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REPORT

OF THE

BOARD OF HEALTH

OF THE

STATE OF NEW JERSEY,

FOR THE YEAR 1878.

II.

State Board of Health.

	P. O. Address.
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Laban Dennis	Newark.
Cyrus F. Brackett	Princeton.
James M. Ridge	Camden.
Theodore R. Varick	Jersey City.
Ezra M. Hunt	Metuchen.
E. A. Osborne	Middletown.

Hon. Henry C. Kelsey, Secretary of State, Ex-Officio.
Hon. John P. Stockton, Attorney General, Ex-Officio.

President	Elias J. Marsh.
Corresponding Secretary	Ezra M. Hunt.
Recording Clerk	E. A. Osborne.

Report of the Secretary of the Board.

To His Excellency, George B. McClellan, Governor:

The State Board of Health of New Jersey begs leave to make report to your excellency in reference to those matters which concern the interests of health and life among the citizens of this State.

The past year has been one which has of itself prominently set forth the great dependency of civic and material welfare and prosperity upon the health of the citizen. It has shown the terror and embarrassment of epidemics, has drawn most earnest attention to the sources of mortality, and in many ways illustrated the effects of localities, employments, conditions and circumstances on the public health.

By a wide spread scourge our whole land has been awakened into sympathy, while within our State there have been localized outbreaks of disease and prevalent sources of ill-health, which have attracted the attention of our citizens. Two persons died within our State of yellow fever. One arrived from Memphis at his father's house in Closter, Bergen county, in apparent good health. Another death from yellow fever is also reported to us from Long Branch.

It is well to remember that New York county and city had from yellow fever over 2,000 deaths in a single year, over 3,000 between 1798 and 1806, that New Jersey had outbreaks at about the same time in five different places, that Philadelphia between 1793 and 1805 numbered from it over 10,000 deaths and that at times since, and notably in 1822 and 1853, it has had a considerable mortality as near us. As it has been the habit of the epidemic to appear successive years in other cities after once gaining headway at central points, we may not be without guard lest our own State should directly suffer from it in exposed localities.

But the occurrence of such an infection is not merely of interest as it concerns one disease or the section especially exposed to its ravages.

The infections of remittent or periodic fevers, of scarlet fever, diphtheria, and many other allied diseases have a history so similar and analogies so suggestive, that the study of any one of the species is a part of the study of other groups.

As to each and all, the most radical question is that of origin. Where and how is the poison generated? Is it only an exotic or is it a native? Or having once been exotic has it become naturalized?

Is it produced within or without the individual? Can it multiply itself so that the person comes to be a source of infection? Is the infectious particle made active by changes after it has left the body? What effect thereupon or upon the person falling sick is produced by surroundings?

Many such questions propound themselves for answer and it is well for all to know that with patient, laborious, hopeful work origin is being studied and some most important facts are awaiting classification and interpretation.

A next important and more successful study is that of the mode of propagation. If we do not know the origin, yet if we can determine the modes and circumstances of propagation of these various infectious diseases, we are thus able to get at facts which help us to limit them.

If we may not catch the infective particle which is the essential cause of chills and fever or the whole train of periodic fevers, yet if we can find that proper drainage limits it, that there are conditions of enforced vegetable decay that intensify it, that avoidance of too early or late exposure, or sleeping in high and dry apartments, or the use of a little bitter extract each day will protect us, we have gained important knowledge for ourselves and for the State.

It is for such reasons that the history of diseases, and of their modes of invasion and spread, becomes of such vital importance to society. We are learning that our most hopeful dealing with many diseases is likely to be in the direction of prevention, rather than in the discovery of specifics for cure. This will bring much of the welfare of the citizens under the care of the State. State medicine has already a wide

and weighty sphere in that it attempts to diminish the necessity for so great reliance on hospitals, asylums and other invalid resorts. It would conserve the interest of the citizen and the material welfare of the State by expending something for prevention and abate the necessity for so lavish expenditures in retention or cure.

We are to remember that not only epidemics disturb the natural course of population and load burdens grievous to be borne upon communities. There are silent forces at work, causing deterioration of health which although without sudden outbreaks are nevertheless potent for reduction and destruction. Like the small steady fire of an infantry corps they kill as many in the aggregate as does the heavy ordnance which occasionally wheels into action. Consumption with its thousands of victims and disorders of the digestive canal which carry to the grave such numbers of children are in a very large majority of cases manufactured diseases. They directly depend upon foul and overheated air, the moisture resulting from impeded evaporation, bad drainage and improper feeding, and improper construction of buildings. In the study of these there is a sphere for preventive medicine, not a whit smaller than that which demands attention through sudden or periodic invasions. The social condition of the people, which means the welfare of the State, is largely interested in the prevention of all preventable sickness.

PROMINENT DISEASES.

The two diseases to which in our State our attention has needed to be attracted for the past year are malarial fevers and diphtheria.

In the prevalence of periodic fevers we have shared in common with portions of adjacent States. Their tax upon material interests is not to be measured either by the number of deaths, nor on the other hand strictly by the number of plainly declared cases. These are not for the most part acutely fatal but so cling and linger and recur as to deduct largely from the health, comfort and resources of the people. Besides they often leave a lowered vitality, or organs permanently embarrassed, so that their record is mingled with that of other diseases or registered in a lowering of the average vital power and labor capacity of the citizen.

Science and experience have so clearly indicated the attendant circumstances of this infection, the conditions under which it acts and remedies not only curative but preventive, that the prevalence is all the more the pity.

There can be no doubt that in certain states of atmosphere, as to heat and humidity such miasms are more active at one time than another. But if only proper drainage is secured, proper precautions exercised by individuals and families, a proper preventive taken, it is in our power to largely abate the nuisance. Already in our own State some advance has been made by the extended drainage of one or two localities.

Our character of soil, the situation of our water sheds and water courses, the massing of great cities toward tide water, and some other considerations, point to the need of more active attention to this subject.

Where cities and railroads are building and new avenues opening there is not only neglect of drainage but aggressive disturbance of ground arrangements favorable to proper water delivery. Hence, while so well able to avoid, no State is more likely to accumulate the causes of malaria or to interrupt by art provisions once well secured by nature.

There is also especial interest attaching to the fact that in the case of the malarial fevers it is known that not only by drainage and precautions, but by the use of certain articles for the individual we may prevent the manifestation of the disease.

This means that by preventive treatment of the person we are able to put in the blood or tissues a something which somehow interferes with the action of the infective particle either by destroying it, by suspending its activity or by so fortifying the system as to render its efforts unavailing.

If this be so, the question very naturally arises whether in regard to other infective material we may not somehow be able to place within the blood or tissues some substance interfering with its supremacy, and thus abort the infection.

Scarlet, yellow and other fevers, as well as diphtheria, measles, erysipelas and allied diseases have hopeful prospects in this direction.

Some of our greatest studies in the political economy of the future will be as to this and other methods of limiting disease.

Diphtheria still continues to recur as an endemic or local outbreak in various portions of the State.

We are not yet able to speak of its causes with that definiteness which is desirable.

It is a disease of country districts even more than of large cities. Although it is spread by infection, it is not apt to become malignant unless warmth and moisture are able to find animal organic materials for its fertilization or dissemination.

Separation even at a short distance, careful ventilation and the avoidance of water-wastage or dampness within buildings do much to aid in the limitation of the disease. It is being carefully studied by physicians, engineers and sanitarians, and by isolation, cleanliness and disinfectants, we are able more than formerly to abate its ravages, where we can secure the employment of known methods. We note with interest that under the patronage of the Sanitary Association of this State, a survey is being made of Paterson, Jersey City and Hoboken, and the most of Hudson county. Geological structure is carefully mapped, and each house noted in which death from diphtheria or other infectious diseases has occurred. Already some facts of value are elicited. Our returns of vital statistics as they will be secured by the law at present in operation, will greatly aid in the study of epidemics.

The Board so soon as it shall have secured accurate data hopes to study both periodic fevers, diphtheria and other diseases with that careful analysis which their frequency demands, and which numerical methods so greatly aid.

The attention of the Board of Health has been called to the prevalence of typhoid fever in Montclair, and in the Reform School, at Jamesburg, beside the occurrence of isolated cases in various portions of the State. This has been called a disease of civilization and of modern improvements because its causes are so often and distinctly traceable to man and his own artistic appliances and conveniences.

This little brief from some citizens of Montclair sufficiently outlines the outbreak there:

"A report having gained wide circulation that Montclair has been during the past season the scene of an alarming epidemic of typhoid fever, we desire to present the facts on which the report above named was based. The disease had its origin in a

small house on Park street. The family occupying this house sold milk. The well which was near the house contained filthy water. The cellar contained various kinds of uncleanness. All the cases of typhoid occurred in the families supplied with milk from this house. The typhoid poison in some way (probably through the medium of the well water,) found its way into the milk, and was thus distributed through the neighborhood. The whole number of cases which presented typhoid symptoms was thirteen, the majority of them being very light. There were five or six severe cases and three deaths. The disease was confined to a very small locality, and did not, at any time endanger those living beyond its immediate influence. It was never in any sense epidemic in the town. Montclair has an area of seven and a half square miles, and a population of about five thousand; it occupies an elevated position, its average height above the sea level being about three hundred and fifty feet, and its highest point about six hundred and fifty feet; it lies on the easterly slope of Orange Mountain, the land having such inclination as to afford almost perfect drainage; it is remarkably free from malaria, and is in a general way a very healthy place. The death rate last year was less than nine per one thousand inhabitants—a better exhibit than is shown by the healthiest town in Massachusetts. (See report State Board of Health, 1877.) Typhoid fever is a disease of very rare occurrence. At present there is not a single case in town, and we can assure our friends that there is no cause for anxiety on our account.

"William A. Torrey,
"Thomas Russell,
"Chas. L. Benedict,
"J. J. H. Love, M. D.,
"J. W. Pinkham, M. D., etc."

The epidemic at Jamesburg was directly brought to the attention of the Board by the Trustees, and a thorough investigation made thereof. As a part of our report will be found a paper as to it. If the occurrence were exceptional or accidental, it would be of only passing interest. But there is good reason to believe that many cities and multitudes of private houses in this State are busy accumulating just such sources of infection, either

showing their effect by a general loss of vigorous health, or likely at some future time to declare themselves by a deadly outbreak.

The locality especially illustrates how a porous soil, of sand and gravel with an impervious clay several feet below may be able for a long time to rid itself of all organic material, but finally so fail as that wells and houses become impregnated with the products of decay. Many towns along our seacoast are filling up rapidly and have not as yet suffered. In their formative periods they give fine advantage for sanitary foresight and construction, while future prospects warrant plans in accord with the best scientific practice. But most of them rely on opinions not expert, so far as sanitary advice and execution are concerned, and are "dabs of sanitation," well advertised as of the most approved methods. The health resorts of England have recently been the subject of several important reports which should warn and instruct us as to the value of prevision.

Evidence both in Europe and our own country has now accumulated sufficiently for us to affirm that fevers known as typhoid, cesspool, etc., and depressions of health vaguely called malarial, are mostly the result of air, earth, or water contaminated by the confined and retained excretions incident to our habits, to house-life or to crowdings of population. Disease is not so accidental and inexplicable as once supposed. It is generally not a mishap, but is providential that mankind, chastened for neglect and warned into a higher regard for natural laws, may secure a higher development.

Our attention as a Board has been called to some private nuisances and infringements upon private rights. Under our present laws there seems to be no available remedy if a neighbor fouls the well of an adjoining lot by placing his out-door conveniences in closest proximity to it. In a case investigated by a member of the Board, the water supply of a small village is very seriously interfered with by embankments made on public works, and in the opinion of most of its citizens there has been an increase of sickness since. A brief report thereupon is herewith transmitted to you. We can point to localities in our State where, by such constructions, the water level has been made much higher and lands made wet and boggy, which before had fair natural drainage. The remedy for these in-

fringements upon private rights must be chiefly furnished by those who fully comprehend the equities of public and personal rights, and who know how technically to frame laws so as to meet all contingencies.

OFFENSIVE TRADES.

During the past years the Local Government Board of Great Britain has published an important investigation into offensive trades and the best methods of conducting them harmlessly. Our own State suffers much from offensive factories, moved out upon it from adjacent cities. These are important industries, but there is no excuse for their being so great an evil to the surrounding vicinage. With a proper outlay science and art now demonstrate how they may be rendered innocuous, and even the odors fully abated. Where such is the case the fact of the nuisance is still more inexcusable, and should be reached by the restrictions of law.

REGISTRY LAW AS TO VITAL STATISTICS.

The Board regards the new law as to the registry of marriages, births and deaths a most important one in the interests of the population, and for the progress of sanitary reform.

There are some slight modifications of the law which will add to ease of administration without weakening its efficiency. It has so important a bearing, not only as a legal registry, but as a guide in vital concerns, that there should be close adherence to the judgment of those who have thoroughly studied the science and art and utilization of vital statistics.

This is in charge of the Department of State, but its medical supervision is under the advisement of the Board of Health. When due provision is made for the clerical force needed in dealing with the large aggregate of returns, we shall be able to gather from them more valuable data and to trace with more exactness the localities, causes and outspreading of disease.

The inconvenience unavoidable in any radical change of method has been found much less than anticipated and we have concurrent testimony as to its general success. The return of marriages and deaths will show a large increase. The birth returns will be less complete in numbers until the duty is enforced, but are of far more value, and in some districts these also show a large increase in return of numbers. Many of our physicians make their returns with business accuracy and promptness and especially those who rank highest in the estimation of the profession.

The law has brought the Board into correspondence with all the cities of the State as well as the townships, and has secured returns from every township and every city. It also corrected a limiting amendment in a former law by giving the State Board power of inquiry in all matters pertaining to the public health alike in city and country.

As to those whose duty it has been to make return of marriages it must be said, that with many oversights and neglects, the former law was nevertheless so carried out as to be of service as a record if not as a basis for vital deductions. Clergymen, Justices, etc., not only were not paid for their certificates, but besides were compelled under penalty to pay twelve cents for each record they have made at the county seat. The present law is much more convenient, involves no expense, and secures fuller returns at less cost to the State. We have heard no complaint from this class, but are rather indebted for some suggestions in perfecting blanks.

Neither as a rule do the educated class of practitioners object to making their returns without special compensation. Their practical exemption from all jury duty is a deliverance which to the most of them is a boon quite equivalent to the two or three hours a year spent in filling out blanks.

Still more when the duty is conceded to be imperative and a honorarium in most countries, and in 1874 was made the general law of England under the sanction of the most eminent members of the Royal College of Physicians and Surgeons, and has been accepted in most cities of our country, objections should be exceedingly strenuous and demonstrative to lead us to substitute our personal views for those of the profession. The present State Board argued this point with some of the fairest legal minds of the State. They were not slow in perceiving what physicians ought to perceive for themselves, that all such exactness of method and record of the results of practice is always in the common interest of the profession it concerns. There are always in every

liberal art duties which do not admit of exact pecuniary reckoning and compensation, yet which performed always accrue to the welfare of the givers, and so each really becomes a sharer in a general pecuniary reward.

The law assumes that there is or ought to be skilled attendance amid the perils of disease and birth, and makes it as it really is, to the interest of every one in such peril to have responsible attendance. While there have been many views as to methods of tabulation and the details of forms, we have never known a careful study of the subject to leave in doubt those who thus got thoroughly before their minds the entire facts in evidence. A reasonable comment on the tendencies to respond to such a view has been furnished by the fact that the best returns are now found in those places where a strict system was already in operation or where it is entirely new. The greatest difficulty has been experienced in towns where by reason of slackness in former administration, a neglect of ordinances had come to be felt excusable.

While the law does add some additional care to undertakers, yet it is to be remembered that any one else may obtain the permit as well as themselves and the obligation put upon them to be assured of its securement is much easier than that system of undertakers' license which is sometimes required.

We do not need, we think, in this State to discuss the necessity of such a law. It has been upon our statute books from our earliest legislation; has received from time to time amendments and some improvements. In the meantime other states and countries, so far from undervaluing, have inclined to make vital statistics the starting point for all statistics as to material conditions, and have largely increased the facilities for their securement. Still more have they become a part of those studies of population now considered vital to the interests of every nation. It is well known that the leading agency in the great work of state sanitary reform in Great Britain has been the Registrar General's Department, and that to it as a guide the Local Government Board has looked in all its more important measures for the welfare of the people. The same must occur in every state as in every profession where the study of the preservation of health is recognised as a weighty public concern.

ADULTERATION OF FOODS.

The attention of the Board has been invited to adulteration and impurities of food, drinks, medicines and illuminating oil.

In times when we are very properly concerned over the interests of labor and the depreciation of compensation and employment, it is well to remember that the wages paid is not the only test of value. It is an important question whether the laborer in return for his money receives an equivalent of such material as his money entitles him to, and as aids him in his work. There are certain protections against adulterations and against dangerous articles on sale and in necessary use, which the individual cannot secure for himself and which must come through the warnings and penalties of legal enactment. The compositions of breadstuffs, of artificial butters and cheese, the condition of slaughtered meats and of liquid foods, the risks in canned fruits and artificial drinks, the value and the safety of burning fluids, all these and such like matters must be inquired into and guarded by the State. An article in one of the leading journals speaks thus:

"There is a demand for severe legislative enactments against the adulteration of food. This is indeed a subject well worthy of the attention of legislators. The wretch who adulterates articles of food is nothing but a poisoner and should be treated as such. This country is certainly blessed with an abundance of cereals, dairy products and meats. While we export enormous quantities of these products to Europe, we often forget that inferior and adulterated food is sold to our own people by unscrupulous dealers. We are all familiar with the operations of the skim milk dealers. While in New York and other states such persons can be brought to justice, we do not know of a single statute in New Jersey which reaches the adulteration of food of any description. It is true that in some of our largest cities we have meat inspectors, and occasionally these functionaries will seize a piece or two of meat unfit for use, but here the matter rests. Oleomargarine can be sold for butter in this State without punishment, sawdust for mustard, marble dust and powdered lime may be found in large quantities in our flour barrels, and the skim milk dealer may carry on his nefarious, yet murderous

trade without fear of molestation." Our laws as to all these are imperfect.

A member of the Board has been appointed to make special inquiry as to food adulterations.

ILLUMINATING OILS have, the last year, enforced the need of some legislation for protection from accidents therefrom.

The press of the State has recorded a large number of accidents. In Newark two persons were burned to death in one week, and similar accidents have been of no infrequent occurrence elsewhere. The November number of the *Plumber and Sanitary Engineer* says: "We began some three months ago collecting such notices of kerosene accidents as we found in the daily papers of this city, but they have accumulated so fast that we cannot publish them *seriatim*. Thus far from our incomplete collection, we might furnish our readers with names and residences of ten unfortunate women burned to death, and men and women badly injured and a large number of fires caused by it. These damages are assessed from $40,000 down. When in search of information about some of the cases in the coroner's office in Brooklyn, we were informed that the oil causing these accidents was frequently or generally above the legal standard."

"It is ascertained, with a reasonable degree of certainty, that about seven thousand persons are slaughtered and six thousand seriously wounded annually in the United States by this deadly fluid. In addition to this, the loss of property reaches into the many hundreds of thousands of dollars. This need not be so, and should not be so. The law should fix a standard test which will insure safety beyond peradventure, and provide the severest punishment for the manufacturers and vendors of explosive kerosene. The State owes it to her citizens to protect them from such great danger.—[*Cincinnati Price Current.*"

The inquest March, 1878, on the body of Catherine Foley, of Jersey City, whose death resulted from the explosion of a kerosene lamp, showed in the expert testimony that what is admitted as strictest refined petroleum by the rule of the New York Produce Exchange is not always safe, although answering to the "burning or fire test," it does not come up to the flashing test.

Prof. H. B. Cornwall, of Princeton, has given much attention, as have various other chemists, to the testing of specimens, and has kindly furnished us these notes, which are more important and conclusive than any mere statements.

NOTES ON KEROSENE.

Kerosene is made from petroleum, which contains several different compounds of carbon with hydrogen. The petroleum is heated in stills, and the very inflammable and volatile liquids which at first are condensed are known as gasoline, naphtha and benzine. Any of these give off at temperatures below 100° Fahrenheit, gases which are very easily ignited and form with air explosive mixtures. After these have been driven off from the petroleum, the kerosene is collected, and if the refiners begin to collect the kerosene from the condenser of the still too soon, it will also contain more or less benzine or naphtha. It is the presence of these in badly refined kerosene which renders it dangerous, because they pass off from the kerosene as gases at very moderate temperatures and in dangerous quantity. If the dealers put benzine or naphtha into good kerosene the result is the same. It is not possible to say certainly whether the injurious ingredients have been left in the kerosene by the refiner or put in by the dealer. Since naphtha and benzine command a much lower price than kerosene, there is a great temptation to sell kerosene containing them.

The quality of kerosene can only be practically ascertained by what is known as the "*flashing test.*" The kerosene is put into a glass vessel holding somewhat less than half a pint and filled nearly to the top. This glass is placed in a metal vessel of water, so that the water rises as high outside as the kerosene inside of the glass, and the water is then slowly heated by a small flame under the metal vessel, currents of air being shut out by a detached screen. By means of a thermometer, whose bulb is just immersed in the kerosene, the temperature of the oil is observed. At every increase of two degrees or so in the temperature the oil is well stirred, the gases are blown from its surface and after a moment or two of rest a very small flame is passed steadily and rapidly across the oil, *not touching its surface,* but at about one-quarter inch distance. If a blue flicker-

ing flame flashes transiently across the oil it shows that *the temperature has been reached at which the oil gives forth inflammable vapors.* This is called the *flashing point.* Since it is the gas thus given off which, mixed with air and ignited by the lamp flame or otherwise, causes the explosion and since, further, an oil heated to this point, if spilled near a light by any chance, such as the upsetting and breaking of a lamp, will be at once set on fire by the ignition of the gases escaping from it, it follows that no oil is safe which gives off such gases at temperatures to which oil is ordinarily exposed in common use.

Dr. C. F. Chandler, of New York, has shown that the average temperature of the oil in thirteen glass lamps, after burning some time in a room of which the temperature was from 90° to 92° Fahrenheit, was 92⅓° Fahrenheit, while the oil in one lamp showed a temperature of 98° Fahrenheit. Any oil that will not stand the flashing test at 100° Fahrenheit is manifestly liable to cause accidents by explosion of gas from the oil mixed with air in the lamp.

A common cause of accidents is the breaking of lamps. It has been shown (*American Chemist, June, 1876,*) that when a lamp containing oil at a temperature of 95° Fahrenheit is lighted and broken by dropping on the floor, oils which flash below 100° Fahrenheit will at once take fire from the gas which is ignited by the wick, while oils that stand a flashing test of 100° will be ignited but very slowly if at all; those which flash at over 105° to 110° not being ignited unless by *actual contact of the burning wick with the oil.* It is, then, the gas from the poor oils which takes fire from the lighted wick of the broken lamp and causes the instantaneous ignition of everything on which the oil has fallen.

It is unfortunate that any other test for oil has been introduced, but most oil is sold by another test, viz: the *fire test,* which means the temperature at which the oil itself takes fire from the ignited gas and continues to burn, when tested in the glass vessel, as above described for obtaining the flashing point. This *fire test* is fallacious, for it is not invariable. While one oil that stands a *fire test* of 110° may stand a *flashing test* of 100°, another of 110° *fire test* may *flash* at 80°, and it must not be forgotten that it is the escape of inflammable gases at a low temperature which occasions all of the danger in ordinary cases.

What constitutes a safe oil? Probably it would be desirable to make the *flashing point* not lower than 110° Fahrenheit, to ensure perfect safety, but since this entails a considerably reduced production of kerosene from a given amount of petroleum, it may be regarded as settled that a *flashing point* of 100° Fahrenheit will be a much more easily procured standard, while it will secure undoubtedly a reasonably safe oil.

I have examined five kerosene oils that actually occasioned explosions in this State, the lamps being burst, not broken by upsetting. They showed the following *flashing* and *fire tests*:

	FLASH TEST.	FIRE TEST.
No. 1	79° Fahr.	99° Fahr.
2	76° "	85° "
3	82° "	106° "
4	84° "	105° "
5	94° "	111° "

These figures show that every oil flashed below 100° Fahrenheit, although three had a *fire test* above 100°, one, No. 5 at 111°, being *one degree better than standard kerosene of the New York Produce Exchange.* It is most unfortunate that this *fire test* was ever introduced. It means nothing, it confuses the public and it has furnished the means for evading the just penalty of the laws against the sale of dangerous kerosene. Many States have adopted 100° *fire test* as the lowest limit, but it has been repeatedly proven and is well known to all who deal in kerosene, that a 100° fire test oil *must be unsafe under all circumstances.* The *flashing test* is the only safe one. The statements of prominent refiners support the view that a 100° flash oil while reasonably cheap is reasonably safe. I have never met with a case of an accident from such an oil.

Experiments show (*Amer. Chem. loc. cit.*) that an average poor oil, flashing at 86° Fahrenheit, can be brought up to the safe 100° flash test by removing six or seven per cent. by distillation, and Mr. H. N. Rogers, of Chas. Pratt & Co., informs me that an oil of 110° *fire test* would yield about eight per cent. less of a 100° *flash oil.* At eight per cent. greater cost, at most, the ordinary poor kerosene could be made safe, and the oils would still burn just as well in ordinary lamps. At present these safe

100° flash oils are rare have examined fourteen ordinary kerosenes in one day and only found four good ones. There are a number of safe, high grade oils in the market, flashing at 110° to 125° Fahrenheit, but they are necessarily higher priced, because the demand for them is small in comparison with the cheap, bad oils. If legislation forced the production of safe oils alone, these still safer oils would become cheaper.

The eight per cent. removed from the kerosene by distillation is not a dead loss. It still has a value, although less than one-half as great. Even if a dead loss it would now be only one cent a gallon. The gain to the community by freedom from danger to life, person and property, and the gain to the refiners and dealers by increased sales of a commodity no longer regarded as probably dangerous, may be offset against the former loss. I hold letters from prominent refiners stating that they greatly desire legislation to improve the quality of kerosene. The insurance companies would probably say the same.

Of the five oils described a few pages before, three caused fatal accident, and two would have caused fires had not fortunate chances prevented. They are fair types of such occurrences, taken just as they came, the only source of information in four cases being one New York paper. How many similar accidents occur in the whole State in a year I do not know, but certainly enough to make the question an interesting one to the Board of Health.

Any legislation on the subject must be decisive and must provide a penalty and means for enforcing it, on refiners as well as dealers. Several States have excellent laws; several have useless ones. The law of New York State is useless, with its 100° *fire test;* the law or ordinance of New York city with its 100° *flash test,* has done a great deal of good. Common people will have the cheapest; they will burn *pure benzine* if it is cheaper than kerosene. I tested one sample which killed a girl in Jersey City. It was simple *benzine,* and worse than gunpowder.

I add a list of oils I have tested:

	FLASH TEST.	FIRE TEST.	
No. 1	78°	.. ..	
2	104°	120°	
3	81°	.....	
4	82°	.....	
5	80°	98°	
6	79°	104°	
7	101°	.....	
8	99°	116°	
9	77°	100°	
10	104°	.....	
11	115°	127°	Sold as Pratt's Astral Oil in Princeton.
12	83°	.....	
13	80°	.....	
14	79°	99°	Exploded in a hall lamp and nearly set fire to the house. The lamp was nearly full and burning quietly.
15	86°	107°	
16	94°	111°	Exploded in a lamp quietly burning and nearly set fire to the house.
17	118°	135°	Pratt's Astral.
18	80°	100°	
19	98°	112°	Vesta Oil.
20	99°	112½°	" "
21	127°	149°	Home Light Oil.
22	128°	148°	Anchor Safety Oil, Princeton.
23	142°	154°	Anchor Safety Oil, five months later.
24	76°	85°	Exploded in lamp when blown out, and killed a woman.
25	119°	139°	Pratt's Astral, Princeton.
26	82°	106°	Exploded after burning some hours and killed a woman.
27	84°	105°	Exploded in a kitchen and killed a woman. No fire in the vicinity of the lamp.

The danger of the oils flashing below 100° Fahrenheit; the uselessness of the 100° fire test, and the very common use of bad oils, are sufficiently shown by the above list. As regards the high grade oils it should be added that a small dealer in New York city told me he filled Pratt's and other marked cans with *any good oil!*

It is certainly time that our State should have definite legislation on the subject, both in the interests of life and property.

The whole matter of adulteration of food, drinks, artificial lights, etc., is so important that we believe our legislators should at once enact such a law as will protect our citizens from imposition. If also provision was made by which the State Board could employ one or more public analysts, at a very moderate expense, society would be largely protected from the daily impositions practiced. We commend the subject to the careful attention of your Excellency and the Legislature, and are ready

when called upon to aid in any method which will accomplish the purpose.

As a part of this report we beg leave to present to your Excellency as follows, several papers, which we believe will be found of much value to the citizens of this State, and will aid to guide our legislators as to some of the best methods of conserving the public welfare.

I. Report of State Board of Health at the Governor's request, "On the disposition to be made of the criminal insane."

II. Report on an outbreak of enteric (typhoid) fever at the State Reform School, Jamesburg, by E. M. Hunt, M. D.

III. A report on the diseases of hatters, by L. Dennis, M. D.

IV. A paper on springs, wells and cisterns as sources of drinking water, by Professor H. B. Cornwall, Ph. D., Princeton, N. J.

V. A paper on sewers by E. A. Osborne, C. E.

VI. A paper on vaccination, by E. J. Marsh, M. D., President of State Board.

VII. Outline of the work of the New Jersey Sanitary Association, by E. M. Hunt, M. D.

VIII. Veterinary report, by J. C. Corlies, D. V. S.

IX. Report on interrupted water supply, at New Village.

X. Climatology.

XI. Report of vital statistics to June 1, 1878.

I. At the request of your Excellency that we would inquire into "the proper disposition to be made of the criminal insane," the Board appointed two of its members to make careful examination into all the evidence they could command.

Diligent investigation led us to the views expressed in this report, and met the approval of the Board. While it is a subject admitting of a diversity of opinion, it needs to be more fully studied by philanthropists, physicians and alienists. We are convinced too that our State charities and penal institutions, while well superintended, need to be strictly compared with those higher laws, the neglect of which does not indicate mal-administration, but the studious recognition of which might make them more useful for reformatory, educational and economical purposes. System so easily degenerates into routine, that what is

conservative is easily reckoned as radical by those who have not re-studied the great questions of insanity, pauperism and crime, and the management of their victims by the light of modern methods of inquiry and practice. They are great personal, civic and State interests and ever need most earnest supervision.

II. The report on the outbreak of enteric fever at the State Reform School, Jamesburg, is in itself so forcible an illustration of what may happen from faulty construction or concealed embarrassments under able superintendence that it is valuable as a warning and incentive, to secure a prevention or correction of similar evils in many a public and private residence of the State. We are glad to bear testimony to the earnest efforts of the Superintendent and Trustees to secure an improvement of inside apparatus, sewers, water supply, etc., as rapidly as the limited funds at their command will permit.

III. The report on the diseases of hatters is but one of very many reports needed as to various industries. It is but a specimen of what evils may result in various trades and occupations. The most of these are avoidable. Even where deleterious substances have to be used the provisions of chemical and pneumatic art are such that the workmen can generally be protected from harm. Our State has large manufacturing interests in iron, pottery, glass-blowing and many other trades especially subject to enervating influences. At one time capitalists looked with suspicion upon any effort to improve the condition of working-places or methods having regard to the health of employees, as they might entail expense upon employers. Men of narrow views may still be found who secretly, if not avowedly have these groundless fears. Our ablest and most successful manufacturers are coming to know that the health and comfort of the skilled workman is a part of their own success. He who summons the artisan to his aid for executing an art from which he expects to receive reward, should see to it that his laborers can do their work free from all unnecessary perils to health, life or cheerfulness. If not it is the common interest of the State and of every citizen in it to strive to secure such a result. This report important as to one class, will be of still further service if it will awaken attention to the avoidable exposures in various de-

partments of industry, with a view to their remedy or abatement.

IV. The paper on springs, wells and cisterns as sources of drinking water specifies the qualities of good water, precautions against impurities and furnishes an outline to guide all householders against the evils which so constantly result from a contaminated water supply. We are able thus to present in condensed form instructions which need to be heeded by every citizen of the State. The evils of bad air, imperfect food and impure drinking water are sometimes manifested in sudden outbreak of disease, but more frequently in a general lowering of the standard of health. There is help to society and great comfort to the individual in deliverance from all avoidable burdens.

V. The paper on sewers will be found to present methods of construction and other points of great importance to cities. Evidence is constantly accumulating as to the evils arising in cities from these underground conveniences and even from the drains and cess-pool connections of private country houses. There is need that the attention of our citizens be carefully directed to the subject.

VI. The subject of vaccination is so important that we cannot too earnestly call attention thereto. The evils of small pox and the value of this protection are sufficiently well known. So long as we were dependent for our supply of vaccine upon matter taken from others, some had a fear of the transfer of human diseases. Some physicians believed in the very rare possibility and so this was a fear and with some valid and plausible reason might lead to hesitation. Since now we can avail ourselves of the vaccine virus direct from the cow no objection founded on risk of the transfer of bad blood can stand. It is the plain duty which every citizen and every child owes to every other that the risk of the small pox contagion should thus be well nigh abolished. Many countries now have and enforce a law of compulsory vaccination. Many claim it as applicable here. Still more claim that when we offer the public school as a gratuity we have the right to make vaccination a condition of entrance. Even if we trust to the voluntary plan, with our

present school system of yearly enrollment, and with the aid of our system of vital statistics, it would not be difficult to ascertain each year how many children over a given age are unvaccinated.

Nor would it be difficult whenever public opinion or intelligent legislation request it for the Educational and the Health Board so to co-operate as that inexpensive and reliable vaccination might be secured to all district schools at some period of the year. We are able to suggest a plan by which such a satisfactory result could be very generally secured.

Other matters are fully treated in the paper which forms a part of our report.

VII. During the last four years there has existed in the State a sanitary association of citizens. Its yearly meetings bring together persons of various callings who feel a deep interest in the health of our citizens, and recognize, both in city and country, avoidable causes of disease. Papers of permanent interest, which have never been published, have been read by physicians, teachers, engineers, etc. As valuable extracts could be made therefrom, this outline has, by permission, been prepared for this report, in order that our citizens generally may avail themselves of the most important suggestions. This is but a mere synopsis of the chief contributions. These and the other papers can be consulted in manuscript.

VIII. In accord with the direction of the law, that the Board should "make inquiries and report in reference to diseases affecting animals and the methods of their prevention," we have, from the date of our organization, noted the most common diseases and the efforts of veterinary medicine in its cure thereof.

Two facts soon became apparent. The descriptions of disease as reported were too general to admit of indentification, and the professional education of most of those practicing among animals in New Jersey has in the past been so imperfect as to leave us with but few sources of information. Veterinary medicine and surgery has long since taken rank as a profession collateral to that which cares for the human kind. In each experience is of great value, but it is that experience which is acquired on the foundation of careful study and exact scientific

knowledge. A correct practice can only be the outgrowth of such methods as are applied to other arts which have a science as the basis. Much of our cruelty to animals is in that promiscuous treatment which they receive when sick, or that want of sanitary care which induces disease.

While there has been some general inquiry as to epidemics or endemics among stock, and an occasional contribution on the subject, no systematic effort has been made to trace the prevalent diseases in our State, or to record such facts as might aid in their investigation.

More recently several graduates from the New York Veterinary College have settled in New Jersey, and these, with the very few reputable practitioners previously here, afford a hopeful nucleus of information. While the opinions of stock raisers and those who have to do with animals is to be noted, just as every good physician listens inquiringly to the statements of nurse or parent, yet there can be no hope of skillful management until men, well trained in this department, make of it both a study and a practice.

We procured the names of those who were best authenticated, and after consulting prominent members of the State Agricultural Society, invited Dr. A B. Corlies, Veterinary Surgeon of Newark, to co-operate with the Board in its work. The plan is to place ourselves in correspondence with some proper person in each county or township, so that knowledge of any outbreak may promptly come to our notice and the character thereof be duly traced. Some advance has already been made in this direction, and a few notices of special cases will be found in the paper herewith transmitted.

In the introductory it was thought proper to give soms descriptions of the diseases of cattle and horses most to be dreaded or which have already appeared in the State. These, although brief, will serve to guard against their introduction and to acquaint dealers in stock with their general character. We shall hope in future reports to deal more closely with the diseases in our own State and be able to designate methods for the better care of this great material interest.

IX. The report on interference with the water supply of New Village, was prepared in reply to a petition made to the Governor

of the State, and signed by about thirty persons, which we think included over three-fourths of the male citizens of the town. The facts of their petition were fully confirmed by E. A. Osborne, C. E., who made a survey of the locality. The evil still remains, because persuasion has thus far failed, and there is some doubt whether any provision on our statute book reaches it. But it is of value as illustrating a defect such as exists as to many other matters. In a good government it is often necessary in health interests to give plenary power and then confide in the judgment of the persons intrusted. Far more liability of assault upon private rights and public welfare accrues from delayed remedy or defective power than from peremptory jurisdiction when the parties exercising it have both character and position at stake, and would be compromised by a mistake of judgment or by undue severity under conferred powers.

X. The importance of climatology and the study both of meteorological and telluric phenomena is fully recognized by the Board. The relations of heat, air, winds, moisture and of sudden changes to the public health is undoubted, and has its ascertainable laws. The subject is a difficult one and for this reason all the more it needs that patience which can wait for results and that extent of observation in different States and localities by which a mass of information may be secured. Returns are kindly furnished us by the Signal Service Bureau, which has five stations along our coast, with an earnest request for similar returns from observers in the State. Other observations are made at several points in behalf of the Smithsonian Institute.

As the instruments for observation are expensive and the work is valueless unless it is accurate, the Board has deemed it wise to place instruments for the present at a northern and central portion of the State, as Cape May, with its Signal Station, represents the most southern latitude. The instruments placed at Princeton will be under the supervision of Professor Brackett, and the one at Newton in charge of Dr. Haven, the Librarian of the Dennis Library.

Observations were not commenced until Fall, and no report is made therefrom for this year.

Professor Brackett and E. A. Osborne, C. E., are a special com-

mittee to oversee the conduct of this work and aid will be secured from our ablest observers.

We are this year again indebted to Hon. Wm. E. Whitehead, of Newark, the veteran observer of the State, for his perspicuous meteorological tables. We call also especial attention to the comments thereupon contained in his monthly letters.

Special attention is called to his July letter, all the more important because of certain meteorological conditions coincident with the epidemic at the South and which have been carefully noted at Memphis, New Orleans and other points.

After remarking that the meteorological phenomena of the month were at variance with previous experiences and new at least to the present generation, he says:

"July was, in some respects, an exceptional month. The extreme heat, which lives in the remembrance of all, commenced on the 27th of June and continued with only slight modifications, on some days with increased intensity, to the 10th of July, the mercury rising every day above 90° (on three of them above 95°) making *fourteen days in succession* thus characterized. The largest number previously recorded in any one of the thirty-five years covered by these reports was *seven* in July, 1845. There were *five* in August, 1853, July, 1854, and July, 1856; *four* in July, 1843, June, 1848, June, 1849, July, 1866, July, 1872, and July, 1877; but, generally, only two or three in succession have been experienced.

"Although there was only one inch of rain fell during the whole fourteen days, and that on four different occasions—on 4th, 8th, 9th and 10th—yet there was so much humidity in the atmosphere that nothing like the ordinary effects of drouth were apparent, but it was conceded that that humidity added to the number of victims to "sunstroke," which was unusually great, especially in some of the western cities.

"On the afternoon of the 11th some welcome clouds obscured the heavens, and in the evening rain set in, which continued to fall in showers during the 12th to the depth of an inch and eight-tenths; so lowering the temperature that the maximum of the day was only 73½°, and the mean temperature 71¾°, the lowest recorded until the 30th.

"The force of the caloric wave was, however, not yet exhausted.

On the 15th 93° was attained, and on the 18th, 19th and 20th, 97°, 97½° and 94° respectively, the 19th having the highest mean of the month, 86¾°; for although the maximum of the day was three-fourths of a degree less than was experienced on the 3d, the minimum, 76°, was higher than on any other day of the month. After the 20th the heat, although on some days very oppressive, was not so great, 90° not being again reached. Light clouds during the morning of the 29th culminated in the afternoon in others of greater density, effectually obscuring the eclipse of the sun, which had been waited for with much interest, and bringing a copious rain of nine-tenths of an inch during the night and following day. The temperature of the last two days was in consequence materially lowered, so that the 31st was the coldest day of the month; the change working such a diminution in the mean of the whole month as to prevent its being exceptional in that respect, as it bid fair to be.

"As less than six-tenths of an inch of rain had fallen (on two occasions, 18th and 20th) since the 13th, the rain of the 30th was very acceptable, but the humidity of the atmosphere, notwithstanding the extreme heat, was a noticeable feature throughout the month, and consequently, at its close, there was no material diminution in the beauty of the emerald tints of the fields or the rich verdure of the trees—with the exception of those of the paper-mulberries and horse-chestnuts, the leaves retaining a firm hold upon the parent stems.

"The month's mean temperature, 78.25°, exceeded that of all but one of its name during the last thirty-five years, and was four degrees and six-tenths above the average of the whole number, which was 73.65°. The mean of July, 1876, was 78.31°, a fraction higher than the last. The other hot Julys of the series were, 1856, 76.07°; 1866, 76.08°; 1872, 76.79°; 1877, 77.86°. The month was exceptional in the number of days having a temperature of 90° and over, fourteen being thus characterized; the greatest number in any previous July having been ten in 1876 and 1877. The maximum temperature of the month, however, was exceeded in four of the series, 1843, 99¼°; 1849, 99¾°; 1866, 98½°, and 1877, 99°. Its minimum, 61½°, was above the minima of all but that of 1872, which was 62½°.

"Opinions were expressed in some quarters during the month

that the heat was not so oppressive as in July, 1876. One fact connected with that month may have led to that opinion. The nights of July, 1876, were warmer than those of July this year by two and a half degrees, so that there was less recuperative power derived from the rest they afforded, and the heat of the days consequently rendered more oppressive. The mean temperature of the nights of the last month was, however, more than three degrees above the mean of the preceding thirty-five Julys, having been exceeded by the nights of two only, 1872 and 1876.

"The observations of the Signal Service Bureau sufficiently demonstrated that the heated current which for two-thirds of the month swept over all the Eastern, Middle and Northern States, took its start far in the northwest, beyond the limits of the United States, moving southwardly and eastwardly with a speed that outstripped the winds; and although the question has been asked, 'Who can estimate the value of a fact?' yet in this instance it must be admitted that the fact elicited would be more valuable if its 'why and wherefore' could be determined But, notwithstanding the progress made in the science of meteorology in late years, it must be acknowledged that more is known of *effects* than *causes*. What were the peculiar circumstances from which were evolved the atmospherical phenomena that originated, and then set in motion, the heated elements, is not explained by the discovery of the region of their development. There are many philosophers, no wiser than Horatio, to whom the things of Heaven and earth are still mysteries unsolved. The time will come, however, as prophesied by Prof. Loomis more than thirty years ago, when the meteorological maps of the Signal Service, giving the condition of the elements daily throughout the whole United States, will show more definitely the origin of atmospherical phenomena such as we have recently experienced.

"The locusts were first heard on the 14th, about a week earlier than last year.

"The barometrical range was between 30.240 observed on the morning of the 12th, and 29.700 on the morning of the 22d, the mean of the morning observations being 30.041 and of those in the evening, 30.016.

"The thermometers gave the following results:

"Maximum temperature, 3d, 98¼°.
"Minimum temperature, 23d, 61½°.
"Mean temperature, 78.25°.
"Highest daily mean, 19th, 86¾°.
"Lowest daily mean, 31st, 67¼°.
"Greatest daily range, 1st, 27½°.
"Least daily range, 30th, 2½°.
"Mean daily range, 19.694°.

"The daily maximum temperature was once 98¼; once 97½; once 97; once 95¾; once 95½; nine times between that and 90; ten times between 90 and 85; three times between 85 and 80; once between 80 and 75; once 73½; once 72½, and once 69.

The daily minimum temperature was once 61½; six times between that and 65; thirteen times between 65 and 70; ten times between 70 and 75, and once 76.

"Fair weather prevailed equal to about eighteen days. It rained in measurable quantities on eleven days and sprinkled on one other, to the depth in all of 4.330 inches, very little more than the average of the month in thirty-five years, which was 4.283 inches, the greatest fall during that period being 8.535 inches in 1868, the least 1.120 in 1861.

"The predominant winds were from points between N. W. and S. W.

"W.

"Newark, August 1, 1878."

Report on the Disposition of Insane Criminals.

To His Excellency, George B. McClellan:

On the receipt of a request from your Excellency that the State Board of Health would express an opinion concerning the proper disposition and treatment of insane criminals in this State, the Board appointed a special committee to consider and report on the subject.

That convicts who have the misfortune to be insane are entitled to the same care and skill in the treatment of their maladies, as other persons of unsound mind, has not been under serious discussion in the present century. It has been settled also by almost universal custom that such treatment should be conducted in buildings having special arrangements and appliances suited to the peculiar cases of the sufferers in question.

The real question to be considered in our report is this:

Are there good and sufficient reasons why convicts who become insane should be treated or retained in hospitals or asylums separate from all other insane persons?

As the question in some of its aspects is not new it may be profitable to inquire how it has been treated in other States and countries where an enlightened and Christian civilization prevails.

The practice of the Continental nations is clearly brought to light in the following extract from Mr. Manning's report on lunatic asylums (1868):

"The almost complete absence of special provision for the criminal insane of all classes which exists on the Continent of Europe, is very remarkable; but it is in accordance with the opinions of the public, and of many of the most distinguished alienist physicians, opinions which have found expression in various pamphlets, and in papers and journals devoted to matters psychological. It is held that insanity should level all distinctions, that the great gulf which separates the convict from

the honest man is bridged over by insanity, and that the bondsman should be as the free; that when sick in body the prisoner should still be kept in his prison and treated for his malady; but when sick in mind the prison should be opened and the badge of the convict forgotten."

When we remember that many of the most valued writers and authorities on the care and treatment of the insane are to be found among the French and Germans, such language is very significant.

In Great Britain the case is somewhat otherwise, for we find at Perth, in Scotland, there is a "criminal lunatic asylum." It is a part of the general prison of Scotland, but yet is under the charge of a special superintendent. This asylum is not, however, in strictness one for insane convicts alone, since it receives as well those who have committed acts of a criminal character while under an insane impulse. The asylum, however, presents the character of an institution for a distinct class, aud this impels us to give in full, so far as relates to the subject, an excellent letter from its able medical superintendent, John McNaughton, M. D.:

"SOUTHVIEW GENERAL PRISON,
"PERTH, 10th Sept., 1878.

"DEAR SIR:—I received your letter yesterday and have much pleasure in answering your questions so far as I am able.

"Our Criminal Lunatic Department consists chiefly of two distinct classes of inmates, viz: those who have been found by a court of law to have been insane while committing the crime charged, and therefore condemned to be detained as lunatics during Her Majesty's pleasure; and secondly, those who became insane during their term of imprisonment.

"Now with regard to the first class they, in the vast majority of cases are homicides, subject to more or less frequent homicidal impulses, in many cases with long perfectly lucid intervals between. With these we put all whose propensities are distinctly homicidal.

"For this class of criminal lunatics I hold that a separate institution upheld by the State is almost indispensable, as it confers on us the power, gives us the means, and holds us responsible for the detention of prisoners, though apparently perfectly sane,

so long as there is the slightest danger of any recurrence of the homicidal tendency, whereas if confined in an ordinary parochial asylum, the authorities, considering the generally crowded state of their establishments, and the desire to keep down the expenses, could hardly be blamed or held responsible for discharging a man as soon as he has again regained his reason.

"This argument applies very forcibly to one class of homicides, viz: dipsomaniacs, as those patients very shortly after confinement and the cutting off of the supply of drink, generally become perfectly sane, but they are not then, and I question very much if they ever can become fitted to be again allowed with safety abroad.

"Take another class of homicides, those who have committed murder through puerperal mania. We have power from the State, if thought necessary, to detain these women at least till after the childbearing period, which would not only be very difficult but almost impossible to do in our ordinary asylums, as now constituted.

"Now considering the second class, those becoming insane during their imprisonment. They are put here for treatment with homicides. If remaining so at its termination, we as a general rule transfer them to the asylum of the parish to which they belong, where they can generally be very well treated along with the other inmates. Even in those cases we have the discretionary power, through the Secretary of State, of detaining them at the expiring of their sentences, when we consider them unfitted for an ordinary asylum, but in very few cases do we require to exercise this power, as they are generally simple cases of insanity resulting from depraved moral and physical habits.

"Your next question, whether they incline to escape more than other lunatics? I cannot well answer, as ours are so confined as to prevent the smallest possibility of such an attempt being successful, and seeing its futility, none have ever, to my knowledge, made the attempt.

"Once a patient has been received into our Lunatic Department there is almost no inducement for him to feign insanity, rather the reverse, as he knows his chances of again being set at liberty entirely hinge on his mental state.

"In our ordinary Convict Establishment, for which I am also

medical officer, we have numerous cases of feigning insanity to escape punishment, or to be released from their imposed task.

"As a general rule, I should say, taking them as a class, our criminal lunatics are much more unmanageable than others, seeing they principally come from the lowest and most degraded orders, hence being naturally of a suspicious and jealous nature, with no curb on their passions to begin with, when insane, one can imagine they will take far more tact and a firmer hand to manage them than ordinary lunatics.

"Considering that over sixty per cent. of our inmates are homicides, attempts at violence are very much more common than amongst the same number of ordinary lunatics.

"I am sorry I cannot direct your attention to any literature which fully discusses the question of separate criminal asylums, but will be happy to give you any other information in my power should you desire it.

"I know of no other Criminal Asylums than those you name, although I am aware they detain lunatics for a certain time in Millbank Convict Establishment.

"Believe me, dear sir, sincerely yours,

"JOHN MCNAUGHTON, M. D."

It will be seen from this that in his judgment, a separate provision for those disposed to homicidal acts, is fully as important as for those who are insane convicts.

An asylum of similar character exists at Broadmore, a few miles from London. It receives insane convicts from the government prisons, and also those who being found to have been insane at the time of the committal of a criminal act, are condemned to be detained as lunatics. Its entire management is similar to that of an ordinary English asylum. It has no special provisions for security beyond those which may be found in the best asylums in this country.

At the expiration of sentence, the rule is to discharge the convict insane and to remand them to other asylums.

The Irish asylum at Dundrum is of a similar character.

Fisherton House, near Salisbury, is a proprietary asylum, available, however, to parishes and county prisons, for the detention of insane paupers or insane persons convicted of minor offences.

While all these are worthy of study, giving as they do, some information respecting special classes of insane persons, none of them shows the result of entire separation of convicted insane persons from all others. Indeed the experience of the medical officer at Perth would rather show the need of providing for the care of other classes of insane persons before setting apart an asylum for insane convicts alone.

In the United States, notwithstanding the organized efforts of the "Association of Asylum Superintendents," we have as yet no separate asylum for the treatment of insane convicts.

In Massachusetts various attempts have been made to secure the separation of insane convicts from other insane persons; and the Legislature has passed votes favoring such a result, but nothing decisive has been secured in favor of separation, till recently. It is now ordered that insane convicts be treated at a hospital connected with a prison.

The new prison at Concord is to have a "special department adjacent to the prison, which will accommodate about thirty insane persons."

