MAINE STATE LEGISLATURE

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PUBLIC DOCUMENTS OF MAINE:

1907

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

Departments and Institutions

FOR THE YEAR 1906.

VOLUME II.

AUGUSTA
KENNEBEC JOURNAL PRINT
1907

FOURTEENTH REPORT

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF MAINE

FOR THE

Two Years Ending December 31, 1905.

1904-1905.

AUGUSTA
KENNEBEC JOURNAL PRINT
1906

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STATE BOARD OF HEALTH OF MAINE.

OFFICE OF THE SECRETARY,
AUGUSTA, ME., September 17, 1906.

To His Excellency, William T. Cobb, Governor, and the Honorable Executive Council:

GENTLEMEN:—I have the honor of submitting to you the Fourteenth Report of the State Board of Health of Maine, it being the seventh biennial report and for the years 1904 and 1905.

Very respectfully,
A. G. YOUNG, M. D., *Secretary.*

MEMBERS OF THE BOARD—1904-1905.

CHARLES D. SMITH, M. D., *President,*	Portland.
E. C. JORDAN, C. E.,	Portland.
PROF. F. C. ROBINSON,	Brunswick.
G. M. WOODCOCK, M. D.,	Bangor.
M. C. WEDGWOOD, M. D.,	Lewiston.
R. H. STUBBS, M. D.,	Augusta.
A. G. YOUNG, M. D., *Secretary,*	Augusta.

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INTRODUCTORY.

This report for the two calendar years, 1904 and 1905, presents in an epitomized form the work of the State board of health, and it seeks to present to co-workers in public hygiene and to the general public trustworthy and helpful information.

Educative Work.—An important function indeed, in the opinion of the board is its educative work, and one which the law sets before it, and the enforced neglect of this part of the work now and again due to the demands of that more spectacular work, the restriction of epidemics within our borders, or guarding against their introduction, has been regretted by the board, for referring to smallpox, the time and money spent in the stamping out of some single epidemic to save loss to our industries, and to save a score of towns, mayhap, from trouble, would suffice to put into every household trustworthy information in regard to the prevention of diseases far more destructive to life and happiness. Public health administration by circularization is far from being the whole of it, but the experience of the board has been that, well-prepared circulars, not too long, distributed in places where an emergency calls for them, or for some diseases always present and always destructive, brought often to the public attention, have a salutary effect, plainly discerned by local health officers, or statistically demonstrable.

The *Bulletin* of the board issued bi-monthly is practically a continuation of *The Sanitary Inspector* formerly published by the board and suspended through necessity after the spread of smallpox over the states and provinces struck our own State—its publication suspended at a time when it was needed to keep the State board and the local boards in frequent touch with one another.

Epidemic Work.—The epidemic work has mostly been confined to outbreaks of smallpox; and outbreaks of that disease

occurred quite often in the first half of the year 1904 as a legacy from the preceding year. In no place in the State, either in 1904 or in 1905, did an extensive outbreak occur, save the one in Jonesport in the former year, where the recognition of the real nature of the malady came late, and the spread of the infection to other towns resulted in some other small outbreaks. Of the 51 outbreaks of smallpox mentioned in the report of the secretary, the State board, through its secretary, other members, inspectors, or other agents, has personally been present in 36 of the places to advise or help the local authorities, or to be assured that such measures are put in force as shall quickly stamp out epidemics. In the unorganized townships, the State board has usually had to take full charge of the cases. The position of the State board, so far as it has jurisdiction, is that outbreaks of smallpox and other epidemic diseases in the State must and shall be stamped out promptly. Mildness of type for the present is no excuse for neglect. There is no knowing how soon the disease may again assume a virulent form, as it has many times in the past. Whether the change comes soon or late, aside from the question of life or health, there is the continued prosperity of industries which must be considered. Some of these, particularly those which depend upon the good repute of Maine as a health and pleasure resort, are quite susceptible to adverse influences. The wish of the State board is that the record of our public health service shall be a guaranty that the State of Maine is a safe place, as well as a pleasant place.

That outbreaks of smallpox can be stamped out promptly even under conditions which are far from favorable for easy work has again and again been shown by the experience of the local boards and the State board. In smallpox work health officers have a precious advantage in vaccination, which they do not have in equal degree in any other epidemic disease, and when the people will meet health officers half-way in accepting this boon, every outbreak of smallpox can quickly be subdued.

Vaccination.—Under the provisions of a congressional law passed a few years ago, every person or firm who would prepare and put upon the market vaccine virus must receive a license from the Surgeon-General of the United States Public Health and Marine Hospital Service, and all laboratories and estab-

lishments in which such products are produced must come up to the strict requirements established by that service. Samples of vaccine found in the open markets are periodically examined in the laboratory in Washington to ensure their purity. Since the Public Health and Marine Hospital Service began this work, there has been a notable improvement in the products of these laboratories from the point of view of both the vaccinator and the laboratory worker.

Tuberculosis.—This, as one of the most destructive of the "Captains of Death," deserves a good part of the efforts of boards of health. While its infection is not so rapid in its seizure or in its destruction of its victims, the plentiful sources of infection in communities and houses where intelligent precautionary measures are not applied to the sick and their environments, and the persistent vitality of the infection fully suffice for the renewal and perpetuation of the malady in such places. Several instances have lately been reported to the State board by local boards of health or physicians in which whole families are apparently being swept away for the want of the observance of the necessary precautionary rules. These houses in which several successive deaths have already occurred, call emphatically for the disinfection of the houses and infected contents. It is as great a dereliction of duty to let these pest-houses go uncleansed as it would be to let go undisinfected houses in which other infectious diseases have occurred. The State board hopes very soon to see the requirement of disinfection as generally recognized for pulmonary tuberculosis as it is for smallpox or diphtheria houses.

But in the treatment of these "tuberculous homes," something more than disinfection is needed. Local boards may require or provide disinfection, but, in these particular homes, a sympathetic and insistent educative influence is needed, and in this work communities, particularly the women in such communities, should come to the rescue. Much of this beneficent work has been done in the larger cities, and it has been found that instruction tactfully given has been gratefully received and has resulted in great changes in the habits in the homes of even the most ignorant of the foreign population.

As an important aid in the fight against tuberculosis, the State board watches with pleasure the good work which is being done at *The Maine Sanatorium,* in Hebron.

Typhoid Fever.—This is another disease regarding which the notions of the people generally need revision. It is hoped that the new circular about this disease may have a good influence in that direction. There is need also of a change of thought and of practice in the work of restricting the spread of typhoid infection. Here disinfection should emphatically be required for, first and foremost, the radical destruction of the infection in the sickroom, and later, for the disinfection of the house, of the sickroom at least, after recovery or death. And it is the wish of the State board to extend to local boards as fast as it is able to do so, help in investigating outbreaks of typhoid fever. The call for an analysis of drinking water undoubtedly sometimes comes when an investigation to discover the well or convalesced person who is still excreting the infection and distributing it broadcast would give more useful results. We are behind some other countries where "travelling laboratories" are promptly sent from the central laboratory to make a full investigation on the spot when there is need of doing so.

The report of Dr. Hawkins, who, as inspector, investigated the typhoid fever epidemic in Millinocket in 1904, is an interesting illustration of the danger of pumping sewage polluted water into the mains of a public water supply; and a serious outbreak of typhoid fever which followed soon afterwards in Old Town and Bangor, both of which cities take their water supply from the Penobscot river, into which the sewage of Millinocket discharges 75 miles or so above, is apparently an illustration that rivers cannot be depended upon to purify themselves.

Disinfection.—The work which has been done in the laboratory of the board has gone a long way toward placing formaldehyde disinfection on a positive basis by means of methods which are simple and devoid of special apparatus. It is gratifying to know that by means of it local boards of health are doing work in these lines which are much more trustworthy than formerly, and it is also pleasing to know that the work done here in our laboratory is appreciated and of use to other states.

Nuisances.—Certain classes of nuisance frequently trouble communities and local boards of health. One of these is the country or village slaughter-house, often an outrageous sort of nuisance detrimental to the health of neighbors or a wrong to

citizens who are injured in their comfort, property, or the enjoyment of their estates. The foul emanations from some of these small establishments should, it would seem, convert to vegetarianism persons who are unable to obtain other meat supplies. Occasionally an offending plant for the manufacture of glue or fertilizer, at some point on the seacoast, has been reported to the State board of health. While every honest industry should be encouraged, some of these which have been reported to this board have undoubtedly been detrimental to the health of their neighbors and have seriously interfered with the comfort of near residents, and in some cases, they have had a tendency to injure other kinds of business which were of greater magnitude than their own. While the State board is not authorized, as the boards of some other states are, to take any direct action for the abatement of such nuisances, it has felt it to be its duty to aid local boards in these matters so far as it may in its advisory capacity.

Laboratory of Hygiene.—It would be noted that the laboratory of hygiene has in its second two years been doing much more of the ordinary routine work for local boards of health and for others, than was done in the preceding two years. The usefulness of the laboratory has, however, been hampered by its inability to purchase a supply of outfits which would enable it to have samples returned to the laboratory by mail instead of by express. That change, when made, will bring it into much more intimate relationship with many parts of the State in which there are no express offices. It would, moreover, effect a great saving in the cost to local boards of health, of the transmission of samples when, in the course of an outbreak, it is necessary to send a large number of such. In addition to the routine work, some original investigations, particularly in the line of disinfection, have been recognized outside of our State, as well as here at home, as furnishing a valuable contribution to the knowledge of practical disinfection.

SECRETARY'S REPORT.

During two years for which this report is made, and at the end of the year 1905, the names and addresses of the members of the board, with the dates of expiration of their terms of office, were as follows:

Prof. F. C. Robinson, Brunswick, term ending January 31, 1907.

G. M. Woodcock, M. D., Bangor, term ending January 31, 1908.

C. D. Smith, M. D., Portland, term ending January 31, 1909.

R. H. Stubbs, M. D., Augusta, term ending January 31, 1910.

E. C. Jordan, C. E., Portland, term ending January 31, 1911.

M. C. Wedgewood, M. D., Lewiston, term ending January 31, 1912.

At the annual meeting in March, 1904, Dr. C. D. Smith was unanimously reelected president for the ensuing year. The following standing committees were appointed.

On Finance.—F. C. Robinson, E. C. Jordan, and C. D. Smith.

On Circulars and Other Publications.—M. C. Wedgwood, G. M. Woodcock, and A. G. Young.

On Sewerage and Drainage and the Disposal of Excreta.—E. C. Jordan, F. C. Robinson, Richard H. Stubbs, and G. M. Woodcock.

On Ventilation.—E. C. Jordan and M. C. Wedgwood.

On Summer Resorts.—M. C. Wedgwood, E. C. Jordan, and C. D. Smith.

On Water and Water Supplies.—F. C. Robinson, M. C. Wedgwood, and A. G. Young.

On School Houses and School Hygiene.—F. C. Robinson, Richard H. Stubbs, and A. G. Young.

On Quarantine.—C. D. Smith, M. C. Wedgwood, G. M. Woodcock, and A. G. Young.

On Legislation.—A. G. Young, F. C. Robinson, M. C. Wedgwood, and Richard H. Stubbs.

On Disinfection and Disinfectants.—F. C. Robinson, C. D. Smith, and A. G. Young.

On the Production and the Use of Vaccine Lymph, Antitoxin, and Other Inoculation Material.—C. D. Smith.

On Organization and Operation of Laboratory.—A. G. Young, F. C. Robinson, G. M. Woodcock, and Richard H. Stubbs.

The secretary made a brief verbal report on the smallpox situation stating that every infected lumber camp had been well cleaned up and disinfected before the men left the woods, and that with the exception of one infected house in Oakfield and a few infected families in the Madawaska region, no cases are known to exist in this State. He reported also that the outbreaks in the Madawaska region have of late been less frequent and that upon the whole, the smallpox situation is much more encouraging than it has been for some time. He reported that it had been found necessary to get out a warrant for the arrest of a man in Cary Plantation and for another in Oakfield, both of whom had broken quarantine and left the camp of John Morrison in Merrill Plantation. The inspection service at Sandy Bay has been discontinued, and the one at Lowelltown has been taken over by the Surgeon-General of the Public Health and Marine Hospital Service.

A number of disputed or questionable bills were referred by the board to the Finance Committee with authority to take such action in regard to the payment of them as the committee may deem equitable and legal.

The following resolution was passed:

"Whereas, The value of perfect sight and hearing is not fully appreciated by educators, and neglect of the delicate organs of vision and hearing often leads to disease of these structures, therefore, be it

Resolved, That it is the sense of the State Board of Health that measures be taken by boards of health, boards of education and school authorities, and, if possible, legislation be secured,

looking to the examination of the eyes and ears of all school children, that disease in its incipiency may be discovered and corrected."

At the second quarterly meeting held in June, the secretary reported on the outbreaks of smallpox which have occurred since the March meeting of the board, viz. outbreaks in the following places: On a lumber drive in the St. Francis region, on another drive at Haskell Rock on the East Branch of the Penobscot, in Pittsfield, Troy, Detroit, Jonesport, East Machias, Columbia Falls, Columbia, Addison, Grand Isle, Connor Plantation, and Island Falls.

The secretary also referred to an outrbeak of diphtheria at Long Pond near the town of Jackman and to an outbreak just across the line from Lowelltown which had lately been reported. Dr. Larrabee and Dr. Boothby, the respective inspectors at these two places, had received instructions in regard to what action should be taken to prevent the spread of infection in the one place and the importation of it in the other.

The secretary also reported to the board that with his advice the inspection service under the Public Health and Marine Hospital Service at Lowelltown had been discontinued and that the inspection service at Van Buren under Dr. Hammond, had also been discontinued, and that with the advice of the secretary the Surgeon-General of the Public Health and Marine Hospital Service lately reappointed him and his assistant.

A brief moment of time was given to the unusual prevalence of typhoid fever at a few places in the State. The question also of the public danger in the transportation by rail of cases of typhoid fever came up, but it was voted to defer the further consideration of that matter to a future meeting.

It was the sense of the meeting that so far as is practicable, experimental work with disinfectants be continued through the summer, but the determination of the scope of this and of the other laboratory work was left with the committee on laboratory.

The secretary was authorized to take such action as he deems best in resuming the publication of an official bulletin for the State board of health.

It was the opinion of the board that the various interests of the State required the readoption of the order requiring the vaccination of all lumbermen.

A special meeting of the State board of health was held at the State House, August 19, 1904, at 10 o'clock in the forenoon, for the purpose of giving an opportunity to any lumberman or lumber operator who wished to be heard in regard to rules and regulations relating to vaccination of lumbermen. Certain lumbermen had expressed a wish to be heard.

After waiting until fifteen minutes past eleven o'clock and no lumber operators nor representatives of them having appeared, Professor Robinson presented the following resolutions:

Whereas, the rules and regulations relating to the vaccination of lumbermen, made at the second annual meeting of the State board of health, June 27, were submitted to the Honorable Governor and Council for approval as the law provides, but no action was taken upon them and they therefore became ineffective.

Whereas, at the last meeting of the Governor and Council the suggestion was made that the State board of health hold a meeting for the purpose of conferring with lumber operators and of giving them a hearing, and whereas a special meeting was called and has this day been held, and after duly considering all suggestions which have been made, and believing that the reenactment of said rules and regulations is urgently needed for the protection of the general public and for the prevention of expense and trouble for many towns and many persons,

Resolved, therefore, that the State board of health fully feels it to be its duty again to make said rules and regulations and again to offer them to the Governor and Council for their approval and do hereby make the following:

Rules and Regulations of the State Board of Health Relating to the Vaccination of Lumbermen.

Section 1. No person shall work in or about any lumber camp or in any lumber crew in any part of this State who cannot show a good vaccination scar and who cannot prove by

a certificate from a legally qualified physician that he has been vaccinated within three years.

Section 2. No lumber company, lumber operator, or agent of any lumber company, or lumber operator shall hire any man to work in the lumber woods or in any lumber crew in any part of this State who cannot show by a good vaccination scar and prove by a certificate from a legally qualified physician that he has been vaccinated within three years, and all persons employing men for the purposes specified in this section shall make special inquiry when employing men whether they have or have not been vaccinated.

This resolution was seconded and carried.

It was voted that the secretary be instructed to put upon the records the following statement of the reasons why the board deemed it necessary to make the foregoing rules and regulations.

I. Smallpox is sufficiently prevalent in those regions from which the supplies of laborers in lumber regions largely come to warrant the belief that there will be much danger the coming season of the introduction of smallpox into camps. Smallpox still exists in the counties of the Province of Quebec between the Maine boundary line and the St. Lawrence river, and at no time this year to the present has smallpox been absent from the Madawaska region, and at no time has it been safe to suspend work there.

II. A general and honest compliance with the requirement of vaccination would effectually do away with smallpox in lumber camps, as compliance with the requirements of the statute law of 1889, that only vaccinated persons shall be employed in paper mills where rags are used, has stopped outbreaks of smallpox in those places. Every outbreak of smallpox which has been found in lumber camps the last two seasons has been due to a neglect of vaccination.

III. One objection to these rules and regulations that has been raised is that the requirement of vaccination increases the difficulty of obtaining men. To this it may be said that the experience and investigations of the State board and all its inspectors indicate that this difficulty would not be very real if the lumber operators would all pull together and cooperate with the State board of health. Some operators who have firmly required vaccination as the condition of employment have had

no difficulty in obtaining men. The Canadians are supposed to be as reluctant to vaccination as any classes of men, but the testimony of the inspectors at the station above Jackman and at Lowelltown is that they do not know of a man who has turned back and relinquished the chance of getting a job because vaccination was required. Neither can it be learned that there was any diminution in the number of men who came into the State through these two points of entry.

Dr. Woodcock moved that Professor Robinson and Dr. Wedgwood attend the meeting of the Governor and Council to be held next Monday, for the purpose of aiding the secretary in presenting the position of the State board of health relating to the rules and regulations regarding the vaccination of lumbermen. This was seconded and carried.

At a conference of representatives of the State board of health with the Governor and Council in August, 1904, the rules and regulations of the board relative to the vaccination of lumbermen in the following amended form were agreed upon, and subsequently were approved by the Governor and Council.

Section 1. No person shall work in or about any lumber camp or in any lumber crew in any part of the State who has not been successfully vaccinated within three years.

Section 2. No lumber company, lumber operator, or agent of any lumber company or lumber operator, or employment agent acting therefor shall hire any man to work in the lumber woods or in any lumber crew in any part of this State who has not been successfully vaccinated within three years, and all persons employing men for the purposes specified in this section shall make special enquiry when employing men whether they have or have not been so vaccinated.

The fourth quarterly meeting of the board was held December 27, 1904.

In a verbal report on the smallpox situation, the secretary reminded the board that at the last meeting he had reported that

for some time no cases of smallpox had been reported to him, and that he knew of no case in the State. In the three months which have elapsed since then one case of smallpox has occurred at St. Francis plantation, one at Square Lake in a lumber camp, which came out to Eagle Lake and there received treatment, one case in Township No. 17, Range 4, which was contracted in the Square Lake lumber camp, one in Westmanland plantation north of New Sweden, four cases of somewhat questionable nature at Vassalboro, one case in South Portland, and at present there is an outbreak in a lumber camp near Chesuncook Lake consisting of four cases, and an outbreak of smallpox in a lumber camp in the Seven Islands region consisting of a single case so far as has yet been reported.

The secretary reported the correspondence relative to hides recently shipped from South America to the port of Boston which, according to the report of the board of health of the city of Boston, had been the cause of one fatal case of anthrax. A part of these hides had been sent to Island Falls. The secretary reported that he had reported the matter to the secretary of the local board of health of Island Falls and had advised the local board to use precautionary measures in handling the hides.

With reference to the Heyburn Pure Food Bill now before Congress, a committee consisting of Professor Robinson, the secretary, and Dr. Stubbs was appointed to consider the matter and to present the views relative to the bill to our congressmen.

At a special meeting of the State board of health held January 19, 1904, the following rules and regulations relating to outbreaks of smallpox in lumber camps and other places in the State, were made and adopted.

Section 1. No person shall leave any camp, house, building, crew, or family in which smallpox or any disease resembling smallpox has appeared or has been present, and go to any other camp, house, building, crew, family, town, or township without the written permission of an inspector or agent of the State board of health or a local board of health.

Section 2. If smallpox or any disease resembling smallpox should appear or has recently been present in any camp or crew,

the lumber company, lumber operator, boss, or agent who has charge of such camp or crew, shall immediately notify the State board of health or any inspector of the State board of health, and no lumber company, lumber operator, boss, or agent in charge shall allow any person to leave his camp or crew, or any such camp or crew over which he has charge without the written permission of an inspector or agent of the State board of health or of a local board of health.

Section 3. If in disobedience of section 1, any person should leave any camp, house, building, crew, or family and go to any other place, it shall be the duty of the lumber company, lumber operator, or boss or agent having charge of such camp or crew, to send as soon as is possible to the State board of health or any inspector of the State board of health the name of the person who has left, the place in which he usually resides and the place to which he has probably gone, if known.

Section 4. Whenever any member, inspector, or agent of the State board of health gives any orders relating to inspection, quarantine, disinfection, or anything else which he deems necessary to prevent the spread of the infection of smallpox or diphtheria, all persons receiving such orders verbally or otherwise shall obey them.

Section 5. When smallpox appears in any lumber camp, all lumber companies, lumber operators, or bosses and agents who have charge of such infected camp, or of other camps in the vicinity of such infected camp, shall give any member, inspector, or agent of the State board of health such assistance as he can, and when any said member, inspector or agent is obstructed in the performance of his duty, he may call to his assistance any person or persons, and it shall be the duty of every person so called upon to render the required assistance.

These rules and regulations were approved by the Governor and Council at their next meeting.

At the same special meeting of January 19, the following action was taken by the board:

At the special meeting of January 19, the State board of health moved and voted that the rules relating to the transporta-

tion of dead bodies, adopted by the Conference of State and Provincial Boards of Health of North America at their meeting in Baltimore, October 23 and 24, 1903, which were made and adopted by the State board of health at its fourth quarterly meeting, December 28, 1903, are hereby again made and adopted in pursuance of the authority conferred upon the board by section 8, chapter 18, Revised Statutes, 1903, as the rules and regulations of the State board of health.

The readoption of these rules is for the express purpose of submitting them, if and so far as required by law, to the Governor and Council, as is provided in section 9, chapter 18, Revised Statutes, 1903.

The rules and regulations made and adopted December 28, and again this day, are as follows:

Rules of the State Board of Health of Maine for the Transportation of the Dead.

Rule 1. The transportation of bodies dead of smallpox or bubonic plague is absolutely prohibited.

Rule 2. The trasportation of bodies dead of Asiatic cholera, yellow fever, typhus fever, diphtheria, (membranous croup), scarlet fever (scarlatina, scarlet rash), erysipelas, glanders, anthrax or leprosy, shall not be accepted for transportation unless prepared for shipment by being thoroughly disinfected by (a) arterial and cavity injection with an approved disinfecting fluid, (b) disinfection and stopping of all orifices with absorbent cotton, and (c) washing the body with the disinfectant, all of which must be done by an embalmer holding a certificate as such, issued by the State board of embalming examiners.

After being disinfected as above, such body shall be enveloped in a layer of dry cotton, not less than one inch thick, completely wrapped in a sheet securely fastened, and encased in an air-tight zinc, tin, copper, or lead lined coffin or iron casket, all joints and seams hermetically sealed, and all enclosed in a strong, tight wooden box. Or, the body being prepared for shipment by disinfecting and wrapping as above, may be placed in a strong coffin or casket, and said coffin or casket encased in an air-tight zinc, copper, or tin-lined box, all joints and seams hermetically soldered.

For interstate transportation under this rule only embalmers holding a license issued or approved by the State board of embalming examiners, after examination, shall be recognized as competent to prepare such bodies for shipment.

Rule 3. The bodies of those dead of typhoid fever, puerperal fever, tuberculosis, or measles, may be received for transportation when prepared for shipment by arterial and cavity injection with an approved disinfecting fluid, washing the exterior of the body with the same, and enveloping the entire body with a layer of cotton not less than one inch thick, and all wrapped in a sheet securely fastened, and encased in an air-tight metallic coffin or casket, or air-tight metal-lined box, provided that this shall apply only to bodies which can reach their destination within thirty hours from the time of death. In all other cases, such bodies shall be prepared by a licensed embalmer holding a certificate as provided for in Rule 2. When prepared by a licensed embalmer as defined and directed in Rule 2, the air-tight sealing and bandaging with cotton may be dispensed with.

Rule 4. The bodies of those dead from any cause not stated in Rules 2 and 3 may be received for transportation when encased in a sound coffin or casket and enclosed in a strong outside wooden box, provided they can reach their destination within thirty hours from the time of death. If the body cannot reach its destination within thirty hours from the time of death, it must be prepared for shipment by arterial and cavity injection with an approved disinfecting fluid, washing the exterior of the body with the same, and enveloping the entire body with a layer of dry cotton not less than one inch thick, and all wrapped in a sheet securely fastened, and encased in an air-tight metallic coffin or casket or an air-tight metal-lined box. But when the body has been prepared for shipment by being thoroughly disinfected by a licensed embalmer, as defined and directed in Rule 2, the air-tight sealing and bandaging with cotton may be dispensed with.

Rule 5. In the shipment of bodies dead from any disease named in Rule 2, such body must not be accompanied by persons or articles which have been exposed to the infection of the disease, unless certified by the health officer as having been properly disinfected.

Before selling tickets, agents should carefully examine the transit permit and note the name of the passenger in charge, and

of any others proposing to accompany the body, and see that all necessary precautions have been taken to prevent the spread of the disease. The transit permit in such cases shall specifically state who is authorized by the health authorities to accompany the remains. In all cases where bodies are forwarded under Rule 2, notice must be sent by telegraph by the shipping embalmer to the health officer, or, where there is no health officer, to other competent authority at destination, advising the date and train on which the body may be expected.

Rule 6. Every dead body must be accompanied by a person in charge, who must be provided with a passage ticket and also present a full first-class ticket marked "Corpse" for the transportation of the body, and a transit permit showing physician's or coroner's certificate, name of deceased, date and hour of death, age, place of death, cause of death, and all other items of the standard certificate of death recommended by the American Public Health Association and adopted by the United States Census Bureau, as far as obtainable, including health officer's or registrar's permit for removal, whether a communicable or non-communicable disease, the point to which the body is to be shipped, and, when death is caused by any of the diseases specified in Rule 2, the name of those authorized by the health authorities to accompany the body; also the undertaker's certificate as to how the body has been prepared for shipment. The transit permit must be made in duplicate, and the signature of physician or coroner, health officer, and undertaker, must be on both the original and duplicate copies. The undertaker's or registrar's certificate and paster of the original shall be detached from the transit permit and securely fastened on the end of the coffin box. All coffin boxes must be provided with at least four handles. The physician's certificate and transit permit shall be handed to the passenger in charge of the corpse. The whole duplicate copy shall be sent to the official in charge of the baggage department of the initial line, and by him to the secretary of the state or provincial board of health of the state or province from which said shipment is made.

Rule 7. When bodies are shipped by express, a transit permit, as described in Rule 6, must be made out in duplicate. The undertaker's certificate and paster of the original shall be detached from the transit permit and securely fastened on the

coffin box. The physician's certificate and transit permit shall be attached to and accompany the express way-bill covering the remains, and be delivered with the body at the point of destination to the person to whom it is consigned. The whole duplicate copy shall be sent by the forwarding express agent to the secretary of the state or provincial board of health of the state or province from which said shipment was made.

Rule 8. Every disinterred body, dead from any disease or cause, shall be treated as infectious or dangerous to the public health, and shall not be accepted for transportation unless said removal has been approved by the state or provincial health authorities having jurisdiction where such body is disinterred, and the consent of the health authorities of the locality to which the corpse is consigned has first been obtained; and all such disinterred remains, or the coffin or casket containing the same, must be wrapped in a woolen blanket thoroughly saturated with a 1-1000 solution of corrosive sublimate, and enclosed in a hermetically soldered zinc, tin, or copper-lined box. But bodies deposited in receiving vaults shall not be treated and considered the same as buried bodies, when originally prepared by a licensed embalmer as defined in Rule 2, and as directed in Rule 2 or 3 (according to the nature of the disease causing death), provided shipment takes place within thirty days from the time of death. The shipment of bodies prepared in the manner above directed by licensed embalmers from receiving vaults may be made within thirty days from the time of death without having to obtain permission from the health authorities of the locality to which the body is consigned. After thirty days the casket or coffin box containing said body must be enclosed in a hermetically soldered box.

Rule 9. All rules and parts of rules conflicting with these rules are hereby repealed.

These rules and regulations were approved by the Governor and Council.

At the annual meeting of the board, for 1905, held at the State House, March 29, Dr. C. D. Smith was again unanimously elected president.

The standing committees chosen were the same as those for the preceding year, (see page 1) with the exception of the

auditing and finance committee the membership of which was: F. C. Robinson, C. D. Smith, and Richard H. Stubbs.

The secretary made a verbal report on the epidemic work during the past three months.

There had been only one case of smallpox in Kittery, one in Perry, and two in a lumber camp near Moosehead Lake.

The secretary exhibited a plan of a bi-monthly bulletin, the authority for the publication of which had already been received by him from the board, the number of pages of each issue to vary from four to sixteen or more in accordance with the time at the disposal of the secretary for preparing the bulletin and the amount of matter needing presentation to local boards of health and the public.

It was voted that a committee be appointed to study the subject of the injury to the public health from the use of nostrums containing opiates, cocaine, alcohol, etc., and to report to the board at the last quarterly meeting of this year and thereafter as they think best. The president appointed upon this committee Prof. Robinson, Dr. Stubbs, and the secretary.

At the second quarterly meeting the secretary reported that, at the request of the local board of health of Bar Harbor, he visited that place to consult the local board in regard to the trouble with their water supply. Samples of water brought home showed various microscopic vegetable growths, the most plentiful by far among which were asterionella and straurastrum.

Dr. Smith who went to Washington as a delegate to attend the Conference of State and Provincial Boards of Health and the Conference of Surgeon-General Wyman with the representatives of the several State Boards of Health made an interesting verbal report on the transactions at those two conferences.

At the third quarterly meeting of the State board of health adjourned from September, the secretary having collected information which shows very clearly that there is much danger

of the importation of the infection of smallpox into this State from various points in New Brunswick, in which the disease now prevails, not efficiently controlled, precautionary measures guarding against this danger appeared to the board to be urgently called for.

Moved and seconded, it was voted that the following rules and regulations be hereby made and adopted:

Rules and Regulations of the State Board of Health Relative to Smallpox in New Brunswick.

Whereas, smallpox having broken out in various places in New Brunswick where its presence seriously threatens the safety of the people of the State of Maine, the State board of health, the more effectually to protect the public health, does this seventh day of December make the following rules and regulations:

Section 1. Until further notice, no person shall come from York, Queens, or Sunbury counties, New Brunswick, or from neighboring or intermediate points, or from near any other place in New Brunswick where smallpox may exist, to any place in the State of Maine unless he can prove to the satisfaction of an authorized inspector of the State board of health, or to the local board of health of the town through which he enters the State, that he has not been exposed to smallpox or been near cases of this disease, and that he has been efficiently vaccinated.

Section 2. An inspection station is hereby established at the Port of Vanceboro. The inspectors of the State board of health there stationed shall inspect all railway trains coming from New Brunswick and shall vaccinate any persons who, in their judgment, may endanger the public health by entry without vaccination, and all such persons refusing to be vaccinated are hereby forbidden to enter the State, or if they have already entered, they shall leave the State forthwith by the nearest route.

Section 3. The inspectors of the State board of health shall disinfect all persons coming from New Brunswick, and their baggage and other effects, when, in the judgment of said inspectors, their entry without disinfection would endanger the public health, and all said persons who refuse to have such disinfection done, are hereby forbidden to enter the State, or if they have already entered, they shall leave the State by the shortest route;

and all public or private carriers are forbidded to transport farther than the State line, any persons, baggage, or other personal effects which said inspectors suspect may be infected.

It was voted that Dr. M. L. Young of Vanceboro be appointed the inspector to take charge of the inspection station at that point. The matter of what action the State board of health should take in supporting the Pure Food Bill to be introduced into Congress by Senator Heyburn, was referred to the committee on this subject appointed at the meeting of the board on December 26, 1904. This committee was authorized to take such action in supporting the measure as in its judgment may appear best. The committee consists of F. C. Robinson, A. G. Young, and R. H. Stubbs.

EPIDEMIC WORK.

By far the most of the epidemic work of the State board of health has been in connection with outbreaks of smallpox, but at various times it has been necessary for the board to act directly to prevent the spread of diphtheria or scarlet fever when outbreaks have not been within the jurisdiction of any local board of health.

Typhoid Fever at Millinocket.—At Millinocket when the disastrous epidemic of typhoid fever occurred, it became necessary to give assistance to the stricken community. The paper by Dr. Hawkins farther over in this report, indicates a part of what he did as the representative of the State board; but in addition to his investigations of the cause of the epidemic he temporarily filled the place of the secretary of the local board of health, and strenuously lent a hand in caring for the typhoid sick and for the frequent surgical cases from the great mill.

In connection with smallpox work it became necessary for the secretary of the State board to stop off at Millinocket just before, and again soon after the outbreak of typhoid fever broke out. At the earlier visit the fire occurred which led to the introduction of polluted water into the main. At the second visit he found one of the four physicians sick with typhoid fever, and another, Dr. Bryant, Secretary of the local board of health, was dragging around still making heroic efforts to attend to his patients and his public health duties, but with a temperature of 102° F. and other symptoms of typhoid infection. At the

earnest request of the secretary of the State board of health he promised to give up, it being understood that someone should be sent to take his place. A telegram to the Eastern Maine General Hospital in Bangor, elicited the information that the beds were all full but they would make room for the doctor. Another message brought Dr. J. B. Thompson of Bangor, to render help for a few days until Dr. Hawkins could be released and could arrive.

In a letter to the director of the laboratory under the date of February 22, accompanying a sample of water, Dr. Bryant, secretary of the local board, wrote as follows:

"Three weeks ago we had a fire here in town. For the next few days an epidemic was very prevalent throughout the place. The principal symptom was diarrhœa with backache. In many cases prostration was present and in some instances nausea and vomiting were marked. The patients were chiefly those who drank from the town water supply.

"February 21 we had another fire. This specimen of water was collected six hours after the fire. It is from our town supply which you were kind enough to examine a while ago, and which was found to be a suitable drinking water.

"But, during a fire, the ordinary pressure at the hydrants is insufficient, and more pressure is given by starting pumps at the mill. These pumps ordinarily not connected with the Town system, take water from Millinocket stream which serves as a tail race for the mill and force it into the town pipes. They take this water at a point about one half mile below an outlet of the Town sewer.

"The question arises—was the epidemic caused by the impurities introduced into the water? The answer is not so evident as it first appears, for some persons were afflicted who did not drink the water. Many who drank it had no trouble. No epidemic has yet arisen after this fire although as much time has elapsed as passed between the first fire and the epidemic's outbreak."

The report on samples of water sent to the Laboratory of Hygiene were to the effect that the water contained the colon bacillus.

A letter was written stating that in the opinion of the Secretary all of the Penobscot towns which use the water from the

river are in very great danger on account of the prevalence of typhoid fever at Millinocket, and suggesting that all persons who use the water in Bangor and Old Town see that every particle of it is boiled before it is used. The idea was expressed that little confidence could be put in the systems of filtration which are in use. It may be added that a serious epidemic of typhoid fever followed in Old Town and in Bangor.

Spinal Meningitis in a Lumber Camp.—In January, 1905, an outbreak of cerebro-spinal meningitis occurred in a lumber camp on Schoodic Lake. Several cases of death followed and fear of the disease caused a stampede of the remaining workmen. Dr. G. M. Woodcock, a member of the State board of health, visited the camp for the purpose of investigating the cause of the outbreak. The following is his report.

"I visited Five Island Camps Schoodic Lake yesterday accompanied by Mr. Chase, Chairman of the Brownville Board of Health. There being no conveyance or road from Schoodic Station we were compelled to travel by way of Brownville.

"The camp is well situated with good surroundings and good water supply, and is built on the cottage plan, of logs. On the ground floor is the kitchen, dining room and men's room, the latter being 20 x 34, the kitchen and dining room taking the rest of the space on that floor. The men's sleeping room is over the above described rooms and its dimensions are 20 x 50.

"It has every chance for good ventilation which I am informed has never been used until after the outbreak. This room has double bunks to accommodate from 36 to 40 men. At the head and near side of each bunk is a small window of two panes 10 x 8 which can be opened.

"There are also two large roof ventilators equal distance apart, with two additional windows at south end of building in the room each containing 6 panes 8 x 10.

"I understand that during the whole winter to the date of the appearance of the fatal case no one of these windows or the ventilators had been opened excepting once in a while one of the small windows was opened for a minute or two when objection being raised it was promptly closed.

"In addition to this a night crew of 15 or 20 men came down and occupied the sleeping apartment of the camp day times.

"So that the air was made more foul by its use as a sleeping room twenty-four hours continuously and for months with practically no ventilation.

"This in my opinion accounts for the outbreak, as on close questioning I could find no history of the disease in the places from which the men hail.

"There are three dead, one from Sangerville, Ernest Whitney, one from Milo, a crossroad two miles from this town, Donald Cunningham, and one who died at the E. M. G. Hospital, Donovan from Newcastle, N. B. In the latter case Dr. Bryant made a lumber puncture and developed a culture which plainly shows the Diplococ. Intracellularis. The smear made looked more like the pneumococcus.

"Mr. Chase on January 19th, 1905, had burned 6 lbs. of sulphur in the room which had been thoroughly washed. After this with a Novy Lamp and one half hour he had forced vapor from three (3) quarts of 40 % formaldehyde into the rooms keeping them closed from 1 P. M. until 9 P. M. when they were opened. I advised the separate treatment of the spreads and bedding, 6 ounces formaldehyde to 1 gallon of water closely rolled and left in a warm camp especially prpared for them twele hours.

"I advised removal of quarantine after this had been done as no new cases had occurred.

"At a camp four miles from this one they had a fatal case of appendicitis, ruptured, and as a result the whole crew, numbering thirty, left thinking it was the same disease which had prevailed in Five Island Camps. The case at Hospital, Bangor, John Parker from Harvey Station, N. B. is slowly recovering,

"In closing this disconnected note I will say that so far as I could see from my investigation the epidemic started from two conditions: exposure to cold and wet and the use of a room for sleeping purposes continuously day and night for months without proper ventilation or admission of good air.

"The building is very open, and is all right if properly used, and is much better than the average camp.

"It needs someone to insist on proper airing daily, and should not be used in the daytime as a sleeping apartment for a number of men so long as it is used nights for that purpose."

SMALLPOX IN 1904.

In the early part of this year smallpox was present in a considerable number of places as an aftermath of the troublesome epidemics which occurred in the preceding year. In most of the places the result of good work was the confining of the outbreak to a few cases. In a few instances, the nature of the disease was not promptly recognized and the disease obtained a start which entailed hard work upon the local boards. The following is a statement of the smallpox prevalence for 1904 with the exception of some of the outbreaks of 1903 which were not quite extinguished until the early part of this year.

Addison.—One case of smallpox appeared at Indian River in this town in the summer in connection with the outbreak at Jonesport.

Bangor.—In this city, there was one case of smallpox in May and the following July, three cases of smallpox were taken off from the Pawnee Bill Show by the local board of health. In this outbreak, there was a total of seven cases. When these cases were found in Bangor, Dr. G. M. Woodcock, a member of the State board, telegraphed the fact to the secretary's office, and until they passed out of the State, the show was kept under observation to know that all of the members of it remained well, and the secretary of the state board of health of New Hampshire was notified before their arrival in that state.

Cape Elizabeth.—In the latter part of the year smallpox appeared in Cape Elizabeth, two cases resulting.

Bradley.—In March a man and his wife came on a visit. The woman came down with smallpox and subsequently her husband had the disease.

Calais.—In February, the secretary of the State board of health received a telegram that there were three or four suspected cases of smallpox in one family. They were visited and found to be smallpox.

Carmel.—Had two cases of smallpox in January.

Charleston.—A pupil in the Higgins Classical Institute the last of February presented suspicious symptoms. The pupil was seen by Dr. Hawkins, a medical inspector for the State board of health, who found a mild case of smallpox. Most of the pupils had left on a vacation. Dr. Hawkins sent by tele-

phone a list of the towns to which pupils had gone and the local boards in all of these towns were notified from the office of the State board of health and advised to have all such returned pupils vaccinated together with their families and keep them under observation.

Chesuncook.—December 7, the secretary of the State board of health received a telegram from Dr. Hunt of Greenville stating that there was a case of smallpox at the hotel at Chesuncook. Mr. T. F. Abildgaard, a nurse and inspector who had before been employed by the State board of health was sent to take charge of the case. In due time, the hotel and everything needful was thoroughly disinfected. Subsequently, smallpox was discovered in a camp a few miles from the hotel. One of the reports in regard to smallpox at this camp is herewith presented somewhat in detail for the reason that it illustrates very well the methods which have been pursued by the State board of health in dealing with smallpox in camps. The careful work thus done has, I think it may be said, invariably prevented subsequent infection from camps in which there have been cases of smallpox, as difficult as we had formerly held it to be to disinfect lumber camps in a trustworthy manner. There were seven cases of smallpox in that camp.

"On December 16, last, I heard that there was sickness at J. F. S———'s camp on Cuxabexis Meadows. On the morning of the 17th, I went over to this camp and found one A. P. M———, of Medway, Maine, sick in the camp, the eruption just appearing. I waited till the crew came in for dinner and found that the camp contained thirty men. By making inquiries and examining the men, I found three more cases among the crew, namely, R. W———, 25 years, of Miramichi, D. C———, 50 years, of Cape Breton, T. M———, 32 years, of Prince Edward Island.

"W——— was in the last stages of desquamation, C——— and M——— in the pustular stage, well advanced. I at once quarantined the camp and tried to vaccinate the men who were not protected by vaccination, but no one would submit. The foreman of the camp went to work and built a small camp to be used as a pest-house and the four cases were placed in said building.

"On the 19th, I again went to the camp and vaccinated eight men. I visited the camp every other day, walking over when the roads were good and using a team when there was slush and water on the lake and meadows. On December 30th, J. J———, 39 years, of Miramichi, broke out very lightly. This man was vaccinated by me; the vaccination took on him, but evidently the virus did not have time to check the disease fully. I placed this man in the pest-house. On January 7th, W. W———, 24 years, of Presque Isle, Maine, broke out, but also very lightly. I placed him in the pest-house. R. F———, 22 years, of New Brunswick, also broke out. This man was vaccinated by me, but as it appears, not in time. He also was placed in the pest-house. January 8th, I went over to the camp with the intention of remaining there until I could clean up everything at the camp but for reasons stated in my letter of January 13, I returned to A. B. S———'s Monday, January 9. I cleaned out the sleeping camp, burned all boughs, rags and paper and swept it clean. I then sprayed the camp and bedding with formaldehyde, and disinfected it with formaldehyde and permanganate of potassium. I also did the same to the cook camp. I gave each man a bath using bichloride solution and furnished each man with clean and disinfected clothing. The clothing the men took off, I also disinfected. I released W———, C———, and M——— after giving them a bath using solution above described and giving them disinfected clothing. Most of the clothing these three men had been wearing in the pest-house was burned, the rest I disinfected.

"On January 28th, I released M———, J———, W———, and F——— after giving them a bath using bichloride solution, and rinsing them in a second bath and furnishing them clean and disinfected clothing. Part of the clothing these men had been wearing, I burned. What underclothing was not burned, I put in soak using bichloride solution; the rest of the clothing I thoroughly disinfected together with the dishes and bedding used in the pest-house. By order of the foreman, I burned some of the bedding. I also again disinfected the sleeping and cooking camps and all the men's clothing and gave them a bath. I then raised the quarantine on the camp.

"I also disinfected J. F. S———'s second camp two miles from the quarantined camp. Formaldehyde and permanganate

of potassium was used as disinfectant, and my experience is that this way of disinfecting gives better satisfaction than using a generator. I know I used quite a large quantity of formaldehyde—six gallons—but I had quite a number of rooms and a good deal of bedding to disinfect at the C——— House besides the disinfecting of the camps.

"As to where the men at the camp contracted the disease, I find that A. P. M——— sometime last November, slept with C. S———, the sick man at the C——— House, and must have carried the disease to the camp."

Clinton.—In the early part of the winter an outbreak of smallpox occurred in Clinton. There were eight cases altogether.

Columbia.—In the early part of the summer, there were two cases of smallpox in the town of Columbia.

Columbia Falls.—In connection with a visit to Jonesport, the secretary of the State board of health visited several cases of smallpox in Columbia Falls. He confirmed the diagnosis of the attending physician that they were cases of smallpox. One case seen by him was of considerable severity in the pustular stage. This was the beginning of an outbreak in which there was a total of thirty-four cases.

Connor Plantation.—An outbreak of smallpox occurred in Connor Plantation in June which was attended to by Dr. Hammond of Van Buren with the assistance of Mr. Omer Keegan. There were thirty-three cases in all.

Cyr Plantation.—Three cases of smallpox occurred in this plantation, one in January and the rest in March. Dr. Hammond of Van Buren attended to them.

Dedham.—In December of this year, a few cases of smallpox occurred in Dedham.

Detroit.—In connection with an outbreak of smallpox in Troy and some of the surrounding towns, the secretary of the State board of health saw one of the cases. Two cases was the total number in this town.

Eagle Lake Plantation.—In the early part of November, an outbreak of smallpox occurred in a lumber camp on Square Lake. He came down to Eagle Lake and was there quarantined.

East Machias.—Several cases of smallpox were seen in East Machias by Dr. Hunter of Machias. The cases were subsequently visited by Dr. Hawkins, an inspector of the State board

of health and the diagnosis was confirmed. The infection of these cases originated in Jonesport.

Frenchville.—In January, Dr. Henry Hawkins medical inspector for the State board of health, reported three cases of smallpox in that town, and in August of that year Dr. Hammond of Van Buren reported one house quarantined on account of the presence of smallpox.

Grand Isle.—There was a small outbreak of smallpox in January and another slight one in July resulting in a total as reported to this office of four cases.

Haskell Rock.—At Haskell Rock on the Upper Penobscot, one case of smallpox occurred upon the drive in May. Dr. Hawkins visited the case which he left in the care of Mr. Abildgaard who had charge of the man and attended to his final disinfection after his full recovery.

Houlton had one case of smallpox in January.

Island Falls.—In June of this year, two cases of smallpox occurred in a hotel in the village.

Jonesboro.—One case of smallpox occurred here in June.

Jonesport.—The secretary of the State board of health visited Jonesport May 12 and found that smallpox was present. The cases seen were far advanced but were unquestionable in their character. Many persons had been exposed to the infection and a total number of two hundred and twenty-five cases resulted before and after the recognition of the true nature of the disease. Some of the cases in this outbreak were subsequently seen by Dr. Hunter, of Machias, who confirmed the diagnosis. Mr. Bean, the sanitary inspector of Augusta, was employed by the local board of health to aid them in disinfecting and in other work required in stamping out the outbreak.

Kittery.—A case of smallpox was reported to the office of the State board of health the latter part of April. The local board of health confined the outbreak to this single case.

Madawaska.—One case of smallpox was reported to the State board by the local board of health, and subsequently Dr. Hawkins discovered and reported several other cases in his work in the Madawaska region.

Madawaska Region.—Excepting the cases which were carried over into the first two months of this year from the epidemic of the preceding year, very few cases of smallpox occurred in

the valley of the St. John. Dr. H. H. Hammond of Van Buren, who had been acting as medical inspector for the U. S. Public Health and Marine Hospital Service, reported to the State board April 25 that so far as he knew, there were no cases of smallpox in the Madawaska region. This was therefore a report of the ending of the troublesome epidemic which had prevailed there the previous year.

Madison.—An outbreak occurred in this town in February. The total number of cases was six.

Mars Hill.—One case occurred here in the summer.

Moosehead Lake Region.—The secretary of the State board of health visited the Moosehead Lake region the latter part of August on account of the rumor of the possibility of the existence of cases of smallpox. The diagnosis of smallpox was made and a telegram was sent to Dr. Hawkins, an inspector of the State board of health, to go up and complete the investigation by tracing out all of the rumors in regard to the cases. It was found that two guides had been affected, one Indian woman, one outsider, and several children. Dr. Hawkins completed the work there with the exception of the disinfection of one guide and his small camp. This was subsequently done by his brother who had been carefully instructed how to do this work and had helped Dr. Hawkins in his work.

New Sweden had one case of smallpox in November.

Pittsfield.—An outbreak of smallpox occurred in Pittsfield and some of the surrounding towns in which a hay press and the workmen which accompanied it were the factors in the spread of the disease. It appears that a man came from New Hampshire where, as he said, he had been exposed to smallpox or perhaps had it in a mild form. Very soon after his return from New Hampshire late in March, he went to work on the hay press. Five men worked in the crew on the press. The secretary of the State board of health was called to Pittsfield May 5 where he found two of the men who had been at work on the press affected with smallpox. The next day, he saw another one of them in Troy who had contracted the disease from the same source. One case was also seen in Detroit. The total number of cases which occurred in Pittsfield was nine.

Through letters to the local boards of health of the endangered towns, they were urged to take prompt and efficient measures to

stamp out the infection which had obtained a foothold in the respective towns. The following directions were given in regard to the disinfection of the hay press: "I think there is danger to men who subsequently work on the hay press unless it is thoroughly disinfected, particularly the ropes and such other parts as have been handled by the infectious men and which, like the ropes, are capable of retaining the infection for some time. Wetting the rope thoroughly or scrubbing it thoroughly so that it is wet with an efficient disinfecting solution, either Solution 6 or Solution 7, would, in my opinion, remove all danger. It would probably be better to have all parts of the press brushed over with the disinfecting solution going over it with a broom which has been dipped into the solution. If Solution 6 is used, it would be well not to have it come in contact with any of the metal parts."

The disinfection was carried out in the manner which had been recommended from this office.

Plymouth had one case of smallpox.

Riceville.—At the mills at Riceville in Township 39, Hancock county, a case of smallpox occurred in the latter part of March. A medical inspector was sent, and subsequently a disinfector was employed to disinfect the person and his infected surroundings.

St. Francis Plantation had one case of smallpox in November.

St. Francis River.—One case occurred on a drive on the St. Francis waters.

Seven Islands.—Two cases of smallpox occurred in a lumber camp at Seven Islands on the Upper St. John in December. The operator engaged Dr. Flint, of Fort Kent, to attend to the cases and he gave the men in the camp a thorough disinfection before he left.

Township No. 17, Range 4.—This township is at the head of Long Lake in the Madawaska region. Information was received from Father Gory, of St. Agatha, secretary of the local board of health of that town of the presence of smallpox in Township No. 17 over across the lake from them. The cases had been seen by Dr. Cote of Frenchville. An inspector and disinfector from Van Buren made an investigation and found eleven cases of smallpox. These cases were all in one family in an isolated locality. Subsequently, he disinfected the persons

infected and the house in which the cases had occurred. In December of the same year, one other case occurred in this township, a man who contracted smallpox on Square Lake.

Van Buren.—That town had one case of smallpox in December.

Westmanland Plantation.—There was one case of smallpox in this plantation the last of November.

SMALLPOX IN 1905.

But few outbreaks of smallpox occurred in 1905. The most important of which estimated from the point of trouble which it gave to the State board of health and to several towns, was the one in a lumber camp on Howe Brook.

Atkinson.—In November, Dr. Woodcock, a member of the State board of health, was called to Atkinson to investigate a suspected case of smallpox. The young man had recently returned from Massachusetts. A careful examination of the case and of the clinical history showed that there was nothing in the history of the lesions to indicate smallpox, but that it was a case of chickenpox with the eruption then at various stages.

Auburn and Lewiston.—April 25, the secretary of the State board of health was called by the local board of health to Auburn. He was told upon arrival that there were suspicious cases among the operatives of one of the mills. He found two cases of smallpox in Auburn and six in Lewiston. At a second visit a few days later, it was found that there were no additional cases in Auburn, but there were nine cases altogether in Lewiston all of which had been removed to the isolation hospital. The affected mill was closed for a short time and a thorough disinfection of the mill, its products, and everything else connected with it was carried out. The total number of cases of smallpox in Auburn for this year was six and in Lewiston, it was fourteen.

Bangor.—Only two cases of smallpox occurred in Bangor this year.

Damariscotta.—This town had three cases of smallpox in November, the first case which was seen by Dr. Tobie, of Portland, and the other two cases, children of the man who was first sick, were seen by the secretary of the State board of health.

East Machias.—Seven cases of smallpox occurred in this town. Dr. Woodcock, a member of the State board, visited the town and confirmed the diagnosis which had been made by the local physicians.

Greenville.—In April, a man broken out with smallpox arrived in Greenville. He was promptly put into the smallpox hospital; and, as he was not a native of this State, the State board of health arranged for the care of him and subsequently paid the bills.

Houlton had only one case of smallpox. That was of a man who came from a lumber camp on Howe Brook.

Howe Brook.—The secretary of the local board of health of Houlton reported to the State board of health December 19 a case of smallpox which had come to that town from a lumber came on Howe Brook. A telegram was sent to Dr. Flint, an inspector for the State board of health, to investigate the matter. He did so, and his opinion was that the original infection was brought to the camp by men from New Brunswick who had worked there. There seemed to be good reason for his opinion, but there is doubt whether the infection was brought direct or from Cary Plantation, a township on the line in which a small outbreak of smallpox was subsequently found, which undoubtedly, was referable to New Brunswick. There had for months been no cases of smallpox elsewhere in Maine from which the infection could have been derived. In some of the portions of New Brunswick near the boundary line, particularly in the region around Frederickton Junction, many smallpox houses had remained without disinfection or efficient control, and the State board of health, through its inspection service at Vanceboro, had sought to keep the infection from our State. A nurse was sent to maintain quarantine at this camp and to give it and the men their final disinfection at the proper time.

It was found that several men had left this camp, and so far as possible, these men were traced. Two men were followed to Dyer Brook and one to Oakfield where one case of smallpox occurred. Smallpox broke out in a lumber camp on the Oxbow. The infection in this camp was apparently brought from Cary Plantation. One man went to Linneus from the Howe Brook camp and one from the Oxbow camp. Both carried infection.

Smallpox was also carried to Hodgdon from the Howe Brook camp. The history of the outbreak in these towns belongs in the year 1906 and will therefore appear in the next report of the board.

Moosehead Lake.—In February, Dr. Hunt of Greenville reported to the State board of health that a lumber operator who had a camp ten miles above Kineo had told him that some of his men had an eruptive disease which he feared might be smallpox. Dr. Moody of Jackman was sent by the State board of health to examine the men and investigate the conditions in the camp. He reported that he found two cases of smallpox of a mild type and two other cases which had practically recovered. The men in the camp were all French Canadians. There were thirty-three men in the camp altogether. The doctor sent a list of the names and places of residence of all the men. The camp was subsequently disinfected in accordance with the directions given by Dr. Hunt of Greenville.

Oxbow.—An outbreak of smallpox occurred in Huntley's camp on the Oxbow. This is briefly referred to under the notes about the outbreak on Howe Brook. How many cases of smallpox occurred there is uncertain. The State board of health did not know of the outbreak until the camp had been vacated. It was disinfected by an agent of the State board of health.

Perry.—One case of smallpox in Perry was reported by Dr. Rogers of Pembroke, the attending physician.

Westbrook had an outbreak of smallpox in December in which there were eight cases which were cared for in the isolation hospital.

INSPECTION SERVICE AT VANCEBORO.

November 23, it was learned that an eruptive disease accompanied in some cases, at least, with serious illness was showing a tendency to epidemic prevalence around Fredericton Junction and Tracy, New Brunswick. The secretary of the State board of health had some correspondence with the secretary of the Provincial Board at Fredericton in regard to the matter. He had assured himself that the disease prevailing across the line was smallpox. On account of this danger, a special meeting of the State board of health was held December 7. At this meeting, the secretary of the board reported what he had been able

to learn in regard to the presence of smallpox at and around Fredericton Junction and in other places in New Brunswick, and that particularly at Fredericton Junction and Tracy, where the attending physicians had had some difficulty in agreeing as to the nature of the disease, no efficient measures had been instituted for the prevention of its spread in New Brunswick or into our own State. After considering these matters, it was the opinion of the board that the conditions constituted a danger which justified the establishment of an inspection service at Vanceboro. It was voted therefore that an inspection service be put on at that point and it was further voted that Dr. M. L. Young of that town have charge of the station.

A telegram was therefore sent to Dr. Young the same day notifying him of his appointment and asking him to begin the inspection service at once. A supply of vaccine points, of disinfectants, and of other supplies that might be needed had already been forwarded to him so there should be no delay in beginning the work. At this meeting rules and regulations were made governing the inspection service and providing that "no person shall come from York, Queens, or Sunbury Counties, in New Brunswick, or from any neighboring or intermediate points, or from near any other places in New Brunswick where smallpox may exist, to any place in the State of Maine unless he can prove to the satisfaction of an authorized inspector of the State board of health, or to the local board of health of the town through which he enters the State, that he has not been exposed to smallpox or been near cases of this disease, and that he has been efficiently vaccinated."

The following are a few extracts from the reports of our inspector at Vanceboro, showing something of the character of the danger and of the work.

"During week just passed up to Friday, A. M. five new houses in Tracy became infected, also one at Tracyville, eight miles out from Tracy. By reference to diagram I sent you note the disease is spreading quite fast to Fredericton, where they are expecting and have made ready for it. I wrote you on Saturday concerning a Mrs. ——— to whom I had refused entry. McAdam Board sent her back to Tracy last night and are today having house she visited disinfected and occupants vaccinated. She told me she was going to ———, a non-infected

place about four miles from Tracy, intending to remain there till she had permission to enter. Possibly she may, but I think she may go to St. John, take boat for Eastport and get home that way. Please advise the proper authorities. Her name is Mrs. ——— and her home is at Hancock Point, Me.

"A Mrs. S., living in Boston, visiting at Fredericton Junction, quarantined in a smallpox house, released without disinfection of house or person, made application Saturday by messenger for admission. Permission refused. This is a sample of what we are getting nearly every day, and after Christmas holidays, when the crowds going east now, return, it will be difficult to handle them. During the past week, we have handled an average of over three hundred people daily, the trains from east running in two sections, necessitating both Dr. Johnston and myself being on duty every day. We are at present guarding the whole New England states, and it will be so, even under present conditions, for at least a month.

"I visited the seat of war yesterday at Fredericton Junction and Tracy. I did so as the only way of getting a correct idea of the situation. I was assured the situation was almost ideal. I got team, driver, and with Dr. Murray was driven over the infected section in one direction about eight miles, see diagram, and road showing schoolhouse. Only one house in that whole road has so far escaped, and they are self-quarantined. On Wednesday, a young man living two miles from Fredericton Junction was driven to station by a brother en route to St. John. His face caused suspicion, and the health officer took Dr. Murray out to the house for examination. Found family of five, two convalescing, and three in suspicious stage. No suspicion attached to this place as the house was isolated.

"The trains are running so at present one man cannot do the work, and even two cannot handle the crowd between McAdam and Vanceboro at night and be certain none escape him. There is only one way to do so, and that is to board night train at Fredericton Junction and work it from there. To do this means to leave McAdam before the morning train from that section arrives. One person must night and day be within easy reach of the station, as from four to twelve freights pass each twenty-four hours, any of which may and often do carry passengers, men with horses, potatoes, or C. P. R. employees, who may or may not be safe for admission."

As this inspection service protected the states west of our own as well as the State of Maine, it was deemed only just that it be assumed by the U. S. Public Health and Marine Hospital Service and the expenses of it borne by the general Government. An application was therefore made to the Surgeon-General early in December, even before the special meeting of the State board of health was held, stating the conditions and the danger, particularly to all of the New England states, and asking that an inspection service be established at Vanceboro. In view of the imminency of the danger, delay was undesirable and the inspection was established by the board; but it was subsequently assumed by the Surgeon-General and maintained until February 28. It was then continued by the State board of health until the infected houses in and around Tracy and Fredericton Junction had been cleaned up and disinfected after the matter had been investigated by the Provincial board of health.

One trouble with the lax methods over there seems to have been due to the fact that the unit of public health administration is the county, and that therefore the health officer often resides many miles from infected neighborhoods. It appears that some of the houses in the region in question were declared to be in quarantine, but the inmates still ran at large. Some of them released themselves from quarantine if they ever considered themselves under quarantine. Many infected houses had not been disinfected. Some of the people disinfected their houses themselves without proper instruction or with none at all. One man burned a pound of brimstone up-stairs and another pound down-stairs. As evidence of the efficiency of the disinfection, he related that after he thought the sulphur had burned long enough, he entered to get the container and the fumes were so strong that they gave him a cough. Another man burned between three and four pounds of sulphur in his house which has a room space of at least fifteen or sixteen thousand cubic feet. An evidence of efficient disinfection was the fact that the family was obliged to stay out doors during a part of the operation! Of course, such disinfection is a delusion and a snare.

Aside from the danger from undisinfected houses was that of concealed cases of which there was good reason to believe that there were many. For instance: "Yesterday, one family at Little Lake was discovered. The father and one son are not

yet ill. Mother, baby, and grandmother in supperative stage. Two latter will probably die. A boy and girl in convalescent stage, another boy in period of invasion. The father was told to consider himself quarantined, but if he had occasion to go to Fredericton Junction to 'keep in the middle of the road.'"

A little later six concealed cases were discovered in one house at Tracy and a few days later this number had increased to eight. At the end of a cul-de-sac four miles from Tracy, there live two families who, on account of the epidemic, kept themselves self-quarantined against their neighbors for several weeks. After the virulence of the disease had supposedly passed in that section, they became a little careless and paid for the penalty with smallpox in their homes.

It would appear that no real effort was made to stamp out smallpox in this region. In its early stages, the disease was mild and its real nature was unrecognized. Churches and schools were attended by persons in all stages of the eruption; and in one instance, the school-teacher was absent from her work only four days, returning as soon as the prodromal fever was over. The health officer lived twenty miles away; and the quarantine was in name only. The fact that persons who, with large crusts on face and hands, supposedly under quarantine, mingled freely with the public is a full justification for this assertion.

Just before the inspection service was discontinued by the National Government, the secretary of the State board of health received a report from a person not connected with the inspection service and not a resident of the infected neighborhoods, a person in whose truthfulness and judgment the State board of health knew it could rely, which stated that it is safe to say that there are somewhere between thirty and sixty families at and around Fredericton Junction who have, at some time this winter, been affected with smallpox. About the same time, the State board received a list of sixty-two owners of houses in and around Fredericton Junction and Tracy, in which houses smallpox had been present, but the houses had remained without disinfection.

As the result of this inefficiency, smallpox was introduced into the State of Maine, where for many months, not a single case of smallpox had been known. In several of these places, it

became necessary for the State board of health to send its own agents—inspectors and disinfectors—to help the local authorities to stamp out the epidemic, or in unorganized places to do the work entirely at the expense of the State board of health.

NEW CIRCULARS.

TYPHOID FEVER.

ITS PREVENTION AND RESTRICTION.

(Edition of 1906.)

Issued by the State Board of Health of Maine.

Typhoid fever is a communicable disease. It is both contagious and infectious; if it is deemed best to try to make a distinction between the meaning of these two words. From patients improperly cared for the danger of taking the disease is considerable; with the sick cared for as this circular advises, there is little danger to nurses and other attendants.

Source of Infection.—The course of infection in every case of typhoid fever is some preceding case. The communication may be direct from patient to attendant, but it is more frequently by indirect infection as is mentioned under the sub-heading "Media of Communication." There is no reason to believe that, without the presence of the specific infection (the typhoid bacillus or germ) a cold, indiscretion in eating, or any unhealthful conditions can alone cause typhoid fever.

In typhoid fever there is a general infection—the whole system is permeated by the germ. The infection is given off plentifully in the excretions from the patient—in the discharges from the bowels, in the urine in many cases, and in what is coughed up and spit out when there are complications affecting the lungs and air passages. Hence the urgent need of thorough disinfection of all these discharges from every typhoid fever patient.

How Received.—The infection is received by the new victim to typhoid fever by swallowing the typhoid germs in infected food, or drink, and probably only by swallowing when infectious dust from infected clothing or infected carpets or floors is inhaled.

Media of Communication.—The most frequent medium for spreading typhoid fever is polluted water supplies—water which has from sewers, house drains, privy vaults, or other sources, received infection. If the source of water supply is polluted with human excreta, solid or fluid, it is a dangerous water. If thus polluted, the chances are that, sooner or later, it will become infected. Many persons suffering with a slight ailment not recognized as typhoid fever, or who, having apparently fully recovered from typhoid fever months ago, are nevertheless still excreting infection. Thus at any time a water receiving pollution may receive typhoid infection and become a source of danger to persons who use it.

In ground which contains considerable organic matter (polluted soil), typhoid infection may remain alive and dangerous for months, and perhaps for years. Thus, the danger of successive infections of wells when the ground around them is polluted. Hence the need of the utmost care to destroy utterly the infection of all typhoid discharges and suspicious discharges, before the final disposition of them. [See "Disinfection of Excreta."]

Frequent outbreaks of typhoid fever are due to milk which has been infected by the addition of polluted water, by the washing of cans and other milk utensils with unclean water, by milkers or caretakers of the milk whose hands, or clothing are infected, etc.

Not infrequently typhoid fever is spread by oysters or other shell fish which have come from beds or waters exposed to sewage pollution.

Undoubtedly typhoid infection is occasionally spread through the medium of low growing fruits or vegetables eaten raw, grown upon infected ground, or by bread, pastry, confectionery, fruits, vegetables, meats, etc., handled by infected hands in bakeries, stores, markets, and slaughter houses, or the same articles and milk infected by flies recently arrived from sources of filth. Some of these articles are congenial culture media for the multiplication of the typhoid germ.

In recent medical opinion "finger infection" is coming to occupy an important place in the spread of typhoid fever. The patient's own fingers unless care for cleanliness is perfect, are sure to be infected, and they in turn infect everything they come in contact with. The fingers of nurses and attendants become infected in attending to the wants of the sick, and, unless they receive more than the ordinary washing, may carry infection directly to the mouths of their owners, or may infect bread or other articles of food handled or prepared by them.

Cases of typhoid fever in washerwomen, after handling the clothing of typhoid fever patients, are frequent enough to emphasize the

necessity of the utmost care for the cleanliness of the typhoid patient, his bed, and his clothing, and for the avoidance of infectious dust.

