermen the construction of a large trunk sewer, which will not only relieve this section, but will drain the entire eastern side of the city. The matter is now before the Board, and they are considering the legal aspects and devising ways and means of accomplishing this result. Our new plumbing and building code has been in operation for one year, and the year's experience has been very satisfactory to us in every respect. All friction ceased after the first few weeks, and the objects for which it was adopted had been fully secured. All plumbing done both in old and new buildings has been carefully examined and passed by this Board, and proper space, ventilation, light and drainage secured for all new tenement-houses. The annual reports of the Plumbing and Building Inspector show that during this year 1,259 plumbing permits and 315 building permits were granted.

(Signed), JOHN L. LEAL, M.D.,
Health Inspector.

POMPTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Lemuel Vanness, Pompton; Martin Drew, Midvale; Daniel W. Wheeler, Erskine; John F. Sisco, Butler; Dr. J. C. Morgan, Pompton.

WAYNE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George R. Berdan, Mountain View; Garrett G. Jefferies, Mountainville; David F. Duncan, Paterson; James D. Berdan, Paterson.

The water is obtained from wells and springs. No distinct system of drainage. There are four places of burial in this township. The Board of Health makes the necessary rules and regulations which, in their judgment, the public safety may require. The Board of Health takes due precautions against the spread of contagious diseases. There have been no prevalent diseases during the year.

(Signed), JAMES B. BERDAN,
Secretary.

WEST MILFORD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joseph Henion, Echo Lake; Oscar F. Smith, West Milford; David Vanderhoff, Oak Ridge; Joseph Schulster, Echo Lake.

There has been no particular cause for action during the past year. All returns that have been received have been sent in to the Bureau of Vital Statistics.

(Signed), JOSEPH H. SCHULSTER,
Assessor.

SALEM COUNTY.

ALLOWAY TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William E. Simpkins, Alloway; Richard Banks, Alloway; Daniel D. Hitchner, Cohansey; J. F. Ayers, Alloway.

LOWER ALLOWAYS CREEK.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. W. T. Smith, Hancock's Bridge; James Hood, Canton; Joseph Beaston, Harmersville; Dr. F. B. Harris, Canton; Mark T. Hilliard, Hancock's Bridge.

LOWER PENNS NECK.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Charles Lindsay, Salem; O. A. Hurley, Pennsville; R. D. Batten, Pennsville; E. L. Irelan, Assessor, Pennsville.

MANNINGTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

David S. Fogg, Woodnutt Pettit, D. W. C. Hinchman, W. H. Acton. P. O. address of all, Salem.

Our Board has to report that the last year was more than usually healthful. During the prevailing high tides during the fall, the bank meadows were under water, caused by breaks in the bank, so that several hundred acres were for a time out to the tide. It was thought at one time that it would be the cause of a great deal of malaria, but after much hard work and expense the bank was repaired, without much ill effect upon the public health.

OLDMANS TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William F. Hunt, Pedricktown; Samuel Stanley, Pedricktown; Frank Gaventa, Pedricktown; Jacob J. Hunt, Auburn. Dr. H. T. Johnson, Pedricktown, Health Inspector.

Our township is mostly farming land. There are two small towns, but no cities. The slaughter-house was ordered by the Board to be removed from the village. It was moved out about three-quarters of a mile. The prevailing diseases during the year have been La Grippe, consumption and typhoid fever.

(Signed), W. F. Hunt,
Assessor.

PILESGROVE TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Charles Richman, Sharpstown; George B. Grier, Woodstown; John G. Borten, Woodstown; Dr. P. G. Sowder; C. H. Richman, Assessor.

Water-supply from shallow wells. Water is somewhat hard. Borough is underlaid with marl and lime formation. Water in some wells has bad smell. Bottom of the wells in mud. Some cellars have to be drained to avoid water in wet seasons. No swamps near. Have had no malaria. Privies mostly without excavations beneath. Have no slaughter-houses within the borough. Schools in good condition. Have borough police and a small lockup. Have six public burying-grounds in the borough limits. Have no special health laws, except ordinance of the Borough Commission forbidding refuse and offensive matter to be thrown upon public streets or retained on private property. Have had no epidemic during the past year.

(Signed), C. H. Richman,
Assessor.

PITTSGROVE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

R. M. Hichner, W. W. Golder, George F. Clark, J. W. Golder. All of Centerton.

QUINTON TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Dr. William S. Good, Quinton; C. L. Smith, Quinton; John G. Fowser, Quinton; Gilbert Ayres, Shiloh; John F. Anderson, Quinton, Assessor.

Land consists of clay in some parts; other parts sandy and undulating. Cesspools are built with open bottom, and the contents are carted out and spread on fields. There has been nothing done by our Board this year.

(Signed), JOHN F. ANDERSON,
Assessor.

SALEM CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

T. B. Sickler, Clinton Bowen, Edwin Chew, Thomas Hewes, Josiah Wistar, Dr. C. M. Sherren. William Carney, Health Inspector.

The source of our water-supply is the same as for some years past; the drinking-water being obtained from private wells, which in many of the lower portions of the town are quite shallow and in no part more than fifteen to twenty feet in depth. We recognize the fact that where the wells are so shallow and the water-bearing strata so near the surface, there is much more danger of contamination from poisonous nitrates which filter down from refuse thrown upon the surface by careless or thoughtless housekeepers. Any measures tending to improve the quality of water furnished by the city authority, and which is brought a distance of three and one-half miles, so as to render it pure and wholesome, and thus obviate the necessity of using well-water for drinking and culinary purposes, would meet with our hearty approval. Our present Water Superintendent is much interested in the subject and is doing all in his power to improve the quality of the water.

In our last report allusion was made to a line of sewers having been laid in one of the principal streets. This sewer continues to work satisfactorily and numerous house-connections have been made with it. It is about 2,050 feet long, with a fall of from one in four hundred to one in two hundred, and empties into the creek midway between high and low-water marks, having an automatic flush-tank at the head of it which is intended to thoroughly cleanse the entire sewer. Six-inch terra-cotta pipes are used for about one-half the distance and eight for the remainder. It was not designed for surface drainage, and during the warm season this Board employs a person as heretofore to flush the water from the fire hydrants, and cleanse with a stiff broom the street gutters twice a week. This is intended to remove any foulness which may accumulate on account of the slight fall obtainable. The adjacent low lands are so thoroughly drained as to prevent any malarious influence.

As mentioned in former reports, the increased number of cesspools, which are built with open bottoms and sides, and the consequent danger and liability of the well-water being contaminated by them, render it highly important that a complete system of sewers should be laid down. Profile levels have been taken, which show there would be some difficulty in draining that portion lying farthest from the creek, but it is hoped the importance of the subject will force itself upon the attention of the public. Several cases of typhoid fever occurred during the past summer, some of which proved fatal. They were mainly confined to one section, and though some efforts were made to ascertain the cause, in order that a remedy might be applied, no satisfactory result was reached. The visitation was not of long duration; had it continued it might have become our duty to have analysis made of the drinking-water from the drinking-wells. The slaughter-houses, as previously mentioned, are under the care of the Board of Health, and are kept in a satisfactory manner. We have three glass factories, one oil-cloth factory and five factories for canning tomatoes. None of which, as at present conducted, are believed to be in any way prejudicial to the general health. The sanitary condition of the public buildings is satisfactory. Connecting the prison with the public sewer has greatly improved its condition. With the exception already noted the general health has been good, and no epidemic disease has prevailed to occasion alarm.

(Signed), JOSIAH WISTAR,
Secretary.

UPPER PENNS NECK TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John M. Bevis, Albert Straughn, Joseph Sailor, Samuel P. Ward, Dr. David Moore, Amos Morris. P. O. address of all, Penns Neck.

Drainage very poor; consists of open ditches and some tile drains. Refuse buried or carted away. Water is supplied by wells. Slaughter-houses and hog-pens have caused some complaints, but upon notification by the Health Committee the hog-pens have been attended to. The slaughter-house was pronounced a nuisance by the Inspector. The Local Health Committee served written notices on the owner, and also upon the party that slaughtered there to stop slaughtering, and remove the house and clean the place up. They have cleaned up somewhat, but are now slaughtering again.

(Signed), AMOS MORRIS,
Secretary.

UPPER PITTSGROVE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Benjamin Bassett, Pittsgrove; Henry Coombs, Elmer; Micajah B. Cassedy, Monroeville; M. J. Palding, Daretown; J. N. Gray, Pittsgrove.

There is nothing to report this year. There has been no business to come under the advisement of the Board, which organized April last.

(Signed), J. N. GRAY,
Assessor.

SOMERSET COUNTY.

BEDMINSTER TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Ralph Davenport, Pluckemin; Erastus Randall, Bedminster; William Logan, Peapack; E. F. Farrow, Peapack; William P. Sutphen, Bedminster.

The Board has nothing of any note to report. The township has been in a healthy condition. No particular disease has prevailed. The Board have had but one or two complaints of a trivial nature, which were speedily adjusted after notice from the Board.

(Signed), WILLIAM P. SUTPHEN,
Secretary.

BRANCHBURG TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

C. V. D. Corle, Neshanic Station; Adonis Nelson, M.D., Neshanic Station; Jno. N. Van Liew, Neshanic Station; Wm. H. Doliver, South Branch; Theo. Starner, North Branch.

As our township is small and containing no large towns, there is consequently very little of importance to report. Taking it altogether, owing to the fact of its high elevation and that it is both well watered and wooded, I think that we have one of the healthiest townships in the whole State. Outside of the influenza, which swept through here in the spring, there has been comparatively little sickness during the past year. No complaints have been brought to the notice of the Board.

BERNARDS TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Compton, Liberty Corner; William Van Doren, Basking Ridge; Malcom Thompson, Bernardsville.

(Signed), S. R. De Coster,
Secretary.

BRIDGEWATER TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

A. H. Brokaw, A. P. Hunt, M D., Augustine Reger, Benjamin F. Little, William K. Hope. All of Somerville.

The Health Board has been able to carry out its measures in reference to the public health in Somerville and Raritan, but Bound Brook has been the cause of some trouble. The drainage in the southern portion is imperfect, and our Board has done what it could to remedy the condition of the place, but could not accomplish what they desired on account of the Commissioners refusing to carry out the necessary projects. Frequent complaints have come to us which our Board could not remedy.

(Signed), Augustine Reger,
Assessor.

FRANKLIN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

L. J. Suydam, Franklin Park; Joseph Christopher, East Millstone; T. R. Hodge, Bloomington; Farley Fisher, M.D., Middlebush; P. Eugene Nevius, East Millstone.

The inhabitants of this township have enjoyed ordinary health the past year. We have had no epidemic or contagious diseases. The Board of Health has only been called upon once to abate a nuisance caused by the waste of the cattle-pens of the Somerset Distillery Company, which was attended to.

(Signed), P. EUGENE NEVIUS,
Secretary.

HILLSBOROUGH TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George Miller, Somerville; Joseph H. Van Cleef, Hillsborough; Adam Hummer, Millstone; W. H. Merrill, M.D., South Branch.

There has been no special sickness during the year. Our report is similar to that of former years.

(Signed), W. H. MERRILL,
Secretary.

MONTGOMERY TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Thomas Skillman, Skillman; Isaac Williamson, Rocky Hill; Jacob S. Hoagland, Harlingen; William Oppie, Harlingen; Abram B. Mosher, M.D., Griggstown.

The health of the township has been good and no epidemic or contagious disease has been among us. I have visited the entire township this summer, and find everything in as good condition as we could expect. Our slaughter-houses are well kept, and our water-supply is from wells and cisterns, and is generally good.

(Signed), WILLIAM OPPIE,
Secretary.

BOROUGH OF NORTH PLAINFIELD.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Rev. T. Logan Murphy, William E Honeyman, P. M. French, B S Braider, J. H. Carmen, M D., Job Coddington, Inspector. P. O. address of all, Plainfield, N. J.

We still use driven wells as the source of supply, and with few exceptions have excellent water. Our sewage we bottle, but do not hermetically seal, and have it carried away from time to time by odorless excavators. The water and sewerage system, while devoutly to be wished, seems to be a thing of the distant future. The Common Council have just consummated a contract with the Edison Electric Light Company, and the plant will be in operation in a few months. We have one or two slaughter-houses in the borough which are kept clean, the offal being carried away or otherwise disposed of. The capacity of our public school is somewhat overtaxed. We have a code of health ordinances, and have added during the past year a supplement providing for the licensing and regulating of the cleaning of cesspools and privies, in accordance with the act of May 9th, 1889. We have an annual inspection of all premises and compel observation of health ordinances, whenever and wherever we find occupants inclined to transgress, which is not often. We regret that we have not power to control the plumbing arrangements of all dwellings, believing defective plumbing to be a frequent and fruitful source of disease, and earnestly wish that the present laws might be so amended as to vest such power in this and like Local Boards of Health. With the exception of the epidemic of La Grippe, we have enjoyed a very healthy year. Had a number of cases of scarlatina simplex in the spring, and a few isolated cases of diphtheria, though the latter were very fatal. They were all traceable to local causes, and rigid quarantine and prompt burial of those that died, in which we found parents willing to co-operate, prevented anything like an epidemic.

(Signed), J. H. CARMEN, M.D.,
Secretary.

WARREN TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joel Coddington, Martinville; Peter J. Zeglio, M.D., Warrenville; J. J. Lang, Warrenville; Peter Bower, Warrenville; John D. Bornmann, Warrenville.

SUSSEX COUNTY.

ANDOVER TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

G. O. Young, Levi H. Space, Joseph P. Longcor, Dr. J. C. Clark, Green C. Cook. P. O. address of all, Andover.

BYRAM TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John D. Lawrence, Stanhope; Robert Slaght, Stanhope; David Stone, Andover; D. W. Goble, Andover. C. K. Davison, M.D., Stanhope, Inspector.

Two new school-houses were built last year, and three others are needed. We have had no prevalent diseases. Public health laws have been well observed. Our Board of Health has had no complaint before it this year.

(Signed), D. W. Goble,
Assessor.

FRANKFORD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Oscar Northrop, J. Cole Price, Jacob A. Coursen, Dr. Joseph Hedges, George Phillips. P. O. address of all, Branchville.

Water-supply from wells, springs and brooks. Natural drainage is good. No tenement-houses. Excreta deposited in vaults of loose, unmortared masonry. Slaughter-houses are well cared for. No violations of sanitary laws. There have been no prevaling diseases during the year. The health of the township has been unusually good.

(Signed), George Phillips,
Assessor.

GREEN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

D. B. Stackhouse, Andover; William C. Gray, Huntsburgh; G. J. Laing, Tranquility. J. J. Decker, Andover, Health Inspector.

HAMPTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Theo. Harding, Newton; John S Courson, Newton; Andrew J. Williams, Baleville; Moses Ackerson, Halsey.

HARDYSTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Edward Kincaird, Stockholm; Daniel D. Munson, Franklin Furnace; Obadiah Bunn, Hamburg. Horace E. Rude, Hamburg, Assessor.

The action of the Board has been limited to the hearing of a complaint made by the citizens of Hamburg concerning an alleged nuisance, being the neglected and filthy condition of the hog-pens and yards in that village. Notice was immediately served upon the owner, requiring him to have them immediately cleansed and purified and to be kept in a clean and healthy condition, or the Board would take summary measures for the abatement of the same as a public nuisance. This seemed to have the desired effect. It is not necessary to state that the Board of Health is in its infancy in this township, and as this is a healthy portion of the State, it is doubtful if it grows to very great dimensions in the immediate future. The State Board has already taken notice of the prevalence of the virulent type of dysentery which existed during the months of September and October.

(Signed), HORACE E. RUDE,
Assessor.

LAFAYETTE TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Samuel Warbasse, Isaac A. Simmons, William R. Case, Nelson Ackerson. P. O. address of all, Lafayette.

MONTAGUE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joshua Cole, Montague; Joseph L. Hornbeck, Montague; Santford Nearpass, Tri-States, N. Y.; William P. Hornbeck, Montague.

NEWTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Simpson S. Cook, Charles S. Steel, Andrew B. Brickner, George Harden. P. O. address of all, Newton.

SPARTA TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John H. Sutton, Monroe; Joseph T. Dolan, Ogdensburg, Charles H. Beatty, Sparta; John McMickle, Sparta.

We have no report to make, as there has been but little sickness and no contagious diseases. There has been no organization of a Local Board of Health for several years, but in making my round to take the valuation of property, I have inquired into the losses of animals by contagious disease, and have also requested the removal of several nuisances, which have been promptly complied with.

(Signed), JOHN MCMICKLE,
Assessor.

STILLWATER TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Jesse Sherred, Swartswood; Edwin Wintermute, Middleville; Mahlon Budd, Huntsburgh; John S. Opdyke, Stillwater; Aaron C. Hoff, Middleville; C. V. Moore, Stillwater.

There have been no special meetings of the Board the past year. It has been a year of unusual good health. The Assessor, in making inquiry, reports no disease among animals. A few cases of dysentery of a malignant type have occurred, with only one resulting death. Less malarial cases than usual have existed.

(Signed), C. V. MOORE, M.D.

VERNON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William H. Foley, Vernon; Nicholas Farber, Vernon; Stephen C. Wright, McAfee Valley; William Van Winkle, Glenwood; Carlos Allen, M.D.

Our Board has not been called on for any purpose during the past year. Water-supply is wholly by wells and springs. No prevalent diseases of animals. When contagious diseases commence, quarantine is established by public demand.

WALPACK TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Emmet H. Bell, Walpack Centre; John B. Fuller, Flatbrookville; Elijah Garriss, Flatbrookville; Joseph W. Bunnell, Walpack Centre.

WANTAGE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Jonathan Coykendall, Jacob Swartswout, S. M. Parcell, H. D. Vangaesbeek, M.D.

Water-supply is from wells and springs, and malarial fevers, formerly common, are now rare. There has been no prevailing disease, with the exception of La Grippe, which visited us in the spring. More among the aged have died during the last year than any previous one to my knowledge; otherwise the general health of the township has been exceptionally good. Slaughter-houses are kept clean and properly disinfected. School-houses are nearly all in good repair. There seems but little for our Board to do, except to have a general oversight. There have been but one or two complaints during the whole year.

N. HALL,
Assessor.

UNION COUNTY.

CLARK TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John A. Haliday, Marx Riefel, Andrew Gibson, Dr. W. E. Cladek, F. P. Bullman. P. O. address of all, Rahway.

ELIZABETH.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John W. Whelan, President; E. L. P. Coleman, William A. M. Mack, M D., E. V. Grier, William Bernie, John L. Donohue. E. J. Putnam, Inspector. P O address of all, Elizabeth.

There is a prospect of having the bed of the Elizabeth river cleaned by the erection of tide-water gates at two of the bridges. As the river is used as a sewer it becomes foul and offensive in low water, and sufficient water can be retained by these gates so that, after the tide is out, the bed of the stream may be flushed, and thus a great portion of the filth that accumulates on the banks by the gradual returning of the water, will be swept away. The Board have also continually urged the City Council to take steps toward establishing a public crematory to get rid of garbage, &c. The Tower Roofing Factory, at Elizabethport, has been declared a nuisance, and application made to the Chancellor for an injunction.

(Signed), E. J. PUTNAM,
Inspector.

FANWOOD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George Kyte, Fanwood; L. W. Miller, Scotch Plains; William H. Terry, Plainfield; John Robison, Scotch Plains; F. W. Wescott, M D., Scotch Plains.

We have had no prevalent diseases during the past year. We have no slaughter-house in the township. The Board of Health hold their meeting on the first Thursday of each month, to hear complaints and transact such business as may come before them.

F. W. WESCOTT, M.D.

LINDEN TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William H. Donaldson, Linden; Benjamin W. Tucker, Linden; George A. Benwell, Linden; Thomas M. Marsh, Tremly; John H. Metz, Tremly; Philip Shangle, Roselle; James Hope, Roselle; John F. Spinning, Elizabeth; J. C. Jepson, Linden, Assessor.

NEW PROVIDENCE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John M. Badgley, New Providence; Maxwell F. Drake, Scotch Plains; Henry F. Barrow, New Providence. A. M. Corey, M. D., New Providence, Health Inspector.

PLAINFIELD CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

George W. Rockfellow, President; Lemuel W. Serrell, Stephen A. Ginna, George W. Endicott, M.D., Oliver B. Leonard, Secretary. P. O. address of all, Plainfield.

The attention of the Board of Health the past year has been mainly directed toward the prevention of causes that tend to create disease. Personal inspections have been kept up so as to avoid the accumulation of deleterious substances. Four hundred and five visitations have been made from house to house, and the Inspector has issued 136 notices for removal of nuisances. Householders have more generally conformed to the rules of the Board in the disposal of their kitchen garbage. Regularly-licensed collectors remove all such refuse matters from the premises for moderate pay, and cartmen carry off ashes and rubbish to a remote dumping-ground approved by the Board. A new ordinance was adopted by the Board, in the spring, regulating the business of cleaning out sinks, cesspools and privy-vaults. Owing to lack of sewers and increased number of dwelling-houses, these underground receptacles require watchful inspection. Permits have been issued in the past twelve months for emptying 665 cesspools and 476 vaults.

The public supply of water so much expected the last year has not yet been realized. Its postponement to a future day, it is hoped, will result in measures being taken to introduce a system of sewers at the same time the water-mains are laid. In the collection and arrangement of vital statistics the Board has been especially careful, all returns being accurately compiled. The general state of health has been very good. There has not occurred any epidemic, and there have been but few deaths from contagious diseases. The principal causes of death have been, cholera infantum, 21 cases; paralysis, 15; consumption, 25; pneumonia, 20, and 18 of heart disease.

It is a pleasure for the Board to be able to report the city of Plainfield in such a good sanitary condition at the close of this year, and to record the fact that its citizens have been exempt from any troublesome nuisances or serious sickness.

(Signed), OLIVER B. LEONARD,
Secretary.

RAHWAY CITY.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

E. B. Silvers, M.D., Walter E. Cladek, M.D., John M. Tufts, Moses H. Acken. Charles H. Lambert, Health Inspector. P. O. address of all, Rahway.

Our water-supply is taken from the Rahway river; the mains are blown out twice a year, in the spring and fall, through the fire hydrants. During the early part of the year it was feared that sewage was received into the river above the water-works, on account of the prevalence of typhoid fever of a mild type. Consequently, two analyses were had of the water, one in behalf of the Water Commissioners and one in behalf of citizens, taken from a faucet in a private residence. Prof. Linsley, after a thorough examination of the water provided by the water company, concluded that it was free from any typhoid or other pathogenic bacteria.

The chemist describes the result of the examination as follows: "The sample is an exceedingly pure, soft water, very free from organic matter liable to chemical or putrefactive changes, and hence prejudicial to the sanitary condition of the water. In the foregoing respects the sample compares favorably with the water-supply of the most favored cities in the United States or Europe."

A great deal of trouble is experienced in the collection of vital statistics, at least twenty-five per cent. of the births not being reported.

(Signed), CHARLES H. LAMBERT,
Secretary.

SPRINGFIELD TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Abner P. Stiles, T. G. Cusack, James Farrow, Albert P. Carter. J. J. Hoff, Inspector. All of Springfield, N. J.

There have been no prevailing diseases in the township during the year. There has been a marked improvement in roads. The Local Board of Health has done a good work during the past summer in causing the cleaning of a large number of vaults, which had been standing uncleaned for years, and had become a menace to the health of the community. In some cases these were located within twenty feet of a well. These latter have been removed to a safe distance and concreted vaults have been constructed. The people have taken kindly to the demands of the Board, and have generally set about the work immediately upon receiving notice from the Board, and in no case has the Board been compelled to have the work done. The Board have in contemplation some drainage on a large scale, that would greatly benefit the community and result in reclaiming a good many acres of what is termed waste-land, and would also add to the healthfulness of the community.

(Signed), J. J. Hoff,
Inspector.

SUMMIT TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Parker W. Page, J. H. Pheasant, J. W. Hughes, J. A. Hicks. Dr. William H. Risk, Health Inspector; J. J. Lane, Second Health Inspector. P. O. address of all, Summit.

No prevalent diseases during the year. Public health good. Nothing special to report.

UNION TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

James B. Woodruff, Roselle; John Leonard, Union; William Allen, Hilton; D. Hobert Sayre, Union.

No disease has been epidemic during the past year. There has been but one complaint (defective house-drainage), which the parties, on being notified, at once abated.

D. Hobert Sayre,
Secretary.

WESTFIELD TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Joseph R. Connolly, Charles D. Endicott, Addison S. Clark, Joseph B. Harrison, John M. C. Marsh. Joseph B. Harrison, Health Inspector. All of Westfield.

This Board has held regularly monthly meetings during the year. A number of minor cases of nuisance have been abated. No epidemics have existed in our township.

JOHN M. C. MARSH,
Secretary.

WARREN COUNTY.

BELVIDERE.

(Names not given.)

There is nothing to report from our Board of Health. There has been only one informal meeting, and the only business done was approving the ground for a new cemetery.

(Signed), J. M. SNYDER,
Clerk.

FRELINGHUYSEN TOWNSHIP.

NAMES AND POST OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Stickles, Johnsonsburg; Levi C. Howell, Johnsonsburg; John V. Allen, Pauling; Frederick Rorback, M.D., Johnsonsburg; N. D. Vasbinder, Johnsonsburg, Assessor.

GREENWICH TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

R. K. Stone, Stewartsville; A. P. Kinney, Stewartsville; R. J. Smith, Bloomsbury; E. E. B. Beatty, M.D., Stewartsville; William Sherrer, Bloomsbury, Secretary.

HACKETTSTOWN TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Alden E. Martin, M.D., William F. Shields, Thomas Nolan. P. O. address of all, Hackettstown.

There is nothing of importance to write about this year, as everything remains the same as at the time of our last report. There are vacancies in our Health Board which our Common Council has neglected to fill.

(Signed), THOMAS NOLAN,
Clerk.

HARDWICK TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Isaac S. Voss, Marksboro; Hiram Frace, Blairstown; David C. Neuman, Blairstown; Peter S. Savercool, Stillwater.

HARMONY TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Roderic Vannatta, Roxbury; J. S. De Witt, M.D., Harmony; Ralph Rush, Montana; A. K. Cole, Montana.

Houses are supplied from cisterns and springs. There were twelve cases of typhoid fever from April to October, three of which resulted in death. The hog cholera is prevailing to some extent at this time. Vaccination is much neglected. The general health in the township has been good.

(Signed), J. S. DE WITT, M.D.

INDEPENDENCE TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR

A. J. Ayers, Hackettstown; J. F. Johnson, Hackettstown; A D. Simanton, Vienna; C. H. Albertson, Phillipsburg.

KNOWLTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Samuel S. Bogart, Delaware Station; W. B. Moore, Columbia; William McCracken, Polkville; Ephraim Dietrich, Columbia; Robert Bond, M.D., Knowlton.

Malaria is not frequent in this locality. Cesspools are generally not cemented. There have been no prevalent diseases this year. There is an inspection of the school and school-houses by the Health Inspector. The Board of Health in this township is very careful to regard all the laws pertaining to the health of the community. All nuisances are abated as soon as reported. Arrangements are made so that we can quarantine any case or cases as soon as reported. The Health Inspector, by order of the Board, is now finding out by school districts how many are not vaccinated, preparatory to recommending a general vaccination. Our Board is better organized and more interest is taken than ever before. We have abated several nuisances without a great deal of trouble.

(Signed), ROBERT BOND, M.D.,
Inspector.

LOPATCONG TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Edwin H. Paulus, Benjamin Swarts, Dr. I. Barbour, Robert D. Melroy, George J. De Witt. All of Phillipsburg.

MANSFIELD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

Nicholas Martenis, Port Murray; Robert M. Thomas, Port Murray; William H. Thompson, Beattystown; James Beatty, Stephensburg.

OXFORD TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. H. Hildebrant, Bridgeville; William K Miller, Oxford; George A. Wildrick, Oxford; Charles Wiseburn, Oxford; L. B. Hoagland, M.D., Oxford.

There is nothing of especial importance to report. Have had a mild epidemic of whooping-cough, with four or five deaths from complication. The Board has held two meetings and has been prompt in causing the abatement of any nuisance which came to its notice.

(Signed), L. B. HOAGLAND,
Secretary.

PAHAQUARRY TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

John Zimmerman, Calno; Ambrose Van Campin, Millbrook; Adam Gransue, Dunfield; Jason K. Hill, Mill Brook.

POHATCONG TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

J. A. Boyer, Finesville; Chas. Shaner, Springtown; George W. Snyder, Riegelsville; David Frace, Shimers. J. C. Allbright, M.D., Springtown, Health Inspector.

Water is supplied by wells and cisterns. Cesspools are usually walled and of good depth. No epidemic diseases reported.

(Signed), JACOB O. BOYER,
Secretary.

WASHINGTON TOWNSHIP.

NAMES AND POST-OFFICE ADDRESS OF MEMBERS AND HEALTH INSPECTOR.

William Rush, Washington; William Miller, Changewater; William Apgar, Port Colden; John P. Castner, Changewater; Peter Weller, Asbury. F. M. Cook, M.D., Washington, Health Inspector.

CIRCULARS AND LAWS.

CIRCULARS.