It so happens that on no point are our correspondents so unanimous as in discouraging the building of such an asylum or hospital near or in connection with a prison. Says one of the former assistants in the Auburn Asylum, who is now connected with the Insane Asylum at Danvers, Massachusetts, "I should especially urge the importance of not building too near a prison, as the environment is pernicious. Get the insane convict off a reasonable distance in the country, with plenty of farm work, fresh and good living, and not only would some good cures be effected, but there would also be many persons wholly reformed." Similar observations are made by the Superintendent of the Taunton Lunatic Asylum.

The nearest approach to an institution for the convict insane in our country is near the State Prison at Auburn. A large proportion of its inmates are, however, unconvicted insane persons. The asylum is placed on a lot of six acres—a part of the prison grounds—and is enclosed by a stone wall. The present Medical Superintendent very properly objects to its proximity to the prison. It was first occupied in 1859, and has had a varying and complicated history. It was originally intended for insane convicts only, but in 1869 it was made to receive those who had

been acquitted on the ground of insanity. It is worthy of note, however, that formerly "from one-third to one-half of the persons transferred to the asylums from the state prisons were certified by the medical officers of the prisons to have been insane when received into them, showing them to have been insane at the time of sentence." The following letter from the able Superintendent of the asylum is important:

"Respecting the propriety of confining persons whose insanity has led them to commit, or attempt, homicidal acts, I may say that, in my opinion, there are cases of this kind which it would be manifestly unjust to confine, in common with the *convicted* insane. The wife, for example, who destroys her infant during an attack of puerperal mania, or, in fact, any individual whose life, prior to the occurrence of insanity, has been exemplary or at least not criminal in character. In this State the statute wisely provides that 'when a person accused of the crime of arson or murder, or attempt at murder, shall have escaped indictment, or shall have been acquitted upon trial upon the ground of insanity * * * * the court shall order such person into safe custody, and to be sent to one of the State lunatic asylums, or to the State Asylum for Insane Criminals at Auburn, at the discretion of the court.' This is intended to prevent injustice in the disposition of such cases, and, practically, it does so whenever the courts see fit to exercise the discretion allowed them.

"I may state in this connection, a fact which has been observed in this State and which has struck me as being noteworthy, namely, that a large majority of the persons who have been acquitted of, or have escaped indictment for the acts mentioned, on the ground of insanity, have led immoral lives previous to their insanity, which, in many cases is the direct entailment of their immoralities.

"It is the custom here to classify patients according to the form of their insanity without much regard to the crimes they may have committed; but my observation leads me to conclude that those who have committed acts of violence against the person are more dangerous, but, as a rule, not more inclined to escape than those who have been convicted of crimes not violent in character.

"All of the penal institutions in the State can, under the statute, send patients to this asylum.

"In respect to the production of moral degredation among the good by contact with the bad I think that the rule which applies to the same holds good, other things being equal, in the case of the insane.

"I have no statistics to show that 'the chances of mental and moral recovery are better by the separation,' but I have no doubt as to the effect upon the moral nature of an innocent, pure-minded individual who is compelled to associate with the vicious and immoral while undergoing treatment for a disease which for the time weakens all of the mental faculties.

"Convicted patients, in case of recovery, are returned to prison; but if they remain insane on the expiration of sentence they may be transferred, upon the approval of the State Commissioner in Lunacy and the Superintendent of Prisons, to the custody of the authorities of the county from whence they were sentenced to prison, or friends may remove them on furnishing evidence of ability, as well as a written agreement, to care for them; provided, (in both cases) that they are regarded as harmless and not likely to be benefited by further treatment in the asylum. If considered dangerous, or curable, they must be retained here.

"Believing I have answered your inquiries, I am,

"Very respectfully, yours,

"CARLOS F. MACDONALD."

We regret the paucity of statistics concerning the life history of insane convicts, but facts, which have plenty of coroboration, compel us to believe that not a few of those who clearly show themselves to be deranged while undergoing sentence in prison were of unsound mind at the time when they committed the act which placed them there.

In Pennsylvania the provision of a separate asylum for the class in question has been urged upon the Legislature by able committees of asylums, superintendents and others.

A commission appointed to consider the matter reported to the Legislature in 1875, advocating a separate asylum for six classes of insane persons, as follows:

1. Dangerous insane persons who have committed or shall

attempt murder, arson, rape, robbery or other high crimes or misdemeanors.

2. Those charged with committing either of the crimes before mentioned who are believed to feign insanity, or of whose sanity there may be so great a doubt as to require the investigation of experts.

3. Those acquitted of such crimes on the ground of insanity, who shall be adjudged by the court trying the offence, as persons dangerous to be at large.

4. Those charged with the commission of either of such crimes while sane, and becoming insane before trial or sentence.

5. Those becoming insane while in prison, after conviction of any crime, and continuing insane through the term of sentence, who shall not have friends or relatives to whom such insane persons may be delivered at the expiration of sentence with safety to the community.

6. Insane convicts generally, whose insanity shall have been ascertained, and who may be transferred in accordance with the laws of this commonwealth.

The persons included in the fifth and sixth classes to be received by the proposed institutions so long as there shall be no separate hospital exclusively for their accommodation, and no longer; and while in this institution their association with other inmates to be regulated according to the discretion of its superintendent.

It is clear that if these recommendations are carried into effect it would finally decide against the erection of a separate asylum for insane convicts.

Unfortunately the legislative acts and inquiries of other States cast no additional light on the subject of this inquiry.

We have now to notice the very decided opinion of the "Association of Asylum Superintendents" in favor of a separate asylum or hospital for insane convicts.

Although there seems so much unanimity of opinion respecting the resolutions formally passed at the annual meeting at Baltimore in 1873, (see *Am. Jour. of Insanity, Oct., 1873,*) yet in the discussion there is apparent not only wise limitation of the position taken on the part of some, but wide diversity of view on the part of others.

In the absence of classified facts at this discussion, it was reasonable to hope that there would be forthcoming exact tables which would show the prison record of each convict, relating to the character of his or her insanity in all its details, so far as they could be ascertained, including suspicions of heredity phases, violence on the one hand and imbecility on the other, etc. It is not too much to say that strong assertions have not been supported by clinical observation widely extended, so as to render induction safe, except as they have been embodied in general statements.

One Superintendent forms his judgment in a crowded asylum, to which are sent from prisons only the dangerous insane. Another says I would, if it were in my power, apply this rule (of separation) not only to epileptics, but also to dipsomaniacs, and hence I have never appreciated the importance of separating criminal lunatics in ordinary institutions for the insane. While he (Dr. Nichols) thinks they should not be promiscuously placed in wards, he has also the same opinion regarding some other classes.

Dr. A. M. Shew, of the Hospital for the Insane, Middletown, speaks thus:

"Three years ago the Legislature of Connecticut passed a law requiring the trustees of the hospital at Middletown to receive all insane convicts, after a proper examination, which was specified, and a commission appointed. We had no separate provision and were obliged to receive them in the hospital proper, and place them in association with the other patients. Since that time twelve insane convicts have been transferred from Wethersfield to Middletown; two of that number have escaped; one of them feigned insanity; arrangements had been made to transfer him to Wethersfield, but he escaped the very night before the transfer was to be made. Of the ten others, seven have been among the most valuable farm laborers, harmless, industrious and peaceable, and yet positively insane, much less dangerous than many of the chronic patients we have."

We have carefully collated the reasons given in the various discussions within reach and find them to be as follows:

(*a*). That the character of insane convicts requires greater safeguards both as to the buildings and in the administration.

To this it may be replied that it can hardly be asserted that

the convict insane require such safeguards or such special constructions as cannot be secured in parts of buildings already erected. There are few who would claim that the convict insane need closer surveillance than do the homicidal insane who have attempted criminal acts.

One of the most prominent advocates for separate asylums (Godding, Superintendent of Taunton Lunatic Asylum, 1871, p. 130,) would make also "distinct provision for the homicidal insane, including with them the incendiaries, a small but very dangerous class."

A lady of fine culture subject to emotional and periodic insanity, who spent considerable time in two different asylums, often as a sane observer, insists that the dangerous and demoralizing class in most insane hospitals is the dipsomaniac class.

They have often lost all self-restraint, are vicious and ungovernable, and disturb both the order and morale of many an institution.

A gentleman now in private practice, but for many years connected with asylums, and consulted as an alienist, tells us that this view is undoubtedly correct.

(*b*). That insane convicts, as a class, require closer discipline than the general average of asylum patients may be true, but it is, we believe, not shown that because of any special peculiarity in the type of their insanity, do they need special hospitals more than do those disposed to homicidal acts, or more than do incendiaries or other classes that might easily be named.

Indeed, in one of our own State asylums, "of the forty-six cases transferred from the State prison to the asylum, thirty-four still remain with us. Most of those brought us are either demented or the tendency is to dementia, and hence, incurable."

Our asylums at present are built not merely as hospitals, having reference to the peaceable insane, but also with reference to the fact that there will be many inmates of a dangerous or extra-hazardous character. Unless it can be shown that the convict insane far surpass all other classes in the element of danger, the argument which presents them as requiring an asylum, and constructive safeguards with expert administration surpassing all others, is not well supported.

(*c*). An argument which is very prevalent and influential is that it is the right of the innocent insane not to be associated with

the "convict insane." "The State has no moral right to compel its honest citizens, sane or insane, to associate with criminals." The author of this proposition declines to offer any support other than "the simple statement of the fact is enough."

That this has not been conclusive to all minds is shown both by direct expression of opinion and by the habit of all countries and States thus far, which do place with the convict insane, those who in the innocence of insanity have committed homicidal acts. While we have great respect for sentiment and the moral conviction of men after due examination had, yet we cannot so hastily conclude on this simple statement that it may not be right or expedient to treat in the same hospital the insane convict with other insane persons—the classification being on a different basis.

The social science student suggests "that the two classes are often not separated on any principle of moral responsibility, as the insane convict is frequently one who was suffering, at the time of his act, under a disability that the courts failed to detect at the trial for want of proper defence, or because the mental disease was still latent." Also that "insanity suspends punishment, based upon previous conduct, and there is, therefore, no reason for any separation based upon moral ground, or any separation except such as is founded upon the natural aversion of the inmates and their friends to such association."

The writer reminds us that it is not fair to represent every convict as a murderer, an outcast, an inevitable wretch. Not all even of the inmates of State prisons are such. Some are undergoing sentence for what the law calls minor offences. If all higher class (or paying) patients were excluded from our asylums, we should find closer bonds of relationship between insanity, pauperism and crime than the superficial observer would otherwise detect. Society does receive back to itself the convict whose sentence has expired and endeavors, often successfully, to prevent such persons from any repetition of criminal acts. It is not moral obliquity to claim that, in relation to the inmates of an asylum, the convict has had expiration of sentence when insanity has vacated penal punishment, and that the asylum is not degraded or endangered by his presence any more than society is by receiving him back to itself.

If the question of insanity were set aside there are many in

asylum wards who would be demoralized by the grade of the inmates. If it is correct to say, as Dr. Gray did, that "a large number of those acquitted on the ground of insanity are essentially of the criminal class," the same might be said of certain other persons found in our asylums.

Our asylums are intended first of all for the pauper or dependent classes whose relation to lost self respect, to inherited evil, to indulged vice and crime has often been such as to forbid our making such incisive distinction between some insane *paupers*, and some insane *convicts*.

When insanity has invaded both and the law of charity has suspended that of retribution we cannot say to every convict, "Still the mark of your crime must be upon you even though insanity has suspended punishment."

The following letter, from a former Asylum Superintendent, an eminent physician of our own State, expresses a view fast gaining ground:

"BURLINGTON, August 23, 1878.

"*To the Secretary of the State Board of Health, of N. J.:*

"MY DEAR DOCTOR:—My own conviction is, that there are no sound reasons for separate institutions for those who are called 'criminal insane.' The term itself is an unfortunate one, if indeed, it is not a misnomer. Insanity precludes the idea of voluntary crime, and occuring in a person who has been previously convicted of crime, and imprisoned, removes the criminal view of his case, and places him on the list of insane persons. Every well defined disease has its recognized pathological character, and the moral state of the sufferer does not alter the pathology of the case. So, every form of insanity, has its own characteristic lesion of structure, or functional disturbance, and I see no more reason why the glandular ulceration which characterises typhoid fever, should be different in a criminal from what it is in a saint, than I do why the cerebral lesion which gives rise to mania or paresis, should be modified by the moral character of the individual. If the pathology therefore does not differ in the criminal, why should the therapeutics? There are convicts in prison who may become insane, and there are insane

persons in asylums who may commit crimes that would consign them to the penitentiary, but for the fact of their insanity; and there is no evidence of any difference in the psychical state, or in the pathological condition of such, to warrant their separation from other insane patients, that is not already provided for in the massive and elaborate appointments of our lunatic asylums.

"The number of convicts who have become insane, and of insane, who commit crime, is so small that it would seem unwise to spend more than the millions that have already been expended on lunatic asylums, for the separate custody of the class referred to. It would seem to be especially unwise in view of the fact that a considerable proportion of the insane in our asylums are harmless, and could enjoy more freedom, be made more comfortable, and have a better chance of recovery, in less expensive and more home-like establishments.

"Admitting the necessity of removing criminals who become insane from prisons, is it not safe to conclude that the cellular plan of our asylums, together with their admirable hygienic arrangements, and the provision for constant and intelligent medical care which they furnish, can be made to meet such necessity by the establishment of criminal wards, and a further classification of inmates, so as to include the so-called 'criminal insane?' I am aware that it is common for alienists to advocate the construction of separate institutions for the class under consideration, and that by such advocacy there is engendered a sentimentalism which takes the form of horror at the thought of contaminating the 'innocent victims of insanity' by the presence of 'dangerous criminals' from the penitentiary. With this unphilosophical view, there is, however, but little sympathy among those who recognize the great truth, that, insanity in criminals and saints alike, is a terrible scourge, which neither respects nor even recognizes rank, or wealth, or culture, but levels all alike to a common scale of broken and dependent humanity; and that, whether the accident of crime, or disease, or misfortune, or sorrow, be the exciting cause, it comes to all its victims with the same dreadful blight, and should be met by an equally wise and generous care.

"I am, my dear sir, yours most truly,

JOSEPH PARRISH."

Thus much it is proper to say, although we fully realize the unfitness of certain insane convicts to mingle with the average inmates of the asylum.

Regarding types of insanity, and the influence which might be exerted over certain classes of patients, and even regarding the sentiment of insane persons not wholly bereft of reason, we would favor special provisions in the care of those whose acts had been specially notorious; but so would we also in other individual cases equally dangerous, equally demoralizing, equally shocking to the prevailing sentiment of the better class of the insane and their friends.

We believe that the tendency of sound opinion based upon experience and reasoning is toward many separations and classifications of the insane in our asylums, which will in time, supercede much of our present ward systems, vacate many of our palatial structures, distinguish between the hospital and the asylum, provide farms and industries and treatments far different from those which at present prevail, thus opening questions of grand import, vital in the future and of interest to all who care for these unfortunates, whom as well as the poor, we have always with us. What we now claim is that the insane convict, like any other insane person, is to be dealt with as an individual, and not as belonging to a class. If he be an idiot, we see no reason for a special hospital for him. If like the homicidal madman or the illusionist, or the incendiary, he requires special guard, that he should have. If his crime has been of a nature so abhorrent as to be singled out, he may be placed with those unconvicted inmates, whose presence in the general wards may, for any reasons, be equally degrading or demoralizing.

What we feel to be the need of our State is that, one of its asylums should have such special provisions as to permit the consignment to it, of all cases, which in the judgment of proper authority, should be separated from the general average of asylum patients. We can see no objection to the use of an extreme wing of our largest asylum; or if there is no room in it, to an annex a few hundred feet therefrom, connected by a corridor, and specially fitted for the reception of all classes of extra hazardous insane. To this should not be attached the odium of a convict hospital. In it, however, might be placed

the homicidal insane, those inclined to arson, and others recognized in all asylums as dangerous and difficult of classification.

We confidently believe that if there is no inflexible routine policy in the management of our State institutions, the force of sentiment, conviction and economy will lead us to thus provide for our more degraded classes, whether pauper or penal, and at the same time secure to some supported at private expense, facilities of separation more valuable than can be secured by merely singling out a class, having no just reference to the type of their insanity or the degree of their insubordination.

CYRUS F. BRACKETT,
EZRA M. HUNT,
Committee of State Board of Health.

This report has been submitted to the Board and ordered sent to your Excellency, with its approval.

Report of an Outbreak of Enteric Fever

at the State Reform School, Jamesburg, N. J.

BY EZRA M. HUNT, M. D.

Under date of August 15th, 1878, I received a letter from Samuel Allinson, Trustee of the State Reform School, stating the existence of sickness at that Institution, and asking the counsel of the State Board of Health. He says: "Within the last two weeks not less than twenty boys have been in bed with fever, and with typhoid symptoms. There have also been a number of cases of dysentery and a few of diphtheria." "The premises, kept scrupulously clean and neat, have been examined, but no adequate cause for such distempers has yet been developed. The water, food, sewage and labor have all been rigorously questioned, without satisfactory response. I have been at the School several times within a week, as have other of the Trustees, but I fear the disease may not yet have run its course. There must be some local cause, as the neighborhood is not affected, as it would be were the cause atmospheric." The next morning I visited the Institution for the purpose of ascertaining the character and cause of the outbreak.

We listened to the history of the endemic from A. J. Knappen, M. D., the Physician of the Institution. He resides at Jamesburg, three miles distant, and is the only physician of this immediate section. Occasional cases of fever, which he regarded as typhoid, had occurred in his practice, but none recently. He had not been able to connect the outbreak with any neighboring conditions. No local causes had been discovered. He regarded the fever as of a typhoid or typho-malarial tpye, and thought it endemic in its character. Up to early spring the health of the Institution had been uniformly good, but in March, and since, there had been many cases of sore throat of a diphtheric type. Malarial fevers were not uncommon in adjoining neighborhoods, but there had been no unusual prevalence this summer.

Some of the pupils had complained more of headache and of stomach and bowel disturbance than usual. The doctor and others recognized the fact that for several months the health of the Institutiou had not been up to its high general average. The number of boys at present in the Institution is two hundred and eighty—the usual number for the last two or three years having been two hundred and fifty. The attendants increase the whole number of persons to over three hundred. The boys are divided into four families, occupying (except when together for eating, work, &c.,) four different buildings, known as No. 1, 2, 3 and 4.

OUTLINE OF THE PRESENT EPIDEMIC.

Early in July a case of sickness occured of marked febrile character. The boy had been necessarily kept for ten or twelve days before in a small room in the attic of the main building, known as No. 4. He belonged to the family of boys of building No. 3, situated as shown on the ground plan, and died in that building the third day after he had first been seen by the physician. He was always stolid and reticent when troublesome, and no doubt concealed his sickness at first. Before his transfer he had used at night the water-closet of No. 3, and afterward was allowed to go to the outside privy used in common by the families of No. 3 and 4. In going from his room he passed the well, known as the chain pump, and obtained water from it. When the attention of the Superintendent was first called to him, he at once recognized his condition as serious. The doctor found him with rapid pulse, high temperature, some diarrhœa and an eruption. His sickness, while under his observation, was so short as scarcely to admit of positive diagnosis.

The second case occurred the seeond week of July, or about one week after the death of the first, and the same week there were five or six new cases, most of them from the families of Nos. 3 and 4. Since then new cases had continued occurring to the number in all of thirty-five. For them a new upper room in No. 2 was being used as a hospital in place of the former small hospital in No. 4. At the time of my visit, August 16th, I found twenty-six in bed in the hospital proper, and five more in the convalescent room outside. A few others were listless, and

evidently avoiding the hospital. It is not necessary to give in full my clinical notes as the only point here in place is identification of the disease. The temperature had been noted once each day, and the fever might rank as remittent or continued. We examined several with reference to the rose colored rash. Some had a fading rash, but none distinct at this visit. Two or three had sudamina; none had had intestinal hemorrhage, and only a few diarrhœa. On my visit August 20th several more had been added to the list. Many were mildly sick, and a few with sordes, delirium, and other critical symptoms. We found a distinct rash in one of the more recent cases. From this time on for about two weeks new cases were constantly occurring, but the disease did not assume a more critical character, and quinine was being freely used as an antipyretic, and seemed to answer its purpose well, except in two or three cases.

Another of the boys died August 24th. That there might be fullness of evidence as to the diagnosis, I secured Dr. E. G. Janeway, Professor of Pathology, in Bellevue College, New York city, to conduct with Dr. J. P. Knappen and myself, a post-mortem examination.

The following is an abbreviated outline of appearances: Right lung nearly normal; left lung had lobular pneumonia of the upper lobe without any discharge, but at one point abscess was forming; other parts of the left lung were congested; the heart was of usual size, walls not thinned, valves complete; the liver was somewhat enlarged but healthy; the spleen was not softened and nearly of usual size; stomach healthy; mesenteric glands—numbers of them enlarged and varying in size and hardness—some of them softened; duodenum and jejunum nearly normal; ileum congested, at points enlarged and ulcerated; commenced its examination at cæcum; an ulceration on the iliac surface of the ileo-cæcal valve; ulcerations in the lowest of Peyers' plates; the patches raised and enlarged; more than a dozen distinct ulcerations extending along three feet of the ileum; one of these had reached the peritoneal coat; solitary follicles raised and infiltrated and prominent at many points; colon healthy, except congested just below the ileo-cæcal valve; kidneys normal, except slight granular change of the epithelium.

The examination, together with further observation of the

sick in the hospital, left no doubt in our minds that the prevalent disease was enteric fever, and even seemed to dismiss the question whether it might not be typho-malarial or a type of some more general form of septic fever.

EXAMINATION INTO THE CAUSES OF THE OUTBREAK.

On our first visit, careful study was made of outlines preparatory to a fuller investigation.

There was no prevalent epidemic in the vicinage and sporadic cases of fever long before did not seem to give any connecting clew.

The milk and food supply was questioned in detail but nothing found suspicious in this direction.

The location would not account for the sickness unless malarial.

The ground is a table land with fair declivity in three directions and a greater slope to the east. The opportunities for drainage and for carrying off sewerage are excellent.

The surface is a gravelly loam and loose gravel not stratified for a depth of ten to twelve feet, when a uniform layer of clay is reached, impervious and so causing all soakage to seek outlet in any excavations deeper than this and rain water to find its way out along at the edges, and especially to the east, to which the slope most inclines.

The absence of any effect to others from lowlands in the distance, precluded a purely malarial origin to a fever, which at this time might have been assumed to be of a mixed character.

The housekeeping of the institution, and its management in all its appointments, on a close inspection of rooms, beds, laundry, kitchens, etc., seemed so good as to be a model for any such institution. Indeed to this, we must attribute in some degree the milder character of most of the cases.

By the method of exclusion attention come to be necessarily fastened upon the water supply and the sewer system indoors or out as in some wise bearing upon the sickness. The buildings located as shown upon the ground plan were then examined with reference to these.

Building No. 1 had its own water supply from a well beneath. Although this was of questionable utility, yet it was not a surface well and not apparently exposed to any impregnating causes.

The fall is good for all house wastage, most of which is emptied outside. The whole situation of the building seemed to us in a sanitary view, the best of any. It had no water closets or laundry. The outhouse is on a side hill, with rapid fall and is easily kept in order.

Building No. 2, several hundred feet to the east, has no inside water closets, and good out-door arrangements. Its storm water like that of No. 1, passes outside. Like it, it is heated by its own hot-air furnace. The bath and the water basins empty by a pipe into the drain of No. 5, but it is well trapped. The drinking water is derived from a well under the building and seems rather more exposed to surface contamination from the bath room and the proximity of other buildings than that of No. 1.

Building No. 5 is next to No. 2, about one hundred feet to the south. The lower part is occupied by the engine room and laundry; most of the first and second floors by a work shop for shirt making by boys from the various buildings. The entire laundry work for all is done in this building.

The dormitory on the third floor was occupied by thirty-four boys. On the same floor in a new extension are the rooms recently occupied for a hospital. It is heated by steam from its own boiler. Formerly the exhaust pipe entered into the inner sewer, but as steam and bad odors were found to come from an upper water closet, the exhaust was changed to the outside. There is but one water closet in the building and this near the hospital, which was very little used and not well trapped. Its soil pipes joins the sewer which carries the laundry and waste water under the building and is carried out to join the main sewer from No. 4.

Its water supply is from the same reservoirs which supply No. 3 and No. 4, hereafter to be noticed. Its supply pipe comes off from the suction engine, which draws the water from the reservoirs and sends it to No. 4, from which No. 3 is also supplied. Thus it will be noticed that these three buildings have a common water supply distinct from No. 1 and No. 2. This building also has at a distant sewer entrance, connection with the sewerage of No. 4. But as there is little soil matter in this building and as the laundry water is carried through a fall to meet the main sewer outside, it is not closely connected therewith. Besides as only one floor is occupied by thirty-four boys as a dormitory, the

building is used more for bakery and workshop purposes than for housing inmates. The soil here for the excavation of the new parts of the building is very gravelly.

While close examination has been made of all these buildings and some few matters seem to need correction in construction arrangements, the history of the first cases of outbreak and defects seen in the first examinations of the other two buildings must lead us to be even more suspicious as to them.

Building No. 4, as shown upon the ground floor, occupies a central position among the other buildings. It accommodates the family of the Superintendent, and is the dining place of all the boys and furnishes dormitories for about seventy-five.

The basement floor is about four feet below the surface, and is occupied for kitchen, dining-room and administrative purposes. The first floor has auditoriums, school-rooms and rooms for the administrative officers, while dormitories and other rooms needed occupy the second and third stories.

This is the only one of the buildings which can be said to have been fitted up with all the modern improvements.

INSIDE WATER CARRIAGE.

The water supply from reservoirs at a distance, hereafter to be more fully noticed, enters the house from a main in the basement, and is lifted by a steam-pump into a large cistern in the attic for distribution. There is also a hot water tank in the attic, the water of which is heated in the basement, carried by a pipe up to the tank in order to be distributed for washing, bathing or other purposes. This was introduced in May or June of the present year. The up-going pipe, which carries the hot water, passes in its length close to the soil pipes for the whole building.

SOIL PIPE.

This commences in the attic, as the overflow pipe from the cold water cistern, so that it may be flushed by water therefrom, as frequently as desired. It has in the attic a deep U bend, or water-seal trap, to prevent the outflow of gases, but has no ventilation out upon the roof just adjacent. Although the depth of

this bend at first seemed quite sufficient to make an effective trap, the mode of its placement showed that only from one-half to one inch of water-trap could be secured in it. When the new hot water tank was set up in May a small tube for steam escape was passed from it to enter the soil pipe about an inch beyond the trap. This was a constant dryer of the water in the trap, and had so affected a joint just beyond as to cause water to drip therefrom. Thus the trap was really ineffective. A tin leader letting water from the roof into the soil pipe on the lower story, would serve some purpose to ventilate the soil pipe, but as the long sewer outside had no opening, this would be imperfect. The refuse water from the bath tubs, wash basins and water closets on each floor is carried by waste pipes directly into this soil pipe adjacent, which runs from the top to the basement. As it is necessary to carry hot water into the attic tank, and as it runs up in a pipe near the soil pipe and is crossed by the hot water offsets from the tank supply under each wash bowl and close to each water closet, heat and moisture are constantly maintained. We found the closet by the wash bowl a heated chamber, and in July could not bear the hand upon the small pipe close to the water closet and the main soil pipe.

WATER CLOSETS.

These are on the second and third floors. On the second floor was one for the part until recently used as the old hospital. It had a separate soil pipe carried to the basement. The chamber slops are emptied into these water closets, each on their respective floors.

The baths connect with the water closets, and in some, one trap served for both these and the wash stands. The third floor water closet had but one trap. These water closets empty directly into the soil pipe, which collects the sewage of the building.

The gentleman who has oversight of the heating engine states that he has occasionally found the traps empty, and that he had noticed, as have others, bad odors through the rooms, and especially at the traps.

As the soil pipe in the second story receives the storm water from a roof this might at times syphon the traps.

The soil pipe which carries the general soil and sewage of the

building has no ventilation save such as it gets from the bath tubs, basins, water closets and the storm gutter on the second floor, which at times may act either to syphon smaller tubes or force out stagnant gases.

OUTSIDE CONNECTION OF SEWERS.

The soil pipe come to a main terra cotta drain just outside the building in the rear of the basement, near by it is joined by the hospital pipe before noticed, then there enters a pipe from a kitchen sink but a few feet distant which receives the slops from dish and dining room work for the whole school. These all not far from each other join to empty all the soil pipe and waste sewage from the entire building and much storm water into this terra cotta pipe. About the last of March it was found by the action of the kitchen sink that there was back flow. On taking up the floor an overflow 6 inches deep was baled out from under a room 20 by 20. This overflow was owing to the fact that in the terra cotta sewer at the point where the kitchen annex joined it a brick had fallen or been left at the time of connecting it a few months before. This kitchen sink has no grease trap and no trap of any kind now, although it is said that one was ordered at the time of its construction. It is but a few feet distant from one of the dining rooms, with an open place between them.

These various pipes thus uniting into an 8 inch terra cotta pipe run some 70 feet to a tightly covered brick enclosure of half barrel size into which enters a small pipe from an outside sink for kitchen slops, and also a small pipe from a basement faucet for hand wash. The continuous pipe for carrying on the sewage from this new centre is narrowed to 6 inches. As we opened this small cess pool the current was very slow and fœcal matter was found floating down from the faucet pipe. A test by putting permanganate of potash as a coloring matter in at the faucet showed that sewage, both liquid and solid, coming down one house pipe found its way up another.

The sewer now continues several hundred yards without ventilation from attic to its terminus, except what it might secure from incidental house defects, and empties a water which the analytical chemist finds likely to have passed through pipes

in the ground which are not sufficiently impervious. The 6 inch pipes also receive at a distance below the brick enclosure the sewer from building No. 5 before noticed.

METHOD OF HEATING.

Before last winter the building had depended upon *furnaces* for heat. In December a high pressure steam system of heating was introduced. The discomforts of the low temperature of former years gave place to excessive temperature which was much complained of.

Some claimed that soon after diphtheria made its appearance, and that the health of the Institution had been decreased. If so, it must be attributed to the fact that increased heat added to the risks from organic contaminations. The introduction of heated water-pipes in May for the hot-water tank in the attic, so near to the soil-pipe, would aid decomposition.

The only remaining building is No. 3, as shown upon the ground plan.

On our way to it, it is well to notice the building marked as the "Old House," which had been on the place for a century. It was in a cleanly condition; its cellar dry; had in it a small school room, and play room used by No. 4 family, but no dormitories. It had formerly been to some extent used as a laundry. Its stone wall needed watchfulness lest some incrustations upon it or decay of stone might furnish organic debris, or be the attaching place of unhealthy fungi. It had no water-closets, but an untrapped urinal and a washing trough connecting with the main sewer of No. 3, were not desirable.

The building No. 3, to which we now come, and where the first patient died, after a sojourn in No. 4, is located to the southwest of the main building, as shown on the plan. It accommodates fifty-seven boys, who sleep in the dormitories on the second and third floors. The heating is by stoves.

It is the newest of the buildings, having been erected in 1875.

The ground over which it stands was a little marshy, and had at times some water on it. The surroundings now seem compact and dry, although no special method of outside drainage was adopted. There is a basement, playroom and boys washing place, and under this the excavation is about two feet

deep in all below ground. On this floor, back of the stairs of the entry, is a water-closet much used. Each dormitory has a water-closet in a recess of just room enough for it, and opening into the middle of the dormitory. These are used at night by the boys, and were in use by the boy who first sickened, as well as by the others, before his temporary transfer to No. 4 two weeks before his death. The closets have a hopper trap which depends for flushing on water which pours into it during use. These gave much trouble, because they would not infrequently stop up, and had even overflowed. For this reason, quite recently all but the basement one had ceased to be used. There were two places in the basement where a small opening in the floor could be raised for inspection. The soil-pipe is the same for the three and was found to enter the house sewer at a point in the sub-cellar under the entry-way. This house sewer, besides the soil sewage, carries also the water from the boys' basement wash room, and the storm water from the roof. The arrangement is thus: The storm water at the northwest corner (A) enters a terra-cotta cemented pipe, passes along it, nearly parallel to the foundation, to the point (B), where, by a curve joint, it passes on to (C) and receives the soil-pipe, and then passes on and out, forming the sewer E, as shown on the ground plan. But at the point E, where the terra-cotta curves, it has an opening made by a Y tile. The fall from this point to where the soil-pipe enters, is one and three-quarter inches in thirty-seven and one-half feet. Beyond the entrance of the soil-pipe the fall does not increase. At our first visit we found this open Y mouth under the building with a little pool of water about it which smelled badly, and we therefore took a sample for examination. The man in charge said he had to bale out sometimes as much as three barrels; that he did not know for what purpose the Y in the sewer had been made; he supposed it was closed, and that the water which he had taken out was merely water which smelled because it had become stagnant. The chemical examination showed a water deriving pollution from various sources, and the presence of nitrous acid showed that an active decomposition of nitrogenous matter was taking place. On my return soon after, the little water had subsided. I had a boy get down to see the condition of this Y joint. It was found open and stenchy. Thus, rain water from the roof, and wash water from the

boys' basins must, with the slight fall, have leakage here. Worse than all, with the defective fall of the sewer, a stoppage of two inches at the entrance of the soil-pipe would send the liquid water-closet matter out at this opening, besides the constant escape of fœcal gases. I felt confident that such stoppage had often taken place, and the next day, on excavating at the point of junction, the sewer was found choked at where the soil-pipe entered. All use of closets was discontinued, and such temporary change made and such disinfectants used as would at least help to suspend so flagrant and exciting cause of disease. On visiting the privy in the rear of this building, used in common by houses No. 3 and 4, discharges were seen of a dysenteric character; some boys were looked up who were about No. 3, and found so unwell as at once to be advised to hospital. We cannot conceive what the original intent of the opening in the sewer alluded to was, except that it had been left as an exit for any surface water which might collect under the building, the fall being deemed enough to carry off the stream without regurgitation. As it was, it not only was an escape hole for sewer gas, but for fœcal and sewer accumulations, and furnished soakage material for all the adjacent soil. It could go down only five feet deeper on account of the impervious clay, and so must spread laterally all the sooner.

WATER SUPPLY.

Our attention must now turn to the water supply. Already we have found that No. 1 and No. 2 buildings are supplied by wells of their own. These are under the buildings and seemed to the senses to be in good condition.

No. 5, No. 4 and No. 3 by way of No. 4, derive all their faucet water supply from two tanks situated in the ground several hundred yards from the buildings. The water from these is mostly intended for other than drinking purposes, but being easily accessible, is often used by the boys. The water in these tanks seems clean, although in one of them having a doubtful odor. Both of these tanks are to be regarded as shallow surface wells, safe perhaps under the most careful watching, or so long as a surrounding soil, free from organic matter or domiciliary sources of decay, and of good percolating capacity, was able to filter it.

Our chemical examinations were made with great care by Prof. P. Townsend Austen, Ph. D., of Rutgers College, New Brunswick, but it did not extend to quantitative analysis. Several specimens were sent at three different times, and in some cases as with the tank, duplicate specimens. Both tanks were each time reported as surface wells without organic matter. The amount of chlorine and nitric acid found were spoken of as danger signals, but it would require a quantitative estimation to positively state them as dangerous.

The water is conveyed from one or the other of these tanks as may be desired, (one only having lately been in use,) through a common main made of close jointed iron pipe of an average depth of four to five feet, the water being drawn by the exhaust or suction of a steam engine, and being distributed by an offset pipe to No. 5, by a main to No. 4, and through it to No. 3.

Prof. Austen also made examinations twice of water from the kitchen faucet of No. 4, which came from the tank water.

The report on this was not so favorable as upon the source from which it came.

"The large amount of chlorine and absence of lime point to infiltration of sewage. View strengthened by presence of considerable nitrates. Presence of nitrates show water to be decidedly dangerous. May be a surface well or rain water impregnated with sewage."

The difference might be accounted for by some defect in the iron pipe, or its joints, or by reason of thinness. The sewer pipes also necessarily come near this iron water main here and there in its course.

Also as the supply is through the cistern in the attic where the water might absorb foul gases, or where the soil pipe, which serves as the overflow pipe, ends, and might have its water-trap imperfect, it is quite possible that somehow the water might be contaminated in coming from its storage.

The water from these outside tanks or reservoirs was not used as drinking water much in either No. 4 or No. 3, and probably not at all by the first boy that died.

The main supply of drinking water for all the boys of No. 4 and No. 3 was derived from a well known as the Chain Pump Well. It is situated, as shown upon the ground plan (marked

F) in the vicinity of buildings and about one hundred and fifteen feet from the corner of building No. 3.

This water was preferred and exclusively used by all the officers and their families in the adjacent buildings, and by the boys of No. 3 almost exclusively, and much by those of No. 4, as most of these had occasion to pass it. The well itself is well covered and an enclosed chain pump raises the water.

Its depth is seventeen feet or *about eleven feet below the level of the sub-cellar of No. 3 with the natural drainage, aided by the old house cellar in that direction.* Here the clay bed is about twelve feet from the surface, so that cesspool drainage from the sub-cellar of No. 3 where the open soil pipe was found, would have a fall of six feet to bring it to the surface of the water which was about thirteen feet from the top of the well at our first visit.

The following is the report of Professor Austen thereupon, the water having been procured August 20th, 1878:

"(118.) Water turbid; chlorine large; nitrites, absent; nitrates, large; lime, large; sulphuric acid trace; carbonic acid present; organic matter, large; ammonia absent; (?) regular well water; lime present as bicarbonate; results of past infiltration probable. The amount of organic matter is large and renders the water totally unfit for drinking purposes. It would be interesting to examine the well about a month later." About the same time A. E. McLain, a chemist of New York city, examined this and other wells. His note reads thus: "Chain pump is similar to that marked family well No. 1, but contains more organic matter. *All of them* contain ammonia, nitrates, organic matter apparently of animal origin and an abnormal quantity of chloride of sodium."

We now restate the problem to be solved with some of the most important conditions bearing upon it plainly before us.

The outbreak is plainly that of enteric fever. All efforts to trace it to an outside source have failed and made it quite positively probable that the causes were to be sought within the confines of the institution. The history of those first attacked, an examination of sewerage systems and water supply, and a comparison of the buildings with each other in the marked difference in their arrangements as to heating, sewerage, inside conservancy, water supply and modes of distribution, associated No. 3 and 4 and 5 together. No. 5 as being less used as a dormitory,

as having but one water closet, not now in use, as having its outside closet arrangements with No. 2, and not so in proximity with the common drinking supply of No. 3 and 4, seemed after careful allowance was made for some defects, not to be prominently be-before us as the fount and origin of the malady.

With the facts as to No. 4 and No. 3 as already stated, we have this hypothesis before us:

A boy of the Family of No. 3 is taken sick. He had used an inside privy now known to have been clogged and been in a building in which excremental and other matters were escaping through an open tile as fully described. Foul air from this source and from the stagnant water thereof could not but permeate this building. We are first in such cases, says Buchanan, to look for conditions under which air contaminated by excremental products could be conveyed. The conditions found in No. 3 would of themselves be fully adequate to the furnishing of excremental or other enteric matter through the air of the playroom, the washroom or the water closets. But besides this the well of water within one hundred and fifteen feet of the corner in which the liquid discharge had made a cesspool, and where the soil was saturated with sewer contents, is found to contain organic matter probably of animal origin.

While for a time at this distance it was possible for the intervening soil to cleanse the soakage, yet with this oft recurring fœcal and waste cesspool beneath No. 3, at the corner toward the well and several feet below the ground level, and with an impervious clay subsoil, it was quite possible for the water to be contaminated as well as the air of the building.

The boys who fell sick within a week after the death of the first boy, were mostly those of Nos. 3 and 4. These were using the outside privy, to which the first boy went daily, and into which his discharges were thrown until the time of his death. A source of infection was easily multiplied in this way.

There were sufficient ill conditions as to sewerage arrangements in building No. 4 to account for the presence of sewer air in that building, but no one condition was so flagrant as that of No 3, and none so likely to furnish the specific poison of enteric fever as either the air of No. 3, the excretions of the outside privy of No. 3, or the well water of the chain pump.

The boy who was temporarily detained for several days in the small attic room of No. 4, we believe had contracted his fever before his transfer there. His closer confinement within doors, the air of the attic and his more restricted diet would incline the the disease to intensify.

When first seen by the medical attendant he was probably in the second week of the disease, and died in ten or twelve days. He had, however, been returned to his room in No. 3, so soon as he was found sick enough to need constant care.

The only confusion in assigning the origin of the outbreak arises from the fact that in No. 3 and in No. 4 so much in construction could be found objectionable.

Yet we believe we are to look to No. 3 with its cesspool beneath the building, fouling the air, with a well contaminated therefrom, and with a boy whose discharges were a constant exposure to the boys of Nos. 3 and 4, for the earlier cases.

It is of comparatively little importance whether the contaminated air, the contaminated water or the changing discharges spread the disease since, for the well we can find no possible cause for pollution, save that which was to be found under building No. 3.

In all other respects save that of exposure to sewer contamination, the care for the pupils was so good and the ability to nurse them so available, and the medical treatment so characterized by singleness of purpose and expectant treatment, that we are to attribute to these, as well as to the mild type of over half the cases, the low rate of mortality.

From August 16th, when there were twenty-six in hospital, up to about September 4th, new cases were occurring every day, until over seventy were down. Some changes were made at each visit, but it was not until the condition of sewers had been fully discovered and the water supplies had been tested, that efficient correction, for the time being, was thoroughly instituted. This was completed about the 23d of the month.

Two weeks from that time, or about September 4th, there was a sudden cessation of new cases, in a most satisfactory manner. The infective cause had ceased to operate, and only those before impregnated suffered.

On our visit October 26th we found three convalescents from the fever still in hospital, all of them having been there over six weeks.

We have occasion for great gratitude that an infection so clear in its character, so potent for evil, so extended in its influence should have been limited even though it cost so much of care and anxiety and so much addition to the usual expense of administration.

But it will not be a useless lesson if only it shall lead to a careful study of the whole subject of manufactured disease and a proper recognition on the part of our authorities of the great importance of skilled construction.

No institution in the State, so far as we know, can boast of better discipline, housekeeping or management. Yet it had errors as to its "conveniences" so terrible that we may almost welcome the trial which has exposed to us the fearful possibilities of greater mortality which impended.

Not only other public institutions, but country and city houses and whole sections of some of our closely populated districts have errors of a similar kind which are constantly causing mild forms of sickness and which by an unfortuitous combination of circumstances may easily give rise to a pestilence which will walk in darkness and to a destruction which will waste at noon day. Our ability to detect, prevent or remedy the causes of disease is now such that very many things once hypothetical are raised from the sphere of the probable or experimental to that of the known and actual. Reliance cannot be placed alone upon the plans of architects and the skill of mechanics, or the general opinion of a physician. There must also be the addition of expert sanitary inspection. The mason cannot be the carpenter and the carpenter cannot be the plumber, although each may have some general knowledge in the department of his co-worker. So the sanitary requirements in all structural appointments is a department by itself and must form a part of the superintendance in construction.

This establishment furnishes an illustration of how much faulty, unsanitary work can be done by mechanics of ordinary repute, and how an institution admirably organized and kept with most sedulous care and presenting the most tidy attractions, can yet have in underground sewers and cesspools, in house traps and closets, in imperfect drainage or water supply, enemies in ambush, casting firebrands, arrows and death.

We desire to testify to the promptness with which the superintendent, trustees and officers of the institution applied remedies for discovered defects and hastened the use of measures to limit the endemic. Yet there are structural changes to be made by which in the future it will be impossible for air or water to become impregnated with sewer air or infective particles.

The State Board of Health gave us at once full authority to make all needed investigation. E. A. Osborne, C. E. of the Board, also visited the school and others who were away from home for August endorsed and urged by letters the most careful examination. We were thus able to co-operate with the trustees, superintendent, physician and other officers in a common interest for a common defence. We doubt not that such corrections and additions of structure will now be executed as will maintain the earlier record of the school for its almost exceptional degree of health and thus continue to render the institution one of the most important and successful charities of our State.

HATTING.

AS AFFECTING THE HEALTH OF OPERATIVES.

BY L. DENNIS, M. D.

At the request of the State Board of Health, of New Jersey, I have, for some months past, been investigating the sanitary relations of the business of hatting.

Inquiry reveals the fact that in the U. S. Medical Library, at Washington, there is no entire volume in English on this subject. Neither in the Astor Library, in New York, nor in the Mercantile Library, in the same city, could anything be found on the healthfulness of trades in general. Which facts would seem to indicate the need of an awakening of our individual physicians as well as boards of health to a more thorough examination of all the hygienic conditions of factory life.

A paper by Dr. J. Addison Freeman, of Orange, on the "Mercurial Diseases among Hatters," appeared in the published transactions for 1860, of the New Jersey State Medical Society, in which it was stated that more than one hundred cases of this disease had occurred in Orange alone. The symptoms were: "Swelling and ulceration of the gums, loosening of the teeth, fetor of the breath, abnormal flow of saliva, tremors of the upper extremities, or a shaking palsy and frequently some febrile action." These cases recovered under the usual remedies for mercurial salivation, especially iodide of potassium, or without any treatment if the work was abandoned for a time. This disease occurred exclusively among the hat finishers, and the presence of mercury having been established by chemical tests in the hat bodies before going through the process of finishing, it seemed clear that the hot iron volatilized the mercury, and the close, ill-ventilated rooms favored the absorption of it in the system, and so the workmen were poisoned. The greater prevalence than usual, of the disease at that time, was found to be due to the use of a larger amount of mercury in order to render poor

materials fit to work up into hats. The author suggested, therefore, that better material be used in the manufacture in order to admit of the diminution of the amount of mercury, and that the finishing room be large and well ventilated.

Some time after, a committee, of which Dr. S. Wickes, of Orange, was chairman, reported to the Essex County Medical Society substantially the same facts as those mentioned in Dr. Freeman's paper, and, after adding that most of the stock is imported, close their report as follows:

"The committee deem this a proper subject to bring to the notice of the State Society. In the eastern section of the State there is a very large number of this class of operatives, and they have a claim upon us as conservators of the public health, to do what we can in their behalf. The facts in the case should be brought to the knowledge of our representatives in Congress, that such prohibitory laws may be enacted, as shall secure the importation of proper and healthy materials. It may be proper to add that the importers have been appealed to by those interested in the hat manufacture, who declare that they cannot control or remedy the evil."

These two reports constitute all the available literature on the subject at our command. The dangers to workmen which they suggest as liable at any time to occur, and the fact that individual cases of the disease above mentioned come to the notice of the profession more or less frequently, prompted a more detailed examination into the whole business. To this end the wholesale dealers in furs, Messrs. White, 63 Broadway, and Hitchcock, Dermody & Co., 91 Mercer street, New York, were visited; also the factory of the latter firm on Park avenue, between Walworth and Sanford streets, Brooklyn, N. Y,, in which are employed about two hundred hands, then in full operation.

The factory of Messrs. White is situated in Danbury, Conn., and employs about seventy-five hands.

The following hatting establishments in Newark and vicinity, were also visited and inspected carefully:

NAME.	LOCATION.	NUMBER HANDS.
V. Hermann	42 Hunterdon street	42
Fairchild & McGowan	Market and Congress	125
R. & A. Fulcher	New and Hoyt	35

NAME.	LOCATION.	NUMBER HANDS.
G. Graah	227 N. J. R. R. avenue	23
E. Sealy, Jr	119 N. J. R. R. avenue	29
J. Schumann	457 Court	39
C. F. Seitz	31 Ward	127
C. Crossley	10 Front	134
Brown & Hyde	Kinnev and McWhorter	53
Tichenor & Klein	N. J. R. R. avenue and Green	56
W. Carrolton	61 Lock	63
Hoefler & Hoepner	25 Exchange alley	27
T. R. Austin	157 Summitt	28
Roth & Rummell	McWhorter	73
J. Mercy & Co	Market and Union	87
Mason	First street	26
E. K. Carley	144 Canal	59
Nichols & Mason	233 Central avenue	53
Yates, Wharton & Co	142 Commerce	260
G. B. Alston & Co	39 Liberty	40
E. A. Dodd	Jersey street	32
Stern & Co	1 Commercial wharf	11
Wheaton's	N. J. R. R. avenue and Market	17
Messrs. Gill	Orange, N. J	85
M. Mercy	22 Scott	65
		1589

In this work I have to acknowledge with thanks the very kind assistance rendered in making up the lists of the workmen, in some cases by the proprietors, and in others by the book-keepers, at the establishments of Messrs. Graah, Sealy, Tichenor & Klein, Carrolton, Mason, Yates & Wharton, Dodd, and Stern. The lists of the remaining factories were made mainly by Mr. E. P. Roberts, of Elizabeth, N. J., a graduate of the Stevens' Institute, Hoboken. The latter gentleman also prepared, at my suggestion, the appended summary:

In order to make clearer the nature of the dangers to which the operatives are exposed in this business a brief description is herewith subjoined of each process in the manufacture from the crude fur to the finished hat. Ordinary felt hats are the only ones studied.

"The furs most largely used for the manufacture of hats are those of the hare, coney and rabbit, all of them rodent quadrupeds belonging to the genus *lepus*, and differing mainly in size and the quality of their fur. The hare is the largest of the family and its fur is the finest. Great quantities of the skins of these animals are brought from England and France, where the breeding of them for market is a regularly established business of considerable magnitude. The English rabbit has been domesticated in Australia, and for a few years past the importations from that country have been large and increasing. Many hare skins come from Russia, the fur being a longer staple than the English, but not as fine. Wild rabbits are found in large numbers in our Middle and Southern States, and their fur is extensively used, though hardly equal in quality to the best from Europe.

"For the finer grades of felt hats, and more especially for fur caps, nutria and beaver furnish the choicest material. They are both amphibious rodents, closely resembling each other in general appearance, the principal difference being that the former has a round tail and the latter a broad, flat one. The nutria is a native of South America, and is very prolific along the rivers of the Argentine Republic. The beaver is at home in colder climates and flourishes in our Northern and Western States."

The preparation of the fur for hatting is termed "carroting" and the chemicals are called "carrot" from the fact that their action on the hair colors it yellow like the vegetable of the same name. A mixture is made consisting of 1 pound of quicksilver, 3 pounds of nitric acid and 13 pounds of water, this is stirred with heat until the quicksilver is entirely dissolved thus forming a strong solution of nitrate of mercury. This, with the aid of a short wisp brush, the hands of the workmen being protected by rubber gloves, is thoroughly rubbed into the hair, the skin being held firmly on an inclined plane and the hair brushed both with the grain and against it so that each hair, for about two-thirds of its length, is thoroughly wet with the solution.

These skins when dried in a well ventilated and heated room upon racks prepared for the purpose, are then sent to the brushing room, where each one is held upon a large rapidly revolving horizontal cylinderical brush, until the fur, matted down by the "carrot," is perfectly smoothed, freed from dust, loose hair and the adhesive particles of dried nitrate of mercury. They are

then sent to the cutting room. "The machines which shave the fur from the skins are fitted with sharp, swiftly revolving knives, which remove the fur in an entire sheet, the skin being reduced to shreds. Then follows sorting of the fur into several grades, and packing in five pound bundles." The small fragments of the skins which are torn off in the process of scouring, together with clippings purchased from furriers are carefully sorted, the larger pieces and those having longer and more valuable fur are laid aside to be cut by hand.