The experience in some military barracks has shown clearly that continued outbreaks of typhoid fever have been due to the use of rooms, bedding, and uniforms not disinfected after their use or occupation by former typhoid patients. Such outbreaks, not referable to any other causes, have suddenly ceased after the infected rooms or clothes have received proper disinfection.

Flies having access to privy vaults or sources of typhoid infection elsewhere, and then, through unscreened doors and windows, to living rooms, alighting upon food already prepared for the table or to be used without subsequent heating, are a serious danger. Again, reference may be made to the fact that some of these articles, liquid, semi-solid, or with moist surfaces, thus slightly infected, serve as congenial culture media for the rapid multiplication of the infection. A few typhoid germs brought on the feet of flies may increase many fold if deposited in milk or on the surface of boiled potato.

The general filth conditions in the homes of extremely untidy families favor the spread of typhoid infection, and in such homes, and in any homes where there is a lack of care for the greatest possible cleanliness of the sick person, his bedding, clothing, and everything else in the management of him, the danger from direct contagion, "contact infection," is serious.

Personal Precautions.—Suspicious water—that which is contaminated, or is liable to contamination with human excreta—should be avoided, or when that is impracticable, should be boiled. Heating water or milk to the simmering point, or even a somewhat lower scalding temperature, will effectually destroy typhoid germs.

In a typhoid house do not eat anything in the sick-room, nor anything which has been in the sick-room. Have left-overs well heated again before they are brought to the table. Avoid cold and raw foods as much as possible.

Do not use infected clothing nor occupy rooms previously occupied by typhoid patients until they have been disinfected thoroughly. Keep the hands clean. Exclude flies.

After a considerable stay in the sick-room, or occasionally while nursing the sick, it would be well to rinse the mouth with plain boiled water or with the addition, if preferred, of a little of the essential oil of cinnamon, peppermint, eucalyptus, or the essence of them, or a combination of them with a few drops of chloroform, shaken before using, but do not keep the mouth-wash in the room, nor use it there. With the conditions of the sick-room fairly satisfactory, this is not a very necessary precaution.

Avoid taking the typhoid patient's breath unnecessarily in his immediate vicinity if he has pneumonia, or has an explosive cough. The sputum bearing infection may be sprayed into the air during

coughing, but the range of possible danger is slight—hardly more than four or five feet.

Precautions in the Sick-Room.—The room should be as large and airy as is practicable. Free ventilation is desirable. Carpets, draperies, pictures, or other unnecessary things which may retain infectious dust and complicate disinfection should be removed.

The bed mattress should be protected with impervious rubber sheeting beneath the usual sheets. There should be two of those pieces of rubber sheeting so that they may be changed and disinfected as required. The best way to make up the bed for the typhoid fever patient is the following: 1st. Over the mattress (no feather bed) spread smoothly and tuck in the sheet. Under the sheet it is well to have a once-folded sheet or blanket. 2d. Next a rubber sheet spread crosswise the bed, the two ends tucked smoothly under the edges of the mattress. 3d. A folded sheet (draw-sheet) also crosswise over the rubber sheet. 4th. A scond rubber sheet. 5th. Over that a second draw-sheet.

The aim of the sick-room management should be: The prompt destruction of every vestige of infection leaving the patient in the discharges from the bowels and kidneys or in the sputum, so that privy vaults, the ground, the home surroundings, or wells, springs, or other sources of water supply may not be infected. (See Disinfection.)

The bedpan or other vessel should contain a moderate quantity of disinfecting solution before it receives the discharges from the patient, and should immediately after, have a liberal additional quantity of the disinfectant poured into it,—three or four times the bulk of the matter to be disinfected. All of the discharges from bowels and kidneys must be disinfected. (See Disinfection.) All sputum (what is spit up) must be burned.

The utmost cleanliness of the patient and his surroundings should be the rule. In those cases in which the condition of the patient makes it difficult to avoid the soiling of his bed, smaller squares of rubber sheeting and folded sheets should be placed above the ordinary sheets. All soiled sheets and clothing should be removed promptly before drying can occur. (See Disinfection.) Care should be had to cleanse and disinfect the patient locally with a solution of corrosive sublimate 1:2000—half a dram to the gallon of water, or one tablet to the quart.

The sick person should have spoons, dishes, and other eating utensils for his own exclusive use, never washed in the same pan or with the same cloths used for other dishes. They are preferably washed by the nurse in or near the sick-room.

Unnecessary visitors should be excluded from the sick-room. The nurse may take her meals at the household table. With proper disinfection of her hands and general tidiness, danger of her carrying infection is not to be apprehended, as with scarlet fever and various other infectious diseases.

Precautions During Convalescence.—In many cases during the period of convalescence, and in some cases for weeks and even months after recovery is apparently complete, the urine of the recent typhoid fever patient may be loaded with the infection. That excretion may, in fact, constitute a pure culture of the bacillus of typhoid fever, though apparently normal, and the person apparently well. Such persons, while in this condition, are a grave source of danger to other persons where they live, and to every place they visit, and, if they happen to have anything to do with the distribution of milk and, perhaps some other food supplies, persons remote from the presence of these convalescents may be infected by them. Public safety requires that persons recovering from typhoid fever be kept under bacteriologic control until there is an assurance that they are no longer a menace to the public.

One Other Precaution.—Typhoid fever often assumes very atypical forms—the typhoid fever of children, "walking typhoid," persons who have been exposed to typhoid infection and have as a result only an apparently insignificant diarrheal disorder. Other persons exposed to the infection may present few or no symptoms of departure from health, but may, nevertheless, excrete for a while a plentiful supply of typhoid infection and thus be a source of imminent danger. Cognizance should be taken of these cases in the investigation of the sources of outbreaks. If there is the least suspicion that such cases are typhoidal, recourse should be had to the state laboratory, for aid in the diagnosis, precautionary measures not being neglected meanwhile.

Disinfection.—The work of disinfection should begin with the beginning of the treatment of cases and should continue during the whole course of the disease. All articles of bed clothing and of body clothing should be disinfected as soon as they are removed from the bed or from the patient.

Most of the disinfection done for typhoid fever is untrustworthy. It is a delusion and a snare. The disinfection work should be carried out in conformity with the following rules as nearly as possible. Do not use disinfectants and processes upon the strength of the recommendations of the manufacturers, or their agents, or the testimonials furnished by them. No bedding or other property of value should be burned or otherwise destroyed if it can be avoided.

Disinfection of Excreta.—The certain disinfection of the discharges from the patient immediately after they are passed is of prime importance. To destroy absolutely the life of the infection *here and now* before it escapes from the care of the nurse or attendant and thereby seeds down the ground, the water supply, or infects the home, should be the rule.

For this purpose use milk of lime prepared from caustic lime (quicklime) just as whitewash is made; or solution 4 or solution 2. For the disinfection of fresh excreta a quantity of one of these

solutions three or four times as large as the volume of the discharge should be used, and before the final disposal, the disinfectant should act three or four hours at least—the longer the better. Time is a *very important element in disinfection,* and the intimate mixture of the disinfecting solution and the material to be disinfected is essential.

A sure way to disinfect fresh excreta, in rural practice, is to pour upon it, in the vessel, at least five or six times its volume of boiling water, cover the vessel and let it stand until it is cooled.

For the disinfection of excreta in privy vaults use milk of lime in large quantity, sufficient thoroughly to saturate the contents, and, after the vault is emptied, gallon after gallon should be poured in until the ground beneath the ordinary privy is completely saturated with the milk of lime.

One fact should here be borne in mind. Many typhoid fever patients give off, or excrete the infection of typhoid fever in the very earliest days of their illness. It is therefore important to consider any privy vault which may have been used by typhoid patients in the very earliest stages of their disease infected and requiring thorough disinfection.

The final disposal of typhoid excreta should be with the view of avoiding the possibility of its reaching, by surface drainage or by percolation through the ground, rivers, lakes, wells, or springs that serve as sources of water supply. Remember that in the disinfection of excreta there is always a fair probability of unsuccessful disinfection at some point, so do thorough work.

Cotton and Linen Clothing.—Disinfection may be done by immersion in solutions 1, 2, or 7. The clothing should remain in the solution ten or twelve hours at least, and then it may be put through the usual laundry processes. Or the clothing may be transferred directly from the patient or his bed to a cold, or preferably, lukewarm solution of soap and water, the temperature of which is later to be raised to the boiling point when efficient disinfection will result.

If clothing is soiled it should be removed immediately from the patient or his bed and transferred to the disinfecting solution, or the soap and water solution, before it is dried. Clothing which has not been stained may be disinfected by immediately steaming or boiling.

In transporting clothing from the sick-room for steam disinfection or boiling, wrap it in a sheet wet in one of the solutions already mentioned, or, in the absence of these, wet in water. As an alternative, the steam disinfector or boiler may be carried into the sick-room and there filled.

Woolen Clothing.—Disinfect with formaldehyde fumigation, using large doses, the disinfection being done in tight closets or other air-tight enclosed spaces. Or such clothing can be disinfected

by soaking in solution 6, or solution 7 the solution being used in a wooden or pulpware wash-tub.

Bedding.—Throw straw beds out of the window. Empty out and burn straw. Then disinfect the tick as for cotton clothing. Disinfect feather beds, pillows, quilts, comforters, and blankets in a steam disinfector when practicable, or if not soiled, with formaldehyde in large doses. The burning of mattresses if discharges have penetrated them, and steam disinfection is impracticable, is advisable.

Rugs and Carpets.—Disinfect with steam, or by soaking in solution No. 6, or with formaldehyde in concentrated doses. If of but slight value burning is preferable. Carpets and rugs only in the sick-room will require disinfection.

Lounges, Couches, and Other Upholstered Furniture.—If possibly soiled by the patient will need disinfection. Leave in place when the room is disinfected with formaldehyde. If of little value, strip off and disinfect the covering as for cotton and linen clothing. Burn worthless filling.

The Hands of Nurses and Others who have attended to the wants of the sick should be disinfected with thorough and prolonged washing and scrubbing in hot soap and water, followed by their immersion for several minutes in one of the disinfecting solution, preferably solution 6, though 7, 2, or 1 may be used.

Sputum.—To be received on pieces of rag or paper or in paper sputum cups and burned; or if received in cuspidors may be disinfected with four or five times its volume of boiling water. Sputum and all other discharges from typhoid patients should not be accessible to flies.

Formaldehyde Disinfection.—In disinfection with formaldehyde the most rapid possible liberation of the gas is desirable. The least troublesome and the best process is, after the room and everything in it has been made ready, to place the requisite quantity of potassium permanganate in the bottom of a ten-quart pail. Pour upon it the requisite quantity of formaldehyde solution of full strength (formalin). The required quantities for 1000 cubic feet of space are 7½ ounces of the permanganate and one pint of formalin. *The permanganate must go in first.* Before the mxture is made everything must be in readiness, because the disinfector must make a rapid flight from the room. Leave the room closed tightly for four hours.

It is much more convenient to measure out the permanganate than to weigh it. Each local board of health or disinfector should have a small tin measure holding exactly 3¾ ounces of permanganate, "strick" measure, without shaking down. Then the rule is: for each 1000 cubic feet of room space to be disinfected, two measurefuls of permanganate and one pint measureful of formalin.

For the suitable disinfection with formaldehyde of clothing, bedding, and other articles in which penetration must be secured, it is better to

treat them by themselves in a small closed room or closet with large quantities of formaldehyde, or, if in the sick-room, double the quantity of formaldehyde recommended in the preceding paragraph should be used. That is, one pint of formaldehyde and its requisite quantity of permanganate for each 500 cubic feet of space, instead of 1000 cubic feet. Clothing when subjected to formaldehyde must be well exposed, preferably over lines.

Steam Disinfection.—Steam disinfection on a small scale may be done in a common tin wash-boiler, by supporting, above the water on two bricks or otherwise, a false flooring of laths or thin boards. Enough water so that the wash-boiler will not go dry should be put into the bottom of it. The clothing should be packed rather loosely above the false flooring. Put the cover on tightly and steam one hour after the water begins to boil, keeping the water briskly boiling all the time. Many kinds of clothing which would be injured by boiling can be disinfected in this way without injury.

DISINFECTING SOLUTIONS.

Solution 1. For clothing, woodwork, floors, leather, excreta in the sick-room, sputum, the hands, the person.
Solution 2. For the same general uses as Solution 1. It is a little more efficient than Solution 1; but more likely to injure colors.
Solution 4. For excreta, privy vaults, cesspools, etc.
Solution 5. For the same purposes as Solution 4.
Solution 6. For clothing, the hands, and the surfaces of walls, floors, furniture, etc.
Solution 7. For clothing, the hands, etc.

Solution 1.

Carbolic Acid (pure liquefied),	7 ounces.
Water,	1 gallon.

Mix. This is approximately a 5 per cent. solution. Its power is somewhat increased by the addition of from 12 to 14 ounces of common salt to each gallon when used for the disinfection of excreta, or for other uses where the salt is not objectionable.

For the disinfection of clothing this solution mixed half and half with water will do.

Solution 2.

Lysol,	5 ounces.
Water,	1 gallon.

Mix. This may be used as a substitute for Solution 1, one-half the strength sufficing for uncolored clothing. Many colors are changed by it.

Solution 4.

Chloride of Lime,	6 ounces.
Water,	1 gallon.

Mix. This is about a 3 per cent. solution. (Decolorizes and destroys fabrics).

Solution 5. "Milk of Lime."

Slake a quart of freshly burnt lime in small pieces with three-fourths of a quart of water,—or to be exact, 60 parts of water by weight with 100 of lime. A dry powder of slaked lime (hydrate of lime) results. Make milk of lime not long before it is to be used by mixing 1 quart of this dry hydrate of lime with 4 quarts of water.

Air-slaked lime is worthless. The dry hydrate may be preserved some time if it is enclosed in an air-tight container. Milk of lime should be freshly prepared but may be kept a few days if it is closely stoppered.

Solution 6.

Corrosive Sublimate,	1 dram.
Water,	1 gallon.

Mix and dissolve. Label, **Poison!** This is approximately a 1: 1000 solution. One ounce of this solution contains very nearly half a grain of corrosive sublimate.

Solution 7.

Solution of Formaldehyde (Formalin),	6 ounces.
Water,	1 gallon.

Mix. This mixture contains a little less than 2 per cent. of formaldehyde.

CIRCULAR NO. 75.

STATE BOARD OF HEALTH OF MAINE.

Formaldehyde Disinfection---A New Process.

[Edition of 1906.*]

A long series of experiments in the Laboratory of Hygiene have developed the fact that formaldehyde may successfully and very conveniently be used in the disinfection of rooms with the use of no lamps, generators, or other special apparatus whatever. In the process which has been employed in this work, formaldehyde gas is liberated by pouring formaldehyde upon permanganate of potassium. At ordinary room temperatures a chemical reaction results whereby a high degree of heat is evolved. This heat causes an effervescence or boiling and formaldehyde gas is given off very rapidly.

* This edition is based upon the results of the experimental work done in the State Laboratory of Hygiene in 1904 and 1906. The later experiments show that half the quantity of formaldehyde recommended in the first edition of this circular is sufficient.

The advantages of this method are, that the disinfector need not transport apparatus from place to place; that there is no generator or lamp which might originate a fire; that almost the whole quantity of formaldehyde available for disinfection is liberated in a few moments, thus giving the maximum concentration of the gas before there has been time for leakage of the part first evolved; that, through the action of the heat liberated by the chemical reaction, a sufficient quantity of steam goes off with the formaldehyde to insure efficient disinfection.

In carrying out this process of disinfection the requisites are simply the ordinary so-called 40% formaldehyde solution, commercial permanganate of potassium, and a vessel to mix them in.

The required quantity of permanganate for each pint of formaldehyde is 7½ ounces.† The permanganate is first put into the dish and the formaldehyde is then poured upon it. *The permanganate must go in first.* Before the mixture is made everything must be in readiness, because a rapid flight from the room must be made. Leave the room closed up tightly four hours.

The vessel in which the permanganate and formaldehyde are to be mixed should be of considerable size, else the vigorous foaming will throw a part of the mixture upon the floor. A flaring ten-quart tin pail is a suitable and large enough vessel unless more than three pints of formaldehyde are to be used, and even then until the disinfector is well acquainted with this process, it would be a safe precaution to set the pail inside of a large pan. In this, as in all methods of chemcal disinfection, the disinfectant action is more efficient the warmer the room.

As it is necessary to adjust carefully the relative quantities of permanganate and formaldehyde, and as it is much more convenient to measure the permanganate than to weigh it, arrangements have been made with some of the druggists to keep in stock a small tin measure holding 3¾ ounces of permanganate, "strick" measure, not shaken down. The rule is, in ordinary disinfection: for each 1000 cubic feet of room space to be disinfected, two measurefuls of permanganate and one pint measureful of formaldehyde.

A large quantity of formaldehyde and a shortened time of exposure are more efficient and generally more economical than a smaller quantity of formaldehyde and a lengthened period of exposure. It is a saving to families that have to submit to disinfection to have the time shortened, and is much more satisfactory to them. With the time at four hours, formaldehyde fumigation may be completed in the forenoon and the rooms may have a lengthened airing in the afternoon so the family may occupy their rooms the same evening.

† The experimental work of 1906 indicates that a drier residium is left in the vessel, and a little larger quantity of formaldehyde is available for disinfection when the quantity of permanganate formerly recommended is slightly increased. The best results were obtained with 7.6 ounces of permanganate to the pint of formalin—practically 7½ ounces.

The State board of health now makes the following recommendations:

1. In ordinary disinfection when the infection to be destroyed is that of typhoid fever, diphtheria, scarlet fever, smallpox, measles, grippe, whooping-cought, dysentery or cholera, use one pint of formaldehyde for each 1000 cubic feet of space to be disinfected. Though a considerably smaller quantity was found efficient in the experimental work allowance must be made for unusual leakage from rooms, for low temperature, for insufficient moisture, for inaccessibility of parts of the infection, etc. It is necessary to have quite a wide margin for safety, but the quantities herein advised provide for that margin if the work is intelligently done.

2. When the infection to be destroyed is the more resistant micro-organisms of tuberculosis, or of specticemia, a pint and a half of formaldehyde (formalin) per 1000 cubic feet of space should be used. The same quantity at least should be used in the disinfection of books, clothing, and in all cases in which the infection is not entirely open and accessible to the gas, that is, when some degree of penetration must be secured. [See Circular No. 68, Disinfection.]

The experiments have shown that, used as is herein recommended, formaldehyde gas has some considerable power of penetration; nevertheless, the State board of health does not yet deem it safe to advise any marked departure from the general method of disinfection given in its circulars on the infectious diseases—scrubbing up of floors, boiling the cotton and linen clothng of the patient and of his bed and such other badly infected articles as can thus be treated, or soaking them in a disinfecting solution.

In the experimental work which has been done to determine the value of this "permanganate process" of liberating formaldehyde, it was sought to have the conditions as nearly as possible like those which the health officer finds in the actual work of disinfection. Most of the work of 1904 was done in a French tenement in which the rooms varied in size from about 500 cubic feet of air space to more than 1800 cubic feet. These rooms were decidedly loose in construction, no pains were taken to paste up or otherwise close the cracks and crevices, and no artificial means were employed for distributing the gas.

The test-bacteria used in the experiments of 1904 were diphtheria, typhoid, albus, aureus, coli, pyocyaneus, tetragenus, streptococci, anthrax, subtilis, and mixed cultures mostly from swabs from the throats of patients thought to have diphtheria. The time of exposure was at first 16 hours, but this was gradually reduced to 3 hours with no lessening of efficiency. The quantity of formaldehyde (formalin) used remained two pints per 1000 cubic feet of space in all the experiments.

Of the 1529 test objects exposed, only 27 showed a growth after incubation for at least 48 hours. Of these 27 unsuccessful results,

21 were with the exceedingly resistant hay bacillus (B. subtilis). None of the bacilli of diphtheria, typhoid fever, or other ordinary pathogenic germs survived the exposure to formaldehyde.

In the experiments of 1906, the work was all done in a room of 862 cubic feet in the laboratory building. The micro-organisms used as tests were practically the same as those used in the former series of experiments, to wit: diphtheria, typhoid, colon, albus, aureus, pyocyaneus, subtilis, anthrax, tetragenus, pneumococci, prodigiosus, the throat bacillus, and the mixed infection derived from diphtheritic throats. These cultures were in serum, agar, and bouillon. In the former experiments, with the quantity of formaldehyde constant, the object was to determine what could be considered a safe minimum period of exposure. In these new experiments, the period of exposure was constantly four hours and the aim was to determine the safe minimum quantity of formaldehyde. The quantity used was successively 500 c.c., 400 c.c., 300 c.c., 250 c.c., and 200 c.c. per 1000 cubic feet of space. Down to 300 c.c. there was no evidence of diminution of efficiency, and even down to 200 c.c., the results were fairly good, indeed, hardly less efficient than with the larger quantities. The period of incubation in all these newer experiments was 196 hours.

The total number of cultures used was 2340. Of these 2340, a growth was obtained in only 35. The results were entirely negative in 2305 after 196 hours of incubation at the temperature of 37.5° C. Of the 35 cultures in which a growth was obtained, 25 of them were subtilis, and these positive cultures have but little bearing on the value of the process for disinfection for the reason that subtilis is so much more resistant than any of the disease-producing organisms.

The following is a tabulated statement of the results of the experiments of 1906:

Quantity.	Total.	Negatives.	Positives.	Subtilis.
500 c.c.	578	573	5	5
400 c.c.	443	435	8	7
300 c.c.	618	616	2	2
250 c.c.	409	400	9	5
200 c.c.	292	281	11	6
	2340	2305	35	25

Note.—The laboratory worker or other person who is interested in the matter may obtain a fuller and more detailed report relating to this work on application to State Board of Health, or to H. D. Evans, Director of Laboratory, Augusta, Maine.

Other circulars of the board on disinfection are:

Circular No. 68, Disinfectants and Disinfection.

Circular No. 70, Disinfection of the Rooms and Things Used by Consumptives.

FORM No. 76.

Investigation of Typhoid Fever.

1. Name of householder, ...
2. Name of patient, ...
3. Age, ... Sex, ...
4. Place where sickness occurred.
5. Date of beginning of the illness.
6. Date when the patient was able to leave the sick-room.
7. Name of attending physician.
8. What occupation in the four weeks before illness?

.....

9. What places visited within four weeks before illness?

.....

10. Where and what places visited during the four weeks after leaving the sick-room?

.....

11. Were there any other cases in the same house or family?

.....

12. Any other cases among the persons with whom the patient worked?

.....

13. Had he as nurse, or in other capacity, attended or associated with any case of typhoid fever?

.....

14. Had he occupied rooms, or used bedding or clothing previously used by typhoid fever patients?

.....

15. Had he ever before had typhoid fever?
16. (In the investigation bear in mind that persons who have had typhoid fever some months previously, and persons some time ago exposed to typhoid infection but without typical symptoms of typhoid fever, may still be excreting the typhoid bacillus, and thus be a continuous source of infection.)
17. Usual water supply during the three weeks before illness.
18. a. At home or boarding place?

.....

19. b. At place of work?
20. Sources from which occasional drinks of water were taken in the four weeks before illness?

21. Did the water from these places ever have any bad taste or smell, or was it roily, or did anything else indicate that it was not good?

.....

.....

22. (If water was from well, spring, cistern or other supply at home or place of business, investigate the surroundings and possibilities of pollution.)

.....

23. (Investigate the possibility of infection from bottled water, soda water, beer, etc.)

.....

24. Source of ice supply and possibilities of infection from that source?

.....

25. Source of milk supply?
26. Name and residence of milkman.
27. Source of cream supply.
28. Source of butter supply.
29. (If milk, cream and butter were produced at home investigate conditions of production.)

.....

30. Had the milker, or any person who cared for the milk, within the four or five weeks before the beginning of this case of illness been entirely well and free from diarrheal disease and from all other symptoms which might have been due to typhoid infection?

.....

31. Had the milker or any person who handled the milk attended any case of typhoid fever or visited where any such case existed?

.....

32. (Possibility of pollution or infection of milk with polluted water used for washing milk-pails, pans, or other utensils.)

.....

33. Was the milk during the process of straining, cooling or creaming, kept where it could have been exposed to exhalations from the privy or to infectious dust or to other source of pollution or infection?

.....

34. (Possibility of the infection of the patient's food or milk supply by flies from infected privies or other sources of infection.)

35. Had the patient eaten raw oysters or other shell fish within four weeks of his illness? If so, when, and where, and whence came the oysters?

.....

36. During the illness how carefully, with what, and in what way were the fecal discharges and the urine disinfected?

.....

.....

37. How long were the discharges left exposed to the disinfectant before their final disposal?

.....

38. What was then done with these discharges?

.....

39. At what date was the work of disinfecting the discharges begun and how long was it continued?

.....

.....

40. What other disinfection was done (sick-room, bedding and clothing of patient, the privy?)

.....

.....

41. If in any case there appears to be a possibility that infection came from handling infected clothing or in laundry work, investigate partincularly:

.....

42. a. Who handled the bed clothing and personal clothing of the patient?

.....

43. b. Was the clothing put into the disinfecting solution in the sick-room?

.....

44. c. If carried from the sick-rom to the disinfecting solution or to be boiled, what precautions were taken to guard against infectious dust from the clothing during transportation?

.....

.....

.....

45. If the patient had a cough, what disinfectant, or other precautionary measures, were observed to guard against infection from the sputum?

.....

46. Sanitary conditions of house where patient lived before his illness?

.....

47. Conclusions of the investigator as to the source and medium of infection.

Additional Notes.

NOTE.—When desirous of investigating outbreaks of typhoid fever, local boards of health or physicians may obtain as many copies of this Form 76 as they need by applying to the State Board of Health, Augusta, Maine.

ABSTRACTS FROM THE REPORTS OF THE LOCAL BOARDS OF HEALTH.

ABBOT. No infectious diseases in the two years.—J. B. Greenleaf, Sec.

ACTON. 1904. Nothing reported for this year.

1905. One case of scarlet fever and two of typhoid fever.—B. J. Grant, Sec.

ADDISON. 1904. Two cases of smallpox.

1905. Two cases of scarlet fever.—U. W. Curtis, Sec.

ALBANY. 1904. Ten cases of scarlet fever in two houses. One nuisance reported which was removed.

1905. One case of scarlet fever is all I have to report for this year.—Geo. Cummings, Sec.

ALBION. No contagious diseases. One nuisance reported and abated in each of the two years.—Wm. A. Varney, Sec.

ALEXANDER. No infectious diseases.—Albion H. Perkins, Sec.

ALFRED. One case of typhoid fever in each year. It is encouraging to note that our people show a greater willingness to use disinfectants.—Dr. C. E. Lander, H. O.

ALNA. Nothing reported.—A. B. Erskine, Sec.

ALTON. No contagious diseases during the two years. One nuisance removed in 1904.—John A. Gerry, Sec.

AMHERST. 1904. One case of typhoid fever.—D. E. Richardson, Sec.

1905. Nothing reported.—S. S. Goodwin, Chr.

AMITY. No infectious diseases except one case of typhoid fever in 1904.—Wm. S. Libby, Sec.

ANDOVER. 1904. This fall we have had epidemics of tonsillitis, "grip" colds and a mild form of chickenpox. Also a very few cases of pneumonia. The general health for the year has

been excellent. In a radius of twelve miles with 2,000 people, there is not a case of phthisis.

1905. Two nuisances were removed. Three cases of typhoid fever, four of whooping cough and ten of measles. Two cases of tuberculosis in cows reported to State Cattle Commission.—Dr. F. E. Leslie, Sec.

ANSON. 1904. Six nuisances reported, five of which were removed. Eight cases of diphtheria. Quite extensive improvement in sewerage has been made.

1905. Eight nuisances were reported to our board, seven being removed. Five cases of diphtheria. We have been using the permanganate process for formaldehyde disinfection and like it much better than the Novy.—Edgar Millay, Sec.

APPLETON. There has been no business for our board for the past two years.—V. O. Keller, Sec.

ARGYLE. 1904. No infectious diseases.—J. M. Freese, Sec.

ARROWSIC. Five cases of diphtheria in 1904. No contagious diseases in 1905.—J. McFadden, Sec.

ASHLAND. 1904. One nuisance has been removed. On account of the good work done by the board the previous year and the vigilance of Dr. Dobson, our health officer, our town has been free from all contagious diseases this year.—P. E. Craig, Sec.

ATKINSON. We have been highly favored with good health the past two years.—C. P. Brown, Sec.

AUBURN. 1904. Twenty-four nuisances reported. About one-half of these have been completely removed, and in most of the others, the conditions have been improved. There have been reported to the board one case of smallpox, thirty-six of diphtheria, sixty-four of scarlet fever and four of typhoid fever.

A baby, the only child of one of the employes of a Lewiston mill, was taken sick with a typical case of smallpox. Its parents were Polish Jews and seemed to be healthy. The source of the contagion could not even be surmised. The father and mother were vaccinated and did not take the disease. The child made a good recovery. The house was carefully fumigated and no other cases appeared. Scarlet fever has prevailed extensively, but in an extremely mild form. There have been several cases where no physician was called and no quarantine established. On this account it has been impossible to entirely stamp out the

disease. During December there were several cases of diphtheria, a few resulting in death. All the fatal cases were either not treated with antitoxin, or it was not used until late in the course of the disease.

1905. Forty-five nuisances, of which thirty were abated. Six cases of smallpox, twenty of diphtheria, thirteen of scarlet fever and eight of typhoid fever. We had one case of cerebro-spinal meningitis. The person affected was taken sick in Lynn, Mass., but came here and died in a few days. There was no other case reported. In regard to smallpox, we had four primary cases. These four persons all worked in Avon Mill and took the disease at that place, infecting four houses. In two of the houses there were no secondary cases. We had a secondary case in each of the other two houses. In one house, the family consisted of father, mother, one son (the primary case) and three daughters. The father had had smallpox, and the others were immediately vaccinated and escaped the disease. The mother's father was stopping there at the time, but kept out of sight and was not vaccinated. He contracted the disease which he had in a mild form. In the other house there were five persons four besides the primary case. These four were all vaccinated but only one was susceptible to the vaccine. He contracted smallpox, not having been vaccinated early enough to confer immunity. He had vaccinia and smallpox at the same time. The others escaped.—Dr. B. G. W. Cushman, H. O.

AUGUSTA. 1905. Eleven nuisances, of which ten were removed. Twenty-six cases of diphtheria, two of scarlet fever and sixty-one of typhoid fever.—M. E. Sawtelle, Sec.

AURORA. No contagious diseases for the two years.—H. T. Silsby, Sec.

AVON. 1904. No infectious diseases.—Fred Morton, Sec.

1905. No diseases to report.—H. W. Worthley, Sec.

BAILEYVILLE. 1904-05. We have had nothing to do.—Michael Malloy, Sec.

BALDWIN. The town of Baldwin has been free from any contagious diseases for the two years. We have had very little sickness of any kind.—E. H. Chadbourne, Sec.

BANCROFT. No diseases for the two years with the exception of one fatal case of diphtheria in 1904.—A. A. Babkirk, Sec.

BANGOR. 1904. One hundred twenty-five nuisances, all of which were removed or discontinued. Nine cases of smallpox, eighteen of diphtheria, four mild cases of scarlet fever and five hundred and fifty of typhoid fever with forty-four deaths. Of the nine cases of smallpox, only two belonged to Bangor. The other seven came here sick with Pawnee Bill's Wild West Show. They arrived here Friday morning, July 1st, and we carried them to our pest-house that night about ten o'clock. We did not have any spread of the disease in our city from them. This year we have laid 4,416 feet of new sewers.—John Goldthwaite, Sec.

1905. Fifty nuisances. Nearly all have been removed or abated. Two cases of smallpox, two of varioloid, three of diphtheria, twenty-five of scarlet fever and twelve cases of typhoid fever. This report dates only from the time of organization, May 11, 1905, to January 1, 1906. For formaldehyde disinfection, we have used the Novy or Robinson and permanganate processes, the last giving best satisfaction. We have been instrumental in having several hundred feet of new sewerage installed. We have recommended the use of covered carts for the removal of garbage. A number of artesian wells have been bored by the city and individuals who have heeded the advice of the board regarding our present water system.—Dr. H. J. Milliken, Sec.

BARING. 1904. No infectious diseases.

1905. Two cases of typhoid fever. We find that the inhabitants of our town are particular in looking after their drainage, so as not to suffer anything to accumulate to create any disease. The two cases of typhoid were caused by drinking bad water while the men were at work some distance from our town. There have been no deaths the past year, except from old age.—J. C. Davis, Sec.

BATH. 1904. Twelve nuisances, all of which were abated. One hundred nine cases of diphtheria, four of scarlet fever and eight of typhoid fever. This report stands from June 1st when this board was organized.

1905. Twenty nuisances which were all removed. Eighteen cases of diphtheria, one of scarlet fever and four of typhoid fever.—Dr. Charles D. McDonald, H. O.

BEDDINGTON. 1904-05. No contagious diseases.—Guilford Small, Sec.

BELFAST. 1905. Six nuisances, five of which were removed. Two cases of scarlet fever and one of typhoid fever. Our local board did not have by-laws such as to give them the power they should have, and so a portion of the regulations of circular No. 40 was adopted by us as by-laws with a few changes as to penalties. Now when we order a thing to be done, we have no trouble in having the nuisance corrected.—Dr. O. S. Vickery, Sec.

BELGRADE. 1904. Three cases of diphtheria. We employ competent persons from other towns to do our disinfecting.—James Tebbetts, Sec.

1905. One nuisance and one case of typhoid fever reported to our board.—F. C. Foster, 3rd member.

BELMONT. 1904-05. No infectious diseases.—Willard S. Morse, Sec.

BENTON. 1904. Two nuisances abated. One case of typhoid fever. Two nuisances removed in 1905.—A. L. Plummer, Sec.

BERWICK. 1904. Two nuisances, both removed. One case of scarlet fever.

1905. Four nuisances abated. Three cases of diphtheria and one of scarlet fever. We have been trying to clean up some cesspool nuisances and privy vaults. We have a fine supply of town water but no sewerage system, which has caused trouble with the cesspools.—Dr. H. V. Noyes, H. O.

BETHEL. 1904. Four cases of smallpox and one of typhoid fever. We are pleased to report the annual extending of our sewer system.

1905. This has been one of the cleanest years in the history of the town as regards all contagious and infectious diseases. The principal advance in sanitation is the continuation of the sewer system, reaching to nearly all of the principal streets.—Dr. Gardiner L. Sturdivant, H. O.

BIDDEFORD. 1904. Sixty-seven nuisances out of sixty-eight were abated. Eighteen cases of diphtheria, twelve of scarlet fever and forty-nine of typhoid. This year our board has taken charge of the collection of garbage.—Dr. C. J. Emery, Sec.

1905. Sixty-four nuisances, of which fifty-eight were removed. Six cases of diphtheria, ten of scarlet fever and fifteen of typhoid fever.—Leon Dansereau, Sec.

BIGELOW PLANTATION. 1905. Nothing to report.—J. F. Ricker, Sec.

BINGHAM. Five cases of smallpox in 1904. No contagious diseases in 1905.—I. C. Pierce, Sec.

BLAINE. Nothing for 1904. In 1905 we had one case of diphtheria and two of typhoid fever. The public, in general, is more favorable to the work of the board than in former years. They are beginning to see the benefits and to realize more and more every year, that immunity from epidemics of contagious diseases, is due largely to the vigilance and care of the local boards of health; and where we used to meet with opposition, more or less violent and determined, they are now in sympathy with us.—Dr. A. J. Fulton, H. O.

BLANCHARD. 1905. No infectious diseases.—E. P. Blanchard, Sec.

BLUEHILL. 1904. Four cases of typhoid fever.—Dr. O. Littlefield, H. O.

1905. Four cases of scarlet fever and one of typhoid. One nuisance abated.—G. F. Candage, Sec.

BOOTHBAY. 1904. Two cases of diphtheria and thirteen of scarlet fever, all of which recovered.

1905. Four nuisances removed. Eight cases of scarlet fever.—Byron Giles, Sec.

BOOTHBAY HARBOR. 1904. Investigated three nuisances, one removed. Four cases of typhoid fever.

1905. Three nuisances, all of which were abated. One case of diphtheria, fourteen of scarlet fever and two of typhoid fever. No changes this year except in method of fumigation. We have been using the permanganate process, and it works finely.—A. P. Wylie, Sec.

BOWDOIN. 1904. We have been favored in having no cases of infectious diseases.

1905. One case of diphtheria.—D. A. Coombs, Sec.

BOWDOINHAM. 1905. Six cases of scarlet fever.—I. H. Purinton, Sec.

BOWERBANK PLANTATION. 1904. No contagious diseases.—John F. Clark, Sec.

1905. One case of typhoid fever.—B. L. Glover, Sec.

BRADFORD. 1904. Four nuisances, all removed. One case of typhoid fever.—Dr. F. A. Bickford, H. O.

1905. Four cases of scarlet fever and two of typhoid.—Dr. A. K. P. Smith, Chr.

BRADLEY. No infectious diseases for either year.—Ruel S. Carter, Sec.

BREMEN. 1904. One nuisance. No infectious diseases have been reported.

1905. One case of typhoid fever.—James Donnell, Sec.

BREWER. 1904. Six nuisances, the most of which were abated. Some cannot be removed until a sewer is provided. Ten cases of diphtheria, one of scarlet fever and seventy of typhoid fever.

1905. Four nuisances, all of which were removed. Three cases of diphtheria and forty of scarlet fever. The only public improvement we have to report is the extension of our sewer system. We have used the "Evans" method for formaldehyde disinfecting.—W. H. Gardner, Sec.

BRIDGEWATER. 1904. One case of typhoid fever.

1905. Six cases of typhoid fever among the Polanders who work in the tannery. They were put in charge of a nurse and were thoroughly looked after, and the building cleaned up and disinfected. We were unable to determine the source of the contagion.—E. B. Morton, Sec.

BRIDGTON. 1904. Three nuisances, all cared for at once. Two cases of tuberculosis, four of diphtheria, one of scarlet fever and one of typhoid.—Isaiah S. Webb, Sec.

1905. Four nuisances, all of which were abated. One case of diphtheria, four of scarlet fever and one of typhoid.—Frank A. Webb, Sec.

BRIGHTON PLANTATION. 1904. One nuisance and one case of diphtheria.

1905. One nuisance which was removed.—L. D. Mathews, Sec.

BRISTOL. 1904. Two nuisances, both removed. Two cases of diphtheria and one of typhoid fever.

1905. One case of diphtheria and two of scarlet fever.—J. F. Coombs, Sec.

BROOKLIN. 1904. One case of scarlet fever.

1905. No contagious diseases except several cases of measles.—E. P. Cole, Sec.

BROOKS. 1904. Two cases of typhoid fever.—Dr. N. R. Cook, Sec.

BROOKSVILLE. 1904. One case of diphtheria and three of scarlet fever.—Dr. Franklin Farrow, Sec.

BROOKTON. 1904-05. No infectious diseases.—A. O. Fish, Sec.

BROWNFIELD. 1904. No contagious diseases.

1905. One case of typhoid fever.—Dr. H. F. Fitch, Sec.

BROWNVILLE. 1904. Ten nuisances, seven of which were abated. If towns were more willing to appropriate money for the use of local boards of health, we would be able to do better and more efficient work. A small sum spent at first, in an outbreak, would save greater expense later.

1905. Six nuisances, all removed. One case of smallpox, three of diphtheria and three of typhoid fever. I have used the permanganate process for formaldehyde disinfecting, and like it very much. One should be careful to use a dish large enough, and to escape from the room at once.—E. A. Chase, Sec.

BRUNSWICK. 1904. Twelve nuisances, all of which were abated. Sixty-five cases of diphtheria and one of typhoid fever.

1905. Six nuisances removed. Fourteen cases of diphtheria and three of typhoid fever.—Dr. Chas. H. Cumston, Sec.

BUCKFIELD. 1904. No infectious diseases.—Dr. H. M. Heald, H. O.

1905. No nuisances and no contagious diseases.—Dr. J. C. Caldwell, H. O.

BUCKSPORT. 1904. Two nuisances removed. Three cases of typhoid fever. We try to induce people to regard consumption as a contagious disease, but the same amount of care is not used as in typhoid and scarlet fever.

1905. Eight cases of typhoid fever.—Dr. Geo. N. Towle, H. O.

BURLINGTON. 1904. One nuisance abated. Four cases of typhoid fever.—A. W. Shorey, Sec.

1905. Three nuisances reported and the same have been removed.—Charles Barker, Sec.

BURNHAM. Two cases of diphtheria and one of typhoid fever in 1904. None in 1905.—F. A. McAlister, Sec.

BUXTON. 1904. Four cases of diphtheria, three of scarlet fever and six of typhoid.

1905. One case of diphtheria and two of typhoid fever.—Dr. V. C. Totman, H. O.

BYRON. 1904. Nothing to report for this year.—H. H. Richards, Sec.

1905. No infectious disease this past year.—A. S. Young, Sec.

CALAIS. 1904. Eight nuisances removed. Four cases of smallpox, twelve of diphtheria and four of typhoid fever. Besides the cases which were identified as smallpox there were others, not seen by any physician, which were suspicious. The premises where these cases occurred were disinfected.

1905. Fourteen nuisances, all of which were abated. Six cases of diphtheria and fourteen of typhoid fever. We think antitoxin, even at its present price, is cheaper than funerals or epidemics; soberly, as a matter of economy, to say nothing of humanity, we think it advisable to furnish antitoxin when necessary. In cases of consumption, patients have generally been provided with spit-cups. Houses disinfected by formaldehyde. —Dr. W. S. McKellar, Sec.

CAMBRIDGE. 1904-05. Nothing for either year.—F. J. Hersey, Sec.

CAMDEN. 1904. Ten nuisances, of which eight were removed. One case diphtheria, four of scarlet fever and three of typhoid fever.

1905. Five nuisances, of the six reported, have been removed. Two cases of scarlet fever and three of typhoid.—A. Buchanan, Sec.

Canaan. 1904. Two nuisances abated. Two cases of scarlet fever and four of typhoid fever.

1905. Two nuisances removed. One case of typhoid fever. —Dr. L. W. Shean, H. O.

CANTON. 1904. Two nuisances removed. One fatal case of diphtheria and one case of scarlet fever.—John Briggs, Sec.

1905. Two nuisances abated. One case of scarlet fever. We are using the permanganate process for disinfecting.—W. L. Roberts, Sec.

CAPE ELIZABETH. 1904. One nuisance. Two cases of smallpox, one of diphtheria and five of scarlet fever.—Edward F. Hill, Sec.

1905. Three nuisances abated. Three cases of diphtheria.—John F. Peabbles, Sec.

CARATUNK PLANTATION. 1904. Three cases of diphtheria. —J. H. Carbino, Sec.

1905. No contagious diseases.—O. H. Clark, Sec.

CARIBOU. 1904. No infectious diseases. A sewer system was begun here last summer and High street was greatly helped. We hope to see the system pushed forward next summer.

1905. Nothing reported to our board except three nuisances; one removed.—Dr. W. E. Sincock, Sec.

CARMEL. 1904. No infectious diseases of any kind this year. There has not been a case of diphtheria in this town for more than fifteen years.—Lewis Robinson, Jr., Sec.

1905. One nuisance removed. We had two cases of diphtheria in the same family. In the first case the use of antitoxin was delayed until the fifth day. The patient died. In the second case antitoxin was used the first day, and the patient recovered and was not much sick.—D. D. Roberts, Sec.

CARROLL. During the past two years, we have had no infectious diseases except one case of diphtheria in 1904.—D. W. Lindsay, Sec.

CARTHAGE. 1904-05. Nothing to report.—C. F. Eaton, Sec.

CARY PLANTATION. 1905. Our board has had nothing to do.—John J. Wilcox, Sec.

CASTINE. 1904. Four nuisances, all of which were abated. No contagious diseases. A partial sewer has been built leading down to low water mark.—Dr. S. J. Wallace, Sec.

1905. Seven nuisances, all removed but one. No infectious diseases with the exception of an epidemic of measles from about January 1 to June 1 with something over 150 cases. There were also three cases of cerebrospinal meningitis following in each case, measles. One case proved fatal. The other two recovered without, as far as we can see, any untoward symptoms. I think the sanitary condition of our village is fully up to the average, and public opinion as a whole, upholds us in our work.—Dr. Edward E. Philbrook, H. O.

CASTLE HILL. 1904. One nuisance removed. One case of scarlet fever which infected three houses and one schoolhouse.

1905. Three nuisances; all removed. Three cases of typhoid fever.—Dr. Chas. E. Dow, Sec.

CASWELL PLANTATION. 1904. No infectious diseases of any kind.—Edward Gerard, Sec.

CENTERVILLE. 1904-05. I can only report a clean bill of health.—Chas. W. Caler, Sec.

CHAPMAN PLANTATION. 1904-05. There has been no work for our board to do.—L. A. Foss, Sec.

CHARLESTON. 1904. One case of smallpox, one of scarlet fever and three of typhoid. People, as a rule here, are very careful as to their sanitary conditions for their own safety.

1905. Two cases of typhoid fever.—Dr. G. B. Noyes, H. O.

CHARLOTTE. 1904-05. No contagious diseases.—Walter Morrison, Sec.

CHELSEA. 1904. Our town has been most fortunate as no cases of contagious diseases have been reported during the year. The town in general, has been in excellent health, only eleven deaths occurring during the year, several of those due to old age.

1905. No contagious diseases, consequently there has been no work for the board.—Patrick Hayes, Sec.

CHERRYFIELD. 1904. Four cases of diphtheria and two of typhoid fever.

1905. Three cases of diphtheria, two of scarlet fever and two of typhoid.—Dr. W. A. Van Wart, Sec.

CHESTER. 1904-05. No infectious diseases.—J. D. Kyle, Sec.

CHESTERVILLE. 1904. Three cases of diphtheria.—Wm. H. Thomas, Sec.

1905. This town has been free from contagious disease for the past year.—A. H. Black, Sec.

CHINA. 1904. Three cases of scarlet fever.

1905. One nuisance removed. Five cases of typhoid fever. —I. T. Merrill, Sec.

CLIFTON. 1904. Nothing to report.—R. G. Chick, Sec.

1905. No contagious diseases.—W. B. Debeck, Sec.

CLINTON. 1904. Four nuisances removed. Two cases of diphtheria.

1905. Six nuisances, all of which were abated. No infectious diseases.—Dr. A. A. Shaw, H. O.

CODYVILLE PLANTATION. 1904-05. No contagious diseases. —Hiram Cochrane, Sec.

COLUMBIA. 1904. One case of smallpox and three of scarlet fever.—John E. Stewart, Sec.

1905. Two cases of scarlet fever.—Frank H. White, Sec.

COLUMBIA FALLS. 1904. Thirty-four cases of smallpox.

1905. Four cases of scarlet fever and one of typhoid.—G. L. Bucknam, Sec.

CONCORD. Nothing for the two years except four cases of diphtheria in 1905.—George Berry, Sec.

CONNOR PLANTATION. 1904. Two nuisances reported. Thirty-three cases of smallpox.—Nelson Lessor, Sec.

COOPER. Nothing to report for the two years. We very seldom have a case of contagious disease.—William H. Morton, Sec.

CORINNA. 1905. Three cases of diphtheria.—J. H. Winchester, Sec.

CORINTH. 1904. Two cases of scarlet fever and one of typhoid.

1905. One nuisance removed. Two cases of diphtheria.—W. E. Jordan, Sec.

CORNISH. One case of diphtheria and two of typhoid fever in 1904. Two cases of typhoid fever in 1905.—Dr. S. G. Sawyer, H. O.

CORNVILLE. 1904. One nuisance removed. Five cases of diphtheria.—W. H. Morrill, Sec.

1905. One nuisance abated. Six cases of typhoid fever in one house.—C. H. Blackwell, Sec.

CRANBERRY ISLES. Our town has been in a very healthy condition the past two years. No contagious diseases excepting several cases of whooping cough in a mild form.—George W. Bulger, Sec.

CRAWFORD. 1904-05. Our town has been quite healthy and we have not been troubled with any contagious diseases.—J. P. Jeffery, Sec.

CRIEHAVEN PLANTATION. 1904-05. We are very thankful to say that we have escaped all contagious diseases the past two years.—E. W. Crie, Sec.

CRYSTAL. 1904. Two nuisances. Two cases of scarlet fever.

1905. Five nuisances, all of which were removed. Three cases of scarlet fever and two of typhoid.—A. A. Emerson, Sec.

CUMBERLAND. Nothing for the two years except one nuisance removed in 1905.—Dr. H. M. Moulton, H. O.

CUTLER. 1904. One case of diphtheria and one of scarlet fever.

1905. Two cases of typhoid fever. Many of our residents have improved the sanitary condition of their homes by adopting

a better method for the disposal of their house drainage.—F. S. Stevens, Sec.

CYR PLANTATION. 1904. Four cases of smallpox and one of typhoid fever.—Francois Cormier, Sec.

1905. No contagious diseases.—Joseph F. Violette, Sec.

DALLAS PLANTATION. 1904. None of the contagious diseases in our town the past year.—C. E. Nile, Chr.

1905. No diseases reported to our board.—Frank Haley, Sec.

DAMARISCOTTA. 1905. Complaint was made to our board of one nuisance which was investigated. Three cases of smallpox. We have no public sewage system but much more care and pains is being taken of sewage than formerly. Many private sewers have been put in, and some complaint has arisen from their emptying on the flats between high and low water.—Dr. J. M. King, Sec.

DANFORTH. 1904. Ten nuisances; all attended to. Five cases of diphtheria.

1905. Twelve nuisances, all of which were removed. Four cases of diphtheria.—Dr. M. L. Porter, Sec.

DAYTON. 1904. Seven cases of scarlet fever which were of a mild type. No other infectious diseases have been reported to this board during the past year. In the country much beef is put upon the market absolutely unfit for food. There should be a penalty attached to a law prohibiting the sale of such stuff. If there is such a law, it is evidently a dead letter. When a cow becomes sick, she is handed over to the butcher and the meat placed upon the market and eaten.—Dr. George Sylvester, Sec.

1905. The only infectious diseases reported to us was one case of diphtheria and one of scarlet fever.—Roscoe B. Hill, Sec.

DEBLOIS. No infectious disease in either year.—Calvin S. Leighton, Sec.

DEDHAM. One case of typhoid fever in 1905 is all we have to report for the two years.—C. E. Johnson, Sec.

DEER ISLE. 1904-05. No contagious diseases.—George W. Small, Sec.

DENMARK. One case of typhoid fever occurred in 1904. There were six cases of measles reported in 1905, which were promptly attended to and there was no spread of the disease.—Alfred W. Belcher, Sec.

DENNISTOWN PLANTATION. 1904-05. No diseases to report. —Moses Holden, Sec.

DENNYSVILLE. None of the contagious diseases were reported to us in either year.—Fred L. Gardner, Sec.

DETROIT. In 1904 we had two cases of smallpox and one of diphtheria. None in 1905.—L. W. Clark, Sec.

DEXTER. 1904. Five nuisances reported, of which three were removed. Fifty-seven cases of diphtheria and one of typhoid fever.

1905. Four nuisances brought to our notice were all satisfactorily remedied. Seven cases of diphtheria, one of scarlet fever and three of typhoid fever.—Dana Crockett, Sec.

DIXFIELD. 1904. Six cases of scarlet fever which infected four houses.

1905. One case of scarlet fever and one of typhoid.—Dr. J. S. Sturtevant, Sec.

DIXMONT. With the exception of four cases of measles, confined to one house, we have had no contagious diseases during the two years.—A. F. Tasker, Sec.

DOVER. 1905. Ten nuisances removed. One very mild case of diphtheria was the only infectious disease reported. We have expended $2,200 on our sewer system the past summer in the part of our village giving us the most trouble in past years, and the sanitary conditions existing now are very good.—S. D. Weymouth, Sec.

DRESDEN. 1905. Two cases of typhoid fever.—Dr. L. H. Dorr, H. O.

DREW PLANTATION. 1904-05. No contagious diseases.—Charles R. Andrews, Sec.

DURHAM. 1904. One nuisance removed. Six cases of scarlet fever.

1905. One nuisance abated. Nine cases of diphtheria and thirteen of typhoid fever at Shiloh.—Samuel B. Libby, Sec.

DYER BROOK. 1904. No infectious diseases.—L. S. Townsend, Sec.

1905. Not any of the contagious diseases for this year.—John L. Moulton, Sec.

E PLANTATION. 1904. No nuisances and no diseases to report.—R. A. Kingsbury, Sec.

EAST LIVERMORE. 1904. Twenty-two nuisances reported; all removed. Four cases of diphtheria, eight of scarlet fever and one of typhoid fever.

1905. Nine nuisances of the eleven reported, were satisfactorily attended to. Six cases of diphtheria. About December 18th our town water supply tasted very badly, fish-like, and had considerable odor, which alarmed the people very much. The Water Co. sent water to Prof. Robinson for analysis and later he came up and took samples himself and inspected the plant, pronouncing the trouble due to a vegetable micro-organism, of the diatomaceae variety, called asterionella; and there being a leak found at the gate-house, where the water is screened and that being the only swampy place in the pond, we thought it might be due to that and as the water has rapidly improved since that was stopped up, it looks like it. The public thought it due to a leaky valve at the Mill by which dirty river water was let into the mains and were not satisfied, so other samples were sent away for analysis. Our greatest and most serious trouble seems to be from lack of proper drainage for sinks and water closets, the village having no sewerage system.—Dr. L. B. Hayden, Sec.

EAST MACHIAS. 1904. Thirty nuisances, all of which were removed. Two cases of smallpox and two of diphtheria. We watched all contagious diseases very sharply and disinfected thoroughly. There was no epidemic of any disease at any time during the year.

1905. Twelve nuisances abated. Seven cases of smallpox, all in one house. Of the eleven inmates of this house, three were vaccinated last year and one this year. None of these four had the slightest form of the disease while the seven were quite sick. —Geo. P. Bogue, Sec.

EASTPORT. 1904. Nineteen nuisances were removed. No contagious diseases.

1905. Fifty-five nuisances; all abated. Three cases of scarlet fever and five of typhoid fever. In regard to public and private improvements, there has been nothing worthy of mention.—John A. Lowe, Sec.

EDDINGTON. One case of typhoid fever in 1904 is all we have to report for two years.—Geo. W. Estes, Sec.

EDEN. 1904. Sixty-eight nuisances, all of which have been removed. One case of diphtheria and one of scarlet fever. We

have built a new isolation hospital. We have had a large number of stables drained, and all new ones have to have a thorough system of drainage. The handling of garbage is in the hands of the board of health, they make the contract and look out for it.—Osmond Emery, Sec.

1905. Seventy-one nuisances reported; sixty-four removed. One case of scarlet fever and two of typhoid fever.—N. W. Chaney, Sec.

EDGECOMB. 1904. None of the contagious diseases.—F. M. Dodge, Sec.

1905. Two nuisances removed. One case of diphtheria.

EDINBURG. We have had no sickness in this town for the two years.—C. W. Eldridge, Sec.

EDMUNDS. 1904. Nothing to report.—Wm. F. Bell, Sec.

1905. We have not been called upon to perform any duties.—Sidney H. Hobart, Sec.

ELIOT. Two cases of typhoid fever in each year is all we have to report.—Dr. H. I. Durgin, Sec.

ELLIOTSVILLE PLANTATION. The only case of infectious disease during the two years was one of smallpox in 1905.—H. W. Lane, Sec.

ELLSWORTH. 1905. One nuisance was reported and promptly removed. This city has been exceptionally free from contagious diseases during the year, not a single case having been reported to the board. Measles has prevailed quite extensively but no action by the board of health was deemed necessary. The sewers and drains of the city have been well looked after by the city government. It is gratifying to note a greater promptness on the part of physicians in reporting contagious diseases as well as a more active co-operation by the municipal officers.—Dr. N. C. King, Sec.

EMBDEN. 1904. One nuisance abated. Two cases of diphtheria and one of scarlet fever.

1905. One case of typhoid fever.—G. W. Dunbar, Sec.

ENFIELD. 1904. Three nuisances were satisfactorily remedied. Eight cases of scarlet fever and six of typhoid.

1905. A few nuisances, of not much consequence, were reported and attended to at once. One case of scarlet fever and two of typhoid. The people are getting educated somewhat and are doing better. A little caution of late years has more effect than hours of talk to them in past years.—A. J. Darling, Sec.

ETNA. 1904. The health of the town of Etna has been good the past year as far as contagious diseases are concerned.—Stillman J. Lock, Sec.

1905. One case of diphtheria.—E. E. Sylvester, Sec.

1905. No contagious diseases.—Dr. T. W. Brigmigion, Sec.

EXETER. No infectious diseases for the two years with the exception of two cases of scarlet fever in 1904.—Dr. S. J. Redman, Sec.

FAIRFIELD. 1904. Twelve nuisances removed. Ten cases of diphtheria, three of scarlet fever and two of typhoid.

1905. Fifteen nuisances, all of which were abated. One case of diphtheria. Our sewerage system is gradually increasing with yearly additions and we shall soon have a complete up-to-date sewerage system.—George C. Eaton, Sec.

FALMOUTH. 1904. Five cases of diphtheria and three of scarlet fever.

1905. Three nuisances removed. Two cases of typhoid fever. We are using the permanganate process for formaldehyde disinfection.—D. W. Lunt, Sec.

FARMINGDALE. 1904. One nuisance removed. Three cases of scarlet fever which infected three houses.

1905. Two nuisances abated. None of the contagious diseases were reported to our board. A sewer on North street has been recommended by our board of health.—Dr. F. M. Putnam, Sec.

FARMINGTON. During each of the two years there were three nuisances removed and we had one case of diphtheria and one of typhoid fever in each year. Our town has been very free from contagious diseases. The local board of health is persistent in thorough disinfection and the people of our town are complying with our rules and requests without any hesitation or trouble, which aids us very much.—S. R. Knowlton, Sec.

FAYETTE. No contagious diseases during the past two years.—W. J. Berry, Sec.

FLAGSTAFF PLANTATION. One nuisance removed in 1905 is all we have to report for the two years.—Ansel A. Eames, Sec.

FOREST CITY. 1904. We have not had any contagious diseases in our town this year.—Frank W. Bartlett, Sec.

1905. Our board has had no work of any kind to do as our town has been entirely free from contagious diseases.—Frank O. Pray, Sec.

FORT FAIRFIELD. 1904. No infectious diseases.—Dr. A. D. Sawyer, Sec.

FORT KENT. 1904. One nuisance abated. One case of diphtheria and six of typhoid fever. Have used the new method of fumigating with formaldehyde and potassium permanganate and find it a great improvement. It ought to simplify the whole process of fumigating.

1905. One nuisance removed. One case of scarlet fever and six of typhoid. One of the greatest dangers to the public health here is caused by the people spreading diseases by attending a closely crowded church, regardless of quarantine or regardless of what illness may be present in the family.—Dr. Edgar T. Flint, Sec.

FOXCROFT. 1904. Six nuisances were attended to as well as possible. Four cases of typhoid fever.—G. W. Ham, Sec.

1905. Nine nuisances were reported. One case of diphtheria and four of typhoid fever. We are using the permanganate process for disinfection. After due notice in the local paper, the town was inspected house to house and all privies and sink drains examined.—John C. Cross, Sec.

FRANKFORT. 1904. One nuisance and two cases of typhoid fever.

1905. Two nuisances removed.—Dr. R. D. Walton, Sec.

FRANKLIN. 1904. One case of diphtheria.—George U. Dyer, Sec.

1905. One nuisance reported but no cases of contagious diseases.—Charles E. Butler, Sec.

FREEDOM. 1905. No contagious diseases with the exception of one case of typhoid fever.—Frank Flye, Sec.

FREEPORT. 1904. Twelve nuisances abated. One case of diphtheria and two of scarlet fever.

1905. Three cases of diphtheria and one of scarlet fever.—Dr. N. D. Hyde, Sec.

FRENCHVILLE. The only infectious diseases during the two years were two cases of diphtheria and two of typhoid fever in 1905.—Dr. Isidore Cote, Sec.

FRIENDSHIP. One nuisance removed in each year. No contagious diseases except one case of typhoid fever in 1904.—Ulysses T. Wallace, Sec.

FRYEBURG. 1904. Seven cases of diphtheria and two of typhoid fever.

1905. Three nuisances, all of which were removed. None of the infectious diseases were reported.—Dr. Arthur J. Lougee, H. O.

GARDINER. 1904. Ten nuisances; eight removed. Eight cases of diphtheria and ten of scarlet fever.

1905. Eight nuisances were abated. Nineteen cases of scarlett fever and one of typhoid.—Dr. F. E. Strout, H. O.

GARFIELD PLANTATION. 1904-05. No cases of contagious diseases in town.—L. K. Tilley, Sec.

GARLAND. One case of typhoid fever in 1904; no other contagious disease in either year.—Dr. W. R. L. Hathaway, H. O.

GEORGETOWN. One nuisance removed each year. No contagious diseases for the two years except two of diphtheria in 1905.—W. H. Dearborn, Sec.

GILEAD. 1904. No infectious disease.—Ralph I. Peabody, Sec.

1905. No nuisances or contagious diseases.—F. B. Coffin, Sec.

GLENBURN. We have been exceptionally fortunate in having no infectious diseases for the two years. The town as a whole has kept well cleaned up and there is a general air of thrift. Better ventilation of houses might be suggested as an improvement, especially in the winter months, as some of our people are inclined to "den up" then.—John F. Tolman, Sec.

GLENWOOD PLANTATION. 1904. Nothing in the way of contagious diseases to report.—Merton E. Grant, Sec.

GORHAM. 1905. One nuisance removed. Four cases of diphtheria, one of scarlet fever, and one of typhoid fever. We have disinfected with formaldehyde, using the permanganate process.—Dr. I. D. Harper, Sec.

GOULDSBORO. 1905. The town in general has been very healthy. Scarlet fever in a light form was present in West Gouldsboro, but no other infectious diseases.—Aaron S. Rolfe, Sec.

GRAFTON. There have been no contagious diseases in this town for the last two years.—J. W. Chapman, Sec.

GRAND FALLS PLANTATION. We have had no diseases in our plantation to report for either 1904 or 1905.—A. S. Folsom, Sec.

GRAND ISLE. One case of smallpox in 1904, but no other infectious diseases in either year.—Florent Sanfacon, Sec.

GRAND LAKE STREAM PLANTATION. No infectious diseases except one case of typhoid fever in 1904. We have quite a clean little town. As spring opens, all seem to take a pride in cleaning up and getting ready for our summer visitors.—A. R. Wheaton, Sec.

GRAY. 1904. Fifteen cases of diphtheria, two of scarlet fever, and two of typhoid fever. One nuisance removed.

1905. No contagious diseases this year.—Dr. L. T. Cushing, Sec.

GREENBUSH. No infectious diseases except one case of diphtheria in 1905. One nuisance was removed in that year.—G. A. French, Sec.

GREENE. 1904. Three nuisances removed. No contagious diseases.

1905. One nuisance removed. One case of scarlet fever and one of typhoid.—F. A. Allen, Sec.

GREENFIELD. One case of typhoid fever in 1904, and two of diphtheria in 1905.—B. C. White, Sec.

GREENVILLE. 1904. Five nuisances removed. Two cases of scarlet fever and eleven of typhoid. We have two buildings located on an old farm and fitted up for use at a moment's notice if they should be needed in case we had an outbreak of smallpox.—L. R. Young, Sec.

GREENWOOD. In 1904 we had one case of scarlet fever; in 1905, one of diphtheria, two of scarlet fever, and two of typhoid fever.—A. C. Libby, Sec.

GUILFORD. 1904. Two nuisances removed. One case of smallpox and one of typhoid fever.

1905. One nuisance removed. No infectious diseases except three cases of typhoid fever.—Dr. R. H. Marsh, Sec.

HALLOWELL. 1904. Two nuisances removed. Two cases of diphtheria, ten of scarlet fever, and one of typhoid.—E. M. Henderson, Sec.

1905. Four nuisances reported, three of which were removed. Three cases of diphtheria, but none of the other infectious diseases.—Geo. F. Church, Sec.

HAMLIN PLANTATION. 1905. No contagious diseases to report.—Henry Duplessis, Sec.

HAMMOND PLANTATION. There having been no contagious diseases in either year, I have nothing to report.—John S. Snell, Sec.

HAMPDEN. 1904. One nuisance removed. Two cases of typhoid fever. Our schoolhouses have been improved.—Dr. W. H. Nason, H. O.

1905. The past year there has not been a case of infectious disease nor a nuisance reported to the board of health, and there has not been but very little sickness generally.—Dr. C. F. Cowan, H. O.

HANCOCK. 1905. One nuisance removed. No contagious diseases.—J. E. Bowden, Sec.

HANOVER. No nuisances or infectious diseases in 1904 or 1905.—Arthur G. Howe, Sec.

HARMONY. 1904. One nuisance removed. One case of diphtheria and two of typhoid fever.

1905. No infectious diseases.—Dr. Wm. McLaughlin, Sec.

HARPSWELL. One case of diphtheria in 1904. The past two years have been years of generally good health.—Harmon O. Coombs, Sec.

HARRINGTON. 1904. One nuisance removed. No contagious diseases.

1905. Two nuisances removed. Four cases of diphtheria.—J. J. Drisko, Sec.

HARRISON. Two nuisances removed in 1904, and one in 1905. No contagious diseases except one case of typhoid fever in 1904.—Dr. E. A. Wight, H. O.

HARTFORD. No cases of infectious disease except one of scarlet fever in 1905.—T. B. W. Stetson, Sec.

HARTLAND. 1904. Three nuisances reported and two removed. Five cases of diphtheria and one of typhoid fever.

1905. Four nuisances reported and removed. Two cases of scarlet fever and five of typhoid fever.—E. K. Fuller, Sec.

HAYNESVILLE. No nuisances or contagious diseases in either year.—James F. Bryson, Sec.

HEBRON. 1904. We have had no complaints this year and very little to do.

1905. Two cases of typhoid fever.—Sylvanus Bearce, Sec.

HERMON. One nuisance removed each year. Two cases of

typhoid fever in 1905. The town is in a good sanitary condition.—Dr. F. P. Whitaker, Sec.

HERSEY. 1904. No contagious diseases.—Lowell M. Davis, Sec.

1905. No cases of infectious disease reported except four cases of typhoid.—Hugh McMann, Sec.

HIGHLAND PLANTATION. 1905. No cases of contagious disease.—C. L. Parsons, Sec.