The Board, since its organization, has printed and published seventy-five circulars, treating in a concise way of the most important sanitary methods, and directing as to the application of laws and the best mode of conserving the public health. A few of these were of special or temporary importance, and have not been reprinted. About forty of them, however, are of permanent interest, and, in addition to single supply, are now furnished to Boards of Health in bound form. They furnish a convenient manual for reference and guidance as to most sanitary questions and regulations. The additional circulars for this year are:

Circular LXXI.—As to Sanitary Inspection of Hotels, &c., at Resorts.

Circular LXXII.—On Vital Statistics and their Uses.

Circular LXXIII.—Cities and their Sanitary Needs.

Circular LXXIV.—October Circular (to accompany annual report blank).

Circular LXXV.—Health Inspectors' Guide.

Of these, Circular LXXII. is to be found in connection with the Report on Vital Statistics, on page 290.

Circular LXXIII. is a reprint, with some changes, from a portion of an article to be found in the last report, pages 21 to 35, and so is not here reprinted.

Circular LXXV. forms a separate article in this report. See pages 33–97.

The other two, Circulars LXXI. and LXXIV., are here given.

A list of all circulars printed by the Board is found in the sixth and eleventh reports, as far as those dates.

Appended is a list of the circulars at present kept in stock for Local Boards.

LIST OF CIRCULARS—1891.

Circular VII.—Protection to Bathers.

Circular XXVII.—Sanitary Instruction and Training in Schools. (School Circular, No. 1.)

Circular XXVIII.—School and Health Circular, No. 2, for Parents, Guardians, Children, Teachers and Trustees.

Circular XXXVII.—School and Health Circular, No. 3.

Circular XXIX.—Charitable and Penal Institutions.

Circular XXX.—Sanitary Survey and Topography.

Circular XXXIX.—To Local Boards of Health.

Circular XL.—Health Counsels for Working People. (Industrial Circular, No. 1.)

Circular XLI.—Health Counsels for Working People. (Industrial Circular, No. 2.)

Circular XLII.—As to Petroleum, Kerosene, &c.

Circular XLIV.—How to Prevent the Spread of Small-pox, Scarlet Fever, Diphtheria and all Communicable Diseases. As to Vaccination.

Circular XLV.—Cholera.

Circular XLVII.—Prevention of Serious Injuries to the Mind, the Eyes, the Ears.

Circular L.—The Contagious Diseases of Animals.

Circular LIII.—Pure Drinking-Water. How to Secure it.

Circular LVII.—To the Physicians of the State.

Circular LIX.—Laws and Regulations Relating to the Adulteration of Foods or Drugs, and as to Petroleum.

Circular LX.—Laws Relating to Public Health.

Circular LXI.—Care of Household Wastes.

Circular LXII.—Drainage for Health.

Circular LXIII.—Farmers' Homes and their Perils.

Circular LXIV.—Disinfectants, and How to Use Them.

Circular LXV.—Construction, Plumbing, Ventilation and Drainage of Buildings and Outside Connections thereof, as Regulated by Local Boards of Health.

Circular LXVI.—Marriage, Birth and Death Returns. Duties of all Concerned as to Vital Statistics.

Circular LXVII.—To Funeral Directors and all Having in Charge the Care and Burial of the Dead.

Circular LXVIII.—To Local Boards. (Spring Circular.)

Circular LXIX.—Meat, Poultry, Game and Fish as Foods, and How to judge of their Quality.

Circular LXX.—Occasional Bulletin Series—Laws, Health Inspectors, &c.

Circular LXXI.—As to Sanitary Inspection of Hotels, &c., at Resorts.

Circular LXXII.—Vital Statistics—Their Uses.

Circular LXXIII.—Cities—Their Needs and their Regulations for Promoting the Health of their Inhabitants.

Circular LXXIV.—October Circular of Directions as to Annual Report of Local Boards.

(Also Circulars XIX., LII.-LV. and LXXV. in small book form.)

CIRCULAR LXXI.

OF THE

STATE BOARD OF HEALTH OF NEW JERSEY.

AS TO SANITARY INSPECTION OF HOTELS, ETC., AT RESORTS.

The State Board of Health of New Jersey has from time to time given attention to the condition of those localities which are largely frequented by visitors seeking recreation or benefit to health. This is no less a public policy than it is a sanitary interest. The relative position of the State, and its wonderful adaptation for health resorts, point to this as a source of revenue, and as a means of social and industrial development of the highest importance. The whole line of available locality, from Cape May to Sandy Hook, and such inland places as Vineland, Lakewood, Lake Hopatcong and Schooley's Mountain, together with such elevated ranges as are seen from High Point, in Sussex county, and in the region near the Water Gap, in Warren county, are but indications of unlimited supply in these directions.

Because of these natural advantages, our attention has been turned to the need of supplementing nature by intelligent sanitary art, instead of, as too often happens, thwarting nature by artificial additions. Hence, the questions of water-supply, drainage, sewerage, &c., have all along received attention. But each year has more and more revealed the fact that the chief dangers to health are to be found within buildings, or in their close surroundings.

The changing character of occupancy; the rapid filling and emptying; the imperfect housekeeping, and the rapid accumulation of waste products and foul liquids, tend to saturate soil, to quickly multiply the gases of decay, and so to imperil health.

To this is added a greater average than usual of bad plumbing and of other evils, which result from hasty construction. We could adduce instance after instance where, despite a fairly good condition of a town, the condition of single houses or hotels has been the cause of individual cases of serious sickness, or of more general outbreaks. For the public safety and the welfare of the State, this must not be. We cannot be satisfied with as good a condition as the resorts of other States, but must be able to claim special sanitary security. Already, at one of our resorts, the visitor can find at the Health Office each spring a true record of the sanitary condition of each house.

To aid in this good work, we are now in a more formal and thorough way carrying on an inspection at health resorts of buildings which receive guests.

It is conducted to protect the health of the people, and also for the benefit of the owner or occupant. If defects are found, they are reported only to him, and the report is of the nature of a confidential communication, unless persistence in neglect renders exposure necessary. There will be no intrusive fault-finding or undue particularity, but only that right of inspection given us by law in the interest of owner, occupant and guests. We had only just started this work when a leading New York journal made this comment:

"The New Jersey State Board of Health has undertaken the important work of investigating the sanitary condition of premises where persons lodge or eat. In the nature of things, this great task will be only imperfectly accomplished. Sources of disease will be overlooked and elements of danger underestimated, and possibly ignorance or over-solicitude may do some injustice; but if carried through with only average intelligence and energy, this extensive exploration into the hiding-places of contagion must produce results of great value. * * * The relation between filth and disease is pretty well understood, in a broad way, even by persons of moderate sagacity; but because nobody really expects to belong to the minority in whose systems the busy germs find lodgment, and because it costs a little money and time to provide against a remote contingency, the demons that riot on corruption live and flourish. Everybody admits the theory that pure air and water and the comprehensive cleanliness that they imply are a good investment, and would acknowledge, for instance, that one cent out of every dollar that the recent epidemic of yellow fever in Florida cost, directly and indirectly, would have made the State safe against its assault; but when it comes to a question of individual effort, almost everybody is willing to let his neighbors put the theory into practice, and, if his neighbors refuse, to shift the responsibility to official shoulders.

"It is, however, a thing to be grateful for that in most communities a majority of the people have been educated up to the point of willingness to be taxed for the support of a Health Board. The investigation just ordered in New Jersey will most certainly supply to the people of that State new arguments for the existence of such a body, and there are few Commonwealths in which work of that character would be followed with so much interest by their neighbors. A special feature of the undertaking will be a rigid examination of the sanitary conditions prevailing at the summer resorts which fringe the sea-coast from New York to Cape May. A better advertisement could not be devised by selfish shrewdness than this proclamation of a sound public policy."

We believe it will prove more than a policy, both for the proprietors and the people, and so ask the most hearty co-operation of all concerned.

1890. E. M. HUNT, M.D., *Sec'y.*

For Circular LXXII., see introduction to Vital Statistics.

Circular LXXIII.—Cities—Their Needs and their Regulations for Promoting the Health of their Inhabitants.

As much of this circular was in the last report, it is not reprinted, but can be had on application. It is important for all cities.

Circular LXXIV.—See pages 182–184.

Health Boards and Health Officers need to have frequent reference to the various circulars gratuitously furnished by the Board, and they also serve as manuals for institutions, schools, and private families. They have been from time to time reviewed, so as to express the latest information on the subject with which they deal. They now furnish a permanent collection of lasting value to the State.

LAWS.

In addition to the full text of some of the more important laws, as given in Circulars LX., LXVI., LXII., LIX., LXV., at the close of Circular LX. is a list of the principal laws bearing on public health as passed from year to year. While it is not possible to give each general law, or clause thereof bearing on health, these are the chief, and are valuable for reference. We call especial attention to the fact that by the act, Chapter CCLVI., Laws of 1887, the right to regulate the cleansing of cesspools, out-houses, &c., was made to include all Local Boards of Health. The chief health laws of the Legislature of 1890 were as follows:

LAWS OF 1890.

Chapter XXXVI.—A supplement to an act entitled "An act to prevent the adulteration of food or drugs," approved March 25th, 1881, and the several supplements thereto.

Chapter XLIX.—An act relative to the cleaning of streets and the removal of ashes and garbage in cities of this State.

Chapter LXII.—A supplement to an act entitled "An act to authorize the incorporation of rural cemetery associations and regulate cemeteries." Approved April 9th, 1875.

Chapter LXV.—A supplement to an act entitled "An act to authorize the construction of drains and sewers upon and across private property, upon suitable compensation to the owner or owners thereof, in incorporated towns in this State." Approved March 6th, 1886.

Chapter LXXVII.—An act to provide for drainage and sewerage in townships.

Chapter CXXXI.—An act to provide for drainage and sewerage in cities of this State.

Chapter CXXXVI.—A further supplement to an act entitled "An act to authorize cities to construct sewers and drains, and to provide for the payment of the cost thereof." Approved March 8th, 1882.

Chapter CLII.—An act in relation to the power and authority of aqueduct boards or other water boards, having the control of the water-supply in the cities of this State, giving such boards power to contract for and construct works, to purchase or condemn lands, waters and rights, and to use for such purposes certain funds in their possession.

Chapter CLX.—An act to provide for sewerage and drainage in incorporated townships in which there is a public water-supply.

Chapter CXC.—An act to regulate the practice of medicine and surgery, to license physicians and surgeons, and to punish persons violating the provisions thereof.

Chapter CCLV.—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 31st, 1887.

Chapter CCLIX.—A supplement to the act entitled "An act concerning marriages, births and death" (Revision). Approved March 27th, 1874.

Chapter CCLXXXIII.—A further supplement to an act entitled "An act relating to the improvement of streets and the construction of sewers in the cities of this State." Passed March 27th, 1882.

Chapter CCXC.—An act to provide for the drainage of lands.

MEDICAL REGISTRY.

Several years since a law was passed which required any physician settling in this State for medical practice to file a copy of his diploma in the office of the County Clerk of the county in which he settled. Iu addition to this, in case of twenty years' practice in any one locality, a certificate setting forth the fact could be filed, and this would have the same recognition as a diploma from a chartered medical college. From time to time this Board has urged the inadequacy of this provision. Year after year the publication of these entries in the offices of the County Clerks showed the great increase of those who filed diplomas from colleges of doubtful standing. So, in our last report, we repeated what had often before been said in substance, that "the State really owes it to itself somehow to protect its citizens more fully from the imperfect knowledge and lack of skill of many who, although graduated from inferior institutions, are not fitted for their work."

The last Legislature enacted a Medical Practice act, which it is hoped may prove of service in the interests of public health, and help to protect the people from those dangers to health which always come from medical and surgical incompetency.

The effect of the law is to repeal former laws as to medical registry, and to substitute in its place a record of the licenses given by the Board of Medical Examiners, in the office of each County Clerk in each county in the State.

The following is the list of Medical Examiners as appointed June, 1890:

H. C. Hendry, M.D., Newark; Henry G. Wagoner, M.D., Somerville; A. H. Worthington, M.D., Trenton; Wm. L. Newell, M.D., Millville; Eugene Tiesler, M.D., Orange; Wm. Perry Watson, M.D., Jersey City; D. R. Atwell, M.D., Hoboken; Geo. W. Brown, M.D., Long Branch; Armin Eubelacker, M.D., Morristown.

As the law took effect July 1st, 1890, and as examination showed that its passage had led to many county entries on the part of non-residents, it was not thought necessary to print this year the record for the few months since our last report. We have, however, procured instead, through city and township authorities, as complete a list as possible of the practicing physicians of the State, with post-office address, which is on file at the office of the Board of Health.

REPORT

OF THE

BUREAU OF VITAL STATISTICS

OF THE

STATE OF NEW JERSEY

FOR THE

Statistical Year from July 1st, 1889, to July 1st, 1890.

WITH CLIMATOLOGY, LOCALITY, POPULATION,
VITAL RECORDS, ETC.

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 past few years have witnessed a steady increase in the consideration given to vital statistics. Apart from their sanitary relation, they have great bearing on social problems, as well as on legal questions, while their application to matters relating to sanitary administration is more and more manifest.

Human statistics very properly take the lead of all other statistics, for they concern the welfare of each individual and of all individuals as related to each other. In addition to the valuable aid of former authorities, the recent work of Dr. Newsholme, of Brighton, the studies of Dr. Ogle, the Registrar-General for England and Wales, and the Cartwright lectures recently given by Surgeon J. S. Billings, of the United States Army, are especially valuable. In fact, the recognition by the United States Government, in the eleventh census, of the great importance of the collection and study of facts relating to the population, as to births, marriages and deaths, certifies the settled conviction as to their necessity. A sanitary engineer recently said that their collection, or non-collection and study, helps to mark the difference between progressive civilization and national decadence. What used to be called general experience or opinion must give way to classified facts and deductions therefrom. If there are many sources of fallacy, there are more sources of correctness. "I was," says Faraday, "in my youth, of a speculative or imaginative turn of mind, but facts they saved me." In order to answer some inquiries, that are natural even to professional men, or to any who have only vague ideas of the importance of these statistics, we here insert a recent circular on the subject issued by this Board.

CIRCULAR LXXII.

OF THE

NEW JERSEY STATE BOARD OF HEALTH.

VITAL STATISTICS.

The design of this circular is to present a few of the reasons for the collection and arrangement of vital statistics, and to draw attention to methods and results. It is desirable that Local Boards and those in charge of these statistics, or who enact or execute laws as to them, should appreciate their value and their uses.

I.—What are Vital Statistics?

They are the collection and record of facts relating to the population of a country, and especially as to marriages, births, deaths, diseases, age, nationality and occupation. The population is the most valuable of the *material resources* of a State. The vital events which concern it are more important than any other statistics. "Population is the statistical element par excellence; it necessarily rules all the others, since it relates above all to the people and the appreciation of their welfare and their wants." Vital statistics furnish one of the chief accounts which the State keeps of its population. Eliot, the American statistician, in his definition of statistics, puts first and foremost, "facts relating to population, deaths, births and marriages; health, disease, and duration of life."

II.—What are the Habits of other Countries and States as to them?

There is a full agreement as to their importance, and in most civilized nations their collection is among the most prominent duties of statistical bureaus. In Great Britian, Germany and France large sums of money are devoted to their collection and study. In preparation of the coming census of the United States (June, 1890), extended arrangements have been made for their compilation and study. At the present time two clerks, detailed from Washington, are busy in our own office, obtaining facts from the records of this

State, and will be employed some months in so doing. Several of our States have Departments of Vital Statistics, either connected with the office of Secretary of State or with State Boards of Health, and the records are greatly valued by the governing powers. Especial reference may be had to the State Vital Statistics of Massachusetts, Michigan, New Hampshire, Rhode Island, &c. Besides this, many of the larger cities have their Bureau of Vital Statistics, the value of which depends largely upon the larger collections and more extended studies made by their respective States.

III.—What is the Testimony of Authorities as to them?

We shall quote only a few of the more prominent authorities. Dr. Farr, the Registrar-General for England and Wales, speaking of one class of such records, says: "The deaths and causes of death are scientific facts which admit of numerical analysis. Science has nothing to offer more inviting than a study of the influence of civilization, occupation, locality, seasons and other physical agencies, either in generating disease or producing death, or in improving the public health." After twenty-one years of registry he says: "We have now before us the results of observations in a certain class of phenomena. They are as valuable as the experimental philosopher could have deduced from his experiments if he had had the power to expose the population to great vicissitudes of heat and cold, of dampness and dryness, to changes incidental to differences in the price of food; to air and water in different degrees of impurity, and to destructive epidemics."

Beneké, the statistician of the German government, has said: "Mortality statistics are the basis of public as well as private care of health. Every step forward in this direction is a gain to human working-power and welfare." Our American statist, De Bow, generalized the accepted fact when he said: "The experience of all countries preserving such records shows a marked amelioration of society, diminution of disease and extension of the average period of human life."

So vital is this interest that at not infrequent intervals since 1853 the great powers have combined in Statistical Congresses, and their deliberations have commanded the attention of all governments. The Austrian Minister of Commerce has well said: "Statistics are no longer viewed as a mere theoretical science for the gratification of the curiosity of the learned, since they subserve the practical ends of political society and lend service to administration as well in determining the value of existing institutions and laws, as in weighing measures not yet carried out." (Toggenburg.)

In this department of statesmanship vital statistics has always commanded large attention, and never more than in those later studies which have shown so important relations to the public health. Indeed, the originator of the International Statistical Congress, and the most distinguished of statisticians, is M. Quetelet, of Brussels, whose labors had primary reference to vital statistics.

In the start of the collection of vital statistics in England, about forty years since, the Royal College of Physicians, the Royal College of Surgeons and the College of Apothecaries issued a circular, and through Sir Henry Halford, Sir Astley Cooper and J. Hingeston as presiding officers, over their own signatures, and by authority of these bodies, "entreat all authorized practitioners through the country to follow our example and adopt the same practice, and so assist in establishing a better registration in future throughout England."

Recently Dr. J. S. Billings, Surgeon of the U. S. Army, and in charge under the Census Department of vital statistics for the eleventh census, has, in lectures under the Newark Cartwright Foundation and before the Medical Department of Columbia College, New York, fully enforced and illustrated the importance of these vital, mortuary returns.

It ought to be quite sufficient that the students of vital and social conditions, who have based their studies on such methods, have established for themselves the fullest recognition, and have become thereby indispensable to the nationalities in which they are citizens. The names of Finlaison, Farr, Graham, Quetelet, Bertillon, Berg, Beneké, Walker, Snow, Billings and many others are not the names of statistical dreamers or visionary experts, but of men whose services their respective governments have gladly commanded in the interests of the population.

Dr. Bowditch, of Boston, eminent as a physician and a sanitarian, speaks of the adoption of the numerical method as marking the epoch of the introduction of the sanitary art, which is largely dependent upon this method of studying the prevention of disease.

If any of the statisticians could by any possibility be accused of infatuation in their chosen pursuit, that cannot be said of those students of sanitation such as Varrentrap, Simon, Buchanan, Russell, Sir Edwin Chadwick and many others, who, as practical administrative officers, have recognized these as among the finger-boards directing to practical sanitary measures.

We have yet to find or hear of a single authority in matters relating to the care of public health who does not regard the collection, arrangement and study of vital statistics as essential.

IV.—What Evidences are there of their Importance as Related to Health Administration and the Interests of Public Health?

Dr. Edmund Parkes, the leading sanitary author of England, shows that "the attention now paid to public health is in a large degree owing to the collection of the statistics of births and deaths, and the causes of death which have been collected in England for the last thirty-eight years. It may truly be said, indeed, that not only all Europe, but gradually the entire world has been influenced by the work."

Its direct practical bearing is thus stated by Dr. Elisha Harris, the New York statist:

"The practical relations of well-kept and complete records of mortality to the correct estimation of sanitary experience, and to the most essential questions connected with the causation and prevention of diseases and premature death, are so important that sanitary authorities, and the wise and effectual application of public health measures, demand that the mortality registration shall be both complete and accurate."

We thus in shorter or longer periods obtain "the fact that the death-rate of living people fluctuates from eleven to forty, fifty, sixty and eighty per thousand each year in different places, the fluctuations being connected with the locality, the domestic, the personal and certain avoidable vital conditions of the population which present these variations in excess of a minimum rate of mortality."

The importance of having the birth-rate, in order to know the significance of the death-rate, is apparent from the fact that we must know the age of the material with which death is dealing. A mortality of 30 to 1,000 among adults is quite different in significance from what it is among children.

It is also to be borne in mind that the discovery by Dr. Snow, of London, as to the relation of water-supply to cholera and that as to the dependency of typhoid fever on fecal contaminations were directly the result of the statistical method of inquiry. The consequence has been, as to the more general diseases, that, "in many cases, those districts which the statistical returns showed to be in the worst conditions have come to be the best," just because the exhibit of figures and facts aroused the local authorities to action.

"It is not too much to say that modern sanitary science owes its existence to the registration of deaths and the localization thereby of insanitary conditions."—*Mass. Rep., 1877.* Dr. Bowditch, in an analysis of 45,000 cases of consumption, has been able to show a very close connection between soil dampness and the prevalence of that malady. These are but illustrations of series of facts which are being tabulated and arranged by close observers as carefully as are the statistics which aid in the study. Political economy and industrial interests no longer need to be persuaded that such studies are within the range and the duty of statesmen.

Says another authority: "One of the first great objects of sanitary organization should be to watch the death-rate; to watch it not only over a city or parish, but in detail; to watch it with due regard to difference of sex, age and circumstances; to watch it from month to month, and even from week to week; to watch it as affected by different diseases, and particularly what are termed epidemic diseases, and such diseases as we believe to be in a great degree preventable; and this done, to make known the result from time to time to those who are chiefly concerned in sanitary evils and their removal, so as effectually to bring home the immense significance of the facts taught by these figures."

Spencer Wells well expresses it, when, in his recent Hunterian oration before the Royal College of Surgeons, he says: "The knowledge gained by the statistical work of Dr. Farr, and since carried on by Dr. Ogle, at the General Register Office, has led to sanitary legislation, and sanitary work has been followed by a lower general death-rate and smaller mortality in single forms of disease, and especially in those places—the great towns—where sanitation has been most active."

Dr. H. B. Baker, speaking of the evidence from statistics in his own State, says: "The record of the great saving of human life and health in Michigan in recent years is one to which, it seems to me, the State and Local Boards of Health can justly 'point with pride.' It is a record of the saving of over one hundred lives per year from small-pox, four hundred lives per year saved from death by scarlet fever, and nearly six hundred lives per year saved from death by diphtheria—an aggregate of eleven hundred lives per year, or three lives per day saved from these three diseases! This is a record which we ask to have examined, and which we are willing to have compared with that of the man who 'made two blades of grass grow where only one grew before.'"

It is indeed only by such records that we know the actual results of such outbreaks of fever as that at Plymouth, or the effect of such a visitation as that of influenza, on the health of the population, and, what is more important, the effect of those local conditions which cause increase and fatality in the more ordinary diseases.

In our own State we may point to the analysis of results as contained in twelve reports of the Medical Bureau of Vital Statistics, to the use made of them in comments on the prevalence of special diseases, and to such articles as that on Consumption as a Preventable Disease in the fifth report, to the article on Water-Supply from the Passaic River, as illustrated by statistics in the eleventh report, and to that on the Perils of Population in the twelfth report. Also, see Circular LVII., to the Physicians of the State, as to Typhoid Fever and Diphtheria. Facts derived from the State reports as to Vital Statistics are known to have had important influence upon sanitary progress in the State.

V.— What has been the Legislation of the State in regard to Vital Statistics?

"A law in regard to marriages was passed in 1795, and an act for the registry of births and deaths in 1799." A law passed in 1848 provided that the Secretary of State shall have general supervision of registry of marriages, births and deaths in the State, and of the records obtained by the Clerks and Assessors of the townships and cities of the State, and that he shall prepare from these returns such tabular results as will render them of practical utility. The system was regarded as incomplete by those in charge of it, returns being made of less than fifty per cent. of the cases, and none at all from many townships. Dr. J. L. Bodine made reports as to it, to the State Medical Society of New Jersey, and also to the New Jersey Sanitary Association, as quoted from in the ninth report of this Board, and urged such changes in the law as would secure returns which would be available for sanitary purposes, since he regarded them as, when rightly collected and studied, "the basis of all sanitary reform." In this he acted as chairman of committees representing the State Medical Society and the New Jersey Sanitary Association.

In 1878 a law was passed which formed a Bureau of Vital Statistics under the charge of the Secretary of State, and with a Medical Superintendent of Vital Statistics appointed by him. The law in its more essential particulars was the same as that now in operation, except that in accord with his judgment and approval, all of it is now under the direction of the State Board of Health, with the same Medical Superintendent and Registrar as have been in charge for many years. The attention of all Boards, and of all those concerned in the collection and return of these statistics is especially called to Circular LXVI., and the law and directions therein contained. That portion of the section of the law of 1888 relating to the use made of these returns reads as follow:

"The said State Board shall also constitute a State Bureau of Vital Statistics, who shall, as such Board, cause to be made such tabular classification, and such index and transcription of the vital facts shown by the certificates of marriages, births and deaths now by law returned to the Secretary of State, as may be useful to the said Board or to the officers thereof in preparing for diffusion among the people of the State such facts as may bear upon public health."

An examination of the entire law shows how definite and extended is the work required to be executed under it.

By another section, the Secretary of the Board is made the Medical Superintendent of Vital Statistics, and under the direction of the Board deduces from these returns, as transcribed, such tables and results relating to public health as commend themselves to the approval of the Board. It greatly facilitates office work if there is punctuality in the transmittal of these returns from City Clerks, Registrars of Vital Statistics and Assessors of townships throughout the State.

VI.—In what respect are Vital Statistics important as Legal Statistics?

While one object of the collection as recognized in the law of 1848, was to secure a record of deaths and the causes of deaths, in the present law this collection is made most prominent and essential as relating to public health, since in the last 25 years their indispensable necessity as a part of health administration has been fully accepted. Hence the guiding law only speaks of them a Vital Statistics, yet incidentally they are of great value in legal evidence as to marriage, birth, death, age, pensions, life insurance and as establishing rights of property. Until two years since they were available for this purpose through the department of the Secretary of State; since then all searches are made and certificates given through this Bureau, all receipts therefrom being paid to the State Treasurer. All the older books of such records have now to be searched here, and much time is consumed.

VII.— What are the Immediate and Remote Benefits of a State System of Vital Statistics Records?

The *immediate* benefits are that the requirement of returns is a guard over life and against improper or criminal concealments, so that so far as deaths are concerned, as one expresses it, "it is a mild and useful form of coroner's inquest." As to records of births, they help to guard against improper attendance or destruction of infant life; and as to marriages, they help to deter from haste and such secrecy as is against the interests of families and of society.

As to mortality, local and weekly returns are secured and verified by means of a central system. These local returns often at once point to some local cause of disease and death, or to an unusual prevalence of sickness or of an epidemic in some one neighborhood or block of houses, and so lead to immediate removal of nuisances or such dealing with the inmates as limits the spread of the disease.

The *remote* benefits of such returns and of deductions made from them are of still more consequence. We have already noticed how, by aggregation of the facts, in various localities for quinquennial, decennial or longer periods, and so representing larger numbers of people, errors which arise from too few numbers or from temporary influences are balanced. So facts are secured which point to social evils to be remedied, and which, as to diseases, show the causes and effective methods for their prevention. States and countries are now utilizing these statistics as never before, and modes of tabulation are being simplified. By means of a recent invention, it is possible to secure combinations of instructive tables as never before. The chief embarrassment still is that there is expense in all such inquiries and in gathering all such facts, and that so few are appreciative of the value of the results secured. Yet no one can make a study of such treatises as the abstracts from Dr. Farr on Vital Statistics (1884), or Newsholme on Vital Statistics (1889), or the Cartwright Lectures (1889), J. S. Billings, M.D., LL.D., or can examine the work of the Registrar-General's office of Great Britain, or that now being done in connection with the 11th U. S. Census, under the direction of Surgeon J. S. Billings, U.S.A., without perceiving that no collection of statistics is more necessary for governments and states. It is a satisfaction to know that in the present census no State Bureau of Vital Statistics has been found superior to our own, and that the U. S. Government is largely availing itself of our records for purposes of study and comparison, and so making a copy of all death records for five years past.

VIII.—What are the Present Defects in Our System or in Deductions from it?

The chief are these:

Localities make too rapid deductions as to healthfulness or sickliness from the death-rate of a single year. The error of this is fully presented in our twelfth report.

Local Boards are not careful enough to study the weekly records to find just in what houses or blocks deaths have occurred, and especially those from diseases known to depend largely on local conditions. Also every death, from week to week and year to year, should be marked on maps or graphic charts, the color or shape of mark indicating the disease. Thus the abiding-places of disease and death can be studied and the causes removed.

Physicians are not always careful enough to state the cause of deaths, or the secondary cause if the primary is doubtful. Peritonitis, for instance, should state whether "Idiopathic," "Traumatic" or "Puerperal." Cancer should state where located; so as to many other diseases.

To show, however, what progress was made when the old law was replaced by that of 1878, we give the death return from the populous township in which the Secretary resided, as made by the Assessor for the year previous (1877). The population of the township was about 3,750. The deaths returned were thirteen, and the causes of death as follows: "Aneuris, common disey head, gastric fever, general debility, perrallis, dopsy, inflamation of lungs, fitts, old age, hemredge of the liver, accident, marasman, heart disease."