"The remainder of the furriers' scraps and all the clippings from the skins used in the factory, are put into a cylindrical machine, and indiscriminately mixed by means of revolving skeleton wheels. They are then spread upon endless aprons, and are thus carried into the mouths of the cutting machines. These machines have teeth something like the ordinary threshing machines. The skins are cut into small square bits, and the fur is removed after the manner of grain from the stalks. This hodge-podge of hide and fur is then screened. After passing from one machine to another the fur is entirely removed from the particles of the skins, is thoroughly cleansed by the process, and is ready for the packers. This is called short fur, and looks like thistle-down."

It is sold to the hatters at a lower price, to be used with the more expensive stock as "filling in" material.

This process of "carroting" the fur is evidently the one in which there is greatest liability to mercurial poisoning by reason of the concentration of that mineral in the wash employed. To guard against this and also against the corrosive action of the solution, the hands of the workmen are protected, as stated above, by rubber gloves. In the establishment of Messrs. Hitchcock, Dermody & Co., the workman longest at this branch of the business had only been employed about six years. He stated that he had never had the tremors but had suffered some from sore mouth and gums, and thought his teeth were beginning to be affected.

One of the Messrs. White stated that they have a number of old men in their factory, some of whom have at various times had the "shakes" and sore mouth, but that of late years there has been no complaint of these troubles since giving the workmen an abundant supply of fresh air.

He also stated that the demand for an increase of "carrot" in the stock has arisen within the past few years. The competition is so close and the margin of profit so small in the hat manufacture that employers are calling for a stock that will felt rapidly and thus materially reduce the time and expense of production. He stated that the process of "carroting" with mercury is a French discovery and was called "*le secret*," all knowledge of its use being for a time kept from other nations, and it being given out that only acids were employed for that purpose. Hence for years in the shops of Great Britain "carroting" was done with a mixture of one pint of nitric acid and four parts of vinegar, and the felting was aided by mixing with fur a certain proportion of Saxony and Spanish lambs' wool. Consequently the workmen were entirely free from mercurial diseases.

A microscopic examination of various specimens of fur which, by the kindness of Prof. C. F. Eickhom, of Newark, were made with his instument magnifying about eight hundred and fifty diameters, revealed the fact that the action of the nitrate of mercury on the hair was to roughen its edges and deepen the natural depressions which exist on its surface, evidently thus favoring the adhesion and entanglements of the parts composing the felted mass. It will be readily understood from this why a fur of short fibre, or inferior quality, should need a greater amount of the "carrot" to cause it to work up satisfactorily, and why workmen are thereby more quickly poisoned. In some instances all the hands in a shop have, in a few days, been either rendered unfit for work or their health seriously impaired by handling stock so treated, compelling the employers to return it to the dealers as unfit for use. Just what, in a chemical way, is wrought by the "carrot," could not be satisfactorily determined in the time at my disposal. Some suppose the whole effect of the drug to consist in its dissolving from the fur the oily and other animal matters which coat its surface, and so prevent the felting. It is a matter of such importance, however, that he who should discover the exact nature of the change produced in the fibre of the fur, and be able to suggest some agent less harmful than nitrate of mercury for the accomplishment of the same work, would certainly be saving hundreds of workmen from much suffering, and very many from the permature wasting of their powers and possibly early death. We heartily commend the subject to the consideration of sanitarians, chemists and microscopists throughout the country.

The fur prepared, as above described, is now mixed by weight and shaken together by hand in various proportions, according to the quality of the hat to be made, from one-half to one-eighth part being a coarse, poor material called "shoddy," composed of short and inferior furs, trimmings of hat brims, &c., which is worked in with the finer qualities to save expense. This material is then passed through a machine called a mixer, in which the fur is passed between a pair of rolls and immediately seized by a cylinder, studded with wires, called a "picker," making eighteen hundred revolutions a minute, by which it is whirled to the top of an enclosing box. It then falls upon an apron and is passed through another set of rolls and over another "picker," by which the several kinds of fur are uniformly and properly mixed.

The same work is done in other factories by an instrument called a "devil," consisting of a cone set with spikes and revolving very rapidly in a case also set with spikes. A set of projecting flanges at the base of the cone produce a strong draught over its surface and the fur fed in an opening of the case near the top of the cone is by this current drawn between the whirling spikes and sent flying in a cloud in a close room which acts as a receiver. Here, as in the other machine, all grades are perfectly blended. After mixing, the fur is placed in a machine called a "blower," somewhat similar in construction to the mixer, but having sets of four to six pickers. Just underneath each one and leading from it to an endless apron is a grating, so inclined as to catch bits of matted fur and pieces of skin with fur attached, called "dags," also all the heavy, long and coarse hairs as by their weight they fall down from the revolving picker, which throws the fur to the top of a grated box, whence it falls upon an apron and is carried forward to another picker, and so on through the set, emerging from the last a delicate fleecy mass, winnowed entirely free from dust, dirt, hair and "dags." The "dags" are collected upon an apron and sent back to be again put through the machine, and at last are collected to be cut and torn for poorer material. The hair and other impurities are collected in a box underneath the machine and thrown away. In this department the air is constantly charged

with dust, so dense and heavy that everything is viewed through a cloud; and a stay of but a few minutes in the room produces in one unaccustomed to it a sense of dryness and unpleasant tingling in the nasal passages, with discharge of mucous which lasts for several hours after leaving the building. Even the next day, sixteen hours after spending about forty-five minutes in the room, the mucous discharged from the nose was discolored with the same dust as on the previous day on just leaving the factory. Showing that it had penetrated very deeply between the folds of the nasal mucous membrane. Some of the hands wear a thin cloth over the nose and mouth while at work feeding the machines and receiving the fur from them; others use no precautions. Boys are mainly employed in this work, but some men were found who had been so engaged for ten to twenty years. Some complain of catarrh, bronchitis, chronic coughs, spitting of blood and loss of flesh. Of thirty-nine hands, five are more or less affected. The dust is also loaded more or less with finely divided particles of nitrate of mercury from the "carroted" stocks.—hence some have suffered from sore mouth and tremors. Of the thirty-nine workmen, eight cases of these diseases were found.

This dust seems less injurious to the bronchial surfaces than that from metals and minerals, perhaps partly from the fact that it is chiefly of an animal nature and thus more readily softened by contact with the secretions of the mucous surfaces and so loses part of its irritating properties and being lighter than the mucous floats on the surface and so is easily expectorated.

Another reason for this difference is suggested by an English writer thus:—"Dust of every kind irritates, but not in an equal degree. Much I conceive depends on the size and figure of the particles which enter the air tube. The dust from the roads produces no apparent mischief, while the mason's chippings from the stone occasions serious and often fatal injury to his lungs. The dust from old iron, which is thrown off so copiously as to deposit a thick brown layer on the dress of the dealers in this article, produces no inconvenience; while the less apparent detachment of particles by the file is decidedly baneful to the workers in iron. It is then the form rather than the material, the spicular, the angular, or pointed figure of the particles detached, which we conceive the chief cause of injury. The

bronchial membrane is mechanically irritated or wounded, and from daily repetitions of this injury the lungs at length become seriously diseased, and a vast majority die consumptive." In very few of the shops visited is any effort made to get rid of this dust. In some establishments ventilators have been put in the ceilings of the blowing rooms, and one manufacturer stated that he had heard much less complaint of sore mouth since that change.

Without doubt, at a trifling expense, with the aid of a fan connected with the main shaft, a gentle current of air could be introduced at various points into these rooms, in warm weather from without, and in cold weather heated by a steam coil so as to make it comfortable for the workmen, and this being allowed to pass out at the upper part of the room would not only perfectly ventilate it, but carry off the greater part of the fine dust which now fills the room. If in addition to this the workmen were protected by close fitting respirators of cotton wool, such as are recommended by Professor Faraday, the greater part of the evil would be remedied.

The fur is next weighed out into parcels of from two and a half to five ounces, according to the size and quality of the hats to be made. Each is then spread separately upon the apron of a feeding machine supplied with a revolving cylinder similar to a "picker," by which it is thrown forward upon another large roller also studded with wire, which projects it forward and upward toward a large inverted cone, in the gill machine, open at the top, into which it is drawn by the action of a fan from the bottom. In the lower part of this open cone, upon a revolving pedestal is placed a perforated copper cone upright, between two and three feet in height, from whose interior the air is exhausted by the fan above mentioned. This latter cone being moistened and set in its place, and the door of the outer, enveloping, inverted cone being closed, the fan draws all the enclosed air immediately toward the copper cone and with it the fine spray of fur admitted to the top from the feeding machine. This fur by the revolution of the copper cone is then deposited in a uniform delicate thin film upon its surface. When the required amount previously weighed out has been laid on the cone it is covered with a conical cloth, sides and top, over which a metallic cover is placed and the whole removed to be immersed for a few seconds in a hot

water bath to contract and compact the material. The covers being removed, the cone is inverted and the felt gently loosened, stripped off and laid aside for further manipulation. In the Burr machine the copper cone is fed through an open funnel, the fur being blown by a fan and suction made on the inside of the cone, as in the Gill machine.

The hat now consists of an immense open bag, which when flattened out, measures from eighteen inches in breadth at the bottom by twenty-four in length for the smaller sizes, to thirty by forty for the larger. It is first subjected to a process called "hardening," which consists of gently rolling and pressing it in a cloth from side to side and end to end, so as to interlace the fibres of the fur more compactly. At the same time it is examined closely within and without, and if there are any thin spots they are patched with bits of fur with the aid of a brush, so as to make the body of uniform thickness. The hands in this department are called "weighers," "feeders," "coners," "wetters," and "hardeners." The first two are handling only the dry stock; the last three the wet stock. The "coners" and "wetters" have their hands moistened constantly with water in which there must be considerable nitrate of mercury in solution. Hence fourteen out of seventy-four workmen, about 25 per cent., have had some form of mercurial diseases. The "hardeners" hold the damp hats on the arms bared to the elbow, in order the more closely to inspect them by letting the light shine through, and so have a larger absorbent surface exposed to the action of the nitrate. Consequently out of thirty-nine men examined, 25 or over 60 per cent., are found to have had some form of mercurial disease.

Among these men inquiry revealed another class of ailments, evidently due to the same cause, namely, a wasting or diminution in size, not very marked but still noticeable, of the muscles, particularly of the arms from the elbows to the wrists; and this, notwithstanding these muscles were in constant exercise and so ought to be expected to increase in size and strength. In one case, besides the general shrinkage, there was a distinct depression between the muscles of the left forearm, so deep that an ordinary lead pencil would lie in the furrow. This man had been working thirteen years at hardening. He complained of impaired memory, lack of power of concentration of his thoughts,

had tremors and general muscular weakness; had not used stimulants for the last eight or nine years. Two others working thirteen and fourteen years respectively, have the same mental symptoms, also increasing physical weakness and diminished size of muscles, though not so marked as in the first instance. Of the nine "hardeners" examined with reference to this in three shops, six were more or less affected, and one of those exempt had only worked in that department sixteen months. In view of this condition and the special dangers in this department our manufacturers should be cautioned against attempting to work up poor materials at the risk of the health of their workmen. The mischief is evidently at the present time not due to imported stock, but to the effort on the part of our manufacturers to supply the market cheaply.

The conical bag above mentioned is now put into the hands of the "sizer" or "maker," who reduces its dimensions to that of an ordinary hat, by rolling it in a cloth and rubbing it back and forth with others on an inclined plank. Four to eight men work about one kettle of water, kept boiling by means of a steam jet. This water is acidulated with sulphuric acid, the action of this being to make the material felt more rapidly. Frequently the fingers are made sore at the edges of the nails, and occasionally when the acid is used in too large quantity the nails are eaten badly by it, and the fingers rendered very sore. These men are in a steam bath constantly, and in the Winter time this is so dense that it is impossible to see more than a few feet in any direction in the room. The frequent dipping of the hats in the kettle and the splashing and slapping of them on the planks splatters the water over the bodies of the men, so that they are most of the time wet. Hence in some cases rheumatic diseases are found among them. About 3 per cent. of the workmen examined report this disease contracted in this room. Only two cases, however, of mercurial disease of the whole number examined who had ever been "makers," probably amounting to four hundred and fifty, ascribe its origin to this department. The comparative exemption of this class from disease is probably due to several causes. The rooms are, as a rule, better ventilated than any others in the factories. For while there is a very small average air space to each man, as shown upon the appended table, yet the lattice work in the upper part of the rooms, with

which nearly all are supplied, is kept constantly open and so furnishes an abundance of fresh air. The work is vigorous and of itself would tend to develop strong active bodies. It is possible, even probable, that the addition of the sulphuric acid and the supply of an abundance of water effect decompositions and recompositions of the salts of mercury, producing several less readily soluble than the nitrate, and thus less deleterious to the workmen. Time did not permit a more critical and chemical examination of this matter.

As a result of these combined causes there is a much larger proportion of old men here than in most other departments of the business, the average ages being only exceeded by those of the "hardeners," "clippers," "dyers" and "blockers," none of whom have as hard work as the "makers," and would, therefore, naturally draw the older men to join them. Then, too, in past times it was customary for apprentices to learn several branches of the business, and as the finishers became incapacitated by age and disease from doing that work, they took position in the making room. In examining the men at work, one would infer in this room the existence of a better state of health than in most others, from the exuberance of spirits manifested. In many cases there was singing and laughing—in nearly all, loud, good-natured, hilarious talking, which was in marked contrast with the quiet of some of the other rooms.

After being sized properly the hats are sent to a drying room, heated to a temperature of 160° to 170° Fahrenheit, whence they go through the hands of a workman who dips them in a solution of shellac, either the brim alone or the whole hat, according to the final finish desired, whether a stiff brim and soft crown or an entirely stiff hat. They are then passed between a pair of rollers to press out any superfluous shellac, when they are ready for a second "sizing." This consists in passing them between a pair of rollers on the surface of which are prominent raised disks, inclined at such an angle to the surface of the roller as to give, when in revolution, a wavy back and forth motion. A number of the hats are rolled in a cloth so as to form a long bundle, which is then thrown in the midst of a set of four rollers of the above pattern, which turn it rapidly about, the disks giving a wavy motion to the surface of the rolls, and thus the size of the hats is still further diminished. They

are now taken to the blockers to receive the first stretching into a shape resembling a hat. Here one machine rounds out the crown somewhat, another pulls it over a cylindrical-shaped block, and at the same time seizes the brim, turns it up and stretches it into shape. It is now ready for the dyer.

Ordinary black hats are produced by successive baths, composed of logwood, copperas and verdigris. In the production of brown, blue, &c., the aniline dyes, bicromate of potash, many varieties of woods and various other substances are used by different manufacturers, some of which are irritating to the hands of the workmen if they have sores upon them. Inquiry failed to discern any specially deleterious effect from these processes, though many workmen, and some employers, were found who believe the "shakes" and sore mouth are due chiefly to impurities in the dyes. After dyeing and drying the hat is again blocked more thoroughly, when, after another drying, it is ready for "pouncing." After leaving the "makers," the processes of drying, stiffening, clipping, dyeing and blocking, seem to be comparatively free from disease. Only two cases of mercurial disease in the whole number of workmen examined refer their origin to either of these processes.

"Pouncing" consists in rubbing off, with the aid of a block of wood covered with a piece of emery paper, all the coarse, rough hairs, which in the process of felting the hat have gradually worked outward and are bristling from all parts of the surface. Formerly this was done by hand entirely and the air of the rooms in which the men worked was filled with dust; the floor, walls and ceiling were loaded with it. This dust was composed of particles of hair and fur, the "carrot" in the stock and all the chemicals used in the process of dyeing. A few cases of disease of the respiratory organs and also of mercurial disease are referred therefore to this department. Of late years in most of the shops this work is done in good part by machinery. Rapidly revolving conical rollers covered with emery paper clean the brim and another instrument sweeps over the crown set on a revolving block. Over each machine is placed an open funnel connected with a pipe leading to a larger pipe the air from which is exhaused by a rapidly revolving fan, so that a strong draught is thus made. The dust and hair are rubbed off and swept out of the room at once to the great comfort and benefit of the

workmen. In the manufacture of white hats in the pouncing room, preparations of French chalk or soapstone are rubbed into the body of the hat. No diseases seem to result exclusively from the use of these substances.

Next in order of sequence but first in importance in a sanitary point of view is the process of finishing. This consists, in the case of black hats, in ironing off smoothly with the aid of a little water the whole hat, crown and brim, with a very hot iron and shaping it to a particular pattern, if it be a stiff hat, upon a block or mould of the required dimensions. The workman is bending over the iron with his face but a few inches from his work, and this for the greater part of the working day.

Here there are conditions favorable to the absorption of mercurial vapors, viz., the highest temperature to which the hat has been exposed in the whole process of manufacture, thus permitting the volatilization of the contained salts of mercury, and the position of the workmen favoring the inhalation of the fumes as they rise. Hence of the one hundred and sixty-eight cases of mercurial disease whose origin is traceable one hundred and seven or 63 per cent. are found to have arisen in the finishing department. Of the four hundred and thirty-eight men at present employed in this work eighty-nine either now have or have had in the past some form of mercurial disease. Of that number only four admit that they now have the disease. This is accounted for in several ways. Several furriers who are said to have used large quantities of mercury, in "carroting" the stock, have gone out of the business. At the time these examinations were made during the months of September, October and November, all the windows and doors of the rooms were open, thus giving perfect ventilation and preventing the breathing in of the mercurial vapors. Again the style of finishing black hats has changed materially within a few years, less of what is called "glazed" surface being produced by the iron. The hatter now uses more moisture and developes a soft smooth finish without the gloss. The latter requires more persistent dry ironing and would be likely, therefore, to volatilize more freely the mercury in the fur. It should be remarked in this connection also that for one reason or another many of the workmen examined seemed unaware that they had any disease, whereas a critical questioning would frequently reveal evidences of it.

Many doubtless supposed they were answering honestly having failed to notice slight indications of disorder and so reported themselves well. For example one of the hardeners, above referred to, suffering from muscular weakness and wasting reported that he had no "shakes." Yet, on being requested to stretch out his hand there was a distinct tremor observable. Some were disposed to make light of the matter and gave frivolous and evasive answers. Some, no doubt, had a false pride in regard to a confession of ill health. Very few indeed would admit that the disease was contracted in their present places of work and were rather disposed to charge it upon some other shop. These facts being considered it will be readily inferred that the figures in the table appended will understate the numbers of those more or less affected by this class of diseases. In white hat finishing the dangers are much less, because the iron is used but little.

The subsequent operations, viz: trimming, flanging and packing were nearly exempt from all these forms of disease.

The trimmers attach the band, braid and lining to the hat. These are usually young girls. They work crowded in rooms often sadly ill-ventilated, as very little provision seems to be made for this in any of the factories. The average time in the business is short, for obvious reasons, many leaving it to enter upon married life. Hence, no conclusions are readily deducible as to the healthfulness of their work. Like all persons of sedentary occupations they are rather disposed to look pale, thin and worn.

The flange, or curl, in the brim of the hat is set on the mould by putting on it a bag of hot sand, thus dispensing with the iron. In this work, therefore, no complaint of disease is made. The packing consists simply in putting the hats in boxes for the market, and of course involves no greater dangers than the subsequent handling and sale of them in the stores.

Attention should be called briefly to some significant facts exhibited in the appended table, and others which were developed in conversation with the employers as well as their men, and not here tabulated.

Each individual in the factories above mentioned was visited, and personal inquiry made as to all the facts in his history relating to the three classes of diseases specified. The dimensions

of the rooms were taken, and the number of the hands in each. It should be stated that the time at which these inquiries were made was near the end of the busy season, consequently fewer men were found at work than are often engaged. About fifteen hundred were employed, while the capacity of these shops is two thousand to twenty-five hundred hands. The figures representing the number of cubic feet of air space to one person would, therefore, be materially changed if the factories were full. The averages also are much raised by several instances of a few men being at work in very large rooms, *e. g.*, the packing rooms. In addition to what has been said in reference to ventilation in the blowing and pouncing rooms, particular attention should be called to the finishing rooms. Here the air is necessarily charged with poisonous vapors and should be renovated by artificial means. The most that is done in this direction in any shop is the furnishing of a skylight or open funnel with lattice work to permit the free passage outward of the heated air.

No provision is made for forcing into the rooms a current of pure air from without, thus insuring their rapid and perfect ventilation. It will be observed from the table that in this, the most dangerous work, the lowest minimum of air space of all is found, and the average is too low for health. Dr. Parkes estimates that fifteen hundred cubic feet of air per hour are necessary for each individual for healthy respiration. Of course a larger volume still is needful if it be vitiated by poisonous chemical fumes in addition to the carbonic acid gas exhaled in the breath. It will be seen that with an average air space of nine hundred and ninety-six cubic feet to a man, as in these rooms, in order to support healthy respiration alone the entire volume of the air of the rooms should be renewed every forty minutes. That this rate should be much increased when mercurial vapors load the air must be evident. All the manufacturers who have observed the health of their workmen agree in stating that mercurial diseases prevail much more extensively in winter, when the rooms are closed, than at any other time. The inference is clear, therefore, that wherever disease breaks out ventilation is insufficient. Undoubtedly if an arrangement were employed for drawing off the air from the finisher's bench, such as is in successful operation in the pouncing room for carrying away the dust and hair, there would be very little complaint of disease from mercurial

fumes. For so successfully does this little appliance act that the smoke from the pipe of a workman standing before it is drawn gently downwards and swept out of the room. Much more would the fumes from the heated iron just in the mouth of the funnel be safely disposed of.

All degrees of severity of mercurial diseases reported are included in the two classes, from a trifling soreness of the gums and tongue to entire loss of the teeth, and from a slight tremor of the hands and arms to such violent spasmodic jerking of the muscles as to render the patient incapable of feeding himself or carrying a cup of fluid to the mouth without spilling the whole or the greater part of it, the latter being accompanied by great loss of strength and manifest impoverishment of blood.

The column marked "where contracted," represents as far as could be ascertained, in what particular room each class of disease was first developed, taking the whole factory through, and is not confined to the number of workmen at the present in that room. Thus one hundred and seven report having contracted the mercurial diseases in black hat finishing, but a number of those are not now engaged in that work, having gone to other departments, since but eighty-nine now report the disease in that room.

Hence, two sets of figures were necessary, one to represent the present condition of the men, and the other to indicate where, including both past and present, the greatest amount of disease had been developed. A glance at the table shows that rooms 1, 3, 4 and 13 have developed most mercurial diseases; 5, most rheumatism, and 1 and 11 most respiratory diseases. The reasons for these results are evident from the description of the processes carried on in the respective rooms. Assuming that the numbers employed in the past are about the same as at present, in rooms 1, 3, 4 and 13, we have one hundred and fifty-nine cases of mercurial disease to five hundred and ninety workmen, an average of about 27 per cent.

In order to make some estimate of hereditary influences the occupation of the father was ascertained in each case. In the table is given only the number of those whose fathers were hatters. Of this number, twenty-six report having had mercurial disease. About 13 per cent. of those whose parents were not hatters had the disease, whereas only 11 per cent. of those whose

parents were hatters developed it. These figures are insufficient, however, as a basis for any general conclusions.

In conversation with the employers as to the diseases to which their men were subject, in fully three-fourths of the cases the statement was made that the chief cause of ill-health among them was intemperance. Since all writers on the articles used as medicines represent muscular tremors as one of the most common effects of the excessive and long continued use of alcoholic stimulants, it seemed necessary to inquire what proportion of the men were addicted to them, in order to judge, if possible, what influence this might have on the disease. The figures attached to each class represent a condition of things sufficiently deplorable to fully justify the statements of the manufacturers. Again, Dr. Phillips, of England, a careful writer on materia medica, and therapeutics, says of the chronic effects of tobacco: "general nervous depression has frequently been produced, showing itself in restlessness, insomnia and a tremulous condition of the limbs, not very unlike the phenomena of chronic alcoholism." Dr. H. C. Wood, of Philadelphia, says of nicotia in poisonous doses: "in one or two instances violent muscular tremblings have come on shortly after the ingestion of the poison and ended in general clonic convulsions." It is worth considering, therefore, how far the constant and excessive use of this drug may have assisted in the production of this class of diseases.

The data here likewise are insufficient, since the element of time is not taken into the account. Independent of that, however, taking only the classes of work in which the men have had the "shakes," out of twelve hundred and twenty-eight hands there are found—

800	using stimulants and tobacco, with 80 cases of shakes	10	per cent.
106	" " but not tobacco, with 8 cases of shakes	7	"
216	" tobacco, " stimulants, with 20 cases of shakes	9	"
75	" neither, with 8 cases of shakes	10	"

Of the whole number of persons examined, leaving out the weighers, feeders and trimmers, who are girls, and do not, as a rule, use either stimulants or tobacco, there are left twelve hundred and fifty. Of these nine hundred and nineteen, or seventy-three per cent., use stimulants, and one thousand and thirty-five, or eighty-two per cent., use tobacco. Of course very many of them use both to excess, thus wasting hard-earned wages, undermining health, destroying the peace and prosperity of families, and in some cases preparing the way for entrance into our

prisons and poor houses. He who shall succeed in so vividly and truly painting the dangers attending the use of these two articles as to deter healthy men from taking them, will confer a priceless blessing on humanity. Perhaps more is to be looked for from early training than any other agency, and it is incumbent on every sanitarian to urge the necessity of teaching thoroughly in all our public schools and institutions of learning the laws of sound health and right living. It may safely be assumed that one of these fundamental laws would teach that, to the human body in a state of health, both stimulants and tobacco are not only worthless but positively detrimental.

CLASS.	Number.	Average Age.	Average Time Hatting.	DISEASES. Respiratory Organs. Past.	Respiratory Organs. Present.	"Shakes." Past.	"Shakes." Present.	Sore Mouth. Past.	Sore Mouth. Present.	Rheumatism. Past.	Rheumatism. Present.	Where Contracted. Mercurial.	Where Contracted. Rheumatic.	Where Contracted. Respiratory.	Number Using Stimulants.	Number Using Tobacco.	VENTILATION. Number Cubic Feet of Air Space to Each Man. Maximum.	Minimum.	Average.	Number of Fathers Hatters.
1 Mixers and Blowers	39	31	7	...	5	2	2	1	7	...	...	14	...	5	18	30	8983	2580	3846	2
2 Weighers and Feeders	44	21	4	...	...	.....	...	...	3	...	...	3	...	...	.....	.....	4000	1203	2415	4
3 Coners and Wetters	74	36	10	1	...	1	2	11	...	...	...	15	...	1	45	61	4000	1203	2361	4
4 Hardeners	39	38	17	...	...	14	3	8	9	1	...	23	1	...	9	15	4000	1203	2389	4
5 Makers	379	37	20	1	3	16	2	...	1	12	1	2	15	...	337	316	2215	284	869	86
6 Dryers	4	21	1	...	...	.....	...	...	...	...	...	.....	...	...	2	4	9000	3300	6150	.....
7 Stiffeners	11	27	16	...	...	1	...	...	...	...	...	.....	...	...	9	10	7200	825	3313	2
8 Clippers	2	56	30	...	...	.....	...	...	...	...	...	.....	...	...	2	1	572	572	572	.....
9 Dyers	45	38	10	...	...	1	...	...	...	...	...	2	...	...	28	36	8250	366	2654	2
10 Blockers	16	40	21	...	...	.....	...	...	...	1	...	.....	...	...	9	14	2700	925	2050	4
11 Pouncers	118	39	10	2	2	4	...	1	...	...	...	1	...	4	98	100	8400	213	1417	13
12 Finishers, white	48	28	10	...	...	5	1	1	...	...	...	1	...	...	28	42	1400	514	939	9
13 Finishers, black	438	30	14	3	...	54	4	31	...	4	...	107	4	2	310	377	3686	200	996	87
14 Trimmers	252	23	5	...	...	.....	...	...	...	...	...	.....	...	...	.....	.....	1639	261	729	38
15 Flangers	19	37	11	...	...	2	...	...	...	1	...	.....	...	...	13	15	5280	924	3369	5
16 Packers	18	22	11	...	...	2	...	3	...	...	...	.....	...	...	11	14	26400	533	6886	5
Total	1546	32	12	7	10	102	14	56	20	19	1	168	20	12	919	1035	6108	944	2559	265

Springs, Wells and Cisterns as Sources of Drinking Water.

BY PROF. H. B. CORNWALL, E. M.

A good well has always been regarded as a most valuable possession, and no water is more wholesome and palatable than fresh, cold, pure well water. To secure such a well wherever it is possible is an object worthy of much trouble and expense. To secure a good substitute for it when the well cannot be obtained should be no less the aim of every householder.

That good drinking water should be cold, clear, colorless, odorless and free from any taste, beyond the natural taste of fresh, cold, well water, as opposed to *flat*, boiled water for instance, is known to all.

So also it is generally admitted that drinking water should not be too hard, and should contain no poisonous mineral substances, like copper, lead, or arsenic compounds.

Let us review these requirements somewhat in detail:

Water, even in wells in peaty districts, may show a slight brownish tinge, when viewed from above through a depth of twelve or fourteen inches, and may yet not be bad to drink, particularly for people already accustomed to its use. Strangers are, however, liable to suffer from slight diarrhœa when drinking such water.

Drinking water must be odorless. Many well waters are free from odor when fresh and cold, but if kept for a few hours in a clean bottle in a warm place, they show a decided and generally unpleasant odor, on being well shaken. It may be taken as an invariable rule that no such water is thoroughly wholesome; on the contrary, it should always be regarded with suspicion, and never used except with the precautions to be given later. Still more certainly bad is any water which has an unpleasant odor when

fresh from the well. Persistent use of such water will not fail to affect generally the health of those drinking it.

This question of odor is important, as it is one very valuable indication of the character of water. Many seemingly good waters give off a mawkish, unpleasant odor when boiled, in a tea-kettle for example, and they are to be regarded with suspicion.

As regards the taste, it is very desirable that water should be as sparkling and fresh as possible, and every good water will have these qualities, due to the presence of oxygen and carbonic acid gases. Still, many very unwholesome waters have been preferred because they seemed especially fresh and sparkling. The very impurities which had contaminated them had charged them more highly than usual with the carbonic acid, without imparting to them any unpleasant taste or apparent smell.

The taste due to *hardness* of water we will consider separately. This hardness is caused generally by the presence of an undue amount of carbonate, sulphate, nitrate, or chloride of calcium (the metallic basis of lime) and magnesium.

The agreeableness of such waters is a matter of taste or habit, and to habit in a great degree is due their good or ill effects on the system. It is well known that very hard water affects, at least temporarily, the bowels of almost all strangers accustomed to softer drinking water, but although eminent authorities hold opposing views on the subject, the general verdict on the question of hard or soft waters is, that no effect on the health can be certainly traced to the use of the softest waters or of moderately hard water; while very hard waters are universally condemned.

Some waters become soft on boiling, because the carbonic acid gas they contain is in part expelled and the carbonate of lime or magnesia which this gas held in solution is thrown down as an insoluble powder, generally appearing as a light colored coating on the inside of the vessel.

When the hardness is due to sulphates, chlorides or nitrates, boiling does not improve the water. The hardness of water is measured by ascertaining how much solution of soap, of known strength, is required to form a lather with a given quantity of the water. The test depends upon the well known fact that hard water forms with soap an insoluble compound, so long as the soap is not in excess of the mineral matters that decompose

it. The hardness ascertained by this test is reckoned in degrees and as it is assumed that all the hardness is due to lime, it has been agreed in England to call one grain of carbonate of lime in seventy thousand grains of water one degree of hardness. Five degrees of hardness is all that should ordinarily be present, but ten or twelve, or even somewhat more may not be too much, provided the water owes its hardness to carbonates, and so becomes much softer on boiling.

The presence of other metallic salts, like iron salts, in notable quantity, renders water unwholesome through the bad effects on the bowels, while even very small quantities of copper, and more especially of lead, produce specific poisonous effects. No water should be drunk which contains enough iron, lead or copper in solution to cause the slightest dark coloration when the water is slightly acidulated with two or three drops of muriatic acid and then mixed with several drops of sulphuretted hydrogen water, well stirred, and viewed from above through a depth of four or five inches in a glass tube held over white paper. Lead or copper are thus at once detected; iron needs the further addition of a few drops of ammonia water, to give to the whole a smell of ammonia when well shaken up. From one-fifteenth to one-tenth of a grain of lead or copper can be thus detected in 70,000 grains of water, and no water which contains so much should ever be used habitually. Hundreds of cases can be cited of lead poisoning, colic and paralysis due to water. Lead and copper get into water from leaders on roofs, from lead pipe and linings in wells and cisterns, and occasionally copper comes from the soil itself. It is true that well and spring waters generally contain mineral salts which soon form on the pipes an insoluble coating of lead salts, and thus protect the lead from further action, but many well waters contain chloride, nitrates and other salts which rapidly and persistently dissolve the lead, and the same is almost invariably true of rain water. No lead should therefore be allowed to come in contact with any water unless actual experiment has proved that the water soon ceases to attack the lead. So dangerous is the use of lead pipes and linings in rain water drinking cisterns, that it should in all cases be condemned without waiting for a trial, and even in case of well or spring water, the water that has remained standing in the lead pipes over night should never be used. These facts are too well

attested to require further notice here, especially since it is so easy to guard against them. Zinc is less dangerous, but neither zinc, lead nor copper should be used on roofs or any where else where drinking water is collected, nor should rain water or soft spring or well water be conveyed through any considerable length of lead pipe. Tin-lined pipe, well made, is perfectly safe, but much tin-lined pipe is badly put together or not lined with pure tin, and therefore it should not be too implicitly relied upon, unless put up by the most trustworthy persons.

Having now considered the most evident qualities of drinking waters and pointed out the precautions to be taken against the mineral, or organic impurities, we come to a more generally important, because more widely spread and less obvious class of impurities, viz: the organic impurities.

It is these that give to waters their malarial properties, these that aid the spread of typhoid fever, and these that, if not manifestly to blame, may justly be suspected of causing a great deal of troublesome, if slight, feverishness, dyspepsia and general ill health. That this is so will not be a matter of surprise when we consider whence the organic impurities are largely derived.

The organic matter in water comes partly from the air, where it is floating in very fine particles. So much of it is washed down by the rain, especially by the first rain after a long dry season, that the rain water often acquires an offensive odor after standing some time in a warm place. Even after a long continued rain the air still contains slight traces of organic matters. These are of both animal and vegetable origin, but consist mainly of dead matter.

When rain water reaches the surface of the earth it finds abundance of vegetable matter, and from this, especially when the late Autumn has covered the ground with dead and decaying vegetable remains, the water extracts an abundance of soluble compounds very prone to putrify. Just as a decoction of grass put in a bottle in a warm place soon smells bad, so do these vegetable extracts tend to become offensive also. If the ground is strewn with dead animal matter, or with excrementitious matter, these give up soluble compounds in abundance to the water. The roofs of buildings likewise furnish a very considerable quantity of similar impurities.

When the water penetrates into the ground it takes up not

only mineral compounds, but if the soil has been overcharged with vegetable or animal matter before, it also extracts from these a still further quantity of putrefiable and soluble materials.

Upon the quality and quantity of the compounds with which the water is thus charged, its properties will largely depend.

The most injurious of these organic matters are the nitrogenous, or as they are often called, albuminoid compounds. These are prone to change, easily putrefy or ferment, and when in the process of decomposition are without doubt capable of inducing very serious sickness. Thus, severe attacks of diarrhœa and obstinate fevers, generally termed malarial, have been proven to prevail among persons using water contaminated only with vegetable organic matter. Animal organic matter has the same tendency, but when the animal matter is excrementitious, when it comes from house drains, sewers, and the like, it may possess far more dangerous properties. It seems probable, but has scarcely been really proven, that water highly charged with such contamination can originate dysentery and typhoid fever; or at least diseases assuming a very similar type. Even although this be not admitted, hundreds of cases can be cited to prove that water once charged with the discharges of patients suffering from typhoid fever or cholera does produce in other persons these same diseases. Some instances to prove these statements will be cited hereafter.

It appears then that much rain water and all surface water, that is, water that is wide-spread over the surface of the ground, is charged with more or less organic impurities. Fortunately the earth itself has a great purifying power. These nitrogenous, putrefiable matters are rapidly oxidized as the water percolates through clean earth, and this natural filtration under ordinary circumstances entirely changes them into harmless, simpler compounds. The change is effected partly by the oxygen of the air contained in the earth; partly, and perhaps chiefly, by the agency of the minutest living organisms, and the products are harmless nitrates and nitrites.

The great purifying power of earth was tested by the Commissioners on the Pollution of Rivers in England, and the following is quoted from their first Report, *Vol. I, p. 69*: "Our experiments also appear to show that, if the soil be not overdosed with sew-

age, it will retain its efficiency for a long, if not for an unlimited period of time, and its pores will not become clogged up." "The cleansing power of a soil seems to be more closely connected with physical condition, as regards porosity and fineness of division, than with its chemical composition." "The nitrifying or purifying power of a soil is not interfered with by moderate cold." A very porous gravel and a light loam were found most efficient, while a light sand was inferior. It may be added, that compact, clayey soils are also less rapid purifiers of water. The above facts are worthy of careful consideration. The earth must not be overloaded with impurity. The commissioners state that one cubic yard of the most efficient soil could purify 9.9 gallons of ordinary sewage daily, if it drained through a depth of six feet, but this was only the purification which they thought necessary before the sewage should be turned into water courses or rivers, and was only accomplished by an intermittent filtration, allowing air to enter the earth at frequent intervals. When the earth is overloaded it is found that the water actually takes up additional impurities from it.

Moreover, it is generally admitted that while the ordinary organic matter even of sewage may thus be rendered harmless with comparative facility, yet when specific diseases like typhoid and cholera have imparted to water their specific properties, whether these be regarded as germs, as chemical compounds, or as of inexplicable nature, a far more thorough and prolonged action of the earth may fail to render the water harmless.

In a little town in the Canton of Basel the inhabitants were supplied with water from public fountains, which were fed by a hillside spring. This spring was known to communicate underground with a brook three-quarters of a mile away, on the other side of a hill, the soil of which was comparatively loose, being regarded as the moraine of an ancient glacier. A solitary farm house stood near this brook and the farmer, returning from a journey, was seized with typhoid fever. Within two months, at intervals, three others of his family were attacked and toward the close of this time the fever broke out in the little town, which had never had before more than a stray case. Soon 17 per cent. of the inhabitants had been sick, and as a very few who did not use the public fountains escaped, suspicion was directed toward the hillside spring. About a ton of salt was poured into

the brook by the farm house, and its presence was soon shown in the fountains of the infected village. Then about two tons of flour were mixed with water and thrown into the brook, but not a trace of it came through the hill. The poison of the typhoid fever, introduced into the brook with the slops and by washing the clothes at the farm house, found its way through the three miles of earth which effectually removed the finest grains of flour.

This is a remarkable case, but similar ones have occurred elsewhere. A gentleman residing near Princeton brought a sample of his well water for analysis. A colored man had brought typhoid fever with him from a distant place and died; another member of the household died of typhoid soon after, and two others who used the well were attacked. Analysis proved that the well was contaminated with sewage, probably from the house drain; the well was abandoned and the patients recovered. It is needless to recite more examples, but the fact must be remembered that once a water is contaminated with the discharges of persons suffering from certain diseases, it is possible for the water to communicate these diseases after an apparently thorough purification. Nor do these defects show themselves only among the weak; healthy persons are quite as liable to attack.

In Manchester and Salford, England, the cases of cholera were reduced to one-sixteenth by the introduction of pure water.

When these specific causes of disease are absent the impure waters do generally affect the weaker persons more readily, as was the case in one particular family in Princeton, N. J. It seems, too, as if by constant use persons may become less liable to injury from ordinary impure water. In this way an English writer explains the fact that many rural and seaside resorts show no excessive mortality among the regular inhabitants, while the unfortunate summer visitors suffer severely.

By what means can the nature of the impurities in water be ascertained? Analysis cannot determine whether the specific poisons of typhoid or cholera are present; the embryos of parasites may escape the most careful microscopic examination; it is not possible, within certain limits, to say how long a dangerous water will continue to be dangerous; still, analysis very often serves to detect danger where it was hitherto unsuspected, and very often analysis can determine whether the impurity is of

vegetable or animal origin. It may therefore, prove a valuable aid in discovering the cause of sickness.

Organic impurity of a dangerous nature from vegetable matter shows itself in water by the presence of an undue proportion of carbon and nitrogen, or of ammonia nitrates and nitrites, the products of decomposition and oxidation of the organic impurities. If the impurity is of animal origin, and especially if it is sewage, chlorine, and often phosphoric acid, will be also found in excessive proportions.

The larger the proportion of nitrogen to the carbon in any given amount of organic impurity, the more injurious is the impurity ordinarily, for the highly nitrogenous compounds are most prone to putrefaction. Accordingly, a method of determining this proportion has been perfected by Dr. Frankland and it is very reliable, but since it is only to be trusted when executed with utmost care, and since it is very tedious in comparison with other methods, it is generally only adopted when the absence of other known facts renders one of the easier methods inadmissible. If the conditions of the water supply can be carefully studied the process known commonly as Wanklyn's process affords a very expeditious and safe method, worthy of confidence in experienced hands. This method consists in determining the amount of ammonia existing as such in water, and also the amount of ammonia which the water will further yield when boiled with a strongly alkaline solution of permanganate of potash. Taken in connection with the amount of chlorine found in a sample of water, with also the nitrates and nitrites, if necessary, this method gives very reliable results where the conditions of the water supply can be carefully studied, as is almost always the case with wells and cisterns. The nitrates and nitrites may become necessary guides where the organic matter has been quite largely oxidized, especially if the chlorine determination is doubtful in its indications.

Assuming that that the oxidation has not been unusual, the following rules may be taken as guides in the interpretation of a well water by Wanklyn's method. The ammonia already present in the free state or combined with an acid, and called always free ammonia, should not exceed .08 parts per 1,000,000; if it does, especially when an undue amount of chlorine is present, it is almost certainly a sign of recent contamination by animal ex-

creta. The ammonia derived from the nitrogenous compounds by boiling with the permanganate solution is called albuminoid ammonia. It should never exceed .15 parts per 1,000,000, and in combination with much free ammonia even 0.05 to 0.1 parts per 1,000,000 is very suspicious; in presence of much chlorine it is an almost certain indication of sewage contamination.

Chlorine varies in normal quantity according to location. Near the seashore the salt water, containing much chloride of sodium, or common salt, may increase the normal amount of chlorine in well water very largely; but generally there should not be over 1.5 to 2 grains of chlorine per gallon of water in good well water.

Generally speaking, a determination of the free ammonia, albuminoid ammonia and chlorine suffice; the nitrates and nitrites serving as valuable guides in cases of doubt. The nitrates and nitrites may come from vegetable impurities alone, but if they occur with chlorine, in excess of the normal amount, they, too, indicate animal impurities.

Below are given a few examples of well water, good and bad.

NO.	FREE AMMONIA.	ALBUMINOID AMMONIA.	CHLORINE.
1	.016	.036	2.
2	.066	.08	2.5
3	.054	.098	2.7
4	.04	.14	3.6
5	.09	.16	1.6
6	.066	.434	5.05
7	1.36	.28	8.5

No. 1 always has been one of the best wells in Princeton. No. 2 is near a surface drain leading from a stable. It was long suspected and is now abandoned. No. 3 is near several privy vaults, some in use, others abandoned. A strong man using it was severely attacked with typhoid fever. No. 4 is near several old vaults. The owner says it almost always caused diarrhœa among strangers using it. The comparatively small free ammonia accords with the fact that the drainage is not recent. No. 5 shows little chlorine, and this accords with the fact that the impurity is mainly vegetable; the well is shallow and in a field, so that the Autumn rains charged the well with water laden with vegetable matter. The well frequently smells bad in the Fall. No. 6 is the well before referred to as having probably spread

typhoid fever. No. 7 is a well manifestly exceedingly impure from sewage. It is near a privy vault, and naturally those using it suffered constant attacks of sickness, and even of typhoid fever, before it was abandoned.

Cistern water unless collected with care, may be more charged with putrescible organic matter than an exposed well water, and it will be decidedly unwholesome; but when it is so impure, especially in warm weather, it generally acquires a more offensive odor, which prevents its use.

Below are analyses of some cistern waters.

NO.	FREE AMMONIA.	ALBUMINOID AMMONIA.	CHLORINE.
1	.05	.16	.175
2	.52	.16	.2
3	.10	.08	1.
4	.02	.02	.2

No. 1 is a fair ordinary cistern water, after heavy fall rains, and neither very good nor very bad to drink. No. 2 is similar; the large amount of ammonia is doubtless due to the presence of a rusty iron pipe, for iron rusting in rain water evolves considerable ammonia. No. 3 has five times as much chlorine as average rain water—the cistern received drainage from a cesspool, and although it has less albuminoid ammonia than Nos. 1 and 2, the free ammonia and chlorine together show where the trouble lies. The water had a very bad smell. No. 4 is a carefully collected and filtered cistern water. Nothing could be better to drink, and more is to be said about this sample hereafter.

Ordinarily, cistern water may be regarded as better than an equally impure well water, for the chances of animal contamination, and consequently of specific disease, are reduced to a minimum. Still cisterns become very unwholesome, by absorbing foul gas from drains, or by leaks admitting drainage.

Water analysis can hardly be undertaken by the inexperienced. A simple test for chlorine has been given in the first report of the Board of Health of New Jersey, 1877, page 84. Very often a dangerous water can be detected by its odor. If it is kept for a day in a closed bottle, half filled and set in a moderately warm place, it will smell bad on being violently shaken,

or still more certainly if it is then heated nearly to boiling and the smell tested frequently during the heating.

How can good water be secured? By keeping impure rain water and surface water from running directly into the wells, springs, and cisterns; and by preventing sewage and excess of soluble vegetable matter from overloading the earth through which water reaches the wells and springs.

The surface water will be so much purified by draining through a moderate depth of light loam, such as the soil of granite districts, or by a somewhat greater depth of sandy soil with a moderate amount of loam, that under ordinary circumstances, in the sparsely settled country, any well sunk to a depth of twenty-five feet or more is certain to be good. It is only necessary to take care that no broken drains run near it and that no cesspool or privy vault comes nearer than one hundred feet. Such security is possible, however, only where the porous, loamy soil is itself deep.

If a light soil of only a few feet covers a heavy, compact clay, the drainage from the cesspool or vault, especially in rainy weather, may run between the clay and the light soil to an unexpected distance, particularly when the slope of the clay bed favors this course. Under these circumstances a well might be contaminated at a distance much greater than one hundred feet. Careful study of the ground, below as well as above the surface, will aid in determining the relative location of well and drain or vault under such circumstances. A further safeguard consists in sinking the well through the clay into lighter soil below, if possible, or at least in sinking it several feet into the clay and lining it with a wall running nearly to the bottom, so tightly cemented as to exclude all water that has not been forced to pass through the clay also.

A shallow well in light soil covering clay is almost certain to be overloaded at times, with vegetable matter at least. In boggy or marshy land, too, these shallow wells, only ten or fifteen feet deep, are necessarily impure. The water from them will smell bad in summer, and is especially liable to cause malarial troubles. Often a new pump log yields enough soluble matter to make a well very offensive.

Surface water must be excluded from all wells, then, in very sandy or marshy soil, or in light soil underlaid at a depth of a

few feet by heavy clay. Wherever the water supply is abundant enough the *driven well*, consisting of an iron pipe forced into the ground, partly by boring, partly by hammering, serves excellently.

Surface water is perfectly excluded, for the water can only enter a perforated section at the bottom of the tube. In sandy soils these are much to be recommended, for it must be remembered that sandy soil lets impure water pass rapidly through it, and so does not as perfectly purify it as would a somewhat more compact loam. Marsh water is also kept out, if the pipe be sunk deep enough. In case of a light soil, with clay at a few feet below the surface, the pipe should go through the clay into light soil below, if possible. If not it will generally be found that the water supply from a *driven well* will be deficient. Clay soils are not suited to them, and recourse must then be had to the dug well, tightly lined with a cemented wall.

Compact rocks do not generally supply enough water for a well; fissured rocks are decidedly dangerous under some circumstances. If a fissured rock lies a few feet below the surface the cracks in it may act like so many pipes, carrying nearly undiluted drainage to a great distance. A gentleman finding his well, near the house, spoiled by a cess pool, dug another deep well at a distance of seventy-five feet or so from his cess pool, the top of the well being several feet higher than the top of the cess pool. Before the well was finished a little stream of foul water began to trickle into it, having come from the cess pool through cracks in the rock. The rock was the red shale and sand stone of New Jersey, and the general course of one system of cracks lay in the direction between the well and the cess pool. The gentleman wisely abandoned the well and constructed a suitable cistern, furnishing the excellent water before mentioned.

In the country there should be no trouble in getting good water, but the little streams that run through low meadows, and often supply houses with drinking water by means of shallow wells or hydraulic rams, are very liable to be bad.

In more thickly-settled villages and country towns the difficulty is much more serious. If the soil is good, and the drainage thrown into it by means of cess-pools and vaults is well managed and not excessive, there need even here be little trouble; but if the soil is sandy, or if it is sand over clay, or a light soil with rock at little depth, great care will not obviate all

danger, while the gross negligence usually manifested everywhere brings its train of sickness with it. In such towns, not provided with well-built sewers, no water-closet should be allowed; cess-pools for kitchen drainage should be forbidden; privy vaults should not be made receptacles for even the chamber slops, and they should be protected from the entrance of surface water during heavy rains by means of tightly cemented walls. They should also be cleaned out regularly and often.

"Out of sight, out of mind," is the rule. If the householder can only get rid of all this refuse by putting it under ground he is satisfied, not stopping to think what becomes of all the water unnecessarily thrown into the filthy receptacles. It is this excess of water that does the main harm. It must go somewhere, and a well, being a very deep drain, the pressure toward it from all sides is great. The cess-pool, located from convenience or supposed necessity, within fifty feet or less of somebody's well, must contaminate it in time, unless the most favorable conditions exist. A light sandy soil may soon show the bad effects; a clay soil more slowly, but not less surely; a thin soil over clay or rock very certainly. Nor is the danger always manifest. General ill-health exists for a long time; perhaps no one is seriously affected until specific poisons are transmitted through the drains or vaults, and then suddenly an epidemic prevails. In the case of the well water referred to as No. 6 in the previous list of analyses, the water was contaminated at a distance said to be about one hundred and fifty feet; it had been so contaminated in all probability for a long time, but the presence of the typhoid patient first made it peculiarly dangerous. There is no escape from the conclusion that, so long as our present *convenient* systems of water-closets, drains, cess-pools and ill-arranged vaults is allowed, so long danger exists in every well in crowded towns.

If the well water must be used it should be thoroughly boiled; not a drop of unboiled water should be drunk from a well, unless the fact is established, that that well is supplied with pure water.

This is not the place to dwell upon the other sanitary aspects of bad drainage in towns; we have only to consider the water supply.

There exists everywhere, except in large manufacturing places, an abundant source of pure water, the sky. Let several hours

of drenching rain thoroughly cleanse the air, the roofs and leaders; then let the rain water run, from a slate roof if possible, into a cistern kept exclusively for drinking water. In families this cistern should be rather small, so that it can be cleaned at least twice a year, on the approach of a long storm. It should be cemented tight, sunk in the ground, kept well covered, the overflow carefully guarded against access of animals or foul gases, and the light Summer rains should on no account enter it. Then it will always furnish sweet, clear water. In Summer the water will not be cold as well water, but that fault can be remedied by ice. Where this is impossible, large, *unglazed* earthenware vessels, holding six or eight gallons, filled with the water, covered and set in the open air, in as windy a place as possible, but in the shade, will be found to supply cool water freely. The water is cooled by the evaporation of the water that slowly oozes through the unglazed vessels. This is the method almost invariably used in tropical countries, especially where rain falls only during a part of the year and must be stored in large cisterns. It is to be regretted that the custom has not found a place here. The vessels must be scoured occasionally with clean sand and water, and then scalded thoroughly. They could be cheaply procured if there was a demand for them, and they last a long time before the pores become clogged.