HILL PLANTATION. No infectious diseases in either year.—Remie Labbe, Sec.

HIRAM. We have had no work in the last two years for the board,—no complaints or notices of any kind.—Llewellyn A. Wadsworth, Sec.

HODGDON. There have been no infectious diseases reported in either year.—Moses Benn, Sec.

HOLDEN. 1904. One nuisance removed. Two cases of typhoid fever.—G. W. Clark, Sec.

1905. No infectious diseases or nuisances.—J. H. Griffin, Sec.

HOLLIS. 1904. Three cases each of diphtheria, scarlet fever, and typhoid fever.

1905. One case of typhoid fever, but no other contagious disease. We are now using the permanganate process of formaldehyde disinfection and think it far better than the generator.—I. S. McDaniel, Sec.

HOPE. Two cases of diphtheria in 1904, and one of scarlet fever in 1905 were all the infectious diseases we have had.—A. S. Lermond, Sec.

HOULTON. 1904. Five nuisances removed. One case of smallpox in a camp, five of diphtheria, and sixteen of typhoid fever. We are making an effort to compel owners of property to enter the sewer instead of using cesspools.

1905. Three nuisances removed. One case of smallpox, thirteen of diphtheria, and five of typhoid fever. We disinfect with formaldehyde, using the permanganate process.—Dr. T. S. Dickison, Sec.

HUDSON. 1904. No contagious diseases.—C. W. Gault, Sec.

1905. The board of health in this town has not been called upon to act the past year.—John A. Peirce, Sec.

HURRICANE ISLE. 1904. Two nuisances removed. No infectious diseases.—L. W. Vinal, Sec.

1905. One nuisance removed. No cases of infectious disease. We have had the drainage of the streets improved.—W. F. Shields, Sec.

INDUSTRY. One case of scarlet fever in 1904, and one of diphtheria in 1905 are all the infectious diseases reported. One nuisance removed in 1905. We use the permanganate process of disinfection.—A. J. Spinney, Sec.

ISLAND FALLS. 1904. Three nuisances removed. One case of smallpox and twelve of typhoid fever.

1905. Eight nuisances were reported, seven of which were removed. Twenty cases of typhoid fever, but no other infectious disease.—M. A. Peters, Sec.

ISLE AU HAUT. 1904. No contagious diseases with the exception of four cases of diphtheria.—S. W. Bridges, Sec.

1905. No infectious diseases.—Geo. C. Hopkins, Sec.

ISLESBORO. Two nuisances removed in 1904, and one in 1905. We have been very fortunate the last two years; have not had a case of contagious disease except a few cases of measles and chickenpox.—J. A. Sprague, Sec.

JACKMAN PLANTATION. No occasion has arisen in the last two years where the board needed to act.—Dr. B. E. Larrabee, H. O.

JACKSON. 1904. No contagious diseases.—J. E. Putnam, Sec.

1905. No cases of contagious disease this year.—W. E. Warren, Sec.

JAY. 1904. Two cases of diphtheria, one of scarlet fever, and three of typhoid fever.—S. B. Farnum, Sec.

1905. Five cases of diphtheria and two of scarlet fever, but no other infectious diseases.—A. J. Merriman, Sec.

JEFFERSON. 1904. No infectious diseases except one case of scarlet fever.—C. W. Besse, Sec.

1905. Nothing in the nature of contagious disease.—Dr. A. W. Nash, Sec.

JONESBORO. 1904. We had one case of smallpox in a mild form. We acted promptly, quarantined the house, and stopped the disease right there. No other contagious diseases. One nuisance was removed.—G. W. Wilson, Sec.

1905. No contagious diseases.—C. W. Crocker, Sec.

JONESPORT. 1904. One nuisance removed. About two hundred and twenty-five cases of smallpox, one of scarlet fever, and five of typhoid fever.—Dr. C. F. Kendall, Sec.

1905. Ninety-six cases of smallpox, four of scarlet fever, and five of typhoid. Two nuisances removed.—D. O. French, Chr.

KENDUSKEAG. 1904. Four nuisances removed. Two cases of typhoid fever.

1905. No infectious diseases except one case of typhoid fever.—Dr. W. S. Purinton, Sec.

KENNEBUNK. 1904. Two nuisances removed. Five cases of scarlet fever and four of typhoid.

1905. Three nuisances removed. Three cases of diphtheria, three of scarlet fever, and one of typhoid fever. We have no sewerage system which is much to be regretted.—J. S. Barker, Sec.

KENNEBUNKPORT. 1904. Four nuisances reported and removed. No infectious diseases except two cases of scarlet fever.—Fred L. Wheeler, Sec.

1905. Four cases of diphtheria, six of scarlet fever, and one of typhoid fever. Six nuisances removed.—Wm. H. Cluff, Sec.

KINGFIELD. 1904. One nuisance was reported to the board, but was not removed. One case of typhoid fever, but none of the other infectious diseases.

1905. Three nuisances reported and one removed. No contagious diseases.—Dr. E. L. Pennell, Sec.

KINGMAN. 1904. One case of diphtheria. No other infectious diseases.—C. S. Griffin, Sec.

1905. No contagious diseases reported.—C. E. Christopherson, Sec.

KINGSBURY PLANTATION. 1904. No infectious diseases.—G. L. Cameron, Sec.

1905. There have been no contagious diseases or nuisances reported this year.—G. G. Robinson, Sec.

KITTERY. 1904. Fourteen nuisances removed. One case of smallpox, one of diphtheria, but none of scarlet fever or typhoid fever.

1905. Ten nuisances removed. Twelve cases of scarlet fever and four of typhoid. We are using the permanganate process of disinfection this year.—Dr. E. E. Shapleigh, Sec.

KNOX. 1904. No contagious diseases.—E. R. Wentworth, Sec.

1905. There have been no infectious diseases in town the past year.—I. H. Ingraham, Sec.

LAGRANGE. The past two years have been very healthy; two cases of typhoid fever in 1904 and one in 1905 were the only contagious diseases we had. We disinfect with formaldehyde, permanganate process.—C. L. Doble, Sec.

LAKE VIEW PLANTATION. 1904. One case of diphtheria, but no other infectious disease.—W. H. Jenkins, Sec.

1905. No nuisances or infectious diseases.—F. J. Roberts, Sec.

LAKEVILLE PLANTATION. 1904. No contagious diseases.—James A. Ham, Chr.

1905. No nuisances or infectious diseases.—Chas. Boyce.

LAMOINE. 1904. One case of scarlet fever; no other infectious disease.—John F. Lear, Sec.

1905. No infectious diseases except three cases of typhoid fever which the board thought were caused by contaminated water.—I. W. Bowden, Sec.

LANG PLANTATION. 1904. No contagious diseases.—M. G. Flagg, Sec.

LEBANON. One nuisance removed in 1904. One case of diphtheria in that year, and two of typhoid fever in 1905 were all the diseases reported.—R. D. Roberts, Sec.

LEE. One nuisance removed each year. One case of typhoid fever in 1904, and one case of diphtheria in 1905, but none of the other infectious diseases.—J. A. Mulherin, Sec.

LEEDS. 1904. No contagious diseases.

1905. Two nuisances removed. Two cases of diphtheria and four of typhoid fever.—E. A. Mills, Sec.

LEVANT. No nuisances or infectious diseases.—C. F. Wilson, Sec.

1905. Nothing in the way of contagious diseases reported.—Frank White, Sec.

LEWISTON. 1904. About fifteen nuisances have been reported to our board and all of them have been removed. Nine cases of diphtheria and ten of scarlet fever.

1905. Fifty-five nuisances were reported and forty-nine of them have been removed. Fourteen cases of smallpox, five of

diphtheria, six of scarlet fever, and thirty-nine of typhoid fever. My observation is that the death-rate of children in the summer is largely due to impure milk and the laws should be more severe to the guilty persons.—Vital Gilbert, Sec.

LEXINGTON PLANTATION. 1904. One nuisance removed. We have had no contagious diseases.—John H. Green, Chr.

1905. One nuisance reported and abated. No infectious diseases.—H. P. Norton, Sec.

LIBERTY. One case of typhoid fever in 1904 is the only contagious disease reported for the two years.—Dr. Chas. B. Hoit, H. O.

LIMERICK. 1904. One case of typhoid fever, but no other contagious disease.—John C. Hayes, Sec.

LIMESTONE. No nuisances in either year and no contagious diseases with the exception of six cases of typhoid fever in 1904, and two cases of the same disease in 1905.—A. D. Hatfield, Sec.

LIMINGTON. 1904. One nuisance abated. One case of typhoid fever.

1905. Again as in last year, typhoid fever was the only infectious disease, two cases being reported to the board.—Dr. J. F. Moulton, Sec.

LINCOLN PLANTATION. 1904. No contagious diseases.—W. H. Hart, Chr.

1905. No contagious diseases to report.—C. T. Fox, Sec.

LINCOLNVILLE. In 1904 one nuisance was removed, and we had one case of typhoid fever. In 1905 there were no infectious diseases.—Dr. Chas. H. Leach, Sec.

LINNEUS. One nuisance was removed in 1904, and two in 1905, but we have had no contagious diseases for the two years. In disinfecting with formaldehyde we use the permanganate process.—Dr. Robert Boyd, Sec.

LISBON. 1904. Twenty-five nuisances removed. Twenty-six cases of diphtheria, six of scarlet fever, and nine of typhoid fever.

1905. Twenty nuisances were removed. Nine cases of diphtheria, twelve of typhoid fever, but none of scarlet fever or smallpox.—Frank A. Jordan, Sec.

LITCHFIELD. 1904. Five cases of scarlet fever.

1905. One nuisance removed. No infectious diseases.—Gardiner Roberts, Sec.

LITTLETON. We have no nuisances in our town, and two cases of typhoid fever in 1904 are all we have had for contagious diseases.—George Crosby, Sec.

LIVERMORE. 1904. One case of diphtheria and one of scarlet fever.

1905. One nuisance abated. One case of scarlet fever, but no other infectious disease.—F. H. Boothby, Sec.

LONG ISLAND PLANTATION. 1905. No contagious diseases. —Wm. S. Rich, Sec.

LOVELL. The only case of infectious disease for the two years was one of diphtheria in 1905.—Dr. C. P. Hubbard, Sec.

LOWELL. 1904. Our town is very healthy. No contagious diseases.—J. R. Shorey, Sec.

1905. No cases of infectious diseases.—L. B. Edgecomb, Sec.

LUBEC. 1904. Three nuisances removed. Twenty-four cases of diphtheria, but none of smallpox, scarlet fever or typhoid.

1905. Five nuisances reported and all removed. No contagious diseases except two cases of diphtheria.—F. W. Fanning, Sec.

LUDLOW. No infectious diseases in 1904 or in 1905.—A. J. Chase, Sec.

LYMAN. We have nothing to report except seven cases of scarlet fever in 1904, and the removal of one nuisance in 1905.— E. N. Littlefield, Sec.

MACHIAS. Eight nuisances were removed in 1905. No contagious diseases in either year.—Dr. G. N. Gardner, Sec.

MACHIASPORT. 1904. No nuisances or infectious diseases. —John Leighton, Sec.

1905. One case of measles, but no other infectious disease.— W. F. Grant, Sec.

MACWAHOC PLANTATION. 1904. No contagious diseases.— E. A. Buck, Sec.

1905. Nothing reported to our board.—G. D. O'Roak, Sec.

MADAWASKA. In 1904 one nuisance was removed. Eight houses were infected with smallpox.

1905. There have been no contagious diseases of any kind in the town this year.—Leonard Dufour, Sec.

MADISON. 1905. Three nuisances reported, two of which were removed. Two cases of diphtheria and three of typhoid fever.—D. L. Churchill, Sec.

MADRID. 1904. No infectious diseases.—Samuel J. Sargent, Sec.

1905. There were several deaths in town the past year due to accidents, pneumonia, etc., but none of the contagious diseases were reported.—Charles E. Crossman, Sec.

MAGALLOWAY PLANTATION. With the exception of one case of smallpox in 1904, there has not been anything for us to do the past two years.—A. W. Linnell, Sec.

MANCHESTER. 1904. There has been no work for the board to do this year.

1905. Six cases of scarlet fever.—G. M. Knowles, Sec.

MAPLETON. Nothing to report for the two years except one nuisance removed in 1904. A suspected case of smallpox proved to be chickenpox.—E. A. Smith, Sec.

MARIAVILLE. 1904. We have had none of the contagious diseases.—E. C. Dunham, Sec.

1905. No infectious diseases.—John C. Jordan, Sec.

MARION. 1904-05. No contagious diseases.—B. L. Smith, Sec.

MARSHFIELD. There has not been a case of contagious disease in town during the two years.—E. L. Hanscom, Sec.

MARS HILL. 1904. One case of smallpox, four of diphtheria and seven of typhoid fever. We do not have much consumption in this cold climate.

1905. With the exception of four cases of diphtheria and one each of scarlet fever and typhoid, there has been very little sickness in town this year.—B. F. Pierce Sec.

MASARDIS. The only case of contagious disease during the two years was one of consumption. I left at the residence and distributed generally the circulars relative to the subject, and have good reason to believe the instructions and advice contained therein have been fully heeded.—Fred W. E. Goss, Sec.

MATINICUS ISLE PLANTATION. 1904-05. No contagious diseases except one case of tuberculosis. The people moved away.—E. A. Young, Sec.

MATTAWAMKEAG. 1904. Four nuisances abated. One case of typhoid fever.—J. C. Scott, Sec.

1905. One nuisance removed. One case of tuberculosis was the only case of infectious disease reported. We have had no cases of diphtheria for seventeen years.—E. P. Reynolds, Sec.

MAXFIELD. 1905. No contagious diseases.—W. W. Fuller, Sec.

MAYFIELD PLANTATION. 1904-05. No cases of infectious diseases have occurred.—John McKiney, Chr.

MECHANIC FALLS. In each of the two years there were five nuisances removed. No infectious diseases, with the exception of one case of scarlet fever in each year.—Leroy Spiller, Sec.

MEDDYBEMPS. None of the contagious diseases in either year.—John S. Bridges, Sec.

MEDFORD. We have had no cases of infectious diseases during the two years.—E. G. Lovejoy, Sec.

MEDWAY. The general health of the town is good. There have been no contagious diseases, with the exception of two cases of typhoid fever in 1904, and three cases of the same disease in 1905. After organizing we visit every home to see that the premises are in a sanitary condition, and distribute the circulars that we receive from the State board of health. We find that this works well, and as a general thing, the people abide by the instructions.—C. F. Moore, Sec.

MERCER. 1904-05. Nothing new to report. There have been no nuisances and no infectious diseases.—I. C. Tracy, Sec.

MERRILL PLANTATION. For contagious diseases this year, we have had three cases of typhoid fever; and last year there were four cases of smallpox although but one house was infected.—Dr. A. B. Libby, H. O.

MEXICO. 1905. We have had five cases of diphtheria, three of scarlet fever and two of typhoid. There were also three nuisances removed. Most cases of this kind are minor ones like dry closets and filthy cellars. We notified the owners and gave them a specified time to have them cleaned up, which they have very willingly done. We have put up notices in regard to the dumping of swill and waste from houses in several places where it might cause a bad odor.—A. D. Virgin, Sec.

MILBRIDGE. There were neither nuisances nor contagious diseases reported in 1904, but this year we have had one nuisance to remove and there were also twelve cases of scarlet fever and one of typhoid.—Dr. J. A. Walling, Sec.

MILFORD. One nuisance abated in 1904. With the exception of two cases of diphtheria in the same year, there have been no infectious diseases.—E. S. Tozier, Sec.

MILLINOCKET. 1904. Four nuisances removed. Thirteen cases of scarlet fever and about two hundred and fifteen of typhoid fever. This typhoid epidemic, which occurred during March, April and May, was investigated for the State board of health by Dr. Henry Hawkins. It was difficult at the time to get an exact account of the number of persons attacked or houses infected as physicians were so busy that reports were made very irregularly. This outbreak followed a pollution of the town water supply.

1905. Two nuisances abated. The only infectious diseases were two cases of scarlet fever and four of typhoid.—Dr. Chas. S. Bryant, Sec.

MILO. 1905. Four nuisances removed. One case of diphtheria and three of typhoid fever. Our population has increased so rapidly that it is impossible to tell what percentage of the people are protected by vaccination. The municipal officers have been improving drainage during the past year. Survey is now being made for sewerage and water systems.—Dr. Louis C. Ford, H. O.

MILTON PLANTATION. 1905. The only cases of contagious diseases were three of scarlet fever.—F. C. Bryant, Sec.

MINOT. 1904. No contagious diseases have been reported. —J. M. Harris, Sec.

1905. One case of scarlet fever is all I have to report.—Willis G. Thorne, Sec.

MONHEGAN PLANTATION. 1904. Not a case of infectious disease. This place is noted for good health.—Reubin Davis, Sec.

1905. No nuisances have been reported. The plantation is in a very healthy condition and has been for the past year.—Irving T. Stanley, Sec.

MONMOUTH. For two years our town has been entirely free from contagious diseases, excepting whooping cough and measles. Our people are neat and look well after the sanitary condition of their homes, except a few and they will be brought into line.—J. L. Orcutt, Sec.

MONROE. 1904. There has been one death from consumption but no other contagious disease, with the exception of several cases of measles in a light form.—F. A. Nye, Sec.

1905. The town has been in a very healthful condition the past year. Fifteen cases of measles is all in the way of contagious diseases.—Franklin Chase, Sec.

MONSON. One case of diphtheria and seven of scarlet fever in 1904, but this year there were only two cases of typhoid fever. We disinfect our schoolhouses once or twice a year and all private houses where there has been much sickness.—D. J. Jackson, Sec.

MONTICELLO. 1905. None of the specified contagious diseases.—L. E. Stackpole, Sec.

MOOSE RIVER PLANTATION. As one case of typhoid fever is all we have had for two years, ,there has been no call for action on part of the board.—Dr. B. E. Larrabee, H. O.

MORO PLANTATION. No contagious diseases in either year. We have not had a case of diphtheria for over forty years.—Stephen T. Bates, Sec.

MORRILL. No infectious diseases, whatever, in either year, and we have made no improvements.—John F. Vickery, Sec.

MOSCOW. Our town, for the past two years, has been blest with good health with the exception of one case of typhoid fever in 1904. This year there was one death from consumption.—B. F. Smith, Sec.

MOUNT CHASE. Neither in 1904 nor in 1905 were any cases of infectious diseases reported to us.—J. A. McDonald, Sec.

MOUNT DESERT. 1904. Five nuisances removed. One case of diphtheria and two of typhoid fever. Our town is making improvements by both public and private sewers. We try to have everything kept as neat and clean as possible and use every precaution to keep any contagious disease from arising.

1905. Three nuisances abated but have had no contagious diseases. The town has expended $1500 in new sewers in the past year.—Edward A. Hodgdon, Sec.

MOUNT VERNON. We have had two cases of typhoid fever this year and last year one case of the same disease and also one case of typhoid pneumonia.—A. P. Cram, Sec.

NAPLES. Two cases of diphtheria and four of scarlet fever in 1904 are all the cases of infectious diseases for the two years.—Dr. J. P. Fickett, H. O.

NASHVILLE PLANTATION. 1904. We have had no trouble with any serious diseases yet.—Andrew Henry, Sec.

1905. None of the infectious diseases reported.—Eugene Hill, Sec.

NEW CANADA PLANTATION. 1904. No contagious diseases. —Henry Desjardins, Sec.

NEWCASTLE. There were no infectious diseases in either year.—D. S. Glidden, Sec.

NEWFIELD. Nothing whatever for last year, but this year we have removed two nuisances and there have been eight cases of scarlet fever which infected three houses.—L. L. Piper, Sec.

NEW GLOUCESTER. 1904. Two cases of diphtheria and four of scarlet fever.—E. C. Hackett, Sec.

1905. One case of diphtheria and six of scarlet fever.—Dr. John I. Sturgis, H. O.

NEW PORTLAND. No infectious diseases in either year, save one case of scarlet fever in 1904.—Elias Hutchins, Sec.

NEWRY. 1904. Only one nuisance and that was removed. One case of diphtheria. As this town has but few inhabitants, and those a naturally healthy and rugged people, all contagious diseases reported in town for the last few years have come from some outside source. Being in a lumbering district, a great many men are employed at the different camps in the winter season, and coming from all over the country as they do, it seems wonderful that we have so few cases of contagious diseases.

1905. There is really no report to make as there have been no infectious diseases.—H. E. Harlowe, Sec.

NEW SHARON. With the exception of two cases of scarlet fever in 1904, we have been free from infectious diseases for two years.—L. F. Dolloff, Sec.

NEW SWEDEN. Only one case of typhoid fever in 1904; no other contagious disease in either year.—N. R. Ringdahl, Sec.

NEW VINEYARD. 1904-05. None of the infectious diseases. —W. S. Morrow, Sec.

NOBLEBORO. One nuisance removed in each year; but there have been no contagious diseases except one case of typhoid fever in 1905.—A. S. Winchenbaugh, Sec.

NORRIDGEWOCK. This town has been free from all contagious diseases for the two years, with the exception of one case of typhoid fever in 1904. The people are not particular enough

in reporting cases of measles, and whooping cough and do not, as a rule, take precautions against consumption by destroying the sputum.—Frank C. Holt, Sec.

NORTH BERWICK. 1904. Ten nuisances, reported to our board, were all removed. Three cases of typhoid fever but none of diphtheria or scarlet fever.

1905. Seven nuisances abated. Five cases of typhoid fever. We have built a new brick schoolhouse, accommodating all pupils. It has every modern improvement and sanitary arrangement.—E. P. Spinney, Sec.

NORTHFIELD. 1905. Not any of the contagious diseases this year.—V. M. Smith, Sec.

NORTH HAVEN. Two nuisances reported in each year and all of them were attended to. During the same time there has not been a case of infectious disease.—J. B. Crockett, Sec.

NORTHPORT. One nuisance reported to us in 1904, was remedied; but no cases of contagious disease occurred in either year, with the exception of two deaths from consumption, one being a non-resident. Our sanitary condition admits of almost no effort on the part of the board.—F. A. Rhodes, Sec.

NORTH YARMOUTH. No infectious diseases this year but last year we had three cases of diphtheria and one of scarlet fever.—E. D. Loring, Sec.

NORWAY. 1904. There has been a decided improvement so far as nuisances are concerned, but thirteen being reported. One case of diphtheria, three of scarlet fever and two of typhoid fever.

1905. Twenty-five nuisances, all of which were removed. One case of diphtheria and four of typhoid fever.—Dr. S. A. Bennett, Sec.

No. 8 PLANTATION. There have been no contagious diseases of any kind in this place during the two years.—Howard C. Fletcher, Chr.

No. 14 PLANTATION. As one case of typhoid fever in 1904 was the only report of any contagious trouble that has come to us during the two years, our report is necessarily brief. We are glad to note a growing interest in these matters, that so deeply concern the health and happiness of all. More care is being taken than in the past to prevent the careless spread of consump-

tion and other diseases; and we feel that the efforts of the State Board are not wasted.—Sydney W. Gray, Sec.

No. 21 PLANTATION, Hancock County. 1904. No contagious diseases.—Dana L. Jordan, Sec.

No. 21 PLANTATION, Washington County. 1904-05. Nothing infectious.—C. H. Yates, Sec.

No. 33 PLANTATION. 1904. One case of typhoid fever. In this small country place there is very little sickness and so there is no need of much work.—George H. Garland, Sec.

OAKFIELD. 1905. One case of smallpox but no other contagious diseases.—B. J. White, Sec.

OAKLAND. 1904. Nine nuisances abated. Two cases of scarlet fever and one of typhoid.—Dr. M. S. Holmes, H. O.

OLD ORCHARD. 1904. Of fifteen nuisances reported to the board, eleven were removed. Five cases of scarlet fever and three of typhoid.

1905. Twenty-nine nuisances, of which twenty-one were removed. There were two cases of typhoid fever, one proving fatal.—Albert O. Hill, Sec.

OLD TOWN. 1904. Nearly one hundred nuisances were reported to us and about seventy have been removed. Four cases of diphtheria, ten of scarlet fever and four of typhoid fever.—O. B. Fernandez, Sec.

ORIENT. 1904-05. No contagious diseases.—Daniel Maxell, Sec.

ORLAND. 1904. One nuisance abated. One case of typhoid fever.—Howard D. French, Sec.

1905. Two nuisances removed. Three cases of scarlet fever. There is some negligence in regard to reporting cases. This has been so in consumption, typhoid fever and measles occurring in town.—Dr. C. W. Brown, H. O.

ORNEVILLE. One nuisance removed in 1904 and three in 1905; bnt no contagious diseases occurred in either year.—J. S. Farnham, Sec.

ORONO. 1904. Five nuisances abated. Seven cases of smallpox, thirty-two of diphtheria and five of typhoid fever.

1905. Ten nuisances removed. Eight cases of diphtheria, three of scarlet fever and five of typhoid fever.—E. J. Kelly, Sec.

OTIS. 1904-05. We have had no cases of contagious diseases.—J. L. Salsbury, Sec.

OTISFIELD. Two cases of scarlet fever in 1904, but nothing infectious this year. We shall do the best that can be done in all cases, and I think the board is fully alive to the duty they owe the town and State and to themselves.—W. W. Hamlin, Sec.

OXBOW PLANTATION. 1905. We have done no work in our plantation this year.—John McLean, Sec.

OXFORD. 1904. Two nuisances removed. Four cases of scarlet fever and the same number of typhoid. Have not had a case of diphtheria for seven years.—Dr. H. R. Farris, H. O.

1905. Sixteen cases of scarlet fever and four of typhoid fever. We are using the permanganate process for disinfecting. —J. W. Hunting, Sec.

PALMYRA. In 1904 there was one nuisance removed and there were also three cases of diphtheria. Not anything of the kind this year.—G. W. Applebee, Sec.

PARIS. 1904. Ten nuisances removed. Four cases of scarlet fever and three of typhoid. In South Paris village, the town commenced a sewer and intends to add to it each year until it extends through the entire village.—Dr. Horatio Woodbury, Sec.

1905. Seven nuisances abated. One case of diphtheria and four of typhoid fever. We have forbidden the cutting of ice on the Little Androscoggin river, for domestic use, on account of sewage pollution.—Dr. J. G. Littlefield, Sec.

PARKMAN. 1904. Everything is well.—N. M. Cobb, Sec.

1905. No nuisances and no contagious diseases. Our town is located in a farming community, and as a rule, we have very little to do in this line of work.—E. S. Waugh, Sec.

PARSONSFIELD. No infectious diseases in 1905. Last year we removed one nuisance and there were twelve cases of scarlet fever.—Dr. F. G. Devereux, Sec.

PASSADUMKEAG. Ten nuisances removed in 1904 and six in 1905. No contagious diseases in either year.—Maurice D. Beane, Sec.

PATTEN. None of the infectious diseases in 1905; but in 1904 we had two cases of smallpox and seven of typhoid fever. —Dr. W. T. Merrill, Sec.

PEMBROKE. No contagious diseases in either year, with the exception of three cases of diphtheria in 1905.—Dr. J. C. Rogers, Sec.

PENOBSCOT. 1904. Twelve cases of scarlet fever and two of typhoid.

1905. Two nuisances removed. One case of typhoid fever. No diphtheria in town for twenty-five years.—John H. Littlefield, Sec.

PERHAM. 1904-05. One nuisance abated. No infectious diseases.—Albert A. Spaulding, Sec.

PERKINS. There has been nothing of interest in this town to report for two years.—Daniel B. Darrah, Sec.

PERRY. One case of smallpox this year. No other cases of infectious disease have occurred during the past two years.—John Humphries, Sec.

PERU. 1904. Two nuisances reported to our board, were removed. There was one case of scarlet fever.—Hollis Turner, Sec.

1905. Our board has had an easy time, as one case of diphtheria was the only report of contagious disease received.—Mandeville Hall, Sec.

PHILLIPS. One nuisance removed in 1904. Two cases of scarlet fever in 1905.—Dr. E. B. Currier, Sec.

PHIPPSBURG. 1904. One nuisance abated. Eight cases of diphtheria which infected five houses.—Dr. A. F. Williams, Sec.

1905. Three nuisances but no infectious diseases.—Dr. James W. Doughty, H. O.

PITTSFIELD. 1904. Six nuisances, all of which were removed. Nine cases of smallpox, and one of scarlet fever.—Dr. T. N. Drake, Sec.

PITTSTON. Two cases of diphtheria and one of scarlet fever in 1904. Nothing to report for 1905.—S. A. Jewett, Sec.

PLEASANT RIDGE PLANTATION. 1904. We have had none of the contagious diseases.—Sidney Berry, Sec.

1905. No infectious diseases.—Heaman Bean, Sec.

PLYMOUTH. 1904. One nuisance abated. One case of smallpox and also one of chickenpox.

1905. Two cases of diphtheria.—W. H. Condon, Sec.

POLAND. 1904. One nuisance reported. The only case of contagious disease was one mild one of scarlet fever. Houses occupied by consumptives have been thoroughly disinfected. Our board has been on the watch and every precaution taken for any and all contagion and all matters pertaining to our trust.

1905. Three nuisances, all of which were removed. We have been very fortunate this year in regard to contagious diseases, having had but two cases of scarlet fever and one of typhoid.—Martin C. Davis, Sec.

PORTER. This has been a very prosperous year with no cases of contagious diseases; last year we had only two cases of scarlet fever. Our board has been alive to the interests of the townspeople and have promptly done their duty in all cases reported. Where we used to have from twelve to fifteen cases of typhoid fever each year, now we get only two or three; all of which can be traced to efforts of the local board of health.—Dr. E. R. Chellis, Sec.

PORTLAND. 1905. Three hundred nuisances reported; all removed. One case of smallpox, one hundred and thirty-six of diphtheria, seventy-one of scarlet fever and fifty-three of typhoid fever.—W. C. G. Carney, Health Inspector.

POWNAL. 1904-05. No infectious diseases. We have done nothing of interest during the two years.—Dr. S. A. Vosmus, Sec.

PRENTISS. 1905. Five cases of diphtheria and one of typhoid fever.—Oscar Judkins, Sec.

PRINCETON. 1904. Three cases of typhoid fever. We have been using the new permanganate process for formaldehyde disinfection.—Dr. C. E. Johnson, Acting Sec.

1905. Five cases of typhoid fever which infected two houses.—Eugene M. Richards, Sec.

PROSPECT. One nuisance reported in 1905, but no contagious diseases in either year except one case of typhoid fever in 1904.—C. R. Cummings, Sec.

RANDOLPH. 1904. Several nuisances were reported to our board and nearly all of them removed. Five cases of diphtheria and ten of scarlet fever.

1905. Five nuisances abated. Four cases of diphtheria and three of scarlet fever. About 1,000 feet additional to the main sewer has been laid.—H. S. Winslow, Chr.

RANGELEY. 1904. One nuisance removed. One case of typhoid fever.—Dr. F. B. Peabody, Sec.

1905. One nuisance was reported but upon investigation, it was decided that none existed. Two cases of typhoid fever.—Dr. Mason Parker, Sec.

RANGELEY PLANTATION. 1904. No infectious diseases.—E. M. Gile, Sec.

1905. Have had nothing to do the past year.—D. E. Lamb, Sec.

RAYMOND. None of the specified contagious diseases during the two years.—Geo. M. Leach, Sec.

READFIELD. 1904. Three nuisances removed. One mild case of diphtheria and one of typhoid fever.

1905. Four nuisances abated. Two cases of typhoid fever. —Dr. W. A. Wright, Sec.

REED PLANTATION. 1904. No contagious diseases.—F. B. Staples, Sec.

1905. One case of diphtheria.—E. H. Washburn, Sec.

RICHMOND. 1904. Three nuisances abated. Four cases of scarlet fever.

1905. Nine nuisances; all removed. One case of scarlet fever and there were also nineteen cases of typhoid fever.—Dr. D. S. Richards, Sec.

RIPLEY. With the exception of four cases of diphtheria last year, there have been no infectious diseases during the two years.—A. G. Farrar, Sec.

ROBBINSTON. Two nuisances removed in 1904. No contagious diseases in either year.—Lincoln Harvell, Sec.

ROCKLAND. 1904. Fifteen nuisances, of the eighteen reported, were removed. We had one suspected case of smallpox. There were also three cases of diphtheria, two of scarlet fever and ten of typhoid.—Justin L. Cross, Sec.

1905. Ten nuisances, nine of which were removed. One case of diphtheria, one of scarlet fever and two of typhoid, one proving fatal. From May 1st up to July 1st, 250 cases of measles were reported. Three bad cases; no deaths. June 3rd, a child who was getting over measles, went out, took cold which developed into membranous croup, resulting in death. There have been a great many cases of chickenpox.—Chas. M. Titus, Sec.

ROCKPORT. One nuisance removed in 1904 and two in 1905. We have not had any cases of contagious diseases during the two years.—Dr. S. Y. Weidman, H. O.

ROME. 1905. There have been no cases of diphtheria in town for many years, and no kind of contagious disease for the past year.—A. S. Turner, Sec.

ROQUE BLUFFS. 1905. There have been no diseases.—H. E. Watts, Sec.

ROXBURY. 1905. None of the contagious diseases.—A. W. Robbins, Sec.

RUMFORD. 1904. Four nuisances removed. Four cases of scarlet fever and twenty-nine of typhoid. About two miles of sewer have been built.—Arthur E. Morrison, Sec.

1905. Twelve cases of diphtheria, five of scarlet fever and thirty of typhoid fever. Am using the permanganate process and it works very satisfactorily.—Dr. A. L. Stanwood, H. O.

SACO. 1905. Thirty nuisances; twenty-eight removed. Two cases of diphtheria, twelve of scarlet fever and five of typhoid. We have made an effort to have all houses connected with sewers and have prohibited the burial of night soil within the city limits.—Dr. Charles W. Pillsbury, H. O.

ST. AGATHA. 1904. One case of smallpox and one of typhoid fever.

1905. We have been exceptionally lucky this year, no contagious disease whatever in town.—Rev. H. Gory, Sec.

ST. ALBANS. Sixteen cases of diphtheria this year and last year one case of the same disease.—J. S. Martin, Sec.

ST. GEORGE. 1904. Not a case of contagious disease reported for the year. We have had more deaths than the average for the year past; most of them from old age and diseases which follow old age.

1905. Two cases of scarlet fever and one of typhoid.—Dr. F. O. Bartlett, Sec.

ST. JOHN PLANTATION. Two nuisances removed in 1904. There were also three cases of typhoid fever and one case of that disease in 1905.—Alseme Daigle, Sec.

SALEM. We have had none of the infectious diseases for the two years.—W. S. Heath, Sec.

SANDY RIVER PLANTATION. 1904-05. No contagious diseases.—Frank A. Hight, Sec.

SANFORD. 1904. One hundred and twenty-five nuisances reported to our board; all removed. One case of smallpox, one of diphtheria, seven of scarlet fever and forty of typhoid. A system of sewers was installed during the year of 1904. At our last town meeting an ordinance was established whereby we can compel all householders to enter the sewers at our discretion.

1905. Ten cases of scarlet fever and one hundred and twelve of typhoid fever.—Frank C. Leavitt, Sec.

SANGERVILLE. 1905. One nuisance removed. No infectious diseases. A very large percentage of our people, probably 80 or 85%, are well protected by vaccination. This board gives free vaccination at any time.—Dr. C. W. Ray, Sec.

SCARBORO. During 1904 there were no nuisances and no infectious diseases, save two cases of typhoid fever. In 1905 ten nuisances were reported to our board, and one case of diphtheria, eight of scarlet fever and two of typhoid.—Dr. Benjamin F. Wentworth, H. O.

SEARSMONT. There have been no cases of contagious diseases reported in the two years. Neither have there been any nuisances.—John Lane, Sec.

SEARSPORT. 1904. Six nuisances abated. One case of diphtheria, three of scarlet fever and one of typhoid.—Dr. H. H. Sellers, H. O.

SEBAGO. 1904. I have no report to give for the past year as our town has been free from contagious diseases, with the exception of two cases of typhoid fever.—Abram J. Ward, Sec.

SEBEC. 1904-05. None of the infectious diseases.—D. L. Annis, Sec.

SEBOEIS PLANTATION. Not any contagious disease for two years.—Chas. L. Smart, Sec.

SEDGWICK. Two cases of typhoid fever this year, and one case of the same disease last year.—Frank H. Harding, Sec.

SHAPLEIGH. 1904. There have been none of the specified contagious diseases reported.—Howard A. Stanley, Sec.

1905. No infectious diseases.—Leroy S. Patch, Sec.

SHERMAN. 1904. Four cases of typhoid fever. In the eighteen years of my service on this board, I have noticed great improvements from a sanitary point of view. Greater care is taken in regard to the healthfulness of farm, school and village premises.—Levi C. Caldwell, Sec.

1905. One case of typhoid fever. One case, reported as scarlet fever, later proved not to be that disease. Our board met in conference with the owner of the starch factory and perfected an arrangement for the carrying off of the waste from the factory which was carried out according to our directions.—L. E. Jackman, Sec.

SHIRLEY. One nuisance removed in 1905. No infectious diseases in either year.—W. W. Sawtelle, Sec.

SIDNEY. 1904. One nuisance removed. Six cases of typhoid fever.—Dr. H. L. Johnson, Sec.

SILVER RIDGE PLANTATION. 1905. We have had a small number of cases of whooping cough, otherwise no contagious diseases.—J. L. Smith, Sec.

SKOWHEGAN. 1904. About twenty-five nuisances were reported to our board and all of them have been removed. One case of diphtheria, one of scarlet fever and three of typhoid.

1905. Eight nuisances abated. Four cases of scarlet fever and six of typhoid.—Dr. W. S. Stinchfield, H. O.

SOMERVILLE. 1905. No contagious diseases.—L. W. Soule, Sec.

SORRENTO. 1904. None of the infectious diseases.—John Andrews, Sec.

1905. There was no person in this town died in the year 1905, and no person sick with any contagious disease, and to the best of my knowledge there is no sickness in town at the present time.—Allen L. Hall, Sec.

SOUTH BERWICK. 1904. Fifty-two nuisances; all removed. Two cases of diphtheria, sixteen of scarlet fever and two of typhoid.—George F. Clough, Sec.

1905. Fifty-three nuisances, all of which were removed. Three cases of diphtheria, the same number of scarlet fever and five of typhoid.—Dr. Frank A. Ross, Sec.

SOUTHPORT. 1904. No cases of contagious diseases.—Alphonso Dyer, Sec.

1905. Twenty-five cases of scarlet fever.—Wm. Cameron, Sec.

SOUTH THOMASTON. 1904. One nuisance removed. Two cases of diphtheria, four of scarlet fever and two of typhoid.—Dr. Geo. C. Horne, Sec.

SOUTHWEST HARBOR. 1905. Several complaints have been made to the board in regard to the foul odor arising from the glue factory in hot weather when they are cooking rotten or old fish heads or other parts of the fish that are thrown away by the fishermen. The odor in hot weather, when the heavy air settles down among the inhabitants, is at times almost unbearable. This place is a summer resort with two hotels and several summer cottages in the near vicinity.—Wm. R. Keene, Sec.

SPRINGFIELD. The only infectious diseases during the two years were two very mild cases of scarlet fever in 1904.—Dr. P. H. Jones, Sec.

STACYVILLE PLANTATION. 1905. Two nuisances abated. One case of scarlet fever in a mild form.—Chas. E. Morrill, Sec.

STANDISH. There has been but little for the board of health to do in this town. Two cases of typhoid fever occurred in 1904, otherwise there were no contagious diseases during the two years. One nuisance was removed in the same year.—Dr. L. O. Buzzell, Sec.

STARKS. 1904. Our town is in a very healthy condition. No sickness to speak of.—J. B. Greaton, Sec.

1905. No contagious diseases.—R. F. Waugh, Sec.

STETSON. No infectious diseases except typhoid fever, five cases occurring in 1904 and one case in 1905. One nuisance abated.—Dr. D. W. Sheldon, Sec.

STEUBEN. 1904-05. No contagious diseases.—J. V. Whitten, Sec.

STOCKHOLM PLANTATION. During the two years there have been none of the contagious diseases in this plantation.—John E. Berquist, Sec.

STONEHAM. Five cases of scarlet fever in 1905. Nothing reported in 1904.—Silas A. Stearns, Sec.

STONINGTON. 1904. Fifteen nuisances removed. Four cases of measles and two of typhoid fever. We placard ditches, hollows, back yards and such places with a sign which reads: "Any person throwing offal, rubbish or slops into this ditch (in case it does not drain away) will be prosecuted to the full extent of the law. Per order Board of Health. Note: $50.00 fine for any one molesting or removing this sign." Now when a complaint is presented us from a neighbor about another, instead of having troublesome talk with the other, we look over the nuisance and see if the complaint is justifiable, and if so, put up a sign to stop such contamination of premises at once. The State Laboratory of Hygiene has been a wonderful help to us.—Asa O. Candage, Sec.

1905. Seven nuisances removed. Three cases of typhoid fever, two of cerebrospinal meningitis and about twenty cases of measles.—Ruel B. Judkins, Sec.

STOW. One case of diphtheria in 1904 is all the contagious diseases for two years.—A. H. Seavey, Sec.

STRONG. 1904. No infectious diseases.—Dr. Charles W. Bell, H. O.

SULLIVAN. Eleven cases of typhoid fever in 1904 infected six houses. There has been no other infectious disease in either year.—Dr. F. W. Bridgham, Sec.

SUMNER. 1904. The only cases of contagious diseases were about fifteen cases of measles that occurred last summer and were confined to two or three families. None of them proved fatal. The board has not been called upon to investigate or remove any nuisances. Sumner being a very hilly town, the water for domestic purposes is exceptionally good, while owing to location the drainage from most residences is natural and free. Hardly any marshes or bogs in town which may account for absence of many contagious diseases. In fact, it is a remarkably healthy town.

1905. One fatal case of diphtheria, one case of measles and five of typhoid fever.—Sharon Robinson, Sec.

SURRY. Two cases of typhoid fever in 1904. Seven cases of scarlet fever and five of typhoid in 1905.—Dr. William E. Emery, Sec.

SWAN'S ISLAND. 1904. Eleven cases of scarlet fever.—Dr. E. S. Hawkes, H. O.

1905. Ten cases of scarlet fever.—S. G. Stockbridge, Chr.

SWANVILLE. 1904. One case of typhoid fever.—D. W. Billings, Sec.

1905. I have nothing to report as we have had no contagious diseases in town for the past year.—C. L. Walker, Chr.

SWEDEN. One nuisance removed in each year. In 1905 there were four cases of scarlet fever in a mild form and also fourteen cases of whooping cough; none fatal. We have not had a case of diphtheria in town for over twenty years.—Alvin S. Bailey, Sec.

TALMAGE. 1905. No contagious diseases.—Andrew Williams, Sec.

TEMPLE. Two nuisances and two cases of scarlet fever in 1904. Nothing reported in 1905.—H. L. Sampson, Sec.

THE FORKS PLANTATION. 1904. None of the infectious diseases.—W. S. Young, Sec.

THOMASTON. 1904. Two cases each of diphtheria, scarlet fever and typhoid fever.

1905. One nuisance abated. One case of diphtheria and two of typhoid fever.—Dr. J. E. Walker, H. O.

THORNDIKE. With the exception of two cases of diphtheria in 1904, there have been no contagious diseases during the two years.—Dr. B. P. Hurd, H. O.

TOPSFIELD. No infectious diseases in either year, save one case of typhoid fever in 1904.—John Kneeland, Sec.

TOPSHAM. 1904. Two nuisances removed. Seventeen cases of diphtheria and four of scarlet fever.—Dana S. Colby, Sec.

1905. Seven nuisances. Twelve cases of diphtheria, nine of scarlet fever and two of typhoid.—Dr. H. O. Curtis, Sec.

TREMONT. 1905. Two cases of typhoid fever in one house. —Eben B. Clark, Sec.

TRENTON. 1904. Not any of the infectious diseases.—William H. Ober, Sec.

1905. One nuisance removed. No contagious diseases.—John W. Kimball, Sec.

TRESCOTT. We have been very fortunate in escaping contagious diseases the past two years, our only affliction being whooping cough, which was quite prevalent with us in 1904, and a few cases of mumps this year.—John Saunders, Sec.

TROY. 1904. One nuisance abated. Three cases of smallpox and two of typhoid fever.

1905. One case of typhoid fever.—Dr. Mark T. Dodge, Sec.

TURNER. This year one nuisance was reported to the board but no cases of infectious diseases. Last year we had one case of scarlet fever and one of typhoid.—J. P. Waterman, Sec.

UNION. One nuisance reported in 1905. One case of diphtheria and one of scarlet fever in 1904.—Dr. L. W. Hadley, Sec.

UNITY. 1904. No contagious diseases.—Joseph Farwell, Sec.

UNITY PLANTATION. 1904. Nothing reported.—S. P. Libby, Sec.

1905. The board has not had one thing to do this year as there has been no sickness of any kind.—J. C. Grant, Sec.

UPTON. 1904. No contagious diseases.—Silas F. Peaslee.

1905. One case of typhoid fever.—J. O. Douglass, Sec.

VANCEBORO. Three cases of typhoid fever in 1904 and one case of the same disease in 1905.—Dr. S. Johnston, Sec.

VASSALBORO. 1904. Four cases of smallpox, one of diphtheria and two of typhoid fever.

1905. Seven nuisances removed. Three cases of scarlet fever and the same number of typhoid. At the beginning of the year, the local board voted to discontinue the use of the wood alcohol lamp and to use formaldehyde and potassium permanganate instead.—George H. Buzzell, Sec.

VEAZIE. 1904. No cases have been reported.—Albert D. Spencer, Sec.

1905. One case of typhoid fever.—Fred L. Pratt, Sec.

VERONA. 1904. None of the contagious diseases reported to our board.—A. H. Whitmore, Sec.

VIENNA. 1904-05. No infectious diseases.—E. N. Allen, Sec.

VINALHAVEN. Seven nuisances removed in 1904 and thirteen in 1905. The only cases of contagious diseases were two of typhoid fever in 1904.—Dr. E. H. Lyford, H. O.

WADE PLANTATION. Two nuisances removed in 1904. No contagious diseases in either year.—W. D. Dunn, Sec.

WALDO. 1904. One nuisance removed. One case of scarlet fever.—C. W. Shorey, Sec.

1905. No infectious diseases.—W. E. Harding, Sec.

WALDOBORO. 1904. One nuisance abated. Seven cases of diphtheria, three of scarlet fever and six of typhoid.

1905. One nuisance removed. Two cases each of diphtheria and typhoid fever and seventeen of measles.—O. V. Hassner, Sec.

WALES. 1904. One case of scarlet fever.—J. F. Greenwood, Sec.

WALLAGRASS PLANTATION. 1904. No infectious diseases.—Dr. A. O. Boulay, Chr.

WALTHAM. With the exception of one case of typhoid fever in 1904, there have been no contagious diseases during the two years.—M. K. Haslam, Sec.

WASHBURN. One nuisance removed in each year. We had two cases of diphtheria and one of typhoid fever in 1905. I think the experience with smallpox we had here a few years ago gives our board prestige so we have no trouble in doing our work. I have noticed that our people generally support us better in our work than they used to do before we had smallpox.—David L. Duncan, Sec.

WASHINGTON. 1904. Four nuisances removed. Two cases of diphtheria and two of typhoid fever.

1905. Two cases of typhoid fever.—B. K. Ware, Sec.

WATERBORO. 1904. One nuisance abated. Two cases of diphtheria, one of scarlet fever and four of typhoid. At the time of the cases of typhoid fever, we recommended boiling all water for drinking purposes and to a great extent the advice was heeded.

1905. One case each of scarlet fever and typhoid.—Wm. A. Follette, Sec.

WATERFORD. One case of typhoid fever in both years.—I. F. Jewett, Sec.

WATERVILLE. 1904. Thirteen nuisances removed. Ten cases of diphtheria and one of typhoid fever.—Appleton H. Plaisted, Sec.

1905. Twenty-four nuisances; all have been investigated, fourteen removed. Sixteen cases of diphtheria, one of scarlet fever and five of typhoid.—Dr. P. S. Merrill, Sec.

WAYNE. One nuisance removed this year, also one last year. No infectious diseases.—Allen E. White, Sec.

WEBSTER. One nuisance removed in 1904 and five in 1905. In the latter year there were seventeen cases of diphtheria, two of scarlet fever and one of typhoid.—James G. Jordan, Sec.

WEBSTER PLANTATION. 1904-05. No contagious diseases.—A. A. Patch, Sec.

WELD. The only cases of infectious disease during the two years were two cases of scarlet fever in 1904. The origin of the disease may be of interest. Nearly thirty years ago, an inmate of the house died of scarletina. He was an uncle of the children affected. Shortly before the outbreak, the children had been playing with his old books, playthings, clothing, etc. The rooms were all flooded with formaldehyde gas, clothing boiled, and the hair, face and hands were disinfected with bichlorid and acid carbolic. No further spread of the disease was noted. —Dr. C. E. Proctor, Sec.

WELLINGTON. Three cases of diphtheria in 1904. Nothing reported to our board in 1905 except one nuisance.—J. H. Hall, Sec.

WESLEY. 1904. There has been no occasion for the board of health to do anything the past year.—S. G. Day, Sec.

1905. No contagious diseases.—Orrin E. Day, Sec.

WEST BATH. During the past two years, the only cases of infectious disease reported to us were two of diphtheria in 1904. We hire a man from Bath to do our disinfecting. Our board keeps a close watch of everything that may become a nuisance and orders the conditions improved when needed.—C. W. Campbell, Sec.

WESTBROOK. 1904. Seven nuisances, all of which were removed. Thirty-seven cases of diphtheria, ten of scarlet fever and fifteen of typhoid.

1905. Three nuisances abated. Eight cases of smallpox, twenty-four of diphtheria, twelve of scarlet fever and twenty of typhoid fever. We find the use of permanganate very efficient and quickly done. There are special reasons why this city should own a house of detention that can be used as an isolation hospital. In the several outbreaks that we have had in Westbrook, the delay that has occurred, the cost of house rent, and the furniture that has been spoiled for want of proper storage has already amounted to enough to have built a suitable house. Our city is doing a good work in extending its sewer system as fast as possible. The secretary of the board at the present time has been a member twenty-three years. Allow me to say that the general public of this city is alive to the sanitary conditions and has always been ready to co-operate with the board in its legitimate work.—H. K. Griggs, Sec.

WESTFIELD. This board was not called upon for anything in 1904; but in 1905 we had five cases of diphtheria and one of scarlet fever.—William B. Day, Sec.

WEST GARDINER. 1904. Two cases of scarlet fever in a very mild form.—Wm. P. Haskell, Sec.

1905. None of the contagious diseases.—D. E. Merrill, Sec.

WESTMANLAND PLANTATION. One case of smallpox last year but nothing reported for this year.—Emil Carlson, Sec.

WESTON. One case of diphtheria in 1904 was the only case of contagious disease for the two years.—Varney W. Putnam, Sec.

WESTPORT. Two nuisances have been reported, one of which was removed. This is considered to be quite a healthy town. There has been only one death reported for 1905 and that was from old age. In 1904 there were four cases of diphtheria in

one family. Antitoxin was used with good results.—Thomas F. Knight, Sec.

WHITEFIELD. The people of this town have been remarkably free from contagious diseases for the past two years, none having been reported.—Marcellus Philbrick, Sec.

WHITING. One nuisance removed in 1904. No infectious diseases in either year.—J. A. Lambe, Sec.

WHITNEYVILLE. 1904-05. No contagious diseases.—Charles Bridges, Sec.

WILLIAMSBURG. 1904. We have had no contagious diseases of any kind the past year.—U. H. Sumner, Sec.

1905. Nothing reported.—A. H. Rogers, Sec.

WILLIMANTIC. One case of typhoid fever in 1904 is all we have to report for the two years.—Leslie W. Knowles, Sec.

WILTON. Two cases each of diphtheria and typhoid fever in 1904. One case of scarlet fever in 1905.—Dr. Alonzo B. Adams, Sec.

WINDHAM. 1904. One nuisance abated. Two cases of scarlet fever and one of typhoid.

1905. One nuisance. Two cases of typhoid fever.—Dr. Chas. F. Parker, Sec.

WINDSOR. Nothing was reported for 1904. In 1905 two nuisances were removed and there were two cases of diphtheria and two of typhoid fever.—C. F. Donnell, Sec.

WINN. Two nuisances removed in 1905. No infectious diseases in either year.—J. R. Cromwell, Sec.

WINSLOW. 1904. Four nuisances; all removed. Two cases of typhoid fever.—Geo. W. Patterson, Sec.

WINTER HARBOR. The removal of one nuisance in 1905, is all we have to report for the two years.—J. M. Gerrish, Sec.

WINTERPORT. 1904. None of the infectious diseases.—T. H. Sproul, Sec.

1905. No contagious diseases.—Dr. A. E. Baker, H. O.

WISCASSET. 1904. Two nuisances abated. Three cases of diphtheria.—Dr. Louis C. Bickford, Sec.

1905. One nuisance reported. Six cases of diphtheria and one of scarlet fever.—Dr. E. Leathers, Sec.

WOODLAND. One case of typhoid fever in 1904. There were no contagious diseases in 1905.—D. A. Snowman, Sec.

WOODVILLE. 1904. No infectious diseases.—Melvin L. Leavitt, Sec.

YARMOUTH. 1904. Eight nuisances, seven of which were removed. Nine cases of diphtheria, four of scarlet fever and two of typhoid.

1905. Three nuisances; two abated. Five cases of diphtheria and six of typhoid fever.—L. R. Cook, Sec.

YORK. 1904. One case of scarlet fever and six of typhoid. We had many cases of pneumonia following German measles in March and April. Such diseases are not properly respected by the public and the health boards.—Dr. Edward C. Cook, Sec.

1905. One nuisance abated. Five cases of typhoid fever. For some fifteen years, we have been looking after consumption closely, disinfecting every house. We have had only two cases in four years now, a man and wife, and do not know of any in town today. Undoubtedly we have not been able to get at every case, but we try to do so.—Dr. John C. Stewart.

HOW TYPHOID FEVER IS SPREAD.

By A. G. YOUNG, M. D., Secretary of the Board.

The demonstration that typhoid fever is a water-borne disease was a distinct advance in our knowledge of the causation of our communicable diseases. That water is often a distributor of typhoid fever is so positively established that there is no danger that it can ever be successfully assailed. Nevertheless, the collector of these notes believes that the fact that typhoid fever is often spread by water has come so to overshadow in the public mind other means by which it is communicated that the efficiency of our effort to limit the prevalence of this serious disease is much lessened. Believing this he wishes to present some of the facts and observations which indicate that the public generally, and some of the members of the medical profession even, in their teachings and in their warnings to the families under their care, should take a broader view of the means by which typhoid infection is distributed and of the scope of the required precautionary measures.

The Cause of Typhoid Fever.—It is understood nowadays by the intelligent public generally, that typhoid fever is the result of the action of a specific kind of infection—the bacillus of typhoid fever. This infectious disease never originates *de novo,* nor as the result of a cold, ordinary disturbances of the digestive system, nor even from the uses of polluted, unclean, or decaying food or drink unless they contain, or are infected by the typhoid bacillus.

Source of the Infection.—This specific infection of typhoid fever always comes directly or indirectly from previous cases of typhoid fever, usually near, but occasionally somewhat remote as regards time.

Typhoid Fever a General Infection.—Probably the generally accepted opinion is correct that the typhoid infection is, at first, a local process confined to the intestinal tract, but recent research leaves this point just a little doubtful. Upon the question o. the general diffusion of the infection through the system, or of

the frequency in which a general infection results, the teachings of even the recent editions of the text-books and of the latest observations, are hardly in accord. For instance, Professor Klemperer[1] says:

"In the circulating blood of the enteric fever patient the demonstration of the bacilli has also been possible—for example, in the blood of the veins, after blood has been removed by a syringe—but this appears to be exceptional. As a rule, the blood of the patient during life is sterile, the important road of transport of the bacilli appears to be by the lymph system."

On the other hand later investigators have found that the typhoid bacillus pervades the general circulatory system in a pretty large percentage of cases examined, and that this general infection occurs early in the course of the disease in a considerable number of cases at least.

"Dr. Ruediger[2] found that, in thirty cases of typhoid fever investigated by him, typhoid bacilli or paratyphoid bacilli were present in the blood in the earlier days of the disease. The differential diagnosis between the typhoid and the paratyphoid bacillus cultivated from the blood is easy, and the demonstration of the bacilli in the blood is comparatively simple."

Dr. Von Drigalski, a brigade surgeon at Kassel, Germany, and one of the men who is taking an active part in the advanced work in that country in the control of typhoid fever says:[3]

"By the way of the mouth only the bacillus of typhoid fever reaches the organism of its victim and implants itself usually, if not invariably, in the intestinal tract from which it pervades the whole system so that generally the bacilli may be found almost everywhere, particularly in the liver, the bile, in the lungs even when there is no apparent pulmonary disease; almost constantly in the mucus membrane of the stomach, in the esophagus, frequently on the surface and in the depths of the tonsils, and occasionally from the tongue successful cultures of the typhoid bacilli have been made. In the intestinal tract, they are more plentiful where the specific pathological changes have not occurred, the most plentiful in the duodenum, while they may be present only sparingly or not at all in the parts of the colon where the swollen and ulcerated glands are present. What a mass of typhoid bacilli are produced in the diseased body is

1. Modern Clinical Medicine, Edition of 1905.
2. Tr. Chicago Pathol. Soc.—*Centr. für Bak.*, XXXIII., 291.
3. *Deutsche Viert. f. öff. Ges.*, XXXVIII., 22, 1906.

almost incredible. There is hardly a secretion or excretion of the patient which does not contain the germ. In the perspiration, however, it has not as yet been demonstrated with certainty."

J. L. Hirsh,[1] Professor of Pathology in the University of Maryland, with the aid of two assistants, examined the blood in 100 cases of typhoid fever and found bacilli present in the circulating blood in 78 and absent in 22 cases. The largest number of positive findings were in the second week of the disease, but in 16 cases examined during the first week, 12 were positive. His conclusions are that the bacillus typhosus is present in the circulating blood in every case of typhoid fever some time during its course; that the bacilli invade the blood very early in the disease; and that they usually disappear from the blood by the end of the third week.

Hirsh opens his paper by saying that "the views regarding the nature of typhoid fever have undergone considerable changes in recent years. While this was formerly considered as an intestinal disease, or as a disease with especial localization in the intestinal tract, the modern conception regards it as a true septicemia. Instead of local lesions in the intestines with subsequent blood infection, the organisms of the disease are first conveyed to the general circulation and the intestinal lesions, when present, are to be regarded as the secondary changes."

Auerbach and Unger[2] in their investigations as to the presence of the typhoid bacillus in the blood of typhoid fever patients, obtained it from the blood in seven out of ten cases in which a definite clinical diagnosis had been made.

In twenty-eight cases of typhoid fever, all severe cases, Courmont and Lesieur[3] succeeded in showing the presence of the typhoid bacillus in the blood by inoculating from 2 to 3 c. m. of blood into 250 c. m. of bouillion. They succeeded thus in making cultures of typhoid bacilli from the first day to the third week.

How is the Infection Excreted?—If typhoid fever is so frequently a general infection, it suggests that the range of possible danger extends to a larger number of the excretions from the

1. *Jr. of Am. Medical Assoc.*, XLVI., 1922. 1906.
2. *Deutsche Viert. f. öff. Ges.*, XXXIII., 142 1902.
3. *Deutsche Viert. f. öff. Ges.*, Sup., XXXVI., 148. 1905.

typhoid patient than it has been usual to take into account in our regulations designed to prevent the spread of the infection. While we are still to consider the discharges from the bowels as the main source of infection, other excretions require thorough disinfection or destruction.

In the report of Drs. Reed, Vaughan, and Shakespeare, constituting the commission appointed to investigate the prevalence of typhoid fever in the U. S. military camps in 1898, the following opinions are expressed:

"The stools of individuals sick with typhoid fever constitute the most important source for the spread of this disease, and it may be stated in a general way that typhoid fever is due to the transference of some part of the feces of an infected individual to the alimentary canal of one susceptible to this infection. This transference in exceptional cases may be quite direct, as when a careless nurse soils her hands with the dejections from her typhoid fever patient and eats her food without disinfecting her soiled fingers. Generally, however, the transference is more indirect and the germs in the infected stools may multiply through many generations and be transported by water or otherwise through considerable distances. Moreover, as has been indicated already, the bacilli may pass through an intermediate host, which may be man or one of the lower animals. An immune individual may visit a distant city, the water supply of which is infected with the typhoid bacillus, and he may carry this infection to his village home, where it may be deposited in his normal stool, may find its way into the local water supply, and cause an epidemic of the disease.

"It should be borne in mind that typhoid stools are infectious often before the individual shows any evidence of the disease. In other words, the stool of a man in the incubation period of typhoid fever may be laden with the bacilli of this disease. In this way every latrine in an encampment may be infected with the specific micro-organism of typhoid fever before the disease has developed sufficiently in the individual to be recognized clinically. On the other hand, the stools may continue to be infectious long after convalescence has set in. So great is the danger of the spread of this disease from infected stools that in all cases where fecal matter can not be removed by water carriage, or otherwise, from immediate proximity with human habitation, all stools, those of both sick and well, should be thoroughly disinfected."

The most significant result of recent investigations is that the urine of typhoid patients frequently contains the typhoid bacillus in enormous numbers, and that such persons, disseminators of infection, may constitute serious sources of danger far into the

period of convalescence and even sometimes until long after the recovery of the patient appears to be complete.

A further significant fact is that the expectoration of the typhoid fever patient may be dangerously loaded down with the bacillus:

"In 1890, Neumann demonstrated typhoid-bacilli in the urine of 11 out of 48 cases examined. His results were received with some skepticism, however, and received no confirmation until Petruschky, in 1898, published the results of cultures from the urine in 50 cases, with isolation of B. typhosus from 3. Later, Richardson obtained the bacilli from 23 out of 104 cases examined—22.1 per cent.; and Horton-Smith obtained them from 11 of 39 cases, 28 per cent.—the urine containing at times as many as 50,000,000 organisms in each cubic centimeter. During the past year, 1900-1901, from the urine of 55 typhoid fever patients in the Johns Hopkins Hospital the typhoid bacilli were isolated in 19 cases." [1]

Richardson[2] found that typhoid bacilli may remain in the urine for weeks and months, thus exposing to danger persons in the neighborhood of the convalescents. In the expectoration of typhoid fever patients with lung complications the typhoid bacillus is present in the sputum, together with the pneumoccus and the influenza bacillus. The urine and the expectoration of typhoid patients must therefore be carefully disinfected.

Stefanalli and Cumbo[3] studied twenty-one cases of typhoid fever and for each case a bacteriological examination of the urine and blood was made, and the Widal test was employed. From this study they conclude that the typhoid bacillus may be found in the urine at any time in the course of the disease whether it contains albumen or not. They thus found the bacillus in 30 per cent. of the cases. Its presence may be transitory or last through the whole course of the disease.

According to Schuzer,[4] in 599 cases of typhoid fever the typhoid bacillus was found in the urine in 177 cases, or in 29.5 per cent. of them.

Burdach[5] found the bacillus in 10 of 25 typhoid fever patients and he refers to the investigations of other observers upon 360

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1. Typhoid and Typhus Fever, Nothnagel's Ency. of Pract. Med. p. 34, 1902.
2. *British Medical Journal*, Feb. 5, 1903.
3. *Rivista Crit. di Clin. Medica.*
4. *D. Viert. f. öff. Ges.*, XXXIV., 153. 1903.
5. *Zeit. f. Hygiene*, XLI., 305, 1902.

patients, in 129 of whom or in 33%, the bacillus was present in the urine.

The urine, says Drigalski,[1] may be entirely clear and normal in appearance and yet contain an abundant quantity of the typhoid bacilli, and the dejections which appear to be entirely normal may contain the infection until long into the period of convalescence. At the time particularly when the clinical convalescence is progressing and appetite and digestion are again restored, the excretions of the typhoid bacilli are particularly frequent and plentiful, so that the bacterial flora of the stools sometimes consist of a pure culture of the typhoid bacillus.

Naturally the frequency of this phenomenon varies, and fortunately not every convalescent is such a source of new infections. I have found the bacillus present in the excretions of the patient in 15% of the cases in the first 5 days; in 11% still present after 8 or 10 weeks; in 4% longer than 3 months. For the reason that the convalescent is frequently excreting the infection after he has resumed his ordinary life and is in close communication with others, he is particularly dangerous to his associates.

Houston[2] reported a case of cystitis of three year's standing due to the infection of the bladder with the typhoid bacillus. An interesting point in this case is that the patient never had typhoid fever, but had nursed cases of that disease.

In Jehle's[3] examination of the expectoration of typhoid patients he found the bacillus present in nine out of fifteen cases. In all these cases typhoid was complicated by bronchitis or broncho-pneumonia. The typhoid bacilli existed in pure culture in 2 cases, in 4 cases they existed very numerously, in 2 cases they were associated with the influenza bacilli, and in 1 case with diplococci and streptococci.

The results of the examination of the bronchial mucus were as follows: In 5 cases in which there existed hæmorrhagic infiltration of the lungs the typhoid bacilli were found 4 times. In 6 cases with simply a congested condition of the lung tissue the presence of typhoid bacilli were proved 4 times.

Numerous observations have shown that the typhoid bacillus retains its vitality for a long while when enclosed in the inflamatory exudates which are the result of its action in various parts

1. *Deutsche Viert. f. öff. Ges.*, XXXVIII., 23, 1906.
2. *British Med. Jr.*, 1899, I., 78.
3. *Wiener Klin. Woch.—Public Health*, XIV., 630, 1902.

of the body, for instance, in purulent collections in periostitis, abscesses of the muscles and elsewhere, in cystitis, but these exudates are infrequent sources of infection. The main and the most frequent sources of supply of infection are the discharges from the bowels and the urine, and next to those the sputum, particularly where there are indications of pulmonary involvment.