Returns of births should be more complete, although each year marks improvement.

State vital statistics should be reported quarterly, but cannot be, because of delays of complete returns.

The annual tables should be more extended, and especially the quinquennial and decennial tables, showing a larger series of deduced facts illustrated by diagrams and analysis. This cannot be until a longer period has elapsed or the State sees fit to make appropriation for more extended work. Yet no one can study the eleven reports made without noting some lines of progress.

The desire of this Board is thus to emphasize the importance of these statistics, and to ask the earnest co-operation of physicians, of Local Boards, of city registrars and of assessors, in efforts, from year to year, to perfect these vital records.

1890.

We may illustrate the possibility and reliability of such statistics in this way: John Noble early displayed a great interest in animals, and especially in horses. His father had large wealth and sought to restrain this passion, lest it should beget a fondness for the turf and result in spendthrift extravagance. But this fondness took a peculiar turn. At an early age the young man came into possession of very large wealth, and determined to make the study of horse life his avocation. His purpose was to know all that related to the life history of this animal, the natural age, the causes of imperfection or disease, so that through this knowledge might be secured the highest perfection, *i. e.* not only long life, but the greatest freedom from all that could lower vitality or restrain usefulness; for with horses, as with men, the value depends largely on the capacity for uninterrupted use and usefulness. Agents were appointed, registry-books opened and six thousand horses registered and marked, while yet colts of less than one year. One thousand of these were born and were to be reared and used only in cities; two thousand more were to be transferred to cities as soon as broken, and of these one thousand were to be returned to the country on the first chronic signs of decline. The other three thousand were always to remain in certain townships and in country occupations. The life history of all these was studied, with all the details of work, kind of occupation, stabling, and everything relating to them duly recorded. Facts as to descent and progeny were ascertained. While various facts were published from time to time, it was only at the close of thirty years, and after there had been the most thorough and detailed study of all this multitude, that Mr. Noble presented the result and his analysis of them. The agents in the selected cities and townships had, from personal observation, filled out all his schedules with events as they occurred, and so the material for the life and death history of these six thousand animals was very abundant. As the life of horses is so much shorter than that of men, it was easy to trace a whole generation. Mr. Noble, with wonderful ability, and in accord with the laws of statistical study, combined his facts so as to show the effect of locality, rearing, food, open air and stable care, occupation, treatment, care of teeth, of limbs, of hair, modes of exercise; in fact, all that could influence effective force and vitality. The author had been much laughed at during his long years of collection of facts and analysis of them, but his treatise proved the most valuable guide to horse care ever published. It substituted facts for so-called guesses, and gave a basis of experience quite different from that of single observations. While any real experience has some value, all came to see that recorded facts and observation of this kind and degree, carefully secured, were of inestimable service.

Similar studies of human vital statistics give far more valuable results, since they deal with a higher order of beings and a class subject to more variations and diseases. Through these, life-saving principles and practice can be reached that can be secured in no other way. During the past year the United States Census Bureau, by permission of the State Board of Health, has made accurate copies of all certificates of death filed in the office from June 1st, 1885, to June 1st, 1890. Massachusetts and this State were the States chosen as furnishing the best records from which to compile a series of facts for analysis and for comparison with other facts obtained in the present census. This affords this Bureau an opportunity to avail itself of these statistics, in order to secure from them a few tables and deductions not possible under our State appropriation, but these will not be available until another year.

THE INFLUENZA EPIDEMIC.

BY EZRA M. HUNT, M.D., MEDICAL SUPERINTENDENT OF VITAL STATISTICS.

During our statistical year we have been visited by a disease generally known as Influenza. The French call it "La Grippe," and the Germans sometimes call it "Blitz-catarrh" (lightning cold). While it has many other local names it is not by any means new. The Annals of Influenza (Sydenham Society, 1852) give records of some twenty epidemics, from the sixteenth century to the nineteenth. A full account of these epidemics, up to 1847 inclusive, will be found in the ninth report of the Register-General for England and Wales, by Dr. Farr. Dr. Peacock, of London, has furnished the details of the epidemic of 1847. Prof. Gairdner, of Glasgow, has given some details of the epidemic of 1837, and Sir Thomas Watson, of London, particulars of that of 1847. Most books on the practice of medicine treat of the disease, while the journals of the past year abound with the varied literature of the subject. The older epidemics were generally spoken of as characterized by their sudden onset, with chills and general aching pains; by sneezing, coryza and cough; by high ephemeral fever, with great depression and a tendency to various pulmonary complications. Attacks have generally occurred in the winter or early spring. It has often had a pandemic character, caring little for distance or seas, occurring both on land and water, without any apparent connection. Its progress has not been uniform, being often opposite to the direction of the winds, passing adjacent countries, and then returning to them.

It was once thought to follow the lines of travel and traffic, but this view is not sustained by the recent outbreak. The following will serve as a brief summary of its appearance:

"The first cases recognized in Europe were observed in St. Petersburg about October 15th, 1889, and by November 12th it had spread over nearly the whole of European Russia. The number of cases in St. Petersburg alone, according to Dr. Butz's estimate, was 650,000, or nearly three-fourths of the total estimated population. It is not known whether the disease traveled from Siberia to St. Petersburg or *vice versa*. The epidemic was first noticed in Tomsk, an important commercial town of Central Siberia—separated by nearly 2,000 miles from St. Petersberg—about October 15th, or at the very time when the epidemic was beginning to develop with rapidity in St. Petersburg. It appeared in the Caucasus about November 11th, and was at its height at Merv, 500 miles to the east, towards the end of December, when the epidemic was decreasing in St. Petersburg and Berlin.

"The influenza broke out in Berlin towards the end of November, and spread very rapidly. Professor Leyden estimated that a third of the inhabitants of the city were suffering from it. It began to decline by December 25th. Meanwhile it had spread rapidly in Central and Southern Germany, and was on December 18th present in nearly every important town from Hamburg, in the North, to Munich, in the South. It was severely felt in Frankfort, and in Mainz the tramway service was partially suspended, owing to the large number of men on the sick list. It was present in Dresden on December 23d; Prague, December 27th; Vienna, December 12th; Belgrade, December 16th, and at Bucharest and Sophia, December 24th. Extending westward, it appeared in Brussels December 12th and in Antwerp December 16th, spreading so extensively in these cities during the following two weeks that it was necessary to close the schools and seriously affected the garrisons. It had already appeared in Amsterdam and other Dutch cities. In Copenhagan the epidemic appeared early in December, and the number of cases notified in the week ending December 21st was over 6,000.

"Cases were observed in Paris as early as November 17th, assuming epidemic proportions about November 26th, when a large number of persons employed in the Magazius du Louvre were attacked. The number of cases in this shop rapidly increased until it reached 670 on December 10th. The epidemic did not prevail to any serious extent in the French provincial towns, but so large a number of cases occurred at Monte Carlo as seriously to interfere with the engrossing occupation of gambling. The disease first appeared south of the Pyrenees on December 12th at Malaga. On December 14th there were a few cases in Madrid, one of the earliest reported being that of the boy King. It spread rapidly, and by December 29th most of the Spanish provinces had become affected. It appeared in Lisbon and Oporto about the beginning of the fourth week in December.

"In Italy the first cases were reported from Rome on December 3d. It prevailed extensively in Verona, Milan, Spezia and other towns. Its presence in Rome was denied, and it is doubted whether any true cases have occurred.

"In England the epidemic, up to January 4th, had not attained serious proportions, and although probably present early in November its presence was questioned. It was conceded that an epidemic of influenza prevailed in the west of London and in the western suburbs late in December. It had, however, not spread with the rapidity observed in St. Petersburg, Berlin, Vienna and Paris. There was no distinct epidemic of the disease in East London. Influenza prevailed extensively among the horses in England."

Dr. Sykes found in the district of St. Pancras, London, 927 horses affected between the middle of September and the end of January. He could find no evidence of the communicability of the horse disease to man; indeed, although there seems to have been plenty of people living over stables where horses were suffering, neither these people nor the stablemen appear to have contracted the disease, whereas stablemen engaged in stables containing healthy horses contracted the prevailing malady. Compare account of Influenza Epizootic, A. P. H. Association, Vol. 1, 1873.

Another account reads thus:

"At the end of November we hear of it in Germany and Austria; Vienna suffered in the first week of December; Paris and Berlin by December 11th and 12th—possibly sooner. Brussels followed Paris about December 14th; from Vienna it spread to Buda-Pesth by December 14th, and thence eastward to Sofia. A simultaneous extension westward took place from France to Spain and Portugal, and southward somewhat later to the Riviera, Italy and Malta. The prevalence of influenza to the north of the Baltic and in North America, not much in excess of what is usual at this time of year, is probably not an offshoot of this latest Russian outbreak. A claim of affinity was, however, made by telegram in the middle of December from Boston, U.S.A., and from New York."

It was not recognized in London until late in December, and reached its height after it had subsided in New York. It prevailed in the provincial towns of England and Scotland after it had ceased in London, and was reported all through February, 1890. The following summary, by Dr. Rauch, of the Illinois Board of Health, traces its progress in the United States:

"In Chicago the epidemic first made its effect manifest in the death-rate for the week ending December 28th, and reached the highest point January 25th, when, also, the mean temperature was the lowest that had been observed during the present winter. It was two weeks longer culminating than in Boston. From the week ending December 28th to the week ending February 8th, 1,500 deaths may be attributed to the malady. Of these there were 774 under five years of age, a number much greater proportionately than in any other city. Is there a greater infantile population in Chicago than in other cities? Nearly two-thirds of the deaths were caused by diseases of the respiratory organs.

"During the week ending January 11th, the malady made itself manifest in Baltimore in the increase in the death-rate, culminating on the 18th of the same month. From its first appearance to the week ending February 8th, there was an increase of 153 deaths, and of these, 119 were under five years. In Washington its effect was noticed in the week ending January 11th, culminating in the week ending January 25th, and causing 178 deaths. In Cincinnati, it did not show its effect on the death-rate until the week ending January 11th, and its culminating point was reached in the week ending January 25th. There was an increase of 155 deaths from the week ending January 11th to the week ending February 8th. In St. Louis, while cases occurred about January 1st, its influence on life was not manifest until the 18th. From the week ending January 18th to that ending February 8th, 192 deaths may be attributed to the disease, and for the week ending February 1st, the deaths at St. Louis were greater, while in other cities where the disease had prevailed for some time, the number had greatly decreased. As a whole the epidemic was mild, and St. Louis did not suffer in comparison with other cities at home and abroad."

The disease began to show its influence upon the death-rate in Boston in the week ending December 21st, 1889, increasing in its effect until the week ending January 11th, 1890, when it reached its height. Taking the number of deaths the week before the malady began to manifest its effect, to the week ending February 8th, as a basis, it will appear that 885 deaths occurred from this cause and the meteorological conditions that obtained. Also, that of this number there was an increase of 136 deaths under five years. This increase of deaths was mainly among diseases of the respiratory organs, those suffering from chronic diseases and the weak and the aged. It is barely possible that the disease manifested itself in the week ending December 21st, in New York City. But its rapid increase during the next two weeks is more marked than in either of the two preceding cities, reaching its highest point January 11th.

From its first appearance to the week ending February 8th, 2,503 deaths may be attributed to this cause; of these there were only 512 under five years. In Philadelphia the disease manifested itself in the week ending December 28th, and culminated in the week ending January 18th. From December 28th to February 8th, there was an increase of 1,344 deaths due to this disease. Of these there was an increase of only 300 cases under five years.

In Cleveland the effect of the disease was manifest in the week ending January 4th, culminating about January 25th, when the mean weekly temperature was the lowest. From the week ending January 4th to the week ending February 8th, 863 deaths may be ascribed to the influenza. Of these, 129 were under five years of age. As in other cities, this increase was mainly among pulmonary diseases.

It prevailed in most of the southern cities in a mild form during February.

"In Boston, New York, Philadelphia and Chicago the effect of the disease was marked; at Baltimore, Washington, Cincinnati and St. Louis, a tier of more southerly cities, the fatality has not been so great, and the epidemic did not manifest its influence as early as in the northern cities. The percentage of increase of the death-rate in the different cities from the time the disease manifested itself to February 8th, is: Boston, 2.11; New York, 1.97; Philadelphia, 1.29; Cleveland, 1.51; Chicago, 1.39; Baltimore, .305; Washington, .791; Cincinnati, .688; St. Louis, .426. It is probable that about 12,000 people have died within the last seven weeks from causes due directly or indirectly to the prevalence of this disease."

It appeared in New Jersey soon after it reached New York City, and all through January the people of the State were generally affected. Hudson county, Newark, Paterson, Trenton and Camden had a very large number of cases. The sickness-rate was very large as compared with the death-rate. Various disturbances of the breathing apparatus were manifest and nervous symptoms were especially marked. Even until the first of May there was a general lowering of the standard of health.

The following is the record of the increase of deaths in prominent localities in the State during the prevalence of the disease, viz., for December, 1889, and January and February, 1890, as compared with the same months of previous years:

HUDSON COUNTY.

December, 1889...... 595	January, 1890........ 887	February, 1890....... 526
December, 1888...... 606	January, 1889........ 565	February, 1889....... 514

NEWARK.

December, 1889...... 388	January, 1890........ 551	February, 1890....... 388
December, 1888...... 273	January, 1889........ 309	February, 1889....... 338

PATERSON.

December, 1889...... 131	January, 1890........ 173	February, 1890....... 130
December, 1888...... 119	January, 1889........ 120	February, 1889....... 132

TRENTON.

December, 1889...... 77	January, 1890........ 129	February, 1890....... 78
December, 1888...... 49	January, 1889........ 54	February, 1889....... 58

CAMDEN.

December, 1889...... 119	January, 1890........ 177	February, 1890....... 126
December, 1888...... 119	January, 1889........ 95	February, 1889....... 106

April 17th, 1890, Prof. Wm. Pepper, of Philadelphia, gave a valuable address before the New York Academy of Medicine, on the prevalence and peculiarities of pneumonia in Philadelphia during the influenza epidemic. This formed the basis of a discussion by Prof. Shattuck, of Boston, Prof. E. G. Janeway, of New York, and Prof. Pepper. (See *Medical News*, July 5th, 1890, and *London Lancet*, June 7th, 1890.)

"Dr. Pepper gave it as his opinion that three out of every four of the eleven hundred thousand people of Philadelphia suffered from influenza in greater or less severity. He gave statistics showing that eighty-four deaths were due to influenza without pneumonia, and 173 to influenza with pneumonia, the mortality-rate of the pneumonia cases being 11.65 per cent., or practically identical with the rate for pneumonia alone. Another striking fact was that the death-rate from pneumonia during the past winter (end of December to beginning of February) was three times as great as in the corresponding period a year ago. So far as could be gathered, the cases of catarrhal pneumonia were about twice as numerous as the croupous. There was a marked excess of right-sided inflammation, and an unusual proportion of apex cases, with predominance of cerebral symptoms. Pleurisy was more frequent than usual, and so was pericarditis. In many cases jaundice was associated with the pneumonia of the right lung. Albuminuria was almost constant, pointing to an infectious nephritis in the pneumonia accompanying influenza. Diarrhœa occurred in some, and was an unfavorable symptom. As regards pyrexia, it was observed that the temperature was often unusually high during the first thirty-six or forty-eight hours, but in some cases the fever was low. Dr. Pepper regarded pneumonia as a sequel rather than a complication of influenza, slight exposure during the convalescent stage sufficing to induce an attack. He referred also to the nervous symptoms of influenza, and suggested that the marked weakness of respiration noted in these pneumonia cases might be due to involvement of the vagus nerve. Owing to this weak breathing, the diagnosis was not always easy. The post-mortem characters were not special. Friedländer's pneumococcus had been found in some. Dr. Shattuck had collected statistics from the Boston hospitals, and arrived at the following conclusions: '1. Pneumonia was unusually prevalent in Boston during the height of the influenza epidemic about the middle third of the visitation. 2. The statistics of the Pacific Mills indicate that less than one per cent. of those severely attacked by influenza acquired pneumonia. 3. Broncho-pneumonia was rare in the hospitals. 4. The pneumonia mortality was probably not increased (probably diminished), as compared with that of the previous five years. 5. The number of cases of pneumonia not preceded by *grippe* symptoms was about the same as the number of pneumonias in an average year. 6. Pneumonia followed *grippe* in so large a number of cases as to show some sort of connection between the affections. 7. In 60 per cent. of the cases a single lobe was involved. 8. Two-thirds of the cases terminated by lysis. 9. Pneumonia was three times as frequent in males as in females, and the mortality rate increased with each decade. 10. The most striking increase in the urban deaths from pneumonia was, on the whole, between the ages of twenty and thirty and eighty and ninety. The increase under ten was slight. 11. The morbid appearances in nine cases examined after death were not specially noteworthy.' Dr. Janeway gave the New York experience, which showed the great prevalence of pneumonia and bronchitis during January, and of pneumonia during all three winter months. The cases he had seen were marked by short duration, the crisis occurring on the third day in one, the fourth day in one, and the fifth day in two. He commented on the 'latent' character of the pneumonia in several instances. He thought sanguineous expectoration was more frequent, and that pleurisy occurred in an unusually large number of cases. There was a large proportion of 'patchy' pneumonia with bronchitis."

There is great variety of description as to the disease; some regard it as chiefly a catarrh, others claim it to be essentially a fever, and still others view it as a nervous affection.

In many of its symptoms it resembled the sub-tropical disease known as dengue, so that in Paris it was for a time claimed that the two maladies were concurrent. In other places, occasionally, an accompanying eruption was reported. The nervous type was so marked that the disease was frequently spoken of as having two forms.

The following description of symptoms would answer for a great number and variety of cases:

"(1) A definite incubation of two days only; (2) prodromal signs of prostration, headache, chills, of a few hours only; (3) fever of three days' duration, with either (*a*) nervous symptoms only, as severe pain in the head, back and limbs, with other neuralgias; (*b*) with catarrh, sneezing and bronchial catarrh; or (*c*) with gastric disturbance, diarrhœa, anorexia, or vomiting, sometimes persistent. Vertigo and hyperæsthesia may occur in each kind of seizure, but soon subside. The temperature rises rapidly to 103° or more, and continues high two days; it often lasts three days, seldom five or six. Convalescence is variable. Some feel well as soon as the fever subsides, or the day after. In others the nervous or catarrhal symptoms last for days, or relapses occur sometimes after the fever has subsided. In other accounts the prevalence of catarrhal symptoms is most noted."

Professor Da Costa, of Philadelphia, says:

"One of the most singular features of the present epidemic is the prevalence of the nervous symptoms. As I have stated, I have passed through other epidemics of catarrhal fever, but this one seems to be stamped by the prominence of the nervous symptoms. These are shown by the violent headache, the severe pain all over the body, the pain in the spine traveling downward, and also by what I have seen in quite a number of cases, hyperæsthesia or a general sensitiveness of the surface. This is something more than what might be attributed to the efforts of coughing. * * * Sometimes pain in the back has been great and has been the first manifestation of the disease. The pain is often referred to the middle of the back, in the dorsal region, and it is quite commonly observed that starting in this position it spreads downward into the legs. As described to me, the pain is at times sharp, with a dull pain persisting. The patient is never free from pain, which occasionally rises into acute exacerbations. While many of the cases begin with pain in the back, they soon have pain in the bones, followed by headache and moderate fever, and then there are or are not catarrhal symptoms."

It was frequently followed by pneumonia or other pulmonary affections. In most localities the death-rate was largely increased from this cause. The records of severity from this source are especially marked in Paris and Madrid. The highest death-rate marked in

London for any week, so far as we could ascertain, was 67, and 173 of influenza with pneumonia. About 84 in all were claimed in Philadelphia. By January 15th, 1890, it was reported in rapid decline in Berlin, Vienna, Paris and London.

As to its infective character, there is the widest diversity of opinion. Many contend that its origin is due to a microbe, although the infective particle is not found. Others cling to the view that it is a miasm, like malaria. Hirsch believes it to be infective, although denying that it has a *contagium vivum.* Proofs of its conveyance to families and its spread in them were constantly reported, while in an equal number of forcible cases a great number of those exposed escaped. In the absence of facts, it is not one of those diseases as to which we can arrive at conclusions by intelligent guesswork. It is to be remembered, too, that it is not, except in its universality, easily distinguished from local and circumscribed epidemics of coryza, fever, &c., which have occurred from time to time. In our own State, the previous year, influenza was reported epidemic in parts of Sussex county and Cape May county. Dr. Barker, of Morristown, also reports that in the fall of 1889 there was prevalence of influenza, which, after an interval, was followed by the special epidemic. Its infective character must still be regarded as undetermined, although no doubt owing to some widely-spread influence. As heretofore, there were varied announcements as to its microbic character. One of these furnished a whole broadside of description for the New York *Herald,* and the microbe was named the Bishop bacillus, because a reporter thought a head seemed to be surmounted with a mitre. At the close of the epidemic, the following (*Medical News,* Philadelphia) fairly states the result:

"At last we have heard the results of the bacteriological studies of influenza. Dr. Weichselbaum, Professor of Bacteriology at the Vienna University, and the discoverer of the coccus of pneumonia, has reported his work at a meeting of the faculty. He made a careful study of the sputum, nasal secretion, and blood of twenty-one cases, and in all of them the utmost precautions were used to get pure materials for examination. Not only were microscopic examinations made, but in every case experiments upon animals were made with pure cultures; so that the utmost scientific care was exercised. He found in all the material examined large numbers of the diplococcus pneumonia, and in the pure cultures his results were verified, for the bacterium found could be distinguished in no way from the diplococcus. It had the same light-colored capsule and the characteristic appearance, and in pure cultures on agar and on gelatin the colonies were exactly the same. In his experiments, inoculating the smaller animals, the results were the same as after inoculations of the diplococcus pneumonia. In a few cases streptococci were also found, but in small quantities. In his *résumé* Weichselbaum concludes that, in regard to the etiology of influenza, there are two possibilities: either the pneumonia coccus is the cause of the disease, or else it is caused by an unknown micro-organism, the action of which brings about conditions that make an excellent soil for the diplococcus, and diplococci very early entirely supplant the primary micrococci. The clinical history gives many points in favor of the first theory; the sudden chills and the rapid course and the great variety of air-passage complications. But we cannot explain the great differences between influenza and pneumonia if the same germ is the cause of both, unless we assume that the coccus has been so varied by unknown meteorological circumstances as to cause marked differences in its action on the human organism. The second theory—namely, that the diplococcus is merely a secondary infection—has many analogies, especially in the etiology of the exanthemata, and is the theory to which Weichselbaum himself inclines. The pneumococcus has often been found in healthy sputum, and grows exceedingly well on inflamed mucous membranes. It has great vitality, and probably the unknown influenza coccus has not. And thus the question stands. There have been many investigations throughout Europe on this point, but nowhere have more definite results been reached."

Because of the general prevalence of the microbe hypothesis there has been no lack of thorough search in the laboratories of Europe and America. The failure to find any specific micro-organism which is accepted as causative adds a new link to the chain of evidence that all infective, transmissible or communicable diseases are not thus produced.

We need to add but little as to the treatment of the disease. It has generally in mild cases been expectant and governed by the symptoms which might appear. "It is," says one, "to be treated on a general, broad line applicable to most febrile attacks." Saline, cooling drinks, and an aperient often do good. But, remembering the prominence of muscular pains as a symptom, I have found most benefit result from the administration of fifteen grains each of bromide of ammonium and salicylate of soda, with twenty minims of liquor ammoniæ acetatis. The tendency to complications, such as bronchitis, pneumonia and other pulmonary complaints, is constantly to be watched for and met with treatment common to each. Especially, too, does the tendency to depression of the nervous system need to be anticipated and counteracted by alimentation. The greatest divergence of view has been in reference to the use of antipyrin. Many, like Jennings, Da Costa, Tyson and others, advise it in small doses for the control of muscular pain. One authority claims that eruptions and severe symptoms of coryza, such as swelling of the eyes and watery discharges, are due to its use. Lionel Beale recognizes the tendency to congestion of the lungs, and, speaking of antipyrin, says that while it may lower the temperature, there is danger that it will add to the depression. Dr. Menzies, of Brighton, wholly disapproves of its use. An examination of a large number of testimonies as to it shows that while freely used in the outbreak of the epidemic, the quantity given was much less as experience increased, so that five-grain doses, and these only for a short time, came to be the rule. Mild outbreaks of the disease have been reported at Breslau, in Germany, and in some other localities, during the present fall and winter, and at a few places in the United States.

TYPHOID FEVER, DYSENTERY AND DIPHTHERIA.

TYPHOID FEVER AT PRINCETON.

In the latter part of May a case of typhoid fever occurred at Princeton. Others followed, but not in rapid succession. Up to September 1st, so far as we could ascertain, there had been twelve cases. Of these, six were students of the college, all of whom recovered. There were in all two deaths. Dr. Wycoff, who attended most of the cases, and saw all of the first cases, has given us a careful verbal account as to probable or possible origin, and a careful investigation was made by the State Board of Health. There were three sources of possible origin. A boy came on a visit from Brooklyn to a boarding-house in which three other cases occurred. He was taken soon after his arrival, and one of the first cases occurred in this house. The next group of cases (five) occurred in a boarding-house on Bergen Row, the first one being in this house two or three days previous to the first case in the former house named (not including the boy from Brooklyn). In this house, late in the fall of 1889, there was a case of typhoid fever, and all excretions had gone to a cesspool in the yard. Several days before this first case occurred, a ditch was dug from the overflowing cesspool and partly discharged into the street gutter, until stopped by the neighbors because of the great stench.

The other cases that occurred were in two houses quite distant from each other and from these, but were not among the earliest cases. In one of these houses both city and well-water were used, and the well was in bad condition. The only one thing in common to all the houses, so far as could be ascertained, was that one milkman supplied all these families. He supplied in all about fifteen families, of which there were cases in four. An examination of milk samples obtained from those supplied showed much water, but no other suspicious fact.

Dr. Wykoff and Professor Cornwall soon after visited the milk farm, one mile from Princeton, and procured samples of the milk just as received from the cows, and found it of excellent quality. The water of the well near by, analysis showed to be unusually pure. Near by was a small stream, which the farmer said was never used for rinsing cans. In a house just above, there had been seven cases of typhoid fever two years before, and the out-building stood near the stream.

If an earlier knowledge of the cases had reached the Board, and if the Local Board had been doing its duty, we should have hoped to have traced the cases to their origin. As it is, we deem it best to state the precise facts, as a record each practitioner can study for himself. To us, the Bergen Row cesspool seems the most probable source, although an argument can be made in favor of the origin being the milk-supply or the Brooklyn case.

It is well to know that the experience has led the borough and the literary institutions to unite in providing a system of sewerage.

DYSENTERY AT AND NEAR HAMBURG.

During the latter part of the summer a tendency to dysentery manifested itself, especially in a few rural districts. The most serious cases were those in the vicinity of Hamburg, Sussex county, there having been about fifty cases and over twenty deaths. The type was unusually severe, and ulceration often resulted in hemorrhage. At the time of the start of the disease there were some very filthy hog-pens connected with a creamery and located on the edge of the village. These had been complained of as a very great nuisance, but were not very promptly dealt with by the Local Board of Health. The first cases were in that section, and it is at least probable that these contaminated the air and added to the gravity of the disease.

DIPHTHERIA AT FIELDSBORO.

Just about, or after the period for the annual report of last year, there occurred a severe epidemic of diphtheria at Fieldsboro, a small hamlet about one mile west of Bordentown. In its small population there were thirty cases and several deaths.

Dr. William M. Shipps, of Bordentown, says: "A thorough inspection of the locality brought to light unsanitary conditions of such a character as to leave no doubt as to the origin of the disease. A rigid system of fumigation and cleansing did much toward controlling further advance of the disease."

Just such records we often have as to the smaller villages; such as those not long since at Elmer, Lyons Farms, &c., and such as are from time to time reported to us. Our larger cities have come to understand the need of prompt attention to first cases, and of rigid isolation, and so when there is effective force, soon limit the disease. But as was the case here, the Board of Health is formed or begins activity only after deaths have occurred. All physicians who understand preventive measures recognize that many lives are sacrificed by these delays, and that every township should have its Health Board in working order.

REMARKS ON MORTUARY TABLES OF THE YEAR.

BY THE MEDICAL SUPERINTENDENT.

COMMENTS AND COMPARISONS.

The following table shows the average number of deaths from each of the principal causes, from July 1st, 1878, to July 1st, 1888:

YEARLY AVERAGE OF DEATHS FROM PRINCIPAL DISEASES FOR TEN YEARS, BEGINNING JULY 1ST, 1878.

Remittent Fever	289
Typhoid Fever	579
Small-Pox	71
Scarlet Fever	610
Measles	135
Whooping-Cough	161
Diphtheria	1,280
Erysipelas	101
Diarrhœal Diseases	2,592
Consumption	3,182
Acute Lung	2,438
Brain and Nervous Diseases of Children	1,762
Diseases of Heart and Circulation	1,313
Renal and Urinary Diseases	753
Adult Brain and Spinal Diseases	1,405
Adult Digestive and Intestinal Diseases	1,093
Cancer	482
Acute Rheumatism	75
Puerperal	245

DEATHS FROM VARIOUS CAUSES FROM JULY 1ST, 1888, TO JULY 1ST, 1889.