Such cistern water will not ordinarily require filtering. If it is desired to filter it, in order to make sure that no parasitic embryos shall be taken into the system, the best filter is a simple glazed earthenware jar, holding five gallons, or even less, having a double bottom. The upper bottom has a small hole closed by a bit of sponge; the space of four inches or so between the two bottoms is packed with clean gravel, above which is fine clean sand; the lower bottom is perforated with very fine holes through which the water slowly passes to an earthenware vessel below, into the top of which the filtering vessel tightly fits. The water is drawn off from the lower vessel by a faucet. If this lower vessel is unglazed it will serve at once as a cooler and reservoir. Such filters and reservoirs are now largely made, except that the reservoir is also glazed, necessitating in Summer, the use of ice, for such filtered water is very flat at first.

An easier and much more thorough way of securing absolute purity in cistern water is to boil the water for half an hour and

then put it into the stone jar, dispensing entirely with the filter. That is the method followed by the writer, using an ordinary cistern. The jar must frequently be scalded. In Summer the water of the ordinary cistern becomes too foul, however, if it has to supply all needs, thus making it necessary to collect all the rain that falls.

These small filters should be cleansed by scalding the sponge weekly, and removing and scalding the sand and gravel at least four times a year, or they may become breeding places of worms, etc. The filter, too, should not be kept full, but a pail of water is to be poured into it and allowed to drain completely off before any more is added. Five gallons a day is as much as the small filters just described can cleanse thoroughly.

Where the drinking water cistern must supply a large number of persons it becomes very troublesome to boil the water, and then it is advisable to place within the cistern a large box-filter of sand and animal charcoal, from which the water is pumped for use. Such filters must be renewed twice a year, to ensure their perfect action; so much of the charcoal, at least, must be replaced by fresh as seems to be most affected by the impurities.

Filters cannot be relied upon to purify a really bad water. The best of them will speedily become so foul that they will render the water even worse. If a bad water must be temporarily used there is no resource but to boil it thoroughly. For domestic use, with already very fair water, the above small sand filter is recommended because it is so readily cleansed, but it is only meant to further purify water already good. No reliance is to be placed upon the statements that this or that filter will last for a year or more. Finally, a well water, ever so slightly contaminated with specific poisons, like typhoid discharges, cannot be certainly rendered harmless by any amount of filtering. The well water must be boiled if it is bad, or it must be abandoned. The filters are useless with poor wells, needless with good ones, and only recommended for rain water cisterns.

Let no lead or copper come in contact with the rain water, not even lead paint. If a pump is used let its pipe be simply iron, or if that is objectionable from rusting, have cast iron pipes, which can be very effectually protected from the action of the water by plunging the newly cast pipes heated to 500° Fahrenheit into a bath of melted pitch and heavy mineral oil, heated

to about 450° Fahrenheit. This coats them with a permanent varnish.

Descriptions of the larger filters for cisterns may be found in Eassies' *Healthy Houses*, published by D. Appleton & Co., New York, and also in Knight's *American Mechanical Dictionary*, published by Hurd & Houghton, New York.

Animal charcoal is recommended for these enclosed filters rather than simple sand, which is better adapted for intermittent filtration, with frequent access of air.

VACCINATION.

BY E. J. MARSH, M. D.

It is almost impossible for an inhabitant of a civilized region at the present date to realize or form a distinct conception of what smallpox was before the discovery of the protective power of vaccination, and yet a faithful representation of its horrors and terrors at that time is necessary to enable us to appreciate our present advantages, to make us carefully guard our precious prophylactic, and at the same time diffuse its benefits, unaccompanied by any danger, as widely as possible among mankind, and in so doing honoring, above all other benefactors of humanity, the name of Edward Jenner.

It is unnecessary to investigate the origin of smallpox, whether it has existed for thousands of years, as long as our written records of history extend, and was one of the numerous forms of disease described by those ancient writers under the common name of "plague." It was first accurately described by the Arabian physicians, and was probably first introduced into Europe in the sixth or seventh century. The first recorded case of smallpox under this peculiar name is that of Elfrida, daughter of King Alfred.

Since that time it has always existed in Europe, though, owing to its peculiar characteristics, not with a uniform degree of severity. These characteristics are a great fatality, extreme contagiousness, and the power of affecting every individual, but affecting them only once in a lifetime. Hence when a district remained free from it for some years, it would be brought by some casual traveller, or perhaps parcel of wares, and thereupon it would quickly spread to those within reach, and the circle of its influence widen until all became affected; then the epidemic would disappear through exhaustion of material, and perhaps it might not be seen for many years and until a new generation had sprung up. From the larger cities smallpox was seldom

altogether absent, but prevailed with varying degrees of severity; like a forest fire at times blazing furiously, then subsiding under the influence of rain or for want of combustible material, smouldering and creeping along quietly, and breaking out unexpectedly with renewed violence.

There was no disease so contagious as smallpox. Sir Thomas Watson writes, "there is no contagion so strong and sure as that of smallpox, none that operates at so great a distance. It is readily communicable in every way; by inoculation, by breathing a contaminated atmosphere, by the contact or vicinity of fomites (clothes, bedding, &c.) Nay, it may be caught from the dead body." Every person was susceptible to the disease, the exceptions at most being extremely rare. It has been estimated that, of every hundred persons born, only four reached the age of thirty years without undergoing smallpox, and a middle-age proverb says: "From-smallpox and love few remain free."

It was one of the most fatal of all diseases. About one-fifth of all attacked died. Among infants its death rate was fifty per cent. or more, and the same was the case in old age, but during youth and middle life a large proportion recovered. In some fortunate cases the disease was very mild and the patients recovered with only a few pock marks. In others the face was deeply disfigured, or the constitution was enfeebled and broken down, while a few completely lost their eyesight. Before the time of Jenner thirty-five out of every one hundred cases of blindness were caused by smallpox. Now it is seldom met with from this cause. The Napoleon medal in honor of vaccination represented Æsculapius protecting Venus—the god of healing protecting the goddess of beauty—and one of the most distinguished French writers on hygiene enumerates the benefits of vaccination as follows: "It has diminished the number of blind, protected the native beauty of the human race, prolonged the average of human life."

During the eighteenth century thirty thousand persons died annually in France of smallpox, and during the last thirty years of that century the mortality from the same cause in England was from thirty-four thousand to thirty-six thousand. And for those whose minds are impressed by large numbers it will be interesting to state that during the hundred years preceding

vaccination smallpox is calculated to have destroyed forty-five millions of the people of Europe.

We have few mortality reports of our own country during the last century, but the following is probably a fair representation of what was passing elsewhere as well. Smallpox was introduced into Boston in 1721, after an absence of nineteen years. The population was about sixteen thousand, and within two years the disease attacked six thousand persons, of whom eight hundred and forty-seven died. There was another epidemic of smallpox in 1752, during which five thousand five hundred and forty-two persons contracted smallpox, and two thousand one hundred and thirteen others were inoculated, or nearly half the population was affected with the disease. The burial records of New York show that during the fifteen years preceding vaccination five thousand seven hundred and fifty-six persons were buried in St. Paul's and Trinity church yards, six hundred and ten or more than one-tenth of whom died of smallpox.

The dangers of smallpox were diminished to a considerable extent by the introduction of inoculation in the year 1721. This practice consisted in inserting into the skin of a healthy person by a lancet a small quantity of the matter taken from a smallpox pustule. This in due time produced the same disease, but in an extremely mild form, so as only rarely to cause death. Under favorable circumstances once in five hundred cases. This practice of engrafting or inoculating was of very great benefit to the individuals on whom it was performed, substituting a mild form of disease, with very little danger of death or disfigurement, in place of a very severe and fatal one. But although it was thus of very great value to the individual, it was often the reverse to the community, as it kept the disease constantly alive and spread it broadcast through regions which otherwise might have escaped, and hence diminished little, if at all, the total deaths from smallpox.

In the year 1798, Dr. Edward Jenner published to the world his wonderful discovery of the protective power of vaccination. Many years before, in early youth, he had heard that persons employed in dairy work occasionally became affected with sores on their hands and fingers, which were supposed to have been contracted from the cows, and that such persons were forever protected from the influence of smallpox. Similar occurrences

had been reported to other physicians, and corresponding observations made by them, but they had noted them only as curious phenomena and pursued the subject no further. To Jenner, however, they were more than curious and interesting; they contained promise of a result well worthy of close study and investigation. Narrating the facts to his seniors and teachers in London, he was by them encouraged to pursue the investigation, and afterwards, when settled in practice in an agricultural community, and devoting himself to a physician's work with ardor and enthusiasm, he availed himself of every opportunity to examine the histories of such cases, experimented as to their non-susceptibility to smallpox, and studied the peculiar diseases of the cows. After years of study, meeting at times with difficulties that appeared almost insurmountable, he convinced himself that he had arrived at a firm basis of truth and fact, and published his observations and belief to the world. He had ascertained that cows were liable to several forms of eruption, which might be communicated to the hands of the milkers; that one of these forms produced a peculiar sore on the hands, and that the person thus inoculated was thereafter insusceptible to smallpox—could not be made to take it. He further found that this disease of the cow was similar to and often propagated from a sore occurring on the heels of horses, and that matter from such a source would also protect from smallpox. Jenner believed that the eruption in the cow was smallpox, and named it *variolæ vaccinæ*, and that it produced in the human being smallpox in an extremely modified form, and that this was the reason for the insusceptibility to smallpox afterward. It was so extremely modified and reduced, as it were, to a minimum, that it produced only one small local sore or eruption, had lost its contagious nature and could be conveyed only by direct inoculation.

This was the first step in the discovery of vaccination, but thus far it was of little practical use. The disease was found in the cow only at comparatively rare intervals, and might be easily confounded with some other eruptive diseases, and hence even with all due care and knowledge could only be conveyed to some few fortunate individuals. Jenner's next and most important step was the attempt to transmit the disease from one individual to another, and ascertain whether in such an event it would still retain its protective power. This experiment he tried on May

14th, 1796, which is therefore considered the birthday of vaccination. Matter was taken from a sore accidentally inoculated on the hand of a milkmaid from a cow, and inserted into the arm of a small child. A vesicle and sore similar to the first was produced, and a few weeks after it had healed, smallpox was inoculated and the child was found to be proof against its influence. Jenner repeated the experiment with similar result as occasion offered, and thus established the fact that a simple, safe and efficient protection against, or rather substitute for, smallpox had been discovered.

After the publication of Jenner's book, the progress of vaccination was rapid. It met with some enemies and some opposition, and was injured by the conceit and incomplete knowledge of its friends; but it was so simple in its theory and in its practice, so easily tested as to value, and of such vast promise of benefit to mankind, that it found everywhere intelligent, zealous advocates, who bore down all opposition and spread it to every part of the civilized world.

Dr. Benjamin Waterhouse, Professor of the Theory and Practice of Medicine in Harvard University, Dr. Valentine Seaman, of New York, Dr. S. P. Griffiths, of Philadelphia, and President Jefferson deserve special mention for their active interest in introducing and promoting vaccination in this country. The first vaccinations in the United States were performed by Dr. Waterhouse upon his own children with matter obtained from England, and, the vaccinations being successful, he subsequently, in the most public manner, had them inoculated with smallpox matter in order to display the protective power.

The practice of vaccination having thus spread rapidly through the civilized world, smallpox as rapidly diminished. Dr. Jenner believed that "vaccination, duly and efficiently performed, would protect the constitution from subsequent attacks of small pox as much as that disease itself will," and hoped "that the annihilation of small pox, the most dreadful scourge of the human species, must be the final result of this practice." This belief was well founded, and the hope was not extravagant or unwarranted as far as the nature of the disease was concerned; but it should have required comparatively little knowledge of human nature to dampen the ardor of these expectations. Smallpox was not the only foe to

be fought. It had for allies, ignorance, conceit, carelessness, obstinacy. The very simplicity of the operation proved an obstacle to its due and efficient performance, for everyone who could handle a lancet considered himself at once qualified to operate without implicitly following the master's directions in minor details, and Jenner was constantly occupied in correcting erroneous methods of procedure. Moreover, provision for the future is not the rule in humanity. Absent dangers as well as absent friends are forgotten, and the very diminution of small pox would lead to a neglect of vaccination. Consequently, now, after a period of eighty years, we find smallpox still existing in the world, and, although shorn of its former powers, still yearly demanding its victims.

The practice of vaccination spread rapidly, institutions for the vaccination of the poor being established in the larger cities, and the mortality from smallpox almost at once diminished; from some districts it was entirely absent for years; epidemics became very infrequent. The actual value of vaccination to communities is well shown by a comparison between the death rate before and since its introduction. In England, before vaccination three thousand, and since vaccination two hundred and twenty-one out of every one million of inhabitants have died annually of smallpox. The following figures will show the same results in several other European countries:

COUNTRIES.	DEATH RATE BY SMALLPOX PER 1,000,000 INHABITANTS.	
	Before Vaccination.	After Vaccination.
Lower Austria	2,484	340
Upper Austria	1,421	501
Bohemia	2,174	215
Prussia, eastern portion	3.321	556
Prussia, western portion	2,272	356
Westphalia	2,643	114
Sweden	2,050	158
Berlin	3,422	176
Copenhagen	3,128	286

In this country we have few mortality reports of the last century, and a single comparison must suffice. As before stated, there were epidemics of smallpox in Boston in 1721 and 1752, when the population of the city was about sixteen thousand; in the first the deaths were eight hundred and fifty, or one in every nineteen inhabitants; in the second the deaths were five hundred and forty-four, or one in every twenty-nine inhabitants; in 1872–73 occurred the most severe epidemic for many years, and the deaths were one thousand in a population of two hundred and fifty thousand, or one in every two hundred fifty inhabitants. But it is quite unnecessary to appeal to statistics to show the vast difference in the prevalence of smallpox before and since the discovery of vaccination. Everyone's own individual experience now tells a different story, from the experience of two hundred years ago, when in the words of the eloquent historian, "Smallpox was always present, filling the churchyard with corpses, tormenting with constant fear all whom it had not yet stricken, leaving on those whose lives it spared the hideous traces of its power, turning the babe into a changeling, at which the mother shuddered, and making the eyes and cheeks of the betrothed maiden objects of horror to the lover." We have all within a few years passed through an epidemic of smallpox, unequalled in severity for half a century, and yet what have we felt and what do we see? Most of us have enjoyed a sense of protection and personal safety, few have lost any of their friends, relatives or immediate social circle. We see on the streets no scarred faces, no sightless eyes. The mortality has fallen almost entirely on those, who from carelessness or prejudice, had neglected vaccination. A few have suffered, notwithstanding a supposed security from this protection but generally have had the disease in only a mild and modified form. The power of vaccination is shown perhaps still more vividly by individual examples in the very presence of smallpox. Dr. Marson, of the London Smallpox Hospital, says: "For just thirty years we have re-vaccinated all the nurses and servants who had not had smallpox on their coming to live at the smallpox hospital, and not one of them has contracted small pox during their stay here." A similar experience has been found among physicians. At a meeting of the Medical Society of London, when about sixty practitioners were present, those

who had taken smallpox after vaccination, were requested to hold up their hands, and of the whole number only four or five were raised. All of them, however, had repeatedly exposed themselves to infection. After a remarkably severe epidemic of smallpox in Milan in 1870-72, it was reported that "of the medical fraternity, including those brought most of all into contact with the disease, but at the same time most safely protected by vaccination, not a single serious example of the affection appeared during the whole period of thirty months."

The writer has frequently vaccinated persons exposed to the contagion of smallpox—persons living in the same house, or even nursing the sick, and has then confidently assured them of complete protection from the disease, and in no instance has such assurance been negatived. The disease has never spread when all those exposed to it were vaccinated.

Jenner believed, as before stated, that vaccination, "duly and efficiently performed," would protect from smallpox as much as an attack of the disease itself, and as second attacks of smallpox were occasionally met with, he expected the same after vaccination. For several years this seemed to be the case, but about 1820 it was noticed that where smallpox prevailed, a certain proportion of the vaccinated were taken sick with a fever and eruption somewhat similar to the original smallpox, but differing from it in certain points, and especially in the very important one of seldom causing disfigurement or death. The disease was called "varioloid," meaning "like small pox." This name, though still used, is unfortunately chosen, as it tends to conceal its real nature. It was really smallpox, "modified" in its course, and rendered mild by the previous vaccination. But though mild itself it was capable of communicating the true smallpox in malignant form to the unprotected. Notwithstanding these cases, the rule of protection by vaccination still held good, and it was only in a comparatively small number that the smallpox afterwards was seen. Jenner believed that in all these cases there was some want of care in the original vaccination, or that the vaccine vesicle had not gone through its course in a perfectly normal manner. And this opinion was undoubtedly correct in the majority of instances, and the imperfect scar on the arm often demonstrated the imperfection of the original process.

The power of vaccination is shown almost as much in this modifying influence as in its protective powers. In the London Smallpox Hospital, two thousand six hundred and fifty-four unvaccinated patients were admitted, of whom nine hundred and ninety-six, or 37 per cent. died, while of four thousand eight hundred and ninety-six vaccinated patients only four hundred and two, or 8 per cent. died. Of sixty-one cases occurring under the observation of the writer in 1872, thirty-one had not been vaccinated, of whom eighteen, or 58 per cent. died, while of thirty vaccinated only one died.

When these instances of varioloid or post vaccinal smallpox became numerous, the question was asked whether the protective influence became exhausted in the system after a certain period of years, or whether the vaccine virus had degenerated by passing through a number of individuals and becoming humanized. That the former is correct is now generally acknowledged to be true, and it has been found that the period of life during which the protective power suffers most loss is the period of growth from childhood to adult age, and it is also found that an efficient revaccination at this period will renew and complete the protection for life. This is the opinion of those who have had the largest experience with smallpox. Dr. Marson writes, "very few patients have been admitted with smallpox into the hospital who stated that they had been revaccinated with effect." Dr. Grieve, Medical Superintendent of Hampstead Smallpox Hospital, says that out of six thousand two hundred and twenty-one cases admitted, in only three could any satisfactory proof of revaccination be discovered. He expresses his conviction that *revaccination is a sure protection against smallpox*, and that cases of small pox subsequent to revaccination are merely the exceptions that prove the rule; they are more uncommon than second small pox. The physicians of the Dublin hospitals after the epidemic of 1872 reported the same experience and expressed themselves to the same effect.

With regard to the second question, whether the vaccine virus has degenerated by transmission through a long succession of human beings, medical opinion is not unanimous. That it may and frequently does degenerate is undoubted, but that it necessarily does so is not sustained by facts.

Jenner wrote: "The matter may undergo a change that may

render it unfit for further use, by passing even from one individual to another, and this was as likely to happen in the first year of vaccination as in the twentieth. * * I vaccinate here weekly, and the vesicles are in every respect as perfect and correct in size, shape, color, state of the lymph, the period of the appearance and disappearance of the areola, its tint, and finally the compact texture of the scab, as they were in the first year of vaccination; and to the best of my knowledge, the matter from which they are derived was that taken from a cow about sixteen years ago."

Dr. Marson, while admitting the frequent degeneration of humanized virus, and advising an occasional return to the cow, says "we have frequently produced, lately, with lymph brought into use by Jenner more than fifty years since, vaccine vesicles which on comparison, exactly correspond with vesicles sketched in Jenner's original work explaining and illustrating the vaccine disease."

The practical rule for the physicians will be to use virus that is proved good by producing typical vesicles, pursuing their course regularly and leaving behind well marked cicatrices, but as soon as there is any inferiority in the vesicle or any irregularity in its course or cicatrix to abandon it and seek a new stock from animal virus, which now fortunately can easily be obtained.

When vaccine lymph is introduced by puncture beneath the skin the following appearances present themselves: For the first two days no particular effect is noticeable, by the third day a slight pustular elevation is perceptible; and this by the fifth or sixth day has become a distinct vesicle of a bluish-white color, with a raised edge and a peculiar central cup-like depression. This gradually enlarges and by the eighth day has attained its highest perfection. It is then plump, round, more decidedly pearl colored, it is distended with clear lymph and the elevation of the margin and the depression of its centre are more marked. At this date, or sometimes a few hours earlier, a ring of inflammation termed the areola begins to form around its base, and the vesicle and areola together continue to spread for the next two days. The areola is circular and has a diameter of from one to two inches; it is often attended with considerable hardness and swelling of the subjacent cellular tissue. The areola is the occular evidence that the vaccination has produced its

specific effect upon the constitution. Generally at this period the constitution shows sympathy with the local disease; there is slight feverishness, restlessness and heat of skin with some derangement of the stomach and bowels, though these symptoms are sometimes very slight. After the tenth day, the areola begins to fade, the vesicle begins to dry in the centre and by the fifteenth day a hard, dry, brown scab is formed. This scab generally contracts, hardens, dries, and falls off about the twenty-fifth day, leaving a cicatrix which is commonly permanent, and which in character is circular, somewhat depressed, foveated, or indented with minute pits and sometimes radiated.

When the vaccination is done by abrasion and not by puncture, it may develope as above, if of small size, or if larger, two or three vesicles may rise, which will coalesce into one large one, either circular, or oval or other irregular shape. This represents the normal course of a primary vaccination; it may be accelerated or retarded for a few days, but any other variation should be regarded as modifying its protective power, and rendering it doubtful.

The vesicle of a revaccination does not follow exactly the same course; generally it runs its course more rapidly, the vesicle being small and the areola formed on the fourth or fifth day. The axilliary glands are generally affected, and there may be considerable headache, nausea, malaise for one day at least. Occasionally the vesicle follows precisely both in form and progress the course of that of a primary vaccination.

After the vaccination sore has passed through this normal course, the subject cannot be made to take smallpox either by inoculation or contagion, but it is sometimes important to know at what precise period this immunity occurs, as in cases where persons who may have been exposed to smallpox contagion request to be vaccinated, or ask what assurance can be given them of protection by vaccination. As a rule of practice it is well to vaccinate at any period after exposure until symptoms of the disease actually set in, because infection does not always occur with the first exposure, and there is no certainty as to when it has actually occurred. After vaccination the mark of protection is the formation of areola. The vesicle may be perfect and still smallpox ensue in severe form, as the writer has seen on more than one occasion, but if the areola be formed without the appearance of any symp-

toms of smallpox, the subject is then secure. "When small pox has been taken into the system there is twelve days freedom from illness generally, forty-eight hours illness and then the eruption begins to appear on the skin. The areola of vaccination is not fully formed until the ninth or tenth day of the progress of the vesicle, so that unless there has been time for the areola to be formed after the vaccination before the illness produced by small pox begins, the vaccination will not be of the least benefit." In other words, if a person be exposed to the small pox contagion, the first symptoms of the disease would appear in twelve days; vaccination requires a period of ten days to protect, therefore if a person be vaccinated within forty-eight hours after exposure the protection will be effective; if vaccinated within the subsequent twenty-four hours, the areola will have commenced to form before the illness of small pox begins and the disease will be modified; vaccination done subsequent to this period will be of no avail whatever. Dr. Marson says, "this we have seen over and over again, and know it to be the exact state of the question." As the revaccination vesicle generally developes in a shorter period than the original, revaccination performed even four days after exposure to contagion may prevent the development of the disease.

In order that vaccination may confer its full protective power, it must, as Jenner said, "be duly and efficiently performed." Unfortunately the method appears so simple that many medical men neglect the study of the essentials of success, and nurses and mothers, who have never heard of them, attempt to imitate the example of their physician. And it is undoubtedly to this carelessness and consequent bad vaccination, that so much post vaccinal smallpox has been due.

The operation of vaccination includes three considerations:

First. The selection of the virus.

Second. The method of operation.

Third. The condition of the person to be operated on.

1st. The selection of the virus.—The vaccine virus consists of the lymph or crust taken from the vaccine vesicle on either a human subject or a cow. The former is used in a large majority of cases. It should be taken only from a first vaccination of a healthy, strong infant—healthy both in general appearance and on special investigation as to any possible constitutional disease.

It should never be taken from adults or from a *re*-vaccination sore. The former, on account of a greater likelihood to such disease; and the latter, because the protective power is much less, or may even be wanting, as in the following instance given in the Report of the New York Board of Health for 1871: "A mother obtained matter from a healthy *re*-vaccination vesicle on the arm of a friend at the eighth day. She vaccinated her four children, none of whom had ever been previously vaccinated, with this virus; the vaccination was, to all appearance, successful in each case, full, healthy-looking vesicles, maturing on the eighth day. Almost a month afterwards all four children were stricken with the smallpox."

A physician should, under no circumstances, make use of inferior vesicles, but use the utmost care in selecting from only the very best subjects; just as a gardener prefers the seeds from the best specimens of his plants. When the stock deteriorates or fails, or if he or his patients have such a preference, he should resort to the animal vaccine, an excellent supply of which is now kept in market. It is not necessary to discuss which lymph is preferable, or if there is any general preference of one to the other. Either, *when good*, will effectually protect, and is entirely devoid of danger. Human lymph must, for a long time, be the one chiefly used, still it is apt to deteriorate, and is, on rare occasions, subject to a danger from which animal virus is free. The animal virus has hitherto been carefully propagated and worthy of confidence, but as the demand for it is increasing, and it is becoming an object of trafic, there is a very great probability that much will be offered for sale entirely unworthy of confidence, inert or even injurious.

As soon as the vesicle forms, the lymph is fit to use, and on the fifth day it is particularly active. The quantity is small, however, and it is better to wait till the eighth day, when the vesicle is full. This is usually, however, the last day on which it should be taken, as afterwards, when the areola has commenced to form, it is far less successful. Jenner laid it down as a "golden rule," never to take lymph for vaccination after the formation of the areola. He found that such lymph was not only less active, but that even when it did produce a regular cow pox, it frequently failed to protect the system from small pox. Lymph is taken by pricking the vesicle in one or more

points with the point of a lancet, or a needle. A few drops of lymph will exude from each puncture, which may be used while fluid by inserting into the arm of another child, or applying to an abraded surface. This arm-to-arm method is the best possible, and is most uniformly successful, but unfortunately can only be applied in vaccinating institutions, in families where there are several members to be vaccinated, and in a few other instances. Generally the lymph must be preserved for a longer or shorter time, and carried to the person to be vaccinated. It may be taken on the point of the vaccinating lancet, and dried there; but the usual method is to collect the exuded lymph on the surface of a quill or ivory point and allow it to dry. These points should then be carefully wrapped up, and kept away from the atmosphere. Another method is by the use of capillary glass tubes; a drop of the virus may be collected in such a tube, the ends of which are then closed by sealing wax, or by melting them in an alcohol lamp; only enough for a single vaccination should be put in each tube. The lymph thus excluded from the air will remain liquid for months and years, retaining its activity, and may be used in the same manner as fresh lymph by breaking off both ends of the tube and blowing it out on the point of a lancet or a piece of glass. Not more than half a dozen quills or tubes should usually be collected from one vesicle. No pressure should be used to make the lymph exude, and if the slighest tinge of blood is visible in the lymph, it must not be taken.

The crust or scab formed by the drying of the vesicle, separates from the cicatrix about the twenty-fifth day. It was first recommended for vaccination purposes by Mr. James Bryce, of Edinburgh. He described its formation as from the early and active lymph of the vesicle, the drying process beginning as early as the fifth or sixth day in the centre. He recommended it as being equal in power to the most active lymph, as affording a more abundant supply, and as being able to be kept for a longer period, and obtained more easily. This form of virus has been much used in this country, on account of the advantages above enumerated, especially the facility of obtaining and preserving it in town and country practice where there are no public institutions to depend upon. It is also extremely active in its power, and gives

more success than any other method, except the arm to arm method. It is a valuable supply in times of small pox epidemics, when a large quantity is virus is required, for while a vesicle will only charge five or six quills, a good crust will vaccinate twenty or thirty, or even more persons. The same care must be used in selecting crusts as in selecting lymph, and they must be taken only from excellent vesicles which have gone through the regular course in children known to be healthy. Mr. Bryce thus describes the character of the proper crust: "It is those crusts only which can be ascertained to have been formed from the vesicle after it has run through a regular course, and which, when separated from the part, are found, on examining them by a strong light, to be nearly transparent, which I would recommend ever to be used." Dr. J. P. Loines, of New York, described the crust as composed by a drying and purifying process, so as "to leave the lymph almost by itself, hardened, amber-colored, semi-crystaline, diaphanous and covered by the hardened cuticle which varies in color according to the surrounding skin, the product falling off in the shape of a very thick, roundish, countersunk scab. Its thickness should be about one-third of its large diameter. It is probably the thickest and heaviest scab produced upon the human body."

2d. The method of operation.—If fluid lymph be used, whether from arm to arm, or from capillary tubes, the point of the lancet should be dipped into the lymph and inserted by a puncture beneath the epidermis; a drop of blood may follow, but this will not often wash away the virus. Or instead of this method, a series of transverse scratches may be made, or a small portion of the epidermis abraded by a lancet—a dull lancet being preferable—or by the vaccinator, made of short needles, like a rake. In either case a surface should be exposed or cut across, equal in size to a split pea, and the lymph rubbed on with the flat side of the lancet; it is an excellent plan to rub the lymph first on the surface of the skin and then scratch through this, and afterwards apply lymph a second time. If the dried lymph on quills, or the crust is used, the skin is to be scratched or abraded in the same manner, the quill to be dipped in luke-warm water so as to soften the lymph, and then rubbed for a minute on the abraded surface. If the crust be used, it is to be pulverized by

crushing between two pieces of glass, then moistened with water and rubbed up until a sort of emulsion is made, and this is then applied by the flat side of a lancet. No more should be mixed than sufficient for the operations proposed, and if any remain it should be thrown away, and under no circumstances should it be laid aside for a subsequent occasion. After being mixed with water it rapidly decomposes, and becomes either inert or positively injurious. Occasionally a small piece of crust is inserted beneath the skin by a puncture, or the powdered crust by a vaccinator, made of a hollow needle with a piston. The writer has never seen this method used, but it is said to be very successful. Whatever method be used, it is of strict importance that the lancet or instrument used should be perfectly clean. A minute quantity of blood is usually drawn, and there is more danger from this source than almost any other. The lancet, therefore, should be dipped in hot water and wiped after each operation, or when practicable it should be cleansed by passing through the flame of an alcohol lamp.

Jenner thought that the formation of one single vesicle was sufficient to afford entire protection, and so it undoubtedly is in the majority of cases. There is reason to believe, however, that the protective power does to some extent depend upon the amount of the local affection, and consequently many physicians prefer to make numerous vesicles. It has not been shown that the number of the vesicles affects the *liability* to the disease, but Mr. Marson has shown from the large experience of the London Small Pox Hospital, that the severity of post-vaccinal small pox does have a direct relation to the number and quality of the vesicles. He found the mortality proportioned inversely to the number of vaccine scars. The mortality among those having one vaccine cicatrix only was 7.73 per cent., of those having three or more, was 1.22 per cent. Among those having *well-marked* cicatrices the mortality was 2.52 per cent.; among those having badly marked cicatrices, 8.82 per cent.

Dr. Marson's own practice was to vaccinate from arm to arm by puncture, and to make six punctures about half an inch or less apart from each other. When vaccination is done by abrasion the vesicles will be much larger, being a compound vesicle formed by the coalescing of several small ones. It would appear rational that there should be no difference between the effect of one large

vesicle of this nature, and that of several small vesicles, and therefore the area of cicatrices is of importance rather than the number of cicatrices. Dr. Loines recommended the formation of a cicatricial surface equal to the area of a circle three-quarters of an inch in diameter. The small vesicles have an advantage over the large one in that they are less liable to be ruptured.

The vaccination process should be seen by the physician as frequently as possible, and at least about the seventh and tenth days, and also when the scab has separated.

In the presence of small pox, that is where a person may have already been exposed to the contagion of small pox, it is advisable to vaccinate in at least two places, so as to give additional surety of success. If one point should not "take" the other may, and immediate success is absolutely necessary and no chance of failure can be allowed.

3d. The condition of the person to be vaccinated.—In the presence of small pox every unprotected person should be at once vaccinated, but in ordinary circumstances there are several conditions to be considered. Healthy infants may be vaccinated within a few weeks after birth, and the operation should, if possible, be done before teething; the third and fourth months are perhaps the best time. If done while the teeth are coming through the gums, convulsions occasionally are induced from this double irritation, and under these circumstances they are always attributed by the parents to the vaccination. If a child is at all sick, or weakly, it is well to defer the vaccination until recovery; this is advisable especially where there is any cutaneous eruption, as these frequently modify the course of the vesicle, and in the opinion of Jenner often interfered with the protective power; even a slight eczema behind the ears should be healed before performing vaccination. The Spring and Autumn are the best seasons for vaccinating, and it should be avoided during Summer as much as possible, partly because infants are more liable to sickness at this season, and also because during the hot weather the children are more apt to scratch and break the vesicles. Vaccination should never be performed if there is a case of erysipelas in the house, or if the disease be prevailing in the vicinity.

Revaccination should be performed under the same conditions as vaccination, except of course as to age. All persons should

be revaccinated between fifteen and twenty years of age, and if the operation be unsuccessful it should be repeated at occasional intervals until success be obtained. Failure of the revaccination is not absolute proof of the continuance of the protection of the first vaccination. The rule is that no adult can be *assured* of protection against smallpox until he has undergone a successful revaccination.

When properly performed, vaccination is almost uniformly a perfectly safe and trifling operation. Still in a few instances it has been followed by serious consequences, and both the frequency and severity of these have been so greatly exaggerated as to give rise to a certain prejudice against its employment. The objections urged against it are—

First—The immediate danger from the operation.

Second—The introduction into the system of some constitutional disease together with the vaccination.

1st. The immediate danger consists in the occurrence of unhealthy inflammation and ulceration, or of erysipelas starting from the vesicle. The former occasionally occurs, but almost never when good fresh virus is used, and any tendency to inflammation can be arrested by rest and soothing applications. Erysipelas may supervene after vaccination, just as after any scratch or wound, and it is the scratch and not the vaccine process that causes it. As erysipelas in young infants is a serious, and sometimes fatal disease, such cases are fortunately rare, and generally may be attributed to the constitution of the child or exposure to the contagion of the disease. They are often seen when erysipelas is prevailing as an epidemic.

2d. The fear of inoculating some other disease is the chief danger in the eyes of the parents, who are not less desirous than the physician that the matter should be taken from a good healthy child. They fear lest a feeble child should graft its own feeble constitution, or a sickly child, a tendency to scrofula and cutaneous eruptions.

It has been demonstrated to the satisfaction of all physicians that there is no possibility of such infection, but scrofula and cutaneous eruptions are extremely common affections, and when they make their appearance subsequent to vaccination, it is natural that parents should rather accuse the vaccination, than the natural constitution of their children.

The charge of inoculating other disease unfortunately cannot be entirely denied, and that, too, in the case of one of the most serious infections—syphilis—but even here vaccination in the large majority of cases has been unjustly accused. All post-vaccinal syphilis is not the result of the vaccination, and the order of their occurrence on the skin is not the order in which they were acquired; and yet here more than in all other cases the parents would prefer to accuse the vaccination.

A few cases have occurred, however, which admit of no other conclusion than that syphilitic poison was conveyed with the vaccine. Such cases, however, are extremely rare. The majority of physicians, of the highest repute and largest experience in the treatment of both classes of cases, vaccination and syphilis, have never met such instances. There is reason to believe that where syphilis has been so transmitted, it has been due to a want of proper care in taking the lymph, which instead of being pure has been mixed with blood. Whether syphilis can be conveyed by pure vaccine virus is not yet absolutely determined. But it certainly can be conveyed by blood, and it is extremely probable that in all the reported cases, it was so conveyed by a few drops of blood effused into the lymph by careless handling, and then taken up on the lancet or quill. The danger of this infection is so slight that it really is no objection to vaccination, but only an additional incitement to the physician to use the utmost care in selecting and collecting the lymph, and to be certain of the cleanliness of his lancet before operating. If doubt, fear or prejudice still continue on the part of physician or patient, a resort to animal vaccine virus will do away with all difficulties.

Since the annihilation of smallpox is of such great importance to the community, it may be proper to consider here whether the State government can or should in any way exert its authority and influence to confer the protection of an efficient vaccination upon all its citizens. The State has certainly the right to require, in the interest of public health, that every person should be vaccinated, and it is no unwarrantable interference with personal liberty to take away the liberty of conveying to others a loathsome and fatal disease; but before enforcing this right it should first give them assurance of a safe and efficient vaccination. Such assurance it cannot give at present, for the

operation requires medical knowledge and skill, and the State exercises no supervision over the practice of medicine. It is manifestly improper to require its citizens to submit themselves to a medical or surgical operation until it undertakes to provide skillful physicians and surgeons. Moreover, if a law should be enacted, requiring the vaccination of all infants, as is the case in England and some other European countries, it would be impracticable of enforcement without a more extended machinery of police and oversight of individuals than we now have, and it would stand consequently as a dead letter on the statute book.

But if it is inexpedient to use authority, the State may use a certain influence by offering facilities for vaccination. This influence it might exert in two ways: by establishing a corps of public vaccinators, and by providing a constant and reliable supply of vaccine virus.

Skillful physicians should be appointed as public vaccinators for every city and township, whose duty it should be to keep the public advised, by circulars and advertisements at stated intervals, of the benefits and necessity of vaccination, and to vaccinate gratuitously all who might desire vaccination. This plan could scarcely be carried out at present, as the State has no method of exercising such control over these communities, but when a general law shall be enacted (at no distant day, we hope) establishing local boards of health in every city and township, such a provision can easily be made.

Meanwhile a great deal of good might be done by the supply of efficient and reliable vaccine virus. The expense would not be great and the benefit would be conferred directly upon every person or family in the State. Individual physicians find great difficulty in keeping on hand a constant supply of vaccine, and they are thus tempted to use an inferior quality. A constant supply of the best human vaccine virus can only be kept up in vaccination institutions of large cities, where there are a large number of infants to vaccinate, and during epidemics of smallpox it is difficult to fill the demand. This difficulty and the fear of the possibility of syphilitic contamination has caused a demand recently for animal virus. At first it was supplied mainly by two or three physicians, whose names were a guarantee of its value. Recently it has been placed on the market and advertised by a number of druggists, from various sources,

and as the demand increases there is every probability that matter of an inferior quality will be offered for sale.

Animal vaccination requires as much care and skill as human vaccination, and should be conducted only by the same thoroughly qualified professional men, and it is of the utmost importance that the supply of virus should not be left to the ordinary competition of trade. There would seem to be a particular propriety in placing the procedure under official inspection or direction, and the establishment of vaccine farms by State Boards of Health would undoubtedly contribute very greatly to the efficient vaccination of the people. Vaccine virus could be distributed gratuitously or at small expense and with an assurance of perfect safety and protective power. Moreover in times of epidemic smallpox, the value of such an institution would be inestimable. At such times the demand for vaccine increases enormously and suddenly. The unvaccinated children are all brought at once, and under this alarm the demand for revaccination now first appears, and the supply of "matter" is soon exhausted. However with an animal vaccine institution this difficulty disappears. A few more heifers are procured, which may each be vaccinated in fifty places if necessary, and in a week's time enough virus obtained to supply the wants of any ordinary city.

Abstracts from Addresses and Papers before The New Jersey Sanitary Association.

BY E. M. HUNT, M. D.

The first meeting was held at Newark, N. J., October 13th, 1875, and was opened with an address by the President, Dr. S. H. Pennington.

He spoke of the necessity of more attention to sanitary matters in this State, and of the need of the co-operation of the people. Human life is in constant peril from deleterious agencies at work within, beneath and around us. Telluric and meteoric emanations and influences, often in localities where they are least suspected, are diffusing themselves through the atmosphere depressing our vital forces, weakening our power of resistance to other pernicious agencies or directly prostrating us with malarious maladies. It is difficult to believe that the fearful waste of human life is due to a defective organization imposed by the Creator. We are compelled to attribute it to causes incident to civilization or called into action by neglect and preventible by the precautionary and corrective agencies that careful investigation and scientific skill may bring to our assistance. Some of the manufactured causes of disease are peculiar to cities—but the country hamlet, even the solitary farmhouse—is not without its perils. The barnyard, the sheepfold, the pig-sty, the unremoved garbage, the compost heap, the cesspool, the privy, the well, the stagnant pool, the pestilential marsh or the neglected mill-pond, will frequently explain the origin of malignant diseases which the sufferer and his neighbors may piously attribute to a mysterious visitation of Providence. Some of the obvious remedies are familiar to you. They

are found in through ventilation and ablution, in the bountiful supply of pure water beyond the reach of cesspools, privies and animal or vegetable deposits; more perfect systems of drainage and sewerage, more efficient police to prevent the sale of adulterated milk and other aliments consumed by our people; to compel the removal of nuisances, not only from streets, but from the premises of citizens; to superintend the construction of buildings; to forbid the overcrowding of the tenements occupied by the poor; to suppress the resorts of intemperance and impurity, whose frequenters are generally among the first victims of epidemic disease; and what is of quite as much importance as any of these, the diffusion of correct principles of hygiene among the people in town and in country and in the institution of scientific commissions to collect and collate facts, and to ascertain the laws governing malaria and miasm, and the most effectual means to counteract and neutralize them.

Dr. Pennington also put in a plea for sanitary attention to animals, and for a closer study of the causes of the diseases to which they too are unnecessarily subjected.

Professor A. R. Leeds discussed the water supply of Newark, Jersey City and Hoboken. He had made analysis of the waters of the Passaic and thought that its impurities had been somewhat magnified.

Dr. Ryerson, of Boonton, thought that the undrained land and swamps along its course added much to its impurity.

Dr. S. B. Hunt read a paper on "atmospheric humidity, in relation to sewage and drainage." The paper showed how largely certain atmospheric conditions influenced the evil effects of sewage and promote disease.

General E. F. Viele read an extended paper on drainage, sewerage and water supply. He carefully distinguished between sewerage and drainage, giving reasons and arguments why they must be kept distinct in practice as they are in fact. The vast amount of poisonous matter discharged into sewers was stated. Unless a sewer is rightly constructed, has a proper descent and is thoroughly flooded it is a public nuisance—a retort from which poisonous gases are thrust into houses through wash basins, water closets and bath tubs. Ventilation of sewers so much ignored in the country must be secured. He suggested

that ventilating tubes be placed in the lamp-posts. There should be also a trap between the soil pipe and the sewer.

General Viele then treated of *Water Supply*, describing the proper source of supply, the proper reservoir, both as to masonry and size. With a large map he illustrated the Passaic river with the large areas of saturated soil bordering on it, and its city soils saturated with still more dangerous organic matters. The water supply for all the cities should be obtained from the mountain streams which drain the counties of Passaic, Morris and Bergen, in New Jersey, and Rockland and Orange counties in New York State. When united they form the Passaic river and drain an area of seven hundred and fifty square miles above Little Falls, and this would supply ten million eight hundred thousand inhabitants. There is ample room below Little Falls for a collecting basin, without any interference with the contemplated removal of the existing obstructions in the river. Near this basin there is on the east side of the first mountain a depression which almost seems formed for a great receiving reservoir, inclosing a valley about five hundred acres in extent, the bottom of which is three hundred and thirty-nine feet above tide-water, the outer rim being four hundred and seventy-two feet above tide-water. From this great reservoir or aqueduct can be constructed distributing reservoirs, so that all the cities from Elizabeth to New York could be supplied. Co-operation in this plan was urged upon all the great cities of New Jersey east of the mountains.

The paper was discussed by Prof. Leeds, Prof. Cook, Dr. E. M. Hunt, and others. Prof. Cook, by request, described the course of the Passaic in its variableness of flow. He noted where impurities entered the water, and where supplies of clear water were received. He thought that the future probable water supply of Newark, Jersey City, Elizabeth, etc., must come from the mountains west and north. The hydrant water is impure. He would prefer General Viele's plan of bringing water from Little Falls, if it were not for the long level back of that place, where the water which flows along is filled with impurities. He thought the better plan was to construct reservoirs beyond the level and bring the water over the mountain.

Dr. F. Gauntt, of Burlington, offered a paper on the sanitary condition and types of disease of Burlington and vicinity. He

claimed that miasmatic disease was the natural result of civilization, especially as men congregated near cities were disposed to interfere with water-courses by dams, wharves, etc. Not only were wet places not drained, but the drainage of nature was interrupted. Malarial fevers had prevailed extensively in his own region. More recently a notable illustration had occurred in one section of the value of efficient legislation. A remedy was found through a bill which gave power to commissioners to go upon the drowned lands and make ditches, sluices and drains. The effect is wonderful. $6,000 expended in this way has during the last four years increased the value of our property, and we are enjoying much better health by comparative freedom from malarious disease. It is interesting to know also that about the same time a freshet broke away the dam of the Assiskunk creek and allowed the tide to flow in its own channel. The usual chills and fever now no longer exists along its borders, while before every person within a mile of it was sure of its pernicious influence.

Mr J. R. Shotwell, of Rahway, read a paper descriptive of the effects of the removal of mill-dams in Rahway, which showed what a great diminution of malarial fevers resulted from the change.

The second annual meeting of the association was held September 28th and 29th, 1876, in the chapel of Rutgers College. The session opened with an address by the President, Prof. Geo. H. Cook, Ph. D. The following is a brief outline of the address:

The work of this association is less exciting but not less important than that of the physician, and is well worthy of the attention of every philanthropist. The statistics of Geneva, London and the British Navy show the following ranges:

Geneva, sixteenth century, forty deaths per one thousand; eighteenth century, thirty deaths per one thousand; nineteenth century, twenty-two deaths per one thousand. London, in 1750, thirty-one deaths per one thousand; 1838, twenty-eight deaths per one thousand; 1873, twenty-three deaths per one thousand. The British Navy in 1770 averaged one hundred deaths per one thousand, and in 1840 ten deaths per one thousand.

Other comparisons were made which, although only approximate, showed that the tendency of hygienic measures is to prolong the average period of human life. We recently have been shocked at the Bulgarian atrocities—twelve thousand people having been massacred in cold blood by the Turks; but we have coolly stood by during the past year while, within fifty miles of us, nearly as many and valuable lives have been lost from causes which certainly might have been removed.

Prof. Cook then noticed some of the means by which the death rate had been diminished. Through preventive methods small pox had been greatly diminished. He contrasted its ravages from neglect in our country in some parts, with the deliverance which in other parts results from careful vaccination. Small pox, so common in Ireland, was so much limited by vaccination that in 1863 it was made compulsory. The following statistics are not without their significance:

From 1830 to 1840 the annual mortality from small pox was five thousand eight hundred; 1840 to 1850, three thousand eight hundred and twenty-seven; 1850 to 1860, one thousand two hundred and seventy-two; 1864, eight hundred and fifty-four; 1865, three hundred and forty-seven; 1866, one hundred and eighty-seven; 1867, twenty; 1868, nineteen.

In Copenhagen, after several previous years of compulsory vaccination, there were thirteen consecutive years without one death from smallpox.

The change made in New York and London by the reconstruction of low and filthy districts of those cities was then noticed. The plague had visited London about every twelve years, and in a single century had numbered over one hundred and fifty thousand victims. Although the infection has been frequently brought to London, it has been watched and guarded so that since 1665 it has never gained foothold.

The *collection of vital statistics* was urged, because it would show in time, by hard figures, the causes and courses of disease. Allusion was next made to the importance of providing wholesome drinking water for all.

Many samples of well water have been examined by us which show that the impurity alleged to exist in many well waters is not exaggerated.

Cases near Camden were cited to show how Kensington water had produced diarrhœal diseases. The Professor closed by showing how the average of life could be brought much higher

by sanitary measures instead of being, as it now is, only a little over thirty-five.

The report of the Committee on State Water Supply was made through its Chairman, Professor A. R. Leeds, of Stevens' Institute, Hoboken. Allusion is first made to the several distinct water basins into which the State is divided by the natural lines of demarcation between its water sheds. The character of these water basins needs to be determined:

1. By an accurate hydrographical map upon the basis of a topographical survey.

2. The determination of the rain fall for each water basin, and the number of gallons of water flowing into its several water courses monthly.

3. An examination of the quality of water in each basin.

4. An inquiry into and a tabulated statement of the amount and character of the solution exisiting at present in the water courses of the State. Under this:

(*a.*) The drainage of sewerage along the banks.

(*b.*) Manufacturing statistics, relating to the subject and the proper disposal of contaminatig refuse. Without attempting to discuss or settle these the paper discussed *whether any particular* community has a natural right to the use of the water supply of the water basin in which such community is located in an *uncontaminated condition.* This right is vindicated. The next point is to arrive at a decision "whether a stream, after pollution, can by flowing a limited number of miles in contact with air and growing plants be again made safe drinking water." The report notices the contradictory views of high authorities and shows that in many cases the addition of pollutions does not show contamination down the stream or sickness resulting therefrom. The Passaic river, in New Jersey, and the Blackstone, in Massachusetts, are cited as showing that rivers do have powers of self-purification. Yet this is not always the case and the pollution of the streams which supply water to large cities is an important sanitary question for investigation.

Another inquiry is whether any means, microscopic, chemical or otherwise, exist to discriminate infected and non-infected sewage and if they can be distinguished? The question is not answered.

If sewage and other impurities are permitted to go into a water

supply how much and what kinds are permissable without detriment to health. The report inclines strongly against the pollution of streams, especially those having their exit amid very large cities and insists that Newark, Jersey City, Hoboken, etc., have occasion for earnest study of this subject. It is also urged that there be close study of disease or ill health as related to polluted water supply.

Dr. J. W. Pinkham, of Montclair, followed with a paper on "Wells and House Supply of Water." The evils possible to water in wells and cisterns were briefly noticed. All enrichment of soil by organic matter, and by natural decay or contamination by sewage, by privy vaults, by decaying animals behind stone walls, or from other sources endangers the water supply. We suffer more in low water than when the well is full, since much of the debris finds its way to the bottom and is not uniformly distributed in solution.

How shall a well be constructed so as to avoid or materially decrease the chances of introduction of foreign matter? First, the well above low water should be made of material impervious to water or by omitting part of the wall altogether. The design of this is that it may not act as a drain for the neighboring soil. The wall of the well may be framed from a point two or three feet from the bottom, made of brick with a coating of hydraulic cement.

The earth around should be thoroughly packed so as to prevent the entry of surface waste. To prevent foreign matter getting into the well, you may place a feed pipe in position, arch over the well, and fill the remainder down to high water with earth.

Dr. Pinkham contends that the prevalent notion that a well must be ventilated is not true. The only noxious gases in a well result from the decay of organic matter, which has found its way into the well.

CISTERNS.

Rain water, when collected in cisterns, is liable to contamination from the dust and filth, which collect on roofs and in gutters, or from whatever may get into the cistern besides pure water. The leaders communicating with the cistern should have a shut-

off, so that the water from the roof can be momentarily cut off if desired.