Life of Typhoid Infection Outside the Body.—The life history of the bacillus of typhoid fever after it leaves the human body, its power of resisting adverse influences, and of retaining its vitality, have been the subjects of an immense amount of patient and careful investigation. Briefly stating some of the results, it may be said that direct and unobstructed sunlight rapidly destroys the life of the bacillus, but its power of resistance is greater than that of many other pathogenic micro-organisms, or, partly protected from its action, it perishes more slowly. Drying is not so rapidly destructive of its vitality as was formerly assumed. Dried in the dark it remains actively viable many days. It easily survives any degree of cold found in nature and remains uninjured by repeated freezings and thawings. By heat Sternberg found that the typhoid bacillus is destroyed at the temperature of 140° F., and Bessenge confirms this statement when this temperature is continued five minutes. Under the conditions of the outer world, the various other bacteria found under natural conditions in water, in the soil, etc., inhibit the growth of the typhoid bacillus or cause it to disappear. Even when exposed to the competition of the bacterial flora in natural waters, its survival of a few days to a month or more confirms the observation of epidemological study as to the danger from water infected with this specific bacterium. In the polluted soil around houses or out-buildings, the infectivity of the typhoid germ may continue some months at least. It finds a congenial culture fluid in milk, and, in the laboratory, the bacteriologist secures a rapid growth of it upon the cut surface of a boiled potato. Upon clothing and in rooms the infection may persist for a long time under favorable conditions, such as frequently pertain to fabrics and dwellings.

All those facts call for careful, intelligent measures for safeguarding human environments from being seeded down with the infection of typhoid fever.

How May Typhoid Fever be Contracted?—In the investigation of the sources of infection in outbreaks of typhoid fever, and of the means through which the infection reached its victims, the search, if intelligently made, cannot be confined to a few long-accepted ways in which the infection may have been received. The investigation must be comprehensive enough to include all of the methods of transmission which recent research has shown are probable or even only possible.

In the following notes which indicate some of the methods by which typhoid fever is spread, there is no attempt to enumerate them in the order of their importance. To arrange them thus would be somewhat difficult. While the medical profession generally holds the opinion that infected water is the most frequent cause, the experience of some health officers leads them to give infected milk a very high rating as a mdium for the distribution of typhoid infection. Again, competent observers have found that, for their localities, and in the communities in which they have made their observations, "contact infection" has manifestly been a leading factor.

The arrangement which follows is that of presenting first and prominently some of the epidemic factors of typhoid fever which have until recently received but scant attention in this country.

Contact Infection.—There is developing a close parallel between the three chief enteric epidemic diseases—typhoid fever, Asiatic Cholera, and dysentery. That will be shown in the appended "Notes on Dysentery and Cholera." While their epidemic extension through the medium of polluted water has long been recognized, their spread from person to person as contagious diseases, or by "contact infection" has received too little attention.

In the report* which was made on the prevelence of typhoid fever in the U. S. military camps at the end of the Spanish War in 1898, by the very competent commission (Drs. Reed, Vaughan, and Shakespeare) appointed to investigate the matter, are found the following:

"Camp pollution was the greatest sin committed by the troops in 1898." * * * "Infected water was not an important

* Abstract of Rpt. on the Origin and Spread of Typhoid Fever in U. S. Military Camps During the Spanish War of 1898. pp. 179-183.

factor." * * * "It is more than likely that men transported infected material on their persons or in their clothing and thus disseminated the disease. We have condemned the method which was followed in many of the camps of detailing men from the ranks to act as orderlies at the hospitals. In some of the commands it was customary to detail 100 or more men from the line every morning. These men went to the hospitals, handled bed pans used by persons sick with typhoid fever, and at night returned to their comrades. The most of these men were wholly ignorant of the nature of infection and the methods of disinfection. In fact, at one of the division hospitals we saw orderlies of this kind go from the hospital and partake of their midday meal without even washing their hands. These men handled not only the food which they ate, but passed articles to their neighbors. It seemed to us that a more certain method for the dissemination of an infectious disease could hardly have been invented."

The medical division of the office of the Prussian War Department* has published a work which presents the prevailing opinion at the present time among the leading authorities upon the subject of typhoid fever in military experience. This pamphlet states that great epidemics of typhoid fever are due to the fact that many men are exposed to the bacilli which are excreted by the sick. Most frequently drinking water is the medium through which infection is conveyed, in many cases, however, food which has been infected with the excretions of the patient is the medium of communication. The communication of the infection often occurs as the result of personal association with the sick. The infectious material may be conveyed by the clothing, bedding, by various utensils and articles which have come in contact with the sick. The rooms formerly occupied by typhoid fever patients may be infected so as subsequently to communicate infection to other persons. The spread of the disease is also favored by the pollution of the surface of the ground with typhoid discharges and by the want of local cleanliness. The early recognition of the first cases of typhoid fever which occur is emphasized as offering the possibility of preventing the further spread of the infection. Quarters that have been vacated by the sick should be thoroughly disinfected, and the clothing of the patient and all the articles used by him must undergo efficient disinfection.

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* *Deutsche Viert. f. öff. Ges.*, XXXIII., (Sup.), 154. 1902.

A discussion on typhoid fever before the German public health association in September, 1905, brought out some interesting points in regard to contact infection.*

Drigalski said: "Epidemics of typhoid fever due to contact are slow in their course. There is a gradual rise and fall in the curve of prevalence which differs from the suddenness of the outbreak when the infection is referable to an infected water or milk supply. In the latter case there is usually a sudden rise and a sudden fall with a smaller prevalence of the disease due to contact infection."

Springfeld states: "Exacerbations of the typhoid fever curve which may appear periodically or irregularly are due in a great majority of cases to massive infection. The single cases of infection are due either to importation or to secondary infections following the original infection. In industrial centers the imported cases are not more than 10% of the total. The single infections (contact infection) usually occur 4 weeks after the primary case and usually in the vicinity of the house where the first case has occurred or upon the same street. In due time the third series of cases may occur, and thus the prevalence of the disease may be continued, case linked with case, chainlike."

The following interesting statement of opinion and of fact was made by Professor Fischer of Kiel: "A great number of cases of typhoid fever are due to contact infection. Infection in this way comes most frequently to the persons who care for the sick and quite a per cent. of the cases under my observation have been among trained nurses. In Kiel, for example, we had in the latter half of the past year only 50 cases of typhoid fever. Five of the hospital nurses contracted the disease. In the preceding year one of the sisters engaged in the care of a typhoid patient took the disease. Two of these sisters died. It is possible that even these trained nurses were not careful enough. That was shown in the case of one, but with the others there was no reason to assume that this was true. Our experience leads to the conclusion that it is difficult in the care of these cases to avoid the danger of contact infection.

"I wish emphatically to state that it is not only in private houses that contact infection occurs, but in hospitals as well, where every precaution is supposed to be taken through disin-

* *Deutsche Viert. f. öff. Ges.*, XXXVIII., pp. 22-65. 1906.

fection of the discharges and otherwise to avoid the danger; and here is a point which I would suggest: whether we should not give the nurses who are thus endangered a protective inoculation. It is true that our experience in regard to this method of immunization is not great, but the question may be raised whether, when persons are especially endangered, it may not be desirable thus to seek to protect them. There are other conditions under which I may be allowed to suggest the desirability of protective inoculations. I remember one outbreak which occurred this year. In a factory in which about 200 men and women worked within a short time, 30 cases of typhoid fever occurred. We were obliged to discharge these patients from the hospital at the earliest date. The hospital was full and it was impossible to retain them longer. There was nothing else to do but to discharge them and let them take their places again in the factory. In this instance a protective inoculation would have been in place."

Professor Griesbach remarked: "In the discussion before this Association we have heard that virulent typhoid germs may be discharged from the organism weeks after convalescence. Further it is easily possible that children who are suffering with suspicious gastric or intestinal symptoms and disease of respiratory organs, and are at the same time attending school, may be transmitters of typhoid fever. The disease may be transmitted through the medium of drinking cups in common use by the children, or through the clothing, by means of books, or otherwise.

"School teachers and directors of schools should in all cases be promptly notified of the appearance of typhoid fever in any of the families in which children live who attend their school. It should then be the duty of the school physician to keep the pupils under observation who have associated with persons who may be the transmitters of typhoid fever. When children present symptoms a bacteriologic investigation of these people is emphatically required, and the children from the families in which there are cases of typhoid fever should be permitted to reenter school only after they have been under the observation of the physician and have been under bacteriologic control."

Dr. Demuth said: "The history of an outbreak of typhoid fever which I will narrate has, I think, the value of a scientific

experiment. In a large ward in a hospital there occurred successive cases of typhoid fever in spite of the strictest precautionary measures against accidents of this kind. We were at first unable to discover any cause for these cases. An appeal was made to the Director of the Bacteriological Station to make an investigation. The result was that he found two patients in this ward who, in their excretions, were giving off typhoid bacilli. These two patients were isolated and thereupon the recurrence of the cases of typhoid fever ceased suddenly. Two nurses were constantly employed in this ward, and this outbreak of fever in the ward was felt the more keenly because every new nurse who had been sent to this ward, six altogether, took the disease. The two patients, carriers of infection, who were isolated were put in charge of a nurse who had previously had typhoid fever. In the course of the summer this nurse left and a new nurse, assigned to duty in the barracks where these two patients were still isolated, came down with typhoid fever in three weeks. After a year had passed both of these carriers of infection were still excreting typhoid bacilli."

Dr. Bestelmeyer, a surgeon on the general staff of the Bavarian Army, stated emphatically in this discussion: "The people generally should be taught that typhoid fever is directly infectious, from person to person, and they must also be taught the danger of infection from impure water and infected milk."

Professor William T. Sedgwick of Boston, who is widely known among other works for his distinguished ability in investigating outbreaks of typhoid fever, wrote the following words in relation to the spread of typhoid fever in Bondsville, Mass., a manufacturing village where water-borne and milk-borne infection was excluded:

"Children abound; and, as there are no fences, and because it is the custom, they mingle freely, playing together and passing from house to house. The families are of that grade in which food always stands upon the table; meals are irregular except for those who must obey the factory bell. The children play awhile, then visit the privies, and with unwashed hands finger the food upon the table. Then they eat awhile, and return to play. Or, changing the order of things, they play in the dirt and eat and run to the privy, then eat, play, and eat again, and this in various houses and in various privies. For them, so long as they are friendly, all things are common,—dirt, dinners and privies; and to illustrate exactly how secondary infection

may go on, I may describe in detail one case which I personally witnessed. A whole family (of six or more) was in one room. Four of them have the "fever." Two of these were children in the prodromal stage. A table stood by the window covered with food, prominent among which was a big piece of cake. It was early September, and a very warm day; but every window was shut and the odor was sickening. Flies innumerable buzzed about resting now on the sick people, now on the food. A kind hearted neighbor was tending the baby. By and by one of the children having the fever withdrew to the privy probably suffering with diarrhoea, but soon returning, slouched over to the food, drove away some of the flies, and fingered the cake listlessly, finally breaking off a piece, but not eating it. Stirred by this example, another child slid from his seat in a half stupid way, moved to the table, and, taking the same cake in both hands, bit off a piece and swallowed it. The first boy had not washed his hands, and if the second boy suffered from secondary infection, I could not wonder at it.

"This was one case; but I have seen so often the table of food standing hours long in the kitchen and serving as one station in the dirty round of lives like these, that it is easy for me to understand how dirt, diarrhœa and dinner too often get sadly confused. Personal filth is apparently the principal agent of secondary infection.

"Thus far I have not even touched upon one feature of the life of this little community, which deserves careful consideration. There was for most or all of these houses a sewer connection for the sinks but not for the privies. Much, perhaps most, of the garbage found its way into the privies. These had been obviously in bad condition, and, from some, filthy streams ran down between them and the houses. In and around these streams the children played. Given any original imported case, the infection might easily have reached these trickling streams. Children's fingers might thence carry the germs to the food, and thus the journey of the germs from one living intestine to another be completed. Or, again, given in such a community an imported case and no disinfection, as was the condition here at first, the importer while in the early stages handles with unclean hands food for others; or the clothing of such a person gets infected and is handled; there need be then no difficulty in completing the history. It follows as a matter of course." *

Finger Infection.—That the fingers of persons attending cases of typhoid fever are, without intelligent cleansing and disinfection, dangerous to their owners and to other persons, is indicated in some of the preceding, and more pointedly in the following quotations.

* 24th Annual Report of State Bd. of Health of Mass. p. 736. 1892.

"With reason," Drigalski remarks, "work with the typhoid bacillus is considered one of the most dangerous kinds of laboratory work. If for years we remain unaffected while doing this kind of work, we may thank the efficacy of the sublimate washing. We have not to fear inoculation through the hands as when working with plague infection. The typhoid organism infects only by the way of the mouth."

In an epidemic of typhoid fever in Springfield, Mass., investigated by the local board of health and by Dr. Magrath,* assistant secretary of the State board of health, it was found that the regions where the cases were the most numerous were those occupied by the poorer, and in many cases, the poorest people in the city. Cases followed no line of water distribution, and there was no reason to incriminate either the milk supply or the ice supply. A close study of all the conditions led to the conclusion that the main factors in the spread of the disease were the many peddlers of fruit and vegetables. It was ascertained that in a number of instances cases of typhoid fever had been present in the families of these small venders themselves, and the conclusion was that the infected material being present on the hands of any persons, these venders or others handling bread or fruit, or vegetables to be eaten uncooked, the transferrence of the infection to those articles of food would be an easy matter. In addition to the means of spread here outlined it was thought that there had in all probability been operative locally in the spread of this epidemic transmission by means of flies. It is certain that in particular localities conditions existed favorable to spread by this means: open vaults, broken windows, domestic uncleanliness, coupled with the occurrence of cases of the disease, furnishing all that was required for such transmission.

In the discussion of the paper by Dr. Magrath, Prof. Sedgwick said that: Of course, hand to hand, and finger to finger, and mouth to mouth spreading is one way in which the slow and insidious spread of typhoid fever can be done. He referred to his experience in Bondsville in 1892, in which case he attributed the transmission of the disease very largely to the filthy handling of food and to the playing of children in filthy gutters which had been infected from houses having cases of typhoid fever in them.

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* Am. Jr. of Public Hygiene, XV., 467. 1905.

In another place, Professor Sedgwick and Wilson* say:

Food, fingers, and flies offer an alliterative summary of the most common agents. The one thing upon which we can fix our attention with certainty is the common point of departure. Every germ of typhoid fever, whatever its subsequent history, originates in the body of a typhoid patient and leaves it in the excreta. Every case of typhoid fever is due to the presence of excreta on food or fingers, or in some other place where excreta should not be. Filth is the fundamental condition for the spread of typhoid fever; cleanliness the universal panacea for its eradication.

One fact which stands out with especial clearness the longer we study the subject is that in spite of all that may be, and has been, said to the contrary, typhoid fever is a contagious disease. Instead of saying, as is often said, that "typhoid fever is infectious, not contagious," we need to say to-day that "typhoid fever is both infectious and contagious;" and, doubtless, it is in part for this very reason that it has been found so difficult to exterminate.

Transmission by Clothing.—"When a command badly infected with typhoid fever changes its location it carries the specific agents of the disease in the bodies of the men, in their clothing, bedding and tentage. This is shown by the fact that when commands changed location, leaving behind them all their sick, and when they went to places free from the infection the disease continued with them. Even an ocean voyage does not relieve an infected command of its infection. This was shown in the study of the various commands that went to Cuba and Porto Rico. After a command becomes badly infected with typhoid fever changes of location, together with thorough disinfection of all clothing, bedding, and tentage is necessary." †

The *British Medical Journal* gives the following as the "real facts" in regard to an outbreak of typhoid fever which occurred on board the training ship "Cornwall:"

"Ten cases of typhoid fever having occurred on the training ship 'Cornwall' early in April, an investigation into its origin was duly undertaken; and as no other cause was found, attention was at last directed to certain blankets recently taken into use. Stains on them awakened suspicion, and examination by Professor Klein, F. R. S., proved that the blankets were swarming with typhoid bacilli in an active condition. The blankets

* Jr. N. E. Water Works Assoc., XX., 51, 1906.

† Report on Typhoid Fever in U. S. Military Camps during War of 1898, p. 185.

in question had been offered to the authorities of the ship at an unusually low rate and as the sample submitted was good, a considerable number were at once bought. All the blankets concerned were army blankets, and the question that next arose was how they came to be upon the market at all, whether clean or unclean."

Apparently a very large number of blankets—many thousand—which had been used by the British troups in South Africa in hospitals and elsewhere were sold by the government, it is said at the vile price of five cents apiece, and in due course found their way to London, and were widely scattered.*

Curschmann narrates the following incident: †

"A number of years ago the following instructive experience occurred to me: A young merchant living in middle Germany, who was accustomed to send a portion of his clothing and linen to his home in Hamburg to be laundered, continued this practice when attacked with "gastric fever." Ten and twelve days respectively after the sister of the patient and a servant had washed the linen, they became ill, the one with a mild, the other with a severe attack of typhoid fever. That the brother had also suffered from the same disease was unfortunately demonstrated by autopsy, death occurring from copious intestinal hemorrhage in the course of an apparently mild attack."

"In 1886 a woman who had been called to one hamlet to nurse her children returned to her home, was taken sick with typhoid fever and communicated the disease to her nurse, and subsequently fifty other cases developed which could not be traced to soil pollution or infected water supply. From this locality three children were admitted to the hospital at Bonn; here four persons were attacked who had come in direct contact, and five washer women who had come in indirect contact, i. e., through the clothing and linen of the patients." ‡

In the German army barracks various instances have developed indicating that typhoid fever has been spread by clothing. In one of the barracks typhoid fever had for a long while been present. Suspicion finally fell upon the bed linen and clothing. It had been discovered that three of the recent cases who had used the clothing had been attacked with typhoid fever and the linings of the trousers were almost without exception soiled with dried fecal matter. The clothing was submitted to a thor-

* Boston Medical and Surgical Journal, CXLVIII., 649. 1903.

† Nothnagel's Encyc. of Pract. Med.—Typhoid Fever Volume, p. 55.

‡ Rpt. St. Bd. of Health, Iowa. 1897, p. 148.

ough cleansing and disinfection. From that time on no more cases of typhoid fever appeared.

In a second history of typhoid fever in one of the German barracks the same results, complete cessation of the prevalence of the disease, followed a thorough disinfection of the clothing.

That the bacillus of typhoid fever, dried upon ordinary fabrics, retains its life for a long while is evinced by experience and experimental investigations.

Heim* found that typhoid bacilli on silken threads retain their vitality 213 days in the dark.

At the conclusion of his experimental work for the purpose of determining the power of resistance of the typhoid bacilli against drying and the possibility of their transportation through the air in a virulent form, Prof. Uffelmann† sums up his results as follows:

The typhoid bacillus remains alive and virulent for at least 21 days; in white sand for at least 82 days; in dirt for more than 30 days; on linen from 60 to 72 days; on "buckskin" from 80 to 85 days; on wood for at least 32 days.

The conditions and the results of these experiments teach that typhoid bacilli resist for a considerable time the influence of a continued drying when the action of sunlight is excluded. They teach also that viable and virulent typhoid bacilli in the dust or filth from the ground, houses, the streets, and clothing may be transported through the air so as to infect milk and other articles of food. The possibility of the transportation of infection through the air must therefore be acknowledged. It is questionable, however, whether the infection can come through the respiratory organs, but probably may through the mouth by being swallowed.

Typhoid Houses.—It has been observed that typhoid fever has recurred successively at intervals of months or years in certain houses. In some of these houses the explanation is that the typhoid bacillus has retained its vitality a long while, sometimes in rooms which were not disinfected after the earlier cases, and sometimes in polluted grounds from which nearby springs or wells have received drainage. A new explanation

* Zeit. f. Hyg., L., 123. 1905.

† Centr. f. Bak., XV., 133. 1894.

for some of these outbreaks is that persons in these houses who had typhoid fever continue for a long time to give off the infection in their excretions.

"In these cases of long continued excretion of typhoid bacilli," says Drigalski, "it is not necessary to look for pathologic changes in the organs. The continuous excretion of the infectious germs sometimes continues in persons who are entirely free from all signs of disease. These observations of mine date back to the beginning of 1903, and in two years I have found in 900 cases of typhoid fever 300 persons, 33% of the whole, who continued to excrete the typhoid bacillus for a period of time longer than ten weeks. In one case it continued for a year and a half almost in pure culture in the urine; in one, for more than nine months; in two, more than seven months; in one, six months; and in seven cases, more than three months."

That the floors, furniture and bedding of barracks may become infected and continue to be infective for a long time has been shown in the experiment of some of the European army surgeons. An instance is a report made by Chour, a Russian medical officer:

Two regiments of infantry stationed at Jitomir and using the same water supply were unequally affected with typhoid fever. One showed a sickness rate of 9.6 per 1,000 in 1885, and 3.2 in 1886 from that disease. The other regiment had at the same time a typhoid morbidity rate somewhat greater; one company particularly was severely affected in 1886. There were 14 cases of typhoid fever among the ninety men. This intensive prevalence in this company suggested the idea of a localized cause of some kind in the room where the men were lodged. In December, 1886, the quarters occupied by this company were evacuated and an energetic disinfection of the walls, floors, clothing and bedding was carried out. After the execution of these prophylactic measures, the company again occupied its quarters. The typhoid sickness rate was reduced to 1.7 per 1,000 in 1887 and there were no cases whatever in 1888. Now it developed that during the same period of time in those rooms of the barracks which had not been submitted to disinfection, typhoid fever persisted and gave a sickness rate of 22 per 1,000 in 1887, and 33 per 1,000 in 1888. This remarkable disappearance of typhoid fever in the rooms which had been carefully disinfected and its persistence in those others which had not been disinfected, confirmed the theory of a local cause.

The rooms were immediately evacuated and the men were quartered in the woods in the vicinity of Jitomir. Three cases appeared among the men within the period of incubation of

typhoid fever, but after that and the disinfection and renovation of the rooms, the epidemic was extinguished.*

Referring to typhoid houses Schlegtendal† narrates the following history:

"In a farmhouse each new servant who came to the house came down with typhoid fever, as also all the children who were born in this house had the disease during their childhood. How long back this recurrence of cases of typhoid fever had occurred in this house is unknown. There was a failure to discover any conditions which offered a solution to the cause of the continued presence of typhoid fever. In the nineteen cases which he records the interval between the succeeding cases varied from two months to five years."

Typhoid Distribution by Flies.—In the report‡ on typhoid fever in the military camps in 1898, flies we are told, undoubtedly served as carriers of the infection. Flies swarmed over the infected fecal matter in the pits and then visited and fed upon food prepared for the soldiers at the mess tents. In some instances where lime had recently been sprinkled over the contents of the pits, flies with their feet whitened with lime were seen walking over the food.

It is possible for the fly to carry the typhoid bacillus in two ways. In the first place, fecal matter containing the typhoid germ may adhere to the fly and be mechanically transported. In the second place, it is possible that the typhoid bacillus may be carried in the digestive organs of the fly and be deposited with its excrement.

Dr. Pötter,§ medical officer of health of Chemnitz, Germany, told of an outbreak of typhoid fever which appears to have been due to transmission of infection by flies.

"While in Leipzig there was a tenement house in one of the suburbs of Leipzig in which in rapid succession eight cases of typhoid fever were reported all which occurred in one-half of the house. There were two tenements on each floor. In the two tenements on the north side of the house the typhoid fever occurred. In the tenement in the other end of the house there was not a single case. Each tenement had its own privy. In the tenement in which the cases of fever were found the privy was located just off from the kitchen. For the tenement in the

* Traite de Medicine, II., 51, 1899.

† Zeit. f. Med. Beamte, XVI., 641, 1903.

‡ Report of Drs. Reed, Vaughan and Shakespeare.

§ *Deutsche Viert. f. öff. Ges.*, XXXVIII., 64. 1906.

other end of the house there was no direct communication between the privy and the living-room. When the cover of the privy in the north part of the house was opened a swarm of flies always came up. Some of the flies were sent to Prof. Fischer in the laboratory of the Hygienic Institute of Leipzig, and typhoid bacilli were found in these flies in large numbers. His investigation showed that the typhoid bacilli which had been eaten by these flies retained their vitality for a period of twenty-three days.

Dr. A. W. Martin,* medical health officer of Gorton, England, referring to figures which he gives relating to diarrhea says that they give every indication that there is a cause operating during the warm months of the year and which is absent during the colder parts. "Since 1898 I have tried to show year by year in my annual reports, the connection between this disease and the domestic fly. A hot, dry summer produces an abundance of flies and diarrhea makes its appearance in about a week after the flies appear in large numbers. The diarrhea sickness fluctuates and keeps pace with the temperature of the atmosphere, which is much influenced by the rainfall, and also the number of flies keep pace with the temperature of the atmosphere and the rainfall. The atmospheric changes are but secondary cuses in the producing of the disease, namely as influencing the appearance and disappearance of the common house fly, and also as affecting their numbers. During the summer a privy vault was examined at the house of a typhoid case; the flies were hanging in bunches and wading and sucking up the liquid excreta, flying directly into the kitchen, into milk vessels, and onto food exposed on the table."

In a report made by a committee of experts appointed to investigate the source of infection in an outbreak of typhoid fever in the jail of New Haven county, Connecticut, it is stated that typhoid attacked only the prisoners, twenty cases in all.

Neither did they find any evidence that the character or quality of the food in itself was chargeable with the outbreak. They found, however, that the food was sometimes exposed for a little while on tables; the windows of the apartment being opened and not screened, it was readily accessible to flies. Having found no satisfactory evidence that the infection had been introduced into the jail in water, milk or other articles of

* Public health, XVII., 711. 1905.

food, their attention was given to the discovery of any sources of infection in the vicinity outside the jail.

It was found that in the adjoining street there were five dwellings adjoining the jail property in which cases of typhoid fever had occurred from the 22d of August to the 17th of September, and that the privies in the rear of these houses were in a very foul condition, "and in several instances fecal matter was found lying exposed on the surface of the ground."

It was the opinion of the committee that the occurrence of cases of typhoid fever in adjacent houses had infected their filthy privies, and the abundance of flies with the open communication through the windows between the kitchen and the adjoining yards, was in all probability the method of transmission of infection.

Sangree, after calling attention to the enormous number of flies present at the military camps where typhoid epidemics occurred, gives the results of some experiments he performed, which were designed to show the ability of flies to carry infection. He allowed flies to remain half a minute on an agar culture of anthrax bacillus in a Petri dish; he then placed them upon a sterile agar plate, and found that at every point where the fly's foot had trod anthrax colonies developed. The same was also shown on potato. It is reasonable to suppose that the same results could have been obtained with the typhoid bacillus.*

Danger From the Sputum.—The exhaled air from the lungs of the typhoid fever subject is germ free, as it probably is in all infectious diseases. There is therefore no possibility of this disease being spread by means of the air exhaled from the lungs. This statement is true only when the exhaled air is free from sputum. In the pneumonias that complicate typhoid fever the Eberth bacillus is found in the diseased lungs and may be eliminated in the matter coughed up and disseminated through the air in the fine spray that accompanies severe fits of coughing. However, the spread of typhoid fever in this manner must be regarded as a bare possibility.†

Dr. P. W. Williams,‡ assistant physician to the British Royal Infirmary, reports five cases of typhoid fever as tending to prove

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* Med. Record—Maryland Med. Jr., XLIII., 19. 1899.

† Rept. of Reed, Vaughan and Shakespeare in U. S. Military Camps in 1898.

‡ British Med. Jr., 1892, Vol. II., p. 1353.

that this disease may be communicated by the breath, or expectoration of infected persons.

In the first case the patient was delirious, and for some days had a good deal of laryngeal and bronchial catarrh, and was constantly coughing and expectorating about the bed. Later there was a relapse with symptoms of acute laryngitis. The autopsy confirmed the diagnosis. The lungs were extremely congested and the lower lobes of both lungs were consolidated. Typhoid ulceration in larynx. He was admitted to the Royal Infirmary on the sixth day of his illness.

Cases two and three were brothers of the first case. They were removed to the Bristol Union Workhouse. Their disease was of a severe type, but there were no special laryngeal symptoms.

The fourth case was the nurse who attended the first case in the Infirmary. She died.

In the fifth case, it was thought the man contracted the disease from the first patient who had the laryngeal complications. This fifth case was a fatal one, and, post-mortem, the bacilli of typhoid fever were found in the typhoidal ulcerations which were present in the larynx.

In investigating the sputum of eleven typhoid patients bronchitis was present in ten, and in one pneumonia developed. In this last patient the typhoid bacillus was present in the sputum for a period of ten days. Edel,* who observed these cases, advises that the sputum of typhoid patients be disinfected with solutions of carbolic acid or lysol.

Typhoid bacillus was also found by Dieudonne† in the expectoration of a typhoid fever patient. The disease first assumed the form of a pneumonia but later clinical symptoms of typhoid fever presented themselves with the typhoid spots and enlargment of the spleen. Widal reaction was also positive. Typhoid bacilli also were present in the sputum seven weeks after the patient was received at the hospital and after the patient felt entirely well.

From Wells and Springs.—The history given by Dr. Austin Flint, Senior, of an outbreak of typhoid fever in the village of

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* Fortschr. d. Med.—*D. Viert. f. öff. Ges.*, XXXIV., 140, 1903.

† Centr. f. Bak., XXX., 481.

North Boston, N. Y., in 1843 was one of the important pieces of work which furnished indubitable proof of the agency of polluted water in spreading typhoid fever. He says:

"The fever was at first imported to that place by a young man from some place in Massachusetts, who, arriving at North Boston by stage, took lodgings at the tavern on the 21st of September, where he died on the 19th of October, 28 days after his arrival.

"In this little hamlet were nine families, consisting of 43 persons. Between October 14th, five days before the date of the death mentioned, and December 7th (twenty-one days), twenty-eight of the forty-three persons comprising this little community, were attacked with the fever, and in ten instances the disease proved fatal.

"An important part of the history of this epidemic, says Dr. Flint, remains to be stated. At the time of writing the report from which the foregoing extracts are taken, and for many years afterwards,—indeed, up to a recent date,—I had no idea of the diffusion of typhoid fever through the agency of drinking water. At the time of the epidemic nothing had been published on the topic, and at the time of writing this report, and long afterwards, I was not aware that any one had entertained this view of the causation,—there was nothing relating to it in the medical literature of the country.

"All of these nine families but three used water for drinking and culinary purposes from the same well,—that belonging to the tavern. Two of the three families not using it, did not on account of their distance from it, and the intervention of a stream some three or four rods wide. Their intercourse, however, with the others was free and familiar. The other family who did not use the water was at enmity with the proprietor of the tavern, and had been forbidden its use.

"So strongly did the circumstances at that time seem to point to the tavern well, as the source of the contagion, that suspicion was aroused and charges of poisoning the well were openly made against the family who, alone in the immediate vicinity of the well did not use of its waters, and did not suffer from the disease.

"It can hardly be doubted that the exemption from the disease of the family of Stearns (who did not drink the water), was due to the animosity of the inn-keeper, which led the latter to prohibit the use of his well, and compelled Stearns to dig a well of his own. The two families living forty rods from the tavern escaped because, owing to the distance, they did not obtain water from the inn-keeper's well.

At the time of the epidemic no suspicion of the presense of the special cause in the drinking water being entertained, pains were not taken to note the situation of the privies, the nature of

the soil, etc. In order to obtain some information on these points I wrote recently to Dr. P. Barber, at the date of the epidemic, and until lately, a practitioner in that neighborhood. Dr. Barber writes that, according to his recollection, the privy attached to the inn was three or four rods from the well, and he recollects that the contents were allowed to accumulate. The well was by the road-side, supplying with water the inn and the stables, as well as the immediate neighbors." *

The history of the North Boston outbreak is cited as one of the important early observations. Since then innumerable observations have been made which show plainly the dangerous character of polluted well water.

The following may serve as a late instance. It is related by George A. Soper,† as a part of the aftermath which followed the outbreak of typhoid fever in Ithaca, N. Y. It was the result of the contamination of a well on the property of a man named Barnes. "The Barnes well had been famous; people who had learned to fear the city water went to the Barnes well with a feeling of perfect safety. No one had ever been made sick from drinking this water. So great was the demand upon the well that the water was actually piped to another house. Many of the people who had been drinking from the Barnes well were taken ill. In all there were fifty cases of typhoid and five deaths traced to this well.

"When suspicion was directed to the well, I visited it and had the drain pipe from the water closet in the Barnes house excavated. The drain ran within three or four feet of the well. When the laborers dug the earth from beneath the drain, they found that the joints had been scamped; that is, insecurely and improperly closed. When the water closet in the Barnes house was flushed, the water would run through the drain to a point about ten feet from the well, whence it would flow out into the porous soil through the leaky joint and so into the well. On analysis, the water of the well was found to be grossly polluted.

"We needed, however, to find out how the drainage which entered the well had actully infected it. It was then discovered that Mrs. Barnes had suffered, some weeks before, with a mild attack of typhoid fever, which had been pronounced by her physician to be grippe. We proved the real character of her disease by taking a specimen of her blood and examining it in the laboratory. The dejecta from this patient passed down through the water closet without disinfection; it escaped from

* Third An. Rpt., State Bd. of Health of Mich., p. 64.

† Jr., N. E. Water Works Assoc., XVIII., 445. 1904.

the drain pipe into the well and, as we have said, occasioned fifty cases and five deaths."

Konradi* refers to a remarkable epidemic of typhoid fever in a village containing 450 inhabitants, in which during the first week of the epidemic about forty cases appeared, and within six weeks the total number had run up to 200. The infection was traced to the well in the market-place and used by all the people. A man came from another village infected with typhoid fever. He dwelt near the well and it could be shown that the soakage from the dejections which were emptied upon a pile of manure could easily find its way into the well. The well was closed and the epidemic soon ended.

Dr. C. O. Probst, Secretary of the State board of health of Ohio, gave the history of an outbreak of forty cases of typhoid fever with five deaths in a little town of four hundred or five hundred inhabitants in that state. There was a stone quarry about half a mile from the center of the village. A peculiarity of the geological formation was that it consisted of limestone ledges and this limestone was cracked in all directions, readily admitting a flow of water for a long distance as we discovered by experiment. The stone quarry, which was 26 feet deep by measurement—a little deeper than the wells—was being pumped out when I arrived at the village. When it was completely emptied of water, the wells for three-quarters of a mile were either entirely dry, or drained to a depth of two or three feet, there being very little water in the wells at that time. I found that they had had three cases of typhoid fever in the spring of this year. This happened only a month ago. The board of health, on the appearance of typhoid fever, ordered a cleaning up of the town. It was found that two barrels of night soil had been taken out and thrown into the stone quarry. This was discovered when the stone quarry was pumped dry. When the wells became lowered by the drouth there was evidently a flow of water from the stone quarry into the wells of the village, and the cases of typhoid fever commenced. I think, said Dr. Probst, many facts might be mentioned to show that it is possible in certain sections, where we have a peculiar geologi-

* Centr. f. Bak. (Orig.), XL, 31. 1905.

cal formation, for the wells to be polluted by cesspools or privy vaults, thus causing typhoid fever.*

A similar geologic formation exists in some parts of this State, notably in sections in Aroostook, where in one instance a new cellar dug and blasted into a ledge was nearly filled with water by a heavy shower, but it all disappeared downward through the ledge before the next morning.

The historic example of Paris illustrates the danger of the transmission of infection long distances beneath the surface of the earth in certain geologic formations. In the French capital there was a very high death-rate from typhoid fever from 1881 to 1890.

The water for the city was obtained from the Vanne, the Avre, the Dhuis and the Lunain. The earth in the region from which these sources of supply were located consisted of chalk in which in all directions there was a plentiful network of connecting cracks and rifts. This chalk is covered with a thin layer of clay and gravel. Through these rifts in the chalk the ground water circulates freely and here and there comes to the surface in the form of springs. The water which circulates in these subterranean passages, on account of its large quantities of carbonic acid, dissolves the openings in the chalk thus continually widening them. Thus there has resulted the formation of veritable subterranean brooks and streams. This enlargement of the fissues in the chalk leads finally to the formation of caverns, the roof of which is formed by the strata of clay and gravel. Where these roofs have fallen in sinks or holes in the ground result. All the surface water which reaches these subterranean galleries comes to the surface in the springs without sufficient filtration. This water is clear, cool, and of unobjectionable taste. By pouring into these sunken places fluorescin, lycopodium, and one of the yeasts, the connection between these springs and these caved-in places was demonstrated, a fact which a knowledge of the geological formation had previously indicated. Fluorescin was also poured into holes bored in the earth at various places. By this means the extent of the ground surface which fed the particular springs was determined. The rapidity with which the coloring matter made its way in these

* Rpts. and Papers of the Am. Pub. Health Assoc., XIX., 265. 1893.

subterranean water-courses varied from 90 to 100 meters in an hour. By the method of Cambiers the drinking water of the city was examined every 3 days, and that of the springs daily for typhoid bacilli. After a small outbreak of typhoid had occurred upon the drainage area of the Vanne, typhoid bacilli were found in the reservoirs fed from these sources.*

The degree of the danger of the infection of wells from sources of pollution on or in the ground surrounding wells depends largely upon the character of the strata entering into the composition of the ground. When it is, for some considerable distance downward, finely granular and homogeneous in structure, sand or sandy loam for example, there is less danger. In coarse sand or gravel, the filtering action of the soil can less be trusted. The danger is intensified by the presence of seamy ledges, or where there is rather a thin soil overlaying an impermeable stratum of rock or clay.

Life of the Typhoid Bacillus in the Ground.—The following observations relating to the life of the typhoid bacillus has an important bearing upon the question of the infection of wells, springs, and other water supplies.

Levy and Kayser† published the following observations bearing upon the duration of the life of the typhoid bacillus.

On the 8th of September, 1901, in the evening, Herrb returned from a journey to S., a suburb of Strasburg. He was then not feeling well, but did not call a physician until the 13th. As his physician suspected typhoid fever he immediately ordered the disinfection of the stools. On the 15th of September the patient was transferred to the hospital. The dejections of the patient had been emptied into the privy vault which is a water-tight cement vault. From the 8th of September in the evening until the 13th at noon the dejections were not disinfected. The vault was emptied February 6, 1902, and the contents were spread upon the surface of a garden. In samples of earth taken from this garden on the 20th of February the typhoid bacillus was shown to be present. The typhoid bacillus had therefore endured exposure to the sun and atmosphere and winter temperature 5 months in the vault and 14 days upon the surface of the ground. From the 6th to the 10th of February there were frequent storms, partly rain and partly snow.

* Hygienische Rundschau, XIII., 105. 1903.

† Centr. f. Bak. (Orig.), XXXIII., 489. 1903.

The following notes are taken from a paper by Prof. Almquist* of Stockholm, upon the question of the preservation of pathogenic bacteria in manure heaps.

The first time that I succeeded in cultivating pathogenic micro-organisms in polluted earth I took the earth from the entrance of a cow stable. The sample there taken consisted of stone, sand, and loam plentifully mixed with manure. Later I made use of a sample taken near a pigpen and from near a slaughter-house which possessed similar characters.

Hitherto I have used only manure which has been composted for some time so that it was black and humus-like. The earth was sterilized in an autoclave at a temperature of 120° C. Only distilled water was added. Some of my investigations show that the typhoid bacillus at the temperature of 24° C. in manure or earth varies in its degree of development. In many cases the maximum point of multiplication was reached within the first week; in other cases it was two weeks before this point was reached.

The bacteria of typhoid fever, cholera, and dysentery grow with particular luxuriance in old well-rotted manure and in earth which has been manured. Their multiplication is sometimes, indeed, more plentiful than in ordinary peptone bouillon. I assume that it is possible, after these disease germs have reached the maximum of vegetation, that their existence may be continued. This has been shown for sterilized manures. In samples which are not sterilized, the development of the flora and fauna is enormous—bacteria, streptothrix, protozoa, of various varieties constitute a lively *wirrwarr* in which I have not yet succeeded in determining the fate of disease germs.

At the present stage of our konwledge I maintain that the theory is correct that the germs of typhoid fever, cholera, and dysentery when distributed in drainage from manure heaps and in earth which has been manured can multiply. If this is correct the specific germs of these three diarrheal diseases have two culture fields where they may thrive: in the human digestive organs and in the fertilized surface soil near our dwellings.

The experiments of Almquist show the following facts:

That in fertilized earth as well as in pure manure after its sterilization and the addition of a sufficient quantity of water, the specific micro-organisms of cholera, typhoid fever, paratyphoid, dysentery, and bacterium coli multiply at various temperatures.

The multiplication of typhoid bacilli reaches its maximum point more slowly at 24° C. as a general rule than at 18° C. The maximum point of the curve is sometimes not reached earlier than

* Zeit. f. Hygiene, LII., 179. 1906.

two weeks. By the addition of 2 or 1½% of common salt the growth of the cholera and typhoid bacteria is luxuriant and the maximum point of multiplication is more quickly reached. The virulence of typhoid and cholera bacteria may remain unimpaired in manure heaps and polluted earth for several weeks.

The biology of these pathogenic germs as well as their epidemiology justifies the theory that these micro-organisms have the power of multiplication outside of our dwellings in the damp or aqueous portions of manure heaps and of polluted soils.

For several years, the Medical Officer of the Local Government Board of England carried on experimental work for the purpose of determining the period during which the typhoid bacillus retains its vitality in the soil. Dr. Sidney Martin* commenting on his two previous reports on this subject says, that the general conclusions to be derived from the previous work are:

1. That in sterilized garden soils and in sterilized soils from the entourage of houses, i. e., in what may be called organically contaminated soils, the typhoid bacillus lived and multiplied, whether the soil were kept at a uniform temperature of 37° C., at the temperature of the laboratory (between 15° and 19° C.), or at the temperature of an outside shed (between 3° and 15° C.).

2. That in these soils the bacillus was still alive after 404 days, and that for a short period it retained its vitality after the soil had been so dried that it could be readily reduced to a powder.

3. That in virgin soils, soils which had never been manured or cultivated and which consisted chiefly of sand or peat, the bacillus did not grow nor live; that in the majority of cases, even on the day following inoculation of the soil with the bacillus, no evidence of its presence in the soil could be obtained.

In experiments with unsterilized soils the doctor was almost invariably unable to find the typhoid bacillus after a very short lapse of time. But in one implantation of natural, unsterilized soil the typhoid bacillus was recovered after fifty days.

Dr. Robertson of England, showed that when typhoid germs were sown into earth soaked with animal filth, the germs can live through the winter and the next year may multiply so that an area containing filth may probably remain infected from year to year.

Under the inspiration of former investigators Rullmann went over practically the same ground as Martin in his experiments. He mixed loam with equal parts of fine-grained gravel. A

*28th Annual Report, Loc. Gov't Board, Rpt. of Med. Officer, p. 382.

part of the samples were sterilized, others were not when they were exposed to the diffused light in a room. Although the vessels containing the samples were larger than those used by Martin the typhoid bacilli had penetrated all parts of the masses of the earth at the end of one month. In one sample these micro-organisms were present nine months, and in another sixteen months after inoculation. They were present nearly a year in one sample which consisted mostly of red river sand. In the unsterilized samples of humus and fine gravel typhoid bacilli were quickly destroyed. In another variety of earth typhoid bacilli were found for a period of 100 days. The diversity of results obtained by Rullmann were by him ascribed to the chemical action of earth of different compositions.

Wurtz and Bourges determined by their experiments that pathogenic micro-organisms which were put upon the surface of the ground or inoculated at a depth of ten centimeters appeared upon the leaves and the stems of plants growing in this earth, a fact which had already been determined regarding tetanus germs. In spite of the bactericidal power of direct sunshine and the washing of the plants by the rainfall they showed that plants may be transmitters of infection.*

In the experiments of E. Pfuhl† the typhoid bacillus remained alive in damp garden earth 88 days, and in dry sand 28 days.

A young woman returned from Ulm to her home village of Riedheim, sick with typhoid fever. Her dejections were thrown upon a pile of manure. After a period of five weeks it was carted away and four of the five persons who were engaged in this work came down in due time with typhoid fever. In like manner the dejections of these patients were thrown upon another manure heap and nine months later the manure was hauled away. Of the men who were employed at this work all came down with typhoid fever who had not already suffered an attack.‡

The history of this outbreak is sometimes referred to as indicating the transmissibility of typhoid infection through the air. It may not prove this, for the hands may have been the medium of transmitting the infection to the mouths and intestinal canals of these laborers. It does, however, appear to show that the infection of typhoid fever may retain its vitality and its virulence for a long time in material of this kind.

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* Cited by Levy and Kayser—Centr. f. Bak. (Orig.), XXXIII., 489. 1903.

† Zeit. für Hygiene, XL., 555. 1902.

‡ Real-Encyclopädie der Gesam. Heilkunde. Band I., 13. 1880.

The results of the experimental work which has been cited together with those of earlier work, when the methods of identifying the typhoid bacillus had not reached that stage of certitude which now exists, are confirmatory of the conclusion which has been drawn from the study of epidemics, that earth which contains much dead organic matter—polluted soil—when once infected with the typhoid bacillus may retain that infection in a virulent form for months, and perhaps for years, contributing a share of its infection now and then to near-by wells, and possibly in other ways endangering human beings. The recognition of this latter possibility does not by any means require the acceptance of Pettenkofer's theory.

But, in favor of the well as a source of water supply in rural life, it may be said that, in most parts of this State, good, pure water may be obtained from the ground if the well is properly constructed and is sufficiently distant from manifest sources of pollution.

From Public Water Supplies.—How the infection in the stools of one typhoid fever patient may infect a large number of persons and thus give rise to a frightful epidemic was strikingly shown by the outbreak in Plymouth, Pa., the lesson of which is worth repeating, again and again.

From early in January until early April a man was sick with typhoid fever at his home near the banks of the stream and above the intake which supplies Plymouth with water.

During the course of his illness, his dejecta passed at night, without any attempt at disinfection, were thrown out upon the snow and frozen ground, toward and within a few feet of the edge of the high bank, which slopes precipitously down to the stream supplying the town with water.

The nurse in charge states explicitly that in emptying the chambers at night she did not stand on the porch to throw out the contents, but stepped down some distance and threw them toward the creek. If she stepped but a few feet away from the porch, she would empty the excreta within twenty-five or thirty feet of the edge of the stream.

The dejecta passed during the day were emptied into a privy a little farther back, the contents of which lie almost upon the surface of the ground, and at the first thaw or rain they too would pass down the sloping bank and into the stream. These dejecta were thrown ont from time to time until the accumulation no doubt equaled the daily passages from many such patients. They remained innoxious upon the snow and frozen

ground until sometime between March 25 and April 1, when they were washed into the stream and thence into the third reservoir.*

The result of this deplorable want of regard for the safety of the public was 1104 cases of typhoid fever,—713 cases in April, 261 in May, 83 in June, 31 in July, 15 in August, and one in September. The intensity of the infection, or the large dose of it received by the earlier victims, was shown by the gravity of the earlier cases,—high fever and delirium, severe and repeated intestinal hemorrhages, extreme prostration, slow convalescence, and tendency to relapse.

This is a good example of an explosive outbreak of typhoid fever—that is, of the sudden attack of many persons within a short time. This was undoubtedly due to a massive infection of the water. The mountain stream from which the water supply was taken, is small. The spring rains suddenly washed into it the accumulated discharges of the typhoid fever patient.

Dr. Springfeld,† in a discussion before the meeting of the German public health association last year said:

"We think of water infection only when a large number of the users of the water suddenly become sick, but my experience shows that the appearance of the disease due to water-borne infection may be sudden or gradual, depending upon the degree of infection of the water. The number of persons infected does not depend alone upon the degree of pollution. Much probably depends upon the virulence of the culture. Even in cases where there appears to be a gross pollution or infection of the water only a small per cent. of the persons who use the water may be attacked. The remainder appear to be immune either as the result of a previous attack of typhoid or otherwise."

A recent outbreak fully as severe but not falling quite so suddenly, was the one which they had in Ithaca, N. Y.

As the result of indifference through a series of years to the dangerous condition of its water supply, a frightful epidemic of typhoid fever appeared in that university town in the first quarter of the year 1903. With a population given by the last census as a little over 13,000, it is estimated that 1,350 cases of typhoid fever occurred, with 82 deaths in a little more than three months. No less than 522 homes were visited with the

* First An. Rpt. St. Bd. of Health of Pa., p. 176. 1885.

† *Deutsche Viert. f. öff. Ges.*, XXXVIII., 45. 1906.

disease; in over 150 of these there were two or more persons attacked. Dr. George A. Soper,* consulting engineer and sanitary expert of New York City, who was employed to investigate the outbreak, says that there was no doubt that the drinking water supplied by the Water Company was the original cause of the outbreak, but it was evident that the disease was transmitted from person to person through carelessness and ignorance in nursing the sick.

Dr. William R. Stokes† reports from the Bacteriologic Laboratory of the State of Maryland an outbreak of typhoid fever which occurred in a city with about 12,000 persons, in which one side of the city was in one state, and the other side was in a neighboring state. Each half of the town had a separate water supply. In the north side of the city practically no fever occurred. The towns were divided by a certain street, and it was said that the line of demarcation between the infected and the non-infected portion of the city was a striking feature of the outbreak. The infected part of the town received its water supply from a spring in a hollow, while the uninfected portion was supplied with water from a spring some distance away in the hills. The bacteriologic examination of the water of the infected half of the city showed the presence of 9,600 bacteria per c. c. and the presence of the colon bacillus.

This outbreak reminds one of the epidemic of cholera in Hamburg, Germany, in 1892. Hamburg with its polluted and infected water supply from the Elbe, had an epidemic of 18,000 cases of cholera, and 8,000 cholera deaths, while Altona had comparatively few cases. In Hamburg 1.3 % of its population died of cholera but in Altona the percentage of deaths was only 0.2 %. They both lie upon the same side of the Elbe, and are practically one city, as intimately coalesced geographically as are Brookline and Boston, Mass., and much more so industrially. Both cities took its water from the Elbe, Hamburg above the two cities, but where the sewage pollution was undoubtedly carried to the intake by tidal flow, Altona from below both cities where the sewage hugs the shore. Altona, however, had a good modern system of water filtration which conferred her comparative immunity.

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*Jr., N. E. Water Works Assoc., XVIII., 431. 1904.

†Jr. of Am. Med. Assoc., XLIV., 595. 1905.

Tavel* reports the following instructive instances of local infection of a water system with typhoid bacilli which occurred in the city of Olten. This city takes its water supply from the Jura, and Tavel designates this water bad. In the second half of October, 1900, at a time when the water supply did not equal the demand, twenty cases of typhoid fever occurred in the higher lying parts of the city. As the outbreak occurred suddenly the water supply was suspected. Infection at the intake was excluded, but there was a suspicion of infection within the limits of the city. The water in the mains is under high pressure, from 5 to 7½ atmospheres. When water was drawn there followed in the higher laying quarters of the city a strong backward movement of the water in the pipes. The water in a stationary washtub, for example, which happened to be connected with the faucet at the time the water was drawn elsewhere, was withdrawn from the tub by aspiration, the connecting hose acting as a siphon. Thus polluted water found its way into the water mains in the locality where most of the cases occurred. There was a man sick with typhoid fever who, a little while before the sudden outbreak, had returned from the Paris Exposition. From this place they think that, in such a way as has been indicated, typhoid infection was received into the mains, when the water pressure in this part of the city was absent. Among the persons who became sick in October there was a child, G. L. While elsewhere in the city from that point of time on, no further cases of typhoid fever occurred, in the family where this child lived there were seven additional cases. This child became sick October 30, and died December 5. December 7 the child's grandmother was taken sick and was sick until January 2. The mother took her bed December 23, but had already been ailing for two weeks. She died January 8. Then there was a pause in the outbreak. March 16, 1901, a son in this family became sick, and April 12, the servant girl. April 16, a niece, and three weeks later the nurse who on April 18 had taken the place of the niece who hitherto had acted as nurse. These persons had, in spite of emphatic commands not to do so, used unboiled water. Those persons only in this household who abstained from the using of unboiled water remained free from

* Center. f. Bak., (Orig.), XXXIII., 166. 1903.

typhoid fever. In this house and the surroundings there were the best sanitary conditions. Just below the house occupied by this family there was stretch of water main 11½ meters long which served as a "dead end." In this piece of pipe there could have been but little circulation. In other words, the water was stagnant, although in the house of L. when the water was drawn it is likely there was some movement of water from this dead end. April 29 and 30 the end of this pipe which was closed was opened, and the filthy water which was found in it was examined bacteriologically. Aside from colon, proteus, and fluorescens bacilli and Staphylococci, the typhoid bacillus was found. Tavel considers this, the finding of the bacillus under these circumstances and in this place, significant as indicating that the typhoid bacillus under certain conditions may retain its vitality and its infectious characteristics for several months in water.

The Vitality of the Typhoid Bacillus in Water.—The question whether the use of polluted water, or water which receives sewage, will produce typhoid fever has many times been answered affirmatively by the results of the experiments to which man has subjected himself or to which he has been subjected by his municipal governments. Aside from these, much work of a scientific character has been done for the purpose of determining the action of waters of various kinds, and of sewage upon the typhoid bacillus. Only a little of the literature of this work is here cited. It shows the general trend of results, that is, that the bacillus of typhoid fever remains alive under varying circumstances for periods ranging from a few days to many. In research work of this kind the same difficulty is met in the search for the bacillus in natural, unsterilized water which is encountered in seeking it in unsterilized soil—the overwhelming growth of micro-organisms which find their natural habitat in these waters.

The experiments of Laws and Andrews for the London County Council indicated that the life of the typhoid bacillus in sewage is brief. The experiments of Dr. Klein for the Local Government Board confirms the observation that the typhoid bacillus, kept in ordinary fluid sewage, has not only no tendency to multiply, but, on the contrary, diminishes in numbers and ultimately dies. On the other hand, these experiments show

that the bacillus coli retains for a long time in sewage its vitality and its power of self-multiplication.

The thought occurred to Dr. Klein that the vitality of the typhoid bacillus in sewage may not be parallel to its vitality in sewage *plus* water of one and another sort, as under the natural conditions in which typhoid fever is disseminated. In his experiments, he found that when a certain quantity of nitrates were added to the sewage, it had a tendency to prolong the life of the typhoid bacillus and even to increase their number. Thus in one of the experiments, after eight weeks, the number of colonies of the typhoid bacillus had increased from 16,000 to 1,600,000.

He also found that water from the public water supplies of London after it had received a trace of nutritive material showed the presence of typhoid bacilli at the end of eight weeks.*

Jordan and Russell† were employed by the Sanitary District of Chicago to conduct some experiments upon the life of the typhoid bacillus in the waters of Lake Michigan, the Chicago Drainage Canal, and the Illinois river. The statement of their conclusions at the end of their paper is to the effect that under conditions that probably closely simulate those in nature the large majority of typhoid bacilli in the several waters studied perished within three or four days; that it is theoretically possible that specially resistant cells may occur which are able to withstand for a longer period the hostile influences evidently present in water. Their experiments, however, show that if such resistant individuals exist they must be very few in number and constitute only a small fraction of the bacilli originally entering the water. They state that it is not their intention to claim that the behavior of typhoid bacilli under the conditions which were described is representative of all conditions obtaining in all natural bodies of water.

Russell and Fuller‡ of the Wisconsin State Hygienic Laboratory, in their experiments in testing the longevity of the typhoid bacillus found that, when exposed to the action of flowing lake water, the life of the organisms ranged from eight to ten days.

* 24th Rpt. Loc. Gov't. Bd. (Sup.), 95. 1894.

† Jr. Infectious Diseases, I., 641. 1904.

‡ Jr. Infectious Diseases, (Supplement No. 2) p. 40. 1906.

When the typhoid bacillus was exposed directly to the action of sewage bacteria its longevity was greatly diminished, three to five days being the longest time in which the organisms could be recovered. They think that the uniformity of their results, confirming the work of the preceding year in the waters of Lake Michigan and the Chicago drainage canal, warrants the conclusion that the longevity of the typhoid bacillus in waters is materially effected by the germ content of its surroundings. In sewage polluted waters it is unable to survive for more than three to five days, the period of time materially longer than that which is noted in normally unpolluted waters.

In 894 samples of water received from various sources Busquet* found typhoid bacilli six times. According to Bertrand the typhoid bacillus may survive in the sediment in the lower part of masses of water for a period as long as three years. Samples of water should be investigated not only from the surface wells and from their central portions but particularly from the bottom of the well. In five of his positive results Busquet had obtained the samples of water from the bottom of the well in which some of the sediment had been taken with the sample.

Bordoni† and his fellow workers have determined that the typhoid bacillus retains its vitality two weeks in sea water.

Fischer and Flatau‡ obtained the typhoid bacillus with all its bacteriological characteristics in a sample of water sent to the laboratory. This sample came from a well in a village in which the inhabitants of two neighboring houses obtained their water from the well. Eight persons were sick in these houses with typhoid fever. In examinations made four weeks later the typhoid bacillus could not be detected in this water.

Mr. Geo. W. Fuller says that the long continued investigations at the Experiment Station of the State Board of Health at Lawrence, Mass., show that the typhoid fever bacillus continues to live in the waters of the Merrimac river, in greatly diminished numbers, for a period of at least twenty-four days.

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* Annal. d'Hyg. Pub.—Deutsche Viert. f. öff. Ges., (Sup.), XXXVI., 169. 1905.

† Giornale della Real. Soc. Ital. d'Igiene, XXI., 500. 1899.

‡ Centr. f. Bak., XXIX., 329. 1901.

The Question of the Self-Purification of Rivers.—In the consideration of the dangers from water-borne infection the question of the self-purification of rivers has been considered of so great importance that much scientific work has been done to elucidate it.

That rivers and other streams have some power of purifying themselves both chemically and bacteriologically is shown by the investigations of Professor Nichols* of Boston; by Frank** in examining the waters of the river Spree above and below Berlin; by Prausnitz† for the Isar at Munich; by Uffelmann‡ for the river Nebel; by Schlatter§ for the Limmat at Zürich; by Draer§§ on the Pregel above, within the city limits, and below Königsberg; by Delépine¶ of Manchester, England, in his study of currents of water artificially conducted through an apparatus which he had devised; by Blasius and Beckurts¶¶ in the study of the waters of the Oker supplying Brunswick, Germany; by Jordan, Russell, and Zeit. in their investigations of the water of the Chicago drainage canal, and by others.

Various agencies are operative in bringing about a partial purification of polluted river waters, some of which are:

Dilution does not destroy bacteria, but simply lessens their numbers in a given quantity of water, if the diluting water is purer.

Sedimentation plays a considerable part in purification, disposing of a part of the bacterial contents of the waters, temporarily at least; but some observations indicate that the life of the typhoid bacillus is greatly prolonged in the sediment or mud at the bottom of bodies of water.

Light is rapidly destructive of the bacillus of typhoid fever under favorable conditions, but in deep waters, waters which are not clear, in ice and snow-covered waters and in cloudy weather, and in the night, its influence is very slight.

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* Rpt. Mass. State Board of Health, 1875.

** Zeit. f. Hygiene, III., 355. 1888.

† Der Einfluss der Münchener Kanalisation auf die Isar. München, 1890.

‡ Deutsche Viert. f. öff. Ges., XXII., 382. 1890.

§ Zeit. f. Hygiene, IX., 56. 1890.

§§ Zeit. f. Hygiene, XX., 323. 1895.

¶ Jr. State Medicine, IX., 502. 1901.

¶¶ Deutsche Viert. f. öff. Ges., XXVII., 337. 1895.

Some of the conclusions of Buchner* based on his observations of the morning and the afternoon fluctuation in the number of bacteria in sewage polluted streams Blasius claims are erroneous. The afternoon diminution is in his opinion due simply to the smaller quantity of sewage received at that time.

Oxygenation has been classed as one of the factors in purification, but Whipple and Mayer† have shown that the vitality of the typhoid bacillus is favored by the presence of dissolved oxygen in waters; and as is stated on page 133 Klein found that the presence of nitrates tended to prolong the life of typhoid germs in sewage.

The antagonistic action of the common water bacteria is inimical to the life of the typhoid bacillus, and, at the same time, rendering its detection difficult. The energy of this antagonistic action, says Frost,‡ depends on the temperature. At rather high or ordinary temperatures the action is very pronounced, while at the temperature of the ice chest the typhoid germ may grow in the by-products of the other germs, which at higher temperatures are quickly fatal. As auxiliary to the ordinary bacteria is that of the protozoa which Huntemüller§ considers the principal agents in the destruction of typhoid bacilli.

Temperature exerts an influence. In winter the process of self-purification goes on much more slowly than in summer. This with the diminished action of light undoubtedly favors winter outbreaks of typhoid fever among the users of some water supplies.

Manufacturing wastes of some kinds inhibit the multiplication of bacteria in waters and the organic wastes from other factories enormously facilitate their multiplication.

Even in the light of the results of all the investigations which have been made in these directions, the general demand among experts for artificial systems for the purification of sewage polluted waters by adequate modern methods before their use as public supplies, confirms the opinion of the English Rivers Pollution Commission which prompted their report many years

* Archiv. f. Hygiene, XVII., 179. 1893.

† Jr. of Infectious Diseases, (Supplement No. 2) p. 76.

‡ Jr. of Infectious Diseases, I., 599. 1904.

§ Hygienisches Centralblatt, I., 255. 1906.

ago that: "It will be safe to infer from the above results, that there is no river in the United Kingdom long enough to effect the destruction of sewage by oxidation."

These notes on water-borne typhoid infection may be closed with this remark of Springfeld: "From an epidemiological point of view it is probable that there is no self-purification of streams, but merely a diminution in the amount of infection by dilution and sedimentation. The distance of the intake of the water supply from the point of infection is therefore of less importance than the demonstration of the causal relation of the cases.*

Typhoid from Milk Supplies.—In the popular estimation infected milk, next to infected water, constitutes the most frequent source from which typhoid fever is contracted. This is probably an error, though milk epidemics of typhoid are frequent.

A milk borne epidemic of typhoid fever, as the Monthly Bulletin of the New York State board of health says, has certain characteristics. It is generally abrupt in its onset. A fulminant outbreak of typhoid fever in a previously healthy locality always suggests it, and while any other infected food may have a similar effect, and even a public water supply may be infected on the instant, an epidemic in which numerous cases come to light within a few days may be suspected as of milk origin. Then it is widely distributed, as much so as the milk from one source usually is, not affecting a whole community as when a public water supply is at fault, not limited to a compact neighborhood where a local cause is acting. Several members of a family, of a susceptible age, are likely to be affected. All or nearly all of those affected will be found to have had milk from one vender or possibly from a special part of his milk kept separate from the rest, and a considerable proportion of the families using the same will likewise be affected. With such characteristics of an outbreak the suspected milk should be investigated along the lines which have been suggested. The acting cause was operative two weeks before the outbreak set in, and as in a recent case may have ceased to exist; this ought to be borne in mind.†

There is no reason to believe that the cow is in any degree susceptible to the infection of typhoid fever, or that her milk, before it is drawn, ever contains the typhoid bacillus. But milk is easily infected or inoculated by the fingers of milkers or other

* Deutsche Viert. f. öff. Ges., XXXVIII., 35. 1906.

† Wisconsin State Board of Health Bulletin.

help in dairies who themselves have recently, or sometimes remotely, had typhoid fever; it may be in an atypical and unrecognized form, or by persons who attend the sick, or by dilution with infected water or by milk vessels or utensils which have been washed with such water. It may sometimes be inoculated by flies which have access, at the same time, to privy vaults or other sources of typhoid infection.

Dr. John S. Fulton,* Secretary of the State board of health of Maryland, reports an outbreak of typhoid fever which occurred in Elkton in that state in 1900. There were 64 persons living in thirty-nine different houses who had the disease, and all these persons obtained their milk supply from the same milkman. Three of these patients had previously been sick with typhoid fever; one in 1884, another in 1893, and the third in 1898.

An outbreak of typhoid fever in Beverly, Mass., referable to an infected milk supply was reported by Dr. Morse, medical inspector for the State board of health.†

"A visit was made to A's farm in the town of Ipswich, he being the milkman supplying these families. He had six cows at his farm, yielding about fifty quarts of milk daily, which he distributed to families in Beverly and Salem; most of his trade, however, being in the first-named city. As an auxiliary supply, he obtained four cans from B's farm, and one can from Mr. C. All of this milk obtained from these different sources was mixed, with the exception of one can, which he supplied to a family by the name of D., and which was milk obtained from his own cows. Upon questioning him in regard to the presence of typhoid fever at his home, it was ascertained that he himself had been ill with the disease fifteen years previously; and that at the present time his son, twenty-one years of age, was ill with the disease, having gone to bed on September 18. It was a part of the son's duty to assist his father in the collecting and delivery of the milk, and it was noted that several days preceding his going to bed he was in a somewhat weakened condition, probably from the invasion of the disease. It was further ascertained that at Mr. B's farm seven cases of typhoid fever were present, the first one coming down with the disease on September 11. The six other cases came down on or about the 20th of the month, which would indicate that the infection of the latter was obtained directly from the first patient.

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* Jr. of Hygiene, I., 422. 1901.

† 32nd Report of State Board of Health of Mass., p. 803. 1900.

"The first case at the B. farm was a boy nineteen years of age, who assisted his father in milking and supplying the milk to Mr. A.; and it is a significant fact that at the same time a relative of his visiting the house and using the same spring water was afterward taken ill at his home with the disease, thus confirming the supposition that the original infection existed on this farm."

Dr. Eberstaller,* health officer of Gratz, states that, in the district over which he has jurisdiction, typhoid fever is a great rarity, so that when cases occur he can afford the luxury of a thorough investigation of the etiological points in the cases. On June 20 of this year three persons were received into the hospital with symptoms indicating typhoid fever. One of these persons was a jurist, one an educated artisan, and the other an assistant in the Medical Institute of the University, people who can be trusted to observe and report facts correctly. All these persons declared emphatically that the infection in their case must be referred to a gathering which they attended on the 4th of June. Further than that they could give no information. Investigating the circumstances I learned of sixty-six persons who were present at this gathering. Among these sixty-six persons typical typhoid fever occurred in eleven, the diagnosis being confirmed by positive Widal reaction. Twelve other persons suffered from loss of appetite, and part of them had headache, disturbance of the digestive tract, etc. All these twenty-three persons visited a particular hotel or restaurant where they had drank milk. So far as could be learned persons who had not visited this restaurant or who did not drink milk there remained well. Only two persons among the sixty-six who drank milk in that place remained well. Further investigation disclosed the fact that the milk was brought to this place from a neighboring farm and in the farmhouse there were five typhoid fever patients.

At the Folkestone Congress a paper was read in which a case was mentioned of an individual who, for more than two years, was employed to milk cows in several different towns and farms of Kent. Wherever he went cases of typhoid fever occurred among those who drank the milk of the cows which he tended. The names and the fullest details were given, and typhoid fever

* Deutsche Viert. f. öff. Ges., XXXVIII., 59. 1906.

only ceased when the man, having thus injured his own son's busiess, was persuaded to give up altogether his occupation of tending and milking cows.*

This man was undoubtedly a "bacillus carrier," as those persos are now designated who, after a typhoid infection, continue to excrete the bacillus for months and sometimes for years afterward.