Remittent Fever	203
Typhoid Fever	724
Small-Pox	3
Scarlet Fever	533
Measles	118

Whooping-Cough	278
Diphtheria	1,574
Erysipelas	114
Diarrhœal Diseases	3,377
Consumption	3,449
Acute Lung	2,862
Brain and Nervous Diseases of Children	1,923
Diseases of Heart and Circulation	1,786
Renal and Urinary Diseases	1,056
Adult Brain and Spinal Diseases	1,791
Adult Digestive and Intestinal Diseases	1,450
Cancer	579
Acute Rheumatism	117
Puerperal	254

NOTE.—It is to be remembered that the latter list, as well as the one following, represents over 200,000 more inhabitants than the former, and that the returns for the first few years were more imperfect.

DEATHS FROM VARIOUS CAUSES FROM JULY 1ST, 1889, TO JULY 1ST, 1890—POPULATION, 1,441,017.

Remittent Fever	195
Enteric, or Typhoid Fever	782
Small-Pox	0
Scarlet Fever	209
Measles	174
Whooping-Cough	371
Diphtheria and Croup	1,575
Erysipelas	81
Diarrhœal Diseases	3,527
Consumption	3,669
Acute Lung	3,804
Brain and Nervous Diseases of Children	2,032
Diseases of Heart and Circulation	1,945
Renal and Urinary Diseases	1,149
Adult Brain and Spinal Diseases	2,308
Adult Digestive and Intestinal Diseases	1,521
Cancer	640
Acute Rheumatism	106
Puerperal	250

As to most of the diseases enumerated no new facts have been elicited the past year. There is a growing appreciation of the power of cleanliness, isolation and disinfection to limit disease.

The diseases as to which we add some items for especial attention this year are pneumonia, diphtheria, enteric fever and phthisis pulmonalis.

COMMENTS ON SOME SPECIAL DISEASES.

PNEUMONIA.

Pneumonia is so prevalent a disease and the cause of so many deaths of those apparently robust, at an early or middle period of life, that it calls for the most careful study. There have for a time been those who have insisted upon it as a communicable disease. Professor Leaming, of New York City, and many others long ago gave series of facts to substantiate this view. More recently the microphyte of pneumonia known as pneumococcus has been apparently well identified. Also, it is claimed that there is a "contagium vivum," the "bacillus pneumoniæ" of Klein, which is special to the so-called croupous pneumonia. It is certain that if we accept these views, which seem to rest upon the same kind of evidence as that produced as to the "bacillus tuberculosis," we must fully recognize the importance of prophylactic measures and of prompt dealing with so acute a disease.

A recent investigation of an outbreak of pneumonia in Middlesborough, England, by that most skillful and painstaking observer, Dr. Ballard, of the Local Government Board, seemed to show a specific form of pneumonia in which the bacillus of Friedlander nor the diplococcus pneumoniæ of Fränkel and Wiechselbaum is not found, but in which the bacillus pneumoniæ of Klein abounds. The epidemic lasted from February 1st, 1888, for twenty-four weeks, During the year there occurred 490 deaths from pneumonia, of which 360 were within twenty-four weeks. There was also for this period an increase of deaths from pneumonia in the adjacent districts. "The presence of local conditions of drain filth" favored its extension, and furthermore, a suspicion that could not be set aside attached to food as having become contaminated with the material of the disease. "The epidemic continued in and around Middlesborough for six months or more. Meanwhile such pathological investigations as could be set on foot in the laboratory were conducted by Dr. Klein, and in his report he describes the reproduction of pneumonia by inoculation of rodents with morbid material taken from the lungs and air passages of Middlesborough patients; and he also gives an instructive account of subsequent attack of various animals by atmospheric spread of infection within his establishment. Certain bacilli, observed in expectoration and in the lung tissues of patients, could be identified and proved to be capable of growth upon appropriate culture substances, and these bacilli, upon further sub-culture, were found as efficient as the original material to produce in rodents a pneumonia identical in character with the disease given to them direct from the human lung. The bacilli in question are described by Dr. Klein as having differential characters of their own, having no relation to other bacillary forms hitherto found in pneumonia. Dr. Ballard, in the result, claims for the Middlesborough epidemic pneumonia a place among the class of 'Acute Specific Fevers,' and would call the disease by preference 'Pneumonic Fever.' The etiology and pathology of one and another kind of pneumonia are subjects fraught with equal importance to curative and preventive medicine."

The more recent experiences in this country as to pneumonia, and especially during and subsequent to the recent visitation of influenza, show us how much we need to be on the watch as to what forms of pulmonary seizure are included under the term "Pneumonia." We also desire to emphasize an important collateral remark of Dr. Ballard, "Epidemicity, frequent or only occasional, is one of the phenomena which characterize most of the communicable diseases. But all diseases which occur epidemically from time to time, are not accepted as communicable from the sick to the healthy, and all diseases which are well known to be communicable from the sick to the healthy do not appear from time to time epidemically."

DIPHTHERIA.

Diphtheria still continues to be the scourge of young life, and claims as its victims many of the healthiest children and not a few of more adult age. While it is undeniable that it attains virulence and momentum from damp and filthy localities, it not unfrequently leaps the boundaries of these and invades the homes where cleanliness is secured. Yet, even in these, too, bad plumbing or imperfect ventilation often has something to do with malignancy. But with all this it must be confessed that its direct causes remain a mystery. In 1888 most careful researches were made by the Local Government Board of England into seven epidemics in different localities. It is almost mournful to read the brief summary of Dr. Buchanan, the

Chief Medical Officer: "This disease has appeared to prevail under every variety of associated conditions. As usual, it has been accompanied, or its outbreak has been preceded, by abundant cases of apparently innocent sore throat. Nor has the approximate cause of diphtheria become any more apparent from the various bacteriological investigations that have been made." Klebs (1883) was the first to point out in diphtheric membranes a bacillus which seemed peculiar to diphtheria. His conclusions were confirmed by Löffler, who, besides isolating it by artificial cultivation, carried on important experiments with the sub-cultures. It was thus that the Klebs-Löffler bacillus seemed to answer to all the requisitions which are deemed essential to prove that a special micro-organism is the cause of the disease. Prof. Prudden, of New York City, as we noted last year, has since been led to the conclusion that not this bacillus, but a "streptococcus diphtheriæ" is the cause, and that it is probably identical with the streptococcus pyogenes, and the streptococcus erysipelatos. Now, we have the exhaustive researches of Dr. Klien, who confirms the views of others, that this Klebs-Löffler bacillus is present in the pharyngeal mucus of many healthy children, and that it "has no etiological connection with the diphtheric process." We probably, therefore, have to abandon this causative relation, which had been accepted by so many.

It is worthy of note that the relation thought by Gerhard, Von Emmerich and others to exist between human diphtheria and a peculiar necrotic disease in fowls and pigeons, is shown by Löffler and Pfieffer to be quite different. We have before noted that some observations have seemed to show that cats are especially affected by the diphtheric poison, and are, too often, the carriers of the disease. There are enough facts to show that cats should not be allowed about the beds or rooms of those sick with diphtheria. The experiments of Dr. Klien seem to show that cats are especially susceptible to effect from inoculation with diphtheritic membrane, "differing, indeed, in certain respects from those of human diphtheria, yet bearing a general similarity to these conditions, too, that are found capable of reproduction of themselves, by inoculation of the new discharges into other healthy cats."

Among the valuable papers at the recent International Congress at Berlin, were those by Professor Löffler, of Griefswald, and Professor Jacobi, of New York City. As these two are among the most eminent authorities on this disease, we quote a brief summary first of Professor Löffler :

"The paper concluded with several propositions (*Berliner Klin. Wochensch.*, No. 40), which may be briefly summarized. The cause of diphtheria is held to be a bacillus, which, contained in the exudation on the affected mucous membranes, is liable to be disseminated in the vicinity of the patient, together with particles of the false membrane. The infectivity of the patient may even persist for a few days after all traces of diphtheritic exudation have disappeared. The strictest isolation of cases is necessary, and children who have suffered from the disease should be kept from school for at least four weeks. The bacilli have been found to retain their vitality in dry membranes for from four to five months. It is therefore essential that all clothing, bed linen, and utensils likely to have been contaminated should be disinfected, either by boiling or by exposure to steam. The room occupied by the patient should be disinfected by washing the floors with warm sublimate solution (1 in 1,000), and cleansing the walls and furniture with bread. It is uncertain how long the bacilli may exist in the moist state, but it seems probable that moisture is more favorable to their vitality than dryness. Thus, diphtheria would seem to be favored by the dampness of dwellings, and also by absence of light. These organisms can exist outside the body at a temperature of 20° C., and they develop well in milk. The sale of this commodity should therefore be carefully supervised. An important statement is that which asserts that the diseases affecting pigeons, fowls, calves and pigs, which resemble diphtheria, are not caused by the bacillus of human diphtheria. These diseases in the lower animals are not, therefore, to be feared as sources of the human affection. Professor Löffler thinks that the etiological identity shown by Klein to exist between diphtheria in cats and in man requires confirmation. Although lesions of mucous membranes favor the retention of the virus, yet in disposed subjects the disease may arise apart from such lesions. It is advised that when diphtheria is prevalent a systematic use of disinfectant gargles and washes (*e. g.* sublimate solution, 1 in 10,000) should be enforced on all children. Lastly, it is stated that the meteorological conditions which favor the spread of the disease are still unknown."

The paper of Professor Jacobi should be read in full. We also give of this a short abstract :

"The present condition of the therapeutics of the disease in North America is marked by the extra attention devoted to prophylaxis both in literature and in practice. The sanitary arrangements made in New York City for combating epidemics of the disease were admirable, the cases being carefully isolated. Practitioners endeavored to preserve the general health of their patients by the use of cold water, and the catarrh of the mucous membranes of the nose and throat were combated with salt water, boracic acid, nitrate of silver, exsection of hypertrophied tonsils, &c. Chlorate of potassium was employed to preserve intact or to restore the mucous membrane of the oral cavity, tincture of the chloride of iron for its anti-fermentative and astringent effects, in frequent doses, so that a child of a year takes from three to four grammes daily, in twenty or forty doses. The local treatment of diphtheritic wounds or surfaces (circumcised prepuce, vagina) was mostly by tincture of iodine, iodoform in powder or ointments, or solutions of bichloride of mercury, one in one thousand or three thousand. An extensive list of other drugs was given. Gargles were considered adjuvants when no violence was used in their administration, but nasal injections were gradually taking their place, seeing that they reach the most affected part of the larynx much better, and are much better tolerated. Nasal diphtheria would not get well without some warm, mild injection. Conjunctival diphtheria he treated with ice and strong solutions of boracic acid. Alcohol ought to be given early, and a certain quantity in all cases, seeing that heart failure comes unexpectedly, and then stimulation is generally too late. It was, therefore, a good practice to give cardiac tonics in time. Strychnine was indispensable in diphtheritic paralysis. The author spoke of the effects of mercury on this disease, and then alluded to the operative treatment by intubation, which had supplanted tracheotomy because of the rapidity, bloodlessness and equal efficiency with which it can be performed. Its results in the hands of its discoverer, O'Dwyer, were as good as those in tracheotomy. Every case was managed according to its individual indications; isolation was enforced, fluid food given, moderate stimulation resorted to, absolute rest enjoined, even the nasal injections are made in a recumbent or semi-recumbent posture, and complications watched and treated."

The view that diphtheria is local before it is constitutional seems to be gaining ground. If so, it magnifies the importance of recognizing the first local symptons and of the active use of remedies both local and constitutional.

While there is still great obscurity as to the causes of the disease, practitioners are having more confidence in the success of methods of preventing and limiting the disease. Prompt isolation, thorough cleanliness and accurate disinfection, with early and skilled treatment, greatly modify the extent and fatality of the disease. The physicians and attendants need fully to realize their relations to the well and seek to prevent extension. It will be noticed that Löffler approves of disinfectant gargles and washes in families where diphtheria is prevalent. As to the carrying of disease by cats or other small animals, or even its communication to them, while good authorities differ, it is well never to allow such animals in the house during prevailing sickness.

ENTERIC FEVER.

No disease with which we have to deal more thoroughly demands our attention than this. As to none have there been more variations in the line of causation. The term pythogenic fever, as used by Murchison, was long ignored before the very positive views of bacteriologists. Those who held to a *de novo* origin, or who looked upon a grade of fevers known as cesspool fever as denoting modified forms of pythogenic genesis, were in such a hopeless minority as almost to be regarded as heretical. The typhoid bacillus was spoken of as the sole entity, and the particular cause as quite beyond dispute. It is true that such is the popular professional view. But that it is not the settled view, the following extracts from the *London Lancet*, October, 1890, and an editorial of the *Medical News*, March 22d, 1890, will show:

"*The Bacillus of Typhoid Fever.*—The existence of a pathogenic micro-organism in enteric fever is strongly upheld by some bacteriologists, especially on the Continent. Most English observers consider the point not yet proved. In sections of the intestines, in cases of typhoid fever, numerous bacilli are constantly found."

"Probably the bacteriological question of greatest practical interest is whether an organism may be benign in one locality and malignant in another; or, to state it differently, whether the property of infection is an adventitious one depending upon the soil in which the organism grows, or inherent in its substance. An attempt to solve this problem, in so far as it relates to the typhoid bacillus, has just been made by Rodet and Roux (*Comptes Rendus Hebdomadaires des Séances de la Société de Biologie*, February 21st, 1890), whose researches have led them to conclude that the bacillus of Eberth is nothing more than a modification of the bacillus *coli communis*.

* * * * * * * * * * *

"The typhoid bacillus of Eberth is, according to the authors quoted, the bacillus *coli* in a state of degeneration. This is shown by the fact that the former is less able to resist heat than the latter, Eberth's bacillus being destroyed by a temperature (80° C.) which is supported by the bacilli *coli*. This is far from saying that the bacillus which causes enteric fever is in a state of degeneration at the time of infection. The bacillus *coli* becomes virulent without any notable change in its appearances and other characters, and it is in the interior of the organism, especially in the spleen, that it assumes the features of Eberth's bacillus. The latter are the result of the destructive forces of the body. The practical conclusions from these researches are two-fold:

"1. Water contaminated with fecal matter, not necessarily typhoidal, may give rise to enteric fever.

"2. The tolerance of the organism for the bacillus *coli* shows that the latter acquires its virulent features outside of the body.

"It is to be hoped that the experiments of Rodet and Roux will be thoroughly investigated. Certainly none more practical could engage the attention of bacteriologists. If confirmed, the term pythogenic fever, introduced many years ago by Murchison, may yet be generally accepted as the proper one for the disease which is now somewhat vaguely styled typhoid or enteric fever."

These views have received strong confirmation by the bacteriological researches of Prof. Vaughan, of Ann Arbor, in a paper on "Some New Bacterial Poisons." At any rate, the practitioner and sanitarian are safe in constant war against filth in air and water, and soil and food, while dealing with all human secretions from the standpoint both of general and specific danger.

We draw renewed attention to Circular LVII. of this Board on typhoid fever and diphtheria, as addressed to physicians. The following abstract from records for the past ten years shows the gravity and the increase of this disease. We select five cities that admit of comparison and draw attention to the possible relation of the lower rate of Paterson and Trenton to the water-supply.

ENTERIC FEVER RECORD FOR TEN YEARS.

	July, 1880, to 1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.
Jersey City	79	156	65	116	100	88	81	114	132	159
Newark.....	51	97	89	87	94	85	84	76	131	194
Paterson ...	29	49	31	34	39	21	20	21	26	23
Trenton.....	19	20	16	21	11	12	17	11	20	11
Camden.....	32	50	39	34	43	41	50	55	90	82

NOTE.—The record is annual, beginning with July 1st, 1880.

NOTE.—In Jersey City, 1882 has some returns before July 1st, 1882.

We can only once more urge that this is a preventable disease; that sanitarians agree in regarding its decennial records as a test of the prevalence or neglect of due sanitary administration, and that it is within the range and duty of far greater control.

PHTHISIS PULMONALIS.

Tuberculosis in its various forms continues to be the great scourge of civilization. It is not wonderful that when one of the most distinguished and painstaking scientists and physicians announces that he hopes to have found a remedy for some forms and stages of this disease, that the whole world should be attent with interest. In 1886 Prof. Robert Koch, in an opening address before the University of Berlin, said: "Hitherto, gentlemen, you have been taught how to endeavor to cure disease. Henceforth you will be taught how to succeed in preventing disease." Working in both directions, there is reason to hope that he has reached a point which may mark an era of great progress, both in preventive and curative practice. August 4th, 1890, in an address before the International Medical Congress, then in session at Berlin, Dr. Koch expressed the hope that he had found a medium by which the progress of tuberculosis could be checked, both in man and animals. With his usual caution he awaited further experiments. On October 20th he communicated to the proper State officer, that he had made the discovery, and asked to retire from State service in order to devote himself more fully to further investigations. The news of this discovery at once excited world-wide attention, and physicians as well as patients hastened to Berlin to secure details and to witness the methods for using the remedy and the results. November 14th he formally announced some details as to the proposed method. In order to avoid false remedies and false methods, the precise character of the liquid was not generally made known, and at this writing has not yet been stated, nor has time enough elapsed to estimate the outreach of this new practice. Suffice it now to say that the modes of investigation, the distinction of Dr. Koch and facts already elicited make it the duty of every physician to secure, as fast and as fully as possible, all the details as to the proposed treatment, to diagnosticate cases at as early a moment as possible, and in a spirit of critical yet hopeful inquiry to do his part in availing himself of any new service thus secured either to preventive or curative art.

TRANSPORTATION OF THE DEAD.

The law of this State as to the duties of physicians, undertakers or others in relation to the dead is contained in Circular LXVI. of this Board, which anyone can obtain on application by postal to this office. It has been found to be as simple in its working as any such law can be to secure the end for which it is intended. In response to public opinion and in the interest of public conveyance, the various railroad companies, as represented by the National Association of General Baggage Agents, in August, 1889, proposed a series of rules which have been adopted by the various companies, and which, since December 1st, 1889, have been in operation. These in general conform to the method already in practice in this State. It will be observed that Rules 5 and 7 have no relation to Health Boards or State regulation, but are for the convenience of railroad companies, and that Rule 6 determines for itself the use to be made of the permit and the two coupons attached. All rules should give as little trouble as possible, although there must be form enough to secure the proper care and protection of the public health.

The following are the rules as adopted:

RULES FOR TRANSPORTATION OF DEAD BODIES,

ADOPTED BY

NATIONAL ASSOCIATION OF GENERAL BAGGAGE AGENTS, AUGUST 1889,

Which took effect December 1st, 1889.

RULE 1. The transportation of bodies of persons dead of small pox, Asiatic cholera, leprosy, typhus fever or yellow fever is absolutely forbidden.

RULE 2. The bodies of those who have died of diphtheria, anthrax, scarlet fever, puerperal fever, typhoid fever, erysipelas, measles and other contagious, infectious or communicable diseases must be wrapped in a sheet thoroughly saturated with a strong solution of bichloride of mercury, in the proportion of one ounce of bichloride of mercury to a gallon of water; and encased in an air-tight zinc, tin, copper or lead-lined coffin, or in an air-tight iron casket, hermetically sealed, and all enclosed in a strong tight wooden box; or the body must be prepared for shipment by being wrapped in a sheet and disinfected by solution of bichloride of mercury as above, and placed in a strong coffin or casket, and said coffin or casket encased in a hermetically-sealed (soldered) zinc, copper or tin case, and all enclosed in a strong outside wooden box of material not less than one inch and a half thick.

RULE 3. In cases of contagious, infectious, or communicable diseases, the body must not be accompanied by articles which have been exposed to the infection of the disease. And in addition to permit from Board of Health or proper health authority, agents will require an affidavit from the shipping undertaker, stating how body has been prepared and kind of coffin or casket used, which must be in conformity with Rule 2.

RULE 4. The bodies of persons dead of diseases that are not contagious, infectious or communicable, may be received for transportation to local points in same State, when encased in sound coffin or metallic case, and enclosed in a strong wooden box, securely fastened so it may be safely handled. But when it is proposed to transport them out of the State to an interstate point (unless the time required for transportation from the initial point to destination does not exceed 18 hours), they must be encased in an air-tight zinc, tin, copper or lead-lined coffin, or an air-tight iron casket, or a strong coffin or casket encased in a hermetically-sealed (soldered) zinc, copper or tin case, and all enclosed in a strong outside wooden box of material not less than one inch thick. In all cases the outside box must be provided with four iron chest handles.

RULE 5. Every dead body must be accompanied by a person in charge, who must be provided with a ticket, and also present a full first-class ticket marked "Corpse," and a transit permit from Board of Health, or proper health authority, giving permission for the removal, and showing the name of deceased, age, place of death, cause of death (and if of a contagious or infectious nature), the point to which it is to be shipped, medical attendant and name of undertaker.

RULE 6. The transit permit must be made with a stub, to be retained by the person issuing it; the original permit must accompany the body to destination, and two coupons, the first coupon to be detached by agent at initial point and sent to the general baggage agent, and the second coupon by the last train baggageman. The stub, permit and coupons must be numbered so the one will refer to the other, and on back of permit will be a space for undertaker's affidavit, to be used in cases of contagious and infectious diseases, as required by Rules 2 and 3.

RULE 7. The box containing corpse must be plainly marked with paster, showing name of deceased, place of death, cause of death, the point to which it is to be shipped, number of transit permit issued in connection, and name of person in charge of the remains. There must also be blank spaces at bottom of paster for station agent at initial point, to fill in the form and number of passage ticket, where from, where to, and route to destination of such ticket.

RULE 8. It is intended that no dead body shall be moved which may be the means of spreading disease, therefore all disinterred bodies, dead from any disease or cause, will be treated as infectious and dangerous to the public health, and will not be accepted for transportation unless said removal has been approved by the State Board of Health, and the consent of the health authority of the locality to which the corpse is consigned has been first obtained, and the disinterred remains enclosed in a hermetically-sealed (soldered) zinc, tin or copper-lined coffin or box encased in hermetically-sealed (soldered) zinc, tin or copper cases.

CLIMATOLOGY.

In order to afford data by which variation in diseases may be compared with variations in climate, the reports of this Board give the various climatological records in localities chosen as representative. In such a plan it is not needful to survey all the scope of the meteorologist, who studies the science which treats of the atmosphere and its phenomena, but rather deal with climate and causes which modify it in a particular place, or with weather as denoting different degrees of temperature, humidity, winds, cloudiness, rains, snows. While various facts appear in all the reports, attention is particularly called to the division "Climatology," in the fifth report, and to the article on "Comparative Facts in Climatology and Geology," in the sixth report, pages 269–284. It is to be remembered that climate is not the mere expression of atmospheric condition, but has to do with distance from the equator, elevation, the distance from the sea or large bodies of water, prevailing winds, the character and contour of the geological structure and of the soil, the natural or artificial drainage, the amount of forests, the cultivation of the soil, the access of light and heat, &c.

STATION, PATERSON, N. J.

Latitude, 40° 55′ N.; Longitude, 74° 11′ W. Height of Barometer Cistern above Sea Level, 142 feet.

OBSERVER, WM. FURGASON, C.E.

	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.						
1889.												
July	......	......	......	89	63	72	......	......	10.81	......	19	......
August	......	......	......	86	57	70	......	......	4.30	......	13	......
September	......	......	......	84	50	66	......	......	7.10	......	19	......
October	......	......	......	67	44	58	......	......	2.40	......	14	......
November	......	......	......	59	27	46	......	......	9.60	......	16	......
December	......	......	......	63	15	38	......	......	1.92	6	12	......
1890.												
January	......	......	......	63	17	41	......	......	2.29	......	10	......
February	......	......	......	65	20	46	......	......	3.60	1	11	......
March	......	......	......	68	10	42	......	......	5.20	18	22	......
April	......	......	......	74	32	58	......	......	2.15	¼	14	......
May	......	......	......	84	46	69	......	......	4.14	......	12	......
June	......	......	......	92	60	77	......	......	4.70	......	13	......
For the year	......	......	......	75	38	57	......	......	58.21	25¼	185	......

* Including melted snow.

REMARKS.—Unusually mild winter, with rainfall for the year nine inches in excess of average since 1836.

STATION, NEWARK, N. J.

Latitude, 40° 29′ N.; Longitude, 74° 27′ W. Height of Barometer Cistern above Sea Level, 35 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.						
1889.												
July	30.250	29.680	30.000	88	59	74.0	....	N. E., S. E.	14.60	....	12	......
August	30.300	29.750	30.074	87	55	70.7	....	S. E., S. W.	4.57	....	12	......
September	30.300	29.450	30.038	81	45	64.4	....	N. E., S. E.	8.23	....	17	......
October	30.420	29.630	30.049	71	32	50.4	....	N.W., S.W.	2.42	....	12	......
November	30.640	29.420	30.092	66	25	45.6	....	S & S. W.	8.87	....	16	......
December	30.860	29.500	30.070	65	12	41.0	....	S. W., S. E.	2.38	....	12	......
1890.												
January	30.740	29.520	30.219	64	17	38.8	....	N.W., S.W.	2.54	5	11	......
February	30 540	29.530	30.111	66	18	37.7	....	N.W., S W.	4.27	4	12	......
March	30.550	29.490	30.040	68	4	35.8	....	N.W., S.W.	6.67	....	18	......
April	30.540	29.480	30.113	80	26	49.0	....	N.W., S W.	2.10	....	9	......
May	30.310	29.620	29.990	80	43	60.2	....	N. E., S. E.	4.19	....	16	......
June	30.310	29.780	30.000	90	57	71.1	....	S. W.	4.44	....	7	......
For the year.	30.860	29.420	30.066	90	4	53.2	....	N.W., S.W.	65.22	....	154	......

* Including melted snow.

STATION, NEW YORK CITY.

Latitude, 40° 43′ N.; Longitude, 74° W. Height of Barometer Cistern above Sea Level, 185 feet.

OBSERVER, E. B. DUNN, 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.						
1889.												
July	30.247	29.654	29.990	88	60	73.6	77.0	S. E.	9.63	....	15	15
August	30.327	29.743	30.080	90	56	70.4	73.9	S. E.	3.39	....	10	6
September	30.320	29.471	30.040	85	46	65.8	79 8	S. E.	7.43	....	15	11
October	30.414	29.618	30 042	73	35	52.0	72.9	N. W.	2.53	....	14	13
November	30.668	29.391	30.085	65	27	46.9	75.6	S W.	9.82	....	17	15
December	30.881	29.526	30.169	65	13	41.4	76.5	S. W.	1.81	....	13	10
1890.												
January	30.777	29.552	30.216	67	15	40 0	69.7	N. W.	2.95	....	12	15
February	30.589	29.518	30.116	69	17	40.0	76.0	N. W.	3.86	....	9	14
March	30.550	29.490	30.040	71	6	38.0	72.0	N. W.	6.67	....	20	13
April	30.630	29.460	30.110	81	30	51.0	62.7	N. W.	2.58	....	13	8
May	30.310	29.620	29.990	80	42	61.0	73.2	S. E.	3.11	....	15	12
June	30.310	29 780	30.000	89	55	70.0	71.0	S.	4.19	....	9	8
For the year.	30.881	29.391	30.073	90	6	54.2	73.4	N. W.	57.97	....	162	140

* Including melted snow.

STATION, NEW BRUNSWICK, N. J.

Latitude, 40° 29′ N.; Longitude, 74° 26′ W. Height of Barometer Cistern above Sea Level, 115 feet.

OBSERVER, MRS. G. 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.						
1889.												
July	....	....	....	88.0	54.5	72.5	....	....	10.35	....	13	12
August	....	....	....	86.0	54.0	70.1	....	....	5.16	....	11	8
September	....	....	....	86.0	43.5	64.1	....	....	8.63	....	17	13
October	....	....	....	72 5	31.0	50.8	....	....	3.32	....	15	12
November	....	....	....	65.5	21 0	45.7	....	....	8.37	....	15	14
December	....	....	....	68.0	12.0	41.0	....	....	1.95	....	11	8
1890.												
January	....	....	....	70.0	15.0	39.3	....	....	2.76	....	10	10
February	....	....	....	67.0	17.0	38.2	....	....	4.15	....	9	14
March	....	....	....	71.0	6.0	36.6	....	....	5.97	....	14	16
April	....	....	....	81.0	26.0	50.3	....	....	2.51	....	10	7
May	....	....	....	85.0	33.0	61.2	....	....	3 93	....	15	13
June	....	....	....	87.0	50.0	68 6	....	....	3.83	....	8	7
For the year.	....	....	....	88.0	6.0	53.2	....	....	60.93	....	148	134

* Including melted snow.

STATION, FREEHOLD, N. J.

Latitude, 40° 15′ N.; Longitude, 74° 16′ W. Height of Barometer Cistern above Sea Level, —— feet.

OBSERVER, MISS A. S. YARD.