Every cistern should also be provided with a filter. A brick partition modeled in a circular form makes a very good filter. The partition should be carefully built of bricks laid up in cement in such a way that there are no apertures between them. The filter, however, can be made of charcoal, sand or gravel. The cistern, as before, should have a circular partition, but with its convexity toward the smaller compartment, which contains the filter. The first layer of bricks should be laid with space between them. The filter may be made thus: Place in the bottom of this smaller compartment a foot or eighteen inches of charcoal, of pieces about the size of nut coal. Upon this place six inches of ordinary gravel, then six inches of sand, then a foot of coarse gravel. Water passing through is freed of impurities, but this filter will need occasional cleansing. The sand and gravel can be washed and the charcoal by washing and heating in an oven, may be used again.

Cistern water frequently becomes saturated with sewer gas from the cess-pool or sewer. This may occur either from too close proximity or from a connection of the overflow pipe with a sewer pipe. The overflow pipe should either discharge on the ground or into a drain which conveys water only.

G. S. Page, Esq., of Morris county, read a paper descriptive of the head waters of the Passaic river, with especial reference to the great morass of several thousand acres a few miles below its source. Mr. Page advocated a dam twenty-six feet high in Long Hill Gorge, below the swamp, by which its nine thousand acres could be covered to an average depth of twelve feet. This would make the level two hundred feet deep above tide water and Newark, Orange, Elizabeth, Jersey City and Hoboken could have an abundant water supply by gravitation. The plan was regarded as feasible by Engineer Ward, of Jersey City, and Professor Cook, if beside a second reservoir be added below.

VITAL STATISTICS.

Dr. J. L. Bodine, of Trenton, then read a Paper on Vital Statistics. The paper claimed that sanitary science is essentially a science of observation, founded on statistics. It must use the

numerical method of observation, a method widely open to fallacious conclusions, but when rightly used, the basis of all sanitary reform. The past history of disease as shown by statistical returns proves that some epidemic diseases have ceased upon the surrender of the habits of life and the avoidance of the causes which gave rise to them, that others have been diminished and the average of life prolonged.

The researches of Drs. Bowditch and Buchanan as to soil moisture in its relation to pulmonary diseases and of Dr. Snow as to drinking water in its relation to cholera were adduced as instances of the triumph of the statistical method. Its advantages in Great Britain and on the Continent are no longer questioned. The defects in our present State law were then rehearsed and evidence furnished by Dr. Bodine, Dr. Hunt and others, as to the incompleteness and inaccuracy of the returns.

SEWERAGE.

The next paper was by Ashbel Welch, C. E., of Lambertville, on Sewerage. He first raised the question whether animal excrement should not be removed in the same way that animal and vegetable offals are removed. We must not shut our eyes to the fact that sewers are themselves great evils and if imperfectly constructed or badly managed may cause worse diseases than they prevent. The sewer may easily become an extended generator of poisonous and sometimes of deadly gases. The dry air above ground has the chance to dilute and dissipate poison, but the moist air of the sewer is a deadly carrier. Modern improvements are especially convenient for carrying it into the bed-rooms of houses. As many of these noxious gases are lighter than air they ascend to high rooms and to elevations which would otherwise escape. Not only do these noxious gases produce general ill-health or disease, but they also convey some specific poisons and probably originate others. They make many a sporadic disease epidemic. House pipes should therefore not have too close connections with the main sewers. Allusion was made to the poison from sewer gas in a Washington hotel, to diseases which had occurred in Glasgow in houses on elevations since house conveniences had been introduced, and to evils which had been incidental to sewers in Croyden, England, and

in Berlin. Mr. Welch declared bath-tubs, water closets and stationery wash-bowls as now scattered through houses, intense evils. Water traps are unreliable because the water is often blown or sucked out by the pressure of foul gases or the poisons pass through it by being absorbed on the one side and exhaled on the other. The pipes break by imperfect workmanship or become honey-combed by the action of the gases or are too thin or porous at the start. The pipes being difficult of access are not often examined. We may expect in every house with water closets and stationary wash-bowls in the bed-rooms a crop of diseases when the pipes have been used ten or fifteen years. In the wash-bowls the overflow hole constantly open is most convenient for admitting foul air. In 1872 the medical authorities of Edinburgh reported that typhoid fever and some other diseases were doubled in fatality where water closets were used.

Dr. Fergus states that where water closets were used diseases increased four-fold.

Bath tubs are open to similar criticisms, as vehicles for the delivery of foul gases. The author incidentally raised the question whether in bathing all the body at once we do not by shock, by chilliness or by suspending the functions of so large a skin. surface run more risk than when one portion after another is moistened and rubbed. If closets, and bath-tubs, and stationary bowls must be had in connection with the house there should be an annex, with supply and sewer connections and special ventilation. The house chimneys, when used for this purpose, must be warmed so that downward currents shall not introduce foul air.

Kitchen sinks should either be outside of the house or being well trapped open into a box outside and thus keep the sewer gas away from the cooks, the food and the household. Grease-traps should prevent the grease from running into the sewer and thus obstructing the pipe or fouling it. The sinks of course need a grating so that nothing but liquids can enter the sewer. Drainage as distinct in many cases from sewerage was insisted upon where the soil needs it. Dampness helps to carry infection. Cellar drains should never enter sewers. Indeed even for drainage and when there is a drainage system outside and around the cellar walls it is better that the whole inside space

should have a porous, sandy or gravel bottom, covered with cement. Where because of area or wetness the gravel bed and outside drainage would not suffice, we may put tile aside of or under the sewer and have a separate discharge and flushing if need be.

Mr. Welch advocated less reliance on sewers for animal excretions and approves the tub system. The plan to be adopted must depend on localities and circumstances.

In either case there is danger in the long retention of fœcal accumulations. The idea was mooted whether disease germs may not find their way into vegetables, when excretions containing specific germs are thrown upon land.

As sewers will be made, the paper then discusses details as to them. They should be small, for economy, for quick discharge and for self-scouring and because there is thus less foul air to remove in ventilation. They should not be expected usually to carry the storm water. If large and having little flowage, they should be egg-shaped, with the smaller arc downward. Salt-glazed pottery, hard burned is the best material, as tighter and less porous than anything else.

The objection to small sewers is that they cannot discharge the storm water. This can run the streets as in Baltimore, or it can be gathered into large conduits, discharging at several points where sewage would be inadmissable. The double system of pipes for sewage and others for storm water is generally disapproved, but needs studying in the light of locality, natural drainage and declivity. Sewage and even stream beds need a constant and not too sluggish flow. The place of outflow is important. It should not be into a sluggish stream or into one used below for water supply.

VENTILATION OF SEWERS.

The usual street hole ventilator, if near the curb is unhealthy, and in very narrow, crowded streets with lofty buildings, does not suffice. It is shown that meat kept near such openings is much more liable to be tainted. Open ends of sewers do not ventilate enough. Artificial ventilation has not always succeeded. The air should be sucked, not blown through the sewers, because it is easier to move air by pulling than by push-

ing and because this draws fresh air into the sewer through every opening, and sends the foul air where you are drawing it to instead of everywhere. The current, except at the ventilators, should be into the sewer. The rarefaction in the sewer should not be so great as to hasten the vaporization of noxious matters and enable the bad gases to spread rapidly even against a current. Mr. Welch then exhibited a plan by which the suction could be made cheaply and effectually. Pipes pass from the sewers into a chamber which has the heated air and flame from a self-heating stove. The heat moves the air in the sewer and helps to destroy germs. A high chimney passes from this chamber so that the foul and heated air thus drawn out is sent above the roofs. It is the application of the principle of an aspiratory chimney to each house. In all these improvements now-a-days we suffer more by unwise and dishonest expenditure than by *necessary* cost.

SCHOOL HYGIENE.

H. B. Pierce, Superintendent of Schools in New Brunswick, read a paper on School Hygiene.

Light, ventilation and heating were presented as claiming far more attention than they have received. Belgium with its model school douse at the Centennial had presented to educators an object of great interest. Pure air is introduced near the base of the wainscot around the sides of the rooms, and by an arrangement over the doors and the windows. Foul air escapes through registers in the floor which open with ducts that lead to a patent stove, from which it passes out through the smoke-flue. The foul air near the top of the room passes out through apertures in the ceiling. Valves for the admission of pure air or for the escape of impure air are under the control of the teachers. In no case, it is claimed, is draft permitted to reach the pupil. The Belgian law requires all school houses to be built on this model.

As to heating, most of our school rooms invert the order of cool heads and warm feet. Often with the temperature at 42° at the feet it is 60° at the head, and the pupils then huddle to the stove and roast and freeze by turns. Where hot air comes from the cellar it is often impure, dusty and with too hot a draft.

As a supplement to that of Mr. Pierce, Dr. H. R. Baldwin read a paper on the subject of *contagious diseases as occurring in and propagated by schools.*

All transmissible disease to which children are liable we include under the term contagious. While children are subject to many inflamatory diseases, to febrile disorders, to local skin diseases and various disorders of nutrition, and to nervous diseases, too often overlooked as fostered by our schools, these communicable diseases need especially to be studied and guarded against, as spread by the assemblage and association of school rooms.

Parrigo Tinea favosa or scald head, mumps, measles, scarlatina, diphtheria, chicken pox, small pox, and whooping cough were especially referred to.

The duty of parents and teachers is to guard against the spread of these. They spread chiefly by the attendance of children from families in which at the time known cases of the disease exist; by too quick return to school of those who have been sick, or by the wearing and use of clothing not thoroughly cleansed and aired.

In New Brunswick a recent epidemic of diphtheria seemed to have been greatly spread by a school. Parents and teachers must be sensitive in observation and guarded in isolation and see to it that proper precautions are used.

The report of Dr. E. M. Hunt, the Corresponding Secretary, gave an outline of the State correspondence for the year. In each county a competent person had been requested to inform as to the general health and any local causes of disease. Communications had been received from many counties and from several cities full reports were given. Those of Newark, Trenton, Camden and Passaic, were among the most important. Replies were given in answer to a series of printed questions. Great defect in sewerage is noticed not only in Newark, but in such towns as Orange, Bloomfield, etc. Not enough attention is given to saturated soil and stagnant water and hence preventible disease occurs.

The water supply of Newark is not satisfactory. In Essex county a disease among hatters is noticed as occuring from the use of mercury in preparation of the stock. Trenton is favorably situated for surface drainage. It is not properly provided with sewers or other methods for preventing the storage of animal

excrement. Miasmatic disease prevails much along the banks of the Delaware. The Seventh ward, which has a hard clay subsoil and is badly drained, suffers most.

In Hightstown there had been much prevalence of malarial and typhoid fevers and of zymotic or contagious diseases. Defective drainage, imperfect sewerage and neglect as to local evils are claimed.

In Passaic there had been an unusual amount of intermittent and remittent fever, consequent upon the draining of a large pond in very hot weather. The need for sanitary authority has we believe since been felt in regulating the health of the city.

In Camden the local difficulties are imperfect drainage, culverting and imperfect erection of buildings. Some of the factories are regarded as detrimental to health. Since some improvements have been made in the drainage of the city there is manifest decrease of miasmatic disease.

Newton, Sussex county, reports itself as a region of lung diseases. There are some evidences that the wells are not always good, and butter working on a large scale as at present conducted is said to be injurious to the health of those in the milk houses and factories.

In Hackensack, Plainfield, Raritan, Rahway, etc., there are the usual complaints as to the existence of local and avoidable evils.

In a review of all these reports it is very evident that most of our towns and townships lack information and intelligent supervision in sanitary matters. There is often acknowledged imperfection of sanitary methods, but little of that co-operative work which insures systematic and effective dealing with the evils. Some of our cities have organizations more or less effective and some smaller towns like Montclair have taken the work in hand with commendable foresight. Such a system of statistics as shall be informatory and such definite local enactments as shall reach special needs are yet to be devised.

The third annual meeting of the Association was held at the School of Science, Princeton, October 17th and 18th, 1877.

SCHOOL HYGIENE.

The Committee on School Hygiene reported through two of its members. The Rev. C. L. Brace as Chairman, after reckoning the importance of the subject by the number of children and the magnitude of the interests involved, proceeded to state the several particulars which most demand attention, and to specify what seemed most desirable in respect to each. Locality should be chosen with reference to healthfulness of ground and without too close proximity of other buildings since light, free air and freedom from noise are so desirable. He approved the suggestion of Olmsted that the corners, not the sides, should be to the cardinal points of the compass, so that the sun's rays would reach every window at some period of the day. Buildings should be not more than two stories high, with rooms for not over fifty pupils. Air space as well as floor space must accord with the amount claimed by standard authorities.

Windows should have blinds on the inside by which light could be regulated. The sash should not be nearer the floor than four feet, but reach nearly to the ceiling. No window should be placed in front of a scholar.

Desks must suit the size of the pupil and also should vary in angle somewhat, according to the work at which he is engaged. The subject of ventilation was fully presented, with the usual facts as to the amount of change of air required.

If furnaces are relied upon for heating great care must be had to avoid red hot cylinders or stoves with badly constructed joinings. When exit pipes are provided for the discharge of used up or foul air, we must be sure that their temperature is such as to secure an upward draught. A central foul air flue inside of the chimney often answers a good purpose. When steam is used steam-coils in the escape flues accomplish the same. S. B. Ward, C. E., has suggested that steam radiators be placed under and in front of each window, there being placed over the radiator and extending to the window sash a marble or other shelf, with a space of three or four inches between it and the bottom of the window. The theory of this is that by raising the lower sash its edge thus coinciding with the shelf in height a strong current of cold fresh air flows in over the radiator, is warmed and diffused through the room.

If stoves must be used, they should be of sheet iron with a brick lining. A stove after the plan of Mr. Stuart's, as described in the "Sanitarian," was advocated as a means of carrying off impure air.

Mr. George Pressey, of Hammonton, has successfully in use a modified method.

The rooms of the High School, in Hammonton, are relieved of their impure air by a box seven inches by eighteen, leading into the chimney by a duct under the teacher's platform. This box is closed by a slide until the fire is made in the stove, when it is opened, the air is carried out, especially the lowest stratum.

The method of introducing air into the Hammonton school building is also described and highly commended. The stove is partly inclosed with a sheet iron case, extending to the floor. Between the case and the stove an opening is made in the floor, fitted with a register about twelve by eighteen inches. This leads to a box placed between the floor and the ceiling, that runs out between two joists to the side of the house, where it is protected by a screen. When the stove is heated the register is opened and the air rushes up coming in contact with the stove and ascends to the ceiling, then makes its circuit through the room, and comes down and passes out through the duct under the teacher's platform. It is important at recesses always to flush school rooms with pure air from open windows, even at the loss of some heat.

The subject of Humidity in its relation to school-room temperature was discussed, and the importance of attention thereto fully illustrated.

Laban Dennis, M. D., presented a paper on the same subject. He noted that within the school age are embraced two hundred and ninety-seven thousand persons, or about one-third of the population of the State. They thus exceed by fifty thousand those engaged in mechanic arts, and fully equal the numbers employed in any two of the great classes of occupation in the State. There are no gatherings of individuals in the State that approach in magnitude or importance to those assembled daily in our schools.

The paper then treats in order of the various subjects: (1) of location; (2) construction and outbuildings; (3) light; (4) ventilation; (5) heating; (6) furniture; (7) discipline; (8) personal habits; (9) physical exercise.

All these matters should claim the attention of every citizen and of every physician. But especially must we insist upon instruction in the schools themselves. Beginning with our primary schools and reaching through our highest institutions of learning, there should be regular, systematic and scientific instruction either didactic or practical in anatomy, physiology, hygiene and general sanitary science. This should be made obligatory. Life is the first and greatest subject of secular instruction; how to preserve, protect and prolong it, how to surround it by such influences and circumstances as to contribute to the development of those noblest of God's creatures, types of perfect manhood and womanhood. Allusion was made to the neglect of this department in the otherwise excellent schools of Newark.

Great encouragement is to be derived from the fact that the pupils themselves become ardent helpers. It is a study in which they delight and which introduces them to the whole domain of natural history. If the sentiment and effort of all now aroused could be combined in fifteen years it would revolutionize our systems of education, add greatly to the sum total of human happiness and save thousands annually from premature death.

VITAL STATISTICS.

The report of the Committee on Vital Statistics was made by Dr. Bodine, on three points, as requested by the Council:

First.—The history of legislation in New Jersey on the subject of Vital Statistics.

Second.—A discussion of methods of obtaining these statistics in other States.

Third—Suggestions of improvements desirable or obtainable in the registration of these statistics in this State.

The paper recounted the various steps of legislation in the past. Reference was made to the methods adopted in Great Britain and in our country, chiefly in the States of Massachusetts and Michigan. As to improvements in our State methods, the writer doubted the practicability of the attempt, not because it

is not eminently desirable, but because the knowledge and appreciation of our citizens is not sufficient to secure intelligent legislation.

STATE WATER SUPPLY.

The report of the Committee on Water Supply was made by Prof. A. R. Leeds, of Stevens Institute, Hoboken. The report was divided into two parts. The first notices the various water basins or water sheds into which the State is divided. The Hackensack basin of about one hundred square miles; the Ramapo, one hundred and forty-eight; the Kingwood, one hundred and eight; and the Rockaway, one hundred and sixty-five, are examples. As a specimen of amount carried, the drainage of the Hackensack basin is fifty-two billions of gallons annually. The relation of these to the water-supply of cities to manufacturers and to deposit of refuse was then traced, and the figures of L. B. Ward referred to as showing the bearing of all these upon health. As an instance, in making wool into fine cloth it passes through forty steps, in ten of which water is used, and some of the impurities are putrescible nitrogenous matters of the most dangerous kind. While manufacturies are to be aided, water contamination must be carefully guarded. Our great water sheds end abruptly in alluvial levels. Those high up upon them think nature designed them for mill sites and to carry off sewage. Those lower down in the great cities want them both for water supply and for sewers. Besides the great forests of our mountains help to make ozone and good air, but these are being rapidly removed. The report described the process by which the rain, the leaves and the atmosphere are at work in the great alembics of the hills, to distil pure water and pure air for the plains, and how this is disturbed, so that our crowded and populous cities toward tide water are robbed of the life forces. Malaria and confervoid growth takes the place of natural equilibrium and aeration and oxidation are disturbed. Sickness comes, but the scare goes over and the rivers cleanse themselves again in time for some chemist to assure the people that the water is good, and sewage does no harm. The paper then speaks of makeshifts for evils, such as the present plan of a dam across the Passaic at Belleville. It then refers to the hope

of an ultimate water supply derived directly from sources high up in these water basins, and to such utilization or disposal of sewage as will prevent the fouling of water courses. Reference is made to the annual report of the State Geologist of 1876, as giving a valuable summary of facts.

The second portion of the report examines in extenso the fish epidemic of the last Summer as affecting certain streams. All sorts of explanations were given of it, by the papers until finally it was attributed to the washing in of Paris green intended for the Colorado beetle. An interesting letter from the Fish Warden, J. C. Roe, attributed it to the low water and drought. Professor Leeds visited Paterson and made some examinations of the water. The low water and warm weather had produced large quantities of aquatic plants of a low order of vegetable life. After reviewing various opinions he presents the hypothesis that the mortality resulted from intense heat upon the river beds bare or slightly covered with water, and the rapid production of vegetable organisms more particularly spores, poisonous to fish life. Also by the organic impurities thus mingled with the water, the supply of dissolved oxygen in the water is diminished so as not to leave enough for the fish. The floating algæ on the surface would also interfere with æration. At the same time there would be an increase of foul gases inimical to life. Professor Leeds gives most prominence to the last or deoxidation theory. The condition of heat, dryness, etc., did not continue long enough to pollute the waters far below. Plant and fish life have much to do in aiding us in determining the state of the water supply. Disagreeable taste and odor are sometimes given to water for a time as especially by the odor of plants of the order *Nostochineæ*. Some interesting facts were given as to the tracing of various tastes and smells from plant-life or plant decay. Professor Cook exhibited a specimen of water thus affected, which was very disagreeable, to a plant of the wild turnip species, but not yet proven to be harmful. Various other plants were referred to as identified in giving peculiar odors in their decay, and some as producing bacteria. Questions of water pollution and purification are closely connected with all these points.

Professor Leeds then traced the improvements made in chemical analysis of waters, but deemed these not sufficient alone. A report as to one of the rivers of France shows how important a

test is afforded by animal and plant life as well as by the chemistry of waters. He gave his preference to the "combustion process" for determining the nature of organic matters present. The determination of the amount of dissolved oxygen present is of much sanitary importance. The chemist, the botanist, the microscopist, the biologist, are all needed in studying water supplies.

WELLS.

The paper on wells by Prof. H. B. Cornwall, of Princeton, discussed the various chemical methods of testing waters, and the need of careful comparison of results obtained by different processes. Several actual analyses were furnished. The value of cisterns and the feasibility of the use of small cisterns for drinking water where the character of ground supply is doubtful, was shown.

Prof. Cornwall has extended his study of this subject in a paper contained in this report.

STATE DRAINAGE.

Prof. Geo. H. Cook presented some notes on the subject of State drainage. He argued and illustrated both its pecuniary and sanitary importance, illustrating his subject by detail as to the history of the great meadows on the Pequest river in Warren county. His delineation of the change which is taking place by reason of the deepening of the outlet some five or six feet, was of the most satisfactory kind. Already growing crops attest the value of the reclaimed lands, and thousands of acres will be added to the productive territory of the State. Prof. Cook rightly claims that not all the cost should fall on the immediate land owners, as the whole adjacent region shares in the benefits.

SEWERS AND SEWAGE.

The report of the Committee on Sewers and Sewerage was made by Dr. H. A. Hopper, of Hackensack. The first proposition of Dr. Hopper is that drainage and sewerage must be distinct.

Sewers must have solid masonry, free of leakage and must not let in sub-soil contaminations. There must be proper descent. He gave his adherence to pipes of only sufficient instead of large calibre. He advocated ventilation by flues along side of chimneys in houses, both for the main sewers and connections, and objected to so numerous street openings. Mr. Ward, the other member of the committee, did not see how we could dispense with street openings. There must be abundant water for flushing. The opposite views of Letheby and Frankland as to water pollution of rivers was discussed. Water traps and sewer gas as the result of obstructed decomposition were noticed. The present out-door water closets were unequivocally condemned. The earth system is capable of greatly modifying and improving it. Four and one-half pounds of dried earth suffice for each person.

As to the disposal of house sewage in towns and rural districts the views of Waring, Town and Bayles were discussed and doubts expressed as the availability of Waring's system of sub-irrigation in cold climates. Letheby also thinks that vegetables raised on such soils may convey the ova of parasites and cause entozoic diseases. Water cresses, celery, lettuce, etc., eaten in a raw condition are especially objected to. Mr. Bayles asserts that he has seen carrots raised on such saturated soil, noxious both to taste, smell and appearance.

A paper on Sewerage as had been requested at the former annual meeting, was then read by Col. R. S. Swords, of Newark.

The paper of Col. Swords gave the early history of sewers—referring to Assyrian, Jewish, Roman and other authorities. The drainage and sewerage of houses, of towns, and the disposal and utilization of sewage matter were consecutively discussed. The drainage of the houses should be so good that the cesspool should never exist as a storehouse for filth. The movable closet and water-tight receptacles should be used, contents being frequently removed. They should be deodorized by charcoal, dried peat mixed with sulphate of iron (copperas), or other cheap material, and be utilized for agriculture. Where house drains are necessary, they must be kept away from wells and cellars, and empty, if possible, from a slope through close jointed, and never less than four inch pipe. The main drain pipe should be trapped outside, near the house. The Soux earth

closet was recommended for family use, and the benefits in health illustrated by cases.

The London and Paris sewer systems were noticed in detail, as well as the history of the sewers. The description of Victor Hugo of the old Paris sewer was given, and believed to be founded on fact. The sewers of London so stagnated the Thames that Franklin, one hundred years ago, inquired, "Does the water of the Thames return to the sea?" The present system, that of Bazalgette, secures the drainage both of rain-fall and house sewage, and is carried into the Thames twelve and a half miles below the city, and through reservoirs let out at a proper state of the tide. The benefits of sewers were illustrated by improved health rates, and the remark of Dr. Farr quoted, "That it is as certain that a high mortality can be reduced by hygienic appliances down to a certain limit, as it is that human life can be sacrificed."

The separation of drainage and sewerage and of animal excrement from all household sewage was advised.

The various plans of utilization and disposal of sewage were then noted, such as Filtration—simple subsidence—Irrigation, Downward Filtration and the Liernur or Pneumatic system. There must be more attention to utilizing excrement and where cess-wells are used they should be as tight as cisterns.

The Fourth Annual Meeting, at Stevens Institute, Hoboken, opened with an address by Prof. A. R. Leeds, Ph. D. He made a rapid survey of the progress of sanitary science, and insisted that most of the work could be better done by States than by the General Government. Vital statistics were claimed as the foundation stone of exact sanitary science, and the progress therefrom illustrated in detail by a review of the New York City methods. Our own system, as recently adopted, was highly commended—the importance of registration of disease urged. The relation of sanitary science to education was unfolded and detailed facts given as to the model method pursued at Amherst College. It is not a mere gymnastic system, but a professorship in which physical takes its place by the side of intellectual and moral instruction. The bearing of invention on sanitary science was illustrated by the effect which the electric light might have, on questions of heat or ventilation. The need of close sanitary

surveys was shown, and the survey of localities now being conducted under the patronage of this association warmly commended. Experiments upon the composition of the atmosphere of different localities were claimed as of great importance. In England the government has appointed Dr. Angus Smith as Air Inspector. In Glasgow a City Analyst has been recently appointed with this special duty. New York is already showing the effect of the sulphurous and nitrous vapors sent out from its myriad chimneys. In Philadelphia there is scarcely a house front which is not disfigured by some stain of magnesia and lime salts, a result in part due to the acid vapors in the atmosphere. Ozone is an important constituent of the atmosphere, but the percentage present is difficult of test. For many months past important experiments as to it have been in progress in the laboratory. We are seeking to make contributions toward a chemical climatology, which is greatly needed to supplement and assist meteorology, agriculture and the study of disease.

PHYSICAL TRAINING.

The next paper, by J. Madison Watson, A. M., treated of the hygienic relations of physical training in schools and colleges. He noted the excellent theories which obtained as to the need of developing the body with the mind, and the sad contrast in practice, presented by modern methods of education. There must be created a public sentiment for educational gymnastics. But when other difficulties are removed, the system of gymnastics so carefully and ingeniously elaborated by the French and the Germans, and usually employed in this country, involving the use of fixed apparatus, presents many obstacles that render its general adoption almost impossible. He did not condemn heavy gymnastics, especially when taught by a suitable instructor. But we seem to have been formed less for bearing herculean burdens than for the vocations which require flexibility, poise, grace, ease, rapidity of muscular action and a general diffusion of muscular vigor.

What has been necessary in order to render physical culture universal, is an extensive and varied system of light gymnastics, both with and without apparatus, well adapted to all places, ages and conditions of life. The primary office of school calis-

thenics is to beautify and strengthen the body by pleasurable exercises which shall develop, regulate and perfect its parts. It is mainly recreative, giving relief to the mind while gratifying the physical sense. It is to be sharply separated from care, brain-labor, ailments and disease. Hence, *first*—an essential element of success and such a natural, systematic and logical arrangement of the subject that each position, each class of movements shall suggest what is to follow without taxing the memory or other faculties situated in the cerebrum. *Second*—a simple, systematic and complete series of commands is essential. *Third*—the movements must have not only a determined form and order of execution, but a determined time, the rhythm or division of which shall be well established in the mind. Musical gymnastics and all modes of marking time should be used. There are six varieties in counting, five in recitation, and six in music and in phonetics. Vocal gymnastics, of which so little is known, either theoretically or practically by the masses, is transcendently interesting and important. During the use of light indoor gymnastics the air of a room can be changed without risk to the pupils. Gymnastics must never be used as a substitute for play. Do not attempt to suppress the animal energy and unharmed enjoyment of your vigorous child, be it boy or girl.

Educate highly, the higher the better, so that you educate symmetrically; but do not defeat the chief end of your noblest efforts by producing physical degeneracy.

The question of compulsory education, confined strictly to the intellectual faculties, is one of grave doubt; but our sanitary material, and military interests imperatively demand the best system of physical training in all schools, and corrective institutions that are sustained, wholly or in part, by the State. The graduates of normal schools, and the public teachers, must be proficients in gymnastics and successful physical trainers of youth.

All schools, both public and private, by legal enactment, should be subjected to the ablest medical supervision.

Our ideal instructor of youth is one who most successfully prepares the student to satisfy, unaided, all the requirements of life; our ideal physician, one who so regulates inherited and other defects, and promotes the health of those under his practice, as most successfully to avoid the need of remedies for disease.

J. T. Hilton, City Surveyor of Paterson, then treated of the construction of sewers.

First of all, there must be study of each locality. In the size and shape of sewers we must be governed by the material of which they are made and the amount of liquid to be carried. The egg-shape is preferred, as the concentration of the water in the small space at the bottom prevents the accumulation of sedimentary deposits. As the country is subject to violent storms, the basis of one inch rain-fall per hour as the maximum fall, as given by English authorities, will not suffice where the sewers need to carry storm water.

None of the sewers we construct are of a less grade than two-tenths feet per one hundred. If we cannot get the required ten feet depth at this grade, we take less rather than get below this low gradient.

By a diagram a method of sub-drain was shown. The cost is but 12 per cent. additional. If more generally understood this would probably end the discussion as to the availability of the same conduit for sewerage and sub-drainage. Attention was called to an important improvement for tight joints in pipe sewers known as "Stanfords Patent Joint." It seems to afford a tight joint without the use of cement. What we want in construction is good material and workmanship, true grades and tight joints, with the sub-drainage separated from the main flow of the sewage. The subject of house and basin traps is discussed, the former meaning those between the main house pipes and the outside sewer, and the latter those of bowls, closets, etc. For the former, preference is given to traps without valves, with two apertures for ventilating pipes, which help the efficiency of the trap and ventilate the sewer. A perfect house trap will prevent obnoxious gas from passing beyond the cellar walls. Much depends upon the proper placing. Our great danger in basin traps is the siphoning of the water.

It is due to two causes, the lodging of solid matter in the trap and more frequently by a heavy draught of water passing through them and a possible suction from the main sewer, a vacuum is created which exhausts the water from the bend.

For the ventilation of sewers free openings into the streets

and house pipes, connecting with the sewers and extending to the roofs, are advocated.

Instances coming under his own observation are given where sewer air was being directly driven into houses.

The paper of Professor H. B. Cornwall, on Springs, Wells and Cisterns, discusses the sources of water supply and how best to protect them from contamination. It does not admit of such condensation as to be of service. Some of the more important suggestions will appear in our report in another form. It is due to all the authors of these various papers to say that this outline deals only with the conclusions of most practical utility, and omits the larger portion of papers, all of which are worthy of preservation in their finished and original forms.

VETERINARY REPORT.

BY J. C. CORLIES, D. V. S.

The State Board of Health, in its effort to ameliorate the sanitary condition and subserve the best interests of the State, early foresaw the necessity and importance of including in their annual report the live stock of the State. With that object in view an article appeared in the last regular issue, stating that as soon as it was possible a Veterinary Department would be added to the Board, whose duty would be to carefully look into the past and present sanitary condition of the live stock, and report upon the same. The importance of this step cannot be over estimated. The suffering animal creation calls for aid, and to the skilled Veterinarian must we look for assistance. Note first of all the fact that we have in the United States, at the present writing, no less than—

Horses	10,500,000
Mules	1,700,000
Milch Cows	11,500,000
Cattle	19,250,000
Sheep	35,740,000
Swine	24,135,000
Making a sum total	102,825,000

These animals aggregate the vast sum of $1,696,620,750, to say nothing of the great number of valuable dogs requiring medical attendance. When we consider the amount of wealth invested in this shape, we must appreciate the laudable efforts put forth, not only to ameliorate the sanitary condition of the same, but to secure to our own State, through her live stock, a great material interest.

VETERINARY SCIENCE.

There are at the present time less than two hundred skilled veterinarians practicing in the United States; one to every one

hundred and fourteen thousand one hundred and twenty-seven animals; and in our own State but three or four, with room for at least two hundred. In lieu of skilled talent, stock raisers are required to employ stablemen and quacks, who know little or nothing of the many diseases they are called upon to treat. To this fact may be attributed the low estimate in which the veterinary profession has been held in the past, and we are reluctantly compelled to acknowledge, is being held by the public still. What we need is more educated veterinarians distributed throughout the country, as the past has satisfactorily proven that skilled talent, though having many obstacles to overcome, is being felt and generally appreciated.

When we consider what has been and what may follow one of those terrible visitations, that have from time to time invaded European countries, in the form of pleuro-pneumonia, foot and mouth disease, rinderpest, anthrax fever, and many other contagious and infectious diseases, who are we to look to but the man skilled in the use of veterinary means and medicine. We are informed that during the last century in Europe no less than two hundred million animals died of rinderpest and foot and mouth disease. To veterinary science alone is due the fact that its opportunities for extension have been so largely checked. The English government wisely saw the importance of appointing skilled veterinarians as commissioners to look after their live stock interest. Should not we, the great American people, second to none in the number of our live stock, profit by their example, not knowing how soon the same scourge may visit our continent? It is not only a necessity but a duty devolving upon us to foster veterinary schools, and urge upon our young men seeking a professional education to embrace a favorable opportunity and be prepared to prevent fatal disease, and thereby become public benefactors.

Up to 1864, although abortive attempts had been made both in Massachusetts and Pennsylvania to establish veterinary schools, there had been no regular lectures delivered. At this time the New York College of Veterinary Surgeons commenced a regular course of lectures, with a full corps of professors, and with seven students attending. The institution continued to flourish up to 1874, when owing to internal dissensions the doors closed, and the College shared the fate of

its predecessors. Soon after a part of the faculty, with Dr. Alexander Liautard at their head—he having in the meantime procured a suitable building—associated themselves together, procured a new charter, and brought into existence the American Veterinary College. Too much praise cannot be bestowed upon the members of that faculty for their laudable efforts, and Professor Liautard more especially, whose zeal and fidelity to veterinary science entitles him to rank as the father of veterinary medicine in America. A Frenchman, who graduated with honor at Alfort, France, in 1854, he came to this country in 1860, and was associated with the first efforts to give to our, his adopted, country that veterinary science and art of which she stood so much in need. He has continued ever since to work zealously and indefatigably, spending the best years of his life and much money for the promotion of veterinary science. To-day he has the proud satisfaction of witnessing the flattering result of his tireless efforts. Strange though it may appear that the two great English speaking nations owe whatever progress they have made in veterinary medicine to Frenchmen. England honors her Bell, and America her Liautard.

The importance of veterinary medicine is being felt all over the country. Agricultural societies, extensive stock raisers and others are becoming deeply interested, feeling that they cannot longer afford to risk their valuable herds to the frequently occurring epizootic and enzootic plagues that so often decimate their ranks, without some avilable means to combat their influence.

No branch of science presents a wider field and offers greater facilities for investigation and experimentation. Physiology yet in its infancy owes much of what it is to veterinarians and veterinary science. Experiments performed on the lower animals have been the direct means of adding greatly to our knowledge of that most important of all physical studies. An animal becoming unfit for further use may be utilized, and it should be the duty of the veterinarian to report the result of his researches to not only his own but the sister profession. Operative surgery likewise could receive a stimulus, and perhaps advance by first performing important operations on the lower animals, and reporting the results. The operation of tenotomy now being so generally employed, and with such happy results, was first performed on the horse, and there is no reason why other opera-

tions equally as important should not follow. It likewise offers excellent opportunities for the study of pathology and morbid processes, while our knowledge of the action of special remedies has been largely gleaned from their having been first administered to the lower animal. We feel it our duty to earnestly impress upon all veterinary practitioners the importance of utilizing these excellent opportunities by deep scientific research, and by so doing aid practical medicine and surgery as well as reflect credit on our profession.

SOME OF THE CHIEF EPIZOOTICS OF CATTLE.

The most prominent is pleuro-pneumonia. We find it first made its appearance in this country in Brooklyn, in 1843, and in New Jersey in 1846. Dr. Chas. Michner, who has given the subject careful attention says, "it first broke out in 1847, in the herd of Mr. Thomas Richardson, he first finding it among his imported stock, and knowing its malignancy, immediately resorted to occision, at a very great sacrifice, thereby stamping it out. Again, in the Summer of 1855, (six years before it made its appearance in Massachusetts,) J. L. Jacobus bought twenty head of cattle in New York, which he turned into pasture three miles from Chatham, N. J. In about three weeks, in going to look after the herd, he found two had died, and three more were very sick. The remaining fifteen did not develop the disease. At about the same time, Dr. Munn, of Chatham, N. J., purchased some cattle from an apparently healthy lot, which he yarded with his other stock, when the disease made its appearance among his other cows, some of which soon died. From Dr. Munn's herd the disease was communicated to that of Mr. Lunn, who also lost several animals. Mr. Abraham Johnson, living near Newark, also purchased some cattle in New York which developed the disease in a short time after he brought them to his farm."

Dr. Michner informs us it was on this farm the first scientific post-mortem examination was made, being conducted by Dr. C. C. Gryce, of New York, in the presence of several physicians.

In 1843 there came from Europe in a steamer, a cow kept for the purpose of supplying the passengers and crew with milk. Upon arrival, she was sold in Brooklyn, where she went into a stable

among a number of other cows, some of which soon presented unmistakable signs of malignant pleuro-pneumonia. As they were diposed of to the butcher the malady did not spread. That case marks the advent of the disease in the United States. We are informed it made its advent into Camden county in 1858, and into Gloucester, in 1859. At that time it was raging extensively in Massachusetts. Mr. J. E. Hancock, of Burlington county, bought some cattle in Philadelphia, in 1861, which introduced the disease in his herd.

An outbreak occurred in Clinton, N. Y., in August of 1877. A Mr. Cramer bought a cow from a car load that came by rail from Ohio to New York, from whence she was shipped to Clinton. This cow soon sickened and died, and though no post-mortem was made, it was believed that she died of malignant pleuro-pneumonia. From that time the disease began to show itself. Out of J. C. Cramer's herd of forty-two head, twelve died, five got well under treatment, and fourteen were destroyed before they had time to develop the disease. The disease was communicated to cattle belonging to Michael French, by pasturing in a lot adjoining Mr. Cramer's, eight of which contracted the disease and four died. Several others likewise lost more or less at the time. It is believed that the disease has not been entirely eradicated, and is liable to break out at any time, notwithstanding energetic and severe measures were adopted.*

In 1873 it visited several farms in Burlington county, causing a loss of one hundred head, where it was introduced by cattle from Pennsylvania.

In 1871 it appeared in Ocean and Camden counties, causing great loss.

In 1872 it appeared in Essex and Union, where it decimated many herds, and where it has existed to a greater or less extent ever since. While the malady was raging so extensively in Massachusetts, the Legislature wisely passed an act providing for the appointment of a commission of three, with power to slaughter all affected cases, and cause all places where it had existed, to be disinfected, and the slaughtered animals to be appraised and paid for by an appropriation from the Legislature.

"The earliest traces of this malady seems to place it in Central Europe, but nothing definite is known of it till 1769. From

*See American Veterinary Review.

that date down to 1789 the malady appears to have been confined to the mountainous regions of Switzerland (Fleming) but the increased commercial relations of countries soon carried it to other districts. It invaded Prussia in 1802, and soon spread over North Germany, reaching Great Britain in 1841, and the United States (Brooklyn,) in 1843," New Jersey in 1846, and Boston in 1859.

Its character is that of a specific contagious disease, peculiar to the bovine race, and wherever it appears it causes an immense destruction of life. It usually appears as an epizootic or enzootic. It is thought that as a rule young and plethoric animals succumb to its ravages first. It may terminate in death, or partial recovery in favorable cases. Convalescence is slow, and the cough will last for a long time.

"The infecting principle of the disease is fixed and volatile, and exists in its greatest intensity in the air expired by the sick animals, and probably in the secretions and excretions, and the air may carry it a distance of three hundred feet. The vitality of the virus is very tenacious, often retaining its virulence for a period of one hundred days." The mode of infection is through the respiratory passages. The incubation period has not been settled. Some authorities say it may exist in the system in a latent form for six or seven months. Its mortality may be computed at fifty per cent.

SANITARY MEASURES.

Our object should be to adopt measures to prevent its spreading to districts where it has not appeared, and to eradicate it in localities where it has already manifested itself. When it has made its appearance, no pains should be spared to inform cattle owners of its presence, who should at once resort to every available means to prevent its further spread. The infected animals should be slaughtered and buried with due precaution, so as not to be unearthed by dogs. Animals suspected should be quarantined.

A good deal has been said about inoculation. This question we shall discuss at some future time. The operation consists in taking some of the serum from a diseased lung while in the first or febrile stage, (the animal being destroyed for the purpose,)

then make a small incision in the lower extremity of the tail, introduce a few drops of the serum and apply a bandage for a few days. If the operation is successful, in about a week to ten days there will be observed a slight constitutional derangement, with swelling of the tail at the point of incision. The only inconvenience following the operation is a loss of a portion of the tail in about ten per cent. of the cases operated on. Of all the diseases which infest the bovine species in this country this is the most to be dreaded. Too much importance cannot be attached to the necessity of guarding closely all thoroughfares by which it may enter a district. Occision and inoculation being the only means by which its spread may be arrested, it is incumbent on the Legislature to enact a law making it incumbent on stock raisers to have their animals examined by an expert, who should be appointed by some delegated authority, and who should be invested with power to exercise occision or inoculation, as the circumstances might demand, and by that means the malady could be kept in check. Next to pleuro-pneumonia, no other disease is so fatal or causes so much apprehension as

SPLENIC OR TEXAS FEVER.

It is an enzootic disease, the pathology of which is now well understood. That it is of an anthroid nature we have little doubt, and not of a malignant typhus or typhoid nature as has been claimed by some. It seems to be exclusively American, originating in Southern cattle, and transmitted to others by direct contact. In 1868 it led to serious trouble, and came near causing a suppression of cattle traffic between the Gulf and Northern States. The disease presented a decidedly striking difference from that which anthrax presents in Europe. A peculiar feature of the malady is that an animal may seem in perfect health at night and be found dead in the morning, the symptoms never being marked and causing but little apprehension. After death, and in making a post mortem examination the only marked pathological lesion is found in the spleen which is found swollen to three times its usual size and of a dark color, and usually with its capsule ruptured. When an animal becomes affected it will seek seclusion by keeping from the rest of the herd, become

stupid, suddenly fall down and die without a struggle. Decomposition quickly follows. The New York Commissioners' report of 1868 says, we have not heard of a single case in any animal that has not been in contact with Texas cattle, or their excrement. The affection is communicated through the medium of the excrement. Animals contracting it from Southern cattle do not communicate it to other natives. The virus appears to be eliminated from the system after a few weeks spent in a Northern climate. It has an incubative period of two weeks; though it may be extended to as many months. The winter is unfavorable to its development. That it is a source of serious apprehension is sustained by the fact that in 1872 the mortality in three Western States alone amounted to twenty thousand animals. As in pleura-pneumonia medicine proves almost inert, but much may be gained by a well regulated sanitary police. We occasionally see or hear of a case but to what extent it now exists we have no means of knowing.

APHTHOUS FEVER,

Known as foot and mouth disease, is a form of vesicular fever. It comes into this country from Canada, where it has been carried from diseased cattle brought from England. But little is known of its early history. It is an aphthous (or eruptive fever), epizootic and contagious, affecting the skin and mucous membrane of nearly all the domestic animals. We are, from our limited knowledge of its pathology, unable to account for its causation. It is characterized by an eruption of vesicles in the mouth, and interdigital spaces of the hoof. The thermometer indicates a rise of temperature, which may run up to 104° or 107° Fah. The animal refuses to eat, saliva falls from the mouth with grinding of the teeth. When the feet are affected the weight will be frequently changed from one to the other foot. With a short, jerking motion, the animal will stand for hours refusing to use the sore feet. When the mouth is affected there are seen on its lining membrane, gums and tongue, small white ulcers the size of a pea. When the udder is the principal seat of disease the vesicles are found grouped in clusters around the orifices of the teats. When recovery is about to take place it is not uncommon to see large patches of epidermis come away from the

mouth. The contagion of this disease is both fixed and floating. It has a latent period of from three to ten days. Its mortality is but trifling, as it readily responds to treatment. The disease exists in some of the Western countries, but to what extent is not known.

RINDERPEST.

Of all dreaded diseases to which the bovine race is subject none causes so much apprehension as the above, which is more familiarly termed in Europe *The Cattle Plague.* Fortunately it has not as yet made its appearance in this country; at least we may draw that conclusion from knowing its fatality and tendency to spread, feeling sure it could not stop at one or two cases. The only source from which we may expect it is through importation and too much care cannot be exercised in having all imported animals undergo a rigid quarantine for the full incubation period.

SPECIAL DISEASES.

Dr. J. V. Corlis, of Monmouth county, reports an unusual number of cases of parturient apoplexy for the year, with an increased mortality. Dr. J. C. Dustan, of Morristown, has also met with an unusual number of cases during the early spring and summer months, and states that the mortality has been much greater than formerly. In our own practice we have met with a number of cases, and think the fact may be attributed to the plethoric condition of the animals, as we have invariably found them carrying an abundance of flesh, and with the blood vessels engorged. We believe the trouble is greatly due to the high standard of feeding that milch cows are subjected to, as well as the mild winter, and would impress upon farmers the importance of seeing that breeding cattle get laxative food a short time previous to parturition, and what would be better to give them an occasional mild cathartic.

CATARRHAL FEVER,

Or hollow horn, is a malady of the spring months, and one that causes a deal of trouble among badly kept animals, but shows a falling off, probably owing to the genial weather of last winter.

HOVE.

We are in receipt of a number of communications from various parts of the State, informing us that a number of calves died from this malady. We usually find it prevalent where there is an abundance of red-top clover. Large quantities being taken into an empty stomach in the early morning while wet with dew, fermentation takes place, and a gas is generated which soon distends the rumen or first stomach to its utmost capacity. If the animal does not get immediate relief, death invariably follows. For such cases every farmer should be provided with a trocar and canula, and understand its use, as the delay in securing a veterinarian might prove fatal. We recommend the use of the trocar only in cases that will not respond to rapid exercise, bi-carbonate of soda, ammonia, &c., freely given per mouth.

STRANGULUS FILARIA.

On October 24th, I was called to Morristown, to see a herd of calves, belonging to Mr. J. G. Foote, said to be ailing from an outbreak of pleuro-pneumonia. After carefully noting the symptoms, I had an intelligent history of the malady from Mr. Foote. On August 10th and 19th, he bought two lots of calves out of a drove, which were said to have come from Sullivan county, N. Y. On the 24th, he bought another lot from a different drove, said to have come from either the northern part of this State, or across the line into Pennsylvania. They were turned into a rich timothy pasture together. On going among them September 10th, he found that many were coughing, and two had died.

When we made an examination we found nearly all of them suffering from a severe and irritable cough, and which seemed to come entirely from the lungs, and was accompanied by a peculiar grunting. The rumen in all of the affected cases was distended with food, and we found a very weak pulse of seventy-six, respiration, sixty, and temperature of 106° Fahrenheit, with the visible mucous membranes very aenemic; the schneiderian membrane ulcerated, and with a slight discharge from the nose. The most remarkable feature of the case was that the animals continued to eat voraciously up to the time of death. Mr. Foote

having kindly placed the herd at our disposal, we at once destroyed two of them. On making a post-mortem examination we found the bronchial tubes largely filled with a *filarial* deposit, which on close examination proved to be a parasite. Many having died and others fast approaching dissolution, we prevailed upon Mr. Foote to place some of the least affected under treatment and report the result, which he promised to do. A very interesting question arises whether both herds coming from different parts of the country brought the disease with them, or whether it was acquired by contact, or generated on the farm. The last does not appear probable, as I have since learned that other calves, purchased from the same drove, and owned miles away from Mr. Foote's farm, also developed the same malady. We shall continue our investigation and hope to arrive at some satisfactory conclusion. We will close our brief allusion to bovine diseases by insisting upon the necessity—

1st. Of Ports of Entry.—There is, at the present time, and has been for a number of years, quite a large commercial traffic in cattle between this country and Europe. Through that traffic can be traced the advent of pleuro-pneumonia to this continent, and who doubts but in a little while we will be made to realize in our midst that most dreaded of all animal plagues, rinderpest. Too much care cannot be exercised in trying to avoid it. There is no easier or better way than to have Ports of Entry. Two or three at most will be sufficient for each State. They should be guarded by a Veterinarian, with powers delegated, if necessary, to place all suspicious animals in a strict quarantine for the incubative period, and also to exercise occision when it may be deemed essential. By this means alone we can hope to obtain immunity.

2d. Of the Stamping out Process.—We believe power should be invested in some qualified person as State Inspector; to investigate all outbreaks that occur, and he be delegated with power to kill if necessary. The animals destroyed should be appraised, and the owner compensated by the State. The process of stamping out would soon be complete, and thousands of dollars saved to the State annually.

DISEASES OF HORSES.

There is perhaps no class of animals, except the human, that attracts such attention as the horse. Although this outline is only introductory, we feel we should briefly refer to a few of the many diseases to which he is liable.

EPIZOOTIC INFLUENZA.

From time immemorial this disease has continued to infect the equine race; ranging over more or less area, but generally in the form of enzootic. Until October, 1872, it did not assume a serious aspect. We quote from a report rendered by Professor Liautard to the State Board of Health of New York city:

"On the evening of October 21st only a few animals were affected, but on the morning of the 22d there was scarcely an animal of the equine species that was not affected. Horses, mules and even a zebra. More than twenty thousand were suffering in different degrees, and it became apparent that the disease was influenza of the catarrhal form, fortunately not serious or fatal."

The symptoms as presented were, with a few exceptional cases, rigors, febrile action, impaired appetite, sneezing, cough, nasal discharge, accelerated respiration, weak and compressable pulse, and dry fæces. The attack was very sudden; the animal would be apparently well in the evening and sick in the morning; there was an abundant discharge from the nose; the temperature per rectum was often as high as 105° Fah., loss of appetite being one of the premonitory symptoms, and the movements of the animal were feeble and staggering. The skin was dry and the hair dull and staring.

The duration of the mild form is from two to three weeks, after which the animal can resume work, though in a few cases the symptoms disappear in eight or ten days.

The most common complications were thoracic pleurisy and pneumonia, destroying a large number of animals. The nervous system was affected in a few cases, in the form of spinal meningitis; in these the result proved quite satisfactory."

Influenza being debilitating in its nature, the animals which succumbed to the disease, did so from exhaustion, induced by the excessive work to which they were subjected, or from complications. Occasionally a relapse would occur, due to unfavorable atmospheric changes.

TREATMENT.

This is very simple, requiring merely close attention to the hygiene and diet, which should consist principally of laxatives, nutritious food, combined with vegetable tonics. But where complications follow, such as purpura, hæmorrhagica, adenitis, cerebro spinal meningitis, &c., the services of the veterinarian are required.

GLANDERS OR FARCY

Are widely diffused diseases, and it is questionable if there is a country on the face of the globe where it does not exist in a greater or less degree. Fleming says "that the designation, glanders and farcy, are employed to distinguish two forms of one disease, and that they are two diseases essentially identical, however dissimilar their external manifestations." The term glanders is applied where the disease affects the nasal, respiratory mucous membranes, lymphatic glands and lungs. Farcy, when it affects the skin and sub-cutaneous connective tissue. This fact has been demonstrated by inoculation, as the form of the disease does not depend at all upon the source from which the virus may be taken; for illustration, a subject may be inoculated with virus taken from a case of farcy, and a case of glanders will be induced, with the characteristic glandular enlargment and ulcerated mucous membranes, and *vice versa*.

A good deal of controversy has from time to time been indulged in as to its origin; some authorities claiming it is induced only by inoculation, while others are equally as positive it has spontaneous origin. We coincide with the latter view.