In an outbreak of typhoid fever which occurred in the town of Adams, investigated by Dr. Morse,† it was found that the patients had all obtained milk from one dealer. He obtained his milk from two farms in another adjoining town, it being brought to the dealer's home in Adams each afternoon and distributed by him personally early the next day. On November 5 he began to feel poorly, but still continued to work until November 11, when, on account of lack of strength, he gave up work and remained at home. The family physician made the diagnosis of influenza, but he was sufficiently sick to remain at home until December 2, when he again went to work on his milk route. But on December 8 he was obliged to give up work for the second time. He lost some weight and considerable strength. Suspecting typhoid fever, Dr. Morse obtained a specimen of blood from him, and a positive Widal reaction was obtained in the laboratory of the State Board, indicating that his sickness was undoubtedly typhoid fever, and the subsequent development of cases among his customers seemed to indicate that such was the fact, for he began to be ill November 5 and it was not until November 15, ten days later, that any of his customers became ill with the disease.

In an outbreak of typhoid fever in Louisville, Kentucky, it was found that most of the cases, forty-four of them, could be traced to the milk delivered from one particular farm, which itself, together with the milk house and the cow house, were unexceptionable. The water used in washing the cans was badly polluted. Dr. Bailey, who investigated the outbreak, required that the water be boiled before it was used for cleansing the cans. The man innocently remarked that he invariably

* Public Health, XVI., 751. 1904.

† Thirty-third Annual Report of Mass., p. 559. 1901.

washed the cans with boiled water, but rinsed them with cold water afterwards.*

Aside from milk itself, there is the possibility of the transmission of typhoid fever by some of its products.

Fraenkel and Kister undertook some experimental work for the purpose of determining the fate of the typhoid bacillus in buttermilk. Their results indicated that small quantities of the typhoid bacilli inoculated into buttermilk are not destroyed by the acids contained in it within forty-eight hours, a length of time which scarcely ever elapses between the period at which the buttermilk would be likely to be infected and its consumption. The possibility of infection through buttermilk must therefore be admitted.

Heim (cited by Laser†) published the results of his investigations concerning the length of time during which cholera, typhoid, and tubercle bacilli may retain their life in milk and butter.

In cheap kinds of rancid butter Heim was able to recover colonies of typhoid bacilli three weeks after the bacilli had been mixed with the butter. After four weeks, however, he was unable to do so.

Bruck‡ says that typhoid bacilli may retain their vitality twenty-seven days in butter and that the origin of typhoid fever may sometimes be referred to infected butter.

According to Lydia Rabinowitsch§ the typhoid bacillus retains its vitality but a very short time in cheese.

Typhoid from Oysters.—Among the food products which serve as disseminators of typhoid fever, raw oysters undoubtedly stand next to milk. The following may be taken as representative of outbreaks of typhoid fever due to infectious oysters:

In 1894 a serious outbreak of typhoid fever occurred at Wesleyan University, and Professor Conn of that institution traced it to polluted oysters. Other possible sources of infection could be excluded. Nearly all of the victims of typhoid fever were members of three of the seven college fraternities. On October 12,

* Rpts. and Papers of the Am. Pub. Health Assoc., XIX., 264. 1893.
† Zeit. f. Hygiene, X., 513. 1891.
‡ Deutsche Med. Woch., XXIX., 461. 1903.
§ Centr. f. Bak., (Ref.), XXXIII., 205. 1903.

eight days before the appearance of the first symptoms, all seven of the fraternities had their initiation ceremonies and had celebrated in the usual way with a supper. No other dish except oysters were from a common source and could in any way be incriminated. Four of the societies had their oysters from a local dealer, one of them took their oysters cooked. Of the remaining three two had no oysters, and the third had some from another source. The oysters from the local dealer which were received by the three societies in which the cases of typhoid fever occurred, were served on the half shell.

It was learned that at these same suppers quite a number of persons present were not students at the college. Some of these were a number of the alumni of the college and five students from Yale. Among the alumni there were several cases of slight illness which appeared at the same time with the cases of typhoid fever at the university, and in addition to these there were four cases of genuine typhoid fever among the alumni. Of the five Yale students who attended the banquet, two developed typhoid fever. It was learned that the oysters came from a place near the outlets of a number of private sewers, and that in a house from which one of these sewers came there were two cases of typhoid fever one of which proved fatal. These two cases of typhoid fever occurred at the proper time to be considered the source of the infection which the oysters carried.

Extending the inquiry to other places it was learned that seven students at Amherst had typhoid fever. One of these students contracted typhoid fever at his own home, and the remaining six attended a banquet on the same date as the banquet at the Wesleyan University, and, at the Amherst banquet, raw oysters from the same source as those which caused the Wesleyan outbreak were served. One young man from Boston who was at Middletown about the date of the banquets came down with an extremely severe case of typhoid.

George A. Soper, Ph. D., a sanitary engineer, of New York, presented* a comprehensive and lucid history of an outbreak of typhoid fever at Lawrence, N. Y., due to oysters. The total number of cases of typhoid fever of which he had knowledge was thirty-one. There were three deaths. None of the cases were

* Medical News, LXXXVI., 241. 1905.

due to insanitary conditions, and the water and milk and other food supplies could be excluded in the search for the cause of the outbreak. More than two-thirds of the cases were traced directly or indirectly to shell-fish taken from water polluted with sewage. In the report it is said that at least two hundred times as many oysters and clams were shipped away as were eaten in the vicinity, and it was thought possible that thousands of cases of typhoid fever may have been caused among the people who ate those oysters. In the judgment of the reporter pollution of Jamaica Bay by sewage was the cause directly or indirectly of twenty-one of the thirty-one cases with which the investigation was concerned, and that the conditions found there fully warranted the opinion that, not only have the oysters and clams taken from these waters been unsafe to eat, but their shells have been dangerous to handle.

Sears* reports on typhoid fever in the city hospital from the first of January to the middle of November, 1903. There were two hundred and three cases which came under his observation and they were furnished by two distinct epidemics. The first of these outbreaks of typhoid fever fell upon a colored school, the pupils of which, during an excursion down the harbor, amused themselves by digging and eating clams.

Sir William Broadbent has found many cases of typhoid fever in his practice among the wealthy classes of London, which were traceable to the eating of raw oysters. One of the cases he saw was that of a young woman in which the sanitary arrangements of the house were perfect. The water and milk which she had taken had been boiled. No other inmates of the house were sick in any way. She had eaten oysters ten days before she came down with typhoid fever.

In another instance he visited two young men living in the same house in which there had been no history of any other cases of typhoid. The house and the place of business where both of these young men were employed were in good sanitary condition. They were both attacked at the same time with typhoid fever in an unusually severe type for which there was no other cause except that ten days before the appearance of any symptoms

* Boston Med. & Surg. Jr., CXLVIII., 142. 1903.

they had eaten an oyster supper together. Both cases terminated fatally.

A young woman and her cousin had on two occasions eaten a half dozen oysters. The young women came down with typhoid fever ten and fourteen days respectively, after eating the oysters, the one in London and the cousin in Italy, whither she had journeyed.

A man and his wife both came down with typhoid fever at the same time in a house which was sanitarily perfect. No possible cause was apparent other than the fact that two weeks before they had eaten oysters.

Dr. Broadbent was called into the country where typhoid fever was unknown, to see a clergyman and his daughter who were both suffering with typhoid fever. Investigations could disclose no other cause for the disease save that about two weeks before they had twice had oysters from London, and they alone had eaten them.*

Sacquépee† had under his observation in Rennes a number of cases of typhoid fever which were undoubtedly referable to the eating of oysters. Particularly noteworthy were the cases of four women who together ate a basket of oysters. Three of them were attacked with typhoid fever, while the fourth, who a while before received a protective inoculation against typhoid fever, failed to take the disease.

Dr. Newsholme,‡ Medical Officer of Health of Brighton, England, has shown that of the cases of typhoid in Brighton, of local origin, in the four years 1893-1897, 33 % of them were traceable to shell-fish.

Whittier§ reported an outbreak of typhoid fever at Marion, a summer resort on Cape Cod.

A house party of six sat down to oysters on a blazer, three of the number had typhoid. A plain or even fancy roast is mere child's play to a microbe that hibernates in a cake of ice and comes up smiling the next summer.

Blenkinsop's Cove, a mile or more long, on the eastern side of the harbor and about a mile across from Marion Village, had

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* British Med. Jr.—Revue d'Hygiene, XVII., 246. 1895.

† Revue d. Hyg.—Hyg. Rundschau, XIII., 1903.

‡ Annual Rpt. for the Borough of Brighton, p. 24. 1897.

§ Boston Med. & Surg. Jr., CXLIV., 444. 1901.

been the chief source of the supply for the summer trade, until in midseason the demand increased and emergency calls arose; then, for convenience in quick delivery, etc., the clean oysters from across the harbor were kept in storage in places polluted by filth and contaminated by sewage. The State Board of Health reports the bacillus coli communis in oysters taken from various places on the village side, none in oysters from Blenkinsop's Cove.

These instances show the danger from the consumption of oysters in the raw state which have come from unsuitable places. There is nothing in the histories of outbreaks of typhoid fever referable to oysters to indicate danger in oysters from clean waters. Invariably, when the source from which the oysters have come has been learned, they have come from waters which have been exposed to sewage pollution. If the oyster industry is to escape severe losses, and the lives of people who consume oysters are to be duly safeguarded, comprehensive legal provisions should be forthcoming forbidding absolutely the "fattening" of oysters near the outlets of sewers.

On the experimental side of the question, the following has been brought out:

In the experimental work of Professors Herdman and Boyce* in the artificial feeding and cultivation of oysters and on the action of sea-water upon the growth of the bacillus of typhoid fever, the following points were developed. In sea-water at a temperature of 35 degrees C. the bacillus lives two weeks, and in cold water it was found at the end of three weeks. Oysters which have been infected with the bacillus clear themselves pretty rapidly when subjected to a running stream of pure, clean sea-water. There was a great diminution or total disappearance of the bacillus in from one to seven days.

Dr. Klein's experiments leave no doubt that the typhoid bacillus can live for many days in sea-water and sewage, and that, when oysters have been laid in such mixtures, the organisms can be found within the shells.†

Prof. Hewlett‡ of Kings College, London, refers to the experiments of Klein, and then describes his own experiments

* Public Health, IX., 60. 1897.

† Jr. of State Medicine, V., 73. 1897.

‡ Jr. Preventive Medicine, XIII., 779. 1905.

which also show that oysters from polluted localities rapidly clear themselves of Bacillus coli, thus indicating that this bacillus is foreign to the oyster and is rapidly destroyed by it. It follows from these experiments that both the Bacillus typhosus and the Bacillus coli communis are microbes alien to the oyster, and when present in it must have been derived from the surroundings.

Typhoid Fever from Other Food Products.—Probably outbreaks are occasionally due to the infection of articles of food, other than milk and oysters. Circumstances have sometimes thrown suspicion upon vegetables eaten raw, particularly celery and lettuce grown upon ground enriched with a fertilizer containing human excreta, and in England, cress grown in polluted water.

Experimental work was carried on by Clauditz* for the purpose of determining the degree of danger of transmitting typhoid fever through the medium of plants and vegetables which are consumed in a raw condition. He found no difficulty in demonstrating the presence of living typhoid bacilli on the surfaces of plants which had been grown in earth contaminated with the bacillus of typhoid fever, and he found that simple washing of the surfaces of these vegetables did not suffice to remove the pathogenic bacteria.

There are two possible ways in which bread may communicate infection. If mixed up with polluted water or other material, or the dough infected with unclean hands, the sterilization of the interior of the loaf is not absolutely certain, particularly as much American bread is underdone. Drs. Waldo and Walsh† cultivated thirteen different microorganisms from the center of loaves of bread soon after they were baked. This danger is slight in comparison with that of infection with dirty hands or otherwise after the bread is removed from the oven. The conditions of the bakeries which the English investigations have disclosed, suggest that the bakeries in every country should be kept under official sanitary control,—direct communication of the bakeroom with water closets, flooding with sewage, which in one instance at least was stopped with the rolling-pin, flies swarming the bakery which had free access at the same time to sources of filth,

* Hyg. Rundschau.—Revue d'Hygiene, XXVII., 550. 1905.
† Lancet, 1894. Vol. II., 906.

want of ventilation and the bakerooms used as sleeping quarters, etc.

The experiments of Troitski* showed that the bacillus of typhoid fever can retain its vitality upon the crust of a loaf of white bread or upon the softer middle portion, from 25 to 30 days or more. Upon rye bread the life of the bacillus was much briefer.

It should be remembered that the danger from an infected water supply is not always escaped by using bottled or aerated waters, soda water, or beer. These drinks, recently prepared from infected water, lose their infectivity only after some time.

The investigations of the Imperial Board of Health of Germany, disclosed the fact that the typhoid bacillus may remain alive and dangerous for five days.†

Dr. Eberstaller,‡ at a meeting of the German Public Health Association in 1905, gave the following histories of an outbreak of typhoid fever in which the infection was transmitted through the medium of bottled beer:

The persons affected were mostly of the better class. There was a total of twenty-four cases. An investigation disclosed the fact that the beer which was incriminated had been bottled by a man on the third day of his illness which had necessitated his removal to the hospital where he had a run of typhoid fever. On the day while engaged in this he was suffering from severe diarrhoea. In filling the bottles he made use of a rubber tube through which he sucked the beer to start the siphon, and handled the end with his fingers which were inserted into the mouth of the bottles to be filled. This investigation led to the establishment, under official regulations, of less objectionable methods of filling beer bottles.

Air-Borne Infection.—Indoors, in infected rooms, or in handling infected clothes dry, infection may occur, but in the open, under the conditions in ordinary life, distribution or infection through the air is hardly worth considering. But in the report on military camps, already quoted, the authors state:

"It is probable that the infection was disseminated to some extent through the air in the form of dust. So prevalent was typhoid fever at Chickamauga that much of this fecal matter

* Revue d. Hygiene, XVI., 726. 1894.

† Arbeiten a. d. Kaiserl. Gesundheitsamts. II., 15. 1887.

‡ Deutsche Viert. f. öff. Ges., XXXVIII., 60. 1906.

must have contained the Eberth bacillus, and it seems hardly possible that the great clouds of dust in which the men lived could have been free from this infection. The shell roads through the encampments at Jacksonville were ground by the heavy army wagons into an impalpable dust several inches thick. Along these roads scavengers carted in half barrels fecal matter containing the typhoid bacillus. The contents of these tubs frequently splashed over and fell in this dust. On each side of these roads soldiers were encamped, and many mess tables were in close proximity to the roads. Local whirlwinds sometimes caught up large quantities of this dust and carried it considerable distances. After seeing these things, we feel that we can not exclude the dust as a probable carrier of the typhoid infection, notwithstanding the fact that it would probably be a very different thing to scientifically demonstrate that the disease was disseminated in this way.

Tooth* assigns four causes for the prevalence of typhoid fever while he was in camp on Modder river in South Africa in 1899: First, the water of the river of which the soldiers could not be restrained from drinking; second, infection in the dust which was blown about by the winds; third, flies; fourth, direct infection from person to person.

Other Sources of Infection.—There are possibilities of infection from an infected water supply in the home even when it is not used as drinking water. In the report of Reed, Vaughan and Shakespeare, already cited, two cases of typhoid fever are narrated in persons who did not drink the infected water but used it with their toothbrushes; and two more who gave themselves treatment with the nasal douche, using the infected water for this purpose.

Primary and Secondary Cases.—In outbreaks of typhoid fever there is often a great difference in the history of the primary and the secondary cases. The earlier cases may have been due to an infected water supply or milk supply and have developed suddenly, while subsequent cases, due to contact infection, transmission by flies, or the infecting of home environments, may prolong the prevalence of the disease and present an epidemiologic picture different from that which was seen at first. Thus conflicting opinions may be held as to the cause of the disease by persons whose observations do not take in the whole field of the epidemic as regards time and territory.

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* Lancet, 1901, Vol. I., 79.

Referring to the study of the epidemiology of typhoid fever made by the French school and particularly by Bretonneau, Almquist* remarks that in their works the unprejudiced reader is compelled to acknowledge that cases of typhoid fever imported into small places where subsequently the course of the disease may easily be studied, show that typhoid fever is a contagious disease and is exceedingly dangerous for the neighborhoods. As a corrective of certain localistic theories I can heartily recommend the study of their works, but a detail relating to typhoid infection well known to earlier French observers has, it is strange to say, disappeared from the text books on typhoid fever.

Almquist here refers to the fact that the period between the appearance of the first case of typhoid fever and the next following cases is from three to four weeks. As Gengron says, a few of the secondary cases appear within a briefer period of time, but they are the exception to the very general rule. He further affirms that the incubation period for typhoid fever is seldom longer than from eight to ten days and occasionally very short.

Piedbache who studied typhoid fever in rural hamlets or villages, observed 452 cases between the years 1839 and 1848. He reports that typhoid fever had extended itself in a very uniform way, to wit: that between the primary and the secondary cases from three to four weeks elapsed. He describes in detail many house epidemics in which this rule is observed. The secondary cases appear most frequently when the primary case was in the fourth week.

Almquist narrates the following in his own experience as illustrating this point. A servant girl became sick August 8, and was carried to her peasant home August 18. After her arrival from the 12th of September on, several of the members of her family, her parents and brothers and sisters, became sick with typhoid fever. Several persons in the city, who received milk from this house, became sick from September 17th on. There was, therefore, a period of about four weeks after her return home before new cases of the disease occurred among the persons who came in contact with her, although in the small and thickly populated house there was no isolation whatever. He

* Zeit. f. Hygiene, X., 163. 1891.

refers to other similar personal experiences of his own and of his associates.

Almquist therefore enumerates the following rule: When a case of typhoid fever gives rise to secondary cases, these appear, as a rule, not until from three to four weeks have passed and then it often occurs that several persons who have been exposed to the first case come down simultaneously.

Von Rieder in reporting an epidemic of typhoid fever in Riga in the year 1900, states that this outbreak was caused by an infected water supply, but that in connection with the outbreak there were a large number of secondary cases in which the infection was from person to person. One of the house physicians in the hospital and thirty-eight of the nurses attending the cases of typhoid fever came down with the disease, and several outbreaks in families strongly indicated contact infection.

Atypical Cases of Typhoid Fever.—To require every case of typhoid fever to conform with the text-book picture of typical cases would be a practice extremely dangerous to the public health. Very atypical cases of typhoid fever, as well as of other infectious diseases, frequently occur, and the delay in expressing a positive opinion on these difficult cases, is creditable to the attending physician, the sanitary precautions required under such circumstances being observed meanwhile, for the infection is often present early in the stools of mild typhoid and of atypical cases.

Dr. C. E. Woodruff,* surgeon U. S. army, says:

"Investigations by Widal's test have shown that typhoid infection can exist in myriad forms even without intestinal lesions, and the atypic forms thus assume a great military importance. Every such case introduced into a crowded camp may infect the whole army so as to disable it, even though the original patient is not bedridden. The serious typhoids with abdominal symptoms are of no military importance, for every one recognizes them. The real danger is in the short mild cases in which the patients are allowed to run about, spreading the infection broadcast—the cases which local pride or fear of public condemnation leads so many physicians to call a 'touch of maleria' or 'biliousness' or any other non-committal diagnosis. Not less dangerous are the atypic cases without abdominal lesions, but having the infection confined to the lungs, kidneys, meningies, bones,

*American Medicine, VIII., 1091. 1904.

or indeed any other part, for no tissue seems to escape. It is believed that these cases costitute a large proportion of all the infections. Osler reports the case of an old man who died of pneumonia, from whom pure cultures of the typhoid bacillus were obtained from the lungs, spleen and other organs, and yet there were no intestinal lesions.

In a paper on mild and abortive forms of typhoid fever Dr. Briggs,* of Washington, D. C., says:

"Probably no one of the common infectious diseases has so many points of interest for us, both as citizens and as physicians, as has typhoid fever. Many an epidemic of typhoid fever, whose origin is officially traced to a perfectly constructed water-supply system, should rather be laid at the door of the medical attendant upon the early, often imported, cases, who has been satisfied with a purely formal disinfection of stools and urine, either taking the most superficial precautions, or recommending the use of disinfectants of notorious inefficiency.

"A diagnosis of 'simple fever,' or of a gastric upset, is fatally easy to make, especially as in most instances no immediate unpleasant consequences will force attention to one's error."

Reviewing the typhoid fever condition in the Spanish-American War, Dr. Anderson,† of Washington, D. C., says that "it should be a golden rule that every case of continuous fever be considered typhoid until proven otherwise."

"Typhoid fever" says Drigalski, "assumes varied forms. Sometimes it is masked, sometimes it resembles influenza, bronchial catarrh, or even pneumonia, or gallstone colic which may be caused by the bacillus in the gall bladder. Gastric or intestinal catarrh should be considered suspicious, and so should various forms of angina. The typhoid bacillus may be present in persons who present a complete picture of health. Particularly in children typhoid fever assumes an atypical form."

Bezancon and Philibert state that the typhoid bacillus may produce a general blood infection without local intestinal lesions. They narrate fifteen cases of this form of typhoid intoxication. These cases were distinguished by the absence of abdominal symptoms, of the characteristic eruption, and of marked enlargement of the spleen. In the severe forms of Eberth's infection the presence of the typhoid bacillus is constantly present in the general circulation. This form of the disease can be considered

* American Med. VIII., 644. 1904.

† American Medicine, III., 476. 1902.

as a general infection with or without secondary localizations in the intestinal tract.

In a second memoir on this subject in the same journal, the authors repeat that the typhoid bacillus may not only produce the specific blood poisoning without the appearance of localized lesions, but the infection may localize itself upon almost any organ of the body, with or without a tendency to general infection. Seventeen observations were made in which meningitis, lobular pneumonia, inflammation of the gall bladder, of the kidneys, the joints, and of the glands, were referable to the typhoid bacillus. The enlargement of the spleen may constitute the only typhoid symptom.

In these cases the diagnosis can be made only with the help of the Laboratory—diazo-reaction, sero-diagnosis, cultures from the blood and feces. There is some difficulty in making a diagnosis between these forms of typhoid fever and paratyphoid fever.*

In a paper read before the New York State Medical Association Dr. Louis C. Jaeger of New York, took up the subject of typhoid fever in children. He said that by no means all the members of the medical profession had yet divested their minds of the old fallacy that typhoid is a very rare condition in young children. In a summary of his paper the doctor says that typhoid fever in children is almost invariably of brief duration and that the temperature, as a rule, is not excessive.

On the other hand, Dr. Morse† of Boston, in a paper on "Infantile Typhoid Fever" expresses the opinion: "In the light of our present knowledge, the symptomology of typhoid in infancy is essentially the same as in adult life, and it is really and not apparently infrequent at this age."

Weichardt‡ describes a case of typhoid fever in the course of which the predominating symptoms were referable to the central nervous system while those which are considered pathognomonic for typhoid fever were wanting. The autopsy gave no distinct points for the diagnosis of typhoid. The bacteriological investigation, however, gave the typhoid bacillus with all its specific

* Journ. de Physiol.—Centr. für Bak. (Ref.) XXXVII., 233. 1905.
† Medical News, LXXXIII., 193. 1903.
‡ Zeit. f. Hygiene, XXXVI., 440. 1901.

characteristics. Weichart considers such cases as this in which the diagnosis of typhoid cannot be made, and in which the necessary precautionary measures, including the disinfection, are disregarded, as extremely dangerous from the point of view of the public health.

Velich* reports on thirty-six sudden deaths in which at the autopsy typhoid fever was found to exist. In twenty-five of the cases, in addition to the typhoid fever, disease of the heart was present, and in all the remaining cases there was other severe disease present. During the illness typhoid fever was not suspected and was first recognized at the autopsy. These cases of latent typhoid fever have great significance from the public health point of view.

In a discussion before the New York State Medical Association in 1905,† on the frequency of types of abrupt typhoid fever, Dr. Manges said that this form of typhoid fever, abrupt onset, is much more common than has been supposed, and as it is likely to be severe and needs treatment early it is necessary the diagnosis should be made at the earliest possible moment. In Dr. Manges's experience and according to the records of the Mt. Sinai Hospital, about ten per cent. of all typhoid cases begin abruptly. The causes of the sudden onset of symptoms in these cases seem to be the silent progress of the bacilli until all resistance is overcome when the organism gives way. There are two forms: the first is the genuine abrupt typhoid fever, and the second, the apparently abrupt. These latter are walking typhoid cases. Some of the cases resemble paratyphoid and in these the Widal reaction is the best possible diagnostic sign; in other cases the headache is so severe as to simulate meningitis. In some cases the temperature is extremely high. Sharp, hard chills occur in about two per cent. of the cases.

Dr. Stockton, of Buffalo, said, whenever typhoid fever selects a special organ for its attack, then the symptoms of its presence are almost sure to announce themselves suddenly. Dr. Moriarity, of Saratoga, referred to groups of cases of typhoid fever occurring in the hospital; four nurses, two orderlies, and three patients. None of them had prodromal symptoms. In two of

* Arch. f. Hygiene, XLIX., 113. 1904.

† Medical News, LXXXVII., 380. 1905.

the cases there was so much abdominal pain that they were thought to be cases of appendicitis. One of them was decidedly hemorrhagic in character and ran a severe course. All of them had slow pulses.

In the report of Reed, Vaughan and Shakespeare, several times quoted in these notes, it is affirmed: "It is altogether possible for an individual to carry in his alimentary canal and eliminate therefrom the Eberth bacillus in virulent form without having the disease himself. The probabilities are that the majority of men who reach 40 years of age have at some time or another carried this germ in their bodies, and this may account for the fact that men of this age are less susceptible to the disease than younger men."

Jürgens* of Berlin holds that the presence of the typhoid bacilli is far from being synonymous with the disease. Following Koch's example, all the infected persons in an infected family were examined for typhoid bacilli, regardless of whether they were sick or well. This revealed a number of slight, atypical cases of typhoid, and also disclosed the presence of the bacilli in certain absolutely healthy subjects. The bacilli in the milder cases were sometimes far more virulent than in the severe ones. The resistance of the individual is evidently the determining factor. The disease process is identical for all, but differs in its degree.

Conradi† relates that in the discharges from the bowels of a child sick with typhoid fever, in addition to numerous typhoid bacilli, a number of paratyphoid bacteria were found (on Drigalski-Conradi plates). The infection was supposed to have been received in ice which the child consumed. Symptoms of the fever appeared eight days later. In the Municipal Hospital occasionally an epidemic of typhoid fever occurs referred to contact infection. In the discharges of some of the sick, typhoid bacilli may be found, while in those from other patients the paratyphoid bacilli are present. A physician who was not sick discharged by stool both typhoid and paratyphoid bacilli, while, at the same time, his serum possessed no power of agglutination. The bacteriological investigation was made twice within eight days.

* Public Health, XVI., 751. 1904.

† Centr. f. Bak. (Ref.) XXXV., 764. 1905.

Two years ago, says Fischer,* we had an outbreak of typhoid in Kiel in which there were eighty cases, and, after a careful investigation of the circumstances, we were forced to conclude that the disease was due to the eating of the meat of a sick animal. This experience is not unique. Three years previously we had a similar experience. In a small place near Kiel fifteen persons suddenly were attacked with typhoid fever, and the persons exclusively were attacked who had eaten the meat from a sick calf. Similar epidemiologic observations have come from the province of Plon. In the Kloten epidemic also 600 of the visitors to a music festival became sick after partaking of meat which had been derived from a sick animal. In the epidemic at Kiel of which I have spoken, in which the disease presented the appearance of typhoid, the paratyphoid bacillus was found instead of the true typhoid bacillus.

I may add that last year we had an epidemic in a small city in which there were sixty cases which presented generally the typical clinical picture of typhoid fever, yet we were unable to find either the specific typhoid bacillus or the paratyphoid bacillus in the dejections or in the blood. This and some similar experience force us to the conclusion that, aside from typhoid bacilli and the two hitherto described paratyphoid germs, there must be other unknown bacilli which sometimes cause a disease identical with typhoid fever or closely resembling it.

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* Deutsche Viert. f. off. Ges., XXXVIII., 57. 1906.

NOTES ON DYSENTERY AND CHOLERA.

By the Secretary of the Board.

These few notes are presented for the purpose of bringing out the parallelism which exists between these two diseases and typhoid fever, so far as the methods in which their distribution is concerned. These three diseases are the chief components of a group which have been known as water-borne. While the rapid spread of typhoid fever and cholera through the medium of infected water supplies has constituted the most dramatic phase of their epidemiology, we need to grasp clearly the teachings of the observations of recent years, that these diseases are largely spread irrespective of water as a medium of transmission, and often in fact when the influence of water supplies can entirely be eliminated—spread directly from person to person, by "contact infection," favored usually by the unclean environments of the people.

Notes on Dysentery.—In a report on an outbreak of dysentery in the Connecticut Hospital for the Insane in 1903, Drs. Diefendorf and Fisher* state that the origin of the epidemic could not be traced to sources outside the hospital, including the food, water, and milk supply. A considerable majority of the cases they think resulted directly or indirectly from contact with infective material in the hospital—dejecta of patients. The bacillus dysenteriæ was recovered in one-third of the cases studied.

Following the Franco-German war of 1870 and 71, says Röttger,† there was a marked increase in the prevalence of dysentery. The susceptibility to dysentery is about the same at all periods, but the mortality rate is much greater in the earlier years and again at the advanced period of life.

An outbreak of dysentery occurred in Bremen in July, 1899. A careful investigation showed that, as early as the end of June

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*26th An. Rept. State Board of Health of Conn., p. 234. 1903.

† Centr. f. allg. Ges.—Deutsche Viert. f. öff. Ges., XXXIII., 167. 1902.

in some houses on the streets in which the outbreak occurred, there had been cases of intestinal disease which were probably dysentery. In what way the infection was first introduced has not been explained, but the disease spread slowly, first in the families of the sick, until the beginning of September, when there was a rapid increase in the prevalence of the disease. The outbreak reached its maximum in the third week of that month with 130 cases. There was a total of 591 cases with 66 deaths. It was observed that the disease gradually spread from house to house and from street to street. The infection of the drinking water could, therefore, apparently be excluded, and the way in which the disease spread indicated contact infection or the extension of the infection from person to person as the result of injudicious association with the sick, and contact with soiled body and bed clothing of the sick, the infection of food with the hands of the sick or of the attendants upon the sick, etc. The social and sanitary conditions of the people in this part of the city were far from satisfactory.

An epidemic of dysentery which appeared in one of the German army barracks was investigated by Robert Koch* and he could not find any reason to suspect that the infection had come through infected water supply, food, drink, or arrangements for the disposal of excreta. Koch came to the conclusion with the military surgeons that the barracks themselves were thoroughly infected. They were therefore vacated.

Borntraeger† reports on a widely distributed outbreak of epidemic dysentery which occurred in the region around Danzig, Germany, in the years 1895 and 1896, and furthermore gives much information in regard to the prevalence of the same disease in the same country in former years.

In one group of cases there was a total of 1,176 cases of the disease with 176 deaths, which was equal to 15 per cent. of them. His observations indicated that the average period of incubation of the disease was three days, ranging from two to six days. He gives many instances which indicate the correctness of his conclusions on this point. He is convinced that, as a rule, the

* Zeit. f. Med.—Deutsche Viert. f. öff. Ges., XXXIV., 163. 1903.

† Zeit. f. Hygiene, XXVII., 378. 1898.

infection of the disease is received by the way of the mouth; possibly occasionally by the way of the rectum. The infectivity of the specific organism of dysentery is very great, either that or the immunity of man against it is slight, for he had observed repeated instances in which all the members of a family of from five to eight persons were attacked, one after another, after a person sick with that disease had come to that house. The endemic history of the outbreak teaches him that the micro-organism must have a long period of vitality. Instances are cited in which it would appear that the infection must have retained its vitality from one to two or three years.

As to the method in which the disease is communicated he is convinced that it is largely spread by direct infection—by contact with infectious persons and with things which have been infected by the patient. The following are a very few of the many instances mentioned by him in support of his views:

A boy returned to his father's house sick with the disease. The result was the infection of his own family and later of other families in the neighborhood with whom they associated. Twenty cases resulted. A man brought the disease from Russia to one of the frontier towns of Germany. Forty-eight cases resulted. A girl was present at the burial of her brother who had died of dysentery. Returning to her home she came down with the disease. A young woman was present at the funeral of a relative. Returning she brought the disease to the town in which she lived and from this implantation of the disease sixty-two cases occurred with sixteen deaths.

A servant girl was brought to her brother's home in H. and infected his family, from which the disease was transported to three other houses in the neighborhood. Thirteen cases followed this implantation of the infection. Many other instances are given in which the disease was transported by persons who returned to their homes, and of persons who were infected by visiting the sick, or by being present at the burial of the deceased.

As regards the transmission of the infection through the water supply he makes these statements: the rapidity of the transmission is against the assumption of water-borne infection, for in numerous instances the persons became sick with the disease in from two to three days after their first exposure. This is

too rapid a transmission of infection to believe that reaching the ground it found its way to the water supply and thence to the patient.

Again the fact that the persons who were in the closest association with the sick ones were the persons who first came down with the disease. Other persons in the same house and persons in the neighborhood came down gradually one after another. The general method was not an explosive outbreak infecting many persons at the same time in a group of houses which used the same local water supply.

In the cities when the disease appeared in a family living several stories above the ground and spread from person to person, the influence of the ground as a factor in the local outbreak could with considerable confidence be excluded. Against the idea of the influence of the ground or the water supply in the propagation of the disease he refers to the fact that some of the regiments infected in the barracks were moved to other quarters in the open field. Nevertheless the infection clung to them and still further affected them after they had removed to other barracks.

Referring to the usual manner in which infection is spread, he reminds us of the conditions of the patient who has this disease with some twenty to sixty evacuations in 24 hours. Under the circumstances it is altogether impossible for the patient, even if of cleanly habits, to avoid the infection of his clothing, of his bedding, and of his hands, and eventually everything touched by him; clothing, eating utensils, and many other things in his vicinity are infected. The hands of the attendants, as can easily be understood, soon become infected, and there is great danger of the transmission by them of the infection indirectly to the lips or mouths through the medium of their food and otherwise. He observes that this sort of finger infection is exceedingly common not only in this disease but in cholera and in typhoid fever.

If this method of propagating the disease can occur in cleanly persons it may be imagined how much more favorable for this method of transmission it is among the uneducated and uncleanly persons in this class of people in the country.

Infection, in dysentery, occurs in the great majority of cases by the mechanical transmission of traces of fecal matter; that

in fact it has a direct fecal infection, and that the ground cannot be considered an etiological factor. Infection is transmissible directly from person to person. Practically considered, the presence of a person sick with this disease is as dangerous for his associates as would be the presence of a person sick with smallpox. The disease is transmissible in the same way as is the infection of cholera.

Accepting his theory, the explanation of some of the epidemiological histories of dysentery is made clear. It shows why the disease is more prevalent in the lower classes of the people. It explains in part at least why children are more frequently attacked than adults. They are less careful and less cleanly in their habits; they are handling everything, they stick their fingers and many other things in their mouth, and out-of-doors come more intimately in contact with sources of filth which may contain infection.

As in cholera the effects of the sick, and particularly of the body and the bed clothing are infectious. This is indicated by the history of a woman who became sick in Danzig after washing infected clothing, and by the case of a young woman in Krangen who became sick after using the clothing which had belonged to persons sick with this disease several years before.

Repeatedly Borntraeger found articles of food as probable carriers of infection in Danzig. Several families were supposed to have beeen infected through milk, cheese, fruit, or vegetables which had been infected. He admits the possibility of the transmission of this disease through water supplies, but in these outbreaks which he investigated he finds no logical indication that the disease was thus spread.

The control of epidemics of dysentery should be through isolation of the sick, care for extreme cleanliness of the patient and of the surroundings, and particularly of the patient's hands, the prompt disinfection and proper disposal of the excreta of the patients, the disinfection of all dishes and utensils used in the sick room, of the clothing and bedding, and of privies. Other persons in the same house must take precautionary measures observing utmost cleanliness, and particularly should they carefully cleanse and disinfect the hands after they have come in contact with the patient and with articles in the sickroom.

Notes on Cholera.—India has been considered the perennial home of cholera. The climate and the life conditions of the natives of that country favor the transmission of the disease from person to person and favor the continuance of the vitality of the infection in the outer world—in the soil and the earth. What some of the conditions are were described by Dr. W. J. Simpson, in 1894, then Health Officer of Calcutta.

"The tanks or ponds form a special feature in the physical topography of Calcutta. Originally excavated to raise the surrounding land in order that huts and houses might be built on the raised land, the tanks became useful, first, as reservoirs of rain-water for supplying the neighborhood, or the surrounding cluster of huts, with water for drinking and for domestic purposes; and, secondly, as a convenient receptacle into which the drainage of the locality should flow. Different districts differ in the number of ponds which they contain; some are honeycombed with these tanks, and during the rainy season there is actually in some areas more water than land; others have fewer tanks, and a number of them are protected from drainage pollution. The public tanks are also, as a general rule, well looked after; but the majority of tanks are the mere drainage cesspools of the locality. Much has been said regarding the filthiness of these ponds. They more or less resemble pea-soup in colour, and their composition has been officially reported as concentrated London sewage. The drainage from latrines often find an easy and convenient outlet into their waters; soiled clothes of the sick and of the healthy are washed therein; men, women and children bathe and perform their ablutions in the pond, while oxen, buffaloes, horses, goats and other animals are taken down to the water's edge, and there given a bath. In such water the inhabitants cleanse their domestic utensils and soak, macerate and wash their rice and *dhal,* and not infrequently prepare other kinds of food."

The spread of cholera from person to person requires the transference to the intestinal tract of new victims of some of the infection generated in the intestinal canals of the cholera sick. As in typhoid fever the transference may take place in various ways.

The large epidemics of cholera have been water-borne, though other factors have contributed their share to the distribution. Following the routes of traffic, cholera has several times spread from our Atlantic and Gulf ports, to which shipping has brought it, and prevailed disastrously at interior points, particularly in the valleys of the Mississippi and Ohio. Of late outbreaks, that of Hamburg, Germany, in 1892, illustrates the rapidity of the extension of water-borne epidemics of cholera. The water of the river Elbe, from which the city water supply was then taken unfiltered, in some way became infected with the bacillus of cholera. Within 18 days of the beginning of the outbreak the disease had spread rapidly over all parts of the city, and 10,000 cases had occurred with more than 4,300 deaths.

The outbreak of cholera in a hospital for the insane in Nietleben, Germany, in the beginning of 1893, is an example of the winter prevalence of cholera which is not by any means unique. The first case occurred in the middle of January. The next day there were six new cases, and the third day, eleven. There were one hundred and four cases in all, among them three physicians and ten nurses and women attendants. It was afterward learned that a man came from Hamburg, where cholera had prevailed, and after his arrival suffered from diarrhea, which later lead the investigators to believe was cholera in a mild form.

Cholera is propagated by infected water, not only by drinking it, but, as in typhoid fever, the presence of infected water in the household constitutes a grave danger, for it may find its way into the stomach through the infection of dishes, tooth brushes, the hands, or lips in washing, etc.

In the ground the bacillus of cholera may retain its vitality some weeks at least under favoring conditions; and in water its life may be considerably prolonged. In one of the water tanks of India, investigated by Koch, the cholera bacillus was found for fifteen days. Out of forty-six water tanks around which cholera existed, near Calcutta, Simpson found the cholera bacillus in forty-two, that is, in 91.3%. Under the observations of Babes, the cholera germ remained alive in the water of the Seine seven days, and the same length of time in the water from the public supply of Berlin. According to Nicati and Rietsch,

it remained viable eighty-one days in the water of the harbor, sixty-four days in sea water, and thirty-eight days in canal water.

It has been shown that in or on some food supplies the micro-organism of cholera retains its vitality for some length of time, or even undergoes rapid multiplication. In his experiments on its behavior in milk, Kitasato found that, at the temperature of 36° C., the cholera bacillus developed very rapidly during the first twenty-four hours. They then diminished in numbers from hour to hour as the acidity of the milk increased. Aboard a ship in the harbor of Calcutta, nine cases of cholera suddenly appeared. An investigation showed that these nine persons and one other person, had received milk from a native milkman. The one person who was spared had taken but very little milk. Eight other persons aboard the ship who used condensed milk, and three who used no milk at all, remained free from the disease.

Uffelmann has shown that the bacillus, on the surface of rye bread open to the air, remained alive twenty-four hours, but when the bread is wrapped in paper it continued viable for three days. On roasted meat placed in a bell jar, it was active at the end of a week. It develops luxuriantly in bouillon, on potato, and, according to Babes, on fresh meat, cooked eggs, cabbage, moistened bread, and legumes. Various foods, therefore, not freshly cooked, which have been exposed to infection in various ways, may transmit dangerous doses of cholera infection.

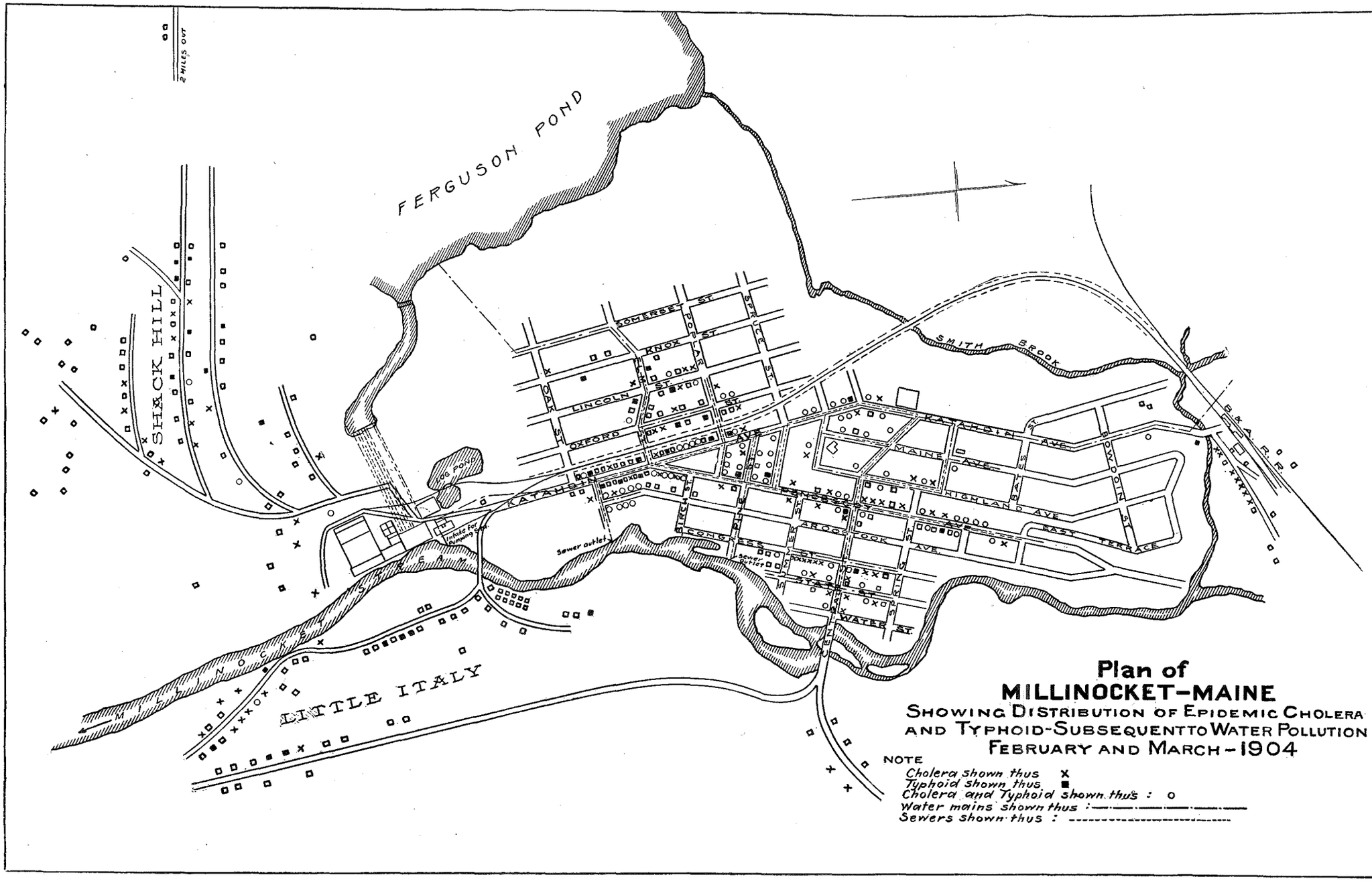
The clothing of cholera patients, second hand clothes, scraps and rags especially, are to be regarded as particularly dangerous and a fruitful source of distribution of infection in cholera times. Upon dampened clothing and other fabrics, the bacillus will not only retain its vitality, but will sometimes increase luxuriantly. Washerwomen have been notoriously exposed to cholera infection. This was noted in Vienna in 1866. In a laundry in that city, sixteen of the women working there were attacked with cholera. In 1873, in the same establishment, there occurred first one case, then two other cases, at a time when there were only a few isolated cases of cholera in the city. It was shown, however, that cholera infected clothing had been sent to this laundry. Later, in the same year, another local outbreak of cholera occurred in this same laundry.

Attendance upon the cholera sick under suitable precaution is not considered especially dangerous. Some of the characteristics of the specific infection of this disease would appear to lessen the danger of contact infection, and perhaps lower the degree of this danger below that of typhoid fever. While the typhoid bacillus is noted for possessing a degree of resistance against adverse conditions exceeding that of many pathogenic bacteria, the bacillus of cholera is noted for its slight power of resistance against adverse conditions. It resists well low temperatures, but is easily destroyed by low degrees of heat, easily destroyed with disinfectants, quickly loses its life upon drying, but when subjected to drying under certain conditions in which desiccation is not perfect, it may retain its vitality some time; according to Uffelmann, on the printed page, seventeen hours, on writing paper in an envelope twenty-four hours, on textile fabrics in a dry state, four days, but when moist, twelve days.

The investigations made by the Imperial Board of Health, of Germany, showed that the disease may be transmitted by uncleanly hands, utensils, etc. The fatal case of cholera which occurred in the laboratory in Hamburg, in 1894, emphasizes the danger of contact infection.

Most of the experimental work relating to the cholera bacillus would lead us to the conclusion that there is little danger from air-borne infection, although this danger undoubtedly exists in uncleanly rooms where cases of cholera have occurred. The transmission of the disease through the air to any great distance appears to be entirely impossible. The cholera bacilli dried under certain conditions, for instance, with clay, sand, or sweepings, may be dispersed in the dust in a living condition, according to Liebermeister. There is good reason to believe that the infection may be carried by flies.

As with typhoid fever atypical cases, even so mild that they can be recognized only by the help of the laboratory, play an important part in the distribution of infection. The "Bacillenträger," that is, persons who have been exposed to the disease and have had but mild symptoms, or none at all, may for some time continue to be sources of danger to persons and to places by discharging cholera bacilli in their excretions.



Plan of MILLINOCKET–MAINE

SHOWING DISTRIBUTION OF EPIDEMIC CHOLERA AND TYPHOID-SUBSEQUENT TO WATER POLLUTION FEBRUARY AND MARCH–1904

NOTE

Cholera shown thus X
Typhoid shown thus ■
Cholera and Typhoid shown thus : o
Water mains shown thus : ———————
Sewers shown thus : ----------

THE "CHOLERA" AND TYPHOID FEVER EPIDEMIC IN MILLINOCKET IN 1904.

By HENRY HAWKINS, M. D., Dorchester, Mass.*

Millinocket, a "paper town" of 2,500 inhabitants situated on the Bangor and Aroostook Railroad in the valley of the Millinocket Stream, taking its water supply from Smith Brook, was overtaken in February, 1904, with an epidemic of "Cholera," (the term "cholera" is adopted for convenience's sake though a misnomer, gastro-entero-colitis would be more nearly correct) and later typhoid fever which broke out in epidemic form.

The population of the town was composed of younger rather than older people, since the town was brought into existence some five years previous by the building of the pulp and paper mills. The permanent population consisted mainly of families of average size, the ages of the parents ranging from the middle twenties to forty years.

A large proportion of the inhabitants consisted of single men, paper makers and mill hands, a drifting population, generally a rugged class, living in the numerous boarding houses. The town for distinction's sake in discussion is divided into Millinocket proper, Shack Hill, Little Italy, and the Station.

Millinocket proper was supplied with water from Smith Brook or Ferguson Pond, so that the family which depended upon springs or wells for water supply was the exception. This water supply was of good quality giving upon analysis very favorable reports except in spring and fall when it gave a high percentage of vegetable matter due to the washing of swampy and marshy land through which its tributaries ran. The normal pressure obtained from the elevation of Ferguson Pond was sufficient for ordinary domestic purposes.

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* During the winter and spring of 1904, Dr. Hawkins held the position of Medical Inspector for the State Board of Health of Maine, in the work against smallpox and other epidemic diseases.

The same portion of the town supplied with the water system was also supplied with a sewerage system which had two outlets into Millinocket Stream above the pulp and paper mills, one outlet approximately 1,500 feet the other 2,500 feet above the mills.

At the mills there was a powerful rotary pumping plant with its intake from Millinocket Stream connected with the town water mains for the purpose of giving high pressure for fire protection which the usual water supply from Ferguson Pond would not give. Ordinarily the pump was shut off from the water mains by a gate in the mill yard. [See map.]

On the morning of January 29, 1904, fire broke out in the Ewen Block, Penobscot Ave., and " fire pressure " was called for by the fire organization. The rotary pumps which had been idle for some time, started, and the water from Millinocket Stream was driven with high pressure into the water mains of the town system. At the time of the fire the muddy condition of the water was noted and as it was applied to the burning structure the foul odor was remarked upon by those present.

The Windsor Hotel burned February 21, 1904, and the " fire pressure " was again obtained from the same source. The water mains were again filled with water from Millinocket Stream the intake being below the two drainage points of the town's sewerage system. [See map.]

Beginning with the second morning after the first fire there was a general epidemic of " cholera " which lasted throughout the spring up into May, 56 persons, or 19% of the population of Millinocket proper falling victims (Chart I) and 14% of the population of the other three sections of the town (Chart II).

CHART I.

Millinocket Proper.

Page of note book.	Population.	City water.	Spring water.	Typhoid Fever.			Cholera.			
				Total.	Males.	Females	Total.	After 1st fire.	After 2d fire.	Later.
12	87	89	0	9	6	3	17	14	0	3
13	138	138	0	17	14	3	119	51	47	21
14	130	109	21	11	4	7	51	41	3	7
15	84	65	19	9	5	4	18	17	0	1
16	111	99	12	12	10	2	72	70	1	1
17	113	113	8	17	8	9	61	61	0	0
18	76	76	0	14	4	10	44	40	4	0
19	122	115	7	12	4	8	67	58	9	0
20	98	98	0	19	14	5	75	72	3	0
21	138	92	46	10	5	5	27	23	1	3
22	110	85	25	10	4	6	41	41	0	0
23	163	144	19	9	7	2	140	138	2	0
24	115	115	0	20	15	5	84	82	2	0
25	120	120	0	17	11	6	81	80	1	0
26	16	16	3	3	1	2	14	14	0	0
	1,621	1,472	160	189	112	77	911	802	73	36

Sick from typhoid fever, 11.65%.

Sick from cholera, total, 56.19%.
Sick from cholera, after first fire, 42.19%.
Sick from cholera, after second fire, 6.12%.

The severest type of the "cholera" occurred during the week following January 29, the date of the first fire. Forty-two per cent. of the entire population of Millinocket proper was that week ill (Chart I) and 5% of the entire population of the rest of the town generally using spring and well water. (Chart II).

Throughout the second and third week up to February 21, there occurred a few cases of "cholera."

After the second fire on February 21 there was a renewed outbreak of "cholera," but not so severe in type or so large a percentage of population. In Millinocket proper 6.12% (Chart I) and in the other sections 8.96% (Chart II). Later throughout March and April there occurred now and then a scattering case of cholera.

CHART II.

"Shack Hill," "Little Italy," and "Station."

Page of note book.	Population.	City water.	Spring water.	Typhoid Fever.			Cholera.			
				Total.	Males.	Females	Total.	After 1st fire.	After 2d fire.	Later.
28	125	0	125	0	0	0	18	3	0	15
29	80	7	80	7	5	2	11	3	0	8
30	140	5	140	5	3	2	2	1	0	1
31	157	35	122	4	4	0	25	1	0	24
32	158	8	138	8	4	4	2	1	0	1
33	109	8	109	8	4	4	11	2	0	9
34	70	0	70	0	0	0	6	1	0	5
35	76	13	63	5	4	1	54	35	0	19
	915	76	847	37	24	13	129	47	0	82

Sick from typhoid fever, 4.04%.

Sick from cholera, total, 14.09%.
Sick from cholera, after first fire, 5.13%.
Sick from cholera, after second fire, 8.96%.

The "cholera" cases had a sudden onset, ushered in with chills, pain in head, back and limbs, rise in temperature, 102°-103° F., nausea, severe abdominal pain, vomiting rapidly coming on, followed by purging. Vomiting and purging were of an alarming type lasting from 12 to 24 hours followed by a drop in temperature to 97° F. or lower and extreme exhaustion. At the time of gathering statistics from the laity no deaths were reported but since, physicians in attendance have reported one or two deaths from this gastro-entero-colitis.

Some two weeks after the first fire (the one of January 29) typhoid fever began to break out with epidemic frequency until 18 cases were reported in February. The greater number of cases did not occur, nor the severest type of the disease until after the second fire a period of time had elapsed corresponding to the incubation period of typhoid fever. In March 94 cases were reported, and in April, 48 cases, or, in these two months 142 cases out of the total of 226 occurring after the second fire.

The typhoid fever of this epidemic was of the severest character ever seen by the local physicians in attendance or by those called in consultation, or by those physicians to whom patients went in other places, as not a few left the town during the period of incubation and were overtaken with the malady at their homes or elsewhere. The histories of the cases gave evidence of a most virulent infection. Nausea, vomiting and purging were often present. High, irregular and uncontrollable temperatures accompanied extreme exhaustion.

The fatal cases proved such on the eighth to the twelfth day, as a rule, from toxemia and exhaustion. The temperature could not be controlled, the heart would not respond to tonic or stimulating treatment, and the nausea or vomiting would persist until the patient rapidly exhausted his strength and died with manifestations of excessive and virulent intoxication. If a patient succumbed in the later part of the second stage or the third stage of the fever it would be from exhaustion or from some of the complications of the disease. Not a few patients who recovered manifested marked cerebrospinal meningeal congestive symptoms, as opisthotonos, or retraction and tremor of the limbs.

A marked feature of the cases which ran rather a comfortable course was the proneness to collapse. The pulse and temperature would be running evenly and with no sign of warning the patient would go into an extreme stage of collapse, suggesting hemorrhage of perfoation, which did not occur as was proved later, from which he might or might not be restored. Parotitis orchitis, phlebitis were seen in some cases, and furuncles, carbuncles and abscesses, hemorrhages and cystitis were met with. Retention of the urine and tympanitis were common throughout the epidemic.

Typhoid fever in this epidemic chose its victims from all ages; but had its usual predilection for those between 18 and 28 years of age and for males rather than for females. (Chart I-II-III.)

The percentage of fatal issues was greater at the usual age, i. e., 18 to 28. The total death rate was not high, 9.74%, considering the number of cases treated under conditions none too favorable, in many instances, and the virulence of the infection.

As shown in Chart III. there were 226 cases of typhoid fever in the town but this does not include all who were infected in

CHART III.

Age.	Under 5.	5-10.	10-15.	15-18.	18-23.	23-28.	28-31.	31-36.	36-45.	45-55.	Over 55.	Totals.
Sick.....	12	26	19	17	53	37	14	15	17	11	5	226
Recovered	11	25	19	17	43	32	12	13	17	10	5	204
Died	1	1	-	-	10	5	2	2	-	1	-	22
% deaths..	0.44	0.44	-	-	4.42	2.21	0.88	0.88	-	0.44	-	9.74%

the town, and during the period of incubation went to other localities running the course of fever often to a fatal issue. From rumors current the percentage of recoveries was greater among those who remained than among those who were taken sick elsewhere.

As to the source of infection it hardly seems as if second thought need be taken when we stop to consider that there were a few cases of typhoid fever in the town during the fall and winter, that the stools from these cases were turned into the sewer, that drained into Millinocket Stream above the intake of the rotary pumps used for fire pressure as above stated, and the mains of the town were filled with polluted water.

The fact remains that during the months of February, March, April and even May the source of infection was hotly discussed. Repeated analyses of the water were made at the State laboratory with varying results, as to fitness of water for domestic and drinking purposes.

The Bacillus Typhosus was not found during any analysis of the water. Of course since it was not found it was not an easy thing evidently for the lay mind to grasp the fact that the water thus proving negative could produce such fatal results.

To prove the source of infection a house to house canvass was made to ascertain who were supplied with the town water and who were not, who drank town water and who drank spring water.

The town was plotted indicating the water supply and sewerage, also indicating all dwellings and houses in which there was "cholera" or typhoid fever, or both. A glance at Charts I and II, as reduced from pages of my note book, and also at the map,

will tell the story emphatically that those who drank the water from the town system were the people afflicted either with "cholera" or typhoid fever, and that those who did not drink such water were not afflicted.

In regard to the portions of the town termed Shack Hill, Little Italy, and the Station where the people were not supplied with city water, every individual afflicted with either malady gave the history, if a child, of drinking water at the school building from the town system, or, if a man, of drinking the town water at the mill.

This canvass revealed what could be called a positive clinical test, costly, yet very valuable. The clinical and bacterial analysis of the water could not present so positive a statement and was even misleading in the minds of the laity.

In this Millinocket epidemic the source of infection seems to the writer, proved beyond a doubt, to be due to polluted water.

REPORT OF THE WORK IN THE LABORATORY OF HYGIENE.

By H. D. EVANS, Director of the Laboratory.

During the past two years there have been two changes at the laboratory; one in the personnel of the laboratory force, and the other in the situation of the laboratory itself. On October 1, 1905, Dr. J. P. Russell, who had been in charge of the laboratory since it was opened, left to enter on the active practice of his profession and Mr. H. D. Evans, who had been in charge of the chemical department, was advanced to the directorship. Mr. H. F. Quinn of Bangor was engaged as assistant and took charge of the bacteriological work. The laboratory force, at the present time, remains the same as when Dr. Russell's resignation took effect.

For the last two years the work of the laboratory has been increasing at a rapid rate, as the tabulations at the end of this report will show, and the old quarters on Water street finally were becoming so cramped that justice could not be done to all the work that was being sent to us. As a result a change had to be made or the work and usefulness of the laboratory curtailed. Finally the whole of a building at the corner of State and Grove streets was engaged, and, on the first of June of this year, the laboratory moved into its new home. As now arranged the ground floor is used exclusively as a water laboratory and microscopical room; while the second floor is devoted to the making of media and to such sundry chemical work as cannot be done in a room where water analyses are being made. On the second floor room was also provided for an office and for a place where experiments on disinfectants could be made under normal house conditions; especially tests of such disinfectants as owe their efficiency to their action when in the gaseous condition. The structure and size of this room will be fully described in the paper which follows on the Permanganate-Formalin method of disinfection.

As in the years before the work of the laboratory has been along two lines, i. e., chemical and bacterial; and the State Board of Health has definitely limited the work in each of these two branches so far as variety goes. The chemical work is confined to the analysis of water, and the bacterial work to the examination of sputum for the tubercule bacillus, of blood for the Widal typhoid reaction, and of throat swabs for the diphtheria bacillus.

All this work is done free of expense to the residents of the State except for the charges of transmission of the samples or specimens, and the expense of the reports on the same when they are requested made otherwise than by mail.

The specimens that come to us must come in our own containers. No exception is made to this rule in the case of water analyses, but more latitude is allowed in the matter of bacterial specimens, as there are many towns in the State where we have no stations where our bacterial outfits are kept in stock. All specimens from towns where we do have such stations must come in the special containers provided there.

At the conclusion of this report several recommendations will be made in regard to the sending of specimens, to which careful attention of physicians is requested, as, if these are followed, much needless expense and possible dissatisfaction will be avoided.

As stated above the chemical work has been confined to the analysis of samples of water. In this branch of laboratory activity there has been a very marked increase in the past two years. In fact with the present equipment it would be hard to attend to much more of this work than we now do. Increase in some parts of our equipment would, however, make it possible to handle much more of this kind of work.

Up to the time of the last report there had been analyzed at the Laboratory 64 samples of water. During the last two years an even 700 have been examined. These samples have been of all kinds. They have come from wells, springs, public supplies, and from brooks, lakes and rivers that have been under consideration for public supplies. In all cases a thorough sanitary analysis has been made of the samples, and reports have been made to the senders of the samples. The effort has been made to not only state what it

is the belief of the director is the condition of the water, but to include a plain and comprehensive statement of the reasons for this belief. Also in all cases where the water shows evidence of past pollution it has been the practise to point out this condition and the possibilities of trouble that may arise at some future time unless precautions are taken.

The methods of analysis are, in the main, those recommended by the American Public Health Association, and all results are expressed in parts per 100,000.

The 700 samples have come from the following sources—322 from wells, 136 from springs, 188 from public supplies, and 54 from ponds, rivers and streams that have been under investigation as possible sources of public supplies. The work of the laboratory has not been confined to any particular section of the State, the samples having come from 139 places, among which are included not only the towns and cities but also the plantations.

It has as yet been impossible for the laboratory to get the chance to make analyses of all the public supplies of the State, as we have our work confined to the analysis of those samples that are sent to us on the initiative of the ones who wish an analysis, and we cannot request samples. We have, however, examined the water from 26 of the public supplies, and in some cases with considerable regularity. In all cases where there has been more than a single analysis in the past two years the results have been tabulated and are presented apart from the general tabulation of all the results of the two years work, which is included at the end of this report. There have been 19 towns and cities where more than a single analysis has been made and the results are placed below in alphabetical order.

AUGUSTA.

Up to January 15th of this year the city of Augusta had taken its water from the Kennebec river at a point a little above the Edwards Manufacturing Company's dam, subjecting it to no filtration of any kind. The river was very badly polluted at this point, and the city paid the penalty of its use in frequent and disastrous typhoid epidemics. The final result of the matter was the formation of the Augusta Water District. The "District" proposed to use the water of Carleton pond for the regu-

lar supply of the city and, by a pumping station at Cobbosseecontee lake, to avoid any failing of a lake water supply. In the middle of January the river water was cut off from the system and pumping from Cobbosseecontee lake begun, as the pipe line from Carleton pond was not yet in condition for use. Later the water from Carleton pond was turned into the system and since that time it has been used exclusively.

The series of analyses recorded below were begun just before the river water was cut out of the pipes. No. 532 thus represents the original Kennebec water supplied to the city, and the next three samples are probably mixtures, in greater or less proportions of Cobbosseecontee and Kennebec water. The three samples following No. 566 are mixtures of Cobbosseecontee and Carleton pond water, and those following No. 600 are samples of Carleton pond water alone. The analyses show plainly the change from river to pond water in this system.

AUGUSTA PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
532	Jan. 13, 1906	.5	Flakey	†	3.6	6.40	3.30	.0026	.0142	Trace	Trace	.05	2.58	0
544	Jan. 25, 1906	.8	*	†	2.1	4.95	2.80	.0022	.0140	.001	Trace	.20	1.70	0
553	Feb. 2, 1906	.4	Veg.	†	2.1	3.30	1.70	.0014	.0162	0	0	.19	2.14	0
566	Feb. 9, 1906	.7	Veg.	†	2.2	3.50	2.00	.0014	.0167	0	0	.19	2.26	0
571	Feb. 16, 1906	.4	Veg.	†	1.6	3.70	2.20	.0018	.0158	0	0	.175	2.01	0
588	Feb. 23, 1906	.7	†	†	2.2	4.15	.90	.0036	.0140	0	0	.15	1.76	0
597	Mch. 2, 1906	.5	Veg.	†	2.6	4.00	2.40	.0024	.0200	0	0	.13	2.14	0
600	Mch. 7, 1906	0	0	†	1.8	3.40	1.80	.0024	.0150	0	0	.14	2.01	0
601	Mch. 7, 1906	0	0	†	1.7	3.40	1.80	.002	.0156	0	0	.14	1.76	0
602	Mch. 7, 1906	0	0	†	1.8	3.35	1.80	.002	.0156	0	0	.14	1.82	0
603	Mch. 7, 1906	0	0	†	1.75	4.00	2.60	.0038	.014	0	0	.14	1.95	0
615	Mch. 22, 1906	.5	Veg.	†	1.9	4.25	2.15	.0028	.0178	0	0	.14	1.70	0
618	Mch. 29, 1906	.5	‡	Veg.	4.2	6.50	3.00	.0022	.0162	Trace	Trace	.05	2.39	0
636	Apr. 19, 1906	0	0	†	1.9	3.20	1.60	.0022	.0130	0	0	.14	1.82	0
653	May 3, 1906	0	0	†	1.9	3.10	1.70	.0016	.0120	0	0	.15	1.70	0
669	June 4, 1906	0	0	†	2.4	3.90	2.10	.0026	.0190	.005	0	.14	1.73	0
670	June 4, 1906	0	0	†	2.4	3.90	2.10	.002	.0196	.005	0	.14	1.73	0
671	June 4, 1906	0	0	†	2.4	3.85	2.10	.0026	.0186	.005	0	.14	1.73	0
672	June 4, 1906	0	0	†	2.4	3.85	2.05	.0026	.0190	.005	0	.14	1.73	0
707	June 26, 1906	0	0	†	2.1	3.40	2.20	.0024	.0130	0	0	.14	1.72	0
752	Aug. 1, 1906	0	0	†	1.8	3.40	1.70	.0026	.0136	.004	0	.15	1.72	0

*Flakey and vegetable. †Vegetable and woody. ‡Slight and sawdust.

Bangor.