	*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.						
1889.												
July	......	......	......	87.5	51.5	72.1	......	S. W.	9.89	......	16	21
August	......	......	......	86.5	52.0	69.8	......	S. W.	7.98	......	12	18
September	......	......	......	86.0	41.5	63.8	......	N. W.	10.63	......	22	13
October	......	......	......	75.0	30.5	49.8	......	N. W.	3.45	......	10	8
November	......	......	......	66.0	20.5	45.0	......	N. W.	7.26	......	13	17
December	......	......	......	66.0	15.0	40.9	......	W.	1.45	......	11	15
1890.												
January	......	......	......	70.0	15.0	39.7	......	N. W.	2.53	......	12	20
February	......	......	......	68.5	17.0	39.2	......	N. W.	4.25	......	12	11
March	......	......	......	73.0	3.5	38.1	......	N. W.	6.34	......	16	15
April	......	......	......	80.5	22.0	48.6	......	N. W.	2.68	......	7	8
May	......	......	......	82.5	34.0	59.2	......	W.	4.28	......	11	13
June	......	......	......	89.0	50.0	69.0	......	N. W.	3.58	......	6	9
For the year	......	......	......	89.0	3.5	52.9	......	N. W.	64.32	......	148	168

* Including melted snow.

STATION, PRINCETON, N. J.

Latitude, 40° 20′ N.; Longitude, 74° 39′ W. Height of Barometer Cistern above Sea Level, —— feet.

OBSERVER, TAYLOR REED.

	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.						
1889.												
July	.....	.....	.....	.....	.....	†73.1	.....	.....	9.06	.....	11	.....
August	.....	.....	.....	.....	.....	†70.0	.....	.....	5.26	.....	14	.....
September	.....	.....	.....	85.0	46.3	64.4	.....	.....	8.59	.....	15	.....
October	.....	.....	.....	71.8	31.3	50.1	.....	.....	3.38	.....	14	.....
November	.....	.....	.....	64.0	23.6	44.8	.....	.....	7.10	.....	15	.....
December	.....	.....	.....	65.5	13.2	40.0	.....	.....	1.55	.....	9	.....
1890.												
January	.....	.....	.....	65.4	16.8	39.1	.....	.....	2.24	.....	12	.....
February	.....	.....	.....	67.0	18 0	38.2	.....	.....	3.86	.....	11	.....
March	.....	.....	.....	69.0	6.0	36.2	.....	.....	5.55	.....	18	.....
April	.....	.....	.....	80.0	28.0	50.0	.....	.....	1.94	.....	7	.....
May	.....	.....	.....	80.0	39.0	60.9	.....	.....	3.48	.....	11	.....
June	.....	.....	.....	.....	.....	†70.3	.....	.....	4.19	.....	7	.....
For the year	.....	.....	.....	85.0	6.0	53.1	.....	.....	56 20	.....	144	.....

* Including melted snow.

† No observations made. The figures given represent the normal for the month, with the average excess or deficiency for the month added or subtracted therefrom.

STATION, BEVERLY, N. J.

Latitude, 40° 4′ N.; Longitude, 74° 55′ 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.						
1889.												
July	...	...	...	90.5	58.0	72.8	83.7	N. W.	7.34	...	17	10
August	...	...	...	91.0	52.0	69.6	83.0	S., N. W.	5.76	...	9	3
September	...	...	...	88.5	41.0	64.0	82.3	N. W.	8.22	...	16	17
October	...	...	...	82.0	32.0	49.9	83.0	N. W.	4.32	...	14	11
November	...	...	...	67.0	21.0	44.9	79.2	N. W.	8.16	...	15	13
December	...	...	...	71.0	15.0	40.8	76.6	N.	1.11	...	10	7
1890.												
January	...	...	...	76.0	17.0	40.6	77.8	N. W.	1 99	...	12	13
February	...	...	...	76.0	19.0	39.8	74.7	N.	3.38	...	11	16
March	...	...	...	77.0	8.0	37.7	76.9	N. W.	6.67	...	17	11
April	...	...	...	84.0	24.0	50.6	69.1	N. W.	2.25	...	10	6
May	...	...	...	87.0	36.0	61.1	77.4	S., N. W.	4.46	...	15	9
June	...	...	...	90.0	52.0	70.7	76.0	N. W.	3.42	...	6	3
For the year.	...	...	...	91.0	8.0	53.4	78.3	N. W.	57.08	...	152	119

* Including melted snow.

STATION, PHILADELPHIA, PA.

Latitude, 39° 57′ N.; Longitude, 75° 9′ W. Height of Barometer Cistern above Sea Level, 117 feet.

OBSERVER, L. M. DAY, 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.						
1889.												
July	30.260	29.670	30.000	94	60	73.8	76.0	N. W.	6.39	....	17	16
August	30.309	29.760	30.096	88	57	72.8	72.6	S. W.	7.07	....	12	12
September	30.330	29.530	30 046	87	47	66.4	80.0	N. E.	4.66	....	17	17
October	30.400	29.560	30.056	79	32	52.7	72.0	N. W.	3.76	....	13	14
November..... .	30.690	29.440	30.100	65	27	47.0	77.0	N. W.	6.76	....	15	16
December........	30.880	29 600	30.194	68	16	43.6	71.8	S. W.	0.85	....	10	16
1890.												
January..........	30.760	29.650	30.246	72	19	41.8	68.0	W.	1.83	....	11	15
February	30.606	29.608	30.132	69	21	41.4	74.0	N. E.	3.39	....	13	16
March............	30.580	29.310	30.070	73	9	38.8	68.0	N. W.	4.61	....	19	15
April	30.670	29.480	30.132	81	30	52.0	61.0	N. W.	2.28	....	10	9
May................	30.310	29.610	29.990	84	39	62.8	69.2	S. E.	2.96	....	16	11
June................	30.360	29 800	30.001	92	55	73.4	64.0	N. W.	1.30	....	6	11
For the year.	30.880	29.310	30.090	94	9	55.5	71.1	N. W.	47.86	....	159	168

* Including melted snow.

STATION, ATLANTIC CITY, N. J.

Latitude, 39° 22′ N.; Longitude, 74° 25′ W. Height of Barometer Cistern above Sea Level, 53 feet.

OBSERVER, WM. T. BLYTH, 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.						
1889.												
July	30.230	29.650	30.000	88.0	56.0	72.0	87.0	S.	4.66	....	16	14
August	30.240	29.750	30.080	84.0	57.0	69.0	85.0	S. W.	1.93	....	7	8
September	30.290	29.540	30.020	82.0	45.0	64.0	89.0	N. E.	3.17	....	11	10
October	30.380	29.590	30.030	71.0	37.0	52.0	81.4	N.	3.02	....	14	14
November	30.670	29.400	30.100	64.0	25.0	47.0	82.6	W.	5.77	....	13	13
December	30.830	29.620	30.180	68.0	22.0	44.0	81.0	S. W.	0.25	....	7	10
1890.												
January	30.740	29.660	30.240	64.0	18.0	42.0	78.2	S. W.	1.27	....	10	12
February	30.540	29.600	30.120	71.0	20.0	41.0	79.9	S. W.	2.43	....	12	11
March	30.580	29.510	30.050	63.0	10.0	38.0	77.4	N. W.	5.20	....	13	12
April	30.660	29.500	30.120	80.0	29.0	48.0	74.8	S. W.	3.86	....	11	6
May	30.280	29.640	29.990	76.0	44.0	57.0	84.3	S. W.	5.81	....	14	13
June	30.360	29.800	30.010	90.0	54.0	69.0	79.0	S.	2.99	....	9	2
For the year	30.830	29.400	30.080	90.0	10.0	53.6	81.6	S. W.	40.36	....	137	125

* Including melted snow.

STATION, CAPE MAY COURT HOUSE, N. J.

Latitude, 39° 4′ N.; Longitude, 74° 49′ W. Height of Barometer Cistern above Sea Level, — feet.

OBSERVER, J. F. LEAMING, 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.						
1889.												
July	....	....	....	90.5	57.0	72 8	....	....	....	....	13	10
August	....	....	....	87.0	56.0	70.7	....	....	....	....	9	8
September	....	....	....	89.5	46.0	65.8	....	....	....	....	11	17
October	....	....	....	75.0	36.5	52.6	....	....	....	....	7	15
November	....	....	....	69.0	25.0	49.6	....	....	....	....	10	13
December	....	....	....	69.5	24.5	46.6	....	....	....	....	4	10
1890.												
January	....	....	....	78.0	18.0	45.3	....	....	....	....	10	13
February	....	....	....	68.0	22.0	44.1	....	....	3.11	....	12	11
March	....	....	....	71.0	10.0	40.4	....	....	4.33	....	12	12
April	....	....	....	80.0	24.0	50.7	....	....	2.99	....	11	6
May	....	....	....	80.0	37.0	60.6	....	....	4.09	....	13	13
June	....	....	....	91.0	50.0	71.4	....	....	1.58	....	6	3
For the year	....	....	....	91.0	10.0	55.9	....	....	....	....	118	131

* Including melted snow.

METEOROLOGICAL SUMMARY FOR THE STATE.

July, 1889.

TEMPERATURE (degrees F.)—The mean temperature for July, 1889, 73.4 degrees, is 1.1 degree below the average for the month, and 2.3 degrees above the average for the corresponding month of 1888. The highest temperature recorded was 96.0 degrees, and the lowest 48.0 degrees, as against 99.0 degrees and 45 0 degrees respectively during July, 1888. The highest temperatures were generally recorded on the 8th, 9th, 10th and 14th, and the lowest on the 15th, 16th, 18th and 24th.

PRECIPITATION.—The average precipitation for the State, 10 19 inches, is 5.87 inches above the average for the month, and is 6.79 inches above the average for the corresponding month of 1888. The rainfall was very unevenly distributed. The fierce downpour on the 30th and 31st did considerable damage, especially in the vicinity of Plainfield and the Oranges. At Plainfield three dams gave way and the entire town was flooded. Several large ice-houses were destroyed and some of the finest residences were damaged. All the Oranges were flooded and many houses were damaged or destroyed. Fritz's dam was swept away, and the waters almost completely wrecked Epples Park. The tracks of the Erie railroad were badly undermined and all traffic was stopped. In East Orange many elegant residences were an open sea, fences, roads and all landmarks having disappeared. The low meadows along the Passaic river and its branches were flooded, destroying thousands of acres of hay. This crop is estimated at $5 per acre, which shows a loss of from $60,000 to $65,000. The most remarkable features of the month were that the thunder storms were generally distant, with almost a total absence of high winds. It appeared that we were always on the edge of the most violent storms. The rainfall at South Orange, 18.58 inches, is phenomenal, and the wonder is that the damage is not greater than it was. Five stations report a total for the month exceeding 14 inches, three exceeding 12 00 inches, six exceeding 10.00 inches and ten 10.00 inches. The excess (above the average) at all stations is from 0.34 inches on the Atlantic Coast, to 14.26 inches at South Orange.

ATMOSPHERIC PRESSURE (in inches) —Monthly mean, 30.000; maximum observed, 30.260, at Philadelphia, Pa., on the 6th; minimum observed, 29.650, at Atlantic City, on the 15th; range for State, 0.610.

TEMPERATURE (degrees F.)—Monthly mean, 73.4; highest monthly mean, 76.7, at Billingsport and Readington; lowest monthly mean, 70.9, at South Orange; maximum, 96.0, at Readington, on the 19th; minimum, 48.0, at Hanover and Tenafly, on the 16th; range for State, 48.0; greatest local monthly range, 45 0, at Tenafly; least local monthly range, 25.0, at Bridgeton; greatest daily range, 38.0, at Tenafly, on the 18th and 20th; least daily range, 0.0, at Billingsport, on the 13th. Mean humidity, 84.5 per cent.

PRECIPITATION (in inches).—Average for the State, 10.19; greatest, 18.58, at South Orange; least, 4.66, at Atlantic City; average number of days on which precipitation equaled 0.01 inch, 13.7; number of days on which cloudiness was 8 or more on a scale of 10, 12.9. *Wind*—Prevailing direction, southeast.

MISCELLANEOUS (dates observed)—*Thunder Storms*—1st, 2d, 3d, 4th, 9th, 10th, 11th, 13th, 14th, 15th, 17th, 19th, 20th, 23d, 27th, 28th, 29th, 30th, 31st. *Hail*—At Trenton on the 15th. *Solar Halos*—13th, 23d. *Lunar Halos*—8th, 9th, 14th. *Meteors*—Beverly, 15th; Tenafly, 17th. *Auroras*—Woodbury, 25th. *Polar Bands*—Beverly, 23d.

OBSERVERS' NOTES.

SOUTH ORANGE.—The heavy rains of the 30th and 31st did great damage to the roads and hillside properties. Many roads are impassable, deep gullies, bridges wrecked and gone. The heaviest rains were as follows: 30th, from 11 A. M. to 12 noon, 3:30 to 5 P. M., 6 to 9 P. M.; total, 6.90 inches. 31st, from 1 to 2 A. M. and from 11:30 A. M. to 12:30 P. M., 1.50 inches. Grand total, 8.40 inches. The monthly rainfall (18.58 inches) is the largest ever recorded at this station.

PLAINFIELD.—Thunder and lightning accompanied nearly all the storms, but was at no time excessive and often only distant. The severe storm of the 30th and 31st did considerable damage by causing an overflow of the brooks. The wind was moderate throughout the month.

UNION.—The most astonishing rainfall ever recorded at this station commenced at 11:15 A. M. on 30th. At 1:15 P. M., 0.25 inches had fallen; at midnight, 4.11 inches; at 2 A. M. of 31st the measurement was 5.76 inches; here a cessation occurred till 8.15 A. M., when the storm recontinued and ceased at 1:15 P. M. Total, 6.20 inches in twenty-six consecutive hours. Violent electrical displays occurred on the 31st from noon to 12:45 P. M. July will be recorded as a month pre-eminently disastrous to all farming interests.

August, 1889.

TEMPERATURE (degrees F.)—The mean temperature for August, 1889, 69.6 degrees, is 2.4 degrees below the normal for the month, and 2.9 degrees below the average for the corresponding month of 1888. The warmest days of the month were the 2d, 8th, 9th, 20th and 21st, when temperatures ranging from 84.0 to 95.0 degrees were recorded. The coolest days were the 12th, 13th, 15th, 16th, 17th, 18th, 27th, 28th and 30th, the temperature ranging between 45.0 and 58.0 degrees.

PRECIPITATION.—The average precipitation for the State, 5.18 inches, is 0.44 inches above the normal and 0.95 inches below the average for the corresponding month of 1888. One station reports a total exceeding nine inches, four exceeding seven inches, two exceeding six inches, nine exceeding five inches, nine exceeding four inches, four exceeding three inches and one exceeding one inch. On the 23d a very severe thunder storm occurred between five and six P. M., near Flemington. The *Hunterdon County Democrat* thus describes it:

"A great mass of inky-black clouds gathered in the northwest, and they increased constantly in volume until the whole northwestern heavens were as black as ebony and darkness fell upon the earth. Suddenly the wind shifted from the southeast to the northwest, the flash of the lightning gave a greenish tint to the angry clouds, and it was seen the wind was carrying the gathering storm back over a southeasterly course. At about six o'clock the storm broke forth all along the line, the rain fell in great torrents, the wind rose high and strong, the deafening thunder clap spitefully followed the flash of the lightning, and the voices of men were hushed in contemplation of the awful fury of the elements. In an incredibly short time the water-courses were swelled to enormous proportions, and the main street of our town seemed like a river. Great damage was done throughout the county.

"The lightning left its mark in Flemington on the new Methodist Church. A bolt struck the cupola and ran a short distance down the stonework, knocking the plaster right and left, and ripping a part of the casing from one of the windows. Fortunately the stroke did not enter the structure, and the damage is all on the outside. Limbs were blown from trees in all parts of the town, and two or three trees were uprooted.

"In the neighborhood of Ringoes and Clover Hill there was a heavy accompaniment of hail, which did much damage to growing corn and fruit."

ATMOSPHERIC PRESSURE (in inches).—Monthly mean, 30.085; maximum observed, 30 340, at Highland Park, on the 27th; minimum observed, 29.743, at New York City, on the 15th; range for State, 0.597.

TEMPERATURE (degrees F.)—Monthly mean, 69.6; highest monthly mean, 76.0, at Trenton; lowest monthly mean, 66.4, at Hanover; maximum, 95.0, at Oceanic, on the 8th; minimum, 45.0, at Tenafly, on the 12th; range for State, 50.0; greatest local monthly range, 43.0, at Tenafly; least local monthly range, 24.0, at Ocean City; greatest daily range, 37.0, at Asbury Park, on the 31st; least daily range, 1.5, at Imlaystown, on the 1st; mean humidity, 84.0.

PRECIPITATION (in inches).—Average for the State, 5.18; greatest, 9.06, at Oceanic; least, 1 93, at Atlantic City. Average number of days on which precipitation equaled 0.01 inch, 9.8. Number of days on which cloudiness was 8 or more on a scale of 10, 8.3. *Wind*—Prevailing direction, southeast and southwest.

MISCELLANEOUS PHENOMENA (dates observed).—*Thunder Storms*—1st, 3d, 4th, 5th, 6th, 7th, 9th, 13th, 14th, 15th, 20th, 22d, 23d. *Hail*—23d, at Moorestown and Rancocas. *Solar Halos*—5th, 13th. *Lunar Halos*—3d, 4th, 6th, 12th.

OBSERVERS' NOTES.

MOORESTOWN.—Haze during most of the month, when not raining. Sometimes very dense.

UNION.—There were fifteen clear days in August, five fair and eleven cloudy. The winds were variable and generally light. The first three weeks of the month were characterized by excessively high humidity. The rainfall for the summer season of 1889, 22.45 inches, is most remarkable, being 8.43 inches in excess of the season of 1888.

OCEANIC.—The rainfall of the 13th and 14th, 5.99 inches, was most remarkable, even for this season.

ASBURY PARK.—The mean daily relative humidity for the month, determined from observations made at seven A. M., two P. M. and nine P. M., was 80.0, the mean of the morning observations being 88.2; afternoon, 69.3, and night, 82.6. The mean daily range of temperature was 20.1 degrees.

September, 1889.

TEMPERATURE (degrees F.)—The mean temperature for September, 1889, 64.8 degrees, is 0.5 degrees below the average for the month, and 1.7 degrees above the average for the corresponding month of 1888. The warmest days of the month were the 1st, 2d, 3d, 5th and 6th, and the coolest the 19th, 20th, 22d, 23d and 29th. Light, harmless frosts occurred on the mornings of the 21st, 22d and 23d.

PRECIPITATION.—The average precipitation for the State, 8.36 inches, is 4.47 inches above the average determined from past records of forty-nine stations, and 1.27 inches above the average for the corresponding month of 1888. One station reports a total exceeding thirteen inches, two exceeding eleven, four exceeding ten, four exceeding nine, five exceeding eight, four exceeding seven, five exceeding five, one exceeding four, and two exceeding three inches.

ATMOSPHERIC PRESSURE (in inches).—Monthly mean, 30.040; maximum observed, 30.330, at Philadelphia, on the 22d; minimum observed, 29.471, at New York City, on the 21st; range for State, 0.859.

TEMPERATURE (degrees F.)—Monthly mean, 64.8; highest monthly mean, 68.4, at

Readington; lowest monthly mean, 60.4, at Hanover; maximum, 90.0, at Plainfield, on the 6th; minimum, 3.40, at Hanover, on the 23d; range for State, 56.0; greatest local monthly range, 54.0, at Allaire; least local monthly range, 33.0, at Ocean City; greatest daily range, 38.0, at Tenafly, on the 4th; least daily range, 1.0, at Oceanic and Trenton, on the 12th. Mean humidity, 86.0.

PRECIPITATION (in inches).—Average for the State, 8.36; greatest, 13.13, at Plainfield; least, 3.17, at Atlantic City. Average number of days on which precipitation equaled 0.01 inch, 14.5. Average number of days on which cloudiness was 8 or more on a scale of 10, 14.4. *Wind*—Prevailing direction, northeast.

MISCELLANEOUS PHENOMENA (dates observed).—*Thunder Storms*—13th, 14th, 15th, 16th, 17th, 18th, 19th, 21st. *Frost*—21st, 22d, 23d. *Solar Halos*—14th. *Lunar Halos*—5th, 6th, 8th. *Hail*—Billingsport, 18th; Valley, 19th; Rancocas, 21st. *Meteors*—Beverly, 23d; Egg Harbor City, 28th.

OBSERVERS' NOTES.

On Sunday afternoon, 15th inst., a great rain fell at Lambertville, beginning at four and pouring down like a cloud-burst until after six o'clock. Dr. G. H. Larison found in his rain-gauge over three inches of water. All the streams in the neighborhood were greatly swollen, and the creek that runs into the city on the east side did much damage by bursting the embankment at the head of York street, and letting the full flow of water into the middle of the city.

October, 1889.

TEMPERATURE (degrees F.)—The mean temperature for October, 1889, 50.8 degrees, is 3.5 degrees below the average for the month, and 1.6 degrees above the average for the corresponding month of 1888. The warmest days of the month were the 1st, 4th and 12th, and the coolest, the 9th, 10th, 15th, 17th, 22d, 23d and 24th. The first snow of the season fell in nearly all portions of the State on the 23d, melting as it fell.

PRECIPITATION.—The average precipitation for the State, 3.80 inches, is 0.61 inches above the average determined from past records of forty-eight stations, and 0.93 inches above the average for the corresponding month of 1888. The month will be noted for its frequent rains, excessive cloudiness, and great daily ranges of temperature.

ATMOSPHERIC PRESSURE (in inches).—Monthly mean, 30.047; maximum observed, 30.431, at Highland Park on the 23d; minimum observed, 29.560, at Philadelphia, on the 27th; range for State, 0.871.

TEMPERATURE (degrees F.)—Monthly mean, 50.8; highest monthly mean, 55.8, at Readington; lowest monthly mean, 45.1, at Hanover; maximum, 82.0, at Beverly, on the 12th; minimum, 23.0, at Hanover, on the 22d; range for State, 59.0; greatest local monthly range, 50.0, at Beverly; least local monthly range, 34.0, at Atlantic City; greatest daily range, 36.0, at Allaire and Gillette, on the 11th, 3d and 5th respectively; least daily range, 4.0, at Oceanic, on the 14th. Mean humidity, 80.8.

PRECIPITATION (including melted snow, in inches).—Average for the State, 3.80; greatest, 5.03, at Hopewell; least, 2.42, at Newark. Average number of days on which precipitation equaled 0.01 inch, 11.4. Average number of days on which cloudiness was 8 or more on a scale of 10, 12.2. *Wind*—Prevailing direction, northwest.

MISCELLANEOUS PHENOMENA (dates observed).—*Thunder Storms*—1st, 12th, 13th. *Frost*—2d, 3d, 5th, 7th, 8th, 9th, 16th, 17th, 19th, 22d, 24th, 25th. *Solar Halos*—3d, 9th, 17th, 19th. *Hail*—1st. *Snow*—22d, 23d. *Meteors*—16th and 19th, observed at Egg Harbor City. *Polar Bands*—9th, observed at Moorestown. *Auroras*—26th, Egg Harbor City; 28th, Woodbury.

OBSERVERS' NOTES.

NEWARK.—As to temperature, the month was, by no means, the coldest of which we have a record. In fact it was not as cold as October of last year, whose mean temperature was 49.96 degrees, while that of the month just closed was 50.40 degrees. The eleven Octobers immediately preceding that of 1888 were extraordinarily warm, giving us a mean temperature of nearly 56 degrees, while that of thirty-four corresponding months preceding them was less, fifty-two and a half degrees. On the 24th, ice was formed in various parts of the city.

RANCOCAS—The thunder storm of the 1st was a sharp electric storm, equal in volume of any during the sultry days of summor, while it lasted.

UNION.—Ice formed on the 22d and 24th. No snow fell during the month.

MOORESTOWN.—5th. Texas horn fly still seen. 17th. First heavy frost of the season. Temperature, 36.5 at six A. M. Close of the season for tender vegetation.

PLAINFIELD.—Light ice formed on the morning of the 22d. First snow on the 22d.

OCEANIC—3d. Several fish hawks seen to-day. The effects of the great gale of September 10th–12th is manifest in the early loss of foliage wherever the trees were directly exposed to the gale.

November, 1889.

TEMPERATURE (degrees F.)—The mean temperature for November, 1889, 45.7 degrees, is 3.6 degrees above the average for the month, and 0.1 degree below the average for the corresponding month of 1888. The warmest days of the month were the 1st, 2d, 3d, 12th, 13th, 14th, 15th and 16th, when the maximum temperatures ranged between 60 and 74 degrees. The coolest days were the 16th, 17th and 30th, the minimum temperatures ranging between 13 and 28 degrees.

PRECIPITATION.—The average precipitation for the State, 8.48 inches, is 5.06 inches above the average determined from the past records of forty-eight stations, and 4.51 inches above the average for the corresponding month of 1888.

ATMOSPHERIC PRESSURE (in inches).—Monthly mean, 30.095; maximum observed, 30.690, at Philadelphia, on the 16th; minimum observed, 29.391, at New York City, on the 25th; range for the State, 1.299.

TEMPERATURE (degrees F.)—Monthly mean, 45.7; highest monthly mean, 49.6, at Cape May Court House and Woodbury; lowest monthly mean, 40.5, at Hanover; maximum, 74.0, at Tenafly, on the 1st; minimum, 13.0, at Hanover and Tenafly, on the 17th; range for the State, 61.0; greatest local monthly range, 61.0, at Tenafly; least local monthly range, 34.0, at Billingsport and Trenton; greatest daily range, 38.0, at Cape May Court House, on the 15th; least daily range, 2.0, at Moorestown, New Brunswick, Trenton and Union, on the 8th, and Lambertville, on the 21st.

PRECIPITATION (including melted snow, in inches).—Average for the State, 8.48; greatest, 11.45, at Belleville; least, 4.70, at Ocean City. Average number of days on which precipitation equaled 0.01 inch, 13.4; average number of days on which cloudiness was 8 or more on a scale of 10, 12.7. *Wind*—Prevailing direction, northwest.

MISCELLANEOUS PHENOMENA (dates observed).—*Thunder Storms*—9th and 27th. *Solar Halos*—5th and 21st. *Lunar Halos*—1st, 2d, 3d, 4th, 10th, 12th and 13th. *Sleet*—30th. *Snow*—30th. *Meteors*—5th, 6th, 12th, 14th, 16th, 20th and 23d. *Polar Bands*—7th, Beverly; 17th, Madison. *Auroras*—2d and 26th, Egg Harbor City.

OBSERVERS' NOTES.

SOUTH ORANGE.—Average temperature of past twenty Novembers, 41.2; average rainfall, 3.72 inches; mean temperature of the autumns, 51.8; total rainfall, 27.22 inches. Average temperature of the past twenty autumns, 52.0; average rainfall, 11.37 inches. The rainfall of November, 1889, is far in excess of that of any November for twenty years, and the same is true of the autumns.

NEW BRUNSWICK (Mr. P. V. Spader).—The rainfall, 8.77 inches, is 4.84 inches above the average for the month, and is the largest rainfall for November in thirty-six years, except in 1861, when 8.77 inches fell.

FREEHOLD.—Ice formed on nights of the 3d, 26th and 28th. Roads frozen on the night of 26th Light snow squalls at intervals on the 29th and 30th.

RANCOCAS —The precipitation for the month, 7.62 inches, is the largest amount recorded for the past twenty-six Novembers. The least precipitation during that time is 0.88 inches. On the 13th, at 8 P. M., rain was observed falling from a cloudless sky.

UNION.—During the month there were ten days which may be called clear, twenty days were cloudy, on fifteen of which rain fell. Three of these storms were excessive. On the 8th and 9th the rainfall measured 3.17 inches in twenty four consecutive hours, followed closely on the 18th and 19th by 1.80 inches, and on 27th and 28th by 2.87 inches. Ice formed on the 7th, 16th, 17th, 26th, 29th and 30th. Total autumn rainfall, 23.39 inches.

NEWARK.—The rains of the month were frequent, and on three occasions, the 9th, 19th and 27th, very heavy. On all other occasions they were comparatively light, varying, when measurable, from six-hundredths to seven-tenths of an inch. The total waterfall amounted to 8 870 inches, coming to us on sixteen days, and occupying in its descent one hundred and eight hours, as estimated. This was an extraordinary rainfall for November, having never been equaled in that month during the entire period of our record. The nearest approach to it was in November, 1846, when the waterfall was 8.745 inches. The average rain for November is 3 637 inches.

December, 1889.

TEMPERATURE (degrees F.)—The mean temperature for December, 1889, 41.5 degrees, is 9.0 degrees above the average for the month, and 6.6 degree above the average for the corresponding month of 1888. The warmest days of the month were the 25th and 26th, and the coolest, the 3d, 4th and 5th. The lowest temperature recorded in the northern portion of the State was 8.0, in the central 16.0, and in the southern 24.5.

At the close of the month the ground was free from frost, and in many places the buds on peach and other fruit trees were swelling Ploughing was quite general during the month. Pasturage continues fair, the grass green and growing.

PRECIPITATION.—The average precipitation for December, 1.62 inches, is 2 00 inches below the average determined from past records of forty-eight stations, and 2.07 inches below the average for the corresponding month of 1888.

The stations report the depth of snowfall during the month as follows: (In inches), Madison, 5 5; Tenafly, 4.7; Union, 4.5; Gillette, 4.0; Highland Park, New Brunswick, Plainfield and Junction, 2.00; Hopewell and Locktown, 1.0.

ATMOSPHERIC PRESSURE (in inches).—Monthly mean, 30.182; maximum observed, 30.881, at New York City, on the 31st; minimum observed, 29.526, at New York City, on the 26th; range for the State, 1.355.