There are several cases on record where a number of animals have during a long, cold, wet spell of weather suddenly developed the malady in all its virulence, when to all appearances the animals were prior to it in excellent health. Owing to the

vitality of the virus, too much care cannot be exercised in thoroughly cleansing and disinfecting all places where glanderous animals may have been kept, it being important that another animal should not occupy the stall or box for the period of six months afterward. All suspected cases should at once be examined by a competent person and if found suffering from the malady, destroyed without delay, and their bodies buried deeply, as all animals are liable to contract the disease, and dogs especially.

The disease is one that should be handled with extreme caution. We cannot undertake to give all the characteristic changes and symptoms so essential to be known in order to detect the malady in the brief space allotted us.

It has been ably discoursed upon in a number of excellent works, which are easily procured.

From the frequency in which we meet with cases, we may draw the conclusion that it prevails to a greater or less extent in all parts of the country. Scarcely a week passes that we are not called upon to see one or more cases, in which we feel it our duty to order occision. We are in communication with a number of practitioners from various parts of the State, who inform us that it has grown to be quite common in their practice. This with other reasons inclines us to believe that it is on the increase, and so long as unscrupulous dealers are allowed to dispose of infected animals with impunity, we cannot expect a different state of affairs.

A law such as has recently been passed in New York, making it a misdemeanor, and punishable with a fine and imprisonment for any person who shall dispose of an animal suffering with glanders, would have a salutary effect in our State.

Dr. Dutan, of Morristown, reports the appearance of an enzootic in Madison, N. J., last Spring, where a number of cases died of a disease resembling diphtheria in the human subject.

A consulting veterinarian surgeon from New York, an excellent authority, differed in his diagnosis, and thought it resembled cerebro spinal-meningitis under a slightly changed form. Not having an opportunity to see enough of the cases we are not prepared to discuss the subject, though we are inclined to think it might have been anthroid angina.

Dr. J. C. Force reports an unusual number of cases of angina

of a mild form, and readily yielding to treatment. Our attention having been called in New Brunswick, Paterson, Princeton, Roselle and Raritan, in our professional capacity to examine what was believed to be a form of influenza. We had little or no difficulty in detecting glanders, and caused a number of cases to be destroyed.

TYPHOID INFLUENZA.

Has been more or less prevalent in and about Newark, N. J., for the last year, and quite a number of cases have died from its effects. We may account for the great number of cases presenting typhoid characters, from the fact that many stables are so constructed that the urine, with other drainage, often lies directly under the animal.

Fermentation is set up and they are compelled to breathe an atmosphere loaded with effluvium; hence the disease. We would endeavor to impress upon horse owners the importance of raising the flooring of such stables, and thoroughly cleaning and disinfecting that part. We feel satisfied the result gained would amply repay the time and trouble. Other diseases and those of other animals will be more fully treated at another time.

Report on Interrupted Water Supply.

Report of the Committee appointed by the New Jersey State Board of Health as to an alleged nuisance at New Village, Warren county, pursuant to a petition herewith attached:

Having visited New Village on January 3rd, 1878, find it contains thirty-four families, one school, two blacksmith shops, one machine shop, one wheelwright shop, one store, one shoe shop, one hotel, and about two hundred inhabitants. The conditions now and formerly of the water supply to said village, together as to the alleged nuisance, are as follows, viz:

1st. Prior to 1831 the village was supplied with water by means of a good sized mountain brook running through it, well digging being impracticable, as water could not be obtained from that source.

2nd. In 1831 the Morris Canal was constructed at the base of the mountains across the brook supplying the village with water, the Canal Company placing a tube of four inches in diameter under the canal for the purpose of giving the necessary supply. The village *at that time*, contained only six or seven families and no business places. The balance of water went into the canal.

3rd. In 1845 the canal was enlarged, by which operation the four inch tube became clogged and partially stopped. The citizens of the village could not get any satisfaction from the Canal Company, and the suffering was so great that a number of persons went in the night and dug the canal through, giving them all the original brook, in which act it does seem as if they were almost justifiable. Afterwards on account of the increase of inhabitants, the Canal Company in addition to the four inch tube, put in a two inch lead pipe, but for some time the four inch tube has been completely clogged, no water going through it, and the two inch pipe partially, so that in dry times no water at all gets to the village, and when it does get there is so impure that cattle will not drink it, the sanitary effect of which can

easily be understood; *i. e.*, the suffering of the inhabitants from sickness and distress from that cause for the past two years has been serious. The head of the two inch pipe had just been cleared when we saw it, but we understand that since that time it has become clogged.

The whole fixture of the two-inch pipe is of the most temporary character—has the appearance of having been placed in by unskilled labor—taking water from the canal instead of from the brook, and arranged in such a manner that it is constantly subject to stoppage. It is certainly surprising that such an arrangement exists when the expense would be trifling and very little skill is required to make a permanent and complete arrangement by taking the water from the brook laterally and above level of the canal, giving a six inch diameter pipe, which would need but little attention afterwards, and give an abundant supply of pure and wholesome water to the village for years to come.

The canal company, in 1831, considered a tube of four inches diameter necessary to supply six or seven families, and now when there are thirty-four families and a number of business places, it undertakes to give the needed supply through a two-inch pipe, and that clogged up part of the time. The cutting off of water from this village seems to be an outrage and nuisance which should be brought properly before the canal company and abated at once.

This case seems to call for an expression from this Board, and we would add that in all cases (especially when it is used for drinking purposes,) when the supply is interfered with, or polluted so as to endanger the health of a community, there should be some way of remedying the evil by summary process, and when the nuisance is permitted, or committed by any corporation, it should be abated by the Board of Health in such place, and the charges and costs be made a preferred lien over any other existing indebtedness. When a whole community is suffering from the neglect or carelessness of an incorporation it should certainly be reached in a shorter manner than the tedious process of the present law. We would therefore recommend the attention of the Committee on Legislation to this subject.

All of which is respectfully submitted,

THEODORE R. VARICK,
EZRA A. OSBORN.

METEOROLOGICAL RECORDS.

No. 1.—Showing Mean Temperature at Cape May, N. J., for 1878. Latitude, 38° 56′; Longitude, 74° 58′.

Days.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	30.7	33.5	41.7	48.2	61.0	56.0	73.2	74.0	78.2	67.2	45.	48.
2	38.5	32.	48.7	49.7	64.5	57.5	73.2	75.0	79.	69.7	53.5	54.7
3	21.2	29	50.5	49.5	65.0	61.5	74.0	75.7	77.2	69.7	43.5	47.
4	40.2	31.	40.2	46.2	64.7	64.7	74.7	75.2	74.7	67.2	41.	47.2
5	28.7	35.2	42.	50.7	59.0	67.0	77.7	75.2	73.7	61.0	43.7	37.
6	26.5	39.2	49.7	50.5	62.0	61.7	76.0	75.2	72.5	61.7	53.	47.
7	20.0	46.	54.5	50.5	62.5	62.0	76.7	74.5	71.0	57.7	42.	38.
8	31.5	50.5	52.5	52.5	67.0	64.2	75.2	75.5	67.7	62.5	40.7	38.
9	42.2	49.2	50.2	51.5	62.7	66.5	76.0	79.0	68.7	71.5	41.5	49.5
10	44.2	43.2	51.7	55.	61.2	64.7	76.2	77.7	74.2	60.5	47.5	49.5
11	41.0	32.5	52.2	55.7	52.2	60.2	77.7	72.0	73.2	59.0	52.2	42.2
12	39.5	37.5	45.7	55.5	51.2	63.7	72.7	73.2	75.5	58.5	52.	39.5
13	43.7	41.7	51.2	54.7	51.2	64.5	73.7	73.2	74.7	58.5	53.	36.7
14	44.	39.2	47.7	56.	50.0	66.5	73.7	75.0	68.0	64.7	41.	41.2
15	39.2	38.2	45.	52.	46.0	67.0	79.0	72.2	67.0	65.0	42.5	40.2
16	31.2	41.7	48.2	47.5	55.0	67.2	73.5	71.7	66.0	67.5	57.5	30.7
17	38.7	46.	45.7	49.5	56.5	73.0	73.5	72.5	68.2	67.5	57.5	32.
18	40.5	35.7	45.2	52.2	57.7	65.5	79.5	76.2	73.7	53.0	48.	34.5
19	45.5	31.5	49.	55.	61.5	68.0	81.7	76.0	75.5	51.7	55.5	30.5
20	48.7	45.2	47.7	59.5	56.7	70.5	78.7	75.7	74.5	55.7	49.2	29.7
21	46.5	49.7	46.7	63.	65.2	76.5	77.5	71.5	75.7	59.7	53.7	43.
22	45.	51.	48.5	59.5	59.7	70.2	74.7	69.7	63.2	62.5	57.7	38.2
23	29.	49.7	51.7	64.5	62.0	68.2	76.0	66.5	64.0	63.5	44.2	27.5
24	34.2	41.7	44.7	60.7	62.5	72.0	77.7	71.2	70.5	55.5	50.0	25.
25	46.7	39.7	30.5	58.2	65.0	72.7	74.7	70.5	70.7	53.2	54.7	22.2
26	46.5	38.2	41.7	60.5	67.2	76.5	73.7	70.2	70.5	56.7	42.	29.7
27	46.5	44.	53.2	59.7	67.7	76.7	76.0	72.0	57.0	61.7	52.7	25.5
28	35.2	46.7	53.7	59.2	69.2	77.2	77.2	73.5	55.0	44.7	45.7	26.2
29	26.0	.....	46.7	59.7	66.5	75.5	74.2	73.5	65.0	47.7	45.2	28.
30	30.8	.....	48.2	59.5	63.7	74.5	72.5	74.7	62.7	59.5	42.5	32.
31	42.2	.....	47.5	.....	55.2	.....	71.5	75.5	.....	46.5	.....	29.7

No. 2.—Barometer reduced to 32° at Cape May, N. J., for 1878.

Days.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	29.85	29.81	30.43	29.76	29.98	29.99	30.09	29.90	30.059	30.113	30.176	30.306
2	29.89	30.22	30.07	28.78	29.80	29.99	30.08	29.78	30.032	30.001	30.104	24.646
3	30.39	30.23	29.40	29.80	29.86	29.99	30.13	29.84	29.980	30.03	30.268	24.746
4	29.75	29.94	29.74	29.43	29.82	29.94	30.09	29.88	29.935	30.028	30.228	29.559
5	29.44	30.07	30.31	29.32	29.75	29.95	29.92	29.91	29.956	30.035	30.271	29.841
6	30 18	30.26	30.24	29.39	29.86	30.05	29.97	29.78	30.093	30.139	29.901	30.015
7	30.51	30.11	30.06	29.71	29.91	29.96	30.04	29.86	30.29	30.24	29.297	30.181
8	30.72	29.52	30.39	30.63	29.78	29.62	30.02	29.91	30.285	30.227	29.718	30.394
9	30.38	29.66	30.47	30.23	29.88	29.74	30.03	29.71	30.176	29.984	29.984	29.945
10	29.63	29.51	30.24	28.98	29.93	29.60	30.08	29.83	30.049	30.047	29.968	28.998
11	29.65	29.87	30.10	29.64	29.94	29.84	30.17	29.91	30.033	29.934	29.726	29.835
12	30.17	30.04	29.88	29.61	30.01	30.03	30.09	29.98	29.94	29.895	29.728	30.338
13	30.16	29.98	29.72	29.72	30.05	30.14	30.02	29.98	29.863	30.123	29.973	30.399
14	29.71	29.95	29.87	29.86	30.04	30.18	29.94	29.96	30.109	30.206	30.407	30.153
15	29.68	29.99	30.08	29.99	29.92	30.08	29.95	30.11	30.207	30.153	30.495	29.818
16	30.18	30.04	30.05	30.16	30.00	30.00	30.08	30.17	30.27	30.141	30.353	30.152
17	30.24	29.92	29.80	30.22	30.06	29.95	30.00	30.08	30.241	30.023	30.083	30.175
18	30.33	30.02	29.95	30.26	30.19	29.91	29.89	29.93	30.160	29.731	29.972	30.217
19	30.30	30.28	29.99	30.04	30.24	29.91	29.86	29.78	30.120	29.851	29.926	30.443
20	30.07	30.08	30.03	29.84	30.10	29.87	29.90	29.74	30.033	30.129	29.824	30.445
21	29.85	29.94	30.17	29.86	29.96	29.79	29.68	29.83	29.987	30.222	29.782	29.624
22	29.80	29.61	30.17	30.03	30.08	29.72	29.79	30.03	30.282	30.026	29.045	29.737
23	30.12	29.76	29.76	29.98	30.09	29.91	30.03	30.17	30.392	29.499	29.576	30.048
24	30.45	29.95	29.41	29.90	29.97	29.92	30.07	30.06	30.247	30.132	29.986	30.027
25	30.31	29.99	29.90	29.74	29.83	29.96	29.96	29.80	30.204	30.314	29.916	30.147
26	30.06	30.11	30.05	29.77	29.67	30.08	29.81	29.97	30.166	30.324	30.225	29.967
27	30.00	30.11	29.81	29.84	29.80	30.11	29.85	29.95	30.364	30.074	29.728	29.808
28	29.77	30.06	29.62	29.72	29.88	30.12	30.08	29.98	30.363	30.214	29.821	30.222
29	30.25	.....	29.94	29.74	30.03	30.10	30.05	30.06	30.256	30.189	30.219	30.326
30	30.42	.....	30.14	29.89	29.93	30.11	29.90	30.14	30.191	29.324	30.343	30.212
31	29.66	.....	29.80	.....	29.91	.....	29.99	30.14	.....	29.313	.....	30.374
	30.370	29.97	29.99	29.84	29.95	29.95	29.98	29.94	30.143	30,054	29.993	.....

No. 3.—Inches of Rain and Melted Snow for 1878, at Cape May, New Jersey.

Days.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	.....	.05 *	.....	.....	.....	.55 .70	.....	.....	.13	.....	.....	.....
2	.....	.....	.....	.....	.....	.05 .03	.....	.....	.....	.....	.....	.95
3	.....	.....	.05	.....	.....	.01	.....	.....	.....	.....	.....	.....
4	1.24	.....	.....	.....	.....	.....	.....	.....	.80	.....	.....	13 .09
5	.....	.....	*	.....	1.30	.....	.....	.....	.02	.....	.....	.01
6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7	.....	.....	.02	.....	.....	.....	.....	.....	.....	.05	.04	.....
8	*	.....	.....	.....	.02	.15 .01	.....	.....	.....	.....	.....	.....
9	.....	.....	.....	.02	.02	.06	.02	.....	.....	.....	.....	.02 .02
10	.99	.22 .20	.....	.40	.....	.15 .50	.....	.....	.08	.....	.....	2.31
11	.14	.....	.64 .03	.02 .08	.....	.10	.....	.....	.....	.04	.....	.22
12	.....	.....	.73	.30 .02	.....	.01	.04 .73	.....	.....	.....	.22	.....
13	.....	.....	.75 Th.05	.....	.32	.08	.07	.....	.03 .11	.....	.....	.....
14	.13	.....	.15	.....	.....	.....	.....	.....	.....	.....	.....	.....
15	.....	.....	.....	.....	2.71	.....	.....	.....	.....	.....	.....	.....
16	.....	.....	.....	.01	.....	.....	.....	.....	.....	.....	.....	1.44
17	.....	.06	.48	.....	.12	.....	.....	.....	.....	.....	.03	.....
18	.....	.03	.....	.....	.....	.62	.....	.....	.....	.10 .36	.37	.....
19	.....	.....	.....	.....	.....	.....	.01	.....	.....	.....	.....	.....
20	.21	.....	.....	.04	.50	.....	.....	.....	.....	.....	.20	.....
21	.....	.....	.....	.02	.30	.....	.25	.....	.....	.....	.....	1.74
22	.01	.07	.....	.....	.....	1.05	.....	.....	.....	.....	.35	.....
23	.....	.....	.....	.....	.....	.....	.....	.....	.....	2.28	.....	.....
24	.....	.....	.08	.....	.....	.....	.....	.....	.....	.....	.....	.....
25	.01	.....	.....	.70	.....	.....	.....	.....	.....	.....	.....	.....
26	.16	.....	.....	.....	.10	.....	.....	.....	.16	.....	.....	.....
27	.02	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.90	.05
28	.02	.....	.35	.02	.....	.....	.....	.....	.....	.....	.06	.....
29	.....	.....	.....	.03	.....	.....	.....	.....	.....	.....	.....	.....
30	.....	.....	.....	.....	.71	.....	.52 .79	.....	.....	.14	.....	.02
31	2.09	.....	.33 .01	.....	.01	.....	.....	.....	.....	.41	.....	.....
	5.02	.63	3.61	2.06	6.11	4.07	2.43	6.41	1.33	3.38	3.17	7.00

* Too small to measure.

No. 4.—Direction of Wind at Cape May, N. J., 1878.

DATE.	JANUARY.			FEBRUARY.			MARCH.		
	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.
1	N. W.	N. W.	N. W.	W. 6	N. W. 4	N. 2	N. 2	E. 4	E. 2
2	N. W.	S.	W.	N. 2	N. 2	N. 2	S. E. 2	S. E. 2	S. 6
3	N. W.	N. W.	N. E.	N. 2	N. 2	N. W. 2	S. 4	S. 4	S. 2
4	E.	S.	W.	N. 2	N. W. 4	N. W. 4	W. 6	S. W. 6	N. W. 6
5	W.	W.	W.	N. 4	N. 4	N. W. 4	N. W. 4	N. W. 4	S. 2
6	W.	W.	W.	N. W. 4	N. W. 2	S. W. 2	S. 4	S. 4	S. 4
7	N. W.	N. W.	N. W.	S. W. 4	S. 4	S. E. 2	S. W. 4	S. W. 4	N. W. 4
8	N.	S.	.....	S. E. 4	S. E. 2	S. 4	N. E. 2	S. 2	N. E. 2
9	N. E.	N. E.	E.	S. W. 4	N. W. 2	S. E. 2	E. 2	S. E. 2	S. E. 2
10	E.	N. E.	N. W.	S. W. 4	N. W. 2	W. 2	E. 2	S. E. 2	S. 2
11	W.	W.	W.	N. W. 6	N. W. 6	N. 4	N. E. 2	S. 2	N. E. 2
12	W.	W.	W.	N. 4	S. W. 2	S. 6	N. E. 4	N. E. 4	N. E. 4
13	N.	E.	E.	W. 2	S. W. 2	E. 2	W. 2	S. W. 2	S. W. 4
14	S. W.	S. W.	S. W.	E. 4	E. 4	E. 4	S. W. 4	W. 6	N. W. 2
15	W.	N. W.	N. W.	N. E. 2	E. 4	E. 2	N. 4	N. W. 4	N. W. 2
16	N. W.	N. W.	N.	N. 2	S. 2	S. W. 4	S. E. 4	N. 2	S. E. 2
17	N. E.	S. E.	S.	S. W. 4	S. 4	S. 4	S. E. 4	N. W. 4	N. 2
18	N.	E.	E.	N. 4	N. 4	N. 6	N. W. 6	N. W. 6	S. 2
19	E.	S. E.	S. E.	N. 4	N. W. 2	S. 4	N. W. 6	N. W. 4	S. 4
20	S. E.	S. E.	S. E.	S. 6	S. 4	S. 4	N. W. 4	N. W. 2	N. W. 2
21	N. W.	S. E.	N. W.	S. W. 2	S. 4	S. 4	N. W. 2	N. W. 6	N. W. 4
22	W.	W.	W.	E. 2	S. 4	S. 4	E. 2	S. 2	S. 2
23	W.	W.	N. W.	S. E. 2	E. 2	N. 2	N. E. 2	S. E. 2	S. 4
24	N. W.	S. E.	S.	N. W. 4	N. W. 4	S. 2	S. W. 4	S. 6	N. W. 8
25	S.	S.	S.	N. 4	N. W. 4	W. 6	N. W. 6	N. W. 6	W. 6
26	W.	W.	N.	N. W. 8	N. W. 8	N. W. 4	N. W. 6	N. W. 2	S. W. 2
27	.....	S. E.	S.	N. W. 6	N. W. 4	S. W. 2	S. 4	S. 2	S. 4
28	W.	N. W.	N.	W. 2	N. W. 2	S. 2	S. 4	S. 4	S. 4
29	N.	N.	N.	.....	.....	.....	N. 6	N. W. 4	N. 4
30	N.	E.	E.	.....	.....	.....	N. 4	S. E. 2	S. 4
31	S. E.	E.	N. E.	.....	.....	.....	E. 2	E. 2	S. W. 2

No. 4.—(Continued.)

DATE.	APRIL.			MAY.			JUNE.		
	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.
1	W. 4	N. W. 4	N. W. 2	E. 2	S. 2	S. 2	N. E. 4	N. E. 4	N. E. 4
2	N. W. 4	N. W. 2	W. 2	W. 2	S. E. 2	S. 4	N. E. 4	N. E. 2	N. E. 2
3	E. 2	S. E. 2	S. E. 2	S. 2	S. 4	S. 4	N. E. 2	E. 2	E. 2
4	N. E. 2	N. E. 4	N. 2	S. 4	S. 4	S. 4	S. E. 2	S. E. 2	S. E. 2
5	N. W. 6	N. W. 4	W. 4	S. W. 4	W. 4	W. 2	W. 2	N. W. 2	N. W. 2
6	N. W. 4	W. 2	W. 4	N. W. 2	N. W. 2	N. W. 2	N. 4	N. W. 2	N. W. 2
7	N. W. 6	N. W. 4	N. W. 2	N. W. 2	S. 2	S. 2	N. E. 2	S. E. 2	S. E. 2
8	N. W. 4	N. W. 2	S. 2	N. W. 2	S. 4	E. 2	S. E. 2	N. W. 2	S. E. 2
9	E. 2	S. E. 4	S. E. 2	S. E. 2	N. 2	E. 2	W. 4	N. W. 2	S. E. 2
10	S. E. 2	S. E. 4	S. E. 2	N. 2	S. W. 2	N. W. 4	N. 4	N. W. 2	S. 2
11	N. E. 2	N. W. 2	S. W. 2	N. W. 4	N. W. 4	N. W. 6	N. W. 4	N. W. 2	S. W. 2
12	N. W. 4	W. 4	W. 2	N. W. 2	S. W. 4	S. W. 2	N. 4	N. W. 2	S. 2
13	W. 4	N. W. 4	N. W. 2	N. 4	N. W. 2	N. 2	N. W. 2	N. W. 2	S. E. 2
14	N. W. 2	N. W. 2	W. 2	E. 2	E. 2	N. 2	N. W. 2	N. W. 2	S. E. 2
15	E. 2	E. 2	E. 2	N. E. 6	N. E. 4	N. 2	N. 2	S. 2	S. 4
16	E. 2	E. 2	N. E. 2	N. 6	N. W. 2	S. W. 2	N. 2	S. 2	S. 4
17	N. E. 2	E. 2	E. 2	S. W. 2	S. 4	S. E. 2	N. W. 2	S. 4	S. 4
18	N. E. 2	S. E. 2	S. E. 2	N. E. 2	W. 2	S. 2	S. W. 2	S. 2	N. 2
19	W. 2	S. 2	S. 2	S. W. 2	S. E. 2	S. E. 2	N. 2	S. E. 2	.....
20	S. 2	S. 2	S. 2	S. E. 2	S. E. 2	S. W. 4	W. 2	S. 2	S. 2
21	S. 2	W. 2	N. W. 2	S. E. 2	S. 2	N. W. 2	S. E. 2	N. W. 2	S. 2
22	S. E. 2	S. E. 2	S. E. 4	N. 4	N. W. 4	N. W. 2	S. E. 2	S. 2	S. 4
23	E. 8	S. W. 4	N. W. 4	N. W. 4	N. W. 2	N. W. 2	W. 2	W. 2	W. 2
24	N. W. 6	N. W. 6	N. W. 4	N. 2	S. E. 2	S. E. 2	W. 2	S. W. 2	S. 2
25	N. 4	S. E. 2	.....	W. 2	W. 2	S. 2	W. 2	S. 2	S. 2
26	.....	S. 2	S. 4	S. 2	S. 2	W. 2	N. W. 2	S. 2	W. 2
27	S. 4	S. 4	S. 4	N. W. 2	S. 2	S. 2	S. 2	S. 2	S. 2
28	N. W. 6	N. W. 4	N. 2	N. W. 2	W. 2	S. 2	N. W. 2	S. 2	S. 2
29	S. 2	S. W. 2	S. E. 2	N. 2	S. 2	S. E. 2	N. W. 2	S. 2	S. E. 2
30	E. 2	W. 2	N. 2	S. E. 2	S. 2	S. E. 2	S. E. 2	S. E. 2	S. E. 2
31	S. E. 2	W. 2	N. 2	.....	N. 4	N. E. 4	.....	.....	.....

Figures along side denote as follows: Breeze, (2); strong wind, (4); gale, (6); violent gale, (8); tornado, (10).

No. 4.—(Continued.)

DATE.	JULY.			AUGUST.			SEPTEMBER.		
	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.
1	E. 2	S. E. 2	S. E. 2	E. 2	S. E. 2	E. 2	S. 2	S. E. 2	S. 2
2	S. E. 2	S. E. 2	S. 2	W. 2	N. W. 2	S. 2	S. 2	S. 2	S. 2
3	S. 2	S. 2	S. 2	N. W. 2	W. 2	S. 2	S. E. 2	S. E. 2	S. 2
4	S. 2	S. 2	S. 2	S. 2	S. 2	S. 2	S. 2	S. 2	E. 2
5	W. 2	N. W. 2	E. 2	S. E. 2	S. E. 2	S. E. 2	N. 2	N. W. 2	N. W. 2
6	N. E. 2	S. E. 2	S. 2	S. E. 2	S. E. 2	N. 4	N. E. 2	E. 2	E. 2
7	S. 2	S. E. 2	S. E. 2	W. 2	N. W. 2	S. W. 2	N. E. 2	E. 4	N. E. 2
8	S. E. 2	S. 4	S. 2	N. W. 2	S. 2	S. 2	N. E. 2	N. E. 2	N. E. 2
9	S. 2	S. 4	N. W. 2	S. 2	S. 2	S. W. 2	N. E. 2	N. E. 2	N. E. 2
10	S. 2	S. 2	S. 2	N. E. 2	S. E. 2	S. 2	N. E. 2	E. 2	E. 2
11	E. 2	E. 2	S. E. 2	W. 2	S. W. 2	S. W. 2	E. 2	E. 2	N. E. 2
12	N. E. 2	S. E. 2	S. E. 2	N. 2	N. W. 2	S. 2	E. 2	E. 2	E. 4
13	N. 2	N. E. 2	S. E. 2	S. E. 2	S. E. 2	E. 2	S. E. 4	S. 4	W. 4
14	S. E. 2	S. E. 2	S. E. 2	N. E. 2	S. 2	E. 2	N. 4	N. W. 2	W. 4
15	W. 2	S. W. 2	S. E. 2	E. 2	S. E. 2	S. 2	N. 4	N. W. 4	N. 2
16	N. E. 2	S. E. 2	S. 2	E. 2	S. 2	S. 2	N. E. 2	E. 2	E. 2
17	S. E. 2	S. E. 2	S. 4	S. 2	S. 2	S. 2	E. 2	N. W. 2	S. 2
18	S. E. 2	S. 4	S. E. 2	S. 2	S. 2	N. W. 2	S. W. 2	N. W. 2	S. W. 2
19	S. W. 2	N. W. 2	S. W. 2	S. W. 2	S. E. 2	W. 2	W. 2	S. E. 2	S. W. 2
20	N. W. 2	E. 2	S. E. 2	N. W. 2	N. W. 2	N. W. 2	S. 4	S. 4	S. 4
21	S. 2	S. E. 2	W. 4	N. 4	N. W. 2	N. 2	S. 4	S. W. 2	S. W. 2
22	N. W. 4	N. W. 4	N. 2	N. E. 2	N. E. 2	E. 2	N. 4	N. W. 2	N. E. 2
23	N. W. 4	W. 2	W. 2	N. E. 2	N. E. 2	E. 2	N. E. 2	N. E. 2	S. E. 2
24	.....	S. 2	S. 2	N. E. 2	S. E. 2	S. 2	N. E. 2	S. E. 2	S. E. 2
25	S. W. 2	S. 4	S. 2	S. 4	N. W. 4	N. 2	N. E. 2	N. 2	S. 2
26	S. 4	S. 4	S. 4	N. 2	S. E. 2	S. 2	S. W. 2	W. 2	N. 2
27	S. 4	W. 2	.....	S. 2	S. 2	S. E. 2	N. 4	N. 2	N. E. 2
28	N. E. 2	S. E. 2	S. E. 2	E. 2	S. E. 2	S. E. 2	N. 2	N. 2	N. E. 2
29	S. E. 2	S. E. 2	S. E. 2	E. 2	S. E. 2	S. E. 2	E. 2	S. E. 2	E. 2
30	S. W. 2	S. 2	N. 2	E. 2	S. E. 2	S. E. 2	N. E. 2	N. E. 2	N. E. 2
31	N. E. 2	S. E. 2	E. 2	S. E. 2	S. E. 2	S. E. 2	.....	.....	.....

No. 4.—(Concluded.)

DATE.	OCTOBER.			NOVEMBER.			DECEMBER.		
	7 A. M.	2. P. M.	9 P. M.	7. A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.
1	N. E. 2	E. 2	E. 2	N. W. 8	W. 4	S. W. 4	N. E. 2	E. 2	E. 4
2	.....	S. E. 2	S. 2	S. W. 6	S. W. 2	S. W. 4	S. E. 6	S. W. 4	W. 4
3	.....	N. W. 2	S. E. 2	N. 4	N. 4	N. 2	W. 4	W. 4	S. 4
4	N. 2	N. W. 2	N. 2	N. W. 2	N. W. 4	N. W. 2	W. 4	W. 2	N. W. 4
5	N. 4	N. W. 2	S. E. 2	N. W. 4	N. W. 4	W. 4	N. W. 6	N. W. 6	N. W. 6
6	N. W. 4	N. W. 2	N. 4	S. W. 4	S. W. 4	N. W. 2	W. 4	W. 6	N. W. 4
7	N. E. 2	S. 2	S. W. 2	N. 2	N. 2	W. 4	W. 4	N. W. 4	N. W. 4
8	N. W. 2	W. 2	S. 2	W. 6	N. W. 6	N. 6	N. 2	N. 2	S. E. 2
9	S. 4	S. W. 6	S. W. 6	N. W. 6	N. W. 6	N. W. 6	S. E. 2	S. E. 4	S. E. 4
10	N. 4	N. W. 4	N. 2	W. 6	N. W. 4	N. W. 2	S. E. 6	S. W. 4	S. W. 6
11	N. E. 2	N. E. 4	N. E. 4	E. 2	S. 2	S. 4	W. 6	W. 6	W. 2
12	N. 4	N. 6	N. 6	S. W. 2	N. W. 4	N. W. 2	N. W. 4	N. W. 4	N. 4
13	N. 6	N. 4	N. W. 2	N. 2	N. 4	N. W. 4	N. W. 4	N. W. 4	N. W. 2
14	N. W. 2	S. E. 2	S. 4	N. 4	N. W. 2	N. E. 2	N. E. 2	S. E. 2	S. 4
15	S. 4	S. 4	S. 4	N. E. 2	E. 2	E. 2	S. W. 2	N. 2	N. W. 4
16	S. 4	S. W. 4	S. 4	N. E. 2	E. 2	N. E. 2	W. 6	N. W. 6	N. E. 2
17	S. 4	S. 4	S. 4	E. 2	S. E. 2	S. E. 2	N. E. 2	N. W. 2	N. W. 2
18	N. W. 4	N. 4	N. W. 6	N. 2	N. 4	N. 4	N. W. 2	W. 4	N. W. 4
19	W. 6	N. W. 4	W. 6	N. W. 2	N. 2	S. E. 2	N. W. 2	N. W. 4	N. W. 4
20	N. W. 6	W. 4	S. W. 4	N. 2	N. E. 2	S. 2	N. W. 4	N. W. 2	W. 2
21	S. W. 2	S. 2	S. 4	S. E. 2	S. E. 2	* E. 4	S. E. 2	S. E. 6	S. 4
22	S. 2	S. E. 2	E. 4	N. E. 2	S. 4	S. W. 4	W. 6	W. 6	S. W. 4
23	E. 8	S. W. 4	N. W. 4	W. 8	W. 8	W. 6	W. 6	W. 6	S. W. 4
24	N. W. 6	N. W. 6	N. W. 4	W. 4	S. 2	S. 2	N. W. 6	W. 6	W. 6
25	N. 4	S. E. 2	.....	S. 2	S. W. 2	S. 4	W. 6	N. W. 6	N. W. 6
26	.....	S. 2	S. 4	N. 4	N. 2	N. 4	N. W. 4	W. 4	.....
27	S. 4	S. 4	S. 4	E. 4	S. E. 4	S. W. 6	N. 4	N. W. 6	N. W. 6
28	N. W. 6	N. W. 4	N. 2	W. 4	W. 6	W. 6	W. 4	N. W. 6	N. W. 4
29	S. 2	S. W. 2	S. E. 2	W. 4	W. 4	S. W. 4	N. W. 4	N. W. 2	S. 4
30	S. E. 4	W. 2	N. 2	N. W. 4	N. W. 2	N. 2	S. W. 2	N. W. 4	N. W. 4
31	E. 2	N. W. 6	N. W. 8	.....	.....	.....	N. 2	N. W. 2	N. W. 2

Figures along side denote as follows: Breeze, (2); strong wind, (4); gale, (6); violent gale, (8); tornado, (10).

Maximum, Minimum and Mean Temperatures—Station, Barnegat, New Jersey.

DAY OF MONTH.	1876.												1877.											
	JULY		AUG.		SEPT.		OCT.		NOV.		DEC.		JAN.		FEB.		MAR.		APRIL		MAY		JUNE	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	80	69	71	64	83	62	60	47	62	48	25	16	29	15	52	36	49	31	40	39	55	46	81	61
2	89	68	71	67	77	63	62	47	64	50	25	17	30	15	44	36	49	35	50	40	51	43	83	62
3	93	64	70	67	77	58	64	44	60	46	35	21	22	7	43	35	52	39	43	32	57	40	82	64
4	79	62	78	69	83	55	68	54	56	42	34	22	17	4	41	29	55	35	40	38	63	46	84	65
5	85	62	81	68	70	58	63	51	50	41	36	21	25	7	39	29	37	29	42	37	54	47	68	59
6	89	63	84	68	74	52	72	58	55	42	39	23	39	14	41	30	36	25	54	35	51	44	69	57
7	78	63	86	70	66	59	60	45	55	50	45	27	44	33	50	30	55	33	57	35	59	43	72	58
8	90	65	84	68	77	63	60	40	53	47	40	27	39	28	39	28	49	39	43	32	52	47	76	60
9	95	72	81	68	73	62	51	42	52	45	39	8	29	14	34	25	52	29	42	39	48	45	72	62
10	84	70	80	70	67	62	65	40	48	39	18	4	35	24	40	30	32	23	44	37	51	44	73	60
11	83	70	80	61	64	57	56	40	48	39	34	17	33	13	42	27	40	21	52	35	53	44	62	54
12	92	66	83	71	68	58	51	36	51	37	34	26	34	20	49	32	44	35	52	39	57	44	64	52
13	87	75	82	74	71	60	57	33	62	39	44	27	34	24	33	20	44	37	45	38	62	43	69	60
14	88	71	81	74	73	65	63	42	65	48	47	33	32	22	37	16	40	35	43	39	72	49	73	60
15	84	73	93	69	75	62	53	28	51	44	43	23	36	29	38	23	38	26	49	34	75	53	74	57
16	82	68	81	72	66	60	50	29	45	39	42	11	48	34	44	28	39	26	54	38	67	54	70	60
17	85	64	80	73	73	60	58	39	51	39	29	7	34	26	41	28	42	23	53	43	79	59	78	59
18	86	68	76	71	74	64	52	36	53	48	43	17	36	25	38	24	29	17	46	44	86	60	74	61
19	81	64	76	71	75	60	58	38	54	50	28	10	44	32	36	22	29	14	52	43	84	62	85	62
20	78	63	84	66	69	59	60	48	54	46	23	13	48	34	34	18	32	20	59	46	77	58	74	60
21	84	69	73	58	65	60	59	56	49	43	30	18	40	27	49	26	49	32	54	40	64	56	74	60
22	76	63	79	57	63	59	58	55	49	44	39	14	30	25	58	31	45	39	52	40	79	57	72	59
23	84	65	77	62	66	61	60	55	46	39	38	22	32	20	44	32	50	39	64	40	72	56	68	56
24	76	59	80	71	65	62	63	51	43	34	24	19	31	17	40	34	49	35	65	45	56	48	71	57
25	81	58	82	71	63	58	54	40	41	33	37	18	26	12	44	34	42	40	68	49	61	47	80	60
26	81	58	77	67	67	55	50	37	39	34	38	32	34	17	38	33	49	39	62	44	60	49	84	63
27	82	61	76	61	63	46	48	39	40	31	34	25	48	26	39	30	48	40	57	48	61	48	69	58
28	81	66	77	59	66	45	53	38	42	31	32	22	34	29	45	30	40	31	43	47	64	46	71	60
29	85	68	76	61	69	52	46	40	42	29	48	31	40	29	....	....	35	30	51	47	67	52	71	60
30	77	66	86	67	59	53	50	37	34	24	34	22	37	27	....	....	49	33	52	45	69	51	75	61
31	72	64	75	66	....	....	58	43	....	....	28	17	38	24	....	....	44	32	....	....	80	56	....	....
Range	37°		36°		38°		44°		41°		44°		44°		42°		41°		36°		46°		33°	
Mo'ly means	74°.3		73°.3		64°.5		50°.6		45°.5		27°		28°.6		34°.8		37°.1		45°.6		56°.3		65°.5	

Maximum, Minimum and Mean Temperatures—Station, Sandy Hook, New Jersey.

DAY OF MONTH.	1876.												1877.											
	JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.		JAN.		FEB.		MAR.		APR.		MAY.		JUNE.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	89	69	77	64	87	67	60	49	65	49	23	16	25	16	51	37	46	33	48	36	60	48	85	64
2	94	75	73	66	76	66	61	49	70	55	27	18	24	20	46	37	51	36	49	38	53	43	87	63
3	87	77	73	65	74	60	65	52	64	50	35	26	23	11	40	36	51	41	48	33	58	40	87	66
4	94	74	78	67	79	60	63	55	56	46	35	28	20	8	41	34	48	33	43	38	61	47	79	66
5	89	74	84	67	70	58	56	51	51	46	35	25	24	11	42	31	39	28	44	36	56	46	73	66
6	86	72	90	70	74	57	72	55	54	44	39	26	36	18	40	33	42	26	51	39	57	46	71	62
7	88	69	93	73	69	61	67	48	56	49	42	33	45	36	41	31	47	33	53	39	64	55	68	60
8	100	72	88	74	74	63	58	42	52	46	42	31	42	27	39	32	55	36	50	34	56	44	78	62
9	97	70	84	70	72	62	53	41	54	45	38	8	28	14	37	25	55	30	46	38	54	46	82	63
10	86	68	86	70	67	57	66	49	47	41	19	6	23	18	39	28	31	23	52	39	52	45	79	65
11	95	72	85	69	62	55	58	42	47	41	26	17	36	18	45	33	45	23	61	40	60	44	67	59
12	92	71	85	70	68	59	58	39	51	41	36	24	37	20	54	28	48	37	52	38	63	49	69	58
13	95	74	83	72	70	59	61	42	59	42	49	31	28	20	29	19	41	35	45	37	71	48	73	61
14	87	75	80	73	75	63	66	45	59	42	47	35	29	21	35	18	40	33	48	38	77	52	82	64
15	92	73	89	71	73	61	46	33	46	41	42	28	33	25	44	18	37	25	59	39	76	54	80	64
16	88	70	85	73	65	51	49	35	46	30	37	8	41	30	51	36	36	27	57	39	82	59	76	69
17	89	69	79	69	72	55	54	42	48	41	22	7	31	24	41	26	36	19	56	43	84	63	79	67
18	93	73	77	69	73	65	56	39	51	45	34	14	36	26	35	25	27	17	46	43	82	64	80	64
19	95	72	77	69	71	61	59	43	48	45	26	14	40	32	37	21	27	14	49	42	86	65	83	68
20	96	72	84	67	68	61	56	47	48	44	23	14	44	36	35	21	33	20	51	45	88	63	72	61
21	86	73	74	61	65	59	59	55	48	42	23	19	38	24	43	31	56	30	51	42	64	55	79	60
22	77	68	79	61	61	58	61	55	48	42	36	17	30	24	52	34	56	39	62	42	74	54	73	60
23	84	68	77	68	63	57	61	56	47	40	34	20	33	23	41	34	56	38	67	44	67	55	73	57
24	78	62	81	69	63	59	61	53	43	37	24	17	33	16	40	33	58	39	74	48	55	45	82	57
25	77	61	85	69	65	58	59	45	44	34	28	17	25	16	41	34	42	37	63	50	60	48	84	67
26	82	63	81	68	65	57	51	42	43	35	33	28	38	21	39	34	46	37	62	46	68	52	88	66
27	82	64	77	65	60	49	46	41	41	34	33	25	43	31	42	33	48	39	61	49	66	53	72	61
28	85	67	78	63	64	48	47	40	41	34	30	21	36	28	46	34	40	28	50	46	73	52	71	59
29	84	68	80	76	72	55	47	37	41	33	42	25	37	31	....	....	35	30	59	46	77	54	71	59
30	70	64	79	67	62	51	54	39	36	23	38	23	39	30	....	....	48	33	64	46	79	57	78	60
31	73	62	80	67	....	....	57	49	....	....	28	18	43	31	....	....	47	35	....	....	87	60	....	....
Range	39°		32°		39°		39°		47°		43°		37°		36°		44°		41°		48°		31°	
Mt'ly means	77°.7		74°.2		63°.9		51°.3		45°.9		27°.3		28°.7		32°.2		37°.4		47°.2		59°.2		69°.2	

Table of Temperature and of Rainfall at Newark, N. J., from January 1, 1878, to December 31, 1878, by W. A. Whitehead.

MONTHS.	MINM. TEMP'E.		MAX. TEMP'E.		Mean Tempt'e of Month.	Fair on Days.	Snow on Days.	Rain on Days.	Total Rain and Melted Snow—Inches.	Monthly Mean of Rain and Melt'd Snow in previous five years.
	Date.	Degree.	Date.	Degree.						
January	8	9.50	22	48.25	31.00	18	5	11	6.445	3.812
February	4	8.00	28	55.75	33.24	16	2	6	4.960	3.292
March	28	17.25	10	67.00	45.16	18	3	13	3.035	4.958
April	6	40.00	21	78.50	55.55	15	0	8	1.730	4.823
May	14	39.00	26	85.00	60.73	21	0	9	4.205	2.432
June	6	48.75	30	93.25	68.20	18	0	8	2.446	2.677
July	23	61.50	3	98.25	78.25	18	0	11	4.330	5.172
August	26	55.00	9	90.50	73.09	17	0	10	8.060	6.189
September	28	43.75	1-2	88.00	67.47	17	0	10	2.535	4.701
October	29	35.00	2	76.75	56.41	23	0	8	2.823	3.628
November	15	27.00	12	58.00	42.65	18	2	9	4.570	4.569
December	25	13.50	2	57.75	31,83	20	6	7	7.459	2.265
Means and Totals	Feb. 4	8.00	July 3	98.25	53.63	219	18	110	54.363	.....
Previous five years	Jan. 12, 1873.	-12.00	July 26, 1877.	99.00	50.48	227	30	97	48.499	.....

Thermometers in the shade, having a northern exposure, protected from reflection.

Statement showing how many times the wind was observed blowing from the eight cardinal points of the compass during each month and season of the year, ending June 30, 1877, compiled from the local observations taken at Station Barnegat, N. J., at 7 A. M., 2 P. M. and 9 P. M. (local time.)

WIND.	July, 1876.	August.	September.	October.	November.	December.	January, 1877.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
N.	2	7	11	17	12	16	12	10	8	9	5	3	12	12	40	38
N. W.	10	11	11	18	26	34	25	31	31	18	18	9	67	30	55	90
W.	14	7	13	16	12	15	13	5	2	3	5	9	10	30	41	33
S. W.	26	11	5	16	5	10	19	11	10	3	22	14	35	51	26	40
S.	25	17	12	9	3	4	7	8	15	12	16	36	43	78	24	19
S. E.	4	15	9	3	4	1	2	4	9	15	12	8	36	27	16	7
E.	4	17	22	5	16	4	5	9	7	12	6	7	25	28	43	18
N. E.	8	7	7	9	12	8	9	6	11	17	8	3	36	18	28	23
Calm	0	1	0	0	0	1	1	0	0	1	1	1	2	2	0	2
Blank	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.....

Statement showing how many times the wind was observed blowing, &c., at Station Sandy Hook, N. J.

WIND.	July, 1876.	August.	September.	October.	November.	December.	January, 1877.	February.	March.	April.	May.	June.	Spring.	Summer.	Autumn.	Winter.
N.	4	7	2	10	14	15	8	10	12	9	10	3	31	14	26	33
N. W.	8	9	18	18	17	23	18	31	27	14	23	8	64	25	53	72
W.	14	8	11	18	15	17	27	15	8	5	15	12	28	34	44	59
S. W.	18	7	6	16	2	13	13	9	5	6	11	11	22	36	24	35
S.	12	11	8	9	2	2	2	3	9	1	8	16	18	39	19	7
S. E.	19	23	15	7	8	0	3	3	12	25	13	25	50	67	30	6
E.	2	8	6	0	0	1	0	4	5	8	0	5	18	15	6	5
N. E.	15	12	21	10	28	16	14	7	13	18	11	6	42	33	59	37
Calm	1	8	3	5	4	6	8	2	2	4	2	4	8	13	12	16
Blank	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Meteorological Summary for 1878 of Observations by E. R. Cook—Station, Trenton

Thermometer highest, July 4th and 18th..... 97°
Thermometer lowest, January 7th..... 12°

Rained on ninety-eight days. *Snowed eighteen times. Five thunder showers. Fifteen fogs. †Twenty-seven frosts. Four hail storms.
First frost, September 16; first ice, October 29; first snow, November 6.

Amount of rain fallen in each month:

	INCHES.
January	7.55
February	2.80
March	3.90
April	1.50
May	4.70
June	5.60
July	4.45
August	4.45
September	3.40
October	1.85
November	4.25
December	5.85
	5.30

Snowfall during the year, 11 inches.
Snowfall since November 6, 4 inches.
*11 snows since November 6.
†17 frosts since September 16.

Report of the Medical Superintendent of Vital Statistics

TO THE SECRETARY OF STATE AND THE STATE BOARD OF HEALTH.

Under the new law concerning the registry and returns of marriages, births and deaths, it is made the duty of the person in charge of vital statistics to study the returns in reference to population and the causes and sources of disease, and the statistics and deductions therefrom are directed to be published as a part of the annual report of the State Board of Health. As the returns previous to June 1st have not yet been published and the year of new record will not be completed until the next annual report, we publish this year the returns as received under the *former* law. The same diligence as usual has been exercised in their collection. The number of marriages, births and deaths are only valuable as in contrast with more approved methods.

Under the new law returns are now received from every city and township of the State. In our next report we shall be able to submit a more correct estimate of the course of population, and of local and general causes of disease, than has before been attempted or been possible in this State. Yet it is to be remembered that a longer period than a single year is required for those more important comparisons which are so instructive for the guide of legislation as to great social questions.

The first intent of governments in such returns was to have a record which is of value in attesting rights of property and inheritance. These are so important as still to call for vigorous methods and careful preservation. References for this purpose are more frequent than generally supposed, and often weighty questions of equity turn thereupon. But vital statistics come to have a far wider sphere since the compilation of full statistics has been found a necessity by all nationalities.

A nation without its statistics is as embarrassed as is a great

mercantile or commercial interest without its data. These must be so analyzed and arranged and reasoned upon as to regulate the State in its plans for development. 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 have primary reference to the physical and intellectual laws of population and to the application of their principles to moral and political science. The department of life insurance is an illustration of how much such studies have to do with development of important interests. Dr. Farr, the English statist, speaks of it as one of the higher branches of mercantile interest and one of the most valuable discoveries of modern times. Yet it is directly dependent upon the accurate calculation of probabilities and of expectations of life which have had their origin and development through vital statistics. Some of the embarrassments which have limited its great capacities for the promotion of social and national welfare, have arisen from defects in statistical observations and classification, and from too great reliance on English tables, without adequate facts as to our own climate, temperament and social conditions.

Now no civilized country of Europe is without its system of registration, and our leading States as well as the general government are perfecting their methods and the whole matter is being investigated by experts preparatory to the census of 1880. Lord Bacon stated an axiom when he said "the true greatness of a State consisteth essentially in population and breed of men." "It is not too much to say that modern sanitary science owes its existence to the registration of death and the localization thereby of insanitary conditions." The language of Elisha Harris, the most eminent of American statists, well expresses their importance:

"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. The fact is that the death-rate per thousand living people, fluctuates from eleven to forty, fifty, sixty, and even eighty per annum, in different places, the fluctuations being directly chargeable to the local, the domestic, personal, and to certain avoidable vital and unfortunate physiological conditions of the populations who present these variations in excess of a minimum rate of mortality. The population of London has suffered yearly death-rates equal to eighty, sixty, forty, thirty, and now, less than twenty-four to the thousand, these variations being due to the sanitary conditions under which the people lived, and the vital and constitutional vigor of the successive generations. * * * * *

"The proper understanding of the great governing causes of the premature mortality, on one hand, and of security to life and vigor, on the other, the unfolding and practical application of the laws of health, and of national prosperity and social welfare, and the true basis of wise sanitary administration in communities and States alike demand the complete and faithful registration of vital statistics. * * * * * * *

"Death, with its infinitely varied causes, is not completely described and most usefully studied until the great groups of the agencies that war against life and health are recognized and brought into the systematic account with the records of mortality, and until, indeed, the public records of marriage and birth in the successive generations, and the social, industrial, and general biological circumstances of the populations in communities and States are correspondingly registered and brought under review. The practical significance of death-rates, the economy of sanitary measures, the value of family or race culture, and of hereditary or constitutional health and the improvement of human welfare, will be correctly understood just in pro-

portion as the records of generations of people in all circumstances, and individuals in all these relations, are brought under correct methods of record and study of their life-history, from the cradle to the grave. The true significance of the records of causes of death will ever require the concurrent public registration of birth and marriage. The interests of the living, duty to those who die, and the ends of justice and order in communities alike require that the public records of mortality shall be complete and faithful in every place and among all classes of people. * * * * * * * * * *

"The permit for an interment must ever be the key to prompt compliance with the law for reporting, certifying, and proving or verifying the deaths, in all places." The results which have been obtained under this method and the inefficiency of all other methods fully justify insistance upon this prerequisite. It is only in exceptional cases and in very sparse communities that the requirement will be found inconvenient. This provision is so essential to that correctness which is indispensable that single cases only show that details should be so adjusted as to give the least possible trouble consistent with an assured return.

Our present law after the annoyance incident to any new requirement or change of method affecting so many has been well operated. The chief inconvenience has been where the proper officer has lived at a distance. This can easily be remedied, by powers of additional appointment entrusted to the Secretary of State, and by allowing the permit to be obtained by the undertaker where he resides. In cases where there has been no skilled attendance there can also be more simplicity as to the procurement of a permit; although not a few of such cases are found to result from improper treatment which the law tends to correct, rather than from suddenness of sickness or pecuniary disability.