The city of Bangor takes its public supply from the Penobscot river, and subjects it to mechanical filtration, using alum as a coagulant. The water at the intake is grossly polluted by the sewage of Oldtown, Orono and Veazie which lie just above, to say nothing of the towns that lie farther to the north. The great typhoid epidemic of 1904 led to a move to filter the water supply of the city, and an alum plant was decided upon, the effluent from the filters to be up to a certain standard as regarded reduction of color and bacteria. While the plant was being installed, and since then, the laboratory has made regular examinations of the water, and it is not going too far to say that the plant has signally failed to do what it was said to be guaranteed to do. The analyses show that but three times in the two years has the color been removed as it was said that it would be. The water has also come from the filters at times very heavily charged with hydrate of aluminum in suspension, and but twice have I failed to detect it in solution. The results of the analyses are appended below, and they include analyses of both the effluent of the filter works and the raw river water itself.

BANGOR WATER DEPARTMENT—RAW PENOBSCOT.

Number.	Date of Collection	Appearance.				Residue on Evaporation		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
274	Mch. 9, 1905	.15	Flakey	Veg.	5.4	6.60	3.05	.0034	.0178	0	Trace	.11	2.23	0
278	Mch. 16, 1905	.5	Slight	Veg.	4.0	7.90	3.70	.0031	.0133	Trace	Trace	.125	2.85	0
280	Mch., 1905	.3	Slight	Veg.	5.3	7.25	3.15	.0024	.0179	Trace	Trace	.125	2.34	0
294	Apr. 14, 1905	.4	Slight	Veg.	5.3	4.90	2.10	.0024	.0176	Trace	Trace	.075	2.00	0
300	Apr. 28, 1905	.25	Slight	Veg.	4.8	5.00	2.20	.0022	.0179	Trace	Trace	.075	1.70	0
305	May 5, 1905	.5	*	Veg.	4.8	4.60	1.90	.0026	.0188	0	0	.075	1.78	0
308	May 13, 1905	.5	Slight	Veg.	6.1	4.90	2.10	.003	.0192	Trace	Trace	.075	1.96	0
312	May 25, 1905	.3	Slight	Veg.	5.4	4.70	1.70	.0040	.0180	Trace	0	.075	1.64	0
319	June 2, 1905	.3	Slight	Veg.	4.6	4.90	2.45	.0020	.0196	Trace	Trace	.08	1.80	0
324	June 7, 1905	.3	Slight	Veg.	4.6	5.15	2.20	.0073	.0187	Trace	0	.075	1.89	0
327	June 15, 1905	.3	Slight	Veg.	4.5	5.10	2.00	.0026	.0176	Trace	0	.08	1.76	0
330	June 22, 1905	.3	Slight	Veg.	4.6	5.40	2.55	.0026	.0205	0	0	.09	1.95	0
335	June 29, 1905	.1	Slight	Veg.	5.0	5.90	2.30	.0038	.0212	Trace	Trace	.10	2.02	0
353	July 13, 1905	.0	Slight	Veg.	6.4	6.30	2.20	.0024	.0202	Trace	0	.11	2.26	0
361	July 20, 1905	.2	Slight	Veg.	5.6	6.00	2.50	.0020	.0206	Trace	0	.10	2.26	0
368	July 26, 1905	.4	Slight	Veg.	5.3	6.30	2.55	.0026	.022	Trace	0	.09	2.14	0
372	July 29, 1905	.2	Slight	Veg.	5.2	5.75	2.45	.0024	.0192	Trace	0	.10	2.14	0
450	Oct. 19, 1905	.1	Slight	Veg.	4.2	6.00	3.40	.0028	.0170	Trace	0	.10	2.39	0
473	Nov. 2, 1905	.4	Slight	Veg.	4.3	8.60	3.80	.0041	.0145	Trace	0	.15	2.77	0
491	Nov. 15, 1905	.2	Slight	Veg.	6.4	7.35	3.45	.0046	.02	Trace	Trace	.19	2.77	0
500	Nov. 28, 1905	.1	Slight	Veg.	8.4	8.20	3.50	.0038	.0207	Trace	Trace	.16	2.77	0
514	Dec. 20, 1905	0	0	Veg.	8.8	8.00	3.50	.0038	.0192	Trace	Trace	.17	1.95	0
529	Jan. 10, 1906	.2	Slight	Veg.	7.4	8.10	3.70	.0038	.0178	.008	Trace	.12	2.96	0
540	Jan. 24, 1906	1.4	Dirty	Veg.	8.4	7.85	3.60	.0040	.0250	.002	0	.10	2.45	0
562	Feb. 8, 1906	0	0	Veg.	7.4	6.90	3.10	.0042	.0226	0	Trace	.13	2.39	0
596	Mch. 1, 1906	.5	Veg.	Veg.	4.9	7.50	3.30	.0034	.0182	0	Trace	.07	2.52	0
608	Mch. 14, 1906	.1	Slight	Veg.	4.3	7.20	3.00	.0042	.0146	Trace	Trace	.05	2.77	0
619	Mch. 29, 1906	.5	Slight	Veg.	4.2	6.50	3.00	.0022	.0162	Trace	Trace	.05	2.39	0
630	Apr. 17, 1906	4.0	Heavy	Veg.	5.1	7.90	4.70	.0028	.0350	.04	.0005	.08	1.51	0
651	May 2, 1906	.5	Veg.	Veg.	5.2	4.40	1.90	.0018	.0186	.009	Trace	.075	1.63	0
684	June 7, 1906	.7	Veg.	Veg.	8.2	5.30	2.20	.0014	.0204	.001	Trace	.10	1.92	0
706	June 25, 1906	.4	Veg.	Veg.	5.0	4.70	2.40	.0016	.0192	.005	Trace	.08	1.86	0
727	July 10, 1906	.4	Veg.	Veg.	4.0	5.10	1.90	.0028	.0210	.003	0	.07	2.19	0
750	July 31, 1906	.4	Veg.	Veg.	5.2	5.90	2.20	.0034	.0222	.003	0	.07	1.99	0
762	Aug. 20, 1906	.2	Veg.	Veg.	4.4	5.80	2.30	.0024	.0196	.007	0	.07	1.92	0

*Considerable.

BANGOR WATER DEPARTMENT—FILTERED WATER.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
275	Mar. 9, 1905	.3	*	Veg.	3.6	9.10	5.50	.0026	.0126	0	Trace	.12	3.59	0
277	Mar. 16, 1905	.5	Slight	Veg.	4.0	7.90	3.70	.0031	.0133	Trace	Trace	.125	2.85	0
281	Mar., 1905	.2	Slight	Veg.	2.7	7.60	4.00	.0026	.0093	Trace	Trace	.145	2.73	0
293	Apr. 14, 1905	.1	Heavy	Veg.	.5	5.10	3.00	.0016	.0089	Trace	Trace	.10	2.01	0
301	Apr. 28, 1905	.5	Slight	Veg.	.7	6.05	3.85	.0013	.0122	Trace	Trace	.085	2.01	0
304	May 5, 1905	.9	*	Veg.	.4	5.20	3.30	.0019	.0083	Trace	Trace	.08	1.89	0
311	May 13, 1905	.7	Heavy	Veg.	.4	5.70	3.70	.0016	.0124	Trace	Trace	.075	1.89	0
318	May 25, 1905	.4	Slight	Veg.	4.5	6.25	3.50	.0022	.0153	Trace	Trace	.075	1.82	0
320	June 2, 1905	.1	0	Veg.	.4	4.60	3.40	.0007	.0075	Trace	0	.075	2.46	0
325	June 7, 1905	.5	Heavy	Veg.	.7	6.10	4.20	.0009	.0105	Trace	0	.10	2.20	0
328	June 15, 1905	.5	Slight	Veg.	.7	6.50	3.60	.0012	.0122	Trace	0	.075	2.02	0
331	June 22, 1905	.5	*	Veg.	.6	6.60	4.30	.0014	.0108	0	0	.10	2.26	0
336	June 29, 1905	.2	0	Veg.	3.2	6.90	4.90	.0014	.0118	Trace	0	.10	2.58	0
354	July 13, 1905	.5	0	Veg	4.8	7.30	4.80	.0018	.017	Trace	0	.11	2.64	0
362	July 20, 1905	.7	0	Veg.	2.0	6.70	4.30	.001	.0104	Trace	0	.10	2.46	0
364	July 25, 1905	.3	Slight	Veg	.8	6.20	3.80	.0014	.0097	Trace	0	.095	2.77	0
367	July 26, 1905	.5	Slight	Veg.	2.6	7.00	4.60	.0014	.0116	Trace	0	.09	2.26	0
373	July 29, 1905	.3	Slight	Veg.	2.7	7.20	5.10	.001	.0124	Trace	0	.10	3.15	0
380	Aug. 1, 1905	.4	Slight	Veg.	1.1	7.10	5.50	.001	.0086	0	0	.09	2.14	0
451	Oct. 19, 1905	.6	Slight	Veg.	2.9	7.80	5.30	.0016	.0095	0	0	.10	2.67	0
474	Nov. 2, 1905	.5	0	Veg.	2.4	9.30	5.80	.0034	.0082	Trace	0	.15	2.96	0
492	Nov. 15, 1905	1.6	Heavy	Veg.	.7	7.90	5.20	.003	.0126	Trace	Trace	.16	2.77	0
501	Nov. 28, 1905	.7	0	Veg.	5.8	†	6.10	.0027	.0213	Trace	Trace	.19	3.78	0
515	Dec. 20, 1905	.8	Slight	Veg.	1.2	9.30	5.50	.0032	.0124	Trace	0	.15	3.65	0
536	Jan. 10, 1906	.3	0	Veg.	2.4	8.30	5.40	.0028	.0096	.009	0	.10	3.34	0
539	Jan. 24, 1906	1.2	*	Veg	.9	7.40	4.60	.003	.0118	.008	Trace	.09	2.58	0
561	Feb. 8, 1906	.6	0	Veg.	2.7	6.90	4.60	.0026	.0138	.01	0	.125	2.77	0
595	Mar. 1, 1906	.4	0	Veg.	2.7	7.40	4.16	.0036	.0114	0	0	.07	2.89	0
607	Mar 14, 1906	.5	0	Veg.	2.7	7.45	4.55	.0034	.0148	Trace	0	.15	3.15	0
620	Apr. 2, 1906	0	0	Veg.	4.3	3.20	1.10	.003	.0138	0	0	.25	1.63	0
631	Apr. 17, 1906	.6	0	Veg.	3.4	4.80	2.70	.0028	.0132	Trace	Trace	.085	1.80	0
652	May 2, 1906	.01	0	Veg.	1.2	3.80	2.40	.0014	.0058	Trace	Trace	.05	1.89	0
683	June 7, 1906	.3	0	Veg.	5.2	6.40	3.60	.0022	.0120	.02	Trace	.07	2.92	0
705	June 25, 1906	.8	Heavy	Veg.	.8	4.55	2.95	.0012	.0092	.007	0	.07	2.26	0
728	July 10, 1906	.1	0	Veg.	3.4	5.20	2.60	.0018	.0146	.014	0	.07	2.26	0
749	July 31, 1906	.5	0	Veg.	3.1	5.20	2.60	.0024	.0138	.007	0	.07	2.46	0
763	Aug. 20, 1906	.4	Heavy	Veg.	2.6	5.90	3.00	.0026	.0140	.008	0	.07	2.26	0

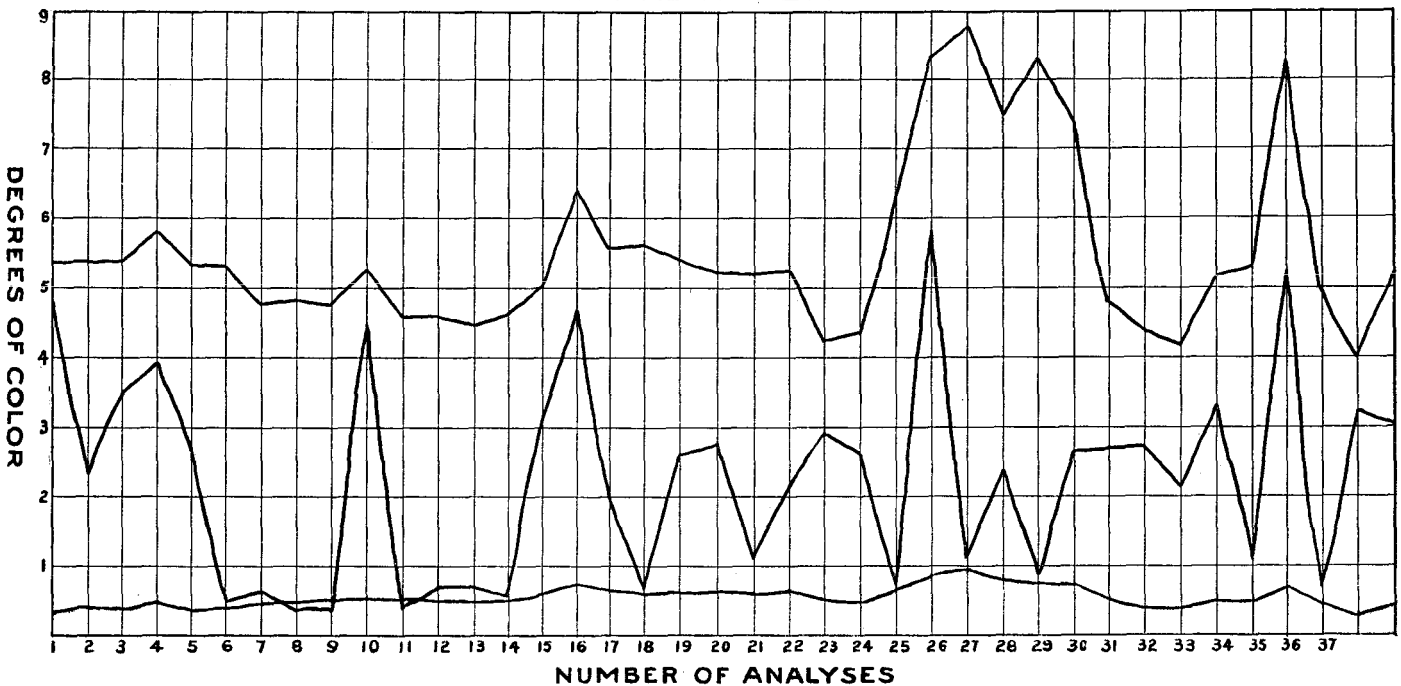
* Considerable. † 10.50

To show the failure of the filter plant to do the work required of it I submit the following graphic illustration of one phase of the operation. The plant was to remove nine-tenths of the color from the raw river water. In the following diagram the perpendicular lines represent the color of the water in terms of the Hazen Cobalt-Platinum Standard, while the divisions laid off along the horizontal line represent the separate analyses, consecutive in point of time.

BANGOR WATER DEPARTMENT

COLOR OF THE RAW AND FILTERED WATER

2 YEARS ANALYSES



The *upper* plotted line in black represents the variations in color of the raw river water for the period from March 9, 1905, to August 20, 1906.

The *lower* plotted line in black represents the actual color of the filtered water of the same date as the raw sample, whose color is plotted above.

The *red* line represents what the color of the filtered water *would have been* had the filter worked as it was said to do. The difference in the height of the line representing the actual color of the filtered sample and the line representing the color that should be in the water shows how near or far the filter is to doing what is claimed for it. But three times in the time that the water has been under observation has the color been as much reduced as was claimed for the filter.

BATH.

The source of the Bath public supply is Nequasset lake, in the town of Woolwich. The lake has an area of about one square mile, with about 26 miles of watershed. There are practically no streams entering the lake, it being fed by springs. The lake is about 4 miles from the salt water, and there is but very little cultivated land about it. There are no buildings near the lake that can sewer into it except the pumping station, and all the drainage from that is taken to a cesspool which is located about 500 feet from the shore.

The intake is located 150 feet from shore. From this point the water flows by gravity into a well in the pumping station. This well is divided into two parts by wire screens of 1-16 inch mesh. The water enters on one side of the screens, is strained through them, and taken from the other side by the pumps and forced into the mains. These mains are of mixed age, some being as old as 16 years, and so there is considerable difference in the iron content of the samples from different parts of the system.

The pipes from the pumping station are carried under the Kennebec river from Woolwich to Bath. The water is pumped directly through the entire system of pipes; the pumps working at such a rate as to just exceed the usual call upon the system, and only the excess over the local demand going to the reser-

voir, which thus supplies an emergency fund for times of greatly increased demand upon the system. The water is thus in almost constant circulation in the mains, the only places where this is not true being the small cross pipes on the cross streets.

During the fall and winter of 1905 and 1906 there was developed in this water a very disagreeable fishy odor and taste, which caused many of the users of the supply to fear sewage pollution. Early in February, I was asked to investigate the matter by the local board of health. In the meanwhile three samples of the water had been sent to me and examined. On February 15th I met the city government in joint session and made a report to them. Investigation and the analyses showed no possibility of sewage pollution, but the biological examination revealed the cause of the trouble to be the presence of large numbers of Dinobryon and Uroglena, the former being especially abundant. The odor soon after vanished from the water and has since furnished no cause for complaint. The chemical results of the analyses of this water are given below.

BATH PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
506	Dec. 5, 1905	.3	Slight	*	2.7	3.10	1.80	.0016	.0142	.006	0	.35	1.19	0
563	Feb. 8, 1906	.3	Slight	†	3.1	3.40	2.00	.0020	.0142	.0055	Trace	.325	1.13	0
564	Feb. 8, 1906	.4	Slight	‡	.3	3.35	1.70	.0020	.0168	.005	0	.325	1.26	0
568	Feb. 12, 1906	.2	Slight	‡	2.8	3.60	1.90	.0021	.0143	.005	0	.33	1.26	0
569	Feb. 15, 1906	.4	Slight	§	.3	3.35	1.40	.0020	.0148	.001	0	.31	1.26	0
570	Feb. 15, 1906	.2	Slight	Fishy	.3	3.35	1.40	.0020	.0138	.001	0	.31	1.26	0
616	Mch. 27, 1906	.3	Slight	‖	2.4	2.95	1.25	.0028	.0138	.002	0	.31	1.13	0
617	Mch. 27, 1906	.2	Slight	¶	2.6	3.00	1.30	.0022	.0135	.003	0	.32	1.19	0
720	July 2, 1906	.1	Slight	**	4.5	3.80	1.80	.0040	.0144	.007	0	.25	1.19	0
721	July 2, 1906	.1	0	††	4.5	4.00	1.80	.0018	.0152	.009	0	.26	1.19	0

* Woody and vegetable. † Fishy and oily. ‡ Fishy and seaweed.
§ Fishy and cucumber. ‖ Rockweed. ¶ Woody. ** Mouldy and Woody.
†† Grassy.

CALAIS.

The public supply of this city comes from the St. Croix river above the city. It is not subjected to any kind of filtration whatever. The starting of construction of the pulp mill plant at Woodland, and the prevalence of a considerable amount of typhoid fever in the city led to a fear of the pollution of the supply by the upriver operations. Analyses were made for the Water Company and also for the local Board of Health, and these analyses have been made on an average of one each month since that time. The water is one of very high color as is natural in a water derived from such an extent of wild land watershed as has the St. Croix. Three times during the course of the analyses positive presumptive tests for the colon bacillus—by the Smith fermentation test—have been obtained in 10 c. c. of the water but in each case failure has resulted in an attempt to isolate the organism from the gelatine plates.

CALAIS PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
273	Mar. 8, 1905	0	0	*	4.4	4.35	2.20	.0028	.0166	0	0	.16	1.96	0
290	Apr. 13, 1905	.2	Slight	Veg.	5.4	3.90	1.50	.0029	.0191	0	0	.125	1.57	0
302	May 4, 1905	0	0	Veg	6.4	3.90	1.30	.0026	.0189	0	0	.11	1.64	0
309	May 18, 1905	.1	Slight	Veg.	6.8	4.00	1.60	.0027	.0204	0	0	.10	1.40	0
310	May 18, 1905	.1	Slight	Veg	6.8	3.90	1.50	.0027	.0209	0	0	.1	1.40	0
342	July 6, 1905	.1	Slight	Veg	6.8	4.60	1.60	.0020	.0194	Trace	0	.08	1.38	0
357	July 18, 1905	0	0	Veg.	5.2	3.60	1.80	.0012	.0188	0	0	.10	1.32	0
404	Sept. 28, 1905	0	0	Veg.	3.8	3.90	1.70	.0014	.0172	Trace	0	.15	1.76	0
417	Sept. 27, 1905	0	0	Veg.	3.6	3.40	1.30	.0014	.0151	.005	0	.15	1.64	0
436	Oct. 12, 1905	0	0	Veg.	2.5	3.90	1.50	.0014	.0126	.002	0	.125	1.58	0
464	Oct. 30, 1905	0	0	Veg.	2.4	3.40	1.70	.0016	.0130	Trace	0	.10	1.63	0
472	Oct. 31, 1905	0	0	Veg.	2.4	3.40	1.60	.0026	.0121	Trace	0	.12	1.63	0
480	Nov. 7, 1905	.2	0	Veg.	4.6	5.10	2.20	.0023	.0202	Trace	0	.13	1.89	0
481	Nov. 7, 1905	.2	0	Veg.	4.7	5.00	2.15	.0019	.0168	Trace	Trace	.125	1.76	0
497	Nov. 21, 1905	.5	Slight	Veg.	9.6	4.70	2.00	.0032	.0266	.025	0	.19	2.14	0
512	Dec. 18, 1905	0	0	Veg.	8.8	5.10	2.10	.0024	.0204	Trace	Trace	.175	2.01	0
535	Jan. 17, 1906	.5	Slight	Veg.	4.6	4.40	1.35	.0020	.0182	Trace	0	.15	2.14	0
565	Feb. 8, 1906	0	0	Veg.	7.5	5.00	2.10	.0028	.0220	0	0	1.25	1.95	0
598	Mar. 5, 1906	.3	Slight	Veg.	4.3	3.20	1.40	.0022	.0156	.001	0	.115	1.76	0
622	Apr. 2, 1906	.3	Slight	Veg.	4.5	3.45	1.25	.0014	.0130	Trace	0	.15	1.89	0
627	Apr. 9, 1906	.6	Slight	Veg.	5.6	3.90	2.10	.0020	.0148	.01	0	.11	1.63	0
682	June 5, 1906	0	0	Veg.	8.5	4.30	1.50	.0014	.0196	0	Trace	.09	1.73	0
745	July 16, 1906	0	0	Veg.	4.4	4.00	1.70	.0028	.0172	.004	0	.08	1.33	0
755	Aug. 13, 1906	.3	Slight	Veg.	3.5	3.40	1.80	.0026	.0168	Trace	0	.10	1.59	0

*Disagreeable.

Damariscotta and Newcastle.

Three analyses have been made of this supply which is derived from a pond and distributed from a standpipe. The first analyses were made on account of a fishy odor appearing in the water. Analysis showed that this was not due to the presence of algae or infusoria, and the subsequent cleaning of the standpipe revealed quantities of dead fish, the removal of which caused a cessation of the odor. Later another sample from this supply was analyzed and no trouble found with it.

DAMARISCOTTA PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
59	Dec. 8, 1903	.2	Slight	Veg.	2.5	3.65	2.60	.0013	.0133	0	0	.47	1.56	0
60	Dec. 9, 1903	.2	Slight	Veg.	2.5	3.70	2.55	.0013	.0133	0	0	.47	1.49	0
192	Aug. 16, 1904	0	Slight	Veg.	2.1	2.60	1.10	.0008	.0118	0	0	.35	1.27	0

Dover and Foxcroft.

The supply of these two towns is derived from the Piscataquis river a little above the towns, and is furnished to the consumers without filtration. The water is taken from the river two miles above the towns, and at a distance of seven miles below Sangerville and Guilford, which sewer into the river. The analyses were made at the request of the local Boards of Health on account of considerable typhoid that was at that time prevailing in the two towns. Analysis showed the colon bacillus present each time, and twice in as small amounts as 1 c. c. The bacterial counts were very high in all three cases.

DOVER PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
533	Jan. 16, 1906	.1	0	*	3.20	5.20	2.20	.0020	.0156	.012	Trace	.110	2.64	0
547	Jan. 30, 1906	.1	0	Veg.	5.75	4.50	2.40	.0032	.0174	.002	0	.125	2.20	0
690	June 11, 1906	0	0	Veg.	5.30	3.60	1.80	.0020	.0122	0	Trace	.060	2.26	0

*Vegetable and woody.

FRIENDSHIP.

Three samples have come from this supply. The source of the supply is a number of boiling springs whose water is stored in a reservoir for use. The analyses were made for the local Board of Health as the water had developed a bad odor and taste and, as the springs were situated near to chances of possible pollution, sewage pollution was feared.

FRIENDSHIP PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
383	Aug. 7, 1905	0	0	*	.6	11.5	7.20	.0047	.0087	.225	Trace	1.775	3.65	0
410	Sept. 26, 1905	0	0	*	.1	10.4	7.60	.0020	.0045	.115	0	2.070	2.52	0

*Mouldy.

LEWISTON.

The source of the supply is Lake Auburn, about three miles from the city. The shores of the lake are dotted with summer cottages. Although the cottagers are not supposed to leave any filth within 200 feet of the shore there was some fear that the water was being polluted from such source, and the analyses were requested to clear up this point.

LEWISTON PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
429	Oct. 10, 1905	0	0	Veg.	.6	3.00	1.80	.0016	.0142	Trace	0	.16	1.76	0
430	Oct. 10, 1905	0	0	Veg.	.6	3.00	1.80	.0016	.0134	Trace	0	.16	1.76	0
431	Oct. 10, 1905	0	0	Veg.	3.15	4.15	1.10	.0036	.0246	.005	0	.19	1.95	0

MILLINOCKET.

The source of this supply is the West Branch of the Penobscot river. Up to the winter of 1904 there had not been any amount of typhoid fever in the town, but in February of that year a severe outbreak occurred. It was during this outbreak that the analyses given below were made. The source of the epidemic was the sewage polluted water of Millinocket stream, which was pumped into the pipes during a big fire. The water from the West Branch was not the cause of the outbreak.

MILLINOCKET PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
88	Feb. 22, 1904	0	0	Veg.	3.7	3.3	0.8	.0047	.0125	Trace	0	.15	2.2	0
92	Mar. 1, 1904	0	0	Veg.	3.6	3.4	1.0	.0032	.0103	Trace	0	.15	1.8	0

North Berwick.

The source of this supply is a number of springs and a brook. The analyses were desired as there was an outbreak of typhoid fever in the town at the time. Two analyses only were made.

NORTH BERWICK PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
525	Jan. 7, 1906	.3	0	*	3.1	4.40	2.40	.0009	.0079	.005	0	.24	1.57	0
526	Jan. 7, 1906	.4	0	Veg.	4.1	4.70	2.75	.0006	.0078	.008	0	.24	1.63	0

*Woody and vegetable.

Presque Isle.

During the dry season of 1905 the water company pumped some water from a millpond to help out the regular system, whose source was a brook, which was dammed about a mile from the town, making an artificial lake about the intake. There

is a great deal of cultivated land bordering this brook. The analyses were made at the request of the water company.

PRESQUE ISLE PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
412	Sept. 25, 1905	.5	*	†	2.4	10.3	7.6	.0035	.017	.005	0	.11	7.18	0
503	Nov. 29, 1905	0	0	Veg.	1.4	19.4	16.1	.0048	.0106	.105	.0005	.275	‡	0

* Earthy and vegetable. † Mouldy. ‡ 15.75

PORTLAND.

The source of this supply is Sebago lake, about 17 miles from the city. The lake and its tributaries have an area of about 100 square miles, and the watershed an area of about 300 square miles, being but sparsely populated. The analyses were made at the request of parties in Yarmouth when there was talk of introducing the Portland water into that town.

PORTLAND PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
625	Apr. 9, 1906	0	0	0	.1	.60	.25	.0034	.0072	0	Trace	.01	.5	0
626	Apr. 9, 1906	0	0	Slight	1.5	2.25	1.50	.0014	.0076	.008	Trace	.12	1.38	0

RICHMOND.

In February of 1906 considerable trouble occurred in this town from typhoid fever, and I was asked to examine the situation and analyze samples of the water. Accordingly I visited the town and collected four samples. The investigation of the local conditions revealed the following.

The town has no underground pipe sewers, the sewage being carried in the gullies which run from the high land to the river. Parts of these gullies are covered and part are not. During the wet seasons there is enough flow of water in these gullies to keep them flushed, but in dry times the sewage collects on the bottom and sides, and there decomposes in the air until such time as the next rain washes it all into the river. Sinkspouts and soil pipes from bathtubs lead directly into these gullies, as do the drainage pipes from the mills. The privies are mostly located on the banks of these gullies and so this drainage ultimately reaches the river.

The pumping station is located at the foot of Main street, and takes the water from the Kennebec river. The intake extends about 100 feet into the channel between Swan's Island and Richmond. The water is pumped into a well in the station, which is divided by wire screens, the water entering on one side, being screened or strained, and then pumped into the pipes from the other side of the screens. During times of fire the water is pumped directly into the mains without even this preliminary screening. The pumps work but a few hours a day, pumping between 70,000 and 90,000 gallons a day and not working at all on Sundays.

The sewers all empty into the Kennebec between Swan's Island and Richmond. It is from this channel that the water is pumped, and there is also a rise and fall of the tide of about five feet. All the sewers empty into the river within 1,000 feet of the intake, and over half are within 500 feet of it. One large sewer empties within 60 feet of the intake. There is considerable current in the river, and the ebb and flood cause enough movement of the water to cause the sewage from both above and below to pass the intake.

The colon bacillus was present in all four samples examined.

RICHMOND PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
591	Feb. 27, 1906	.1	Slight	*	3.1	7.45	3.90	.0042	.0208	.011	0	.6	2.45	0
592	Feb. 27, 1906	.5	Veg.	*	3.0	6.90	3.95	.0048	.0136	.012	Trace	.2	2.64	0
593	Feb. 27, 1906	.1	Slight	*	3.1	6.90	3.90	.0026	.0158	.011	0	.275	2.65	0
594	Feb. 27, 1906	.3	Slight	†	3.1	7.05	3.90	.0040	.0128	.010	0	.2	2.64	0

* Vegetable and woody. † Woody.

Rumford Falls.

Two samples were examined from this supply. The source of the supply is a series of 73 wells driven on an intervale near the Androscoggin river. The samples were sent by the local Board of Health.

RUMFORD FALLS PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
444	Oct. 17, 1905	0	0	*	.5	3.40	3.20	.0006	.0041	.008	0	.2	3.27	0
445	Oct. 17, 1905	3.2	Iron	†	.5	6.60	5.30	.0006	.0050	.008	0	.2	4.91	0

* Woody. † Musty.

SANFORD.

This supply comes from a series of driven wells near the river bank, it being pumped from them into a reservoir for distribution. The samples have come both from the local Board of Health and from the water company.

SANFORD PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as				
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.	Chlorine.	Hardness.	Lead.
188	Aug. 8, 1904	0	0	0	0	3.00	2.20	.0006	.0004	.0075	0	.17	2.34	0
189	Aug. 15, 1904	0	0	0	0	3.00	2.20	.0003	.0009	.0075	0	.17	2.34	0
508	Dec. 5, 1905	0	0	Slight	.1	3.30	2.50	0	.0017	.0090	0	.2	1.89	0
509	Dec. 5, 1905	0	0	Slight	.2	3.35	2.50	0	.0019	.0090	0	.2	2.10	0
605	Mch. 7, 1906	.2	Slight	0	.8	4.30	3.40	.0006	.0014	0	0	.175	1.76	0

SPRINGVALE.

The source of the supply is Littlefield's pond located about a mile from the village. The pond has an area of about 30 acres, and a part of the surrounding area is farm land.

The first sample was sent me in October, 1905, and comparison with former analyses showed a very peculiar condition to exist. The water was strongly acid in reaction, and a complete analysis showed that this acidity was due to sulfuric acid in a free condition. There was also a large amount of decomposed organic material as evidenced by the Ammonias. This condition presisted for about a month and then began to decline until in March the water had returned to its normal condition except for a continuance of a slight degree of acidity.

SPRINGVALE PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
456	Oct. 27, 1905	0	0	Slight	.1	8.80	6.30	.032	.0060	.005	0	.15	4.66	0
457	Oct. 27, 1905	0	0	Slight	.1	8.50	5.50	.0342	.0140	.005	0	.15	4.90	0
502	Nov. 28, 1905	0	0	Slight	.1	8.60	7.50	.0460	.002	.005	0	.20	4.66	0
531	Jan. 11, 1906	.9	0	Veg.	3.1	7.00	5.00	.0260	.0312	.008	0	.225	3.52	0
604	Mar. 7, 1906	0	0	Slight	1.3	6.10	4.50	.0020	.0090	.005	0	.11	3.21	0
640	Apr. 24, 1906	0	0	0	.5	3.70	3.40	.0014	.0076	.005	0	.125	2.14	0
641	Apr. 24, 1906	0	0	0	.6	3.70	3.40	.0018	.0030	.005	0	.13	2.14	0

STRONG.

The analyses given below were made of samples of water taken from the pond that was to be used as a source of a public supply and they were all made before the water was turned into the pipes. The pond from which the samples were taken was Mt. Day pond. The pond is about 10 acres in extent, and is situated in a basin between the two peaks of Mt. Day, at an elevation of about 850 feet above the village of Strong. The shores are surrounded by heavy growths of hard and soft woods with no houses or cultivated land near.

STRONG PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
81	Feb. 18, 1904	.1	Slight	Veg.	4.2	5.70	2.50	.005	.0198	Trace	0	.16	2.90	0
142	May 20, 1904	0	0	Veg.	6.0	4.10	2.05	.002	.0236	Trace	0	.085	2.20	0
143	May 26, 1904	0	0	Veg.	5.6	4.10	2.10	.0018	.0139	Trace	0	.085	2.40	0
215	Oct. 5, 1904	0	0	Veg.	4.0	6.10	3.70	.0014	.0195	0	0	.15	3.05	0

VAN BUREN.

Two samples were sent from this supply; one from the brook, located in wild lands, which is the source of the supply, and one from the reservoir. A slight turbidity in the reservoir sample was the reason for requesting the analysis.

VAN BUREN PUBLIC SUPPLY.

Number.	Date of Collection.	Appearance.				Residue on Evaporation.		Ammonia		Nitrogen as		Chlorine.	Hardness.	Lead.
		Turbidity.	Sediment.	Odor.	Color.	Total.	Fixed.	Free.	Albuminoid.	Nitrates.	Nitrites.			
723	July 1, 1906	1.2	Slight	*	2.1	7.40	5.00	.0012	.0076	.01	0	.03	4.72	0
724	July 1, 1906	0	0	†	2 0	7.20	4.70	.0012	.0066	.005	0	.02	4.72	0

* Grassy. † Woody and vegetable.

In addition to the examinations recorded above from public supplies where more than a single sample has been furnished, the following work has been done upon public supplies already in existence or on waters that were under consideration as possible sources for public supplies.

During the fall of 1905 the water company at Springvale made repairs on the part of the system near Littlefield pond, and as a result the water from the pond was shut off for some time and water from some springs substituted for the regular supply. An epidemic of typhoid soon started, and analysis of the water from the springs showed the water to be badly polluted.

Eleven analyses of Howard lake and stream were made for the Maine Water Company and the city of Calais to see if it would furnish an acceptable drinking water in place of the present public supply.

Six samples were sent from the Bangor Water Department from outlying lakes and ponds to determine their quality as possible sources of a future pond supply.

Three analyses were made for the Yarmouthville Board of Health during the time they were deciding on a source of supply.

Three analyses were made of lake samples, the samples being from ponds that were under consideration as possible sources of a public supply for Waldoboro.

One analysis was made of waters under consideration as possible supplies for Orono and Greenville respectively.

A single analysis was made of the public supplies of each of the following towns, i. e., Livermore Falls, Mechanic Falls, Milo, Oakland, Oldtown, Stockton Springs and York Harbor.

In the case of Livermore Falls the analysis was called for on account of the bad odor of the water, which a biological examination showed to be caused by the presence of large numbers of Asterionella.

The above comprises the work done at the laboratory upon the public supplies of the State. In conclusion it might be stated that the laboratory would like to be able to make analyses of all the public supplies in the State at stated intervals of time, as for example four times a year. It would, of course, be prepared to make more analyses than this if any trouble arose in connection with the supply, and to do all in its power to aid in any investigations as to the cause of the trouble.

WATER ANALYSIS.

13

ANALYSES OF SAMPLES OF WATER—EXPRESSED IN PARTS PER 100,000.

Number.	Town or city.	Source.	Hardness.	Alkalinity.	Color.	Oxygen consumed.	Chlorine.	Nitrite.	Nitrate.	Ammonia.	
										Free.	Albuminoid.
65	Bath	Well	16.25	8.97	0.3	0.1	5.2	0.00018	0.28	.0024	.0076
66	Bath	Well	13.00	8.84	0.2	0.04	11.95	Trace	0.06	.0037	.0059
67	West Windsor	Well	4.29	0.39	0.3	0.14	0.85	Trace	0.44	.0019	.0038
68	Bar Mills	Well	14.30	3.38	0.1	0.25	8.70	0.0056	1.32	.0053	.0174
69	South Waldoboro	Well	2.83	1.03	0.2	0.17	2.25	Trace	0.10	.0037	.009
70	Augusta	Well	12.96	5.74	0.2	0.17	3.95	0	1.10	.0004	.0073
71	Brunswick	Well	11.61	1.70	0.4	0.21	7.35	0.004	3.00	.0302	.0107
72	Waldoboro	Well	5.09	1.74	0.1	0.09	1.20	0	0.01	.0006	.0026
73	Millinocket	Spring	2.12	0.83	0.6	0.08	0.70	Trace	0.14	.0044	.0093
74	Millinocket	Well	4.77	1.03	0.3	0.04	1.58	Trace	0.44	.0006	.0039
75	Millinocket	Spring	1.54	0.90	0	0.05	0.30	Trace	0.07	.0015	.0023
76	Millinocket	Well	3.22	1.41	1.0	0.03	0.45	Trace	0.27	.0007	.0028
77	Brunswick	Well	4.74	3.70	2.0	0.27	0.47	0	0	.0033	.0164
78	Richmond	Well	8.25	0.76	0	0.04	2.92	0	0.20	0	.0016
79	Sheepscot	Well	4.70	3.16	0.8	0.12	0.70	0	0	.0006	.0052
80	Augusta	Well	12.64	7.22	0	0.08	0.92	Trace	0.22	.0005	.0058
81	Strong	Mount Day Pond	2.90	0.83	4.20	0.75	0.16	0	Trace	.005	.0198
82	Bryant's Pond	Spring	3.87	2.39	0.4	0.16	0.08	Trace	0	.0094	.0074
83	Foxcroft	Well	2.90	1.16	2.2	0.44	0.15	0	Trace	.0026	.0101
84	Cornish	Well	2.83	1.54	1.3	0.31	0.24	0	Trace	.011	.0165
85	Cornish	Well	1.87	0.58	0.7	0.19	0.40	0	0.04	.0007	.0099
86	North Yarmouth	Spring	2.58	0.44	0	0.01	0.30	Trace	Trace	.0002	.0021
87	North Yarmouth	Well	2.58	0.77	0	0.01	0.30	Trace	Trace	.0001	.0021
88	Millinocket	Public supply	2.25	0.45	3.7	0.71	0.15	0	Trace	.0047	.0125
89	Yarmouth	Spring	3.65	0.81	0.75	0.16	0.63	Trace	0.07	.0048	.0087

90	Monmouth	Spring	2.25	0.45	0	0.03	0.32	0	0.005	.0015	.0022
91	Monmouth	Spring	2.90	1.35	2.2	0.26	0.42	0	0.02	.005	.0109
92	Millinocket	Public supply	1.80	0.77	3.6	0.76	0.15	0	Trace	.0032	.0103
93	Millinocket	Millinocket Stream	1.80	0.64	3.7	0.76	0.15	0	Trace	.0087	.0162
94	Millinocket	Spring	5.71	3.26	0	0.05	0.20	Trace	0	.0003	.0056
95	Livermore Falls	Spring	2.06	0.51	0	0.63	0.17	0	0.02	.0003	.0023
96	Brunswick	Spring	4.70	3.68	0.2	0.12	0.50	0	0	.0014	.0061
97	Greenville	Well	3.61	3.45	0.2	0.15	1.40	.0009	0.25	.0231	.0075
98	Waldoboro	Well	4.96	3.67	2.3	0.92	5.15	0	Trace	.12	.067
99	Greenville	Spring	3.35	0.43	0.2	0.02	0.24	0	0.09	.0007	.0023
100	Greenville	Spring	3.22	1.93	0	0.01	0.24	0	0.09	.0008	.002
101	Greenville	Bored well	2.90	0.70	0.7	0.01	0.15	Trace	0.03	.001	.0068
102	Greenville	Well	6.19	4.38	0	0	0.12	0	Trace	.0007	.0019
103	Greenville	Bored well	3.87	1.66	0.2	0	0.13	0	0.04	.001	.0028
104	Greenville	Well	3.16	1.87	0.1	0	0.15	0	0.02	.001	.001
105	Millinocket	Spring	5.41	4.12	0	0.07	0.11	0	0	.0019	.0037
106	Lisbon Falls	Frazier Brook	1.61	1.09	3.7	0.61	0.30	0	Trace	.0025	.0218
107	Lisbon Falls	Little River	1.74	0.68	3.6	0.65	0.25	0	Trace	.0015	.023
108	Litchfield	Spring	2.70	1.93	0	0	0.25	0	0	.0001	.0037
109	Fairfield	Spring	3.99	1.80	0	0.01	0.30	0	0.02	.003	.0038
110	Kennebunk	Well	4.83	2.38	1.5	0.06	2.20	.0002	0.50	.0015	.0081
111	Lisbon Falls	Fisher Brook	1.80	0.64	4.0	0.63	0.25	Trace	0	.0047	.0193
112	Lisbon Falls	Mill Pond	1.67	0.64	5.7	0.78	0.15	0	0	.0023	.0145
113	Oldtown	Public supply	1.80	0.90	4.7	0.43	0.14	Trace	Trace	.002	.0149
114	Oldtown	Spring	2.25	1.05	0.1	0.06	0.30	Trace	0	.0009	.0073
115	Oldtown	Spring	5.79	4.26	1.5	0.34	0.50	.0006	0.10	.0185	.0162
116	Bangor	Well	12.90	7.03	0.1	0.12	2.75	0	0.60	.001	.0088
117	Millinocket	Spring	3.28	0.80	0.1	0.12	0.20	0	0.02	.0002	.0048
118	Greenville Junction	Drilled well	4.51	2.55	1.1	0.06	2.15	.0018	.009	.0028	.0042
119	Augusta	Spring	4.51	3.40	0.1	0.02	0.50	0	.005	.0005	.0043
120	Augusta	Well	5.16	3.35	0.1	0.01	0.80	0	0.10	.0002	.0036
121	Augusta	Well	8.83	4.80	0.4	0.08	2.25	Trace	0.42	.0004	.007
122	Augusta	Well	21.23	12.75	0.2	0.19	2.20	0	0.65	.0042	.0103
123	Patten	Spring	10.32	5.80	0.4	0.15	2.41	.06	0.50	.0023	.0112
124	Togus	Spring	11.86	10.90	0.2	0.06	4.95	.001	0	.0312	.0016
125	East Brownfield	Well	2.32	1.05	0	0.03	0.14	0	0	.0034	.0047
126	Millinocket	Well	2.70	0.90	0.3	0	0.27	Trace	0.12	.0003	.0016
127	Old Town	Spring	3.22	2.37	0.2	0.08	0.21	0	0.03	.0008	.0027
128	Millinocket	Well	2.51	0.68	0.1	0.01	0.30	0	0.01	.0006	.0015
129	Lisbon Falls	Alder Brook	1.99	1.10	10.0	1.2	0.32	Trace	0.017	.0048	.0227

ANALYSES OF SAMPLES OF WATER—Continued.

Number.	Town or City.	Source.	Hardness.	Alkalinity.	Color.	Oxygen Consumed.	Chlorine.	Nitrite.	Nitrate.	AMMONIA.	
										Free.	Albuminoid.
130	Lisbon Falls	Spring	4.12	4.05	0	0.03	0.24	.003	0.015	.0002	.0024
131	Livermore Falls	Well	7.74	4.15	0.1	0.02	4.57	.0037	0.62	.0175	.0064
132	West Scarboro	Brook	1.03	0.60	4.7	0.66	0.35	0	0	.0022	.0139
133	Greenville	Well	4.51	1.30	1.3	0.35	1.72	.0008	0.51	.0668	.0024
134	Greenville	Spring	5.35	2.60	0.4	0.16	1.12	.0002	0.27	.0016	.0112
135	Acton	Well.	9.67	9.60	0.3	0.15	0.41	0	0.055	.0018	.0074
136	Madison	Well	4.12	1.03	0	0.02	1.42	0	0.62	.0018	.0029
137	Greenville	Well	5.16	1.65	0.5	0.01	2.25	.0003	0.40	.0522	.0055
138	Millinocket	West Branch Penobscot	1.87	1.00	4.2	0.37	0.08	0	Trace.	.0028	.0120
139	Islesford	Well	3.65	1.15	3.7	0.33	4.50	0	0	.0012	.0084
140	Lisbon Falls	Well	32.55	18.15	0.8	0.32	16.10	.0048	0.26	.2914	.0250
141	Lisbon Falls	Well	8.51	0.60	0.4	0.10	6.55	.001	3.20	.6060	.0718
142	Strong	Mt. Day Pond	2.20	1.10	6 0	0.74	0.08	0	Trace.	.0020	.0236
143	Strong	Mt. Day Pond	2.40	1 12	5.6	0.60	0.08	0	Trace.	.0018	.0139
144	Hallowell	Spring	3.09	1.90	0	0.03	0.13	0	0	0	.0016
145	Oakland	Public Supply	2.12	0.90	3.2	0.50	0.16	0	0	.0014	.0158
146	Augusta	Well	6.32	2.70	0.9	0.23	2.40	.0002	0.86	.0012	.0128
147	Greenville Junction	Well	9.28	0.60	0	0.08	5.12	0	1.10	.0002	.0051
148	Augusta	Devine Springs	6.45	5.05	0.1	0.01	0.27	0	0.05	0	.0017
149	Augusta	Well	2.58	1.65	1.0	0.12	0.32	Trace.	0	.0048	.0081
150	Bridgton	Spring	2.06	1.80	0.1	0.02	0.12	0	0	.0004	.0055
151	South Paris	Spring	3.16	2.20	0.1	0.03	0.09	0	0.01	.0005	.0021
152	Norridgewock	Well	3.09	2.10	0.4	0.22	0.65	0	0.10	.0010	.0053
153	Readfield	Well	6.19	2.30	0.1	0.18	2.37	Trace.	0.75	.0035	.0105
154	South Vassalboro	Spring	6.19	4.40	0	0	0.61	0	0.08	0	.0010

155	Strong	Spring	2.83	1.80	0	0.06	0.19	0	0.04	.0004	.0032
156	Strong	Well	3.48	1.45	0.05	0.07	0.31	0	0.15	.0005	.0038
157	Augusta	Cistern	2.83	1.20	0.1	0.33	0.01	.0008	0.03	.0041	.0118
158	Augusta	Cistern	10.70	5.55	0.1	0.27	1.32	Trace	0.42	.0019	.0103
159	Andover	Spring	1 61	0.70	0	0.10	0.05	0	0	.0007	.0015
160	The Birches	Spring	3.59	0.88	0	0.04	0.32	0	0.17	.0006	.0028
161	Bath	Well	7.74	6.20	0.1	0.07	2.27	.0006	0.11	.0007	.0038
162	Bath	Well	11.67	8.75	0.1	0.15	3.87	.0056	0.32	.0070	.0108
163	Portland	Spring	4.38	1.60	0.1	0.03	0.50	0	0	.0003	.0018
164	Bangor	Well	14.83	12.70	0.2	0.01	1.10	.0006	Trace.	.0009	.0017
165	Bangor	Well	23.92	21.00	0.1	0.16	4.75	.0019	0.04	.0616	.0165
166	Saco	Well	5.58	5.48	12.0	0.12	1.00	0	0	.0153	.0101
167	Alexander	Well	6.03	4.05	1.6	0.05	1.90	.0003	0.13	.0038	.0069
168	Standish	Drilled Well	2.47	1.65	1.2	0.06	0.20	Trace	0	.0004	.0037
169	Lisbon Falls	Well	8.31	5.20	0	0.005	1.53	.0004	0.37	.0003	.0034
170	Lisbon Falls	Well	5.65	0.40	0.1	0.03	7.51	.0005	1.10	.0005	.0043
171	Lisbon Falls	Well	4.06	0.85	0	0.01	2.87	Trace.	0.48	.0008	.0018
172	Lisbon Falls	Well	4.50	1.70	0.1	0.03	1.50	Trace.	0.32	.0002	.0018
173	Lisbon Falls	Well	2.99	1.45	0.1	0.02	0.47	0	0.16	.0008	.0044
174	Lisbon Falls	Well	9.39	5.80	0	0.06	2.79	.0003	0.31	.0006	.0060
175	Augusta	Spring	4.63	3.95	0	0	0.15	0	0.02	.0002	.0016
176	Livermore Falls	Well	3.55	0.75	0.1	0.04	0.63	Trace.	0.15	.0065	.0036
177	Cyr Plantation	Well	23.24	9.45	0.4	0.08	4.45	.0012	2.10	.0022	.0064
178	Camden	Spring	2.15	1.30	1.0	0.007	0.55	0	0	0	.0010
179	Camden	Well	5.84	3.95	0.4	0.04	0.85	Trace.	0.07	.0065	.0059
180	Togus	Spring	12.51	10.75	1.2	0.10	4.82	.0003	0.02	.0399	.0016
181	Newcastle	Well	14.47	8.95	1.3	0.13	4.47	.0012	1.00	.0009	.0079
182	North Edgecomb	Well	3.30	1.55	0.2	0.08	0.47	Trace.	0	.0032	.0040
183	Portland	Spring	7.36	5.95	0.4	0.08	0.45	Trace.	0.005	.006	.0099
184	Livermore Falls	Well	6.47	2.40	0.1	0.05	0.59	0	0.62	.0013	.0056
185	Dayton	Spring	2.41	1.65	0	0.03	0.24	0	0.002	.0012	.0027
186	Augusta	Spring	3.55	1.35	—	0.24	0.30	0	0	.0006	.0096
187	West Bath	Spring	4.50	3.05	0	0.02	0.44	0	0.017	.0005	.0006
188	Sanford	Public Supply	2.34	0.95	0	0.03	0.17	0	0.007	.0006	.0004
189	Sanford	Public Supply	2.34	0.95	0	0.03	0.17	0	0.007	.0003	.0009
190	Kennebunkport	Spring	1.52	0.65	0	0.01	0.30	0	Trace.	.0002	.0014
191	Bridgton	Well	3.93	3.30	0.1	0.04	0.95	0	0.15	.0003	.0055
192	Newcastle	Public Supply	1.27	0.50	2.1	0.22	0.35	0	0	.0008	.0118
193	Newcastle	"Town Pump"	7.49	4.50	0.1	0.01	2.74	.0002	0.405	.0003	.0021
194	Portland	Spring	5.08	3.55	3.1	0.13	0.65	0	0	.0005	.0054
195	Vinalhaven	Drilled Well	72.39	5.85	0.1	0.11	84.40	.015	.002	.0029	.0017

ANALYSES OF SAMPLES OF WATER—Continued.

Number.	Town or City.	Source.	Hardness.	Alkalinity.	Color.	Oxygen consumed.	Chlorine.	Nitrite.	Nitrate.	AMMONIA.	
										Free.	Albuminoid.
196	Bluehill	Spring	3.23	2.40	0	0.02	0.65	Trace	0.08	0	.0015
197	Skowhegan	Well	17.14	10.55	0.2	0.12	1.50	.006	0.08	.0212	.0086
198	Orr's Island	Spring	2.92	1.05	0	0.09	0.77	0	0.05	.0012	.0057
199	Waterville	Spring	11.81	6.00	0.1	0.06	4.05	.0012	0.70	.0045	.0056
200	Harrison	Spring	2.41	0.35	0	0.03	0.22	.0004	0.32	.0004	.0020
201	Alfred	Well	2.66	1.45	0.1	0.10	0.36	Trace	0.01	.0082	.0044
202	North Bridgton	Spring	2.98	2.90	0	0.06	0.22	0	0.02	0	.0018
203	North Bridgton	Well	1.33	0.40	0	0.12	0.22	0	0.04	.0002	.0022
204	Camden	Spring	6.22	4.85	0.4	0.01	0.56	0	0	.0014	.0003
205	South Bridgton	Well	1.77	0.95	0.3	0.21	0.19	0	0	.0008	.0074
206	Livermore Falls	Well	6.79	2.55	0.1	0.03	2.40	.0001	0.18	.0011	.0028
207	Ridlonville	Brook	2.66	1.55	0.3	0.12	0.15	0	0.01	0	.0046
208	Ridlonville	Spring	1.52	1.10	0	0.005	0.11	0	0	.0661	.0001
209	Acton	Spring	2.05	1.10	0.1	0.04	0.13	0	0.01	0	.0017
210	Bay View	Well	3.17	0.35	5.8	1.56	2.52	.0001	0	.0037	.0252
211	South Waldoboro	Well	3.55	1.85	1.6	0.12	2.62	0	0.07	.0013	.0092
212	York	Well	5.58	3.40	0.2	0.07	3.22	Trace	0.90	.0004	.0051
213	Greenville	Well	7.74	1.75	0.1	0.05	3.12	.032	0.62	.0053	.0025
214	Greenville	Drilled well	7.05	5.30	0.9	0.03	0.03	0	0	0	.0022
215	Strong	Mount Day Pond	3.05	1.85	4.0	0.74	0.15	0	0	.0014	.0195
216	Lisbon Falls	Well	15.75	0.25	0.5	0.25	12.00	.0017	2.87	.6750	.0116
217	Lisbon Falls	Spring	6.98	0.15	0.2	0.06	3.20	Trace	1.72	.0006	.0066
218	Lisbon Falls	Well	4.19	2.80	2.0	0.07	0.62	Trace	0.12	0	.0017
219	Lisbon Falls	Well	7.11	2.05	0.3	0.04	4.30	0	0.62	.0010	.0035
220	Lisbon Falls	Well	3.56	0.80	0.7	0.05	2.05	.001	0.87	.0126	.0047
221	Lisbon Falls	Well	5.08	0.05	1.0	0.05	2.15	0	1.50	.0170	.0034

222	Greenville	Well	4.76	1.30	0	0.02	1.75	Trace	0.50	.0003	.0022
223	Lisbon Falls	Drilled well	5.96	2.60	0.3	0.03	0.52	0	0.13	0	.0020
224	South Turner	Well	4.82	3.50	0.1	0.05	0.57	Trace	0.12	.0010	.0039
225	Portland	Spring	2.15	1.35	0	0.02	0.16	0	Trace	.0015	.0019
226	Greenville	Well	3.04	2.30	0	0.01	0.06	0	0.008	0	.0004
227	Lisbon Falls	Well	10.14	2.30	0.1	0.06	3.42	.0001	2.12	0	.0041
228	Arrowsic	Spring	5.39	0	0	0.06	0.32	0	Trace	.0012	.0022
229	Lisbon Falls	Driven well	3.68	2.05	0	0.02	0.37	0	0.12	0	.0004
230	East Waterboro	Well	3.55	0.70	0	0.06	2.62	0	0.17	.0068	.0022
231	Acton	Spring	5.52	1.35	0.4	0.19	2.25	.0002	1.65	.0034	.0091
232	Lisbon Falls	Well	2.86	1.55	0.1	0.04	0.44	0	0.08	.0001	.0019
233	Lisbon Falls	Well	3.30	0.60	0.1	0.04	0.82	Trace	0.28	.0001	.0017
234	Brunswick	Spring	5.33	4.00	0	0.11	0.42	.0001	0.07	.0028	.0051
235	Lisbon Falls	Well	3.30	1.80	0	0.07	0.40	0	0.02	0	.0044
236	Lisbon Falls	Well	3.68	0.45	0	0.07	1.45	Trace	0.55	.0021	.0054
237	Lisbon Falls	Well	3.17	1.05	0	0.03	0.52	0	0.17	.0002	.0028
238	York Village	Pond	4.06	1.00	6.0	1.20	1.92	0	0.02	.0030	.0409
239	Pine Point	Spring	4.19	2.35	0	0.03	1.42	0	Trace	0	.0073
240	Wilton	Well	1.65	0.30	0.1	0.24	0.20	0	0.01	.0011	.0043
241	Lisbon Falls	Well	3.90	2.15	0.1	0.03	0.72	.0001	0.12	.0013	.0025
242	Lisbon Falls	Well	9.01	4.80	0.1	0.05	2.97	0	0.24	.0007	.0029
243	Lisbon Falls	Well	13.32	2.90	0.5	0.11	5.22	.0003	3.00	.0020	.0093
244	Augusta	Carleton Pond	1.95	0.95	1.6	0.46	0.17	0	Trace	.0012	.0207
245	Lisbon Falls	Well	7.42	1.70	0	0.05	3.10	Trace	0.27	0	.0019
246	Oxford	Well	3.78	2.85	0.2	0.10	0.13	0	0.03	.0003	.0041
247	Lisbon Falls	Well	9.45	1.85	0.1	0.07	4.00	0	1.87	.0006	.0045
248	Augusta	Carleton Pond	1.95	0.95	1.7	0.51	0.17	0	0	.0029	.0335
249	Augusta	Carleton Pond	1.95	0.95	1.6	0.52	0.17	0	0	.0030	.0271
250	Lisbon Falls	Well	3.34	1.95	0.5	0.04	0.28	.0003	0.16	.0005	.0014
251	Freedom	Spring	7.18	5.60	0	0.04	1.01	0	0.10	.0017	.0028
252	Acton	Well	5.79	2.95	0.3	0.14	5.60	0	0.32	.0002	.0075
253	Patten	Well	5.85	4.05	0.7	0.11	0.42	.005	0.24	.0004	.0066
254	Patten	Spring	2.77	0.80	1.6	0.51	0.25	0	Trace	.0006	.0106
255	Parsonsfield	Spring	1.57	1.15	0	0.01	0.10	0	0	.0008	.0016
256	Augusta	Well	9.20	6.55	0.1	0.04	2.60	0	0.40	0	.0042
257	Cornish	Spring	4.73	1.75	0.1	0.07	1.72	.0001	0.19	.0188	.0057
258	Norridgewock	Well	4.15	3.35	0	0.04	0.15	0	0	0	.0007
259	Limerick	Well	3.71	1.25	0.2	0.005	0.32	0	0.53	.0003	.0025
260	York Village	Spring	4.66	4.05	0	0.03	0.65	Trace	0.05	.0014	.0036
261	York Village	Ice—Goodale Ice Pond	0.37	0	0.3	0.14	0.09	Trace	Trace	.0049	.0148

ANALYSES OF SAMPLES OF WATER—Continued.

Number.	Town or City.	Source.	Hardness.	Alkalinity.	Color.	Oxygen Consumed.	Chlorine.	Nitrite.	Nitrate.	Ammonia.	
										Free.	Albuminoid.
262	Orono	Chemo Stream	1.76	0.65	5.8	1.07	0.22	Trace.	0	.0047	.0266
263	Augusta	Well	7.56	6.20	0.5	0.13	1.80	Trace.	6.02	.0008	.0068
264	Rangeley	Saddleback Stream	1.38	0.45	1.2	0.28	0.05	0	0.02	.0005	.0048
265	Rangeley	Long Pond	1.13	0.35	1.3	0.40	0.04	0	Trace.	.0012	.0077
266	Cornish	Well	4.47	1.75	0	0.04	1.27	Trace.	0.46	.0003	.0048
267	Livermore Falls	Well	3.71	0.50	0.3	0.20	0.15	0	0	.0046	.0137
268	Bangor	Filtered River	3.37	1.30	4.8	1.92	0.08	0	Trace.	.0046	.0185
269	Bangor	Raw River	2.33	1.15	5.4	1.98	0.09	Trace.	Trace.	.0036	.0172
270	Munroe	Well	9.76	6.25	0.3	0.21	1.10	.01	0.80	.0045	.0124
271	Bangor	Filtered River	3.21	0.45	2.3	1.52	0.10	0	Trace	.0029	.0126
272	Naples	Well	2.79	1.25	0	0.04	0.32	0	0.32	.0009	.0028
273	Calais	Public Supply	1.96	0.95	4.4	0.99	0.16	0	0	.0028	.0166
274	Bangor	Raw River	2.23	1.35	5.4	1.88	0.11	Trace.	0	.0034	.0178
275	Bangor	Filtered River	3.59	0.89	3.6	1.46	0.12	Trace.	0	.0026	.0126
276	Kittery	Well	6.30	4.30	0.2	0.13	1.35	Trace.	0.01	.0014	.0052
277	Bangor	Filtered River	2.85	0.65	4.0	1.76	0.12	Trace.	Trace.	.0031	.0133
278	Bangor	Raw River	2.48	1.30	5.8	2.05	0.07	Trace.	Trace.	.0038	.0156
279	Unity	Spring	2.60	1.00	0	0.03	0.55	0	0.22	.0002	.0015
280	Bangor	Raw River	2.34	1.35	5.3	2.00	0.12	Trace.	Trace.	.0024	.0179
281	Bangor	Filtered River	2.73	0.60	2.7	1.59	0.14	Trace.	Trace.	.0026	.0093
282	Greenville	Well	4.22	1.75	0.2	0.03	0.80	.0006	0.16	.0262	.0024
283	Greenville	Well	6.86	4.60	0.4	0.27	2.80	.0008	0.27	.0696	.0002
284	Bangor	Well	12.89	7.50	0.4	0.19	3.97	.0030	1.47	.0214	.0053
285	Bangor	Well	18.85	7.45	0.2	0.03	1.90	.0001	1.62	.0002	.0028
286	Bangor	Cistern	3.84	0.95	1.1	0.16	0.17	Trace.	0.06	.0236	.0168

287	Bangor	Cistern	6.07	3.50	0.8	0.18	0.15	Trace.	0.12	.0016	.0042
288	Dover	Spring	10.16	8.80	0	0.03	0.42	Trace.	0.18	.0004	.0014
289	Bangor	Well	28.50	15.00	0.2	0.08	7.40	.0002	0.86	.0070	.0050
290	Calais	Public Supply	1.57	0.55	5.4	1.24	0.12	0	0	.0029	.0191
291	Cumberland	Spring	2.71	1.85	0	0.05	0.25	0	0.03	.0003	.0011
292	Cumberland	Spring	2.77	1.95	0	0.06	0.26	0	0.03	.0004	.0006
293	Bangor	Filtered River	2.01	0.56	0.5	0.56	0.10	Trace.	Trace.	.0016	.0089
294	Bangor	Raw River	2.00	0.90	5.3	1.17	0.07	Trace.	Trace.	.0024	.0176
295	Yarmouth	Spring	5.09	1.60	0	0.01	0.48	0	0.04	.0003	.0019
296	Riverside	Spring	8.12	7.30	0	0.01	0.30	Trace.	0.01	0	.0014
297	Oxford	Well	8.94	7.70	0.5	0.30	2.95	0	0.12	.0008	.0177
298	Richmond	Spring	2.64	0.70	0	0.08	0.25	Trace.	0.03	.0006	.0030
299	Augusta	Well	2.64	1.00	0.2	0.12	0.62	.0003	0.10	.0236	.0072
300	Bangor	Raw River	1.70	0.75	4.8	1.29	0.07	Trace.	Trace.	.0022	.0179
301	Bangor	Filtered River	2.01	0.40	0.7	0.76	0.08	Trace.	Trace.	.0013	.0122
302	Calais	Public Supply	1.64	0.65	6.4	1.35	0.11	0	0	.0026	.0189
303	Calais	Well	7.37	1.90	0.4	0.26	2.30	.0002	1.45	.0024	.0113
304	Bangor	Filtered River	1.89	0.25	0.4	0.71	0.08	Trace.	Trace.	.0019	.0083
305	Bangor	Raw River	1.78	0.90	4.8	1.31	0.07	0	0	.0026	.0188
306	Berwick	Well	52.29	11.70	3.4	1.66	33.00	.021	3.95	.2044	.0450
307	Bangor	Spring	5.41	3.75	0	0.01	1.00	0	0.14	.0004	.0036
308	Bangor	Raw River	1.95	0.75	6.1	1.30	0.07	Trace	Trace.	.0030	.0192
309	Calais	Public Supply	1.40	0.70	6.8	1.25	0.10	0	0	.0027	.0204
310	Calais	Public Supply	1.40	0.70	6.8	1.25	0.10	0	0	.0027	.0209
311	Bangor	Filtered River	1.89	0.25	0.4	0.81	0.07	0	Trace.	.0016	.0124
312	Bangor	Raw River	1.64	0.95	5.4	1.37	0.07	0	Trace.	.0040	.0180
313	Bangor	Filtered River	1.82	0.40	4.5	1.09	0.07	Trace.	Trace	.0022	.0153
314	Hermon Pond	Well	3.71	2.70	0	0.03	0.45	Trace.	0.15	.0027	.0032
315	Hermon Pond	Well	4.15	2.40	0.1	0.02	0.45	0	0.06	0	.0014
316	Richmond	Spring	3.78	3.20	0.1	0.03	0.37	0	Trace.	.0004	.0037
317	Augusta	Well	5.67	4.50	0.4	0.06	0.27	Trace.	0.03	.0015	.0079
318	York Beach	Well	7.56	5.75	0.8	0.23	3.67	.015	0.55	.0206	.0099
319	Bangor	Raw River	1.80	0.90	4.6	1.26	0.08	Trace.	Trace.	.0020	.0196
320	Bangor	Filtered River	2.46	0.20	0.4	0.38	0.07	0	Trace.	.0007	.0075
321	North Yarmouth	Spring	1.38	0.50	0	0.05	0.30	0	0.01	.0022	0047
322	Mapleton	Well	17.64	13.70	4.1	0.79	0.77	.005	0.15	.0447	.0320
323	Augusta	Well	13.85	5.70	0.3	0.06	4.92	Trace.	1.20	.0003	.0083
324	Bangor	Raw River	1.89	0.90	4.6	1.35	0.07	0	Trace.	.0023	.0187
325	Bangor	Filtered River	2.20	0.35	0.7	0.67	0.10	0	Trace.	.0009	.0105
326	Bangor	Spring	12.60	11.10	0.7	0.06	0.77	0	0	.0192	.0074
327	Bangor	Raw River	1.76	0.95	4.5	1.36	0.08	0	Trace.	.0026	.0176

ANALYSES OF SAMPLES OF WATER—Continued.