TEMPERATURE (degrees F)—Monthly mean, 41.5; highest monthly mean, 46.6, at Cape May Court House; lowest monthly mean, 37.8, at Hanover; maximum, 71.0, at Beverly, on the 25th; minimum, 8.0, at Hanover and Plainfield, on the 4th and 5th respectively; range for the State, 63.0; greatest local monthly range, 60.0, at Plainfield; least local monthly range, 38.0, at Ocean City; greatest daily range, 45.0, at Gillette, on the 4th; least daily range, 1.0, at Trenton and Asbury Park, on the 14th and 18th respectively.

PRECIPITATION (including melted snow, in inches).—Average for the State, 1.62; greatest, 3.69, at Tenafly; least, 0.25, at Atlantic City. Average number of days on which precipitation equaled 0.01 inch, 8.7; average number of days on which cloudiness was 8 or more on a scale of 10, 9.1. *Wind*—Prevailing direction, southwest.

MISCELLANEOUS PHENOMENA (dates observed).—*Thunder Storms*—26th. *Solar Halos*—16th. *Lunar Halos*—1st, 2d, 4th, 8th, 9th, 14th, 15th, 29th and 31st. *Hail*—14th. *Sleet*—5th, 6th, 14th. *Meteors*—7th, 11th, 12th, 13th, 15th, 21st, 27th. *Polar Bands*—14th (Madison).

OBSERVERS' NOTES.

BEVERLY.—The 25th was a bright, spring-like day, one in which outdoor pleasures could be enjoyed. Mosquitoes and wasps about. Trees showing considerable budding. Grass generally of a bright green.

OCEANIC.—December ends with no frost in the ground. Grass green and growing. Buds of fruit and maple trees swelling. In places fruit trees have bloomed and fruit formed.

NEW BRUNSWICK.—Christmas Day was the warmest on record. The maximum, 65 degrees of December, is the highest for that month, except 1847, when it was 70, and in 1859, 1873 and 1881, when it was 67; but in these years it occurred before the middle of the month. The average rainfall for thirty-six years is 46.82 inches. The average for the year 1889 was 61.30 inches, which shows an excess of 14.48 inches.

January, 1890.

TEMPERATURE (degrees F)—The mean temperature for January, 1890, 41.3 degrees, is 11.8 degrees above the average for the month, and 5.1 degrees above the mean of the corresponding month of 1889. The warmest days of the month were the 2d, 6th, 13th and 15th, the temperature ranging between 65 and 78 degrees. The coolest days were the 22d, 23d and 25th, when the mercury fell to 16 degrees in the northern section, to 12 in the central and to 18 in the southern section of the State. During the month ploughing was possible on every day except four, when the ground was frozen and ice formed to the thickness of from 1 to 3 inches (22d to 24th). The rivers continue free from ice, and navigation on all the water-ways of the State has been continuous. Tree frogs, lady bugs and ants were observed as early as the 2d, and on the 12th bees were seen carrying pollen. Maple, peach and pear trees were in bloom throughout the month.

PRECIPITATION.—The average precipitation for the month, 2.29 inches, is 0.65 inches below the normal determined from past records, and 3.39 inches below the average for the corresponding month of 1889. One station reports a total slightly above three inches, twenty slightly above two inches and ten slightly above one inch. The greatest depth of snowfall reported was one inch. At the close of the month the ground was free from frost, the grass and grain "green and growing."

ATMOSPHERIC PRESSURE (in inches).—Monthly mean, 30.23; maximum observed, 30.777, at New York City, on the 1st; minimum observed, 29.520, at Newark, on the 8th; range for the State, 1.257.

Temperature (degrees F.)—Monthly mean, 41.3; highest monthly mean, 45.3, at Cape May Court House; lowest monthly mean, 37.1, at Madison; maximum, 78.0, at Cape May Court House, on the 12th; minimum, 12.0, at Highland Park, on the 22d; range for the State, 66.0; greatest local monthly range, 61.3, at Egg Harbor City; least local monthly range, 45.5, at New Brunswick; greatest daily range, 43.0, at Cape May Court House, on the 13th; least daily range, 0.5, at Princeton, on the 3d.

Precipitation (including melted snow, in inches)—Average for the State, 2.29; greatest, 3.22, at Plainfield; least, 1.05, at Asbury Park. Average number of days on which precipitation equaled 0.01 inch, 9.5; average number of days on which cloudiness was 8 or more on a scale of 10, 10.9. *Wind*—Prevailing direction, northwest and southwest.

Miscellaneous Phenomena (dates observed)—*Thunder Storms*—8th *Solar Halos*—2d, 3d, 19th, 25th. *Lunar Halos*—3d, 5th, 9th, 13th, 23d, 25th, 29th, 31st. *Hail*—1st, 21st. *Snow*—16th, 22d, 23d, 24th. *Meteors*—13th, 15th. *Polar Bands*—3d, 17th, 19th. *Auroras*—8th, 20th.

Annual Meteorological Summary for the Year Ending December 31st, 1889.—Annual mean, 52.8; highest annual mean, 55.9, at Bridgeton and Readington; lowest annual mean, 50.4, at Union; maximum, 96.0, at Readington, July 19th; minimum, 3.0 below zero, at Locktown, February 24th; range for State, 99.0.

COMPARATIVE MEAN TEMPERATURE (BY SEASONS).

	1888.	1889.	Normal.
Mean winter temperature	30.3	35.1	31 2
Mean spring temperature	44.4	51.3	48.1
Mean summer temperature	71.4	71.0	72.0
Mean autumn temperature	52.7	53.8	53 9

Precipitation (including melted snow, in inches).—Average for the year, 63.33; greatest, 82.31, at Plainfield; least, 38.83, at Atlantic City; greatest monthly, 18.58, at South Orange, July; least, 0.25, at Atlantic City, December; average number of days on which rain or snow fell, 134.6; average number of days on which cloudiness was 8 or more on a scale of 10, 138.

COMPARATIVE PRECIPITATION (BY SEASONS).

	1888.	1889.	Normal.
Winter	11.99	9.50	10.27
Spring	13.91	13.08	11.64
Summer	12.21	19.65	12.86
Autumn	15.79	21.11	11.68

February, 1890.

Temperature (degrees F.)—The mean temperature for February, 1890, 39.9 degrees, is 8.4 degrees above the average for the month, and 12.2 degrees above the mean of the corresponding month of 1889. The warmest days of the month were the 5th, 18th and 26th, when the maximum temperatures ranged between 66 and 76 degrees. The coolest days were the 7th and 21st, when the mercury suddenly fell to 14 degrees at Gillette, Morris county, on the former date, and to 15 degrees at Tenafly, Bergen county, and Madison, Morris county, on the latter date. The mean temperature of the winter of 1889 and 1890, 40.9 degrees, is 9.7 degrees above the normal, 10.6 degrees above the winter of 1888, and 5.8 above the winter of 1889.

PRECIPITATION.—The average precipitation for the month, 4.17 inches, is 0.79 inches above the normal, and 1.68 inches above the average for the corresponding month of 1889. Five stations report a total exceeding 5 inches, 13 exceeding 4 inches, 13 exceeding 3, and 1 exceeding 2 inches. The snowfall during the month was generally very light, the greatest depth reported (for the month) was 2.3 inches at South Orange, Essex county. The deficiency of precipitation at Atlantic City since January 1st is 3 67 inches; at Philadelphia, 1.43 inches and at New York, 0.64 inches.

ATMOSPHERIC PRESSURE (in inches).—Monthly mean, 30.20; maximum observed, 30.606, at Philadelphia, Pa., on the 7th; minimum observed, 29.518, at New York City, on the 5th and 14th; range for the State, 1.088.

TEMPERATURE (degrees F.)—Monthly mean, 39.9; highest monthly mean, 44.1, at Cape May Court House; lowest monthly mean, 36.0, at Tenafly; maximum, 76.0, at Beverly, on the 18th; minimum, 14.0, at Gillette and Junction, on the 14th and 21st, respectively; range for the State, 62.0; greatest local monthly range, 57.0, at Beverly; least local monthly range, 44.0, at Billingsport, Ocean City and Tenafly; greatest daily range, 40.0, at New York City, on the 7th; least daily range, 0.2, at Readington, Union, Billingsport and Newark, on the 1st, 4th, 6th and 28th, respectively.

PRECIPITATION (including melted snow, in inches).—Average for the State, 4.17; greatest, 5.32, at South Orange; least, 2.43, at Atlantic Oity. Average number of days on which precipitation equaled 0.01 inch, 10.3 average number of days on which cloudiness was 8 or more on a scale of 10, 12.5. *Wind*—Prevailing direction, northwest and southwest.

MISCELLANEOUS PHENOMENA (dates observed).—*Thunder Storms.*—17th, 18th, 19th, 24th, 25th. *Solar Halos.*—4th, 7th, 17th, 19th, 26th, 27th. *Lunar Halos.*—3d, 4th, 5th. *Hail.*—7th, 19th, 28th. *Sleet.*—7th, 28th. *Snow.*—2d, 19th, 20th, 21th. *Dense Fog.*—24th, 25th.

OBSERVERS' NOTES.

WOODBURY.—Peach and cherry trees were in bloom on the 26th.

MOORESTOWN.—On the 5th columbine and phlox appeared above ground and disclosed leaves, woodbine shooting. On 17th, bluebirds' first visit and song. On 26th, kill deer plover, crow black-birds, red-wing black-birds, robins in flocks and larks singing.

FREEHOLD.—Earthquake on the 7th at 4:17 P. M. House-flies, wasps, mosquitoes and caterpillars appeared on the 4th and 5th.

UNION.—Winter grain looks well and buds on all trees very far advanced. No ice has been housed at this station during the winter.

SOUTH ORANGE.—The warmest February and the warmest winter in twenty years. Average temperature for the past twenty Februaries, 29.9; average temperature for the season, 37.6; average for the past twenty winters, 30.2.

LAMBERTVILLE.—Blue birds observed on the 16th, black-birds and robins on the 21st. There has not been snow enough at any time this winter to gather up a snow-ball, unless swept together with a broom. Wheat has grown all winter and looks fine. Rye has obtained a good stand.

CAPE MAY COURT HOUSE.—The most noticeable phenomena, aside from the generally high temperature and summer-like weather, is the blooming throughout the month of some varieties of peach and plum trees. The japonicas are all in full bloom, and many summer shrubs are in partial leaf.

March, 1890.

TEMPERATURE (degrees F.)—The mean temperature for March, 1890, 37.6 degrees, is 0.8 degrees above the normal for the month, and 3.7 degrees below the average of the corresponding month of 1889. The warmest day of the month was the 12th, when the maximum temperatures ranged between 63 and 77 degrees. The coldest day was the 7th, when the mercury fell to zero at Tenafly, Bergen county (extreme northeastern section), and to 10 degrees above zero at Cape May Court House (extreme southern section).

The severe freezing weather of the 7th did great damage to all early fruits. It is estimated that nearly seventy-five per cent. of the buds of the peach and pear trees have been killed.

PRECIPITATION.—The average precipitation for the month, 6.08 inches, is 2.49 inches above the normal and 2.29 inches above the average for the corresponding month of 1889. Owing to the abnormally heavy rains and snowfalls during the month, all farming operations have been greatly retarded, very little plowing, except on the uplands, has been accomplished. In some portions of the State the early plantings, especially peas, have rotted to such an extent as to necessitate re-planting. At the close of the month the ground was covered with snow to the depth of from one to four and seven-tenth inches.

ATMOSPHERIC PRESSURE (in inches).—Monthly mean, 30.05; maximum observed, 30.58, at Atlantic City, on the 10th; minimum observed, 29.31, at Philadelphia, on the 28th; range for the State, 1.27.

TEMPERATURE (degrees F.)—Monthly mean, 37.6; highest monthly mean, 42.0, at Bridgeton; lowest monthly mean, 34.4, at Tenafly; maximum, 77.0, at Beverly, on the 12th; minimum, zero, at Tenafly, on the 7th; range for the State, 77.0; greatest local monthly range, 73.0, at Tenafly; least local monthly range, 51.0, at Ocean City; greatest daily range, 34.0, at Tenafly, New Brunswick, Hanover and Egg Harbor City, on the 10th, 12th, 20th and 26th respectively; least daily range, 1.0, at Tenafly, Billingsport, Lambertville, Trenton and Moorestown, on the 2d, 14th, 15th and 29th respectively.

PRECIPITATION (including melted snow, in inches).—Average for the State, 6.08; greatest, 7.92, at Tenafly; least, 4.14, at Imlaystown. Averge number of days on which precipitation equaled 0.01 inch, 14.4; average number of days on which cloudiness was 8 or more on a scale of 10, 13.4. *Wind*—Prevailing direction, northwest.

MISCELLANEOUS PHENOMENA (dates observed).—*Thunder Storms.*—6th, 22d, 25th, 26th, 28th, 30th. *Solar Halos*—3d, 4th, 5th, 8th, 10th, 20th, 21st, 23d, 26th, 27th, 29th, 31st. *Lunar Halos*—3d, 4th, 6th, 7th, 27th, 30th. *Hail*—1st, 5th, 6th, 28th, 30th, 31st. *Sleet*—1st, 6th. *Snow*—1st, 2d, 15th, 17th, 19th, 23d, 29th, 30th, 31st. *Meteors*—15th. *Polar Bands*—27th, 31st.

April, 1890.

TEMPERATURE (degrees F.)—The mean temperature for April, 1890, 50.4 degrees, is 2.5 degrees above the normal and 0.8 degrees below the mean of the corresponding month of 1889. The warmest days were the 13th, 14th and 23d, when the maximum temperatures ranged from 75 to 86 degrees. The coolest days were the 1st, 2d, 19th and 20th, when the minimum temperatures recorded ranged from 21 to 34 degrees. On these dates ice generally formed in all portions of the State and did very great damage, especially on the 1st and 2d, almost, if not entirely destroying the peach crop of the season of 1890.

PRECIPITATION.—The average precipitation for the month, 2.65 inches, is 0.82 inches below the normal and 2.67 inches below the average for the corresponding month of 1889.

The most noticeable features of the month were the almost total absence of rain from the 9th to the 23d, inclusive, and the severe local storm which passed over the central portion of Atlantic county on the 27th. This storm was accompanied by very heavy thunder and lightning, high winds (the force of a strong gale), and a remarkable downpour of rain, measuring 1.39 inches in fifteen minutes, or at a rate of 5.56 inches per hour. The first half of the month was noted for its excessive cloudiness and the latter half for its excessive sunshine.

ATMOSPHERIC PRESSURE (in inches)—Monthly mean, 30.119; maximum observed, 30.67, at Philadelphia, on the 2d; minimum observed, 29.46, at New York City, on the 9th; range for the State, 1.21.

TEMPERATURE (degrees F.)—Monthly mean, 50.4; highest monthly mean, 53.3, at Oceanic; lowest monthly mean, 48.0, at Atlantic City; maximum, 86.0, at Readington, on the 13th and 14th; minimum, 21.0, at Egg Harbor City, on the 2d; range for the State, 65.0; greatest local monthly range, 60.0, at Beverly and Egg Harbor City; least local monthly range, 45.0, at Asbury Park; greatest daily range, 50.0, at Beverly, on the 13th; least daily range, 2.0, at Lambertville, on the 9th, 10th and 25th.

PRECIPITATION (including melted snow, in inches).—Average for the State, 2.65; greatest, 4.58, at Egg Harbor City; least, 1.89, Locktown. Average number of days on which precipitation equaled 0.01 inch, 8.5; average number of days on which cloudiness was 8 or more on a scale of 10, 6.7. *Wind*—Prevailing direction, northwest and southwest.

MISCELLANEOUS PHENOMENA (dates observed).—*Thunder Storms*—4th, 7th, 8th, 9th, 10th, 13th, 26th, 27th, 28th. *Frost*—2d, 3d, 6th, 8th, 11th, 12th, 16th, 17th, 19th, 20th, 21st, 29th. *Solar Halos*—1st, 2d, 4th, 8th, 15th, 16th, 23d, 24th. *Lunar Halos*—3d, 4th, 9th, 29th. *Hail*—9th. *Polar Bands*—22d, 29th (Beverly).

May, 1890.

TEMPERATURE (degrees F.)—The mean temperature for May, 1890, 60.7 degrees, is 1.0 degree above the normal and 1.6 degrees below the mean of the corresponding month of 1889. The warmest days were the 1st, 4th, 5th, 10th, 16th, 19th, 24th, 27th, 29th and 31st, when the maximum temperatures recorded ranged from 75 to 87 degrees. The coolest days were the 2d, 3d, 8th, 9th and 16th, the minimum temperatures ranging from 33 to 41 degrees. A very heavy frost occurred on the 9th, in the counties of Middlesex, Monmouth, Burlington, Atlantic, Morris and Sussex, where considerable damage was done to all tender vegetation. The highest temperature was reported from Beverly, Burlington county, and Oceanic, Ocean county; the lowest from Newton, Sussex county, and New Brunswick, Middlesex county.

Precipitation.—The average precipitation for the month, 4.24 inches, is 0.50 inches above the normal and 0.15 inches above the mean for the corresponding month of 1889. Thunder storms were quite frequent during the month, and as compared with May, 1889, just double the number occurred. At the close of the month all the staple crops were in a most flourishing condition, except in some of the southern counties, where the aphis was doing considerable damage to wheat and rye.

Atmospheric Pressure (in inches).—Monthly mean, 29.990; maximum observed, 30.310, at Newark and New York City, on the 22d; minimum observed, 29.610, at Philadelphia, on the 6th; range for the State, 0.700.

Temperature (degrees F.)—Monthly mean, 60.7; highest monthly mean, 66.0, at Trenton; lowest monthly mean, 57.0, at Atlantic City; maximum, 87.0, at Beverly and Oceanic, on the 19th and 29th respectively; minimum, 33.0, at New Brunswick and Newton, on the 9th; range for the State, 54.0; greatest local monthly range, 52.0, at New Brunswick; least local monthly range, 30.0, at Ocean City; greatest daily range, 42.0, at Freehold, on the 5th; least daily range, 2 0, at Newark, on the 6th.

Precipitation (including melted snow, in inches).—Average for the State, 4.24; greatest, 7.17, at Newton; least, 2.60, at Rancocas. Average number of days on which precipitation equaled 0.01 inch, 12; average number of days on which cloudiness was 8 or more on a scale of 10, 11. *Wind*—Prevailing direction, southwest.

Miscellaneous Phenomena (dates observed)—*Thunder Storms*—1st, 3d, 4th, 5th, 7th, 13th, 14th, 15th, 16th, 17th, 19th, 20th. *Frost*—2d, 9th. *Solar Halos*—3d, 9th, 10th, 30th. *Lunar Halos*—3d, 5th, 29th. *Hail*—1st, Beverly; 14th, Imlaystown. *Meteors*—2d, Madison; 19th, Beverly; 22d, Egg Harbor City.

OBSERVERS' NOTES.

Cape May Court House.—The month has but little to note, excepting its favorable condition for growing crops and grasses. No bad storms. Forests look unusually beautiful.

Union.—The marked features of the month were the cool nights, and up to the 20th, frequent though not heavy rains; these conditions have rendered the season backward. Cereals and grass have grown luxuriantly, while most vegetables have been retarded. Chimney swallows appeared on the 1st, and the oriole on the 4th.

June, 1890.

Temperature (degrees F.)—The mean temperature for June, 1890, 70.7, is 1.3 above the normal, and 0.8 above the mean of the corresponding month of 1889. The warmest days were the 4th, 5th and 25th, and the coolest the 1st, 3d, 8th, 9th, 13th and 30th. The highest temperature recorded was 95.0, at Woodbury, Gloucester county, and Imlaystown, Monmouth county, and the lowest 42.0, at Gillette, Morris county.

Precipitation.—The rainfall during the month was very unevenly distributed, two stations reporting a total exceeding five inches, ten exceeding four inches, twelve exceeding three inches, three exceeding two inches, three exceeding one inch, and one less than an inch. The average for the month, 3.59 inches, is 0.39 inches below the normal, and 0.14 inches below the average for the corresponding month of 1889. The stations in the central and northern portions of the State generally received an excess, while those in the southern portions report a deficiency.

Atmospheric Pressure (in inches)—Monthly mean, 30.004; maximum observed, 30.360, at Atlantic City and Philadelphia, on the 9th; minimum observed, 29.780, at New York City, on the 28th; range for the State, 0.580.

TEMPERATURE (degrees F.)—Monthly mean, 70.7; highest monthly mean, 76.0, at Trenton; lowest monthly mean, 67.0, at Allaire; maximum, 95.0, at Woodbury and Imlaystown, on the 5th; minimum, 42.0, at Gillette, on the 30th; range for the State, 53.0; greatest local monthly range, 48.0, at Gillette; least local monthly range, 30.0, at Bridgeton, Readington, Trenton and Union; greatest daily range, 48.0, at Readington, on the 30th; least daily range, 3.0, at Ocean City, on the 16th.

PRECIPITATION (in inches)—Average for the State, 3.59; greatest, 5.16, at Tenafly; least, 0.99, at Bridgeton. Average number of days on which precipitation equaled 0.01 inch, 6.7; average number of days on which cloudiness was 8 or more on a scale of 10, 6.2. *Wind*—Prevailing direction, southwest.

MISCELLANEOUS PHENOMENA (dates observed)—*Thunder Storms* are reported as follows: Beverly, 4th, 5th, 6th, 11th, 12th, 13th, 18th, 21st, 22d, 23d, 24th and 28th; Billingsport, 11th and 12th; Cape May Court House, 11th, 12th and 24th; Tenafly, 4th, 5th, 6th, 11th, 14th and 25th; Rancocas, 4th and 25th; Woodbury, 6th, 11th, 23d and 24th; Imlaystown, 4th and 6th; Ocean City, 11th, 12th and 18th; Trenton, 4th, 6th, 11th and 12th; Union, 4th, 6th (2), 12th (2) and 14th; Freehold, 4th, 6th and 11th; South Orange, 4th, 6th, 13th and 14th; Madison, 4th, 6th, 7th, 11th and 12th. *Hail*—Moorestown, on the 16th at 5 A. M.; Rancocas, on the 6th at 4:30 A. M., and at Beverly on the 11th. *Solar Halos* were observed at Beverly on the 8th and 10th, Egg Harbor City on the 7th, Rancocas on the 9th, Woodbury on the 8th and 9th, and at Union on the 9th. *Lunar Halos* were observed at Trenton, Tenafly and Beverly on the 26th. *Meteors* at Madison on the 8th. *Polar Bands* at Madison on the 8th, and at Beverly on the 8th, 10th and 27th.

NUMBER OF MARRIAGES, BIRTHS AND DEATHS,

BY TOWNSHIPS AND COUNTIES, AND TOTALS FOR THE STATE, FOR THE YEAR ENDING JUNE 30TH, 1890.

ATLANTIC COUNTY.

	M.	B.	D.
Absecon	4	12	13
Atlantic City	165	281	261
Buena Vista	4	25	12
Egg Harbor City	25	37	27
Egg Harbor Township	29	85	66
Galloway	7	38	19
Hamilton	8	45	42
Hammonton	30	78	41
Mullica	3	17	20
Weymouth	....	7	8
	275	625	509

BERGEN COUNTY.

	M.	B.	D.
Boiling Spring	4	18	24
Englewood	36	46	101
Franklin	10	52	44
Harrington	12	36	32
Hohokus	13	46	29
Lodi	33	129	91
Midland	9	25	28
New Barbadoes	63	108	84
Orvil	14	16	21
Palisade	12	37	33
Ridgefield	20	78	66
Ridgewood	2	23	28
Saddle River	4	42	30
Union	26	53	68
Washington	18	49	41
	276	758	720

BURLINGTON COUNTY.

	M.	B.	D.
Bass River	6	28	25
Beverly	17	21	35
Bordentown	39	92	93
Burlington	88	95	150
Chester	30	64	52
Chesterfield	11	23	15
Cinnaminson	29	77	58
Delran	14	57	31
Easthampton	....	9	1
Evesham	8	29	26
Florence	6	60	28
Little Egg Harbor	12	45	21
Lumberton	6	18	8
Mansfield	7	43	27
Medford	12	35	33
Mount Laurel	4	28	10
New Hanover	17	21	37
Northampton	71	109	115
Pemberton	6	27	28
Randolph	4	9	6
Shamong	4	15	4
Southampton	12	29	16
Springfield	3	26	20
Washington	....	6	5
Westhampton	1	1	4
Willingboro	2	12	4
Woodland	....	1	2
	409	980	854

CAMDEN COUNTY.

	M.	B.	D.
Camden City	*4,631	1,188	1,349
Centre	4	48	31
Delaware	3	28	24
Gloucester City	59	124	124
Gloucester	13	63	78
Haddon	32	96	70
Stockton	53	148	136
Waterford	13	61	40
Winslow	13	52	40
	4,821	1,808	1,892

*Marriages of non-residents, 3,805.

CAPE MAY COUNTY.

	M.	B.	D.
Cape May City	22	50	46
Dennis	15	36	35
Lower	13	41	26
Middle	11	43	44
Upper	23	38	23
	84	208	174

CUMBERLAND COUNTY.

	M.	B.	D.
Bridgeton	115	279	203
Commercial	14	46	12
Deerfield	11	50	23
Downe	14	52	14
Fairfield	6	38	31
Greenwich	4	14	21
Hopewell	10	29	22
Landis	76	154	139
Lawrence	11	46	25
Maurice River	12	38	36
Millville	83	268	194
Stoe Creek	6	12	8
	362	1,026	728

ESSEX COUNTY.

	M.	B.	D.
Belleville	25	94	68
Bloomfield	58	164	118
Caldwell	19	54	41
Clinton	26	58	40
East Orange	81	257	127
Franklin	9	32	11
Livingston	6	19	14
Millburn	6	51	49
Montclair	63	215	106
Newark	1,573	4,902	4,948
Orange	175	456	460
South Orange	30	84	58
West Orange	25	67	67
	2,096	6,453	6,107

GLOUCESTER COUNTY.

	M.	B.	D.
Clayton	22	24	51
Deptford	6	38	17
East Deptford	....	1	....
East Greenwich	12	22	19
Franklin	14	42	45
Glassboro	30	70	46
Greenwich	6	44	32
Harrison	14	28	32
Logan	8	37	17
Mantua	11	28	29
Monroe	31	51	35
South Harrison	9	18	6
Washington	....	27	15
West Deptford	7	52	23
Woodbury	44	113	70
Woolwich	20	36	26
	234	631	463

HUDSON COUNTY.

	M.	B.	D.
Bayonne	94	418	387
Guttenberg	8	70	52
Harrison	22	302	237
Hoboken	414	1,408	1,116
Jersey City	1,102	3,587	4,258
Kearny	23	175	189
North Bergen	32	88	243
Town of Union	120	209	239
Union	2	59	57
Weehawken	2	27	63
West Hoboken	91	363	228
	1,910	6,706	7,069

HUNTERDON COUNTY.

	M.	B.	D.
Alexandria	2	13	10
Bethlehem	20	30	32
Clinton	17	47	35
Delaware	14	44	49
East Amwell	8	12	19
Franklin	14	18	23
Frenchtown	15	23	21
High Bridge	15	29	20
Holland	21	19	24
Kingwood	11	19	13
Lambertville	61	58	75
Lebanon	31	48	46
Raritan	24	46	57
Readington	22	33	41
Tewksbury	20	46	44
Union	6	9	7
West Amwell	1	16	6
	302	510	522

MERCER COUNTY.

	M.	B.	D.
East Windsor	29	18	32
Ewing	7	36	113
Hamilton	20	27	105
Hopewell	26	72	65
Lawrence	4	15	22
Princeton	24	93	62
Trenton	*620	846	1,015
Washington	3	10	14
West Windsor	4	15	13
	737	1,132	1,441

* Marriages of non-residents, 85.

MIDDLESEX COUNTY.

	M.	B.	D.
Cranbury	12	34	28
East Brunswick	31	93	51
Madison	....	26	12
Monroe	18	22	22
New Brunswick	140	394	327
North Brunswick	6	21	12
Perth Amboy	64	214	165
Piscataway	20	59	54
Raritan	24	51	46
Sayreville	23	59	11
South Amboy	13	71	105
South Brunswick	17	40	36
Woodbridge	18	101	64
	386	1,185	933

MONMOUTH COUNTY.

	M.	B.	D.
Atlantic	2	13	31
Eatontown	16	89	37
Freehold	54	88	60
Holmdel	7	10	21
Howell	32	58	48
Long Branch	62	154	106
Manalapan	12	19	27
Marlboro	5	14	41
Matawan	22	75	64
Middletown	24	95	83
Millstone	10	35	15
Neptune	85	147	175
Ocean	5	22	41
Raritan	36	118	84
Shrewsbury	69	72	128
Upper Freehold	26	56	44
Wall	45	94	90
	512	1,119	1,095

MORRIS COUNTY.

	M.	B.	D.
Boonton	32	33	36
Chatham	24	87	70
Chester	11	32	33
Hanover	20	45	123
Jefferson	12	16	13
Mendham	14	29	26
Montville	7	5	12
Morristown	55	196	144
Mount Olive	7	23	18
Passaic	11	18	22
Pequannock	11	66	26
Randolph	56	149	119
Rockaway	34	91	129
Roxbury	14	66	47
Washington	13	42	11
	321	898	829

OCEAN COUNTY.