In cases of interment out of the State by an arrangement with adjacent cities, we are now able to give permits which save the former inconvenience and expense, and the arrangement has been highly approved by all concerned. The marriage returns give far less trouble and are more complete and inexpensive than formerly, and have commended themselves to those concerned.

Our examination indicates that the birth returns will be fuller

than under the former law, but still will not be as complete as those of marriages and deaths. The total increase thus far for six months is over three thousand.

The chief difficulty arises from the inadvertency of physicians or from a feeling on the part of some of them that the State should not exact this service without compensation.

Such as have taken this view are no doubt sincere, but they are mistaken, and are without the support of those of their own profession who have given to the subject close examination and mature thought. The early opposition of some Scotch physicians is a matter of history. But it yielded not more to judicial opinion than it did to the calm advocacy of medical men. In 1874 the law was extended to England—the Registrar General with some severity discusses any dissent from the sustained view of the leading practitioners. It is not to be forgotten that in the advocacy of the voluntary returns of deaths, the Royal Colleges of Physicians, Surgeons and Apothecaries were foremost, and that Sir Henry Halford, Sir Astley Cooper and J. Hingeston, as their 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." Ever since there has been increasing recognition on the part of practitioners of the importance to themselves as well as to the State of all these vital records. Discussions have been in later years merely as to methods. The custom of all our larger cities has been the same. The consideration accorded to our uncertified signatures in such special and vital professional relations makes the rendering as a favor more decorous than claim as a reward, while our practical exemption from all jury duty may at least be reckoned as an offset. The counterfoil furnishes a convenient brief of cases and both the printed nomenclature and the habit of record tend to aid in method and precision. By those in Europe who have a right to speak from experience and for the profession, and by those in our own country who have given special thought thereto, it is recognized that not only does elevation accrue to the profession and service to the State, but that even in a pecuniary direction a reward accrues more than commensurate to the service. We therefore ask with confidence of all practitioners accurate re-

sponse to the requirements as to birth returns, as well as to those of death, as a duty due from our calling and citizenship without that urgency which pay may offer or penalty may enforce.

Our thanks are due to officers of county and city boards, and to the assessors of the townships for an efficiency and a courtesy which shows faithfulness and fulfillment of law beyond any motive which their small compensation can present. For this extra official work the compensation has never before been less than ten cents, and this is as small an amount therefore as economy can indicate. As returns are now made directly to the office of the Secretary of State at Trenton, there is by this a saving on each return over the former law, which will more than allow for the greatly needed increase. The objections that have been made to the practical operations of the law have been carefully considered, and it is fully recognized that the system can be made facile in its operation without impairment of those vital conditions upon which its value depends.

With the confident expectation that we shall be able to present in the future important facts, bearing on the course of population, the health of localities, and the general advancement of the interests of our citizens, this report is respectfully submitted.

MARRIAGES.

COUNTIES.	TOWNSHIPS.	Number.	Total in County.	REMARKS.
Atlantic	Atlantic City	.....		No return.
	Absecon	13		
	Buena Vista	.....		No return.
	Egg Harbor City	15		
	Egg Harbor Township	16		
	Galloway	10		
	Hamilton	5		
	Hammonton	11		
	Mullica	4		
	Weymouth	.....		No return.
			74	
Bergen	Englewood	17		
	Franklin	11		
	Harrington	9		
	Hohokus	4		
	Lodi	20		
	Midland	12		
	New Barbadoes	47		
	Palisade	3		
	Ridgefield	5		
	Ridgewood	1		
	Saddle River	5		
	Union	8		
	Washington	.....		No return.
			142	
Burlington	Bass River	.....		No return.
	Beverly	7		
	Bordentown	29		
	Burlington	32		
	Chester	.....		No return.
	Chesterfield	.....		No return.
	Cinnaminson	.....		No return.
	Evesham	12		
	Florence	.....		No return.
	Little Egg Harbor	18		
	Lumberton	20		
	Mansfield	.....		No return.
	Medford	11		
	Mount Laurel	.....		No return.
	New Hanover	7		
	Northampton	53		
	Pemberton	.....		No return.

COUNTIES.	TOWNSHIPS.	Number.	Total in County.	REMARKS.
Burlington	Randolph	.....		No return.
	Shamong	.....		No return.
	Southampton	11		
	Springfield	.....		No return.
	Washington	.....		No return.
	Westhampton	.....		No return.
	Willingboro	.....		No return.
	Woodland	.....		No return.
			200	
Camden	Camden	155		
	Centre	14		
	Delaware	7		
	Gloucester	12		
	Gloucester City	34		
	Haddon	19		
	Merchantville	4		
	Stockton	4		
	Waterford	6		
	Winslow	6		
			261	
Cape May	Cape May City	.....		No return.
	Dennis	10		
	Lower	5		
	Middle	8		
	Upper	15		
			38	
Cumberland	Bridgeton	77		
	Commercial	12		
	Deerfield	2		
	Downe	.....		No return.
	Fairfield	33		
	Greenwich	10		
	Hopewell	10		
	Landis	13		
	Maurice River	9		
	Millville	77		
	Stoe Creek	6		
			249	
Essex	Belleville	.....		No return.
	Bloomfield	24		
	Caldwell	6		
	Clinton	.....		No return.
	East Orange	39		
	Franklin	4		
	Livingston	5		
	Millburn	20		
	Montclair	21		
	Newark	941		
	Orange	67		
	South Orange	14		
	West Orange	7		
			1148	

COUNTIES.	TOWNSHIPS.	Number.	Total in County.	REMARKS.
Gloucester	Clayton	16		
	Deptford	.....		No return.
	Franklin	17		
	Greenwich	27		
	Glassboro	16		
	Harrison	27		
	Logan	17		
	Mantua	11		
	Monroe	3		
	Swedesboro	.....		No return.
	Washington	16		
	West Deptford	3		
	Woodbury	40		
	Woolwich	12		
			205	
Hudson	Bayonne	23		
	Guttenburg	.....		No return.
	Harrison	7		
	Hoboken	147		
	Jersey City	600		
	Kearney	3		
	North Bergen	42		
	Town of Union	22		
	Union	2		
	Weehawken	1		
	West Hoboken	24		
			871	
Hunterdon	Alexandria	11		
	Bethlehem	15		
	Clinton	7		
	Delaware	17		
	East Amwell	14		
	Franklin	12		
	Frenchtown	14		
	High Bridge	8		
	Holland	.....		No return.
	Kingwood	21		
	Lambertville	37		
	Lebanon	11		
	Raritan	21		
	Readington	33		
	Tewksbury	10		
	Town of Clinton	.....		No return.
	Union	.....		No return.
	West Amwell	13		
			244	
Mercer	Chambersburg	16		
	East Windsor	.....		No return.
	Ewing	3		
	Hamilton	13		
	Hopewell	.....		No return.
	Lawrence	13		
	Princeton	24		

COUNTIES.	TOWNSHIPS.	Number.	Total in County.	REMARKS.
Mercer	Trenton	.....		No return.
	Washington	14		
	West Windsor	6		
			89	
Middlesex	Cranbury	13		
	East Brunswick	29		
	Madison	.....		No return.
	Monroe	.....		No return.
	New Brunswick	.....		No return.
	North Brunswick	17		
	Perth Amboy	.....		No return.
	Piscataway	19		
	Raritan	21		
	Sayreville	2		
	South Amboy	16		
	South Brunswick	36		
	Woodbridge	.....		No return.
			153	
Monmouth	Atlantic	1		
	Eatontown	11		
	Freehold	27		
	Holmdel	8		
	Howell	15		
	Manalapan	14		
	Marlboro	.....		No return.
	Matawan	14		
	Middletown	.....		No return.
	Millstone	.....		No return.
	Ocean	.....		No return.
	Raritan	43		
	Shrewsbury	.....		No return.
	Upper Freehold	48		
	Wall	.....		No return.
			181	
Morris	Boonton	19		
	Chatham	7		
	Chester	.....		No return.
	Hanover	.....		No return.
	Jefferson	11		
	Mendham	12		
	Montville	5		
	Morris	50		
	Mount Olive	12		
	Passaic	10		
	Pequannock	12		
	Randolph	.....		No return.
	Rockaway	20		
	Roxbury	.....		No return.
	Washington	.....		No return.
			158	
Ocean	Berkeley	3		
	Brick	.....		No return.
	Dover	6		

COUNTIES.	TOWNSHIPS.	Number.	Total in County.	REMARKS.
Ocean	Eagleswood	.....		No return.
	Jackson	.....		No return.
	Lacey	.....		No return.
	Manchester	5		
	Ocean	.....		No return.
	Plumsted	14		
	Stafford	2		
	Union	7		
			37	
Passaic	Acquackanonk	5		
	Little Falls	.....		No return.
	Manchester	.....		No return.
	Passaic	.....		No return.
	Paterson	337		
	Pompton	28		
	Wayne	5		
	West Milford	25		
			400	
Salem	Elsinboro	.....		No return.
	Lower Alloways Creek	8		
	Lower Penns Neck	8		
	Mannington	13		
	Pilesgrove	15		
	Pittsgrove	13		
	Quinton	.....		No return.
	Salem	54		
	Upper Alloways Creek	.....		No return.
	Upper Penns Neck	18		
	Upper Pittsgrove	13		
			142	
Somerset	Bedminster	21		
	Bernards	20		
	Branchburg	.....		No return.
	Bridgewater	142		
	Franklin	9		
	Hillsborough	16		
	Montgomery	11		
	North Plainfield	11		
	Warren	10		
			240	
Sussex	Andover	4		
	Byram	11		
	Frankford	4		
	Green	2		
	Hardyston	.....		No return.
	Hampton	1		
	Lafayette	.....		No return.
	Montague	5		
	Newton	.....		No return.
	Sandyston	16		
	Sparta	5		
	Stillwater	11		
	Vernon	.....		No return.

COUNTIES.	TOWNSHIPS.	Number.	Total in County.	REMARKS.
Sussex	Walpack	12		
	Wantage	15		
			86	
Union	Clark	.....		No return.
	Cranford	.....		No return.
	Elizabeth	192		
	Fanwood	.....		No return.
	Linden	10		
	New Providence	.....		No return.
	Plainfield	30		
	Rahway	41		
	Springfield	6		
	Summit	.....		No return.
	Union	15		
	Westfield	5		
			299	
Warren	Allamuchy	3		
	Belvidere	.....		No return.
	Blairstown	12		
	Franklin	9		
	Frelinghuysen	12		
	Greenwich	23		
	Hackettstown	11		
	Hardwick	5		
	Harmony	18		
	Hope	10		
	Independence	.....		No return.
	Knowlton	7		
	Lopatcong	6		
	Mansfield	13		
	Oxford	.....		No return.
	Pahaquarry	.....		No return.
	Phillipsburg	.....		No return.
	Town of Washington	29		
	Washington	.....		No return.
			158	

RECAPITULATION.

MARRIAGES IN THE SEVERAL COUNTIES.

COUNTIES.	Number.	REMARKS. TOWNSHIPS IN WHICH NO RETURNS HAVE BEEN MADE.
Atlantic	74	Atlantic City, Buena Vista, Weymouth.
Bergen	142	Washington.
Burlington	200	Bass River, Chester, Chesterfield, Cinnaminson, Florence, Mansfield, Mount Laurel, Pemberton, Randolph, Shamong, Springfield, Washington, Westhampton, Willingboro, Woodland.
Camden	261	
Cape May	38	Cape May City.
Cumberland	249	Downe.
Essex	1,148	Belleville, Clinton.
Gloucester	205	Deptford, Swedesboro.
Hudson	871	Guttenburg.
Hunterdon	244	Holland, Town of Clinton, Union.
Mercer	89	East Windsor, Hopewell, Trenton.
Middlesex	153	Madison, Monroe, New Brunswick, Perth Amboy, Woodbridge.
Monmouth	181	Marlboro, Middletown, Millstone, Ocean, Shrewsbury, Wall.
Morris	158	Chester, Hanover, Randolph, Roxbury, Washington.
Ocean	37	Brick, Eagleswood, Jackson, Lacey, Ocean.
Passaic	400	Little Falls, Manchester, Passaic.
Salem	142	Elsinboro, Quinton, Upper Alloways Creek.
Somerset	240	Branchburg.
Sussex	86	Hardyston, Newton, Vernon.
Union	299	Clark, Cranford, Fanwood, New Providence, Summit.
Warren	158	Belvidere, Independence, Oxford, Pahaquarry, Phillipsburg, Washington.
Total in State	5,375	

BIRTHS.

Births in Atlantic County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.								
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.	Sex not reported.	Total.
Absecon	6	4	.....	.....	1	.....	8	1	1	1	11
*Atlantic City	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Buena Vista	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Egg Harbor City	16	20	.....	1	19	4	10	2	.....	.....	36
Egg Harbor Township	36	39	15	.....	6	4	49	1	.....	.....	75
Galloway	28	19	15	.....	2	2	28	.....	.....	.....	47
Hamilton	22	18	8	.....	7	1	18	6	.....	.....	40
Hammonton	24	15	9	1	8	4	13	4	.....	.....	39
Mullica	7	3	4	.....	3	.....	.....	1	2	.....	10
Weymouth	9	8	2	.....	2	1	12	1	.....	1	18
*No returns.	148	126	53	2	48	16	138	16	3	2	276

Births in Bergen County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.							Sex not reported.	Total.
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.		
Englewood	35	38	2	.....	24	8	34	3	2	.....	73
Franklin	18	6	13	.....	6	.....	4	1	.....	.....	24
Harrington	29	27	8	.....	12	7	29	.....	.....	.....	56
Hohokus	3	1	4	.....	.....	.....	1	.....	.....	1	5
Lodi	60	63	3	2	4	18	50	3	.....	1	124
Midland	20	26	16	.....	11	4	14	1	.....	.....	46
New Barbadoes	55	45	1	.....	24	21	31	16	7	.....	100
Palisade	16	7	3	.....	4	3	11	1	2	1	24
Ridgefield	9	12	7	1	9	6	11	3	11	27	48
Ridgewood	6	10	2	.....	3	2	9	.....	.....	.....	16
Saddle River	11	12	11	.....	2	1	9	.....	.....	.....	23
Union	35	39	6	1	18	7	38	5	.....	1	75
*Washington	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*No returns.	297	286	76	4	161	77	241	33	22	31	614

Births in Burlington County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.							Sex not reported.	Total.
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.		
*Bass River	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Beverly City	11	13	1	.....	10	4	9	.....	.....	.....	24
Beverly	13	12	3	.....	1	.....	17	4	.....	.....	25
Bordentown	44	26	5	.....	23	11	29	2	.....	.....	70
Burlington	68	67	10	3	45	18	49	6	4	.....	135
*Chester	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Chesterfield	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Cinnaminson	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Evesham	10	20	10	.....	2	2	14	.....	4	2	32
*Florence	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Little Egg Harbor	43	23	5	1	11	4	43	2	.....	.....	66
Lumberton	9	17	14	.....	4	.....	8	.....	.....	.....	26
*Mansfield	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Medford	13	15	12	.....	5	3	6	2	.....	.....	28
*Mount Laurel	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Hanover	23	16	8	.....	5	5	19	2	.....	.....	39
Northampton	23	24	.....	1	13	2	19	3	10	1	48
*Pemberton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Randolph	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Shamong	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Southampton	16	8	5	.....	6	1	12	.....	.....	.....	24
*Springfield	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Washington	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Westhampton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Willingboro	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Woodland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*No returns.	273	241	73	5	125	50	225	21	18	3	517

Births in Camden County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.								
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.	Sex not reported.	Total.
Camden	519	445	13	10	69	22	84	15	875	124	1088
Centre	16	27	14	.....	3	.....	24	1	1	.....	43
Delaware	12	10	11	.....	1	.....	10	.....	.....	.....	22
Gloucester	28	32	21	2	2	2	26	.....	16	9	69
Gloucester City	58	59	1	.....	48	11	51	6	.....	.....	117
Haddon	33	27	12	.....	11	13	20	4	.....	.....	60
Merchantville	5	3	1	.....	1	2	3	1	.....	.....	8
Stockton	29	20	4	.....	.....	.....	42	.....	3	.....	49
Waterford	3	1	1	.....	1	.....	2	.....	.....	.....	4
Winslow	9	18	4	.....	13	.....	10	.....	.....	.....	27
	712	642	82	12	149	50	272	27	895	133	1487

Births in Cape May County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.								
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.	Sex not reported.	Total.
*Cape May City	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dennis	11	15	6	.....	3	2	14	1	.....	.....	26
Lower	16	20	9	.....	9	.....	15	2	1	.....	36
Middle	16	16	8	.....	3	1	18	2	.....	.....	32
Upper	20	26	13	1	4	1	27	.....	.....	.....	46
*No returns.	63	77	36	1	19	4	74	5	1	.....	140

Births in Cumberland County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.								
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.	Sex not reported.	Total.
Bridgeton	109	88	28	3	63	24	57	12	10	.....	197
Commercial	47	24	19	.....	9	5	39	.....	.....	1	72
Deerfield	18	17	23	.....	2	1	9	.....	.....	.....	35
*Downe	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fairfield	35	54	16	.....	7	4	30	2	30	.....	89
Greenwich	14	16	10	.....	1	.....	19	.....	.....	.....	30
Hopewell	19	12	17	.....	3	1	14	.....	.....	4	35
Landis	43	46	50	1	18	9	7	4	.....	.....	89
Maurice River	37	40	20	.....	3	2	51	1	.....	.....	77
Millville	94	76	9	.....	112	15	21	8	5	.....	170
Stoe Creek	13	9	11	.....	.....	.....	10	1	1	1	23
*No return.	429	382	203	4	218	61	257	28	46	6	817

Births in Essex County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.								
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.	Sex not reported.	Total.
*Belleville	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bloomfield	63	47	7	5	41	13	39	5	.....	.....	110
Caldwell	22	18	12	1	19	5	3	.....	.....	.....	40
Clinton	19	14	7	.....	7	10	5	4	.....	.....	33
East Orange	59	59	.....	4	36	30	25	23	.....	.....	118
Franklin	4	6	.....	.....	5	.....	5	.....	.....	.....	10
Livingston	3	2	4	.....	.....	.....	.....	1	.....	.....	5
Millburn	25	26	.....	1	9	2	11	.....	28	.....	51
Montclair	58	67	7	.....	28	19	57	13	1	.....	125
Newark	1913	1890	22	135	1465	432	1193	58	498	.....	3803
Orange	133	147	.....	2	110	30	28	5	105	.....	280
South Orange	37	46	8	.....	12	15	40	8	.....	.....	83
West Orange	35	21	2	.....	24	6	22	2	.....	.....	56
*No return.	2371	2343	69	148	1756	562	1428	119	632	.....	4714

Births in Gloucester County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.							Sex not reported.	Total.
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.		
Clayton	33	29	11	2	23	2	21	3	.....	.....	62
Deptford	20	17	11	.....	3	3	18	2	.....	.....	37
Franklin	40	31	27	1	19	2	20	2	.....	.....	71
Greenwich	34	29	28	2	4	4	21	4	.....	.....	63
Glassboro	24	34	4	.....	16	3	34	1	.....	.....	58
Harrison	30	24	38	2	6	4	.....	4	.....	.....	54
Logan	19	15	19	.....	1	.....	13	1	.....	.....	34
Mantua	21	20	21	.....	5	5	9	1	.....	.....	41
Monroe	16	17	2	.....	17	2	12	.....	.....	.....	33
*Swedesboro	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington	17	18	21	.....	1	1	9	1	2	.....	35
West Deptford	12	17	28	.....	2	2	2	1	.....	6	35
Woodbury	25	20	3	.....	14	8	18	5	4	7	52
Woolwich	24	22	21	.....	6	1	19	.....	.....	1	47
*No return.	315	293	234	7	117	37	196	25	6	14	622

Births in Hudson County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.							Sex not reported.	Total.
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.		
Bayonne	99	82	.....	5	36	32	96	8	4	.....	181
*Guttenburg	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Harrison	36	27	3	2	31	8	16	3	.....	.....	63
Hoboken	312	293	.....	7	232	166	184	13	3	.....	605
Jersey City	618	608	3	21	463	275	394	32	38	.....	1226
Kearney	9	7	.....	1	8	.....	6	1	.....	.....	16
North Bergen	14	11	2	.....	7	4	9	1	2	.....	25
Town of Union	61	61	3	3	60	23	29	4	.....	.....	122
Union	22	7	.....	.....	18	8	2	1	.....	.....	29
Weehawken	4	1	.....	.....	4	.....	1	.....	.....	.....	5
West Hoboken	33	31	1	.....	26	15	17	2	3	.....	64
*No return.	1208	1128	12	39	885	531	754	65	50	.....	2336

Births in Hunterdon County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.							Sex not reported.	Total.
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.		
Alexandria	10	23	12	.....	4	5	10	2	.....	.....	33
Bethlehem	19	13	9	.....	3	2	16	2	.....	.....	32
Clinton	28	11	18	.....	6	1	13	1	.....	.....	39
Delaware	37	32	26	.....	11	4	22	6	.....	.....	69
East Amwell	22	11	18	.....	5	4	6	.....	.....	.....	33
Franklin	11	13	17	.....	4	1	2	.....	.....	.....	24
Frenchtown	5	2	1	.....	4	1	1	.....	.....	.....	7
High Bridge	24	18	11	.....	6	4	20	1	.....	.....	42
*Holland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kingwood	20	16	20	.....	5	3	7	1	.....	.....	36
Lambertville	72	33	.....	.....	47	8	45	5	2	2	107
Lebanon	13	13	12	.....	2	1	11	.....	.....	.....	26
Raritan	21	21	21	.....	5	4	11	1	.....	.....	42
Readington	22	22	22	.....	5	4	10	3	.....	.....	44
Tewksbury	9	12	16	.....	3	.....	1	1	.....	.....	21
*Town of Clinton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Union	5	5	6	.....	.....	1	3	.....	.....	.....	10
West Amwell	11	11	4	.....	2	1	15	.....	.....	.....	22
*No return.	329	256	213	.....	112	44	193	23	2	2	587

Births in Mercer County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.								
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.	Sex not reported.	Total.
Chambersburg	48	44	.....	.....	49	6	35	2	.....	.....	92
*East Windsor	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ewing	16	10	7	.....	1	1	16	1	.....	.....	26
Hamilton	25	19	17	.....	3	1	23	.....	.....	.....	44
*Hopewell	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lawrence	29	29	11	.....	22	.....	23	2	.....	.....	58
Princeton	27	20	8	.....	5	6	24	1	3	.....	47
*Trenton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington	7	4	5	.....	2	1	2	1	.....	.....	11
West Windsor	19	9	19	.....	2	.....	7	.....	.....	.....	28
*No return.	171	135	67	.....	84	15	130	7	3	.....	306

Births in Middlesex County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.								
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.	Sex not reported.	Total.
Cranbury	15	6	9	.....	1	1	9	.....	1	.....	21
East Brunswick	37	45	28	.....	17	7	27	2	1	.....	82
*Madison	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Monroe	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*New Brunswick	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
North Brunswick	14	16	10	.....	15	3	1	1	.....	.....	30
*Perth Amboy	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Piscataway	36	37	23	.....	8	13	23	4	2	.....	73
Raritan	52	37	26	2	17	2	37	4	1	.....	89
Sayreville	15	7	.....	.....	1	3	18	.....	.....	.....	22
South Amboy	53	55	.....	.....	17	8	80	3	.....	.....	108
South Brunswick	34	25	28	.....	3	4	23	1	.....	.....	59
*Woodbridge	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*No return.	256	228	124	2	79	41	218	15	5	.....	484

Births in Monmouth County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.								
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.	Sex not reported.	Total.
Atlantic	10	9	5	.....	3	3	8	.....	1	1	20
Eatontown	25	16	9	2	10	3	16	1	.....	.....	41
Freehold	4	3	1	.....	1	1	3	1	.....	.....	7
Holmdel	7	7	4	.....	.....	.....	10	.....	.....	.....	14
Howell	13	23	14	.....	9	.....	8	2	4	1	37
Manalapan	19	16	16	.....	2	7	10	1	.....	1	36
*Marlboro	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Matawan	40	33	6	1	10	6	47	3	.....	.....	73
*Middletown	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Millstone	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Ocean	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Raritan	46	51	8	.....	12	15	61	1	.....	.....	97
*Shrewsbury	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Upper Freehold	21	30	11	.....	2	4	32	1	1	.....	51
*Wall	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*No return.	185	188	74	3	49	39	195	10	6	3	376

Births in Morris County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.								
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.	Sex not reported.	Total.
Boonton	12	27	1	.....	13	5	16	1	3	.....	39
Chatham	33	32	9	2	16	5	29	4	.....	.....	65
*Chester	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Hanover	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Jefferson	16	10	11	.....	3	1	11	.....	.....	.....	26
Mendham	13	14	11	.....	3	2	2	.....	9	.....	27
Montville	4	7	8	.....	1	.....	1	.....	1	.....	11
Morris	165	132	9	2	50	41	165	10	30	10	307
Mount Olive	15	21	7	.....	4	.....	23	2	.....	.....	36
Passaic	17	14	15	1	5	2	8	.....	.....	.....	31
Pequannock	22	23	19	.....	10	5	10	1	.....	.....	45
*Randolph	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rockaway	91	81	16	1	21	3	126	5	.....	.....	172
*Roxbury	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Washington	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*No return.	388	361	106	6	126	64	391	23	43	10	759

Births in Ocean County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.								
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.	Sex not reported.	Total.
Berkeley	6	3	3	.....	1	1	4	.....	.....	.....	9
*Brick	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dover	36	28	13	1	7	5	33	5	.....	.....	64
*Eagleswood	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Jackson	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Lacey	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Manchester	11	8	2	.....	4	.....	12	1	.....	.....	19
*Ocean	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Plumsted	30	24	13	.....	10	.....	29	2	.....	.....	54
Stafford	9	10	7	.....	2	1	7	2	.....	.....	19
Union	15	12	1	.....	2	1	20	2	1	.....	27
*No return.	107	85	39	1	26	8	105	12	1	.....	192

Births in Passaic County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.								
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.	Sex not reported.	Total.
Acquackanonk	14	10	13	.....	3	1	7	.....	.....	.....	24
*Little Falls	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Manchester	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Passaic	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Paterson	689	664	12	33	593	200	460	40	15	.....	1353
Pompton	23	22	9	.....	4	1	30	.....	1	.....	45
Wayne	17	8	10	.....	8	.....	7	.....	.....	.....	25
West Milford	41	40	37	.....	11	2	31	.....	.....	.....	81
*No return.	784	744	81	33	619	204	535	40	16	.....	1528

Births in Salem County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.							Sex not reported.	Total.
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.		
*Elsinboro	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lower Alloways Creek	20	9	12	.....	2	1	14	.....	.....	.....	29
Lower Penns Neck	12	17	15	.....	1	1	11	1	.....	.....	29
Mannington	38	27	17	.....	4	1	35	.....	8	.....	65
Pilesgrove	14	20	9	.....	5	3	16	1	.....	.....	34
Pittsgrove	14	12	13	.....	1	1	10	1	.....	.....	26
Quinton	7	13	6	.....	6	.....	7	.....	1	.....	20
Salem	58	43	3	.....	40	8	47	3	.....	.....	101
Upper Alloways Creek	8	5	6	1	4	1	1	.....	.....	.....	13
Upper Penns Neck	52	40	36	.....	8	7	39	2	.....	.....	92
Upper Pittsgrove	31	21	30	.....	3	1	17	1	.....	.....	52
*No return.	254	207	147	1	74	24	197	9	9	.....	461

Births in Somerset County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.							Sex not reported.	Total.
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.		
Bedminster	23	18	15	.....	7	5	18	1	.....	5	46
Bernards	34	27	28	.....	12	4	15	2	.....	.....	61
*Branchburg	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bridgewater	79	67	10	.....	42	18	69	7	.....	.....	146
Franklin	50	42	29	.....	22	7	26	4	5	1	93
Hillsborough	36	27	22	.....	8	4	27	2	.....	.....	63
Montgomery	20	27	16	.....	7	.....	14	3	.....	.....	40
North Plainfield	39	32	6	1	30	21	8	5	.....	.....	71
Warren	12	14	15	.....	6	1	3	.....	1	.....	26
*No return.	293	247	141	1	134	60	180	24	6	6	546

Births in Sussex County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.							Sex not reported.	Total.
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.		
Andover	7	5	3	.....	1	3	5	.....	.....	.....	12
Byram	24	7	8	.....	1	2	18	2	.....	.....	31
Frankford	13	4	6	.....	3	.....	6	.....	2	.....	17
Greene	10	3	7	.....	2	.....	4	.....	.....	.....	13
*Hardyston	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hampton	4	6	5	.....	.....	.....	5	.....	.....	.....	10
*Lafayette	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Montague	7	6	6	.....	1	1	5	.....	.....	.....	13
*Newton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sandyston	2	4	5	.....	.....	.....	1	.....	.....	.....	6
Sparta	25	17	8	.....	4	3	27	.....	.....	.....	42
Stillwater	28	18	18	.....	6	3	19	.....	.....	.....	46
*Vernon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Walpack	11	5	13	.....	2	.....	.....	.....	1	.....	16
Wantage	26	17	20	.....	2	4	16	1	.....	.....	43
*No return.	157	92	99	.....	22	16	106	3	3	.....	249

Births in Union County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.							Sex not reported.	Total.
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.		
*Clark	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Cranford	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Elizabeth	712	683	13	19	540	94	536	42	151	.....	1395
Fanwood	3	10	3	.....	3	1	5	1	.....	.....	13
Linden	16	11	6	.....	5	2	12	2	.....	.....	27
*New Providence	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Plainfield	62	82	3	.....	27	7	20	10	77	.....	144
Rahway	78	88	1	5	65	19	60	7	9	.....	166
Springfield	11	20	2	2	7	3	5	.....	12	.....	31
*Summit	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Union	31	33	13	.....	10	11	27	3	.....	.....	64
Westfield	17	16	1	.....	9	7	14	2	.....	.....	33
*No return.	930	943	42	26	666	144	679	67	249	.....	1873

Births in Warren County.

TOWNSHIPS.	SEX.		OCCUPATION OF FATHER.							Sex not reported.	Total.
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.		
Allamuchy	10	8	6	.....	.....	1	9	.....	2	.....	18
*Belvidere	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blairstown	14	26	13	.....	12	4	10	1	.....	.....	40
Franklin	13	17	17	.....	1	2	9	1	.....	.....	30
Frelinghuysen	9	19	9	.....	2	2	14	.....	1	.....	28
Greenwich	43	42	21	.....	18	6	36	2	2	.....	85
Hackettstown	19	28	1	.....	13	8	23	2	.....	.....	47
Hardwick	10	6	11	.....	1	.....	1	.....	3	.....	16
Harmony	13	11	10	.....	5	1	7	1	.....	.....	24
Hope	19	18	10	.....	.....	2	23	2	.....	.....	37
*Independence	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Knowlton	19	14	14	.....	3	3	12	1	.....	.....	33
Lapatcong	33	24	9	.....	9	1	38	.....	.....	.....	57
Mansfield	23	17	16	.....	2	5	14	.....	4	1	41
*Oxford	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pahaquarry	8	3	5	.....	3	.....	3	.....	.....	.....	11
*Phillipsburg	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Town of Washington	21	26	2	1	16	6	19	3	.....	.....	47
Washington	19	10	4	.....	4	2	18	1	.....	.....	29
*No return.	273	269	148	1	89	43	236	14	12	1	543

RECAPITULATION.

BIRTHS IN THE SEVERAL COUNTIES.

COUNTIES.	SEX.		OCCUPATION OF FATHER.							Sex not reported.	Total.
	Male.	Female.	Farmer.	Manufacturer.	Mechanic.	Merchant.	Laborer.	Professional.	Not reported.		
Atlantic	148	126	53	2	48	16	138	16	3	2	276
Bergen	297	286	76	4	161	77	241	33	22	31	614
Burlington	273	241	73	5	125	50	225	21	18	3	517
Camden	712	642	82	12	149	50	272	27	895	133	1487
Cape May	63	77	36	1	19	4	74	5	1	......	140
Cumberland	429	382	203	4	218	61	257	28	46	6	817
Essex	2371	2343	69	148	1756	562	1428	119	632	......	4714
Gloucester	315	293	234	7	117	37	196	25	6	14	622
Hudson	1208	1128	12	39	885	531	754	65	50	......	2336
Hunterdon	329	256	213	......	112	44	193	23	2	2	587
Mercer	171	135	67	......	84	15	130	7	3	......	306
Middlesex	256	228	124	2	79	41	218	15	5	......	484
Monmouth	185	188	74	3	49	39	195	10	6	3	376
Morris	388	361	106	6	126	64	391	23	43	10	759
Ocean	107	85	39	1	26	8	105	12	1	......	192
Passaic	784	744	81	33	619	204	535	40	16	......	1528
Salem	254	207	147	1	74	24	197	9	9	......	461
Somerset	293	247	141	1	134	60	180	24	6	6	546
Sussex	157	92	99	......	22	16	106	3	3	......	249
Union	930	943	42	26	666	144	679	67	249	......	1873
Warren	273	269	148	1	89	43	236	14	12	1	543
	9943	9273	2119	296	5558	2090	6750	586	2028	211	19427

Deaths in Atlantic County.

TOWNSHIPS.	SEX.		CAUSE OF DEATH, AND NUMBER FROM EACH CAUSE.																							Sex not reported.	Cause not reported.	Total.
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Childbed.	Croup.	Cholera Infantum.	Convul-ions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small-pox.	Typhus Fever.	Whooping Cough.	All others.			
Absecon	7	9	...	...	1	4	...	...	...	...	1	2	...	...	...	...	...	2	...	1	1	...	...	...	2	...	2	16
*Atlantic City	.....	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	......
*Buena Vista	.....	......	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	......
Egg Harbor City	13	14	2	...	...	...	...	...	1	1	1	...	...	...	...	...	...	...	...	...	10	...	...	...	12	...	...	27
Egg Harbor Township	21	15	...	1	1	8	1	...	...	...	2	2	...	...	...	1	1	1	...	...	3	...	...	...	8	...	7	36
Galloway	24	6	...	...	2	10	...	1	...	2	...	...	...	...	1	...	1	...	...	...	2	...	1	...	10	...	...	30
Hamilton	14	11	...	...	...	6	2	...	...	1	2	...	...	...	...	...	...	...	...	...	8	...	...	...	5	...	1	25
Hammonton	16	24	...	...	1	8	1	...	4	1	1	...	1	...	...	...	...	...	4	2	8	...	...	1	8	...	...	40
Mullica	4	2	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	1	...	...	...	...	6
Weymouth	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	3
	100	83	2	1	5	37	4	1	5	5	7	4	1	...	1	1	2	3	4	3	36	...	2	1	45	...	13	183

*No return.

Deaths in Bergen County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																											
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diptheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Wooping Cough.	All others.	Sex not reported.	Cause not report.	Total.
Englewood	21	21	...	...	1	2	1	1	3	3	1	1	11	...	1	...	...	...	2	1	6	...	1	...	8	...	1	42
Franklin	8	6	...	...	...	4	...	...	...	2	...	1	...	...	...	...	...	...	1	2	...	...	...	...	2	...	1	14
Harrington	22	22	2	...	4	7	...	1	...	1	2	1	1	...	4	...	1	...	1	...	...	...	...	...	19	...	...	44
Hohokus	3	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	2	...	...	4
Lodi	25	15	1	...	...	4	...	2	2	2	3	3	1	2	...	...	...	...	...	1	3	...	...	...	14	...	1	40
Midland	21	22	1	...	2	7	1	...	1	2	5	2	...	...	1	...	3	...	2	1	3	...	...	...	11	...	1	43
New Barbadoes	29	27	1	...	5	9	...	...	1	...	6	1	...	1	2	...	...	...	...	4	...	...	...	...	24	1	3	57
Palisade	4	4	...	1	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	1	...	...	...	...	4	...	...	8
Ridgfield	.....	.....	...	...	...	2	...	1	4	1	...	...	...	...	...	...	...	...	2	2	...	...	...	...	4	21	5	21
Ridgewood	3	2	...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	...	...	...	3	...	...	...	.....	...	...	5
Saddle River	6	3	...	...	...	4	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1	...	1	...	2	...	...	9
Union	22	26	...	...	4	10	...	...	...	1	8	1	1	...	1	...	...	...	1	...	2	...	1	...	15	4	7	52
*Washington	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	...	...	.....
*No return.	164	149	5	1	16	49	2	5	11	12	26	10	17	2	12	...	4	...	10	12	18	...	3	...	105	26	19	339

Deaths in Burlington County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																											
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small-pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not report'd.	Total.
*Bass River	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
*Beverly City	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
Beverly	8	10	1	...	1	1	...	...	.....	...	...	...	...	...	.....	2	.....	...	...	1	...	2	.....	.....	10	...	.....	18
Bordentown	88	87	...	...	6	34	3	9	10	6	6	4	...	...	3	3	.....	...	11	5	15	...	5	.....	43	...	12	175
Burlington	71	66	1	...	4	36	...	7	10	3	15	...	...	...	1	.....	.....	...	2	7	12	...	2	.....	34	...	3	137
*Chester	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
*Chesterfield	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
*Cinnaminson	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
Evesham	7	6	...	...	...	2	...	...	.....	...	...	2	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
*Florence	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	8	...	1	13
Little Egg Harbor	14	15	1	...	1	6	...	...	1	2	12	...	...	...	.....	.....	.....	...	...	1	...	...	1	.....	3	...	1	29
Lumberton	12	14	...	...	1	9	...	1	2	1	1	1	...	...	.....	.....	.....	...	2	...	1	...	...	.....	6	...	1	26
*Mansfield	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
Medford	20	13	...	...	...	7	...	1	1	...	2	...	...	...	.....	.....	.....	...	2	1	...	...	3	.....	11	5	10	38
*Mount Laurel	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
New Hanover	12	11	...	2	...	5	...	...	7	...	...	...	...	...	.....	.....	.....	...	2	3	...	...	...	.....	3	...	1	23
Northampton	32	33	1	...	1	14	...	1	4	1	4	...	...	1	1	.....	.....	...	2	4	4	...	2	.....	20	...	5	65
*Pemberton	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
*Randolph	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
*Shamong	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
Southampton	5	4	...	...	...	1	...	1	.....	1	3	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
*Springfield	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	1	...	2	9
*Washington	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
*Westhampton	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
*Willingboro	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
*Woodland	.....	.....	...	...	...	.....	...	...	.....	...	...	...	...	...	.....	.....	.....	...	...	...	...	...	...	.....	.....	...	.....	.....
*No return.	269	259	4	2	14	115	3	20	35	14	43	7	...	1	5	5	.....	...	21	21	33	...	15	.....	139	5	36	533

Deaths in Camden County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																										
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diptheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Camden	291	235	18	...	19	122	8	22	53	61	75	22	7	9	22	8	19	16	...	17	20	7	32	16	312	380	21	906
Centre	14	19	...	...	2	8	...	1	2	2	1	...	1	...	...	...	...	...	1	...	3	...	...	...	10	.....	2	33
Delaware	5	9	...	...	1	2	...	...	1	1	...	1	...	1	...	...	...	...	...	2	...	...	1	...	3	.....	1	14
Gloucester	29	20	...	...	...	9	...	...	1	1	2	5	1	...	...	...	...	...	1	...	3	...	...	...	26	3	3	52
Gloucester City	10	18	...	...	2	5	...	...	2	4	1	1	...	...	1	...	...	...	...	...	...	...	2	...	8	.....	2	28
Haddon	24	22	1	...	1	8	...	1	3	1	3	...	1	...	2	...	...	...	2	1	...	...	2	...	19	.....	1	46
Merchantville	2	3	...	...	...	.....	...	...	...	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	2	.....	...	5
Stockton	4	5	...	...	...	.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	.....	9	9
Waterford	24	19	...	...	4	5	...	...	1	...	1	2	...	...	...	...	...	...	3	...	6	...	2	...	16	.....	3	43
Winslow	5	7	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	...	...	...	4	.....	2	12
	408	357	19	...	29	162	8	24	63	71	85	31	10	10	25	8	19	16	7	21	34	7	39	16	400	383	44	1148

Deaths in Cape May County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																										
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diptheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
*Cape May City	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dennis	16	11	3	...	...	6	...	...	...	...	...	3	...	...	...	...	...	...	3	...	...	...	2	...	5	2	7	29
Lower	20	24	1	...	...	6	...	2	...	...	15	2	...	...	...	...	...	...	2	...	...	...	1	...	14	...	1	44
Middle	12	7	...	...	1	5	2	...	...	...	5	2	...	...	1	...	...	...	...	1	...	...	...	...	2	...	...	19
Upper	8	8	...	1	2	2	...	...	1	...	...	3	...	...	...	...	...	...	1	...	...	...	1	...	3	...	2	16
	56	50	4	1	3	19	2	2	1	...	20	10	...	...	1	...	...	...	6	1	...	...	4	...	24	2	10	108

*No return.

Deaths in Cumberland County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																									
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sexes not reported.	Cause not reported.	Total.
Bridgeton	65	70	...	...	2	37	2	...	16	4	1	4	...	...	...	...	...	8	8	7	...	...	3	2	41	...	.....	135
Commercial	14	8	1	1	...	6	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	2	2	3	3	8	25
Deerfield	3	5	...	...	...	.....	1	...	...	1	1	1	1	1	...	...	...	...	...	...	...	...	...	...	2	...	.....	8
*Downe	.....	.....	...	...	...	.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....	...	.....	.....
Fairfield	10	15	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	6	...	.....	...	14	25
Greenwich	9	5	...	...	...	2	...	...	4	...	1	...	...	...	...	...	...	1	1	...	...	...	...	...	4	...	1	14
Hopewell	21	12	...	1	...	4	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	2	...	24	33
Landis	23	22	...	...	4	10	...	1	1	1	13	...	3	...	2	...	...	...	1	1	...	...	...	...	8	...	.....	45
Maurice River	9	16	...	1	1	4	1	...	2	1	...	1	...	...	1	...	...	...	1	1	...	...	...	...	11	...	.....	25
Millville	60	54	...	2	7	26	1	1	14	1	...	7	...	...	2	1	3	...	3	2	3	...	3	2	18	5	23	119
Stoe Creek	1	7	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	2	...	2	8
*No returns.	215	214	1	6	15	91	5	2	37	8	16	13	6	1	5	1	3	10	18	12	4	...	14	6	91	8	72	437

Deaths in Essex County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																									
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
*Belleville	.....	.....	...	...	.....	.....	...	...	.....	.....	...	...	...	...	.....	.....	.....	...	...	...	.....	...	.....	...	.....	...	...	.....
Bloomfield	34	22	1	...	1	11	...	2	2	.....	3	3	3	...	...	.....	.....	...	2	2	.....	...	.....	...	26	...	...	56
Caldwell	18	18	...	...	.....	6	1	1	.....	.....	4	...	...	...	...	.....	.....	1	1	3	1	...	.....	...	16	4	6	40
Clinton	14	12	...	...	.....	4	...	...	2	.....	2	...	...	...	...	.....	.....	...	2	1	8	...	.....	...	7	...	...	26
East Orange	28	27	1	...	1	15	...	5	1	.....	3	...	...	...	...	1	.....	...	3	1	1	...	.....	1	21	...	...	55
Franklin	11	7	...	...	.....	5	...	2	3	.....	2	...	...	...	...	.....	.....	...	1	...	1	...	.....	...	4	...	...	18
Livingston	3	6	...	...	.....	2	...	...	.....	.....	...	...	...	...	...	.....	.....	...	...	...	2	...	.....	...	5	...	...	9
Millburn	.....	1	1	...	2	6	...	...	.....	.....	...	1	...	1	...	.....	.....	...	...	1	.....	...	.....	...	4	29	14	30
Montclair	23	20	...	1	.....	10	2	5	.....	.....	...	...	...	...	...	.....	.....	...	1	...	1	...	.....	...	23	3	3	46
Newark	1660	1643	45	5	143	497	13	52	250	398	69	82	38	11	71	261	270	12	72	54	92	13	150	20	673	...	12	3303
Orange	15	18	...	1	1	11	...	1	4	2	6	3	...	...	1	.....	.....	...	...	2	4	...	.....	4	18	50	25	83
South Orange	17	9	...	...	.....	5	...	...	2	.....	...	...	...	...	...	1	2	...	1	1	1	...	.....	...	13	...	...	26
West Orange	10	9	...	...	1	2	...	...	.....	.....	1	...	...	1	...	.....	.....	...	3	...	.....	...	.....	...	11	...	...	19
*No returns.	1833	1792	48	7	149	574	16	68	264	400	90	89	41	13	73	262	273	13	86	65	111	13	150	25	821	86	60	3711

Deaths in Gloucester County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																							
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Clayton	17	13	...	...	...	6	...	2	...	1	1	1	1	...	...	...	...	...	1	2	...	...	2	1	15	...	...	30
Deptford	13	6	...	...	1	5	...	...	3	...	...	4	...	1	...	...	...	...	...	...	1	...	...	...	4	...	...	19
Franklin	10	12	...	1	1	5	...	...	...	...	1	...	...	...	...	...	...	...	1	2	...	...	1	...	10	...	...	22
Greenwich	13	8	...	...	...	6	...	...	1	...	...	1	...	...	1	...	...	...	...	1	...	...	...	1	3	...	7	21
Glassboro	10	16	...	...	2	7	...	...	3	1	1	2	...	...	...	...	...	...	...	1	...	...	...	...	9	...	...	26
Harrison	9	10	1	...	1	6	...	...	...	...	...	1	1	...	...	...	...	...	2	...	...	...	2	...	3	...	...	19
Logan	6	5	...	...	...	3	...	...	...	...	...	1	...	...	...	...	...	...	...	1	...	...	...	2	3	...	1	11
Mantua	12	9	...	...	...	2	1	1	...	1	...	3	...	...	...	...	...	...	...	...	1	...	1	...	10	...	1	21
Monroe	1	5	...	...	...	2	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	6
*Swedesboro	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.....
Washington	8	9	1	...	...	2	...	...	...	...	3	...	...	...	...	...	...	...	...	...	1	...	1	...	5	...	4	17
West Deptford	10	4	1	1	2	...	...	2	...	...	...	1	1	...	...	...	...	...	...	2	...	...	...	...	3	3	4	17
Woodbury	18	18	...	...	1	4	...	1	2	1	2	2	1	...	...	...	...	...	1	3	2	...	...	...	14	1	3	37
Woolwich	7	13	...	...	2	4	...	...	...	...	...	...	...	...	1	...	...	...	1	1	...	...	1	...	10	...	...	20
*No return.	134	128	3	2	10	52	1	6	9	4	8	17	4	1	2	...	...	...	5	11	5	...	8	4	93	4	21	266

Deaths in Hudson County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																								
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Bayonne	.....	.....	2	...	3	7	2	3	9	4	10	2	...	1	3	...	2	3	...	1	8	...	...	3	18	81	...	81
*Guttenburg	.....	.....	...	...	...	.....	...	...	.....	...	.....	.....	...	...	.....	...	.....	...	...	.....	.....	...	...	...	.....	.....	...	.....
Harrison	.....	.....	...	...	2	19	2	2	16	6	9	5	...	...	4	1	3	...	...	...	13	...	...	...	23	105	...	105
Hoboken	.....	.....	9	4	13	32	13	20	36	27	47	13	5	12	19	12	18	13	7	17	23	3	14	12	113	482	...	482
Jersey City	.....	.....	29	8	38	171	27	43	147	113	159	82	16	11	53	34	69	37	26	38	59	7	38	47	372	1624	...	1624
Kearney	.....	.....	...	...	...	4	...	1	2	2	3	1	...	...	...	...	.....	...	...	1	3	...	...	...	.....	17	...	17
North Bergen	.....	.....	1	...	2	22	...	2	11	5	12	4	...	...	2	...	3	...	...	4	15	...	...	2	21	107	...	107
Town of Union	.....	.....	...	...	2	7	1	...	4	3	6	1	...	...	3	...	2	...	...	2	6	...	1	2	15	55	...	55
Union	.....	.....	...	...	3	5	2	6	4	3	2	.....	...	...	1	...	1	...	...	1	2	...	1	1	12	44	...	44
Weehawken	.....	.....	1	...	1	2	...	...	3	.....	4	.....	...	...	...	...	2	...	...	...	3	...	...	...	5	21	...	21
West Hoboken	.....	.....	...	...	...	5	...	...	6	2	3	2	...	...	2	...	1	...	...	2	6	...	1	1	24	55	...	55
*No return.	.....	.....	42	12	64	274	47	77	238	165	255	110	21	24	87	47	101	53	33	66	138	10	55	69	603	2591	...	2591

Deaths in Hunterdon County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																									
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Alexandria	12	10	...	5	3	5	...	...	...	...	...	...	1	...	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	5	.....	.....	22
Bethlehem	9	7	1	...	2	1	...	...	...	...	...	2	...	...	.....	1	.....	.....	.....	.....	.....	.....	1	.....	4	.....	4	16
Clinton	7	6	...	...	...	1	...	...	2	...	1	1	...	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	13
Delaware	20	12	...	...	1	6	...	1	...	1	1	2	...	...	1	.....	.....	.....	4	.....	.....	.....	.....	.....	13	.....	2	32
East Amwell	11	10	...	...	1	4	...	...	2	...	...	1	...	...	.....	.....	.....	.....	.....	2	.....	.....	1	.....	10	.....	.....	21
Franklin	7	7	...	1	...	2	...	...	...	...	1	...	1	...	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	4	.....	4	14
Frenchtown	4	2	...	...	...	...	...	...	...	...	...	1	...	...	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	4	.....	.....	6
High Bridge	8	8	...	...	1	1	...	...	1	...	2	1	1	...	.....	.....	.....	.....	.....	.....	1	.....	2	.....	6	.....	.....	16
*Holland	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kingwood	8	9	1	...	...	1	...	...	1	...	...	3	...	...	.....	.....	.....	.....	2	1	.....	.....	.....	.....	8	.....	.....	17
Lambertville	33	26	...	...	4	6	...	2	9	4	6	3	...	...	1	.....	.....	.....	4	2	.....	.....	.....	1	15	.....	2	59
Lebanon	8	9	...	...	...	2	...	...	1	...	...	...	...	...	.....	.....	1	.....	2	.....	.....	.....	7	.....	4	.....	.....	17
Raritan	8	8	2	...	...	5	...	...	1	...	...	1	...	...	.....	.....	.....	.....	3	.....	.....	.....	.....	1	3	.....	.....	16
Readington	9	13	1	...	2	4	...	...	1	...	1	2	...	...	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	8	.....	.....	22
Tewksbury	12	5	...	...	...	...	...	...	2	...	...	...	...	...	.....	.....	.....	.....	3	1	.....	.....	6	.....	4	.....	1	17
*Town of Clinton	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Union	3	1	...	...	...	2	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	4
West Amwell	3	6	...	...	1	1	...	...	1	2	3	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	9
*No return.	162	139	5	6	15	41	...	3	21	7	15	17	3	1	2	1	1	.....	25	7	1	.....	17	2	98	.....	13	301

Deaths in Mercer County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																									
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All Others.	Sex not reported.	Cause not reported.	Total.
Chambersburg	25	22	.....	.....	2	6	3	6	1	2	7	...	.....	.....	...	1	.....	5	...	1	1	.....	2	.....	10	.....	.....	47
*East Windsor	.....	.....	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	.....	...	...	...	...	.....	...	.....	...	.....	.....	.....
Ewing	6	11	.....	.....	1	1	...	...	...	1	2	2	.....	.....	...	...	.....	1	2	...	...	.....	.....	1	3	1	4	18
Hamilton	51	24	.....	.....	1	13	...	2	1	4	2	...	2	2	2	4	2	...	2	2	1	.....	4	.....	31	.....	.....	75
*Hopewell	.....	.....	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	.....	...	...	...	...	.....	...	.....	...	.....	.....	.....
Lawrence	20	22	.....	.....	1	7	1	2	...	1	2	2	.....	.....	1	...	.....	2	2	...	1	.....	.....	.....	16	.....	2	42
Princeton	12	14	1	.....	1	2	...	...	...	1	1	...	.....	.....	...	...	.....	...	1	1	...	.....	.....	2	17	.....	1	26
*Trenton	.....	.....	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	.....	...	...	...	...	.....	...	.....	...	.....	.....	.....
Washington	10	3	1	2	...	1	...	...	...	3	2	2	.....	.....	...	...	.....	...	1	..	...	.....	.....	.....	1	.....	.....	13
West Windsor	5	9	.....	.....	1	5	...	...	...	...	...	1	.....	.....	...	...	.....	...	1	1	...	.....	.....	.....	4	.....	1	14
*No returns.	129	105	2	2	7	35	4	10	2	12	16	7	2	2	3	5	2	8	9	5	3	.....	6	3	82	1	8	235

Deaths in Middlesex County.