Number.	Town or City.	Source.	Hardness.	Alkalinity.	Color.	Oxygen consumed.	Chlorine.	Nitrite.	Nitrate.	Ammonia.	
										Free.	Albuminoid.
328	Bangor	Filtered River	2.02	0.20	0.7	0.79	0.07	0	Trace	.0012	.0122
329	Saco	Well	3.78	2.25	0.5	0.26	2.45	Trace	0.06	.0607	.0103
330	Bangor	Raw River	1.95	0.95	4.6	1.61	0.09	0	0	.0026	.0205
331	Bangor	Filtered River	2.26	0.25	0.6	0.82	0.10	0	Trace	.0014	.0108
332	Yarmouthville	Well	1.89	0.80	0.5	0.37	0.41	Trace	0.01	.0036	.0108
333	Buxton	Bored Well	7.56	7.30	0	0.19	0.85	Trace	0.09	0	.0015
334	Palermo	"Well Spring"	3.84	3.00	0	0.25	0.17	0	Trace	.0002	.0022
335	Bangor	Raw River	2.02	1.05	5.0	1.81	0.10	Trace	Trace	.0038	.0212
336	Bangor	Filtered River	2.58	0.45	3.2	1.06	0.10	0	0	.0014	.0118
337	Ferry Beach	Well	2.84	0.15	0.8	0.31	3.25	0	0.02	.0007	.0067
338	Bar Harbor	Public Supply	1.13	0.25	0.5	0.26	0.52	0	0	.0009	.0091
339	Bar Harbor	Public Supply	1.13	0.25	0.5	0.25	0.52	0	0	.0008	.0096
340	Old Orchard	Spring	5.17	3.15	0	0.26	1.45	0	0.17	0	.0014
341	Vanceboro	A Public Supply	1.51	0.80	3.6	0.85	0.07	0	Trace	.0012	.0132
342	Calais	Public Supply	1.38	0.95	6.8	1.43	0.08	0	Trace	.0020	.0194
343	Whitneyville	Spring	1.51	0.75	0.2	0.05	0.42	0	0	0	.0008
344	Dover	Well	6.74	4.30	0.7	0.25	0.90	.0008	0.69	.0040	.0110
345	Small Point Beach	Well	3.78	0.35	0.2	0.08	2.05	0	0	0	.0064
346	Bangor	Well	5.69	3.25	0.5	0.12	0.70	.0005	0.69	.0003	.0082
347	No. Bridgton	Well	8.82	5.30	0.7	8.40	0.80	Trace	Trace	.0030	.0400
348	Greenville	Well	3.91	1.55	0.5	0.16	1.35	Trace	0.41	.0006	.0045
349	Greenville	Well	2.14	0.60	0.5	0.05	0.33	0	0.09	.0002	.0012
350	Guilford	Well	8.19	1.15	0.5	0.08	0.97	.0001	0.75	.0008	.0036
351	East Sebago	Well	1.63	0.90	0.7	0.06	0.54	0	0.03	0	.0022
352	Farmington Falls	Well	3.47	2.65	0.5	0.12	0.25	0	0.01	.0004	.0032

353	Bangor	Raw River	2.26	1.10	6.4	1 87	0.11	0	Trace	.0024	.0202
354	Bangor	Filtered River	2.64	0.65	4.8	1.67	0.11	0	Trace	.0018	.0170
355	Small Point Beach	Spring	3.08	1.30	0	0.09	1.10	0	0.04	.0002	.0023
356	Springvale	Mousam River	1.38	0.75	2.1	0.53	0.15	0	0	.0009	.0138
357	Calais	Public Supply	1.32	0.60	5.2	1.00	0.10	0	0	.0012	.0188
358	Whitneyville	Spring	1.51	1.20	0.5	0.08	0.35	0	0.007	.0006	.0032
359	Whitneyville	Well	28.35	17.40	1.4	0.57	14.45	.01	2.30	.1309	.0737
360	Whitneyville	Well	22.05	17.10	1.6	0.32	10.10	.0002	1.10	.0140	.0184
361	Bangor	Raw River	2.26	1.05	5.6	1.82	0.10	0	Trace	.0020	.0206
362	Bangor	Filtered River	2.46	0.30	2.0	0.95	0.10	0	Trace	.0010	.0104
363	Lincolnville	Well	14.99	11.80	2.2	1.20	2.65	.015	Trace	.0706	.0702
364	Bangor	Filtered River	2.77	0.20	0.8	0.99	0.09	0	Trace	.0014	.0097
365	Biddeford	Well	7.93	5.70	1.2	0.24	4.27	.005	0.07	.0089	.0132
366	Augusta	Spring	3.84	3.40	0.1	0.03	0.30	0	0.01	.0002	.0016
367	Bangor	Filtered River	2.26	0.35	2.6	1.38	0.09	0	Trace	.0014	.0116
368	Bangor	Raw River	2.14	1.00	5.3	1.91	0.09	0	Trace	.0026	.0220
369	Buckfield	Well	4.03	3.05	0.6	0.07	0.17	.0001	0.04	.0824	.0088
370	Bangor	Well	11.34	9.55	0.6	0.82	1.72	Trace	0.16	.0026	.0088
371	Bath	Well	6.93	3.70	1.9	0.37	3.00	Trace	0.06	.0020	.0174
372	Bangor	Raw River	2.14	1.00	5.2	1.75	0.10	0	Trace	.0024	.0192
373	Bangor	Filtered River	3.15	0.45	2.7	1.27	0.10	0	Trace	.0010	.0124
374	Portland	Well	11.34	10.45	0.6	0.15	0.94	.005	0.25	.0458	.0092
375	Portland	Well	3.34	2.60	0.7	0.14	0.29	0	0	.0062	.0055
376	Greenville	Well	11.97	5.90	0	0.04	0.07	Trace	0.001	.0002	.0005
377	Sprague Falls	Well	10.08	4.25	1.2	0.09	0.25	0	0	.0078	.0046
378	Sprague Falls	St. Croix River	1.32	0.45	3.2	0.74	0.10	0	Trace	.0012	.0158
379	Pine Point	Spring	0.81	0.10	0	0.02	0.20	0	0	0	0
380	Bangor	Filtered River	2.14	0.40	1.1	0.90	0.09	0	Trace	.0010	.0086
381	Sargentville	Spring	3.46	2.30	0	0.22	0.57	.0001	0	.0008	.0052
382	Augusta	Well	2.83	2.35	0.4	0.20	0.10	0	0.04	.0002	.0054
383	Friendship	Public Supply	3.65	1.70	0.6	0.22	1.77	Trace	0.22	.0047	.0087
384	Cornish	Well	6.93	2.25	0.6	0.23	3.22	.0015	0.90	.0048	.0145
385	York Harbor	Well	4.66	3.00	0	0.08	2.50	Trace	0.12	.0014	.0063
386	Yarmouth	Spring	3.52	2.20	1.1	0.18	0.38	0	0.07	.0009	.0070
387	Yarmouth	Spring	3.40	2.00	0	0.06	0.36	0	0.09	0	.0054
388	Yarmouth	Royal's River	2.14	1.30	6.6	1.07	0.22	0	Trace	.0060	.0364
389	Wayne	Well	4.28	3.60	0.2	0.11	1.31	.0001	0.09	.0052	.0066
390	So. Paris	Well	3.78	2.85	0.1	0.06	0.30	.0002	0.10	.0008	.0044
391	Fort Fairfield	Well	18.90	17.20	0.3	0.02	0.50	0	0.21	.0007	.0013
392	Fort Fairfield	Spring	21.42	18.60	0.2	0.02	0.80	Trace	0.18	.0003	.0020
393	Sprague Falls	Well	4.66	4.45	1.7	0.03	0.22	0	0	0	.0010

ANALYSES OF SAMPLES OF WATER—Continued.

Number.	Town or City.	Source.	Hardness.	Alkalinity.	Color.	Oxygen consumed.	Chlorine.	Nitrite.	Nitrate.	Ammonia.	
										Free.	Albuminoid.
394	Sprague Falls	Well	3.15	2.10	0.4	0.03	0.42	0	0	.0006	.0020
395	Greenville	Well	10.33	8.70	0.6	0.15	2.97	.0001	0.32	.0026	.0096
396	Lewiston	Well	2.26	2.20	0	0.03	0.72	0	0.01	.0002	.0014
397	Bangor	Filtered River	2.39	0.10	2.1	0.81	0.09	0	Trace	.0014	.0100
398	Oakland	Well	10.96	6.30	0	0.03	1.77	0	0.42	.0004	.0061
399	Greenville	Well	9.07	7.75	0.2	0.14	1.27	.01	0.11	.0220	.0038
400	Greenville	Well	3.78	2.55	0.1	0.06	0.52	0	0.11	.0006	.0047
401	Greenville	Well	5.67	4.00	1.3	0.36	2.45	0	0.46	.0048	.0120
402	Greenville	Well	5.16	4.65	0.6	0.18	0.35	0	0.21	.0002	.0033
403	Yarmouthville	Spring	2.27	1.20	1.1	0.10	0.47	.0001	0.07	.0012	.0071
404	Calais	Public Supply	1.76	1.00	3.8	0.76	0.15	0	Trace	.0014	.0172
405	Biddeford	Well	7.68	5.90	0.8	0.27	4.32	.005	0.05	.0062	.0144
406	Friendship	Well	1.65	0.30	0.1	0.07	1.05	0	0.07	.0005	.0033
407	Friendship	Well	2.39	0.90	0	0.06	2.02	0	0.10	.0010	.0041
408	Friendship	Well	3.40	1.75	Blue	1.14	1.40	Trace	0.01	.0060	.0195
409	Friendship	Well	5.42	1.10	0.1	0.09	8.50	.004	0.23	.0051	.0052
410	Friendship	Public Supply	2.52	0.35	0.1	0.04	2.07	0	0.11	.0020	.0045
411	York Harbor	Water Co. pond	1.00	0.25	3.7	0.61	0.40	0	0.01	.0014	.0146
412	Presque Isle	Public Supply	7.18	6.15	2.4	0.51	0.11	0	0.005	.0035	.0170
413	Friendship	Well	2.64	0.70	0	0.07	2.10	0	0.15	.0014	.0043
414	York	Well	1.64	1.60	0.4	0.07	0.20	0	0.007	.0016	.0047
415	Cornish	Spring	1.89	1.10	0	0.01	0.02	0	0.01	.0003	.0003
416	Cornish	Well	4.66	1.80	0	0.07	1.82	0	0.54	.0006	.0033
417	Calais	Public Supply	1.64	0.90	3.6	0.80	0.15	0	0.005	.0014	.0151
418	Topsham	Spring	5.04	4.60	0.6	0.12	3.25	0	0	.0113	.0153

419	Topsham	Spring	9.07	6.45	1.9	0.42	3.25	.0005	0.80	.0030	.0250
420	Topsham	Spring	2.89	2.85	2.7	0.57	1.17	.003	0.005	.0046	.0466
421	Yarmouthville	Well	3.02	1.60	0.2	0.11	0.95	0	0.01	.0002	.0052
422	Bangor	Well	10.08	7.35	0.6	0.14	1.78	0	0.56	.0802	.0052
423	Anson	Well	25.95	5.85	0.4	0.40	7.97	.006	3.00	.0076	.0134
424	Anson	Well	10.71	9.10	0.8	0.43	4.50	.014	0.60	.3150	.0340
425	Presque Isle	Spring	13.23	12.00	0.3	0.13	0.15	0	0.11	0	.0047
426	Presque Isle	Spring	10.08	10.05	0	0.03	0.10	0.	0.01	.0002	.0006
427	Bucksport	Well	6.68	5.85	1.4	0.43	5.40	.001	0.24	.0019	.0204
428	Limerick	Well	7.05	5.90	0	0.06	0.87	.001	0.09	.0007	.0023
429	Lewiston	Lake Auburn	1.76	0.90	0.6	0.17	0.16	0	Trace	.0016	.0142
430	Lewiston	Public Supply	1.76	0.90	0.6	0.17	0.16	0	Trace	.0016	.0134
431	Lewiston	Inlet Lake Auburn	1.95	0.95	3.1	0.60	0.19	0	0.005	.0036	.0246
432	So. Bristol	Well	18.64	3.85	0.7	0.29	18.30	.015	1.15	.2878	.0588
433	Sabattus	Well	15.75	11.60	0.3	0.11	2.66	.0015	0.17	.0008	.0058
434	Vanceboro	A Public Supply	1.51	0.60	2.6	0.58	0.09	0	0.002	.0014	.0142
435	Whitneyville	Spring	1.76	1.75	0	0.01	0.42	0	0.007	.0005	.0001
436	Calais	Public Supply	1.58	0.85	2.5	0.61	0.12	0	0.002	.0014	.0126
437	Springvale	Boiling Springs	5.98	1.95	0	0.04	5.05	Trace	0.40	.0008	.0031
438	Springvale	Boiling Springs	5.85	2.15	0.6	0.04	5.07	Trace	0.40	.0012	.0030
439	Greenville	Well	2.77	2.05	0.3	0.04	0.08	0	0.03	.0014	.0035
440	Kennebunkport	Brook	2.14	1.05	11.6	1.63	0.80	0	Trace	.0038	.0314
441	Kennebunkport	Brook	2.26	1.10	11.2	1.55	0.87	0	Trace	.0061	.0325
442	Waldoboro	Spring	1.89	1.15	0.2	0.04	0.17	0	0.007	0	.0016
443	Yarmouthville	Well	13.98	5.35	0.3	0.12	7.10	.016	0.22	.0326	.0041
444	Rumford Falls	Public Supply	3.27	1 00	0.5	0.11	0.20	0	0.008	.0006	.0041
445	Rumford Falls	Public Supply	4.91	2.05	0.5	0.26	0.20	0	0.008	.0006	.0050
446	Waldoboro	Well	3.40	2.60	1.7	0.16	0.78	0	0.04	.0009	.0093
447	Foxcroft	Well	10.20	9.60	0	0.02	0.10	Trace	0.05	.0006	.0014
448	Christmas Cove	Top of a Well	3.15	0.90	0.4	0.09	1.75	0	0.007	.0005	.0049
449	Christmas Cove	Bottom of a well	3.27	1.25	0.4	0.09	1.76	0	0.005	.0023	.0052
450	Bangor	Raw River	2.39	0.95	4.2	1.59	0.10	0	Trace	.0028	.0170
451	Bangor	Filtered River	2.67	0.20	2.9	1.21	0.10	0	0	.0016	.0095
452	Vanceboro	A Public Supply	1.51	0.65	2.8	0.56	0.10	0	Trace	.0020	.0164
453	No. Newry	Spring	2.77	0.20	0	0.26	0.72	0	0.29	.0006	.0038
454	Bangor	Well	18.90	16.20	2.7	0.52	2.30	.005	0.03	.0402	.0186
455	Peaks Island	Spring	2.45	0.90	0	0.04	1.72	0	0	.0009	.0028
456	Springvale	Public Supply	4.66	Acid	0.1	0.03	0.15	0	0.005	.0320	.0060
457	Springvale	Public Supply	4.90	Acid	0.1	0.05	0.15	0	0.005	.0340	.0140
458	Springvale	Well	9.32	7.70	0.2	0.11	1.85	0	0.32	.0010	.0059
459	So. Vassalboro	Well	13.86	12.50	0.7	0.10	0.55	0	0	.0067	.0045

ANALYSES OF SAMPLES OF WATER—Continued.

Number.	Town or City.	Source.	Hardness.	Alkalinity.	Color.	Oxygen consumed.	Chlorine.	Nitrite.	Nitrate.	Ammonia.	
										Free.	Albuminoid.
460	So. Vassalboro	Well	4.63	3.30	0.4	0.05	0.22	0	0.01	.0016	.0032
461	Gardiner	Spring	7.56	6.20	0.5	0.02	0.21	0	0	.0008	.0038
462	Sprague Falls	St. Croix River	1.63	0.50	2.4	0.53	0.10	0	Trace	.0012	.0136
463	Sprague Falls	St. Croix River	1.60	0.50	2.3	0.57	0.12	0	Trace	.0010	.0139
464	Calais	Public Supply	1.63	0.60	2.4	0.58	0.10	0	Trace	.0016	.0130
465	No. Bridgton	Well	2.14	1.65	0.6	0.06	0.07	0	0	.0012	.0044
466	Calais	Well	6.74	4.90	1.3	0.38	2.38	.0003	0.44	.0032	.0139
467	Calais	Well	23.94	11.85	0.5	0.08	6.40	.005	1.95	.0014	.0056
468	Calais	Well	16.38	10.80	0.3	0.11	2.92	0	0.54	.0012	.0052
469	Calais	Well	4.66	3.50	3.1	0.25	0.33	0.010	0.07	.0408	.0096
470	Calais	Well	22.05	12.30	0.2	0.07	8.47	.001	0.83	.0006	.0052
471	Calais	Well	11.84	3.50	0.2	0.12	5.30	.001	0.97	0	.0058
472	Calais	Public Supply	1.63	0.55	2.4	0.58	0.12	0	Trace	.0026	.0121
473	Bangor	Raw River	2.77	1.10	4.3	2.22	0.15	0	Trace	.0041	.0145
474	Bangor	Filtered River	2.96	0.30	2.4	1.71	0.15	0	0	.0034	.0082
475	York Village	Well	2.89	1.80	1.1	0.05	1.20	0	0.05	.0006	.0043
476	Orono	Spring	1.89	1.35	0	0.61	0.12	0	0.11	.0003	.0009
477	Augusta	Well	17.64	13.25	1.7	0.19	3.00	Trace	0.05	.0116	.0280
478	Winthrop	Well	7.43	6.05	1.6	0.28	3.70	.0003	0.73	.0234	.0198
479	Bangor	Well	16.38	10.60	0	0.02	3.44	.0002	0.54	.0005	.0009
480	Calais	Public Supply	1.89	0.75	4.6	0.97	0.13	0	Trace	.0023	.0202
481	Calais	St. Croix River	1.76	0.75	4.7	0.97	0.12	Trace	Trace	.0019	.0168
482	Cornish	Spring	2.52	1.55	0	0	0.15	0	0.05	.0006	.0008
483	Cornville	Well	8.19	6.10	0.4	0.08	1.80	Trace	0.85	.0006	.0062
484	Cornville	Well	6.42	5.55	0.7	0.09	0.48	.0001	0.13	.0025	.0087

485	Castine	Well	15.75	10.10	1.1	0.08	5.22	0	0.32	.0012	.0071
486	Sanford	Well	2.52	1.20	0	0.08	0.50	0	0.08	.0004	.0034
487	Springvale	Public Supply	5.04	Acid	0.3	0.09	0.17	0	0.01	.0412	.0015
488	Springvale	Bog	1.89	0.35	4.2	0.78	0.32	0	0.01	.0014	.0190
489	Yarmouth	Spring	2.77	0.55	0.4	0.03	0.82	0	0.25	.0003	.0049
490	Yarmouthville	Royal's River	2.14	0.65	6.8	1.09	0.32	0	0.03	.0028	.0280
491	Bangor	Raw River	2.77	1.65	6.4	2.24	0.19	Trace	Trace	.0048	.0200
492	Bangor	Filtered River	2.77	0.05	0.7	1.49	0.16	0	Trace	.0030	.0126
493	Calais	Well	26.40	17.20	1.8	0.54	1.60	.03	0.38	.0028	.0240
494	Tenant's Harbor	Well	4.66	0.80	3.2	0.82	6.47	Trace	0.22	.0054	.0294
495	No. Baldwin	Well	1.89	0.40	0.6	0.14	0.75	Trace	0.65	.0008	.0078
496	Sprague Falls	Well	4.41	3.70	0.2	0.01	0.20	0	0	.0006	.0040
497	Calais	Public Supply	2.14	0.50	9.6	1.85	0.19	0	0.02	.0032	.0266
498	Greenville Junct.	Well	4.53	1.70	0.6	0.005	1.47	Trace	0.25	.0010	.0016
499	Greenville Junct.	Well	11.97	7.45	1.3	0.41	6.33	0.02	0.41	.0890	.0904
500	Bangor	Raw River	2.77	1.10	8.4	2.48	0.16	Trace	Trace	.0038	.0207
501	Bangor	Filtered River	3.78	0.40	5.8	2.34	0.19	Trace	Trace	.0027	.0213
502	Springvale	Public Supply	4.66	Acid	0.1	0.04	0.20	0	0.005	.0460	.0020
503	Presque Isle	Public Supply	15.75	12.10	1.4	0.36	0.27	.0005	0.10	.0048	.0106
504	Cornish	Spring	4.53	1.60	0.5	0.07	1.07	0	0.22	.0004	.0126
505	Cornish	Well	2.83	1.00	0.5	0.04	2.62	0	0.34	.0002	.0018
506	Bath	Public Supply	1.19	0.60	2.7	0.50	0.35	0	0.006	.0016	.0142
507	Calais	Well	23.31	23.00	0.8	0.21	2.22	.0008	0.24	.0006	.0106
508	Sanford	Public Supply	1.89	1.25	0.1	0.02	0.20	0	0.009	0	.0017
509	Sanford	Public Supply	2.10	1.20	0.2	0.01	0.20	0	0.009	0	.0019
510	Augusta	Well	6.67	1.45	4.8	1.49	1.85	.0007	0.78	.0202	.0188
511	Springvale	Public Supply	4.91	Acid	0.5	0.08	0.03	0	0.005	.0400	.0052
512	Calais	Public Supply	2.01	0.75	8.8	1.46	0.17	Trace	Trace	.0024	.0204
513	Yarmouth	Well	6.11	0.75	0.2	0.15	6.30	Trace	0.69	.0004	.0084
514	Bangor	Raw River	1.95	1.20	8.8	2.59	0.17	Trace	Trace	.0038	.0192
515	Bangor	Filtered River	3.65	0.10	1.2	1.92	0.15	Trace	Trace	.0032	.0124
516	Guilford	Well	28.35	8.80	0.2	0.007	8.27	0	1.57	.0006	.0086
517	Princeton	Well	30.87	7.20	2.6	0.74	14.55	.0005	6.60	.0066	.0482
518	Yarmouthville	Driven Well	4.53	2.35	0.7	0.007	1.12	Trace	0.40	.0019	.0038
519	Yarmouthville	Spring	3.02	1.70	1.2	0.22	0.35	0	0.10	.0006	.0090
520	Scarboro	Drilled Well	6.80	4.25	0.6	0.20	1.07	0.01	0.70	.0066	.0084
521	Sprague Falls	St. Croix River	1.89	0.75	7.2	1.11	0.13	0	Trace	.0027	.0171
522	Sprague Falls	St. Croix River	1.89	0.80	7.2	1.13	0.13	0	Trace	.0029	.0183
523	Livermore Falls	Public Supply	1.63	0.60	0.7	0.14	0.12	0	0	.0014	.0138
524	Yarmouth	Spring	2.89	0.45	0	0.07	0.77	Trace	0.23	.0025	.0037
525	No. Berwick	Public Supply	1.57	0.75	3.1	0.52	0.24	0	0.005	.0009	.0079

ANALYSES OF SAMPLES OF WATER—Continued.

Number.	Town or City.	Source.	Hardness.	Alkalinity.	Color.	Oxygen consumed.	Chlorine.	Nitrite.	Nitrate.	Ammonia.	
										Free.	Albuminoid.
526	No. Berwick	Public Supply	1.63	0.65	4.1	0.69	0.24	0	0.008	.0006	.0078
527	Yarmouthville	Spring	2.89	0.95	0	0.01	0.65	Trace	0.15	.0019	.0095
528	Yarmouthville	Royal's River	2.01	1.15	3.7	0.59	0.27	0	0.01	.0019	.0205
529	Bangor	Raw River	2.96	1.30	7.4	2.86	0.12	Trace	0.008	.0038	.0178
530	Bangor	Filtered River	3.34	0.25	2.4	1.89	0.10	0	0.009	.0028	.0096
531	Springvale	Public Supply	3.52	Acid	3.1	0.37	0.22	0	0.008	.0260	.0312
532	Augusta	Public Supply	2.58	1.15	3.6	1.74	0.05	Trace	Trace	.0026	.0142
533	Foxcroft	Public Supply	2.64	1.95	3.2	0.74	0.11	Trace	0.01	.0020	.0156
534	Yarmouth	Spring	5.67	3.65	0	0	2.07	0	0.52	.0002	.0036
535	Calais	Public Supply	2.14	0.50	4.6	0.80	0.15	0	Trace	.0020	.0182
536	Lincoln	Well	13.54	7.15	1.1	0.10	1.63	Trace	0.15	.0002	.0084
537	Milo	Public Supply	1.76	0.75	3.2	0.80	0.06	0	0.008	.0028	.0152
538	Dexter	Well	18.52	13.25	0.5	0.50	1.30	0	0.13	.0002	.0032
539	Bangor	Filtered River	2.58	0.05	0.9	1.15	0.09	Trace	0.008	.0030	.0118
540	Bangor	Raw River	2.45	1.15	8.4	1.91	0.10	0	0.002	.0040	.0250
541	Bangor	Artesian Well	29.86	24.65	0	0.04	5.45	.0004	0.08	.0001	.0043
542	Yarmouthville	Spring	4.47	3.15	0	0	0.52	0	0	0	.0022
543	Yarmouthville	Driven Well	4.66	2.60	0.6	0.02	1.17	0	0.30	.0008	.0022
544	Augusta	Public Supply	1.70	1.30	2.1	0.64	0.20	Trace	0.001	.0022	.0140
545	Bangor	Phillips Lake	1.26	0.50	1.6	0.30	0.21	0	0.002	.0022	.0142
546	Bangor	Brook at Phillips Lake	2.20	1.30	6.8	1.14	0.23	0	0.015	.0042	.0240
547	Dover	Public Supply	2.20	1.20	5.7	1.03	0.12	0	0.002	.0032	.0174
548	Bangor	Drilled Well	18.52	14.05	0.7	0.02	2.37	.0005	0.15	.0208	.0026
549	Bangor	Drilled Well	26.08	17.35	0	0.04	4.60	.001	1.08	.0068	.0040
550	Berwick	Well	2.70	0.85	0	0.01	3.52	0	0.72	.0006	.0032

551	Berwick	Well	6.23	1.15	0	0.03	2.87	0		1.24	0	.0036
552	Henderson	Well	1.26	0.40	0.5	0.03	0.09	0		0.02	.0006	.0028
553	Augusta	Public Supply	2.14	0.80	2.1	0.44	0.19	0		0	.0014	.0162
554	Falmouth	Spring	2.64	0.85	0.6	0.03	0.50	0		0	.0002	.0030
555	Dover	Well	3.78	1.90	1.5	0.45	0.30	0		0.47	.0022	.0206
556	Springvale	Well	1.51	0.45	0.5	0.13	0.27	0		0.001	.0004	.0054
557	Lincoln	Well	1.89	0.80	0.2	0.03	0.15	0		0.013	.0024	.0034
558	Lincoln	Spring	6.74	3.75	0.6	0.07	0.98	0		0.43	.0004	.0050
559	Lincoln	Well	3.02	1.20	0.1	0.06	0.91	0		0.17	.0004	.0030
560	Blaine	Drilled well	26.08	20.60	0.5	0.01	1.47		.0002	0.37	.0042	.0030
561	Bangor	Filtered River	2.77	0.05	2.7	1.30	0.12	0		0.01	.0026	.0138
562	Bangor	Raw River	2.39	0.90	7.4	1.98	0.13	Trace		0	.0042	.0226
563	Bath	Public Supply (Tap)	1.13	0.30	3.1	0.57	0.32	Trace		0.005	.0020	.0142
564	Bath	Public Supply (Lake)	1.26	0.30	3.0	0.57	0.32	0		0.005	.0020	.0168
565	Calais	Public Supply	1.95	0.90	7.5	1.33	0.12	0		0	.0028	.0220
566	Augusta	Public Supply	2.26	1.20	2.2	0.60	0.19	0		0	.0014	.0167
567	Calais	Well	10.03	4.90	2.1	0.21	3.15		.003	0	.0176	.0114
568	Bath	Public Supply (Tap)	1.26	0.30	2.8	0.53	0.33	0		0.005	.0021	.0143
569	Bath	Public Supply (Tap)	1.26	0.32	3.0	0.51	0.31	0		0.001	.0020	.0148
570	Bath	Public Supply (Tap)	1.26	0.30	3.0	0.51	0.31	0		0.001	.0020	.0138
571	Augusta	Public Supply	2.01	1.25	1.6	0.37	0.17	0		0	.0018	.0158
572	Livermore Falls	Well	20.58	5.50	0.2	0.04	7.92	0		1.18	.0002	.0038
573	Bangor	Phillips Lake	1.70	0.80	1.6	0.27	0.20	0		0	.0017	.0137
574	Yarmouth	Royal's River	2.39	1.45	2.2	0.35	0.27	0		0.005	.0014	.0128
575	Yarmouth	Spring	3.71	1.80	0	0.02	0.70	0		0.33	.0002	.0040
576	Augusta	Well	2.64	1.10	0.6	0.15	1.87	0		0.16	.0016	.0058
577	E. Winthrop	Well	6.80	3.20	0.2	0.09	0.73	0		0.23	.0008	.0042
578	Acton	Well	8.19	1.35	0.4	0.04	4.15	0		2.10	.0118	.0042
579	Buckfield	Public Supply (Pond)	1.51	0.60	1.2	0.27	0.14	0		0	.0048	.0276
580	Buckfield	Public Supply (Tap)	2.20	1.10	2.1	0.29	0.14	0		0	.0028	.0144
581	Springvale	Spring	1.95	1.25	0.2	0.01	0.20	0		0.005	.0002	.0014
582	Bangor	Eaton Brook	2.89	2.00	2.6	0.43	0.27	0		0.008	.0016	.0110
583	Bangor	Felts Brook	5.46	4.70	2.8	0.47	0.52	Trace		0.005	.0056	.0146
584	Bangor	Pushaw Pond	1.98	0.70	17.0	3.02	0.27	0		0	.0096	.0640
585	Lincoln	Well	8.11	3.85	0.4	0.01	1.50	0		0.52	.0002	.0016
586	Lincoln	Well	5.21	3.15	0.2	0.03	1.25		.0005	0.21	.0016	.0026
587	Scarboro	Drilled Well	6.72	4.10	0.2	0.08	1.10		.005	0.75	.0134	.0046
588	Augusta	Public Supply	1.76	0.80	2.2	0.50	0.15	0		0	.0036	.0140
589	Calais	Howard Lake	1.38	0.50	2.9	0.56	0.30	0		0.007	.0052	.0280
590	No. Haven	Drilled well	8.69	4.15	–	0.92	4.45	0.005		0.014	.0362	.0564
591	Richmond	Public supply	2.45	1.25	3.1	1.39	0.60	0		0.011	.0042	.0208

ANALYSES OF SAMPLES OF WATER—Continued.

Number.	Town or City.	Source.	Hardness.	Alkalinity.	Color.	Oxygen Consumed.	Chlorine.	Nitrite.	Nitrate.	Ammonia.	
										Free.	Albuminoid.
592	Richmond	Public Supply	2.64	1.15	3.6	1.56	0.20	Trace	0.012	.0048	.0136
593	Richmond	Public Supply	2.65	1.35	3.1	1.46	0.27	0	0.011	.0026	.0158
594	Richmond	Public Supply	2.64	1.35	3.1	1.53	0.20	0	0.010	.0040	.0128
595	Bangor	Filtered River	2.89	0.15	2.7	1.38	0.07	0	0	.0036	.0114
596	Bangor	Raw River	2.52	1.00	4.9	2.09	0 07	Trace	0	.0034	.0182
597	Augusta	Public Supply	2.14	0.70	2.6	0.52	0.13	0	0	.0024	.0200
598	Calais	Public Supply	1.76	0.35	4.3	0.84	0.11	0	0.001	.0022	.0156
599	Brownfield	Well	1.63	0.55	0	0.04	0.08	0	0	.0004	.0012
600	Augusta	Public Supply	2.01	0.65	1.8	0.45	0.14	0	0	.0024	.0150
601	Augusta	Public Supply	1.76	0.80	1.7	0.41	0.14	0	0	.0020	.0156
602	Augusta	Public Supply	1.82	0.75	1.8	0.43	0.14	0	0	.0020	.0156
603	Augusta	Public Supply	1.95	0.65	1.7	0.43	0.14	0	Trace	.0038	.0140
604	Springvale	Public Supply	3.21	Acid	1.3	0.10	0.11	0	0.005	.0020	.0090
605	Sanford	Public Supply	1.76	1.25	0.8	0.01	0.17	0	0	.0006	.0014
606	Greenville Junct.	Well	9.95	3.15	0.2	0.11	5.00	.008	2.16	.0856	.0002
607	Bangor	Filtered River	3.15	0.20	2.7	1.75	0.15	0	Trace	.0034	.0148
608	Bangor	Raw River	2.77	1.20	4.3	2.10	0.05	Trace	Trace	.0042	.0146
609	Greenville	Wilson Pond	1.69	0.45	1.3	0.37	0.05	0	0	.0032	.0112
610	Greenville	Wilson Pond	1.69	0.45	1.3	0.34	0.05	0	0	.0030	.0110
611	Greenville	Drilled well and spring	3.78	2.85	0.3	0.09	0.14	.0009	0.10	.0036	.0036
612	Greenville	Reservoir	3.08	2.80	0	0.10	0.08	0	0	.0006	.0032
613	Calais	Well	2.26	0.70	0.5	0.08	0.70	Trace	0.21	.0010	.0062
614	Biddeford	Spring	2.14	0.95	0.6	0.10	0.70	Trace	0.20	.0026	.0072
615	Augusta	Public Supply	1.70	0.85	1.9	0.50	0.14	0	0	.0028	.0178
616	Bath	Nequasset Lake	1.13	0.32	2.4	0.50	0.31	0	0.002	.0028	.0138

617	Bath	Public Supply	1.19	0.35	2.6	0.50	0.32	0	0.003	.0022	.0135
618	Augusta	Public Supply	1.89	0.80	1.8	0.46	0.14	0	0	.0034	.0142
619	Bangor	Raw River	2.39	0.95	4.2	2.14	0.05	Trace	Trace	.0022	.0162
620	Bangor	Filtered River	2.52	0.10	2.1	1.24	0.07	0	Trace	.0028	.0112
621	Calais	Howard Lake	1.63	0.25	4.3	0.68	0.25	0	0	.0030	.0138
622	Calais	Public Supply	1.89	0.45	4.5	0.76	0.15	0	Trace	.0014	.0130
623	Mechanic Falls	Public Supply	1.65	0.55	3.4	0.59	0.13	Trace	0.009	.0030	.0184
624	Calais	Howard Lake	1.32	0.25	3.9	0.61	0.27	0	0.008	.0018	.0118
625	Yarmouth	Sebago Lake	0.50	0	0.1	0.04	0.01	Trace	0	.0034	.0072
626	Portland	Public Supply	1.38	0.30	1.5	0.32	0.12	Trace	0.008	.0014	.0076
627	Calais	Public supply	1.63	0.70	5.6	0.92	0.11	0	0.01	.0020	.0148
628	Bar Mills	Well	7.56	3.10	0.7	0.05	3.37	0.0003	0.60	.0002	.0038
629	Dexter	Well	16.00	11.45	0.3	0.06	0.30	0	0.04	.0002	.0022
630	Bangor	Raw River	1.51	0.65	5.1	1.53	0.08	0.0005	0.04	.0028	.0350
631	Bangor	Filtered River	1.80	0.10	3.4	1.02	0.08	Trace	Trace	.0028	.0132
632	Addison	Spring	4.72	3.90	3.3	0.05	0.67	0	0	.0010	.0038
633	Calais	Howard Lake Stream	1.38	0.30	3.8	0.66	0.24	0	0	.0016	.0144
634	Calais	Howard Lake	1.38	0.30	3.4	0.54	0.32	0	0	.0046	.0104
635	Washington	Well	3.08	1.90	1.4	0.28	0.48	0	0.14	.0018	.0190
636	Augusta	Public Supply	1.82	0.60	1.9	0.41	0.14	0	0	.0022	.0130
637	No. Haven	Drilled Well	7.56	13.40	0.5	0.18	3.45	Trace	Trace	.0162	.0090
638	Greenville	Well	4.28	1.65	1.3	0.43	3.97	0.0007	0.78	.0074	.0222
639	Acton	Well	3.84	2.10	0.6	0.08	0.40	0	0.40	.0006	.0038
640	Springvale	Public Supply	2.14	Acid	0.5	0.17	0.12	0	0.005	.0014	.0076
641	Springvale	Tap Public Supply	2.14	Acid	0.6	0.12	0.13	0	0.005	.0018	.0030
642	Calais	Well	10.45	9.95	1.4	1.17	0.75	0.0005	0.08	.0220	.0096
643	Calais	Howard Lake Stream	1.26	0.30	3.8	0.73	0.22	0	0	.0020	.0138
644	Calais	Howard Lake	1.26	0.30	3.4	0.64	0.25	0	0	.0010	.0116
645	Richmond	Well	7.11	1.90	1.3	0.18	3.97	0	0.68	.0010	.0106
646	Auburn	Spring	4.72	4.10	0	0.07	0.17	0	0.03	.0002	.0020
647	Belgrade	Well	2.01	1.85	2.2	0.39	0.12	Trace	0.02	.0110	.0348
648	Bangor	Artesian Well	1.63	16.70	0.4	0.06	1.22	0.0005	0	.0032	.0012
649	Calais	Howard Lake Stream	1.26	0.30	3.7	0.75	0.22	0	Trace	.0014	.0134
650	Calais	Howard Lake	1.26	0.45	3.1	0.69	0.22	0	Trace	.0014	.0110
651	Bangor	Raw River	1.63	0.50	5.2	1.20	6.07	Trace	0.009	.0018	.0186
652	Bangor	Filtered River	1.89	0	1.2	0.38	0.05	Trace	Trace	.0014	.0058
653	Augusta	Public Supply	1.70	0.50	1.9	0.43	0.15	0	0	.0016	.0120
654	Topsham	Spring	11.59	6.30	1.3	0.15	2.52	Trace	0.65	.0076	.0118
655	Topsham	Spring	7.81	1.75	0.4	0.06	2.17	0.001	0.62	.0020	.0038
656	Dexter	Well	4.66	4.00	0.3	0.05	0.42	0	0.01	.0002	.0040
657	Fryeburg	Spring	1.38	0.45	0.4	0.12	0.08	0	0	.0008	.0040

ANALYSES OF SAMPLES OF WATER—Continued.

Number.	Town or City.	Source.	Hardness.	Alkalinity.	Color.	Oxygen consumed.	Chlorine.	Nitrite.	Nitrate.	Ammonia.	
										Free.	Albuminoid.
658	Bath	Well	3.96	3.15	1.6	0.21	1.15	0	0.01	.0006	.0098
659	Vanceboro	Semi Public Supply	1.38	0.45	4.8	1.04	0.10	0	Trace	.0020	.0132
660	Biddeford	Spring	2.58	1.20	0.2	0.05	0.70	0	0.17	.0010	.0016
661	Smyrna Mills	Well	18.55	15.10	0.7	0.11	1.72	Trace	0.001	.0032	.0032
662	Smyrna Mills	Spring	6.04	5.20	0.5	0.15	0.07	0	0.03	.0010	.0082
663	Smyrna Mills	Well	16.62	10.25	0.1	0.07	0.97	Trace	0.50	.0012	.0024
664	Smyrna Mills	Well	14.74	13.35	3.2	0.55	1.67	.0008	0.02	.1134	.0832
665	Smyrna Mills	Well	4.35	2.35	0.4	0.16	1.17	.001	0.29	.0022	.0074
666	Smyrna Mills	Well	4.03	3.20	1.4	0.18	0.72	.0005	0.27	.0020	.0066
667	Calais	Howard Lake	1.26	0.35	3.1	0.85	0.26	0	0	.0014	.0108
668	Calais	Howard Lake Stream	1.26	0.45	3.8	0.77	0.25	0	Trace	.0014	.0106
669	Augusta	Public Supply	1.73	0.90	2.4	0.59	0.14	0	0.005	.0026	.0190
670	Augusta	Public Supply	1.73	0.85	2.4	0.59	0.14	0	0.005	.0020	.0196
671	Augusta	Public Supply	1.73	0.85	2.4	0.51	0.14	0	0.005	.0026	.0186
672	Augusta	Public Supply	1.73	0.85	2.4	0.55	0.14	0	0.005	.0026	.0190
673	E. Brownfield	Well	2.66	1.80	0.4	0.02	1.85	Trace	0.06	.0003	.0045
674	E. Brownfield	Well	1.39	0.65	0.5	0.08	0.22	0	0.006	.0008	.0064
675	Livermore Falls	Well	4.18	3.35	0.7	0.06	0.07	.01	0	.0056	.0012
676	Gray	Goose Pond	0.99	0.05	5.0	0.62	0.20	0	0.01	.0014	.0134
677	Monson	Well	23.27	13.95	0.5	0.08	5.40	Trace	1.40	.0002	.0042
678	Bar Harbor	Well	3.59	1.75	13.2	1.37	2.20	Trace	0	.0042	.0160
679	Woodland	Well	4.58	4.15	2.7	0.06	0.22	Trace	0	.0016	.0016
680	Woodland	Well	3.39	2.40	1.6	0.05	0.85	.001	0.01	.0186	.0026
681	Woodland	Well	4.65	3.85	0.2	0.06	0.48	Trace	0.007	.0026	.0020
682	Calais	Public Supply	1.73	0.55	8.5	1.43	0.09	Trace	0	.0014	.0196

683	Bangor	Filtered River	2.92	0.15	5.2	1.27	0.07	Trace	0.02	.0022	.0120
684	Bangor	Raw River	1.92	0.80	8.2	1.55	0.10	Trace	0.001	.0014	.0204
685	No. Haven	Drilled Wells	8.90	13.40	0.8	–	3.30	Trace	0.008	–	–
686	W. Fryeburg	Brook	1.39	0.45	2.6	0.44	0.05	0	0.005	.0026	.0036
687	Buxton	Spring	2.19	0.85	0.1	0.02	0.20	0	0.007	0	.0014
688	Dover	Spring	23.95	19.50	0.1	0.02	2.30	0	0.94	.0002	.0020
689	Dover	Spring	4.12	2.80	0.2	0.06	0.10	.0008	0.01	.0004	.0016
690	Dover	Public Supply	2.26	1.05	5.3	1.04	0.06	Trace	0	.0020	.0122
691	Springvale	Spring	1.72	0.45	0	0.02	0.51	0	0.11	.0002	.0014
692	Monson	Well	8.21	6.10	1.2	0.22	1.10	.001	0.23	.0326	.0094
693	Bluehill	Well	1.26	0.15	0.8	0.18	0.75	0	0	.0018	.0038
694	No. Fryeburg	Well	4.25	1.45	0	0.01	0.95	Trace	0.40	.0006	.0026
695	York Harbor	Well	4.78	4.50	0.8	0.12	1.90	.001	0.12	.0060	.0078
696	No. Haven	Drilled Wells	8.97	13.70	0.7	0.14	4.10	.0005	0	.0008	.0108
697	Farmington	Spring	4.52	3.70	0	0.02	0.15	0	0.03	.0004	.0042
698	Acton	Well	2.39	1.15	0	0.02	0.35	0	0.15	.0008	.0032
699	Acton	Well	7.97	0.45	0	0.03	8.45	.0003	1.60	.0020	.0034
700	Bridgton	Well	9.57	0.80	0	0.07	5.80	.004	1.75	.0006	.0066
701	Milltown	Well	12.63	8.55	0.1	0.02	0.65	0	0.06	.0012	.0008
702	Cooper's Mills	Well	33.91	1.10	1.7	0.14	112.0	.0003	0.28	.0018	.0056
703	Springvale	Well	3.32	1.00	0.1	0.09	2.02	.0008	0.04	.0022	.0068
704	Andover	Spring	3.72	3.17	0.4	0.19	0.01	Trace	0	.0008	.0062
705	Bangor	Filtered River	2.26	0.06	0.8	0.69	0 07	0	0.007	.0012	.0092
706	Bangor	Raw River	1.86	0.90	5.0	1.42	0.08	Trace	0.005	.0016	.0192
707	Augusta	Public Supply	1.72	1.15	2.1	0.42	0.14	0	0	.0024	.0130
708	Woodland	Well	5.18	4.45	0.5	0.04	0.30	Trace	0.008	.0012	.0010
709	Woodland	Well	5.71	4.30	0.8	0.06	0.22	0	0.004	.0020	.0030
710	Woodland	Well	5.18	4.40	0.2	0.02	0.20	Trace	0	.0018	.0030
711	Woodland	Well	6.91	3.95	0	0	0.22	0	0	.0002	.0010
712	Woodland	Well	7.18	7.00	0.6	0.04	0.21	0	0	.0024	.0028
713	Augusta	Spring	17.90	11.50	0	0.01	2.47	.0002	0.60	.0014	.0060
714	Springvale	Well	4.52	4.35	0.3	0.03	0.55	Trace	0.11	.0016	.0046
715	Woodland	Well	1.99	0.90	0.1	0.01	0.50	0	0.003	.0006	.0006
716	Woodland	Well	4.25	3.60	2.6	0.38	0.45	0	0.01	.0014	.0158
717	Saco	Spring	3.05	0.40	0	0.03	0.65	0	0.34	.0026	.0112
718	No. Fryeburg	Well	3.32	0.90	0	0.10	0.66	.0002	0.82	.0022	.0050
719	Bridgton	Well	2.97	1.70	0	0.14	0.37	Trace	0.18	.0068	.0026
720	Bath	Public Supply (Lake)	1.19	0.55	4.5	0.65	0.25	0	0.007	.0040	.0144
721	Bath	Public Supply (Tap)	1.19	0.55	4.5	0.69	0.26	0	0.009	.0018	.0152
722	Greenville Junct.	Well	3.59	3.30	1.8	0.19	0.02	0	0.03	.0008	.0068
723	Van Buren	Public Supply (Reservoir)	4.72	4.25	2.1	0.53	0.03	0	0.01	.0012	.0076

ANALYSES OF SAMPLES OF WATER—Concluded.

Number.	Town or City.	Source.	Hardness.	Alkalinity.	Color.	Oxygen Consumed.	Chlorine.	Nitrite.	Nitrate.	Ammonia.	
										Free.	Albuminoid.
724	Van Buren	Public Supply	4.72	4.15	2.0	0.46	0.02	0	0.005	.0012	.0066
725	Scarboro	Bored Well	6.10	4.16	0.1	0.07	1.37	.005	0.69	.0090	.0038
726	Ashland	Well	13.96	10.70	0.7	0.08	1.17	.0005	0.27	.0037	.0049
727	Bangor	Raw River	2.19	0.80	4.0	1.62	0.07	0	0.003	.0028	.0210
728	Bangor	Filtered River	2.26	0.30	3.4	1.38	0.07	0	0.014	.0018	.0146
729	Birch Island	Spring	1.86	1.80	0.1	0.10	0.38	0	0.03	.0004	.0086
730	Augusta	Spring	7.98	7.25	0	0.07	0.37	0	C.11	.0012	.0014
731	Augusta	Spring	2.92	2.35	0	0.05	0.17	0	0	.0004	.0006
732	Springvale	Well	3.85	2.70	1.1	0.19	1.12	Trace	0.05	.0018	.0084
733	Springvale	Well	6.11	4.35	0.1	0.10	0.40	0	0.15	.0046	.0064
734	Lake View	Well	3.72	2.45	0	0.16	1.67	0	0.08	.0030	.0020
735	Lake View	Spring	3.19	1.75	0	0.04	0.93	0	0.20	.0002	.0040
736	Milo	Spring	4.12	3.30	0	0.02	0.06	0	0.01	.0004	.0034
737	York Corner	Spring	6.51	3.80	1.3	0.11	1.00	Trace	0.09	.0022	.0126
738	Woodland	Well	3.19	2.90	1.4	0.09	0.22	0	0	.0012	.0048
739	Woodland	Spring	1.86	1.10	0	0.09	0.50	0	0.01	.0002	.0038
740	Woodland	Well	14.63	11.70	0.4	0.11	2.80	0	0.18	.0022	.0070
741	Woodland	Well	5.98	4.15	0.5	0.05	1.10	0	0.25	0	.0038
742	Woodland	Well	4.38	2.55	0.5	0.12	1.95	.0006	0.14	.0346	.0026
743	Woodland	St. Croix River	1.25	0.70	4.3	0.70	0.07	0	0.002	.0042	.0196
744	Calais	Spring	2.06	1.44	0.5	0.09	0.17	0	0.02	.0026	.0064
745	Calais	Public supply	1.33	0.80	4.4	0.80	0.08	0	0.004	.0028	.0172
746	York Harbor	Well	8.40	8.80	2.7	0.72	1.95	0	0.42	.0074	.0348
747	Scarboro	Well	3.92	3.30	0.2	0.11	0.25	0	0.005	.0050	.0110
748	Augusta	Well	10.64	7.00	0.4	0.24	1.40	0	0.25	.0014	.0060

749	Bangor	Filtered River	2.46	0.25	3.1	1.31	0.07	0	0.007	.0024	.0138
750	Bangor	Raw River	1.99	1.05	5.2	1.68	0.07	0	0.003	.0034	.0223
751	Augusta	Spring	2.12	1.65	0.2	0.04	0.27	0	0	.0002	.0024
752	Augusta	Public Supply	1.72	1.05	1.8	0.55	0.15	0	0.004	.0026	.0136
753	Fryeburg	Spring	2.32	1.30	1.9	0.43	0.35	0	0.004	.0014	.0196
754	Bethel	Well	1.72	0.60	0.3	0.08	0.07	0	0.003	.0028	.0026
755	Calais	Public Supply	1.59	0.75	3.5	0.78	0.10	0	Trace	.0026	.0168
756	Greenville	Well	1.59	0.70	0.4	0.06	0.15	0	0.04*	.0004	.0042
757	Greenville	Well	3.25	3.40	0.7	0.04	0.12	0	0.005	.0004	.0030
758	Winslows Mills	Spring	2.66	1.25	0	0.01	0.61	0	0.06	.0008	.0006
759	Hampden	Well	9.44	6.50	0.1	0.08	1.95	0	0.31	.0014	.0040
760	Biddeford	Well	15.50	15.60	–	0.33	1.17	0	0.005	.0544	.0168
761	Brookton	Well	5.12	4.25	1.4	0.29	1.35	0	0.01	.0112	.0218
762	Bangor	Raw River	1.92	0.85	4.4	1.59	0.07	0	0.007	.0024	.0196
763	Bangor	Filtered River	2.26	0.15	2.6	0.96	0.07	0	0.008	.0026	.0140
764	Friendship	Spring	5.52	4.95	1.2	0.20	0.70	0	0.005	.0046	.0078

As stated above the bacteriological work has been confined to the microscopic examinations for the tubercule, diphtheria and typhoid bacillus.

As in the case of the chemical work the bacterial work has very greatly increased during the past two years. The records show that there have been examined 1,195 specimens for the tubercule bacillus; 981 cultures for diphtheria bacilli have been made; and 390 specimens of blood have been examined for the Widal reaction; this in contrast with 427 tuberculosis, 624 diphtheria, and 187 typhoid specimens examined during the previous time that the laboratory had been in operation. The tables appended below show the results of these examinations. In addition to this a large amount of bacterial work has been done in connection with later developments of the Permanganate-Formalin method of disinfection. These results are included in a separate paper dealing with this subject. Under the bacterial work done at this laboratory might also be included the numerous fermentation tests for the presumptive presence of the colon bacillus. These tests have been made on every sample of water sent to the laboratory during the past two years and three tubes have been put up on each sample, the quantities of water being 0.1 c. c., 1.0 c. c., and 10. c. c. to the tube.

In order that outfits sent out by the laboratory may always be accessible to physicians and boards of health arrangements have been made with the following druggists to keep them in stock at all times. The list of the stations where these outfits may be obtained is given below, revised to the first of October, 1906. It is the intention of the laboratory to extend this list in the immediate future so as to include all towns of any size in the State.

Andover, Dr. F. E. Leslie; North Anson, H. F. Holley; Ashland, Dr. H. L. Dobson; Athens, L. C. Williams; Auburn, Bumpus & Getchell; Augusta, J. F. Young.

Bangor, East Side Pharmacy Co.; Bar Harbor, Morrison Pharmacy; Bath, Walter G. Webber; Belfast, Wm. O. Poor & Son; Belgrade, Dr. L. E. Reynolds; Bethel, G. R. Wiley; Biddeford, Moran Bros.; Bingham, Lander & Moore; Blaine, Dr. A. J. Fulton; Boothbay Harbor, Harris & McClearn; Bowdoinham, Dr. I. C. Irish; Bridgton, Frank P. Bennett; Brownfield,

H. F. Fitch; Brunswick, F. H. Wilson; Buckfield, J. A. Ramson; Bucksport, R. B. Stover; Buxton, Dr. V. C. Totman.

Calais, Percy L. Lord; Camden, L. M. Chandler; Canton, Nathan Reynolds; Caribou, S. L. White; Castine, Wm. A. Walker; Clinton, P. L. Cotton; Corinna, H. J. Goulding; Cornish, Geo. H. Parker.

Damariscottta, A. H. Snow; Danforth, Danforth Drug Store; Dexter, E. A. Brewster & Son; Dixfield, J. P. Johnston; Dover, Elmer E. Cole & Co.

East Jefferson, Dr. A. W. Nash; Eastport, E. E. Shead & Co.; Elliot, Dr. H. J. Durgin; Ellsworth, Geo. A. Parcher; Enfield, C. S. Spencer.

Fairfield, Geo. E. Wilson; Farmington, Hardy & Tarbox; Fort Fairfield, Scates & Co.; Fort Kent, Stanley Bussell; Foxcroft, W. Buck & Co.; Freeport, Thomas & Lunt.

Gardiner, Jackson Bros.; Gray, I. E. Hall; Greenville, I. A. Harris; Guilford, E. W. Genthner.

Hallowell, W. D. Spaulding; Harrison, Chas. L. Jackson; Hartland, A. W. Miller; Hebron, Dr. J. C. Donham; Hebron, Maine Sanitarium; Houlton, H. J. Hathaway Co.

Island Falls, S. R. Crabtree; Islesboro, Dr. H. F. Dolan.

Jackman Plantation, B. E. Larrabee; Jonesport, B. F. Adams.

Kennebunk, A. W. Meserve; Kingfield, L. L. Mitchell; Knightville, G. E. Blish.

Lewiston, Babcock & Sharp; Lewiston, Walter W. Parmlee; Lincoln, Perly L. Cotton; Litchfield Plains, Dr. C. Kindrick; Lubec, A. W. Kelley.

Machias, D. A. Curtis & Co.; Madison, F. A. Manter; Marr's Hill, Kincaid & Wilson; Mechanic Falls, Merrill & Denning; Milbridge, Dr. J. A. Walling; Millinocket, Wm. J. Heebner; Milo, W. S. Owen; Monmouth, The E. A. Dudley Co.; Monson, Ray M. Hescock.

New Gloucester, J. I. Sturgis; Newport, G. M. Barrows; Norridgewock, Dr. J. D. Ames; North Berwick, R. H. Hurd; Norway, Frank Kimball.

Oldtown, C. A. Low Drug Co.; Orono, Chas. F. Nichols; Oxford, Geo. H. Jones.

Patten, Patten Drug Store; Phillips, W. A. D. Cragin; Phippsburg, Dr. A. F. Williams; Pittsfield, H. W. Ferguson; Portland, Brown & Turner; Portland, W. W. Foss; Portland,

Geo. C. Frye; Portland, Chapman & Wyman; Presque Isle, J. D. Henry & Co.

Readfield, G. W. & M. W. Manter; Richmond, W. A. Bibber; Rockland, Titus & Hills; Rockport, A. D. Champney; Rumford Falls, The Cote Pharmacy.

Sabattus, E. Woodside; Saco, C. H. Sawyer; Sanford, Geo. G. Brown & Co.; Sangerville, H. L. Densmore; Skowhegan, Geo. E. Sampson; Solon, L. W. McIntire; South Paris, F. R. Shurtleff & Co.; South Waterboro, Dr. W. J. Downs; South Windham, D. M. Rand; Springfield, Dr. Bert G. Jewett; Steep Falls, F. L. Strout; Stonington, Peoples Drug Store; Strong, Chas. E. Dyer.

Thomaston, G. I. Robinson Drug Co.; Topsham, Dr. H. O. Curtis; Troy, Dr. Mark T. Dodge.

Vinalhaven, Lyford & Ginn.

Waldoboro, E. R. Benner's Drug Store; Warren, H. Newman; Washburn, Washburn Drug Store; Waterville, C. W. Hawkes & Co.; Westbrook, C. B. Woodman; Winn, The Winn Drug Store; Winterport, T. C. Atwood; Winthrop, C. P. Hannaford; Wiscasset, W. S. Peaslee.

Yarmouthville, L. R. Cook; York Village, J. F. Sanford.

Tuberculosis. At the present time the specimens to be examined for the tubercule bacillus must be sent by express, but it is the expectation to be able to shortly provide outfits that may be sent by mail, a method that will lead to the saving of considerable expense to the physician.

A point to be borne in mind by the physician is the fact that even in real cases of tuberculosis it is not an unusual thing to have specimens of sputum sent in which the tubercule bacillus is not to be found. As a result if, after a negative laboratory finding, the physician still makes a clinical diagnosis of tuberculosis other specimens should be sent to the laboratory.

The point at which the laboratory can be of especial use to physicians is in the early diagnosis of this disease, and in the differentiation of a true case of this kind from what is often considered as chronic bronchitis until it is too late to save the patient.

Diphtheria. During the past two years the laboratory has done a large amount of very useful work in assisting physicians

in determining the nature of throat affections which might or might not be diphtheria. Another very useful phase of this work has been the examination of throat swabs to determine the possibility of quarantine release by the absence of the bacillus of diphtheria.

By the use of the laboratory in this latter way the physician is relieved of any uncertainty as to the time of releasing the patients, and the patients themselves are not subjected to the restrictions of quarantine any longer than is absolutely necessary. Also the element of danger which accompanies a release from quarantine based on the usual ocular examination is removed from those with whom the released person comes in contact. It might be remarked here that swabs from the nasal passages might be of special value in determining the time of quarantine release as the bacillus often is to be found there after it has vanished from the throat.

It is the intention of the laboratory to have arrangements made by which it will be possible to send the diphtheria outfits to the laboratory by mail instead of by express, as is now the custom.

Typhoid Fever. The very simple typhoid outfits which are in use at the laboratory can be returned by mail at the present time.

Attention of the physician is called to the point that it is very unusual to get a positive Widal reaction inside of 10 days of the onset of the disease, and so it is urged that specimens of blood intended to be examined by this method be not sent until after the disease has been in progress at least 10 days. It should also be remembered that while the Widal reaction responds with true typhoid blood in about 95% of the cases there is no fixed time in the disease at which this response takes place, and so, if the clinical diagnosis of typhoid is held to after a negative result from the laboratory, other specimens of the blood should be sent from time to time. If this course is followed there is little chance of failing in a correct laboratory diagnosis. On the other hand the report of a negative result when the physician is certain of typhoid would naturally lead to a doubt of the efficiency of the laboratory, unless it were understood that the blood of the patient was itself at fault.

Below are given in tabular form the results of the examinations of all cases of Tuberculosis, Diphtheria and Typhoid fever sent to the Laboratory during the past two years.

TUBERCULOSIS.

Town or City.	Number.			Results		Positives.		Negatives.		No slip		Total.
	Male.	Female.	Total.	+	0.	Male.	Female.	Male.	Female.	+	0.	
Andover	0	2	2	1	1	0	1	0	1	0	0	2
Ashland	0	2	2	0	2	0	0	0	2	0	0	2
Auburn	5	3	8	1	7	1	0	4	3	0	0	8
Augusta	19	23	42	14	28	9	5	10	18	9	16	67
Bangor	20	20	40	14	26	6	8	14	12	0	0	40
Bar Harbor	0	1	1	0	1	0	0	0	1	0	0	1
Bath	39	42	81	24	57	8	16	31	26	0	0	81
Belfast	1	0	1	0	1	0	0	1	0	0	0	1
Berwick	4	0	4	2	2	2	0	2	0	0	0	4
Bethel	7	8	15	3	12	1	2	6	6	0	0	15
Biddeford	12	16	28	15	13	5	10	7	6	0	1	29
Bingham	1	0	1	0	1	0	0	1	0	1	0	2
Blaine	9	13	22	3	19	1	2	8	11	0	0	22
Bluehill	2	1	3	1	2	1	0	1	1	0	0	3
Boothbay Harbor	6	13	19	9	10	3	6	3	7	0	0	19
Bowdoinham	2	0	2	0	2	0	0	2	0	0	0	2
Bradford	5	2	7	4	3	2	2	3	0	0	0	7
Bridgton	3	2	5	2	3	1	1	2	1	0	0	5
Brunswick	1	2	3	0	3	0	0	1	2	0	2	5
Bryant's Pond	1	0	1	0	1	0	0	1	0	0	0	1
Buckfield	2	1	3	0	3	0	0	2	1	0	0	3
Calais	21	32	53	16	37	7	9	14	23	0	0	53
Camden	1	8	9	2	7	1	1	0	7	0	0	9
Canton	2	2	4	1	3	0	1	2	1	0	0	4
Caribou	4	1	5	2	3	2	0	2	1	0	0	5
Castine	0	2	2	1	1	0	1	0	1	0	0	2
Charleston	0	1	1	1	0	0	1	0	0	0	0	1
Cherryfield	3	7	10	6	4	2	4	1	3	0	0	10
Clinton	3	1	4	2	2	1	1	2	0	0	0	4
Corinna	1	0	1	0	1	0	0	1	0	0	0	1
Damariscotta	0	1	1	1	0	0	1	0	0	0	0	1
Danforth	1	3	4	1	3	1	0	0	3	0	11	15
Deer Isle	0	1	1	0	1	0	0	0	1	0	0	1
Denmark	4	1	5	2	3	1	1	3	0	0	0	5
Dover	0	4	4	0	4	0	0	0	4	0	0	4
Dresden	0	1	1	1	0	0	1	0	0	0	0	1
East Corinth	1	1	2	1	1	1	0	0	1	0	0	2
East Dixfield	2	5	7	1	6	0	1	2	4	0	0	7
East Machias	0	1	1	1	0	0	1	0	0	0	0	1
Eastport	8	5	13	1	12	0	1	8	4	0	0	13
Enfield	3	7	10	4	6	1	3	2	4	0	0	10
Fairfield	1	0	1	0	1	0	0	1	0	0	0	1
Falmouth	2	1	3	2	1	2	0	0	1	1	1	5
Farmington	5	8	13	4	9	2	2	3	6	0	0	13
Foxcroft	0	1	1	1	0	0	1	0	0	0	0	1
Fryeburg	1	1	2	1	1	0	1	1	0	0	0	2
Gardiner	10	8	18	4	14	1	3	9	5	0	0	18
Greenville	3	3	6	3	3	3	0	0	3	0	0	6
Guilford	2	8	10	0	10	0	0	2	8	0	0	10
Hallowell	14	5	19	13	6	10	3	4	2	1	1	21
Hartland	1	5	6	2	4	0	2	1	3	0	0	6
Hebron	3	6	9	9	0	3	6	0	0	0	0	9
Henderson	1	0	1	1	0	1	0	0	0	0	0	1
Islesboro	3	0	3	1	2	1	0	2	0	0	0	3
Jonesport	0	2	2	1	1	0	1	0	1	0	0	2
Kennebunk	2	1	3	0	3	0	0	2	1	0	0	3
Lagrange	2	1	3	2	1	1	1	1	0	0	0	3

TUBERCULOSIS—Continued.

Town or City.	Number.			Results		Positives.		Negatives.		No slip.		Total.
	Male.	Female.	Total.	+.	0.	Male.	Female.	Male.	Female.	+.	0.	
Lewiston	24	28	52	13	39	5	8	19	20	0	7	59
Limerick	0	1	1	0	1	0	0	0	1	0	0	1
Lincoln	5	9	14	5	9	4	1	1	8	0	1	15
Lincolnville	0	1	1	0	1	0	0	0	1	0	0	1
Litchfield Corner	0	1	1	0	1	0	0	0	1	0	0	1
Livermore Falls	11	8	19	3	16	2	1	9	7	0	1	20
Lubec	2	2	4	2	2	1	1	1	1	0	0	4
Machias	5	4	9	2	7	0	2	5	2	0	0	9
Madison	2	3	5	3	2	2	1	0	2	0	0	5
Mars Hill	1	1	2	0	2	0	0	1	1	0	0	2
Mechanic Falls	4	1	5	3	2	3	0	1	1	0	0	5
Millbridge	2	8	10	1	9	0	1	2	7	0	0	10
Millinocket	1	0	1	1	0	1	0	0	0	0	0	1
Milo	1	0	1	0	1	0	0	1	0	0	0	1
Naples	1	0	1	0	1	0	0	1	0	0	0	1
New Gloucester	1	0	1	1	0	1	0	0	0	0	0	1
Norridgewock	0	1	1	0	1	0	0	0	1	0	0	1
North Leeds	1	0	1	0	1	0	0	1	0	0	0	1
Oakland	0	1	1	0	1	0	0	0	1	0	0	1
Old Orchard	1	1	2	2	0	1	1	0	0	0	0	2
Oldtown	0	0	0	0	0	0	0	0	0	2	1	3
Orono	1	0	1	0	1	0	0	1	0	0	0	1
Oxford	1	0	1	1	0	1	0	0	0	1	1	3
Palermo	1	0	1	0	1	0	0	1	0	0	1	2
Parker's Head	1	0	1	1	0	1	0	0	0	0	0	1
Patten	2	3	5	3	2	2	1	0	2	0	0	5
Pemaquid	1	0	1	0	1	0	0	1	0	0	0	1
Phillips	1	3	4	2	2	1	1	0	2	0	0	4
Pittsfield	0	0	0	0	0	0	0	0	0	0	2	2
Portland	65	88	153	45	108	23	22	42	66	4	6	163
Presque Isle	8	10	18	7	11	3	4	5	6	0	0	18
Princeton	1	2	3	2	1	1	1	0	1	0	0	3
Rangeley	3	1	4	3	1	2	1	1	0	0	0	4
Readfield	2	1	3	1	2	0	1	2	0	0	6	9
Rockland	0	3	3	0	3	0	0	0	3	0	0	3
Rockport	1	2	3	2	1	1	1	0	1	0	0	3
Rumford	0	2	2	2	0	0	2	0	0	0	0	2
Rumford Falls	2	3	5	1	4	0	1	2	2	0	0	5
Saco	1	5	6	3	3	0	3	1	2	0	0	6
Sangerville	1	1	2	2	0	1	1	0	0	0	0	2
Searsport	1	1	2	1	1	0	1	1	0	0	0	2
Sidney	5	7	12	5	7	1	4	4	3	0	0	12
Skowhegan	7	7	14	9	5	3	6	4	1	0	0	14
South Brewer	1	0	1	0	1	0	0	1	0	1	1	3
South Gardiner	1	0	1	0	1	0	0	1	0	0	0	1
South Paris	1	0	1	0	1	0	0	1	0	0	0	1
South Portland	9	10	19	11	8	7	4	2	6	0	0	19
South Windham	1	2	3	2	1	0	2	1	0	0	0	3
Sprague's Mills	0	1	1	1	0	0	1	0	0	0	0	1
Springfield	1	2	3	2	1	1	1	0	1	0	0	3
Stonington	5	10	15	5	10	2	3	3	7	0	0	15
Strong	0	0	0	0	0	0	0	0	0	0	1	1
Tenant's Harbor	5	3	8	5	3	4	1	1	2	0	0	8
Thomaston	5	1	6	0	6	0	0	5	1	0	0	6
Topsham	1	0	1	0	1	0	0	1	0	0	0	1
Turner	1	0	1	0	1	0	0	1	0	0	0	1
Van Buren	8	2	10	3	7	3	0	5	2	0	0	10
Vienna	0	1	1	0	1	0	0	0	1	0	0	1
Vinalhaven	5	2	7	1	6	1	0	4	2	0	0	7
Waldoboro	1	11	12	5	7	0	5	1	6	0	0	12
Warren	0	1	1	0	1	0	0	0	1	0	0	1
Washburn	0	3	3	2	1	0	1	0	2	0	0	3
Washington	0	1	1	1	0	0	1	0	0	0	0	1

TUBERCULOSIS—Concluded.