	M.	B.	D.
Berkeley	....	21	10
Brick	31	75	69
Dover	33	46	33
Eagleswood	2	12	19
Jackson	8	27	27
Lacey	8	11	10
Manchester	8	25	12
Ocean	1	18	7
Plumsted	11	32	24
Stafford	11	10	20
Union	13	23	8
	126	300	239

PASSAIC COUNTY.

	M.	B.	D.
Acquackanonk	5	36	33
Little Falls	6	57	27
Manchester	....	34	18
Passaic	89	363	219
Paterson	849	1,953	1,714
Pompton	29	57	37
Wayne	11	29	25
West Milford	20	9	32
	1,009	2,538	2,105

SALEM COUNTY.

	M.	B.	D.
Alloway	10	16	31
Elsinboro	....	4	7
Lower Alloways Creek	12	19	13
Lower Penns Neck	6	16	24
Mannington	2	16	28
Oldmans	5	22	13
Pilesgrove	12	62	82
Pittsgrove	25	75	24
Quinton	13	23	27
Salem	63	85	97
Upper Penns Neck	21	33	22
Upper Pittsgrove	11	24	15
	180	395	383

SOMERSET COUNTY.

	M.	B.	D.
Bedminster	16	32	23
Bernards	11	44	41
Branchburg	4	18	22
Bridgewater	70	163	152
Franklin	11	64	59
Hillsborough	25	44	39
Montgomery	6	25	37
North Plainfield	25	68	60
Warren	5	4	8
	173	462	441

SUSSEX COUNTY.

	M.	B.	D.
Andover	13	27	12
Byram	19	16	23
Frankford	10	22	23
Green	4	12	5
Hampton	7	....	8
Hardyston	25	2	25
Lafayette	5	10	10
Montague	4	2	12
Newton	23	34	21
Sandyston	13	4	4
Sparta	14	15	23
Stillwater	13	15	12
Vernon	2	13	8
Walpack	3	4	2
Wantage	21	53	45
	176	229	233

UNION COUNTY.

	M.	B.	D.
Clark	....	2	6
Cranford	....	3	9
Elizabeth	273	896	727
Fanwood	4	22	15
Linden	11	9	51
New Providence	1	9	14
Plainfield	74	214	190
Rahway	69	100	137
Springfield	6	12	8
Summit	17	74	45
Union	3	29	26
Westfield	12	57	38
	470	1,427	1,266

WARREN COUNTY.

	M.	B.	D.
Allamuchy	1	5	4
Belvidere	43	38	33
Blairstown	8	22	16
Franklin	7	7	15
Frelinghuysen	3	16	10
Greenwich	11	18	14
Hackettstown	17	31	36
Hardwick	3	14	12
Harmony	8	20	16
Hope	3	20	16
Independence	6	7	13
Knowlton	91	35	20
Lopatcong	3	38	22
Mansfield	16	16	30
Oxford	33	99	62
Pahaquarry	1	....	2
Phillipsburg	*389	208	129
Pohatcong	9	43	24
Washington	53	76	53
	705	713	527

*Marriages of non-residents, 297.

TOTALS OF MARRIAGES, BIRTHS AND DEATHS FOR ALL THE COUNTIES.

	M.	B.	D.
Atlantic	275	625	509
Bergen	276	758	720
Burlington	409	980	854
Camden	4,821	1,808	1,892
Cape May	84	208	174
Cumberland	362	1,026	728
Essex	2,096	6,453	6,107
Gloucester	234	631	463
Hudson	1,910	6,706	7,069
Hunterdon	302	510	522
Mercer	737	1,132	1,441
Middlesex	386	1,185	933
Monmouth	512	1,119	1,095
Morris	321	898	829
Ocean	126	300	239
Passaic	1,009	2,538	2,105
Salem	180	395	383
Somerset	173	462	441
Sussex	176	229	233
Union	470	1,427	1,266
Warren	705	713	527
	15,564	30,103	28,530

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, 1890.

COUNTIES. Statistical Divisions.	DEATHS AT ALL AGES.						Population, census of 1890.	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.	Number of deaths from chief preventable diseases.	Comparative number of deaths in each 100 from chief preventable diseases.	DEATHS FROM THE MORE COMMON CAUSES.																				
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Total, including unclassified.							Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic	133	55	35	145	140	509	28,807	17.67	15.09	36.93	164	32 22	3	10	3	3	7	9	...	82	27	20	46	35	47	23	53	37	14	3	4	21
Bergen	159	67	59	231	201	720	47,223	15.25	....	31.39	233	32.36	7	14	6	10	11	28	3	70	44	40	94	37	53	31	79	54	16	3	7	42
Burlington	192	65	62	242	289	854	58,438	14.61	15.52	30.09	259	30.33	3	29	4	5	10	20	1	82	49	56	93	45	80	37	107	50	32	3	8	37
Camden	516	250	166	591	363	1892	87,600	21.60	18.31	13.58	725	38.32	10	93	9	11	16	97	7	245	117	120	217	170	131	60	147	84	51	4	16	88
Cape May	42	14	3	38	75	174	11,245	15.47	....	32.18	48	27.59	1	2	1	2	2	2	1	17	11	9	17	15	26	4	29	7	8	2	......	3
Cumberland	198	96	54	178	198	728	45,340	16.06	13.42	40.38	300	41.20	1	19	1	6	23	35	...	105	55	55	79	41	40	25	70	45	18	3	5	21
Essex	1588	902	550	2033	1019	6107	255,660	23.89	12.62	40.77	2,432	39.81	42	228	74	67	72	387	16	726	454	366	869	509	338	268	457	274	117	13	60	177
Gloucester	108	68	30	130	125	463	28,585	16.20	....	38.01	171	36.93	.....	10	4	2	4	14	1	68	32	36	55	33	38	6	42	31	13	1	3	18
Hudson	1898	1137	644	2498	879	7069	274,855	25.72	24.24	42.91	2,761	39.06	62	206	42	43	102	588	11	861	453	393	1078	543	389	238	366	345	126	31	51	356
Hunterdon	67	35	34	118	257	522	35,315	14.78	....	19.54	121	23.18	3	6	6	3	10	11	3	30	20	29	66	17	52	30	85	32	18	4	9	22
Mercer	360	123	116	487	342	1441	79,803	18.06	19.99	33.51	607	42.12	6	19	2	6	5	57	4	293	120	95	174	93	98	52	151	87	27	7	12	72
Middlesex	216	90	85	301	239	933	59,487	15.68	13.98	32.80	326	34.94	15	16	20	.....	18	45	6	96	55	55	136	56	64	52	70	44	22	9	12	50
Monmouth	228	114	98	309	334	1095	69,062	15.86	16.09	31.23	357	32.60	7	21	3	2	18	38	5	133	59	71	135	57	109	63	100	63	29	3	7	59
Morris	140	67	86	263	272	829	54,085	15.33	17.71	24.97	256	30.88	4	13	4	.....	7	41	6	56	57	68	94	44	73	37	122	51	20	5	8	47
Ocean	48	20	19	71	80	239	15,960	14.97	....	28.45	80	33.47	1	6	1	.....	3	11	...	19	14	25	21	16	20	7	19	24	5	......	1	11
Passaic	657	258	178	659	348	2105	105,035	20.04	19 93	43.47	806	38 29	10	28	4	1	27	90	10	360	149	127	273	183	134	83	138	93	50	3	11	82
Salem	82	43	22	110	124	383	25,148	15.27	14.62	32.55	152	39.58	4	10	1	5	11	7	2	55	22	35	28	13	27	24	32	29	11	3	8	17
Somerset	77	20	26	145	172	441	28,290	15.58	....	21.99	134	30.39	5	5	......	......	3	17	1	40	27	36	54	17	50	23	44	34	17	1	2	18
Sussex	37	4	13	77	99	233	22,233	10.48	....	17.60	61	26.18	3	6	1	.....	.....	3	1	19	12	16	39	6	19	9	36	21	4	1	4	9
Union	282	147	109	422	305	1266	72,321	17.56	13.00	33.88	441	34.84	6	33	21	7	15	63	3	121	93	79	182	74	103	56	96	68	27	4	14	57
Warren	87	48	41	161	190	527	36,589	14.40	14.23	25.62	149	28.27	2	8	2	1	7	12	...	49	33	35	54	28	54	21	65	48	15	3	8	28
Totals	7115	3623	2430	9209	6051	28,530	1,441,017	19.80	15.39	37.64	10,583	37.09	195	782	209	174	371	1575	81	3527	1903	1766	3804	2032	1945	1149	2308	1521	640	106	250	1235

NOTE—Small-pox is omitted in the tables, because no cases were reported.

NOTE.—Under the heading "Number of deaths from chief preventable diseases," the first eleven diseases are classified, including consumption, male and female. Of those dying under one year, 2,050 died under one month, of which 1,459 died in the large cities. Of those dying under one year, 5,182 died in the large cities. Of the 10,738 that died under five years, 7,953 died in the large cities. Total death-rate from consumption for the State, as compared with the total deaths, 12 96; the deaths being 2,406 in cities, 1,263 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 larger aggregates. The number of deaths before twenty, in proportion to the rest, is much more informatory as to local causes affecting health than the total deaths. See, also, the number dying from preventable diseases.

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, 1890.

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.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	Deaths under five in each 100, or comparison of these with total deaths.	Number of deaths from chief preventable diseases.	Comparative number of deaths in each 100 from chief preventable diseases.
Atlantic County.												
Atlantic City	*75	35	17	79	55	......	261	13,038	†20.01	42.15	85	32.57
Burlington County.												
Bordentown	13	10	5	31	34	......	93	5,045	18.43	24.73	21	22.58
Burlington City	26	9	20	51	43	1	150	8,198	18.30	23.33	53	35.33
Camden County.												
Camden City	367	192	123	437	228	2	1,349	58,274	23.15	41.44	546	44.47
Gloucester City	32	25	12	39	15	1	124	6,563	18.89	47.29	37	29.84
Cumberland County.												
Bridgeton	70	33	13	45	42	......	203	11,471	17.70	50.74	78	38.42
Millville	56	26	11	56	45	......	194	9,957	19.48	42.27	93	47.91
Essex County.												
Newark	1327	766	442	1640	761	12	4,948	181,518	27.26	42.30	2,019	40.80
Orange	120	72	40	172	56	......	460	18,774	24.50	41.74	184	40.00
Hudson County.												
Bayonne	146	70	32	108	30	1	387	18,996	20.37	55.71	151	38.76
Harrison	74	40	20	79	23	1	237	8,528	27.67	46.41	101	42 62
Hoboken	283	210	88	404	127	4	1,116	43,561	25.62	44.18	479	42.92
Jersey City	1111	647	415	1582	499	4	4,258	163,987	25.96	41.29	1,597	37.51
Town of Union	71	53	21	59	35	......	239	10,660	22.42	51.88	116	48.54
Mercer County.												
Trenton	317	96	83	320	192	7	1,015	58,488	17.35	40.69	389	38.32

CITIES HAVING OVER 5,000 POPULATION. Statistical Divisions	DEATHS FROM THE MORE COMMON CAUSES. Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic County.																				
Atlantic City	......	6	1	2	7	4	...	48	10	7	25	21	25	15	24	19	6	...	2	12
Burlington County.																				
Bordentown	......	......	......	1	1	7	...	3	2	7	14	5	8	3	19	6	2	1	1	5
Burlington City	1	6	1	1	......	3	...	14	17	10	16	9	14	6	15	8	4	1	1	9
Camden County.																				
Camden City	10	82	8	7	13	76	7	180	78	85	158	125	89	40	92	60	30	3	12	60
Gloucester City	......	2	1	......	......	13	...	14	10	7	16	14	6	3	9	4	4	..	2	12
Cumberland County.																				
Bridgeton	......	3	1	2	3	6	...	36	14	13	31	14	13	7	18	11	4	...	......	7
Millville	......	3	......	1	7	17	...	31	17	17	20	11	6	1	13	15	5	...	2	......
Essex County.																				
Newark	36	194	67	64	47	314	12	624	368	293	693	428	254	200	358	224	85	13	51	145
Orange	......	14	3	2	18	44	2	49	38	14	79	29	16	30	33	16	8	...	5	13
Hudson County.																				
Bayonne	10	7	7	1	18	10	1	68	12	17	67	36	22	7	8	15	4	...	5	19
Harrison	2	6	10	1	12	3	...	43	15	9	27	29	10	6	13	13	3	...	1	10
Hoboken	4	19	1	15	7	126	2	144	92	69	173	66	49	40	55	58	19	6	10	47
Jersey City	41	159	19	23	52	341	6	459	235	242	681	336	240	143	206	218	80	21	28	236
Town of Union	......	3	......	......	4	44	...	41	11	13	28	15	18	8	10	5	2	1	1	9
Mercer County.																				
Trenton	5	11	1	6	5	43	3	171	79	65	133	79	59	34	74	50	19	4	9	45

* Probably due to infants brought to the city sick.

† This death-rate is calculated on the resident population, whereas the real population is often several times larger, and on account of this floating population, the death-rate is not a criterion of health conditions.

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, 1890.

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.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	Deaths under five in each 100, or comparison of these with total deaths.	Number of deaths from chief preventable diseases.	Comparative number of deaths in each 100 from chief preventable diseases.
Middlesex County.												
New Brunswick......	54	37	34	109	92	1	327	18,459	17.71	27.83	114	34.86
Perth Amboy..........	65	20	8	50	22	......	165	9,476	17.41	51.52	67	40.61
Monmouth County.												
Long Branch	30	7	10	29	23	7	106	7,231	14.66	34.90	37	34.91
Morris County.												
Morristown............	29	15	12	46	42	......	144	7,231	19.91	30.56	49	34 03
Passaic County.												
Passaic City............	76	33	19	67	23	1	219	13,027	16.81	49.77	101	46.11
Paterson..................	542	209	142	551	267	3	1,714	78,358	21.87	43.82	649	37.86
Salem County.												
Salem City..............	17	11	6	34	28	1	97	5,512	17.60	28.87	46	47.42
Union County.												
Elizabeth.......	178	108	62	244	135	......	727	37,670	19.30	39.34	263	36.18
Plainfield......	38	15	15	58	64	......	190	11,250	16.89	27.89	59	31.05
Rahway..................	29	11	15	52	30	......	137	7,090	19.32	29.20	53	38.69
Warren County.												
Phillipsburg............	36	21	9	31	29	......	129	8,622	14.96	44.19	58	44.90
Totals................	5182	2771	1674	6376	2940	46	18,989	820,984	23.13	41.36	7,455	39.26

Statistical Divisions.	DEATHS FROM THE MORE COMMON CAUSES. Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Middlesex County.																				
New Brunswick......	6	10	6	......	7	23	1	27	16	18	54	18	27	28	23	11	11	4	3	11
Perth Amboy..........	4	1	3	......	6	6	1	27	11	8	25	12	7	4	10	9	3	3	2	3
Monmouth County.																				
Long Branch	......	4	......	......	1	9	...	14	5	4	15	4	13	2	4	10	2	...	......	9
Morris County.																				
Morristown............	1	2	2	......	......	5	1	10	15	13	12	13	13	7	18	7	7	2	......	5
Passaic County.																				
Passaic City............	1	3	......	......	......	20	1	53	16	7	12	17	12	11	23	7	4	...	3	8
Paterson..................	8	23	4	1	23	68	9	285	122	106	241	156	100	67	99	73	41	3	8	67
Salem County.																				
Salem City..............	1	1	1	2	2	1	1	17	8	12	6	1	2	6	8	9	5	1	5	5
Union County.																				
Elizabeth.......	4	20	19	5	3	40	1	84	50	37	102	51	58	33	38	37	12	3	10	35
Plainfield......	......	2	1	......	3	12	1	13	13	14	25	8	17	8	26	15	3	1	1	5
Rahway..................	1	5	1	......	6	6	...	8	16	10	19	8	9	6	9	3	7	...	1	6
Warren County.																				
Phillipsburg............	......	3	1	......	5	7	...	23	9	10	8	10	12	1	9	7	4	...	......	7
Totals................	135	589	158	134	250	1248	49	2486	1299	1107	2680	1515	1099	716	1214	910	374	67	163	790

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, 1890.

ATLANTIC COUNTY. Population, 28,807. Statistical Divisions.	DEATHS AT ALL AGES. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES. Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Absecon	1	2	2	2	6	.....	13	....	....	.....	.....	.....	.....	.....	.....	.....	3	1	1	.....	1	1	.....	.....	1	2	1	.....	1
*Atlantic City	75	35	17	79	55	.....	261	13,038	20.01	.....	6	1	2	7	4	.....	48	10	7	25	21	25	15	24	19	6	.....	2	12
Beuna Vista	2	.....	.....	3	7	.....	12	....	....	.....	.....	.....	.....	.....	.....	.....	....	1	1	1	1	2	2	.....	2	.....	.....	.....	.....
Egg Harbor City	4	2	1	7	13	.....	27	....	....	.....	.....	.....	.....	.....	1	.....	1	1	2	1	4	6	.....	5	.....	.....	.....	.....	1
Egg Harbor Township	19	7	8	12	20	.....	66	....	....	1	2	1	.....	.....	1	.....	14	4	4	5	2	4	2	6	5	2	.....	1	2
Galloway	5	.....	1	2	11	.....	19	....	....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1	3	2	2	1	.....	.....	.....	2
Hamilton	12	4	4	15	7	.....	42	....	....	.....	1	.....	1	.....	2	.....	7	3	3	7	2	1	1	5	3	1	2	.....	.....
Hammonton	12	4	.....	14	10	1	41	....	....	.....	.....	1	.....	.....	.....	.....	7	3	1	6	1	3	1	4	3	3	.....	.....	2
Mullica	2	.....	2	8	8	.....	20	....	....	2	.....	.....	.....	.....	1	.....	.....	3	1	.....	1	1	.....	5	3	.....	.....	1	1
Weymouth	1	1	.....	3	3	.....	8	....	....	.....	1	.....	.....	.....	.....	.....	1	1	.....	1	1	1	.....	2	.....	.....	.....	.....	.....
Totals	133	55	35	145	140	1	509	28,807	17.67	3	10	3	3	7	9	.....	82	27	20	46	35	47	23	53	37	14	3	4	21

* 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 in 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, 1890.

BERGEN COUNTY. Population, 47,223. Statistical Divisions.	Deaths at all ages: Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.
Boiling Spring	5	3	3	9	4		24		
Englewood	16	10	14	33	28		101		
Franklin	12	2	2	15	13		44		
Harrington	5	4	4	8	10	1	32		
Hohokus	6	3		9	11		29		
Lodi	28	10	7	24	22		91		
Midland	4	2	1	7	14		28		
New Barbadoes	18	7	5	30	23	1	84		
Orvil	7	1	1	6	6		21		
Palisade	5	1	2	11	13	1	33		
Ridgefield	14	9	2	25	16		66		
Ridgewood	5	3	2	12	6		28		
Saddle River	7		3	12	8		30		
Union	21	10	10	18	9		68		
Washington	6	2	3	12	18		41		
Totals	159	67	59	231	201	3	720	47,223	15.25

Statistical Divisions.	Deaths from the more common causes: Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Boiling Spring						2		5	1	1	4	1	2		2	4			1	1
Englewood		5	2	1	1	6		6	7	7	11	12	6	3	12	7	3		2	1
Franklin		1						6	6	1	8	4	6	1	3	2				2
Harrington	1					2		6	1	2	3	1	3	3	2	2	2			1
Hohokus	1				1	1		3	3	2	2	1	2		5	3	1			2
Lodi	1			4		4		11	3	6	20	7	4	3	9	4	1	1		5
Midland		1								2	3	1	3	2	6	3				3
New Barbadoes	2	2	2	4	1	1		3	4	6	12	2	11	4	8	1	3		1	7
Orvil		1						2	1		1	2	1	1	3	3	2	1		
Palisade		1							3	2		1	2	4	8	4	1		1	
Ridgefield		2	1		2	3	1	7	4	2	8	1	5	2	6	6	1	1		8
Ridgewood	1	1				1	1	2	2	2	6	1	1		3	2			1	1
Saddle River						2		6	1	1	4		3	2	2	4				3
Union			1	1	5	4	1	12	3	5	7	2	1	1	6	4	1		1	5
Washington	1				1	2		1	5	1	5	1	3	5	4	5	1			3
Totals	7	14	6	10	11	28	3	70	44	40	94	37	53	31	79	54	16	3	7	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, 1890.

BURLINGTON COUNTY. Population, 58,438. Statistical Divisions.	DEATHS AT ALL AGES. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES. Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases	Digestive and intestinal diseases	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bass River	10	4	2	5	4	......	25	....	....	......	2	......	......	......	3	......	7	2	......	1	......	1	......	......	1	......	......	......	2
Beverly	6	3	3	11	11	1	35	....	....	......	......	1	2	......	......	......	1	2	2	2	1	6	2	5	......	1	......	3	3
Bordentown	13	10	5	31	34	......	93	5,045	18.43	......	......	......	1	1	7	......	3	2	7	14	5	8	3	19	6	2	1	1	5
Burlington	26	9	20	51	43	1	150	8,198	18.30	1	6	1	1	......	3	......	14	17	10	16	9	14	6	15	8	4	1	1	9
Chester	11	1	2	16	22	......	52	....	....	......	......	......	......	3	......	......	2	4	5	6	......	3	1	10	4	4	......	2	1
Chesterfield	2	......	......	......	13	......	15	....	....	......	......	......	......	......	......	......	......	......	......	2	......	1	2	5	1	1	......	......	1
Cinnaminson	17	8	9	12	12	......	58	....	....	......	4	1	1	2	1	......	9	1	4	4	5	8	4	4	1	2	......	......	1
Delran	13	1	2	8	7	......	31	....	....	......	1	......	......	......	......	......	7	2	3	1	1	3	1	1	1	1	......	......	2
Eastampton	......	......	......	1	......	......	1	....	....	......	......	......	......	......	......	......	......	......	1	......	......	......	......	......	......	......	......	......	......
Evesham	11	......	1	8	6	......	26	....	....	1	1	......	......	......	......	......	6	2	1	1	1	3	1	3	2	1	......	......	......
Florence	10	3	1	9	5	......	28	....	....	......	......	......	......	......	......	......	2	1	3	6	4	3	......	1	1	1	......	......	2
Little Egg Harbor	7	1	......	5	8	......	21	....	....	......	......	......	......	......	......	......	2	......	1	1	2	1	2	2	2	3	......	......	1
Lumberton	1	1	......	1	5	......	8	....	....	......	......	......	......	......	......	......	1	......	1	2	1	1	1	1	......	......	......	......	......
Mansfield	4	......	1	15	7	......	27	....	....	......	4	......	......	......	1	......	......	2	......	2	2	......	2	8	2	1	......	......	1
Medford	5	4	......	8	15	1	33	....	....	1	2	......	......	1	......	......	1	2	2	6	......	3	2	6	1	......	......	......	......
Mount Laurel	3	1	2	2	2	......	10	....	....	......	......	......	......	......	......	......	1	......	1	1	1	......	2	......	......	......	......	......	2
New Hanover	10	2	3	6	16	......	37	....	....	......	......	......	......	1	1	......	1	......	4	4	1	4	......	5	3	1	1	1	2
Northampton	27	6	7	34	41	......	115	....	....	......	5	1	......	1	1	1	12	5	9	15	8	15	5	13	10	3	......	......	1
Pemberton	7	4	1	2	13	1	28	....	....	......	2	......	......	......	2	......	5	2	......	3	1	1	1	3	2	2	......	......	2
Randolph	......	1	......	2	3	......	6	....	....	......	......	......	......	......	......	......	......	......	2	......	1	......	......	1	......	......	......	......	......
Shamong	1	......	......	......	3	......	4	....	....	......	......	......	......	......	......	......	1	1	......	......	......	......	......	1	......	......	......	......	......
Southampton	5	......	......	3	8	......	16	....	....	......	......	......	......	......	......	......	4	......	......	2	1	2	1	......	2	3	......	......	......
Springfield	2	2	1	7	8	......	20	....	....	......	1	......	......	......	......	......	1	3	......	3	......	2	......	4	3	......	......	......	1
Washington	......	1	1	2	1	......	5	....	....	......	1	......	......	1	......	......	......	......	......	......	......	1	1	......	......	1	......	......	......
Westampton	......	2	......	1	1	......	4	....	....	......	......	......	......	......	......	......	1	......	......	1	......	......	......	......	......	1	......	......	1
Willingboro	1	1	1	1	......	......	4	....	....	......	......	......	......	......	1	......	1	......	......	......	1	......	......	......	......	......	......	......	......
Woodland	......	......	......	1	1	......	2	....	....	......	......	......	......	......	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......
Totals	192	65	62	242	289	4	854	58,438	14.61	3	29	4	5	10	20	1	82	49	56	93	45	80	37	107	50	32	3	8	37

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1890.

CAMDEN COUNTY. Population, 87,600. Statistical Divisions.	DEATHS AT ALL AGES.									DEATHS FROM THE MORE COMMON CAUSES.																				
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Camden City	367	192	123	437	228	2	1,349	58,274	23.15	10	82	8	7	13	76	7	180	78	85	158	125	89	40	92	60	30	3	12	60
Centre	8	5	1	8	9		31				1		2				2		1	9		5		2	1		1	1	2
Delaware	6	2	2	9	5		24										1	3	3	3	3	2	1	2	1				2
Gloucester City	32	25	12	39	15	1	124	6,563	18.89		2	1			13		14	10	7	16	14	6	3	9	4	4		2	12
Gloucester	18	6	2	20	31	1	78				1		2	1	1		12	10	8	2	4	7	1	13	3	1		1	3
Haddon	19	3	6	17	24	1	70				2				2		9	3	6	4	8	9	1	11	2	4			3
Stockton	50	8	11	36	31		136				1			2	2		19	9	7	18	10	6	9	11	7	8			1
Waterford	7	3	3	15	11	1	40				3						4	3	2	3	1	5	4	2	3	2		..	4
Winslow	9	6	6	10	9		40				1				3		4	1	1	4	5	2	1	5	3	2			1
Totals	516	250	166	591	363	6	1,892	87,600	21.60	10	93	9	11	16	97	7	245	117	120	217	170	131	60	147	84	51	4	16	88

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, 1890.

CAPE MAY COUNTY. Population, 11,245. Statistical Divisions.	DEATHS AT ALL AGES.							Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES.																			
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.			Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Cape May City	18	5	1	11	11	......	46	....	....	......	......	1	1	......	......	....	7	4	......	7	7	6	......	5	2	......	1	......	1
Dennis	5	4	2	6	18	......	35	....	....	......	......	......	1	1	2	1	2	2	4	2	2	3	2	8	......	2	1	......	1
Lower	7	3	......	5	11	......	26	....	....	......	2	......	......	......	......	......	3	......	1	4	3	2	......	5	......	2	......	......	.....
Middle	6	2	......	10	25	1	44	....	....	1	......	......	......	1	......	......	4	2	3	4	1	12	......	9	2	1	......	......	1
Upper	6	......	......	6	10	1	23	....	....	......	......	......	......	......	......	......	1	3	1	......	2	3	2	2	3	3	......	......	......
Totals	42	14	3	38	75	2	174	11,245	15.47	1	2	1	2	2	2	1	17	11	9	17	15	26	4	29	7	8	2	......	3

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, 1890.

CUMBERLAND COUNTY. Population, 45,340. Statistical Divisions.	DEATHS AT ALL AGES.							Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES.																			
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.			Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bridgeton	70	33	13	45	42		203	11,471	17.70		3	1	2	3	6		36	14	13	31	14	13	7	18	11	4			7
Commercial	1	1		4	6		12										1	1		5		1	1	1					1
Deerfield	2		3	6	12		23										2	1	2	3	1	2	2	4	2		1		1
Downe	6			4	4		14				1						3	1		1			2	1	1				
Fairfield	9	3	1	11	7		31				2		2	1			3	5	2	3		3		2	1	1			1
Greenwich	10	1	1	2	6	1	21			1				3	1		4	1		1	1	1	3	2				1	1
Hopewell	4	1		4	13		22										2	3		1	1	2	1	4	3				
Landis	25	21	12	36	43	2	139				5		1	5	8		13	10	16	8	9	8	6	18	8	5	1	1	6
Lawrence	3	2	3	6	10	1	25							1			2	2	2	3	2	3	2	4	1		1	1	
Maurice River	8	6		13	9		36				5			2	3		5		2	3		1		3	3	2			4
Millville	56	26	11	56	45		194	9,957	19.48		3		1	7	17		31	17	17	20	11	6	1	13	15	5		2	
Stoe Creek	4	2		1	1		8							1			3		1		2					1			
Totals	198	96	54	178	198	4	728	45,340	16.06	1	19	1	6	23	35		105	55	55	79	41	40	25	70	45	18	3	5	21

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, 1890.