TOWNSHIPS.	SEX. Male.	Female.	CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE. Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Childbed.	Croup.	Cholera Infantum.	Convul-ions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Cranbury	10	6				8			1			1	1						2						4	1		17
East Brunswick	24	32	2		6	5	1	1		1	6		3		1					1	6			1	20		2	56
*Madison																												
*Monroe																												
*New Brunswick																												
North Brunswick	9	7			1	1	1		3			1							1	1	3				4			16
*Perth Amboy																												
Piscataway	13	10			1	4				2						1	2								4		9	23
Raritan	40	33			3	6		2	2		14	2			2	1				5	3		2	2	29			73
Sayreville	3	6				1					4										3				1			9
South Amboy	41	34		1	7	9	1	4	4	9	4	2					1	1	2		19				11			75
South Brunswick	21	11			4	1	1				1	2					1	2		1			1		17		1	32
*Woodbridge																												
*No return.	161	139	2	1	22	35	4	7	10	12	29	8	4	......	3	2	4	3	5	8	34	......	3	3	90	1	12	301

Deaths in Monmouth County.

TOWNSHIPS.	SEX. Male.	Female.	CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE. Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Atlantic	4	2			1														2								3	6
Eatontown	15	7		1		2		2			1	2			2	1			4	2			2	1	2			22
Freehold	10	4		1	1	2				1	1												1		4		3	14
Holmdel		1																									1	1
Howell	6	11				2						1									4				1		9	17
Manalapan	10	11			1	3					2	1			1	1			3	1					6		2	21
*Marlboro																												
Matawan	25	18		1	1	7				1	2	2					1		2	1	5		1	1	18			43
*Middletown																												
*Millstone																												
*Ocean																												
Raritan	38	25	2		2	4		3	3		4	4			1	2			2	1	13				19		3	63
*Shrewsbury																												
Upper Freehold	31	16		1		11	1	1			2	1							2	1					15		12	47
*Wall																												
*No return.	139	95	2	4	6	31	1	6	3	2	12	11	......	......	4	4	1	......	15	6	22	......	4	2	65	......	33	234

Deaths in Morris County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																												
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diptheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Boonton	12	12	...	.....	...	2	...	...	.....	1	1	2	1	...	1	...	...	.....	.....	.....	.....	.....	...	...	12	...	1	24
Chatham	15	9	1	.....	...	2	...	...	.....	.....	.....	1	.....	...	1	...	...	.....	.....	.....	.....	.....	1	...	16	...	...	24
*Chester	.....	.....	...	.....	...	...	...	...	.....	.....	.....	.....	.....	...	...	...	...	.....	.....	2	.....	.....	...	...	.....	...	...	.....
*Hanover	.....	.....	...	.....	...	...	...	...	.....	.....	.....	.....	.....	...	...	...	...	.....	.....	.....	.....	.....	...	...	.....	...	...	.....
Jefferson	5	12	...	.....	...	3	...	...	.....	.....	4	1	.....	...	...	...	...	.....	.....	.....	.....	.....	...	...	5	...	3	17
Mendham	10	7	...	1	...	6	1	...	.....	.....	.....	.....	.....	...	...	...	...	.....	1	2	.....	.....	...	...	3	...	3	17
Montville	7	4	...	.....	...	1	...	2	.....	.....	1	.....	.....	...	...	...	...	.....	.....	.....	3	.....	...	...	2	...	2	11
Morris	100	85	3	.....	2	29	1	3	9	5	12	7	5	3	2	2	3	1	9	3	5	.....	3	...	58	6	26	191
Mount Olive	9	7	...	.....	3	2	...	1	.....	.....	1	.....	1	...	1	...	1	.....	.....	.....	2	.....	...	...	5	...	...	16
Passaic	14	4	...	.....	1	4	...	...	1	2	.....	.....	.....	...	...	...	...	.....	.....	3	.....	.....	1	...	4	...	1	18
Pequannock	3	6	...	.....	1	1	...	...	.....	1	.....	.....	.....	...	...	...	...	.....	.....	.....	.....	.....	...	1	3	...	2	9
*Randolph	.....	.....	...	.....	...	...	...	...	.....	.....	.....	.....	.....	...	...	...	...	.....	.....	.....	.....	.....	...	...	.....	...	...	.....
Rockaway	27	22	...	.....	2	2	1	2	1	5	3	1	4	2	...	...	3	.....	.....	3	5	.....	4	3	2	...	6	49
*Roxbury	.....	.....	...	.....	...	...	...	...	.....	.....	.....	.....	.....	...	...	...	...	.....	.....	.....	.....	.....	...	...	.....	...	...	.....
*Washington	.....	.....	...	.....	...	...	...	...	.....	.....	.....	.....	.....	...	...	...	...	.....	.....	.....	.....	.....	...	...	.....	...	...	.....
*No return.	202	168	4	1	9	52	3	8	11	14	22	12	11	5	5	2	7	1	11	13	18	.....	9	4	110	6	44	376

Deaths in Ocean County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																												
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Berkeley	7	10	...	...	.....	4	.....	.....	...	...	2	...	...	.....	1	.....	.....	.....	...	2	5	.....	...	.....	3	.....	.....	17
*Brick	.....	.....	...	...	.....	...	.....	.....	...	...	...	...	...	.....	.....	.....	.....	.....	...	...	...	.....	...	.....	...	.....	.....	.....
Dover	36	20	1	...	3	12	.....	.....	5	...	1	1	...	.....	.....	.....	.....	.....	1	3	10	.....	...	4	15	.....	.....	56
*Eagleswood	.....	.....	...	...	.....	...	.....	.....	...	...	...	...	...	.....	.....	.....	.....	.....	...	...	...	.....	...	.....	...	.....	.....	.....
*Jackson	.....	.....	...	...	.....	...	.....	.....	...	...	...	...	...	.....	.....	.....	.....	.....	...	...	...	.....	...	.....	...	.....	.....	.....
*Lacey	.....	.....	...	...	.....	...	.....	.....	...	...	...	...	...	.....	.....	.....	.....	.....	...	...	...	.....	...	.....	...	.....	.....	.....
Manchester	4	14	...	...	.....	2	.....	.....	...	...	...	...	...	.....	.....	.....	.....	.....	...	...	13	.....	...	.....	1	.....	2	18
*Ocean	.....	.....	...	...	.....	...	.....	.....	...	...	...	...	...	.....	.....	.....	.....	.....	...	...	...	.....	...	.....	...	.....	.....	.....
Plumsted	15	20	1	...	.....	6	.....	.....	4	3	...	1	2	.....	.....	.....	.....	.....	2	...	5	.....	...	4	7	.....	.....	35
Stafford	9	2	...	1	.....	1	.....	.....	...	...	2	...	...	.....	.....	.....	.....	.....	...	1	...	.....	...	1	3	.....	2	11
Union	7	9	...	1	.....	7	.....	.....	...	1	...	1	...	.....	.....	1	.....	.....	...	...	...	.....	...	.....	5	.....	.....	16
* No returns.	78	75	2	2	3	32	.....	.....	9	4	5	3	2	.....	1	1	.....	.....	3	6	33	.....	9	.....	34	.....	4	153

Deaths in Passaic County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																											
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Acquackanonk	6	7	....	.....	2	1	....	....	1	.....	1	1	....	....	....	.....	.....	.....	1	....	....	.....	.....	.....	6	.....	.....	13
*Little Falls	.....	.....	....	.....	....	.....	....	....	....	.....	.....	....	....	....	....	.....	.....	.....	....	....	....	.....	.....	.....	.....	.....	.....	.....
*Manchester	.....	.....	....	.....	....	.....	....	....	....	.....	.....	....	....	....	....	.....	.....	.....	....	....	....	.....	.....	.....	.....	.....	.....	.....
*Passaic	.....	.....	....	.....	....	.....	....	....	....	.....	.....	....	....	....	....	.....	.....	.....	....	....	....	.....	.....	.....	.....	.....	.....	.....
Paterson	495	489	9	4	38	128	18	33	40	43	183	21	13	5	15	37	41	6	34	14	64	8	12	7	204	.....	7	984
Pompton	12	7	2	.....	1	2	1	....	1	.....	.....	....	....	2	....	.....	.....	.....	....	....	....	.....	.....	.....	6	.....	4	19
Wayne	6	8	....	.....	1	1	....	....	....	.....	1	2	....	....	....	.....	.....	.....	1	1	2	.....	.....	.....	4	.....	1	14
West Milford	7	9	1	.....	....	1	....	....	....	.....	.....	2	3	....	....	.....	.....	.....	1	1	....	.....	.....	.....	7	.....	.....	16
*No return.	526	520	12	4	42	133	19	33	42	43	185	26	16	7	15	37	41	6	37	16	66	8	12	7	227	.....	12	1046

Deaths in Salem County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																											
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
*Elsinboro	.....	.....	....	.....	...	...	.....	.....	...	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	.....	...	...	...	...	...	.....
Lower Alloways Creek	6	4	.....	.....	...	1	.....	.....	4	...	.....	1	.....	.....	.....	.....	.....	1	...	...	...	.....	...	...	3	...	...	10
Lower Penns Neck	8	9	.....	.....	4	3	.....	.....	...	1	.....	1	.....	.....	.....	.....	.....	...	2	...	...	.....	...	...	4	...	...	17
Mannington	16	18	.....	1	...	9	.....	.....	...	3	.....	...	.....	.....	.....	.....	.....	...	1	3	...	.....	...	...	7	...	9	34
Pilesgrove	13	37	1	.....	1	14	2	.....	4	1	.....	3	.....	.....	.....	.....	.....	...	4	1	...	.....	...	...	9	2	4	52
Pittsgrove	7	15	.....	.....	...	8	.....	.....	...	...	2	...	1	.....	.....	.....	.....	...	...	...	...	.....	...	...	6	...	4	22
Quinton	3	4	.....	.....	...	4	.....	.....	...	...	...	...	...	.....	.....	.....	.....	...	...	...	1	.....	...	...	2	...	...	7
Salem	23	30	.....	.....	2	8	.....	1	2	1	1	3	.....	.....	1	.....	.....	1	2	1	...	.....	5	1	23	...	1	53
Upper Alloways Creek	2	.....	.....	.....	...	1	.....	.....	1	...	.....	...	.....	.....	.....	.....	.....	...	...	...	...	.....	...	...	...	...	...	2
Upper Penns Neck	25	20	.....	.....	3	9	1	1	2	...	.....	2	.....	.....	.....	.....	.....	...	1	2	1	.....	7	...	16	...	...	45
Upper Pittsgrove	10	8	.....	.....	...	2	.....	.....	2	1	.....	1	.....	.....	.....	.....	.....	...	3	...	...	.....	2	...	7	...	...	18
*No return.	113	145	1	1	10	59	3	2	15	7	3	11	1	.....	1	.....	.....	2	13	7	2	.....	26	1	77	2	18	260

Deaths in Somerset County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																										
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Bedminster	16	15	.....	1	1	8	1	1	4	.....	1	3	.....	.....	1	.....	.....	.....	2	1	.....	.....	.....	.....	7	4	4	35
Bernards	18	15	.....	.....	.....	6	1	.....	1	.....	.....	3	2	.....	1	.....	1	.....	2	4	1	.....	.....	.....	11	.....	.....	33
*Branchburg	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bridgewater	52	51	1	...	10	18	.....	.....	3	.....	3	...	.....	1	...	.....	1	.....	8	2	.....	.....	1	1	20	.....	34	103
Franklin	23	16	.....	1	6	7	.....	1	2	.....	...	1	.....	.....	2	.....	3	.....	2	1	1	.....	2	.....	10	.....	.....	39
Hillsborough	23	21	.....	.....	4	5	.....	.....	3	1	3	2	.....	.....	1	.....	1	.....	7	3	.....	.....	1	1	12	.....	.....	44
Montgomery	12	13	.....	.....	1	1	.....	.....	2	.....	1	2	1	.....	...	1	...	1	1	...	.....	.....	...	1	13	.....	.....	25
North Plainfield	16	9	.....	.....	2	7	.....	.....	2	1	...	1	.....	.....	...	.....	...	.....	...	...	.....	.....	1	.....	8	.....	3	25
Warren	7	5	1	1	....	3	.....	.....	2	1	...	1	.....	.....	...	.....	...	.....	...	1	.....	.....	.....	.....	2	.....	.....	12
*No return.	167	145	2	3	24	55	2	2	19	3	8	13	3	1	5	1	6	1	22	12	2	.....	5	3	83	4	41	316

Deaths in Sussex County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																										
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Andover	3	7	1	...	1	2	.....	...	.....	.....	...	...	.....	.....	...	...	.....	.....	...	...	3	.....	1	.....	2	.....	.....	10
Byram	11	5	.....	...	3	1	.....	...	.....	.....	...	1	1	.....	...	...	1	.....	1	...	.....	.....	2	.....	6	.....	.....	16
Frankford	19	17	.....	...	...	5	.....	...	.....	.....	...	1	.....	.....	...	...	.....	.....	...	...	1	.....	...	.....	6	3	26	39
Greene	6	7	.....	2	...	2	.....	...	.....	.....	6	...	.....	.....	...	...	.....	.....	1	...	.....	.....	...	.....	...	.....	2	13
*Hardyston	.....	.....	.....	...	...	...	.....	...	.....	.....	...	...	.....	.....	...	...	.....	.....	...	...	.....	.....	...	.....	...	.....	.....	.....
Hampton	.....	1	.....	...	...	1	.....	...	.....	.....	...	...	.....	.....	...	...	.....	.....	...	...	.....	.....	...	.....	...	.....	.....	1
*Lafayette	.....	.....	.....	...	...	...	.....	...	.....	.....	...	...	.....	.....	...	...	.....	.....	...	...	.....	.....	...	.....	...	.....	.....	.....
Montague	3	4	.....	...	...	1	.....	...	.....	.....	...	...	.....	.....	...	...	.....	.....	4	...	.....	.....	...	.....	...	.....	2	7
*Newton	.....	.....	.....	...	...	...	.....	...	.....	.....	...	...	.....	.....	...	...	.....	.....	...	...	.....	.....	...	.....	...	.....	.....	.....
Sandyston	4	2	.....	...	...	...	.....	...	.....	.....	2	...	.....	.....	...	...	1	.....	...	...	.....	.....	...	.....	1	.....	2	6
Sparta	20	16	.....	...	1	4	.....	2	2	.....	2	1	.....	.....	...	...	.....	.....	4	...	4	.....	...	.....	13	.....	3	36
Stillwater	10	9	.....	...	1	4	.....	...	.....	.....	3	1	.....	.....	1	...	1	.....	1	...	.....	.....	1	.....	5	.....	1	19
*Vernon	.....	.....	.....	...	...	...	.....	...	.....	.....	...	...	.....	.....	...	...	.....	.....	...	...	.....	.....	...	.....	...	.....	.....	.....
Walpack	9	6	.....	...	2	3	.....	...	.....	1	...	...	.....	.....	...	...	2	.....	...	...	.....	.....	1	.....	6	.....	.....	15
Wantage	14	13	.....	...	...	3	1	....	.....	.....	6	1	.....	.....	...	...	.....	.....	...	...	.....	.....	....	.....	14	.....	2	27
*No return.	99	87	1	2	8	26	1	2	2	1	19	5	1	.....	1	...	5	.....	11	...	8	.....	5	.....	53	3	38	189

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Deaths in Union County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																											
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
*Clark	.....	.....	...	...	.....	.....	...	...	.....	.....	...	.....	...	...	...	.....	.....	...	...	...	.....	...	.....	...	.....	...	...	.....
*Cranford	.....	.....	...	...	.....	.....	...	...	.....	.....	...	.....	...	...	...	.....	.....	...	...	...	.....	...	.....	...	.....	...	...	.....
Elizabeth	424	446	12	...	34	99	8	30	61	69	54	26	17	12	9	10	26	15	12	19	35	7	9	18	256	...	32	870
Fanwood	1	2	...	...	.....	1	...	...	.....	.....	...	...	...	...	...	.....	.....	...	...	...	.....	...	.....	...	.....	...	2	3
Linden	3	3	...	1	.....	1	...	...	.....	1	...	...	...	...	1	.....	.....	...	1	...	.....	...	.....	...	1	...	...	6
*New Providence	.....	.....	...	...	.....	.....	...	...	.....	.....	...	.....	...	...	.....	.....	.....	...	...	...	.....	...	.....	...	.....	...	...	.....
Plainfield	34	34	3	...	1	27	...	...	.....	.....	2	1	..	1	...	.....	.....	...	1	3	2	...	.....	...	19	...	8	68
Rahway	62	65	2	4	3	12	1	2	7	4	6	4	...	...	5	1	3	...	3	3	4	...	6	2	30	...	25	127
Springfield	6	3	...	...	1	2	...	...	.....	.....	...	2	...	...	...	.....	.....	...	2	...	.....	...	.....	...	2	...	...	9
*Summit	.....	.....	...	...	.....	.....	...	...	.....	.....	...	.....	...	...	...	.....	.....	...	...	...	.....	...	.....	...	.....	...	...	.....
Union	11	12	...	...	1	.....	3	...	1	1	...	2	...	1	...	.....	.....	...	3	1	3	...	1	...	5	...	1	23
Westfield	13	16	...	...	.....	5	...	...	.....	.....	12	...	...	...	1	.....	.....	...	2	1	1	...	.....	2	5	...	...	29
*No returns.	554	581	17	5	40	147	12	32	69	75	74	35	17	14	16	11	29	15	24	27	45	7	16	22	318	...	68	1135

Deaths in Warren County.

TOWNSHIPS.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																									
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Ch'l'a Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflammation of Bowels.	Inflammation of Brain.	Inflammation of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small Pox.	Typhus Fever.	Whoop'g Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Allamuchy	6	4	...	...	...	...	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	7	10
*Belvidere	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blairstown	9	6	1	...	...	1	...	...	...	...	4	...	1	...	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	7	.....	.....	15
Franklin	3	6	...	...	...	...	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	7	9
Frelinghuyssen	2	8	...	...	1	2	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	10
Greenwich	9	18	...	2	3	3	...	...	...	2	...	3	...	...	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	4	.....	.....	27
Hackettstown	10	11	...	...	...	7	1	5	...	...	...	1	...	...	.....	.....	.....	.....	1	.....	.....	.....	.....	2	10	.....	1	21
Hardwick	4	.....	...	...	...	...	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	4
Harmony	8	4	...	...	...	1	...	2	1	1	...	1	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	12
Hope	5	8	...	1	...	3	...	1	...	...	1	2	...	...	.....	.....	2	.....	1	.....	.....	.....	.....	.....	5	.....	.....	13
*Independence	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	1	.....
Knowlton	7	10	...	...	...	1	...	1	...	...	1	...	...	...	.....	.....	1	.....	1	1	2	.....	2	.....	6	.....	1	17
Lapatcong	15	9	...	...	...	2	2	...	1	4	3	...	...	...	1	.....	.....	.....	1	.....	.....	.....	3	.....	7	.....	.....	24
Mansfield	19	15	1	1	...	6	...	1	1	1	...	3	1	...	.....	.....	1	.....	2	1	.....	.....	4	.....	9	.....	2	34
*Oxford	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pahaquarry	2	1	...	...	...	...	1	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	3
*Phillipsburg	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Town of Washington	1	10	...	1	...	3	...	...	1	...	...	...	...	...	.....	.....	1	.....	1	.....	.....	.....	.....	.....	2	.....	2	11
Washington	6	7	...	...	1	...	...	...	3	...	...	1	...	...	.....	.....	4	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	13
*No return.	106	117	2	5	5	29	4	10	7	8	9	11	2	...	2	.....	4	.....	14	7	2	.....	9	3	68	.....	22	223

RECAPITULATION—Deaths in the Several Counties.

COUNTIES.	SEX.		CAUSES OF DEATH, AND NUMBER FROM EACH CAUSE.																							
	Male.	Female.	Apoplexy.	Bilious Fever.	Casualty.	Consumption.	Child Bed.	Croup.	Cholera Infantum.	Convulsions.	Diphtheria.	Dropsy.	Dysentery.	Erysipelas.	Inflam'n of Bowels.	Inflam'n of Brain.	Inflam'n of Lungs.	Measles.	Old Age.	Paralysis.	Scarlet Fever.	Small-pox.	Typhus Fever.	Whooping Cough.	All others.	Sex not reported.	Cause not reported.	Total.
Atlantic	100	83	2	1	5	37	4	1	5	5	7	4	1	...	1	1	2	3	4	3	36	...	2	1	45	......	13	183
Bergen	164	149	5	1	16	49	2	5	11	12	26	10	17	2	12	.....	4	.....	10	12	18	...	3	.....	105	26	19	339
Burlington	269	259	4	2	14	115	3	20	35	14	43	7	.....	1	5	5	.....	.....	21	21	33	...	15	.....	139	5	36	533
Camden	408	357	19	...	29	162	8	24	63	71	85	31	10	10	25	8	19	16	7	21	34	7	39	16	400	383	44	1148
Cape May	56	50	4	1	3	19	2	2	1	.....	20	10	.....	...	1	.....	.....	.....	6	1	.....	...	4	.....	24	2	10	108
Cumberland	215	214	1	6	15	91	5	2	37	8	16	13	6	1	5	1	3	10	18	12	4	...	14	6	91	8	72	437
Essex	1833	1792	48	7	149	574	16	68	264	400	90	89	41	13	73	262	273	13	86	65	111	13	150	25	821	86	60	3711
Gloucester	134	128	3	2	10	52	1	6	9	4	8	17	4	1	2	.....	.....	.....	5	11	5	...	8	4	93	4	21	266
Hudson	......	......	42	12	64	274	47	77	238	165	255	110	21	24	87	47	101	53	33	66	138	10	55	69	603	2591	.....	2591
Hunterdon	162	139	5	6	15	41	.....	3	21	7	15	17	3	1	2	1	1	.....	25	7	1	...	17	2	98	......	13	301
Mercer	129	105	2	2	7	35	4	10	2	12	16	7	2	2	3	5	2	8	9	5	3	...	6	3	82	1	8	235
Middlesex	161	139	2	1	22	35	4	7	10	12	29	8	4	...	3	2	4	3	5	8	34	...	3	3	90	1	12	301
Monmouth	139	95	2	4	6	31	1	6	3	2	12	11	.....	...	4	4	1	.....	15	6	22	...	4	2	65	......	33	234
Morris	202	168	4	1	9	52	3	8	11	14	22	12	11	5	5	2	7	1	11	13	18	...	9	4	110	6	44	376
Ocean	78	75	2	2	3	32	.....	.....	9	4	5	3	2	...	1	1	.....	.....	3	6	33	...	9	.....	34	......	4	153
Passaic	526	520	12	4	42	133	19	33	42	43	185	26	16	7	15	37	41	6	37	16	66	8	12	7	227	......	12	1046
Salem	113	145	1	1	10	59	3	2	15	7	3	11	1	...	1	.....	.....	2	13	7	2	...	26	1	77	2	18	260
Somerset	167	145	2	3	24	55	2	2	19	3	8	13	3	1	5	1	6	1	22	12	2	...	5	3	83	4	41	316
Sussex	99	87	1	2	8	26	1	2	2	1	19	5	1	...	1	.....	5	.....	11	.....	8	...	5	.....	53	3	38	189
Union	554	581	17	5	40	147	12	32	69	75	74	35	17	14	16	11	29	15	24	27	45	7	16	22	318	......	68	1135
Warren	106	117	2	5	5	29	4	10	7	8	9	11	2	...	2	.....	4	.....	14	7	2	...	9	3	68	.....	22	223
	5615	5348	180	68	496	2048	141	320	873	867	947	450	162	82	269	388	502	131	379	326	615	45	411	171	3626	3122	588	14,085

DEATHS.

Deaths in Atlantic County.

TOWNSHIPS.	AGES.												Ages not reported.	Total.
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.		
Absecon	7	.....	1	1	1	1	2	1	1	.....	.....	.....	1	16
*Atlantic City	.....	.....	.....	...	...	...	.....	...	...	.....	.....	.....	...	.....
*Buena Vista	.....	.....	.....	...	...	...	.....	...	...	.....	.....	.....	...	.....
Egg Harbor City	10	4	1	3	1	3	.....	3	...	.....	.....	.....	2	27
Egg Harbor Township	11	1	1	4	6	2	1	1	1	.....	.....	.....	8	36
Galloway	7	.....	3	3	2	3	1	4	3	3	.....	.....	1	30
Hamilton	12	1	1	...	2	2	1	2	1	.....	.....	.....	3	25
Hammonton	16	6	2	...	1	...	5	2	4	2	1	.....	1	40
Mullica	1	1	3	...	1	...	.....	...	...	.....	.....	.....	...	6
Weymouth	.....	.....	.....	...	...	...	.....	...	1	1	.....	.....	1	3
*No return.	64	13	12	11	14	11	10	13	11	6	1	.....	17	183

Deaths in Bergen County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Englewood	25	5	1	2	2	3	4	...	...	...	...	.....	...	42
Franklin	2	.....	.....	1	2	.....	2	3	2	2	...	.....	...	14
Harrington	20	1	3	2	.....	4	4	2	6	2	...	.....	...	44
Hohokus	.....	.....	.....	.....	1	1	...	...	...	...	2	.....	...	4
Lodi	13	.....	.....	10	5	1	1	3	2	...	...	.....	5	40
Midland	10	5	1	3	4	1	5	6	2	4	1	.....	1	43
New Barbadoes	8	2	6	5	3	4	5	2	6	4	2	.....	10	57
Palisade	2	2	1	.....	1	.....	1	1	...	...	...	.....	...	8
Ridgefield	3	2	.....	2	.....	1	3	3	2	1	...	.....	4	21
Ridgewood	1	2	1	.....	.....	1	...	...	...	...	...	.....	...	5
Saddle River	2	.....	.....	.....	1	2	...	2	2	...	...	.....	...	9
Union	19	4	5	2	6	3	3	4	1	2	...	.....	3	52
*Washington	.....	.....	.....	.....	.....	.....	...	...	...	...	...	.....	...	.....
*No return.	105	23	18	27	25	21	28	26	23	15	5	.....	53	339

Deaths in Burlington County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
*Bass River	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
*Beverly City	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
Beverly	6	2	1	1	3	...	...	1	3	...	1	.....	.....	18
Bordentown	68	13	7	17	10	13	11	9	10	6	4	.....	7	175
Burlington	50	10	6	11	13	14	9	12	9	3	...	.....	.....	137
*Chester	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
*Chesterfield	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
*Cinnaminson	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
Evesham	6	.....	.....	.....	.....	1	3	1	2	...	...	.....	.....	13
*Florence	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
Little Egg Harbor	9	5	5	2	3	1	2	1	...	...	...	.....	1	29
Lumberton	9	1	1	1	6	5	...	1	2	...	...	.....	.....	26
*Mansfield	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
Medford	7	3	4	4	2	1	2	3	6	2	...	.....	4	38
*Mount Laurel	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
New Hanover	7	1	1	.....	1	3	2	2	3	3	...	.....	.....	23
Northampton	16	4	2	3	3	3	5	8	9	4	1	.....	7	65
*Pemberton	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
*Randolph	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
*Shamong	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
Southampton	2	2	.....	1	.....	1	...	1	...	...	...	.....	2	9
*Springfield	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
*Washington	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
*Westhampton	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
*Willingboro	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
*Woodland	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....	.....	.....
*No return.	180	41	27	40	41	42	34	39	44	18	6	.....	21	533

Deaths in Camden County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Camden	415	68	46	53	52	49	46	51	41	43	5	.....	37	906
Centre	11	2	2	6	2	2	1	1	2	2	...	.....	2	33
Delaware	4	2	1	.....	3	.....	1	2	...	1	...	.....	...	14
Gloucester	17	.....	2	3	5	3	2	6	7	4	...	.....	3	52
Gloucester City	15	.....	1	4	4	1	...	2	1	...	...	.....	...	28
Haddon	15	1	4	4	2	1	7	3	4	1	2	.....	2	46
Merchantville	1	3	.....	.....	.....	1	...	...	...	...	...	.....	...	5
Stockton	4	.....	1	1	.....	.....	1	...	1	...	...	.....	1	9
Waterford	16	1	3	2	3	4	2	4	2	2	1	.....	3	43
Winslow	5	.....	1	.....	1	.....	...	2	2	...	...	.....	1	12
	503	77	61	73	72	61	60	71	60	53	8	.....	49	1148

Deaths in Cape May County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
*Cape May City	.....	.....	.....	.....	.....	.....	...	...	...	...	...	.....	...	...
Dennis	3	.....	2	4	2	2	2	4	4	...	...	.....	6	29
Lower	8	11	3	4	1	2	6	2	2	1	...	.....	4	44
Middle	3	3	2	2	1	1	...	...	2	3	...	.....	2	19
Upper	4	.....	3	1	.....	1	3	1	1	1	1	.....	...	16
*No returns.	18	14	10	11	4	6	11	7	9	5	1	.....	12	108

Deaths in Cumberland County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Bridgeton	46	3	9	10	10	9	7	17	12	8	3	1	....	135
Commercial	8	1	2	3	1	1	1	4	1	1	...	...	2	25
Deerfield	5	.....	1	1	.....	1	.....	...	...	...	...	...	...	8
*Downe	.....	.....	.....	.....	.....	.....	.....	...	...	...	...	...	...	.....
Fairfield	7	1	2	2	4	1	.....	1	3	1	...	...	3	25
Greenwich	7	1	1	1	1	.....	.....	...	1	1	...	...	1	14
Hopewell	5	1	2	.....	4	.....	4	1	9	5	...	1	1	33
Landis	11	10	2	5	5	4	1	2	2	1	...	...	2	45
Maurice River	12	.....	1	1	1	5	2	2	1	...	...	...	...	25
Millville	46	3	8	13	13	7	5	7	6	2	...	...	9	119
Stoe Creek	2	2	.....	.....	1	.....	.....	1	...	...	...	...	2	8
*No return.	149	22	28	36	40	28	20	35	35	19	3	2	20	437

Deaths in Essex County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
*Belleville	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	...	...	.....	.....
Bloomfield	19	3	3	4	9	5	2	2	4	4	...	...	1	56
Caldwell	7	5	2	1	3	2	2	6	5	1	...	...	6	40
Clinton	9	4	1	.....	2	1	2	2	2	3	...	...	.....	26
East Orange	25	2	3	3	3	2	5	3	6	3	...	...	.....	55
Franklin	9	.....	.....	.....	.....	.....	4	4	1	...	...	...	.....	18
Livingston	1	1	.....	.....	1	.....	3	2	1	...	...	...	.....	9
Millburn	5	2	1	3	5	2	3	2	5	1	...	...	1	30
Montclair	12	1	5	1	4	2	2	7	4	3	...	...	5	46
Newark	1250	350	253	229	236	202	236	170	118	59	8	2	190	3303
Orange	29	8	4	5	9	13	4	4	2	2	...	...	3	83
South Orange	6	4	.....	3	1	3	3	3	2	1	...	...	.....	26
West Orange	5	1	.....	3	3	1	2	.....	2	1	1	...	.....	19
*No return.	1377	381	272	252	276	233	268	205	152	78	9	2	206	3711

Deaths in Gloucester County.

TOWNSHIPS.	AGES.													Ages not reported.	Total.
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.			
Clayton	12	1	2	4	1	2	1	4	2	1	.....	.....	...		30
Deptford	4	1	2	1	2	1	1	4	3	.....	.....	.....	...		19
Franklin	6	2	.....	3	3	....	1	4	3	.....	.....	.....	....		22
Greenwich	9	1	.....	2	3	...	1	1	1	.....	.....	.....	....	3	21
Glassboro	6	1	1	2	3	1	5	3	1	1	2	.....	....		26
Harrison	4	.....	1	1	2	1	2	....	5	3	.....	.....	...		19
Logan	3	.....	2	...	...	1	.....	3	....	1	.....	.....	...	1	11
Mantua	6	.....	.....	2	....	2	1	2	6	1	1	.....	....		21
Monroe	3	.....	2	...	1	....	.....	...	...	.....	.....	.....	....		6
*Swedesboro	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington	1	3	1	...	1	1	1	3	....	.....	.....	.....	...	6	17
West Deptford	5	1	1	2	...	....	1	2	2	.....	.....	.....	....	3	17
Woodbury	14	2	1	2	3	2	1	4	5	.....	.....	.....	....	3	37
Woolwich	6	1	1	3	...	1	1	3	2	1	.....	.....	...	1	20
*No return.	79	13	14	22	19	12	16	33	30	8	3	.....	17		266

Deaths in Hudson County.

TOWNSHIPS.	AGES.												Ages not reported.	Total.
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.		
Bayonne	43	6	4	3	7	4	3	3	6	1	....	.....	1	81
*Guttenburg	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Harrison	44	12	7	10	12	5	6	3	4	2	....	.....	....	105
Hoboken	203	42	29	34	49	27	29	36	19	11	3	.....	....	482
Jersey City	797	102	88	103	107	104	99	93	76	39	7	.....	9	1624
Kearney	7	3	.....	2	1	1	1	1	1	....	...	.....	...	17
North Bergen	40	11	4	7	15	10	7	6	3	4	....	.....	....	107
Town of Union	25	3	2	4	3	10	2	2	1	2	1	.....	....	55
Union	20	7	1	2	1	2	2	6	2	1	...	.....	....	44
Weehawken	9	.....	1	5	.....	6	.....	.....	.....	....	....	.....	....	21
West Hoboken	22	4	.....	2	8	8	2	2	5	2	....	.....	....	55
*No return.	1210	190	136	172	203	177	151	152	117	62	11	.....	10	2591

Deaths in Hunterdon County.

TOWNSHIPS.	AGES.												Ages not reported.	Total.
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.		
Alexandria	2	....	3	3	2	1	.....	6	3	1	1	.....	.....	22
Bethlehem	3	2	2	...	1	1	1	4	.....	1	.....	.....	1	16
Clinton	6	...	1	...	2	...	1	1	1	1	.....	.....	.....	13
Delaware	2	2	1	2	1	4	3	4	5	6	.....	.....	2	32
East Amwell	3	....	1	4	1	1	2	4	3	2	.....	.....	.....	21
Franklin	5	....	1	...	...	2	.....	.....	2	3	.....	.....	1	14
Frenchtown	2	....	...	...	...	...	.....	.....	3	1	.....	.....	.....	6
High Bridge	5	3	1	1	...	2	.....	2	2	.....	.....	.....	.....	16
*Holland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kingwood	2	....	...	1	1	...	.....	4	6	3	.....	.....	.....	17
Lambertville	27	1	1	3	4	1	5	5	5	2	1	1	3	59
Lebanon	4	2	2	1	...	2	.....	1	2	2	1	.....	.....	17
Raritan	2	1	1	2	1	3	1	2	1	2	.....	.....	.....	16
Readington	3	3	...	1	5	4	1	1	1	3	.....	.....	.....	22
Tewksbury	2	....	1	1	2	1	6	.....	3	.....	1	.....	.....	17
*Town of Clinton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Union	.....	.....	.....	.....	1	.....	.....	.....	3	.....	.....	.....	.....	4
West Amwell	3	1	3	1	...	.....	.....	.....	.....	1	.....	.....	.....	9
*No return.	71	15	18	20	21	22	20	34	40	28	4	1	7	301

Deaths in Mercer County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Chambersburg	20	10	7	4	2	2	....	1	1	....	....	.....	....	47
*East Windsor	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
Ewing	3	.....	3	1	.....	.....	....	1	1	....	1	.....	8	18
Hamilton	13	6	8	6	9	5	7	7	6	6	....	.....	2	75
*Hopewell	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
Lawrence	14	2	3	1	4	3	5	5	2	1	1	.....	1	42
Princeton	6	.....	.....	1	2	3	2	6	4	2	....	.....	....	26
*Trenton	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
Washington	3	1	3	1	.....	.....	2	2	....	1	....	.....	....	13
West Windsor	1	.....	2	.....	1	1	3	....	2	2	1	.....	1	14
*No return.	60	19	26	14	18	14	19	22	16	12	3	.....	12	235

Deaths in Middlesex County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Cranbury	2	.....	.....	3	2	1	3	2	2	1	....	.....	1	17
East Brunswick	21	4	6	2	4	4	7	2	3	3	....	.....	....	56
*Madison	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
*Monroe	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
*New Brunswick	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
North Brunswick	4	2	1	2	.....	.....	....	4	....	2	....	.....	1	16
*Perth Amboy	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
Piscataway	10	.....	3	1	1	1	2	4	.....	.....	.....	.....	1	23
Raritan	28	6	2	4	4	6	3	7	5	7	1	.....	....	73
Sayreville	4	1	2	.....	.....	.....	1	....	.....	.....	.....	.....	1	9
South Amboy	36	10	3	5	4	6	3	5	2	....	1	.....	....	75
South Brunswick	3	.....	3	4	2	5	1	5	6	1	....	.....	2	32
*Woodbridge	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
*No return.	108	23	20	21	17	28	20	29	18	14	2	.....	6	301

Deaths in Monmouth County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Atlantic	3	.....	.....	.....	1	.....	1	....	.....	.....	.....	1	....	6
Eatontown	3	2	5	1	2	.....	2	2	2	2	.....	.....	1	22
Freehold	3	.....	2	2	3	2	1	1	.....	.....	.....	.....	....	14
Holmdel	.....	.....	.....	.....	.....	.....	....	1	.....	.....	.....	.....	....	1
Howell	.....	3	3	3	2	.....	.....	2	1	.....	.....	.....	3	17
Manalapan	4	2	4	.....	1	2	.....	2	5	1	.....	.....	....	21
*Marlboro	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
Matawan	13	5	4	3	2	2	6	4	2	2	.....	.....	....	43
*Middletown	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
*Millstone	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
*Ocean	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
Raritan	27	7	4	5	4	3	2	3	5	2	1	.....	....	63
*Shrewsbury	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
Upper Freehold	10	1	7	1	2	4	2	4	7	5	.....	.....	4	47
*Wall	.....	.....	.....	.....	.....	.....	....	.....	.....	....	....	.....	....	.....
*No return.	63	20	29	15	17	13	14	19	22	12	1	1	8	234

Deaths in Morris County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Boonton	5	3	4	1	1	4	1	1	4	...	....	.....	...	24
Chatham	4	.....	2	1	.....	3	.....	6	5	2	....	.....	1	24
*Chester	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	....	.....	...	.....
*Hanover	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	....	.....	...	.....
Jefferson	6	2	2	2	.....	2	.....	1	2	...	....	.....	...	17
Mendham	3	.....	1	1	2	.....	1	4	5	...	....	.....	...	17
Montville	3	3	.....	.....	1	.....	.....	.....	3	1	....	.....	...	11
Morris	63	13	7	12	15	13	9	22	14	9	4	.....	10	191
Mount Olive	3	3	1	2	2	.....	3	2	.....	...	....	.....	...	16
Passaic	4	.....	.....	2	1	1	2	2	3	1	1	.....	1	18
Pequannock	3	.....	1	4	.....	.....	.....	.....	.....	1	....	.....	...	9
*Randolph	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	....	.....	...	.....
Rockaway	27	3	3	4	2	2	2	2	4	....	....	.....	...	49
*Roxbury	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	....	.....	...	.....
*Washington	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	....	.....	...	.....
*No return.	121	27	21	29	24	25	18	40	40	14	5	.....	12	376

Deaths in Ocean County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Berkeley	1	3	2	2	1	.....	1	2	2	3	.....	.....	.....	17
*Brick	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dover	17	8	5	6	7	1	3	3	3	3	.....	.....	.....	56
*Eagleswood	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Jackson	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*Lacey	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Manchester	7	4	3	.....	2	.....	.....	1	1	.....	.....	.....	.....	18
*Ocean	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Plumsted	19	2	1	3	4	.....	.....	2	3	1	.....	.....	.....	35
Stafford	4	1	1	1	...	.....	.....	.....	2	2	.....	.....	.....	11
Union	6	.....	1	4	1	.....	1	.....	1	2	.....	.....	.....	16
*No return.	54	18	13	16	15	1	5	8	12	11	.....	.....	.....	153

Deaths in Passaic County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Acquackanonk	3	2	1	.....	.....	2	...	2	3	.....	.....	.....	.....	13
*Little Falls	.....	.....	.....	.....	.....	.....	...	...	...	.....	.....	.....	.....	.....
*Manchester	.....	.....	.....	.....	.....	.....	...	...	...	.....	.....	.....	.....	.....
*Passaic	.....	.....	.....	.....	.....	.....	...	...	...	.....	.....	.....	.....	.....
Paterson	462	120	52	69	60	50	39	40	44	15	7	.....	26	984
Pompton	5	.....	1	.....	1	2	...	1	6	2	.....	.....	1	19
Wayne	4	.....	.....	.....	.....	.....	2	3	2	3	.....	.....	.....	14
West Milford	4	2	.....	1	.....	.....	...	2	6	.....	1	.....	.....	16
*No return.	478	124	54	70	61	54	41	48	61	20	8	.....	27	1046

Deaths in Salem County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
*Elsinboro	.....	.....	.....	.....	.....	.....	...	...	...	...	...	.....	...	.....
Lower Alloways Creek	4	.....	1	1	1	.....	...	1	2	...	...	.....	...	10
Lower Penns Neck	4	.....	1	4	1	1	3	...	1	2	...	.....	...	17
Mannington	10	1	.....	4	5	1	2	3	1	3	1	.....	3	34
Pilesgrove	12	2	3	6	6	3	4	8	3	2	1	.....	2	52
Pittsgrove	4	.....	1	5	2	1	...	2	2	1	...	.....	4	22
Quinton	2	.....	1	2	.....	.....	1	1	...	...	...	.....	...	7
Salem	13	1	3	9	2	4	5	7	4	3	2	.....	...	53
Upper Alloways Creek	1	.....	.....	1	.....	.....	...	...	...	...	...	.....	...	2
Upper Penns Neck	10	4	1	8	3	2	2	2	2	1	...	.....	10	45
Upper Pittsgrove	5	1	1	1	3	.....	...	1	2	3	...	.....	1	18
*No return.	65	9	12	41	23	12	17	25	17	15	4	.....	20	260

Deaths in Somerset County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Bedminster	8	.....	2	4	1	1	5	5	7	...	...	.....	2	35
Bernards	5	1	1	4	5	4	4	4	4	...	...	.....	1	33
*Branchburg	.....	.....	.....	.....	.....	.....	...	...	...	...	...	.....	...	.....
Bridgewater	24	9	8	10	13	10	9	8	6	5	...	.....	1	103
Franklin	11	5	2	3	.....	4	3	5	2	3	1	.....	...	39
Hillsborough	12	1	2	4	2	2	3	3	6	7	1	.....	1	44
Montgomery	10	.....	.....	2	4	.....	2	...	6	1	...	.....	...	25
North Plainfield	8	.....	2	2	1	1	2	4	3	...	...	.....	2	25
Warren	4	.....	2	2	.....	.....	...	...	3	1	...	.....	...	12
*No return.	82	16	19	31	26	22	28	29	37	17	2	.....	7	316

Deaths in Sussex County.

TOWNSHIPS.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Andover	3	1	.....	...	2	1	.....	1	2	.....	.....	.....	...	10
Byram	2	2	1	3	3	...	1	1	1	1	.....	.....	1	16
Frankford	14	2	2	1	1	3	2	6	6	2	.....	.....	...	39
Greene	3	4	1	...	...	2	.....	2	1	.....	.....	.....	...	13
*Hardyston	.....	.....	.....	...	...	.....	...	...	.....	.....	.....	.....	...	.....
Hampton	.....	.....	1	...	...	.....	...	...	.....	.....	.....	.....	...	1
*Lafayette	.....	.....	.....	...	...	.....	...	...	.....	.....	.....	.....	...	.....
Montague	.....	.....	.....	...	1	...	.....	...	2	1	1	.....	2	7
*Newton	.....	.....	.....	...	...	.....	...	...	.....	.....	.....	.....	...	.....
Sandyston	.....	1	1	1	1	1	.....	...	1	.....	.....	.....	...	6
Sparta	6	3	5	4	2	1	1	2	6	5	.....	.....	1	36
Stillwater	4	1	1	2	1	1	1	2	2	1	.....	.....	3	19
*Vernon	.....	.....	.....	...	...	.....	...	...	.....	.....	.....	.....	...	.....
Walpack	4	.....	.....	2	1	1	2	4	...	1	.....	.....	...	15
Wantage	8	4	3	3	...	2	2	1	2	2	.....	.....	...	27
*No return.	44	18	15	16	12	12	9	19	23	13	1	.....	7	189

Deaths in Union County.

TOWNSHIPS.	AGES. Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
*Clark	.....	.....	.....	.....	.....	.....	.....	...	...	...	.....	.....	.....	.....
*Cranford	.....	.....	.....	.....	.....	.....	.....	...	...	...	.....	.....	.....	.....
Elizabeth	418	45	43	59	60	67	64	59	25	5	.....	.....	25	870
Fanwood	2	.....	.....	.....	.....	.....	.....	...	...	1	.....	.....	.....	3
Linden	.....	2	1	1	.....	.....	1	...	...	1	.....	.....	.....	6
*New Providence	.....	.....	.....	.....	.....	.....	.....	...	...	...	.....	.....	.....	.....
Plainfield	16	5	5	6	6	5	9	12	1	3	.....	.....	.....	68
Rahway	44	7	4	7	7	10	12	10	15	3	1	.....	7	127
Springfield	.....	1	.....	.....	2	.....	.....	2	2	1	.....	.....	1	9
*Summit	.....	.....	.....	.....	.....	.....	.....	...	...	...	.....	.....	.....	.....
Union	13	1	.....	1	.....	.....	1	1	4	2	.....	.....	.....	23
Westfield	9	6	3	3	2	.....	2	1	2	...	.....	.....	1	29
*No returns.	502	67	56	77	77	82	89	85	49	16	1	.....	34	1135

Deaths in Warren County.

TOWNSHIPS.	AGES. Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Allamuchy	.....	.....	.....	...	...	...	.....	...	...	4	.....	.....	6	10
*Belvidere	.....	.....	.....	...	...	...	.....	...	...	.....	.....	.....	...	.....
Blairstown	3	3	1	1	...	...	2	2	...	3	.....	.....	...	15
Franklin	.....	.....	2	...	...	...	1	...	2	.....	.....	.....	4	9
Frelinghuysen	3	1	1	...	2	...	.....	...	...	3	.....	.....	...	10
Greenwich	8	.....	2	...	2	2	3	5	2	1	.....	.....	2	27
Hackettstown	5	2	.....	2	6	4	1	...	1	.....	.....	.....	...	21
Hardwick	.....	.....	.....	...	...	...	.....	...	2	.....	1	.....	1	4
Harmony	5	.....	.....	...	...	...	1	2	1	3	.....	.....	...	12
Hope	2	.....	1	2	1	1	3	...	3	.....	.....	.....	...	13
*Independence	.....	.....	.....	...	...	...	.....	...	...	.....	.....	.....	...	.....
Knowlton	3	2	1	2	2	1	1	2	1	2	.....	.....	...	17
Lapatcong	12	1	3	2	1	1	1	1	1	.....	1	.....	...	24
Mansfield	5	2	3	5	2	1	3	4	1	4	1	.....	3	34
*Oxford	.....	.....	.....	...	...	...	.....	...	...	.....	.....	.....	...	.....
Pahaquarry	1	.....	.....	1	...	...	.....	1	...	.....	.....	.....	...	3
*Phillipsburg	.....	.....	.....	...	...	...	.....	...	...	.....	.....	.....	...	.....
Town of Washington	7	.....	2	1	...	...	.....	...	...	1	.....	.....	...	11
Washington	2	.....	1	...	...	...	.....	3	3	3	.....	.....	1	13
*No return.	56	11	17	16	16	10	16	20	17	24	3	.....	17	223

RECAPITULATION.

DEATHS IN THE SEVERAL COUNTIES.

COUNTIES.	AGES.													
	Under 5 years.	5 and under 10.	10 and under 20.	20 and under 30.	30 and under 40.	40 and under 50.	50 and under 60.	60 and under 70.	70 and under 80.	80 and under 90.	90 and under 100.	Over 100.	Ages not reported.	Total.
Atlantic	64	13	12	11	14	11	10	13	11	6	1	...	17	183
Bergen	105	23	18	27	25	21	28	26	23	15	5	...	23	339
Burlington	180	41	27	40	41	42	34	39	44	18	6	...	21	533
Camden	503	77	61	73	72	61	60	71	60	53	8	...	49	1148
Cape May	18	14	10	11	4	6	11	7	9	5	1	...	12	108
Cumberland	149	22	28	36	40	28	20	35	35	19	3	2	20	437
Essex	1377	381	272	252	276	233	268	205	152	78	9	2	206	3711
Gloucester	79	13	14	22	19	12	16	33	30	8	3	...	17	266
Hudson	1210	190	136	172	203	177	151	152	117	62	11	...	10	2591
Hunterdon	71	15	18	20	21	22	20	34	40	28	4	1	7	301
Mercer	60	19	26	14	18	14	19	22	16	12	3	...	12	235
Middlesex	108	23	20	21	17	23	20	29	18	14	2	...	6	301
Monmouth	63	20	29	15	17	13	14	19	22	12	1	1	8	234
Morris	121	27	21	29	24	25	18	40	40	14	5	...	12	376
Ocean	54	18	13	16	15	1	5	8	12	11	...	...	.....	153
Passaic	478	124	54	70	61	54	41	48	61	20	8	...	27	1046
Salem	65	9	12	41	23	12	17	25	17	15	4	...	20	260
Somerset	82	16	19	31	26	22	23	29	37	17	2	...	7	316
Sussex	44	18	15	16	12	12	9	19	23	13	1	...	7	189
Union	502	67	56	77	77	82	89	85	49	16	1	...	34	1135
Warren	56	11	17	16	16	10	16	20	17	24	3	...	17	223
	5389	1141	878	1010	1021	881	894	959	833	460	81	6	532	14085

INDEX.

ADDENDA.

The paper on Sewers is postponed until the next report.

In description of map, page 58, omit E, line 22, and E, line 23.