Town or City.	Number.			Results		Positives.		Negatives.		No slip.		Total.
	Male.	Female.	Total.	+	0.	Male.	Female.	Male.	Female.	+	0.	
Waterville	31	36	67	34	33	18	16	13	20	1	2	70
Westbrook	9	6	15	5	10	1	4	8	2	0	0	15
West Jonesport	3	0	3	2	1	2	0	1	0	0	0	3
West Paris	1	0	1	0	1	0	0	1	0	0	0	1
Winn	0	0	0	0	0	0	0	0	0	1	0	1
Winslow	1	0	1	0	1	0	0	1	0	0	0	1
Wiscasset	0	2	2	1	1	0	1	0	1	0	0	2
Woodland	1	1	2	0	2	0	0	1	1	0	1	3
Wytopitlock	2	1	3	1	2	0	1	2	0	0	0	3
Yarmouth	2	5	7	4	3	1	3	1	2	0	0	7
York	0	2	2	1	1	0	1	0	1	0	1	3
York Harbor	2	2	4	1	3	1	0	1	2	0	0	4
York Village	0	3	3	0	3	0	0	0	3	0	0	3
	507	602	1,109	393	716	182	211	325	391	22	64	1,195

DIPHTHERIA.

Town or City.	Number.			Results		Positives.		Negatives.		No slip.		Total.
	Male.	Female.	Total.	+	0.	Male.	Female.	Male.	Female.	+	0.	
Andover	1	0	1	0	1	0	0	1	0	0	0	1
Ashland	3	4	7	1	6	0	1	3	3	0	0	7
Auburn	7	12	19	4	15	1	3	6	9	1	1	21
Augusta	33	39	72	25	47	13	12	20	27	4	17	93
Bangor	0	1	1	0	1	0	0	0	1	0	0	1
Bar Harbor	0	1	1	0	1	0	0	0	1	0	0	1
Bar Mills	0	1	1	0	1	0	0	0	1	0	0	1
Bath	119	157	276	82	194	33	49	86	108	2	7	285
Belfast	4	2	6	1	5	1	0	3	2	0	1	7
Belgrade	1	1	2	0	2	0	0	1	1	0	0	2
Bethel	0	4	4	3	1	0	3	0	1	2	0	6
Blaine	1	2	3	2	1	1	1	0	1	0	0	3
Boothbay Harbor	1	5	6	2	4	1	1	0	4	0	0	6
Bowdoinham	0	1	1	0	1	0	0	0	1	0	0	1
Brewer	1	0	1	0	1	0	0	1	0	0	0	1
Bridgton	3	12	15	9	6	3	6	0	6	0	0	15
Brownfield	1	0	1	0	1	0	0	1	0	0	0	1
Brunswick	1	1	2	0	2	0	0	1	1	0	0	2
Calais	22	42	64	14	50	3	11	19	31	0	1	65
Camden	1	0	1	0	1	0	0	1	0	0	0	1
Canton	0	1	1	1	0	0	1	0	0	0	0	1
Castine	0	1	1	0	1	0	0	0	1	0	0	1
Charleston	0	1	1	0	1	0	0	0	1	0	0	1
Cherryfield	1	9	10	2	8	1	1	0	8	0	0	10
Clinton	0	2	2	1	1	0	1	0	1	0	0	2
Corinna	3	1	4	2	2	1	1	1	1	0	0	4
Cumberland Center	2	6	8	2	6	0	2	2	4	0	0	8
Damariscotta	0	0	0	0	0	0	0	0	0	1	0	1
Danforth	5	4	9	4	5	3	1	2	3	1	0	10
Deer Isle	0	0	0	0	0	0	0	0	0	0	1	1
Dexter	22	28	50	21	29	8	13	14	15	0	0	50
East Jefferson	2	1	3	0	3	0	0	2	1	0	0	3
Fairfield	0	1	1	1	0	0	1	0	0	1	0	2
Falmouth	0	0	0	0	0	0	0	0	0	1	1	2
Farmington	0	4	4	0	4	0	0	0	4	0	0	4
Friendship	1	0	1	0	1	0	0	1	0	0	0	1
Gardiner	1	1	2	1	1	0	1	1	0	0	0	2
Gray	2	1	3	1	2	1	0	1	1	0	0	3
Greenville	0	3	3	0	3	0	0	0	3	0	1	4
Guilford	1	0	1	0	1	0	0	1	0	0	0	1
Hallowell	11	7	18	9	9	6	3	5	4	0	1	19
Hartland	4	6	10	6	4	3	3	1	3	0	0	10
Hebron	0	1	1	0	1	0	0	0	1	0	0	1
Houlton	5	3	8	4	4	2	2	3	1	1	0	9
Jackman	1	2	3	1	2	0	1	1	1	0	0	3
Kingfield	0	1	1	0	1	0	0	0	1	0	0	1
Lewiston	6	2	8	3	5	3	0	3	2	0	0	8
Lincoln	0	2	2	0	2	0	0	0	2	0	0	2
Lisbon	0	2	2	0	2	0	0	0	2	0	0	2
Livermore Falls	8	9	17	9	8	5	4	3	5	0	0	17
Lubec	22	23	45	18	27	7	11	15	12	1	3	49
Machias	1	2	3	0	3	0	0	1	2	0	0	3
Madison	4	5	9	5	4	3	2	1	3	1	0	10
Milltown	2	3	5	2	3	1	1	1	2	0	0	5
Newport	0	1	1	1	0	0	1	0	0	0	0	1
North Anson	2	5	7	0	7	0	0	2	5	0	0	7
North Berwick	0	2	2	0	2	0	0	0	2	0	0	2
North Vassalboro	0	1	1	0	1	0	0	0	1	0	0	1
North Whitefield	0	1	1	0	1	0	0	0	1	0	1	2
Norway	1	1	2	0	2	0	0	1	1	0	2	4
Oakland	1	3	4	3	1	1	2	0	1	0	0	4
Oldtown	2	8	10	0	10	0	0	2	8	0	0	10
Orono	1	5	6	5	1	1	4	0	1	0	0	6
Pemaquid	0	0	0	0	0	0	0	0	0	1	0	1
Phillips	1	1	2	2	0	1	1	0	0	1	1	4

DIPHTHERIA—Concluded.

Town or City.	Number.			Results		Positives.		Negatives.		No slip.		Total.
	Male.	Female.	Total.	+.	0.	Male.	Female.	Male.	Females.	+.	0.	
Pittsfield	2	1	3	1	2	0	1	2	0	1	0	4
Portland	7	10	17	5	12	2	3	5	7	1	0	18
Presque Isle	1	1	2	0	2	0	0	1	1	1	0	3
Princeton	0	1	1	1	0	0	1	0	0	0	0	1
Rockland	0	1	1	0	1	0	0	0	1	0	0	1
Rumford Falls	2	0	2	1	1	1	0	1	0	0	0	2
Saco	2	1	3	1	2	0	1	2	0	0	0	3
Searsport	2	1	3	0	3	0	0	2	1	0	0	3
Sidney	2	0	2	2	0	2	0	0	0	0	0	2
Skowhegan	4	0	4	1	3	1	0	0	0	0	1	5
Solon	2	1	3	1	2	0	1	1	0	1	1	5
South Portland	0	1	1	1	0	0	1	0	0	0	0	1
South Windham	0	1	1	1	0	0	1	0	0	0	0	1
Springfield	0	1	1	1	0	0	1	0	0	0	0	1
Thomaston	2	4	6	0	6	0	0	2	4	0	0	6
Topsham	2	3	5	2	3	1	1	1	2	0	0	5
Union	2	0	2	0	2	0	0	2	0	0	0	2
Van Buren	0	1	1	0	1	0	0	0	1	0	0	1
Vinalhaven	2	0	2	1	1	1	0	1	0	0	0	2
Waldoboro	18	33	51	17	34	3	14	15	19	0	0	51
Warren	2	3	5	3	2	2	1	0	2	0	0	5
Washburn	0	1	1	0	1	0	0	0	1	0	0	1
Waterville	13	13	26	13	13	6	7	7	6	0	0	26
Westbrook	3	3	6	1	5	0	1	3	2	0	1	7
West Enfield	0	1	1	0	1	0	0	0	1	0	0	1
Wiscasset	0	0	0	0	0	0	0	0	0	1	0	1
Woodfords	2	1	3	0	3	0	0	2	1	0	0	3
Wytopitlock	2	0	2	0	2	0	0	2	0	0	0	2
Yarmouth	2	1	3	0	3	0	0	2	1	0	0	3
York Harbor	0	2	2	1	1	0	1	0	1	0	0	2
York Village	1	0	1	0	1	0	0	1	0	0	0	1
Total	386	531	917	301	616	122	179	262	354	23	41	981

TYPHOID FEVER.

Town or City.	Number.			Results		Positives.		Negatives.		No. Slip		Total.
	Male.	Female.	Total.	+.	0.	Male.	Female.	Male.	Female.	+.	0.	
Ashland	4	2	6	4	2	2	2	2	0	0	0	6
Auburn	3	7	10	3	7	1	2	2	5	0	0	10
Augusta	10	15	25	12	13	5	7	5	8	1	10	36
Bath	5	5	10	5	5	3	2	2	3	0	0	10
Bethel	1	1	2	0	2	0	0	1	1	0	0	2
Bingham	0	0	0	0	0	0	0	0	0	0	1	1
Blaine	1	3	4	3	1	0	3	1	0	0	0	4
Bradford	4	0	4	1	3	1	0	0	3	0	0	4
Bridgton	4	1	5	0	5	0	0	4	1	0	0	5
Bryants Pond	4	4	8	3	5	3	0	1	4	0	0	8
Buckfield	1	0	1	1	0	1	0	0	0	0	0	1
Calais	37	25	62	27	35	18	9	19	16	2	0	64
Canton	1	2	3	3	0	1	2	0	0	0	0	3
Caribou	0	1	1	0	1	0	0	0	1	0	0	1
Cherryfield	5	8	13	3	10	0	3	5	5	0	0	13
Clinton	1	0	1	0	1	0	0	1	0	0	0	1
Cumberland Mills	0	0	0	0	0	0	0	0	0	0	1	1
Cushing	0	1	1	0	1	0	0	0	1	0	0	1
Danforth	0	0	0	0	0	0	0	0	0	2	7	9
Dixfield	2	0	2	1	1	1	0	1	0	0	0	2
Gardiner	1	0	1	1	0	1	0	0	0	0	0	1
Greenville	1	2	3	0	3	0	0	1	2	0	0	3
Guilford	12	4	16	2	14	2	0	10	4	0	2	18
Hallowell	3	0	3	0	3	0	0	3	0	0	5	8
Hebron	1	2	3	1	2	0	1	1	1	0	0	3
E. Jefferson	2	0	2	2	0	2	0	0	0	0	0	2
Jefferson	2	1	3	0	3	0	0	2	1	0	0	3
Kennebunk	1	0	1	0	1	0	0	1	0	0	0	1
Kingfield	0	1	1	0	1	0	0	0	1	0	0	1
Lewiston	1	0	1	1	0	1	0	0	0	0	1	2
Lincoln	1	0	1	1	0	1	0	0	0	2	0	3
Livermore Falls	1	2	3	1	2	0	1	1	1	0	0	3
Machias	0	1	1	1	0	0	1	0	0	0	0	1
Mechanics Falls	0	1	1	1	0	0	1	0	0	0	0	1
Millbridge	2	3	5	3	2	1	2	1	1	0	0	5
Millinocket	1	0	1	0	1	0	0	1	0	0	0	1
Milltown	0	4	4	1	3	0	1	0	3	0	0	4
Monson	2	1	3	2	1	1	1	1	0	0	0	3
Naples	0	1	1	0	1	0	0	0	1	0	0	1
New Portland	0	1	1	0	1	0	0	0	1	0	0	1
No. Berwick	6	3	9	4	5	3	1	3	2	0	0	9
No. Windham	1	1	2	1	1	0	1	1	0	0	0	2
Norway	1	0	1	0	1	0	0	1	0	0	0	1
Oakland	0	1	1	0	1	0	0	0	1	0	0	1
Old Orchard	1	1	2	1	1	1	0	0	1	0	0	2
Parker Head	1	0	1	0	1	0	0	1	0	0	0	1
Patten	1	1	2	2	0	1	1	0	0	0	0	2
Portland	21	15	36	15	21	11	4	10	11	0	0	36
Presque Isle	1	1	2	1	1	1	0	0	1	0	0	2
Princeton	1	2	3	1	2	0	1	1	1	0	0	3
Rangeley	2	2	4	1	3	0	1	2	1	0	0	4
Robbinston	2	0	2	0	2	0	0	2	0	0	0	2
Rockport	1	0	1	1	0	1	0	0	0	0	0	1
Saco	2	0	2	2	0	2	0	0	0	0	0	2
Sangerville	0	1	1	1	0	0	1	0	0	0	0	1
Searsport	0	0	0	0	0	0	0	0	0	0	2	2
S. Portland	0	1	1	0	1	0	0	0	1	0	0	1
S. Windham	1	4	5	3	2	0	3	1	1	0	0	5
Springfield	0	1	1	0	1	0	0	0	1	0	0	1
Stonington	4	2	6	4	2	2	2	2	0	0	0	6
Thomaston	1	2	3	1	2	0	1	1	1	0	1	4
Union	1	0	1	0	1	0	0	1	0	0	1	2
Van Buren	1	1	2	0	2	0	0	1	1	0	0	2
Vinalhaven	3	3	6	3	3	2	1	1	2	0	0	6

TYPHOID FEVER—Concluded.

Town or City.	Number.			Results		Positives.		Negatives.		No. Slip		Total.
	Male.	Female.	Total.	+.	0.	Male.	Female.	Male.	Female.	+.	0.	
Waldoboro	9	7	16	4	12	3	1	6	6	0	1	17
Warren	0	1	1	1	0	0	1	0	0	0	0	1
Washburn	7	0	7	0	7	0	0	7	0	0	0	7
Waterville	4	2	6	4	2	3	1	1	1	0	0	6
Westbrook	2	1	3	0	3	0	0	2	1	0	0	3
Woodfords	0	1	1	0	1	0	0	0	1	0	0	1
Woodland	7	0	7	0	7	0	0	7	0	0	0	7
Wytopitlock	0	1	1	1	0	0	1	0	0	0	0	1
Yarmouth	2	0	2	1	1	1	0	1	0	0	0	2
York Harbor	5	0	5	3	0	3	0	2	0	0	1	6
York Village	2	2	4	1	3	0	1	2	1	0	0	4
Total	204	156	360	139	221	79	60	122	99	7	33	400

DISINFECTION BY THE FORMALIN-PERMANGANATE METHOD.

By HENRY D. EVANS, Director, State Laboratory of Hygiene.

In the thirteenth report of the Maine State Board of Health there appeared a paper by Dr. J. P. Russell and myself on a method of liberating formaldehyde from a solution of "formalin" by the use of potassium permanganate. That paper carried the work down to a point where, by using a fixed amount of the formalin solution, the time necessary for efficient disinfection was shown to be not over three hours, and possibly less. The State board of health adopted four hours as the minimum time for efficient disinfection, and then I began work on determining what amount of formaldehyde was to be considered the minimum with which to secure thorough disinfection in four hours time. Upon the results of that work, and the many new observations that have been made in the process of that work the present paper deals.

It has seemed best to make this paper include all the work that has been done at this laboratory upon the above method of disinfection. As a result the paper will include much that was in the first article, but in a form and substance considerable altered by the results and observations that have resulted from the continuation of the work along other lines. The work of determining the minimum of time for efficient disinfection was done in conjunction with Dr. J. P. Russell, then director of the laboratory; and in the latter part of the work I have to thank my assistant, Mr. H. F. Quinn, for his thorough and painstaking aid.

Early in the nineties interest was first widely aroused in formaldehyde as a disinfecting agent. Up to that time, and in many cases up to the present time, sulphur had headed the list of disinfecting agents. No doubt is to be cast on the efficiency of sulphur as a disinfecting agent, but its use is open to a

variety of objections such as the necessity of fire in preparing the gas, the long period of exposure necessary, and the destructive action it exercises on a large variety of fabrics, especially colored ones, and upon metallic objects. As a result of the above inconveniences attendant on the use of sulphur, the claims made for the new disinfecting agent caused not only considerable interest but wide investigation. These investigations not only revealed the fact that formaldehyde was an efficient germicide when it is intelligently used, but that cumbersome apparatus was apparently an essential part of the process.

While formaldehyde is now the most widely used of gaseous disinfectants those who have had to do with the work of actual disinfection have found the present methods, both of generating the gas or of liberating it from its water solution, far from satisfactory. At present there are three methods of obtaining the gas which are in general use, i. e. the lamps which form formaldehyde by the oxidation of methyl alcohol, generally through the catalytic agency of platinum black; the lamps or autoclaves which evaporate the water solution of formaldehyde known commercially as "formalin;" and the so called "sheet method" where the solution of formaldehyde is sprayed upon suspended sheets, from which it evaporates and diffuses throughout the room. At the present time the method described here, and in its first form published in 1904, has received considerable recognition.

One of the chief objections to the three earlier methods mentioned above was the long period of time necessary for the introduction of the requisite quantity of formaldehyde into the space to be disinfected. This naturally permits of a very considerable leakage of the gas and, more important still, prevents the bacteria from being exposed to the full strength of the gas at once. The first two methods also present the rather serious objection of having to use fire to generate or liberate the gas, thus introducing not only the need of constant attention but the element of danger from fire as well. Not only does the "sheet method" still more delay the process of diffusion of the gas throughout the room, but the long and disagreeable process of spraying the sheets fails to recommend itself to the majority of practical workers.

It has been and still is a vexed question as to whether formaldehyde exerts its germicidal power when in the gaseous condition or whether the gas must be condensed on the object to be disinfected before it can exert this germicidal action. The latter idea finds considerable substantiation in the fact that water vapor is necessary for efficient disinfection. Also von Brunn states that the greater part of the formaldehyde introduced into a room almost at once condenses on the walls and articles in the room. If it were to the condensed formaldehyde that the germicidal action is entirely due it would seem that more efficient disinfection should be secured in cold rooms, as the cold walls would precipitate a greater amount of the gas than would warm walls. This fact of a cold room precipitating more of the gas than a warm room is shown by results obtained by introducing into the same room the same amount of the gas once when the temperature of the room was high, and once when it was low and then determining the amount of gas present in the air in each case. It is always much smaller in the case of the cold room, and at the same time disinfection is not as efficient under these conditions as under warmer ones. These results would make it appear that the main part in disinfection is played by the gaseous formaldehyde, although there can be no doubt but that the condensed gases have considerable germicidal power also.

It had long been the opinion of the writer that, if it were possible to get an almost instant liberation of the entire amount of formaldehyde that was to be used, not only the time of exposure to the gas but the amount of the gas necessary for efficient disinfection could be very greatly decreased. In other words, it seemed probable that bacteria would be killed quicker and by a less amount of the gas if they were exposed at once to its full strength. How well this assumption has been borne out the results herein tabulated will show.

In December, 1903, Dr. Young called my attention to the fact that a gas having the odor of formaldehyde was liberated when permanganate of potassium was allowed to act on formaldehyde solution, and he requested that I see if the matter could be turned to any practical account.

The reaction in question has long been known, and has probably been employed by many, as by myself, in classroom to

illustrate the formation of an acid by the direct oxidation of an aldehyde. Base states that the final results of the reaction are probably these:

$4KMnO_4+3H.COH+H_2O=4MnO(OH)_2+2K_2CO_3+CO_2$.

Theoretically formic acid (H.COOH) is formed by the oxidation of formic aldehyde (H.COH) just as the latter results from the oxidation of methyl alcohol (CH_3OH). This reaction can be brought about by adding to the formaldehyde a substance that rapidly gives up part or all of its oxygen, such as the dichromate or permanganate of potassium. In reality the presence of an excess of oxygen carries the reaction a step farther and results in the decomposition of some of the formic acid into water (H_2O) and carbon dioxide (CO_2).

The amount of heat generated by the formation of the formic acid is very great and, under proper conditions, this total amount of heat is liberated in a very short space of time. When proper proportions of the permanganate and formaldehyde solution are mixed oxidation at once begins and the sudden and great amount of heat generated by this oxidation is sufficient to cause the evaporation of a large amount of the aldehyde before it is oxidized, *and to do this very quickly.* The permanganate is reduced to a lower oxide of manganese with the liberation of much oxygen. The reaction is very vigorous and attended by much effervescence but, best of all, this amount of formaldehyde which is evaporated and thus removed from the oxidizing action of the permanganate, *is avilable within five minutes of beginning of the reaction and in its maximum amount.*

Here seemed to be the desired method with all three of the desiderata, i. e. instant availability of the maximum amount of the gas; absence of need of skilled attention, and absence of all danger from fire. As an additional advantage experience has shown that no special apparatus is needed with it. Work was at once started to determine the practicability of the method for actual disinfection.

At first hand this method may seem an anomalous one as the disinfecting agent is obtained by a process that involves the destruction of a part of it but, as I was working along the idea that instantaneous exposure of the orgaism to the full strength of the gas would decrease the amount of the latter needed, it

seemed as though in the end the cost of the operation would be considerable decreased. Also its very simplicity was greatly in its favor.

At the time that work was started along these lines I was unaware that this method had ever been advanced as a means of practical disinfection, although no claims of originality were presented with the first report that was made. When it had been shown that the method could be used successfully it developed that the method was first suggested in 1902-3, but it was given no publicity until 1904, when it was described in a paper by Dr. G. A. Johnson of Sioux City, Iowa; the paper being read before the Sioux Valley Medical Association. Even then it attracted little attention, and the work at this laboratory was the first subjection of the method to systematic tests.

All the work has been performed using the ordinary commercial solution of formaldehyde supplied to the State board of health; an article that rarely assays above 36% of formaldehyde by weight. The permanganate has been the fine needle-shaped crystals of commerce, not the large c. p. octohedral crystals. In the work of 1904, in determining the amount of formaldehyde available through the use of this reaction, the c. p. crystals were used, but were first powdered. In the latter work the commercial article has been used entirely. All determinations of the formaldehyde have been made by Romjin's potassium cyanide method, as described on page 393 of Sutton's "Volumetric Analysis," eighth edition, experience having shown that this method was especially reliable for use with the very dilute solutions of formaldehyde that were obtained by aspirating the charged air from rooms.

The first work was to determine the proportions of the two reagents that would furnish the greatest yield of the gas. Results of experiments in 1904, the experiments being conducted in glass beakers, led me to decide on the use of 3.75 grams of permanganate to 10 cubic centimeters of formaldehyde solution. Practical work in the disinfecting room showed that this amount of permanganate was too small when large quantities of the reagents were employed, a moist residue being left in the generator that contained considerable formaldehyde. As a result, since the experiments then reported, I have carried on others using as large quantities of the reagents as would be

used in actual disinfection. *The new proportions decided upon are 4.75 grams of permanganate to 10 cubic cetimeters of formaldehyde.*

It was of interest to observe, after considerable work had been done, using these proportions, that Base in an independent investigation decided on the proportions of 5 grams of permanganate to 10 cubic centimeters of formaldehyde solution. In the 1906 circular of the Illinois board of health on disinfection the proportions recommended were about 2 grams of permanganate to 10 cubic centimeters of formaldehyde. Work at this laboratory has shown that when these proportions are used a layer of formaldehyde solution remains over the manganese residue in the generator at the end of the reaction, a thing that shows great waste of formaldehyde. The air aspirated from a room charged under these conditions has never shown as much as 9% of the formaldehyde that was put into the generator, the usual amount being about 5%. As this report goes to press a second edition of this same circular comes to hand in which the proportions are practically as in my first report. In view of the recent work I think that the minimum proportions should be *4.75 grams of permanganate to 10 cubic centimeters of formaldehyde solution.*

Experience has shown that no change should be made in the original method of bringing the reagents together. The permanganate is to be put into the generator first and the formaldehyde solution poured upon that. The reagents are never to be mixed in the reverse order. If the operator's courage is good it is of advantage to quickly shake the contents of the generator after putting in the reagents, as the pouring of the formaldehyde solution upon the permanganate is apt to disturb the even distribution of the latter, so heaping it up in places that it may be some time before the interior of the mounds thus raised are acted on by the solution. Experience has failed to show any advantage to be gained by the addition of sulphuric acid to the formaldehyde solution in order to increase the yield of oxygen from the permanganate. In fact it seems to be slightly detrimental to the reaction.

In order to get as rapid and vigorous action as possible the permanganate must be in powdered form, or in the long needle-shaped crystals of the commercial article. If the large chem-

ically pure crystals are used they must first be powdered. The reason for this is of course plain. Chemical action takes place between two substances only when they are in actual contact, and varies in intensity as the amount of surface which the substances present to each other for contact. As a result, the greatest amount of chemical action in a given time will take place when the substances present the greatest amount of surface for mutual action. In the large crystals the action does not reach the material in the interior of the crystals until the surfaces have been eaten away. This necessarily increases the time required for the reaction and involves loss of available permanganate, as the greater part of the material in such a crystal lies not on the surfaces but in the interior. The greatest possible exposure of surface of the permanganate gives the highest and quickest yield of the gas. As a result the permanganate should always be in a fine crystal or in powdered form.

There is little to be said in regard to the kind of generator to be used in this work as any dish, with sides high enough to prevent the solutions from boiling over, will answer the purpose. So far as bacteriological results go there is no preference to be given to any kind of generator. In our report of 1904 a special form of generator was described but was not recommended, as it was desired to make the method of operation and the apparatus as simple as possible. It is now to be stated as the belief of the writer that the apparatus then described can be discarded with more profit than it can be used.

The reaction is so violent, and so much frothing and effervescence attends it that either very high or very wide dishes must be used as generators. In our work a variety of materials have been used as generators, such as tall glass beakers, tall earthern jars, pails both of tin and galvanized iron, wide bottomed and shallow tins such as the ordinary dishpan, and agate lined ware with moderately high sides and wide bottoms. As a result of my experiments I am led to favor the wide bottomed and comparatively shallow dishes. Glass does not make an acceptable generator for, apart from the score of fragility and cost of large enough beakers, glass is a very poor conductor of heat. This, coupled with its fragility, constitutes a serious drawback to the use of glass, for the production of sudden and great heat at the bottom of the dish results in too sudden a strain within

the glass itself, and the bottom often breaks out. In addition, and on account of the poor conductivity of glass, a considerable amount of formaldehyde gas coming in contact with the cold upper walls of the dish is converted into the solid white modification known as paraformaldehyde ($C_3H_6O_3$), and this latter is deposited on the sides of the generator, resulting in the loss of this amount of formaldehyde for disinfecting purposes.

In the work of 1904 earthern jars and pails of tin and galvanized iron were used entirely. The earthern crocks are not recommended as there results too great an absorption of heat by them, this resulting in less heat being available for evaporating the formaldehyde solution and either consequent loss of the latter or increase in the amount of permanganate that must be used. There was here but slight tendency of the gas to polymerize. The tin and galvanized iron pails were superior to the earthern jars in not absorbing as much heat, but offered no indications of superiority as far as polymerization of the gas was concerned.

One great drawback to the use of all these tall dishes was the spattering out of the reagents. The amount of actual loss of formaldehyde for disinfecting purposes was of course slight from this source, but it necessitated the use of some wide dish in which to set the generator or else covering the floors in the immediate vicinity of the latter. Attempts were made to obviate this difficulty by changing the shape of the dish in which the gas was liberated with the result that it was found that the use of a wide shallow dish, such as a dishpan, will prevent all spattering of the reagents and also all apparent polimerization. The dishes to be so used need not have sides more than 8 inches in height *but must have wide bottoms.* A good rule to follow in deciding on the size of the dish to be used is to choose one whose bottom is such that it will just be hidden from sight when the requisite amount of the permanganate is poured in and evenly distributed. Proceeding thus practically the entire surface of the permanganate that is used is in contact with the formaldehyde solution and the reaction proceeds evenly, where, if the permanganate lies to some depth on the bottom of the dish, after the surface action between the reagents is evenly under way the hot formaldehyde solution works down into the layers of the permanganate below, and sets up a more

violent reaction than is proceeding above it. The products of this more violent reaction are forcibly thrown up through the effervescing liquid above, causing a spattering of the reagents. An even and uniform union of the reagent, while attended by effervescence, is not accompanied by spattering, and this reaction is obtained when the permanganate and formaldehyde solution are spread out in such a thin layer as to be practically all in contact at once.

From the very even and excellent results obtained with these dishes I would recommend the use of these wide bottomed and comparatively shallow pans as generators, the fact being borne in mind that there will be no spattering of the contents if the bottom of the dish be so wide that the requisite amount of permanganate just conceal it, and the sides be 8 inches high. It was with the purpose of obtaining a thin and even layer of the permanganate that I recommended, in a previous paragraph, that the contents of the generator be shaken somewhat after adding both the reagents. The rather low walls of these dishes also offer little chance for sudden cooling of the gas and consequent polymerization. The width of the dishes also makes any additional flare to the tops unnecessary, the column of gas not being thrown straight up to the ceiling but beginning to spread out as soon as it rises above the top of the generator.

This reaction between the formaldehyde and permanganate does not result in the formation of any products that are harmful either to the texture or color of any materials that may be in the room when it is disinfected. The only products that get into the room are those that are gases, and these are water vapor, formaldehyde, carbon dioxide, a very little formic acid and a little oxygen. None of these would be expected to have any effect on the material left in the rooms, and a number of experiments have shown that they do not. The considerable amount of carbon dioxide which occurs is the product of a secondary reaction by which the formic acid, which is first formed, is broken up in the presence of an excess of oxygen and of heat into carbon dioxide and water vapor. This decomposition of the formic acid cannot be regarded as detrimental to the principal reaction as it removes a compound which might be undesirable in large amount, and at the same time adds to the heat of the first reaction.

In the work reported in 1904 the determination of the yield of formaldehyde was made not by measuring the gas in the room into which it had been introduced but by generating the gas in a specially designed flask, the products of the reaction being led into absorption bulbs, and a check being arranged in the generating flask by means of which the large amount of formaldehyde that condenses on the cold walls of the flask and ordinarily runs back upon the permanganate to be revaporized was itself collected. The result of taking all possible precautions to collect all the formaldehyde given off was the surprisingly large yield there recorded as compared with those I have obtained by aspirating the air from the room where the disinfection was actually going on.

In the work just finished determinations were made of the amount of the gas in the air drawn from the room where disinfection was in actual progress, and it was intended to repeat the experiments of the two years previous. One determination was made in the latter way, yielding 74.6% of formaldehyde, but the apparatus was broken in the process of the second experiment. At the same time the amount of formaldehyde in the air drawn from the charged rooms had been determined. The great difference in the results showed that we were dealing with widely divergent conditions and, as I wished the results set forth in this paper to represent the figures to be obtained in actual disinfection, the older method was abandoned and determinations only made on the air that was aspirated from the charged room.

The room in which the latter experiments were carried on was built into a room in the laboratory, a jog in one end of the laboratory room making it possible to get a good-sized room by building a wall from the jog to the opposite wall of the laboratory. This wall was built of matched pine boards and the side within the test room was papered. In this wall was put a heavy door, 3 x 7 feet, with a window set into the upper portion through which observations of the instruments in the test room could be had. This door was perforated with inch holes which were tightly closed with cork stoppers. Through these holes test objects could be introduced and withdrawn without opening the door or allowing escape of the gas. The room in question measured 20 x 4½ x 10 feet high. The wall to the south

was the one of matched boards just described. The north wall was of the same size and papered save for a strip running around the wall about three feet from the floor, and being three feet wide. This strip was of painted plaster, having once been used as a blackboard. Midway in this wall and 8 feet from the floor was a long narrow window 1 x 9½ feet, and opening into another room. The west wall was 4½ x 10, and a duplicate of the one just described except for the window. The east wall was of the same size as the west one but had a window let into it two feet above the floor, the window measuring 3¼ x 6¼ feet. Around the north and east walls ran four coils of pipes from the hot water heater, so as to permit of work in it during cold weather. The door and the windows were no more tight than in an ordinary room nor was any effort made to make them tighter, as it was desired to work under ordinary disinfecting conditions. No cracks were covered or patched while the experiments were under way. This is true both of the cracks by the door and the windows. The capacity of this room, including the jog into which the east window was set, was 862 cubic feet.

For drawing air from this room the following apparatus was devised. A glass tube passed into the test room through two rubber stoppers set tightly into one of the holes in the door. This tube projected two feet into the room and terminated in a funnel. The end of this tube which was outside the test room was connected with the first of a series of three Dreschsel gas wash-bottles. The last Dreschsel bottle was connected with a bottle holding a little more than ten liters of water, from which a siphon tube discharged the water. In each of the three Dreschsel bottles was placed 75 cubic centimeters of distilled water; the siphon bottle filled to the ten liter mark, and all joints and connections rendered air tight by sealing them with paraffin wax. When in operation the water was siphoned off at such a rate that at least 30 minutes were required to draw off the ten liters. The amount of water that had to run from the siphon bottle before the air began to bubble through the Dreschsel bottles was measured and, after ten liters had been run out from the siphon bottle, this measured amount was run off in addition to make correction for the amount that had to run from the siphon before the partial vacuum was established

that was necessary to start the bubbling through the Dreschsel bottles.

When the requisite amount of air had passed through the apparatus, and pressure conditions had been equalized the wash-bottles were disconnected and their contents were emptied into a 500 c. c. flask; each bottle washed with three changes of water, and the wash water added to the contents of the 500 c. c. flask. Into this flask was then run 10 c. c. of a standard solution of potassium cyanide (KCN), the whole thoroughly agitated and allowed to stand for five minutes. Then 10 c. c. of N-10 silver nitrate solution, to which had been added ten drops of 75% nitric acid, were run into the flask; the whole mixed; distilled water added to the 500 c. c. mark; 100 c. c. filtered and the excess of silver determined by Volhard's method. (See Sutton, "Volumetric Analysis." Eighth edition, page 155.) From this result the amount of formaldehyde in the ten liters of air drawn from the room was obtained, and the percentage of formaldehyde in the room determined. As an example of the calculation the following will suffice:

The reagents used were N-10 silver nitrate ($AgNO_3$) and N-10 ammonium sulphocyanide (NH_4SCN), the two solutions being accurately adjusted to each other, also a standard solution of potassium cyanide (KCN). The potassium cyanide solution was of such strength that when 10 c. c. of it were treated with 10 c. c. of the silver nitrate solution 1.5 c. c. of the silver solution was left uncombined.

In this case the time required to draw the ten liters of air was 34 minutes, the temperature of the room was 54° F, and the contents of the Dreschsel bottles, when treated as above described, showed the presence of 5.0 c. c. of uncombined silver solution. By calculation this showed that an amount of formaldehyde corresponding to 3.5 c. c. of N-10 silver nitrate had been absorbed from the ten liters of air, this corresponding to 0.0105 grams of formaldehyde. ($3.5 \times 0.003 = 0.0105$).

One cubic foot is the equivalent of 28.315 liters; therefore a cubic foot of air in the test room would contain 0.02973 grams of formaldehyde ($0.0105 \times 2.8315 = 0.02973$). The formaldehyde used was of 35.27% strength as determined by the cyanide method above used, and 431 c. c. were used in the room, this corresponding to the proportion of 500 c. c. of formaldehyde

to 1,000 cubic feet, the room having a capacity of 862 cubic feet. 431 c. c. of 35.27% formaldehyde having been used the actual weight of formaldehyde was 153.01 grams in all, or 0.176 grams per cubic foot. $(431 \times 35.27 \div 862 = 0.176)$

$$\frac{0.02973 \times 100 = 16.8\%}{0.176}$$

By this method the following determinations were made:

Number.	Temperature.	Formalin used c. c.	Permanganate used, gms.	Formaldehyde found per cubic foot.	Formaldehyde introduced per cubic foot.	Percentage formaldehyde present.	Time of drawing the air.
1	83	431	204.7	0.06370	0.176	36.2	34 min.
2	74	431	204.7	0.05946	0.176	33.7	38 min.
3	74	431	204.7	0.05521	0.176	31.3	35 min.
4	80	431	204.7	0.05967	0.176	33.9	40 min.
5	64	431	204.7	0.04247	0.176	24.1	35 min.
6	55	431	204.7	0.02973	0.176	16.8	34 min.

A feature especially noticeable in these results is the very marked decrease in the amount of formaldehyde obtained when the temperature fell below 65° F. There are two explanations for this. As the temperature of the room drops the amount of condensation of the moisture is increased and this condensing moisture undoubtedly carries down with it very considerable amounts of formaldehyde. Also below 65° F. polymerization of the formaldehyde seems to begin and the amount of this polymerization increases rapidly as the temperature drops, this being evinced by the appearance of a hazy cloud which appears in the room as soon as the gas is liberated, but which soon disappears by settling out. In the results tabulated above I began drawing air from the room at the end of twenty minutes after the beginning of the reaction except in the case of No. 6, when I wated until the hazy appearance had disappeared. I did this since the paraformaldehyde has no value as a disinfectant, but would react with the cyanide solution just as the formaldehyde itself. The fact that paraformaldehyde has no disinfecting power in itself may aid in explaining why formaldehyde disin-

fection is not as efficient in cold as in hot weather, and why but little liberation of the gas is to be obtained under these same conditions with the "sheet method."

In considering the amount of formaldehyde gas found in a room it is to be remembered that the amount found by aspirating the air from the room does not represent the whole amount that was liberated in the room, as there is a very considerable amount of condensation of the gas on the walls and objects in the room. The amount of this condensation is said to depend on the surface of the walls and objects in the room, and that it takes place almost as soon as the gas is introduced, being greater upon fabrics and vegetable material than upon the metals. Proof of this very considerable condensation of the formaldehyde gas is had in practical disinfection for, even after a room has been disinfected and so aired that there is no odor of the gas, warming the room will cause the development of such an odor of the formeldehyde that it is often impossible to stay in the room. This odor is undoubtedly caused by the vaporization of the condensed gas from the walls and objects in the room. It is to be remembered that this condensed solution of formaldehyde has a disinfecting value of its own apart from the formaldehyde gas in the room, but that, while this condensed formaldehyde is available for surface disinfection, it is upon the gas, *as a gas,* that we have to depend for all disinfection of the interior of fabrics. As a result it is well to see that the amount of formaldehyde solution used is well on the side of safety if disinfection is to be attempted at temperatures below 60° F. Whenever possible the temperatures should be above this point.

The bacteriological work was carried on in the test room described above. The work of 1904 had been carried on in the rooms of a tenement house under the usual disinfecting conditions, and using 1,000 cubic centimeters of the formaldehyde solution to 1,000 cubic feet. Just before the work of reducing the amount of formaldehyde was started the New Hampshire state board of health announced that as good results could be obtained with 500 c. c. as with 1,000, and work was started with this amount, all decrease being from that as a starting point after it was proved that that amount was efficient.

In the bacterial work we used cultures of the following organisms:—Subtilis, pyocyaneus, typhoid, colon, albus, aureus, diph-

theria, anthrax, pneumococci, throat, prodigiosus, tetragenus, and mixed cultures from throat swabbings from persons suspected of having diphtheria. In the tabulations these latter cultures are marked "mixed," and include cultures some of which did, and some of which did not contain diphtheria bacilli. The cultures used were some on argar, some on blood serum, and some in bouillon, the majority being in the latter. Part of the cultures were exposed open to the gas and part were buried between layers of cloth to test the penetrating power of the gas. The cloths used to bury the cultures in were silk, cottonflannel, and ticking.

The infected slips that were exposed to the gas were made of glazed paper, filter-paper, silk, cottonflannel, and ticking. It was found necessary to sterilize the strips of cottonflannel and ticking before inoculating them, as they were usually found to contain subtilis. This was done by exposing the strips, in a closed bottle, to a temperature of 180° C. for an hour.

The technique of handling the cultures was as follows. On a piece of glazed paper were placed five of the strips to be inoculated with the organisms, then a full loop of a 48 hour, 37.5° C. culture of the organism was taken up on a sterile platinum loop and spread on each of the five strips. If this were done from a bouillon culture of course the entire loopfull was absorbed while of the argar or serum cultures streaks resulted. The bottom of the glazed supporting paper was then bent up, forming a trough, and into this trough the infected strips were shaken. The paper with its five identical cultures was then placed in the test-room in the desired position.

When the cultures were to be buried the following method of procedure was used. A piece of tin six inches square had a circular hole cut in the middle of it, the hole being three inches in diameter. Over one of these tins were spread the requisite number of thicknesses of the cloth and upon the last piece were placed the five infected strips, inoculated as described above, care being taken that they were placed over the circular hole in the tin. The same number of thicknesses of cloth as was put below were now placed above the infected strips, and above that a tin cover the exact duplicate of the tin bottom described. The four sides of the square were then clamped down so that no air

could enter between the folds of the cloth, and thus making it possible for the gas to get at the organisms only by penetrating through the cloth where it was exposed by the holes in the tins. It is unnecessary to add that controls were put up from all the cultures used in the work. In the test-room the cultures were distributed on the floor, on the walls, and suspended from the ceiling. Some were laid on the cracks of the window frames, but just as good results were obtained in one position as in another, showing an equal diffusion of the gas.

After the organisms had been exposed to the gas for four (4) hours the test-room was opened and, while airing it, a leaf of the glazed paper with its five inoculated strips was removed from the room, the strips lifted by sterile forceps and dropped into separate tubes of sterile bouillon of a +1 reaction. These tubes were then incubated at 37.5° C. for 196 hours. All tubes in which growths of bacteria appeared were examined microscopically to see if the growth was of the organism with which the strip was inoculated or was the result of contamination in transferring to the bouillon tubes. Also strips of the same materials as the cultures were exposed on were put into the room and exposed for four hours. They were then put into tubes of sterile bouillon and a loop of the various cultures added. This was to see if enough formaldehyde condensed on the papers to inhibit the growth of the different organisms. In no case was the growth inhibited even when the strips added to the organism were five times the area of the strips on which the cultures were exposed. It may be noted that few cultures showed a growth at a period later than 48 hours after incubation, and none later than 96 hours.

While the test objects were being exposed to the gas observations were being made on the temperature and humidity changes that were in progress in the test-room. The rise in temperature was very slight, averaging 3-4° F., and the temperature soon dropping down to that of the outside air. The observations on the humidity of the room were made with a hair hygrometer, and these observations showed that the gas was equally diffused throughout the room in all cases in twenty (20) minutes, and usually this condition was established in fifteen (15) minutes. Below are given the results of the work in cutting down the

amount of formaldehyde necessary for efficient disinfection, and the average increase in humidity is appended to each of them.

The first series of tests was made using formaldehyde solution in the proportions of 500 c. c. to 1,000 cubic feet. The capacity of the room being 862 cubic feet this necessitated the use of 431 c. c. of the formaldehyde solution and 205.7 grams of permanganate. (47.5 grams of permanganate to 100 c. c. of formaldehyde solution.)

Tests were made with these proportions on four separate days, the temperatures on the successive days being 74° F., 72° F., 79° F., and 76° F. The outside humidity on these same days was 88, 50, 63, and 65, the measurements all being made on a hair hygrometer. The humidity within the test-room after the reaction had been over for twenty minutes was 99, 62, 79, and 80 on the same days, and at the end of the four hours of exposure the humidity was never less than 8% higher than that of the outside air.

The cultures used were serum, argar and bouillon cultures of subtilis, pyocyaneus, typhoid, colon, albus, aureus, diphtheria and mixed cultures from throat swabs, varying from 24 to 72 hours in age.

The total number of cultures exposed was 578. Of these 235 were exposed open to the gas, and 343 were buried, as described, in silk, cottonflannel and ticking, from one to four thicknesses being employed. These cultures were exposed to the action of the gas for four (4) hours, and then put into tubes of bouillon and incubated at 37.5° C, for 196 hours, as described under the section on technique. The results are as follows:

500 C. C. TO 1,000 CUBIC FEET.

Culture.	Number.	Growth.	No growth.
Subtilis	30	5*	25
Pyocyaneus	30	0	30
Albus	30	0	30
Aureus	20	0	20
Colon	95	0	95
Diphtheria	108	0	108
Typhoid	130	0	130
"Mixed"	135	0	135
Total	578	5	573

* The 5 subtilis growths were from open cultures made from heavy argar smears.

After the above work, the quantity of formaldehyde solution was cut down to 400 c. c. to the 1,000 cubic feet, this necessitating the use of 344.8 c. c. of formaldehyde solution and 163.7 grams of permanganate in the test-room. Tests were made with these proportions on four separate days, the temperatures being 72°, 74°, 75° and 80° F. The out-of-doors humidity was 85, 76.5, 68 and 72, and the humidity of the test-room twenty minutes after the reaction was over was 90, 94.5, 85, and 90. This represents an average rise of 17% in the humidity of the room due to the reaction.

The cultures used were serum, argar and bouillon cultures of diphtheria, tetragenus, albus, subtilis, colon, pneumococci, typhoid, throat, aureus, anthrax, prodigiosus, pyocyaneus, and mixed cultures from throat swabs, 403 were open and 40 were buried cultures. The cultures ranged from 24 to 72 hours in age. The time of exposure to the gas was again four (4) hours, and the time of incubation was 196 hours at 37.5° C.

400 C. C. TO 1,000 CUBIC FEET.

Culture.	Number.	Growth.	No growth.
Diphtheria	22	0	22
Typhoid	86	0	86
"Mixed"	43	0	43
Subtilis	31	7*	24
Anthrax	18	0	18
Colon	42	0	42
Albus	41	0	41
Throat	35	0	35
Pneumococci	29	0	29
Tetragenus	25	0	25
Aureus	14	0	14
Prodigiosus	33	0	33
Pyocyaneus	24	1†	23
Total	443	8	435

* Four of the positive subtilis growths were in open cultures and three in buried cultures.

† The pyocyaneus growth was from an open culture.

After this work the formaldehyde solution was cut to 300 c. c. to the 1,000 cubic feet. This necessitated the use of 258.6 c. c. of the formaldehyde solution and 122.8 grams of permanganate in the test-room. Tests were made with these proportions on five separate days, the temperature being 80°, 83°, 81°, 79°, and 80° F. The out-of-doors humidity was 63, 65, 73, 67, and 79, and the humidity of the test-room was 80.5, 81.5, 84.5, 84, and 92 when the reaction had been over for twenty minutes. This represents an average rise of 15.1% in the humidity of the test-room due to the reaction.

The cultures used were serum and bouillon cultures of pneumococci, colon, anthrax, subtilis, typhoid, throat, albus, diphtheria, tetragenus, aureus, prodigiosus, and mixed cultures from throat swabs. 503 were open and 105 were buried cultures. The cultures varied from 48 to 72 hours in age. They were exposed to the action of the gas for four hours, and then incubated at 37.5° C. for 196 hours.

300 C. C. TO 1,000 CUBIC FEET.

Culture.	Number.	Growth.	No growth.
Diphtheria	30	0	30
Typhoid	97	0	97
"Mixed"	37	0	37
Subtilis	30	2*	28
Anthrax	54	0	54
Colon	70	0	70
Albus	48	0	48
Throat	57	0	57
Pneumococci	57	0	57
Tetragenus	21	0	21
Aureus	5	0	5
Prodigiosus	76	0	76
Pyocyaneus	36	0	36
Total	618	2	616

* Both subtilis growths were from open cultures.

The amount of formaldehyde solution was again cut down, this time to 250 c. c. to the thousand cubic feet. In this work 215.5 c. c. of the formaldehyde solution and 102.3 grams of permanganate were required. Tests were made with these proportions on four separate days, the temperatures being 81°, 79°, 79°, and 79° F. The out-of-doors humidity was 84.5, 78, 70, and 66, and the humidity of the test-room at the end of twenty minutes after the reaction had started was 91, 88, 83, and 81, representing an average rise of 11.1% due to the reaction.

The cultures used were serum and bouillon cultures of typhoid, pyocyaneus, colon, prodigiosus, throat, anthrax, subtilis, pneumococci, albus, diphtheria, and mixed cultures from throat swabs. The cultures ranged from 24 to 96 hours in age, the prodigiosus culture being the only 96 hour one. The time of exposure to the gas was four hours and the time of incubation was 196 hours at 37.5° C.

The total number of cultures exposed was 409. Of this number 282 were open and 127 were buried cultures.

250 C. C. TO 1,000 CUBIC FEET.

Culture.	Number.	Growth.	No growth.
Diphtheria	20	0	20
Typhoid	54	1*	53
"Mixed"	31	3†	28
Subtilis	15	5‡	10
Anthrax	30	0	30
Colon	51	0	51
Albus	41	0	41
Throat	41	0	41
Pneumococci	34	0	34
Prodigiosus	51	0	51
Pyocyaneus	41	0	41
Total	409	9	400

* The typhoid growth was from an open culture.

† The subtilis growths were all from open cultures.

‡ The three "Mixed" growths came from swabs that contained the diphtheria bacillus and a tetrad. Examination of the growth obtained here showed *no diphtheria bacilli*, but that the growth was composed entirely of the above mentioned cocci.

The amount of formaldehyde solution was once more reduced, this time to 200 c. c. to a thousand cubic feet. This required 172.4 cubic centimeters of formaldehyde solution and 81.9 grams of permanganate. Tests were made on three separate days, the temperatures being 80°, 85°, 82°. The out-of-doors humidity was 60, 86, 66, and the humidity in the test-room twenty minutes after the reaction was over was 73, 95, and 76, representing an average increase of the humidity of 10.6% due to the reaction.

The cultures used were serum and bouillon cultures of colon, albus, diphtheria, pneumococci, pyocyaneus, typhoid, prodigiosus, throat, tetragenus, subtilis, and mixed cultures from throat swabs. The total number of cultures exposed was 292. Of this number 233 were open and 59 were buried cultures. The cultures ranged from 24 to 72 hours in age. The time of exposure to the gas was four hours, and the time of incubation was 196 hours at 37.5° C.

200 C. C. TO 1,000 CUBIC FEET.

Culture.	Number.	Growth.	No growth.
Diphtheria	21	0	21
Typhoid	44	0	44
"Mixed"	17	3*	14
Subtilis	6	6†	0
Colon	39	0	39
Albus	31	0	31
Throat	25	0	25
Pneumococci	22	0	22
Prodigiosus	36	0	36
Pyocyaneus	31	2‡	29
Tetragenus	20	0	20
Total	292	11	281

* The growths from the "Mixed" cultures were composed entirely of tetrads, as in the case under the proportions of 250 c. c. to a thousand cubic feet. The diphtheria bacilli were all killed. These cultures were made from the same blood-serum growth as were those that gave growths in the former experiment.

† The subtilis growths were from open cultures.

‡ The two growths from the pyocyaneus cultures were from buried cultures in two thicknesses of cotton-flannel. The parent culture was an old serum culture.

SUMMARY.

Quantity.	Total.	Negatives.	Positives.	Subtilis.
500 c. c.	578	573	5	5
400 c. c.	443	435	8	7
300 c. c.	618	616	2	2
250 c. c.	409	400	9	5
200 c. c.	292	281	11	6
Total	2340	2305	35	25

It was not attempted to carry the work beyond this point as the State board of health adopted the proportions of 500 c. c. to the thousand cubic feet after looking over what had been done. This certainly leaves a wide margin of safety as 300 c. c.

to the thousand cubic feet gives as good results as does 500 c. c., or as does 1,000 c. c. for that matter. Work will be carried on with this method to determine its efficiency at low temperatures and in very dry air, but it may be mentioned that some results already obtained point to but little, if any diminution in the efficiency of the gas thus liberated at a temperature as low as 50 F., and using 300 c. c. to the thousand cubic feet. Also it may be mentioned that some experiments have shown that the time limit is far on the side of safety. The Maine board of health recommend an exposure of the organisms to the gas for four hours. Some experiments have shown that using 300 c. c. of formaldehyde solution to the thousand cubic feet the typhoid bacillus is killed by an exposure of one hour when the temperature is as low as 54 F.

It seems to me that this method of disinfection is at least the equal of others in common use in efficiency and their superior in ease and simplicity of operation and, in view of the experimental work that has been done upon it, the proportions of 500 c. c. to the thousand cubic feet with an exposure period of four hours will give entire safety from contagion.

REPORT OF THE STATE BOARD OF EMBALMING EXAMINERS.

Complying with the requirements of Chapter 18, Section 17, the following report for the years 1904 and 1905 is made to the State Board of Health:

A. G. Young, secretary of the State Board of Health, is *ex officio* a member and clerk and treasurer of the board. The other members for these two years were:

Frank Redington, Waterville, Chairman.
M. C. Wedgwood, M. D., Lewiston.
Ralph B. White, Bangor.

Meetings were held for the purpose of examining candidates May 10 and October 5, 1904, and June 22 and December 14, 1905. At each of these meetings, the following instructions were given to the candidates:

"A list of questions is herewith submitted to you numbered from 1 to 40.

"The answers are to be made in writing, the figure to be placed before each answer which corresponds to that before its respective question.

"Two hours will be given within which time the answers to the questions will be handed in.

"The answers may be handed in any time within the two hours when completed, but the candidate when handing in his answers must immediately retire and not re-enter the room.

"Any candidate leaving the room before his answers have been completed and handed in will not be allowed to return, nor to finish his examination this day.

"Talk in the room or communcations of any kind between candidates will debar from completion of the examination.

"Satisfactory answers to at least 30 of the questions (75 per cent.) will be required.

"No catch questions are submitted, only those which every practical undertaker should be able to answer.

"In any answers to questions relating to contagious and infectious diseases, no distinction between the two will be required. They will be considered simply in the sense of dangerous communicable diseases.

"Each candidate must place his signature to his examination paper."

The following is a list to the end of the year 1905 of the persons who have passed a successful examination at the meetings of the board and have received the certificate which is given to licensed embalmers. The dates indicate the meeting at which the several persons received their examinations and the last column of the table gives the license number upon the certificate of each.

Name.	Residence.	Date of examination.	License number.
Fred P. Adams	Farmington, Me.	August 26, 1903	1
Edwin P. Sampson	Lewiston, Me.	August 26, 1903	2
Bryce K. Edwards	Madison, Me.	August 26, 1903	3
Walter Graham Hay	Portland, Me.	August 26, 1903	4
Charles A Redington	Waterville, Me.	August 26, 1903	5
Howard A. Teague	Lewiston, Me	August 26, 1903	6
J. Clark Flagg	Richmond, Me.	August 26, 1903	7
Harvey E. Bates	Augusta, Me.	August 26, 1903	8
Thomas J. Finnigan	Bangor, Me.	August 26, 1903	9
Ralph B. White	Bangor, Me.	August 26, 1903	10
E. E. Hussey	Brewer, Me	August 26, 1903	11
Charles A. Lawry	Fairfield Me.	August 26, 1903	12
Frank Redington	Waterville, Me	August 26, 1903	14
William E. Gordon	Brunswick, Me.	August 26, 1903	15
Albert S. Plummer	Lewiston, Me	August 26, 1903	16
A. C. Bradbury	Newport, Me	August 26, 1903	17
George M. Phoenix	Alfred, Me.	August 26, 1903	18
Irving C. Trufant	Bath, Me	August 26, 1903	19
Curtis R. Foster	Ellsworth, Me.	August 26, 1903	20
Fred S. Curtis	Bath, Me.	August 26, 1903	21
W. G. Preble	Gardiner, Me.	August 26, 1903	22
J. Smith Nutting	Skowhegan, Me.	August 26, 1903	23
Willard H. Stetson	Brunswick, Me.	August 26, 1903	24
John M. Clark	Bath, Me	August 26, 1903	25
J. Edward Huggard	Brewer, Me.	September 23, 1903	26
Edgar A. Burpee	Rockland, Me	September 23, 1903	27
H. W. Rich	Portland, Me	September 23, 1903	28
Charles F. Ayer	Waterville, Me.	September 23, 1903	29
Wilder S. Varney	Bangor, Me.	September 23, 1903	30
Fred E. Hanson	Portland, Me.	September 23, 1903	31
R. A. Wing	Livermore Falls, Me	September 23, 1903	32
J. F. Jefferds	Livermore Falls, Me	September 23, 1903	33
C. M. Drew	Guilford, Me	September 23, 1903	34
C. F. Chandler	Phillips, Me	September 23, 1903	35
Roy Furnel	Wilton, Me	September 23, 1903	36
Harry C. Quinby	Saco, Me.	September 23, 1903	37
John T. Kelleher	Bangor, Me.	September 23, 1903	38

Name.	Residence.	Date of Examination.	License number.
Oliver W. Ham	Portsmouth, N. H	September 23, 1903	39
J. Walter Strout	Thomaston, Me	September 23, 1903	40
Henry W. Plummer	Augusta, Me	September 23, 1903	41
Herbert G. Lilly	New Sharon, Me	September 23, 1903	42
Harry F. G. Hay	Westbrook, Me	September 23, 1903	43
Frank W. Halpen	Augusta, Me	September 23, 1903	44
E. N. Bucknam	Yarmouth Me	September 23, 1903	45
Frank Hewins	Augusta, Me	September 23, 1903	46
Abel Hunt	Bangor, Me	September 23, 1903	47
Michael J. Finnigan	Bangor, Me	September 23, 1903	48
W. Guy Sawyer	Gardiner, Me	September 23, 1903	49
Roscoe E. Wood	Richmond, Me	September 23, 1903	50
H. M. Barrett	Weld, Me	September 23, 1903	51
Fred J. Tibbetts	Harmony, Me	September 23, 1903	52
Amanda M. McIntire	South Berwick, Me	September 23, 1903	53
F. A. Davis	Farmington, Me	September 23, 1903	54
E. J. Kelly	Orono, Me	November 17, 1903	55
J. L. S. Hincks	Old Town, Me	November 17, 1903	56
F. A. Nye	Monroe, Me	November 17, 1903	57
William L. Girt	Fairfield, Me	November 17, 1903	58
Fred T. Leavitt	Guilford, Me	November 17, 1903	59
Robert H. Byles	Lewiston, Me	November 17, 1903	60
William J. Tower	South West Harbor, Me	November 17, 1903	61
Galen S. Pond	Bangor, Me	November 17, 1903	62
F. E. Sherman	Bar Harbor, Me	November 17, 1903	63
W. L. Roberts	Canton, Me	November 10, 1903	64
S. A. Hall	Casco, Me	November 10, 1906	65
Emma F. Guild	Old Orchard, Me	November 10, 1903	66
Grace Thayer	South Paris, Me	November 10, 1903	67
A. L. Eastman	Boston, Mass.	November 10, 1903	68
Frank B. Wood	Hallowell, Me	November 10, 1903	69
John C. Nichols	South Windham. Me	November 10, 1903	70
George R. Bucknam	Yarmouth, Me	November 10, 1903	71
Everett C. Staples	Welchville, Me	November 10, 1903	72
Leroy Spiller	Mechanic Falls, Me	November 10, 1903	73
L. A. Wentworth	Sanford, Me	November 10, 1903	74
H. W. Nickerson	Portsmouth, N. H	November 10, 1903	75
William A. Cosgrove	Biddeford, Me	November 10, 1903	76
Fred W. B. Martin	Portland, Me	November 10, 1903	77
John E. Feeney	Portland, Me	November 10, 1903	78
John G. Downs	Portland, Me	November 10, 1903	79
B. E. McDonough	Portland, Me	November 10, 1903	80
John S. Cushman	Portland, Me	November 10, 1903	81
James A. Martin	Portland, Me	November 10, 1903	82
Charles D. Fox	Milton Mills, N. H	May 10, 1904	83
B. M. Jenness	Springvale, Me	May 10, 1904	84
William E. Craig	Old Town, Me	May 10, 1904	85
L. A. Hurd	Sanford, Me	May 10, 1904	86
F. D. Nudd	Waterville, Me	May 10, 1904	87
Arthur D. Hall	Winthrop, Me	May 10, 1904	88
W. F. Buzzell	Houlton, Me	May 10, 1904	89
H. W. McKinney	Bridgton, Me	May 10, 1904	90
Abner D. Bryant	Freeport, Me	May 10, 1904	91
Wendall P. Roberts	Readfield, Me	May 10, 1904	92
C. H. Lucas	Kennebunk, Me	May 10, 1904	93
W. H. Wheeler	Oakland, Me	May 10, 1904	94
C. Norman McIntire	Saco, Me	May 10, 1904	95
A. Lester Faunce	Somersworth, N. H	May 10, 1904	96
A. C. Dinsmore	Bingham, Me	May 10, 1904	97
Charles A. Nichols	South Windham, Me	May 10, 1904	98
George W. Osgood	Gray, Me	May 10, 1904	99
C. H. Wyman	Dexter, Me	May 10, 1904	100
H. B. Snell	Waterville, Me	May 10, 1904	101
A. M. Andrews	West Paris, Me	May 10, 1904	102
H. D. Sawyer	Warren, Me	May 10, 1904	103
H. C. Sinclair	Winthrop, Me	May 10, 1904	104
Asa A. Fox	Milton Mills, N. H	May 10, 1904	105
Marcellus Cain	Clinton, Me	May 10, 1904	106
Tressellian R. Abbott	Gardiner, Me	October 5, 1904	107
Frank R. Andrews	West Paris, Me	October 5, 1904	108
Lyman M. Alden	Farmington, Me	October 5, 1904	109
Arthur Hanscom	Machias, Me	October 5, 1904	110

Name.	Residence.	Date of examination.	License number.
Charles F. Russell	Bristol, Me	October 5, 1904	111
John N. Martin	Pittsfield, Me	October 5, 1904	112
Charles C. Swan	Camden, Me	October 5, 1904	113
William H. Downs	Brownville, Me	October 5, 1904	114
Ethan A. Small	Houlton, Me	October 5, 1904	115
Eugene F. Stanley	South Hiram, Me	October 5, 1904	116
Harry N. Wakefield	Gardiner, Me	October 5, 1904	117
Walter I. Dennett	Biddeford, Me	October 5, 1904	118
Guy D. Meldrim	Houlton, Me	October 5, 1904	119
Charles H. Faunce	Chelsea, Mass	October 5, 1904	120
Loren W. Rumill	West Tremont, Me	October 5, 1904	121
Wendell P. Hubbard	Greenville Jct., Me	October 5, 1904	122
George G. Downing	Dover, Me	October 5, 1904	123
F. B. Hutchins	Kingfield, Me	October 5, 1904	124
George A. Emerson	Auburn, Me	October 5, 1904	125
Frank L. Amesbury	Gardiner, Me	October 5, 1904	126
Dana W. Libbey	Old Town, Me	October 5, 1904	127
Viola K. Rollins	Portland Me	October 5, 1904	128
Herbert A. Hodsdon	Fryeburg, Me	October 5, 1904	129
Harry Gardner	Boston, Mass	October 5, 1904	130
Albert L. Beaulieu	Rumford Falls, Me	October 5, 1904	131
Anthony E. McDonough	Lewiston, Me	October 5, 1904	132
Walter E. Tobie	Portland, Me	June 22, 1905	133
Gilbert M. Elliott	Brunswick, Me	June 22, 1905	134
Eugene I. Herrick	Rangeley, Me	June 22, 1905	135
Charles R. Coombs	Belfast, Me	June 22, 1905	136
W. D. Boisvert	Biddeford, Me	June 22, 1905	137
W. Raymond Davis	Farmington, Me	June 22, 1905	138
H. Clifton Eye	Bangor, Me	June 22, 1905	139
George P. Pulsifer	Poland, Me	June 22, 1905	140
G. F. Austin	York Village, Me	June 22, 1905	141
Arthur W. Hall	Dover, Me	June 22, 1905	142
Dean E. Wheeler	Oakland, Me	December 14, 1905	143
A. G. Cookson	Corinna, Me	December 14, 1905	144
William Newton Nealley	North Cambridge, Mass.	December 14, 1905	145
Frank E. Day	Corinna, Me	December 14, 1905	146
John C. Finnigan	Bangor, Me	December 14, 1905	147
Fred Eugene Crosman	Lisbon Falls, Me	December 14, 1905	148
Luther F. McKinney	Bridgton, Me	December 14, 1905	149
H. Edwin Hayes	North Berwick, Me	December 14, 1905	150
Wilfred E. Jones	Belfast, Me	December 14, 1905	151
Llewellyn W. Brown	Gorham, Me	December 14, 1905	152
William Y. Fossett	Vinalhaven, Me	December 14, 1905	153
Leslie F. Roberts	Livermore Falls, Me	December 14, 1905	154

RECEIPTS AND DISBURSEMENTS.

RECEIPTS—1904.

Balance, January 1, 1904	$253 40
License fees	260 00
	$513 40

DISBURSEMENTS.

Printing	$18 25
Fees returned	34 00
Expenses of Clerk	27 50
Expenses of Members	77 40
Balance on hand	356 25
	$513 40

RECEIPTS—1905.

Balance, January 1, 1905	$356 25
License fees	120 00
Balance on hand December 31, 1905	$476 25

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