ESSEX COUNTY. Population, 255,660. Statistical Divisions.	DEATHS AT ALL AGES.									DEATHS FROM THE MORE COMMON CAUSES.																			
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Belleville	14	8	8	26	12		68			1	2				2	1	8	3	5	7	8	5	8	5	4	1			2
Bloomfield	19	13	11	33	42		118			1	3			2	4		6	6	10	18	12	12	5	14	9	2			6
Caldwell	7	2	1	13	18		41				2							1	5	5	7	3	5	6	1	2			1
Clinton	8	1	1	13	17		40			1	2						2	3	1	6	1	7	2	1	4	1		1	2
East Orange	30	7	19	41	29	1	127			1	4	1		1	13		10	7	7	13	4	16	5	13	7	5		1	1
Franklin	1	2	2	3	3		11				1						1	1	1	2	2			1	1				1
Livingston	1	1	1	4	7		14										1	1	1	2		4	1	2		1			
Millburn	13	6	4	12	13	1	49			2		1		1			3	1	5	9	4	5	1	4	2	1		1	1
Montclair	21	9	11	39	26		106				5			2	2		10	13	14	13	8	7	5	10	2	4			2
Newark	1327	766	442	1640	761	12	4,948	181,518	27.25	36	194	67	64	47	314	12	624	368	293	693	428	254	200	358	224	85	13	51	145
Orange	120	72	40	172	56		460	18,774	24.50		14	3	2	18	44	2	49	38	14	79	29	16	30	33	16	8		5	13
South Orange	11	6	4	14	23		58					1			4		4	3	5	11	2	6	2	6	3	5			1
West Orange	16	9	6	23	12	1	67				1	1	1	1	4	1	8	9	5	11	4	3	4	4	1	2		1	2
Totals	1588	902	550	2033	1019	15	6,107	255,660	23.89	42	228	74	67	72	387	16	725	454	366	869	509	338	268	457	274	117	13	60	177

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, 1890.

GLOUCESTER COUNTY. Population, 28,585. Statistical Divisions.	DEATHS AT ALL AGES. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES. Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Clayton	9	15	4	12	11		51				2		2	1	2		10	4	6	7	3	1		5	2	2			1
Deptford	1	3		8	5		17				1				1		1	1		4		2		2	2				1
East Deptford																													
East Greenwich	2	1		6	10		19				1								2	4		1		3	2				4
Franklin	13	5	1	13	13		45				1			1	1		8	3	3	5	1	4	1	2	2	3	1	1	
Glassboro	11	10	6	10	9		46				3			1			6	5	2	7	6	3		1	2	1			1
Greenwich	10	5		12	5		32				1				1		6	3	1	4	2	7		1	2				2
Harrison	5	5	1	8	13		32					4					3	3	1	3		1	1	4	7	2			1
Logan	3	1	2	6	4	1	17							1		1	1	3		3				1	1	1		1	2
Mantua	6	3	2	7	11		29				1				2		4	2	3	3	4	4		1	2	2			
Monroe	10	5	6	6	8		35								2		7	2	3	3	5	3		4	1	1			
South Harrison	1	1		2	2		6										1	1			1	1			2				
Washington	1	3		3	8		15								1		2	1	1	2		2	2	2					
West Deptford	8	5	1	3	6		23								1		8		2	2	2	1	1	1	1				2
Woodbury	27	4	4	20	14	1	70								1		7	3	10	6	9	4	1	8	4	1			3
Woolwich	1	2	3	14	6		26								2		4	1	2	2		4		7	1			1	1
Totals	108	68	30	130	125	2	463	28,585	16.20		10	4	2	4	14	1	68	32	36	55	33	38	6	42	31	13	1	3	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, 1890.

HUDSON COUNTY. Population, 274,855. Statistical Divisions.	DEATHS AT ALL AGES. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES. Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases	Digestive and intestinal diseases	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bayonne	146	70	32	108	30	1	387	18,996	20.37	10	7	7	1	18	10	1	68	12	17	67	36	22	7	8	15	4	......	5	19
Guttenberg	18	11	8	7	8	.....	52	....	....	......	.....	1	......	......	8	1	7	1	2	7	6	1	......	7	1	1	......	......	......
Harrison	74	40	20	79	23	1	237	8,528	27.67	2	6	10	1	12	3	......	43	15	9	27	29	10	6	13	13	3	......	1	10
Hoboken	253	210	88	404	127	4	1,116	43,561	25 62	4	19	1	15	7	126	2	144	92	69	173	66	49	40	55	58	19	6	10	47
Jersey City	1111	647	415	1582	499	4	4,258	163,987	25.97	41	159	19	23	52	341	6	459	255	242	681	336	240	143	206	218	80	21	28	236
Kearny	39	27	20	64	39	......	189	....	....	4	4	3	3	4	4	......	19	14	6	15	16	18	11	21	9	3	1	3	14
North Bergen	41	20	15	98	69	......	243	....	....	1	5	......	......	......	14	......	25	27	15	34	9	8	13	37	13	5	1	2	10
Town of Union	71	53	21	59	35	.....	239	10,660	22.42	......	3	......	......	4	44	......	41	11	13	28	15	18	8	10	5	2	1	1	9
Union	25	8	2	11	11	.....	57	....	....	......	1	......	......	......	3	......	15	4	3	7	5	2	3	1	1	3	......	......	2
Weehawken	19	12	5	24	2	1	63	....	....	.....	1	......	.....	......	4	......	7	4	8	8	8	4	1	1	2	1	1	......	4
West Hoboken	71	39	18	62	36	2	228	....	....	......	1	1	......	5	31	1	33	18	9	31	17	17	6	7	10	5	......	1	5
Totals	1898	1137	644	2498	879	13	7,069	274,855	25.72	62	206	42	43	102	588	11	861	453	393	1078	543	389	238	366	345	126	31	51	356

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, 1890.

HUNTERDON COUNTY. Population, 35,315. Statistical Divisions.	DEATHS AT ALL AGES.							Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES.																			
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.			Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Alexandria				2	8		10									1				4		2		2					
Bethlehem	4	2	1	11	14		32					1					2		3	1	1	6	2	5	1				6
Clinton	4	1	1	4	25		35										1	2	1	5	3	4	4	4	5			1	
Delaware	6	5	5	11	22		39								3		3	2	3	4	2	5	3	11	2	2			3
East Amwell	1			2	15	1	19											1	2	3		2	1	3	2	2		1	
Franklin	1	1	4	6	11		23			1	1						2	2	3			2	1	4	2			1	
Frenchtown	2	3	2	7	7		21				1			3			1			1	1	1	2	4		1	1		
High Bridge	3		1	4	12		20								1		1	1	1	1	1	3		5	2	1			1
Holland	5			4	15		24			1							3	1		1		1	2	7	1			1	1
Kingwood	1		1	3	8		13										1			2	1	2	1	2	1				2
Lambertville	15	11	6	20	23		75			1	1	5		1	3	1	6	6	4	9	2	6	2	13	2	2	1		
Lebanon	6	6	5	11	18		46				1		2	1	2	1	4		3	6		8	2	5	1	2		2	1
Raritan	7	1	4	14	31		57						1		1		4	1	3	13	2	4	4	6	5	1	1	2	3
Readington	4	4	4	8	20	1	41							5	1			2	3	3	2	2	2	7	4	4			3
Tewksbury	8	1		11	24		44				2						2	1	3	10	2	1	2	4	4	3	1		2
Union					2	5	7													1		3	1	2					
West Amwell					2	4	6											1		2			1	1				1	
Totals	67	35	34	118	257	11	522	35,315	14.78	3	6	6	3	10	11	3	30	20	29	66	17	52	30	85	32	18	4	9	22

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, 1890.

MERCER COUNTY. Population, 79,803. Statistical Divisions.	DEATHS AT ALL AGES. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES. Remittent fever, &c.	Enteric fever.	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	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases	Cancer.	Acute rheumatism.	Puerperal.	Accident.
East Windsor	8	5	......	8	10	1	32	......	......	......	......	......	......	......	......	......	5	3	1	5	2	3	2	2	3	......	......	1	1
Ewing	4	5	7	51	42	4	113	......	......	......	3	1	......	......	2	......	4	18	7	5	1	9	2	35	11	1	1	......	3
Hamilton	15	3	6	51	30	......	105	......	......	1	4	......	......	......	3	......	3	16	7	6	4	7	8	14	7	1	......	1	14
Hopewell	3	7	6	21	28	......	65	......	......	......	......	......	......	......	1	1	1	......	9	10	3	11	3	12	3	......	......	1	3
Lawrence	3	1	5	7	6	......	22	......	......	......	......	......	......	......	4	......	3	......	......	1	......	2	2	2	2	......	......	......	5
Princeton	7	3	7	21	23	1	62	......	......	......	1	......	......	......	2	......	5	3	5	8	4	5	1	10	8	3	1	......	1
Trenton	317	96	83	320	192	7	1,015	58,488	17.35	5	11	1	6	5	43	3	171	79	65	133	79	59	34	74	50	19	4	9	45
Washington	1	2	1	4	6	......	14	......	......	......	......	......	......	......	1	......	1	......	......	2	......	1	......	1	......	2	1	......	......
West Windsor	2	1	1	4	5	......	13	......	......	......	......	......	......	......	1	......	......	1	1	4	......	1	......	1	3	1	......	......	......
Totals	350	123	116	487	342	13	1,441	79,803	18.06	6	19	2	6	5	57	4	293	120	95	174	93	98	52	151	87	27	7	12	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, 1890.

MIDDLESEX COUNTY. Population, 59,487. Statistical Divisions.	DEATHS AT ALL AGES.									DEATHS FROM THE MORE COMMON CAUSES.																			
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Cranbury	6	2		12	8		28			1				2			2	3	2	5	1	1	4	4	1		1	1	
East Brunswick	11	2	3	19	16		51			1	2			1		1	3	2	2		3	8	1	6	5	4			5
Madison	1	3		3	5		12										1	2		1	1			1	2	1		1	1
Monroe	2	1	2	9	8		22			1						2		1	1	6	1	1	1	2	1			1	1
New Brunswick	54	37	34	109	92	1	327	18,459	17.71	6	10	6		7	23	1	27	16	18	54	18	27	28	23	11	11	4	3	11
North Brunswick	2			3	7		12				1									2		1	1	1	2				1
Perth Amboy	65	20	8	50	22		165	9,476	17.41	4	1	3		6	6	1	27	11	8	25	12	7	4	10	9	3	3	2	3
Piscataway	16	1	4	16	17		54				1			1		1	6	2	2	7	2	8	3	3	3			1	5
Raritan	8	3	8	11	16		46			1	1	1			2		7	2	3	9	4	4	4	5	1		1		
Sayerville	3		1	7			11											1		3	1							1	2
South Amboy	32	14	15	27	16	1	105					10		1	8		17	6	8	12	5	4	3	2	6	2			7
South Brunswick	3	2	3	14	14		36								3		2	4	2	6			2	8	1	1			5
Woodbridge	8	6	7	20	18		64			1					3		4	5	9	6	8	3	1	5	2			2	9
Totals	216	90	85	301	239	2	933	59,487	15.68	15	16	20		18	45	6	96	55	55	136	56	64	52	70	44	22	9	12	50

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, 1890.

MONMOUTH COUNTY. Population, 69,062. Statistical Divisions.	DEATHS AT ALL AGES.							Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES.																			
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.			Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Atlantic	5	3	.....	10	13	.....	31	.....	.....	.....	1	.....	.....	1	.....	.....	3	4	2	3	1	3	.....	2	1	2	.....	.....	2
Eatontown	6	5	3	7	16	.....	37	.....	.....	.....	.....	.....	.....	.....	2	.....	3	4	2	5	1	3	5	3	2	1	.....	.....	.....
Freehold	10	4	7	19	20	.....	60	.....	.....	.....	.....	1	.....	.....	.....	.....	4	6	6	9	5	6	8	2	3	1	.....	1	2
Holmdel	1	2	4	6	8	.....	21	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	2	3	3	3	3	3	1	.....	.....	.....	1
Howell	8	3	6	18	13	.....	48	.....	.....	.....	2	.....	.....	2	1	.....	2	2	3	9	.....	5	4	5	4	1	.....	1	.....
Long Branch	30	7	10	29	23	7	106	7,231	14.66	.....	4	.....	.....	1	9	.....	14	5	4	15	4	13	2	4	10	2	.....	.....	9
Manalapan	5	3	1	7	11	.....	27	.....	.....	.....	1	.....	.....	.....	.....	1	4	.....	1	.....	3	2	2	6	2	3	.....	.....	1
Marlboro	3	6	4	9	18	1	41	.....	.....	1	1	1	.....	.....	.....	.....	3	2	2	5	2	4	4	2	5	1	.....	1	4
Matawan	19	7	5	19	14	.....	64	.....	.....	.....	.....	.....	.....	.....	2	.....	13	3	5	3	6	9	4	10	4	.....	.....	.....	1
Middletown	16	12	6	25	23	1	83	.....	.....	1	2	.....	2	1	3	.....	8	4	8	11	5	10	1	7	4	4	1	.....	5
Millstone	2	3	3	1	6	.....	15	.....	.....	.....	1	.....	.....	1	.....	.....	1	1	.....	4	1	.....	1	1	1	.....	.....	.....	1
Neptune	44	17	11	50	53	.....	175	.....	.....	1	1	.....	.....	1	7	2	31	4	9	16	8	20	9	19	11	6	2	1	6
Ocean	7	5	7	11	11	.....	41	.....	.....	.....	1	.....	.....	.....	4	.....	3	1	2	11	3	4	.....	2	2	1	.....	1	3
Raritan	18	2	7	29	27	1	84	.....	.....	2	2	.....	.....	1	.....	1	10	5	2	11	2	6	4	10	3	2	.....	1	8
Shrewsbury	27	15	11	39	35	1	128	.....	.....	.....	2	1	.....	6	3	.....	19	10	13	14	2	13	6	12	5	2	.....	1	13
Upper Freehold	5	4	6	12	17	.....	44	.....	.....	1	.....	.....	.....	.....	4	.....	2	4	5	6	4	3	3	5	1	1	.....	.....	1
Wall	22	16	7	18	26	1	90	.....	.....	1	3	.....	.....	4	2	1	13	4	5	10	8	5	7	7	4	2	.....	.....	2
Totals	328	114	98	309	334	12	1,095	69,062	15.86	7	21	3	2	18	38	5	133	59	71	135	57	109	63	100	63	29	3	7	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, 1890.

MORRIS COUNTY. Population, 54,085. Statistical Divisions.	DEATHS AT ALL AGES. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES. Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Boonton	6	2	4	12	12	......	36	....	....	1	2	......	......	......	......	1	4	4	3	5	1	4	4	1	1	1	......	......	1
Chatham	11	6	9	19	25	......	70	....	....	......	1	......	......	......	1	......	3	4	7	3	13	10	3	9	7	1	......	2	4
Chester	4	3	4	6	16	......	33	....	....	......	3	1	......	......	2	......	......	1	3	8	......	4	1	5	2	......	......	......	......
Hanover	7	3	6	55	52	......	123	....	....	......	2	......	......	1	......	2	6	9	8	11	2	8	3	42	10	5	......	......	8
Jefferson	2	......	......	5	6	......	13	....	....	......	......	......	......	......	......	......	......	1	1	......	......	3	......	4	......	......	......	......	2
Mendham	3	2	1	4	16	......	26	....	....	......	......	......	......	1	1	......	1	1	1	1	1	4	3	8	2	......	......	......	......
Montville	1	......	2	8	1	......	12	....	....	......	......	......	......	......	1	......	......	2	3	1	......	1	1	......	1	......	......	1	......
Morristown	29	15	12	46	42	......	144	7,231	19.91	1	2	2	......	......	5	1	10	15	13	12	13	13	7	18	7	7	2	......	5
Mount Olive	3	......	1	9	5	......	18	....	....	......	......	......	......	......	1	......	1	1	1	3	1	2	1	3	......	......	......	1	1
Passaic	4	......	1	10	7	......	22	....	....	......	1	......	......	......	......	......	1	1	1	6	......	1	......	3	......	2	1	1	1
Pequannock	7	1	3	6	9	......	26	....	....	......	......	......	......	1	1	......	5	2	3	3	1	1	1	......	1	2	......	......	4
Randolph	29	13	12	35	29	1	119	....	....	1	2	1	......	3	3	......	7	6	8	21	6	10	4	11	9	......	1	1	8
Rockaway	20	18	26	36	29	......	129	....	....	1	......	......	......	1	23	1	14	6	11	16	1	7	3	8	10	2	1	1	11
Roxbury	13	4	5	11	14	......	47	....	....	......	......	......	......	......	3	1	4	4	4	3	4	4	3	7	1	......	......	1	2
Washington	1	......	......	1	9	......	11	....	....	......	......	......	......	......	......	......	......	......	1	1	1	1	3	3	......	......	......	......	......
Totals	140	67	86	263	272	1	829	54,085	15.33	4	13	4	......	7	41	6	56	57	68	94	44	73	37	122	51	20	5	8	47

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, 1890.

OCEAN COUNTY. Population, 15,960. Statistical Divisions.	DEATHS AT ALL AGES.							Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES.																			
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.			Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Berkley	5		1	1	3		10				1									1					2				1
Brick	9	8	2	27	23		69				2			2	3		2	7	10	7	3	8	4	6	5	2			1
Dover	6	2	4	9	12		33			1	2			1	1		3		3	2	2	4	1	3	2				3
Eagleswood	5	3		7	4		19				1						2		2	2	4	2		2	1			1	
Jackson	9	1	2	4	11		27					1			1		5		2	3	2	1	1	3	2				
Lacey	3		2	2	3		10								1		1		2					2	1				1
Manchester	2	1	1	4	4		12								1			1	1			3			1	1			1
Ocean		1	2	1	3		7								1		1	2	1		1				1				
Plumstead	3	3	3	8	7		24								3		3	2	2	2	2	1			4	2			1
Stafford	4	1	2	5	7	1	20										2		1	3	2	1	1	1	4				3
Union	2			3	3		8											2	1	1				2	1				
Totals	48	20	19	71	80	1	239	15,960	14.97	1	6	1	......	3	11	......	19	14	25	21	16	20	7	19	24	5	......	1	11

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, 1890.

PASSAIC COUNTY. Population, 105,035. Statistical Divisions.	DEATHS AT ALL AGES.									DEATHS FROM THE MORE COMMON CAUSES.																			
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Acquackanonk	8	5	5	7	8	.....	33	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	1	2	3	4	3	1	2	2	1	.....	.....	2
Little Falls	9	3	2	7	6	.....	27	.....	.....	.....	1	.....	.....	.....	.....	.....	2	.....	4	5	1	3	.....	1	1	1	.....	.....	2
Manchester	5	1	3	2	7	.....	18	.....	.....	.....	1	.....	.....	.....	.....	.....	3	2	.....	3	1	.....	2	.....	4	1	.....	.....	.....
Passaic City	76	33	19	67	23	1	219	13,027	16.81	1	3	.....	.....	.....	20	1	53	16	7	12	17	12	11	23	7	4	.....	3	8
Paterson	542	209	142	551	267	3	1,714	78,358	21.87	8	23	4	1	23	68	9	285	122	106	241	156	100	67	99	73	41	3	8	67
Pompton	8	1	6	7	15	.....	37	.....	.....	.....	.....	.....	.....	2	.....	.....	3	4	3	4	1	8	.....	3	3	.....	.....	.....	.....
Wayne	5	2	1	6	11	.....	25	.....	.....	.....	.....	.....	.....	2	1	.....	2	2	2	4	.....	4	.....	3	1	2	.....	.....	1
West Milford	4	4	.....	12	11	1	32	.....	.....	1	.....	.....	.....	.....	1	.....	1	2	3	1	3	4	2	7	2	.....	.....	.....	2
Totals	657	258	178	659	348	5	2,105	105,035	20.04	10	28	4	1	27	90	10	360	149	127	273	183	134	83	138	93	50	3	11	82

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, 1890.

SALEM COUNTY. Population, 25,148. Statistical Divisions.	DEATHS AT ALL AGES.									DEATHS FROM THE MORE COMMON CAUSES.																			
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Alloway	6	1	3	10	11		31				2		1	2			3	2	3	2	1	2	2	3	3	1			2
Elsinboro	1		1		5		7			1							1			1			1	1	1				
Lower Alloways Creek	4	3		5	1		13			1							4	2		1		1			1				1
Lower Penns Neck	6	4	1	2	10	1	24							3			1		1	1	2	3	2	2	3		1		1
Mannington	5	4	1	10	8		28							1			4	2	4	2	1	2		1	3				3
Oldmans	2	4	1	4	2		13			1					1		3	1	2		1		1			1			1
Pilesgrove	15	7	4	26	30		82				3			1	2		10	5	7	9	4	8	8	11	4	1	1	3	
Pittsgrove	9	2	2	5	6		24				2			1			5	1	1	1	1	2	2		1	1			3
Quinton	8	5	2	8	4		27				1		1	1	2	1	3		3	3	2	2	1	2	1				
Salem	17	11	6	34	28	1	97	5,512	17.60	1	1	1	2	2	1	1	17	8	12	6	1	2	6	8	9	5	1	5	5
Upper Penns Neck	5	1	1	3	12		22						1		1		3	1		2		4		4	1	1			1
Upper Pittsgrove	4	1		3	7		15				1						1		2			1	1		2	1			
Totals	82	43	22	110	124	2	383	25,148	15.27	4	10	1	5	11	7	2	55	22	35	28	13	27	24	32	29	11	3	8	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, 1890.

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SOMERSET COUNTY. Population, 28,290. Statistical Divisions.	DEATHS AT ALL AGES. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES. Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Bedminster	3	1	1	8	10	.....	23	....	....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	5	1	4	2	4	1	1	.....	.....	.....
Bernards	6	.....	3	15	17	.....	41	....	....	1	2	.....	.....	.....	.....	.....	1	4	4	4	2	7	.....	1	7	2	.....	.....	1
Branchburg	4	2	.....	6	10	.....	22	....	....	1	.....	.....	.....	2	.....	.....	2	1	2	2	.....	3	1	2	1	1	.....	1	.....
Bridgewater	35	7	9	54	46	1	152	....	....	1	2	.....	.....	1	7	.....	17	5	13	19	6	21	11	15	5	5	.....	1	9
Franklin	9	4	4	19	23	.....	59	....	....	.....	.....	.....	.....	.....	3	.....	4	7	4	9	1	1	3	5	9	3	.....	.....	3
Hillsborough	4	2	2	8	23	.....	39	....	....	.....	.....	.....	.....	.....	.....	1	3	1	.....	3	4	9	5	3	3	1	.....	.....	2
Montgomery	5	1	3	12	16	.....	37	....	....	1	1	.....	.....	.....	.....	.....	5	1	6	4	1	1	.....	4	3	1	.....	.....	2
North Plainfield	7	3	4	23	19	.....	60	....	....	1	.....	.....	.....	.....	7	.....	7	7	6	7	2	4	1	8	3	2	1	.....	1
Warren	.....	.....	.....	.....	8	.....	8	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	2	2	1	.....	.....	.....
Totals	77	20	26	145	172	1	441	28,290	15.58	5	5	.....	.....	3	17	1	40	27	36	54	17	50	23	44	34	17	1	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, 1890.

SUSSEX COUNTY. Population, 22,233. Statistical Divisions.	DEATHS AT ALL AGES.							Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES.																				
	Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.			Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Andover	2	1	1	5	3		12				2						3		1	1			1	3	1				
Byram	1		2	10	10		23			2					2		1	1	2	5		1	1	2	2			1	2
Frankford	3			6	12	2	23				1						2	1		5		2		4	3	1			1
Green	2			1	2		5													1	1	1	1						
Hampton	2			2	4		8										1	2		1		1		2	1				
Hardyston	5	1	1	9	9		25			1						1	4		4	4		2	2	2		2		1	
Lafayette	1	1		2	6		10										2		1	1		1	1	3	1				
Montague	3		1	2	6		12								1		1	3		2	1			1	2				1
Newton	3			9	8	1	21										2	1		3		2	2	3	1	1		1	1
Sandyston			1		3		4												1	1		1			1				
Sparta	6	1	5	8	3		23				2						1	1	1	4	3	1		4	1		1		1
Stillwater	5			3	4		12										1		1	2		3							
Vernon	2			2	4		8												1					2	3				
Walpack			1		1		2					1						1											
Wantage	2		1	18	24		45				1						1	2	4	9	1	4	1	10	5			1	3
Totals	37	4	13	77	99	3	233	22,233	10 48	3	6	1			3	1	19	12	16	39	6	19	9	36	21	4	1	4	9

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, 1890.

UNION COUNTY. Population, 55,571. Statistical Divisions.	DEATHS AT ALL AGES. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES. Remittent fever, &c.	Enteric fever.	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.	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases.	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Clark	1			3	2		6											1	1		1			2	1				
Cranford	3			4	2		9										1	1		4				1	1				
Elizabeth	178	108	62	244	135		727	37,670	19.30	4	20	19	5	3	40	1	84	50	37	102	51	58	33	38	37	12	3	10	35
Fanwood	1		2	3	9		15			1									1	1	1	3		5	1				2
Linden	10	2	4	17	17	1	51				1			2	3		1	1	6	9	1	4	1	5	4			1	4
New Providence	3		2	2	7		14								2	1	2	1	1	3	1	1		1	1				
Plainfield	38	15	15	58	64		190	11,250	16.89		2	1		3	12	1	13	13	14	25	8	17	8	26	15	3	1	1	5
Rahway	29	11	15	52	30		137	7,090	19.32	1	5	1		6	6		8	16	10	19	8	9	6	9	3	7		1	6
Springfield	1	1	2	1	3		8				1						2					2	1						1
Summit	7	3	4	18	13		45										3	4	8	4	2	6	3	3	2			1	2
Union	1	4	1	6	14		26				1		2	1			1	1	1	8		2	1	1	2	3			2
Westfield	10	3	2	14	9		38				3						6	5		7	1	1	3	5	1	2			
Totals	282	147	109	422	305	1	1,266	55,571	17.56	6	33	21	7	15	63	3	121	93	79	182	74	103	56	96	68	27	4	14	57

Return of Deaths from all Causes and Certain Specified Diseases, in the Statistical Divisions of the State of New Jersey, for the Year ending June 30th, 1890.

WARREN COUNTY. Population, 36,589. Statistical Divisions.	DEATHS AT ALL AGES. Under one year.	One to five.	Five to twenty.	Twenty to sixty.	Over sixty.	Unclassified.	Total, including unclassified.	Population, census of 1890.	Death-rate per 1,000.	DEATHS FROM THE MORE COMMON CAUSES. Remittent fever, &c.	Enteric fever.	Scarlet fever.	Measles.	Whooping-cough.	Croup and diphtheria.	Erysipelas.	Diarrhœal dieases.	Consumption—male.	Consumption—female.	Acute lung diseases.	Brain and nervous diseases of children.	Diseases of heart and circulation	Renal and urinary diseases.	Adult brain and spinal diseases.	Digestive and intestinal diseases	Cancer.	Acute rheumatism.	Puerperal.	Accident.
Allamuchy	.....	.....	.....	3	1	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	1	1	.....	.....	.....	.....
Belvidere	4	1	.....	15	13	.....	33	.....	.....	1	1	.....	.....	.....	.....	.....	3	2	2	4	1	2	3	4	3	1	1	.....	4
Blairstown	3	.....	3	6	4	.....	16	.....	.....	.....	1	1	.....	.....	.....	.....	1	.....	2	1	1	1	.....	4	1	.....	.....	.....	1
Franklin	1	2	.....	5	7	.....	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	1	1	1	1	4	1	.....	1	1	1
Frelinghuysen	.....	.....	.....	3	7	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	2	.....	2	2	1	.....	.....	.....
Greenwich	2	2	1	5	4	.....	14	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	1	2	2	1	1	3	2	.....	.....	.....	.....
Hackettstown	5	3	4	14	10	.....	36	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	2	4	1	3	6	3	4	3	.....	.....	2	1
Hardwick	3	.....	1	3	5	.....	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	1	.....	3	1	1	.....	.....	.....
Harmony	.....	1	3	4	8	.....	16	.....	.....	.....	2	.....	.....	.....	.....	.....	1	1	1	2	.....	2	.....	4	.....	.....	.....	.....	1
Hope	2	2	1	5	6	.....	16	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2	.....	1	1	1	2	5	.....	.....	.....	.....	1
Independence	1	.....	1	3	8	.....	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	3	.....	3	.....	.....	3	.....	.....	.....	.....
Knowlton	3	.....	1	6	10	.....	20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	1	2	1	5	.....	.....	2	.....	.....	1	3
Lopatcong	4	1	2	6	9	.....	22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	2	1	2	1	.....	2	2	2	1	1	2
Mansfield	.....	3	2	9	16	.....	30	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	3	.....	2	.....	8	2	3	3	3	.....	.....	2
Oxford	11	6	9	17	19	.....	62	.....	.....	1	1	.....	.....	.....	1	.....	5	5	6	11	4	3	6	3	6	.....	.....	1	3
Pahaquarry	.....	.....	.....	.....	2	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
Phillipsburg	36	21	9	34	29	.....	129	8,622	14.96	.....	3	1	.....	5	7	.....	23	9	10	8	10	12	1	9	7	4	.....	.....	7
Pohatcong	4	2	.....	7	11	.....	24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	4	2	3	.....	5	4	.....	.....	.....	1
Washington	8	4	4	16	21	.....	53	.....	.....	.....	.....	.....	1	2	3	.....	5	2	1	6	.....	2	2	9	7	3	.....	2	1
Totals	87	48	41	161	190	.....	527	36,589	14.40	2	8	2	1	7	12	.....	49	33	35	54	28	54	21	65	48	15	3	8	28

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(By the Medical Superintendent of Vital Statistics.)

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