PUBLIC DOCUMENTS OF MAINE:

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

DEPARTMENTS AND INSTITUTIONS

FOR THE YEAR

1901

VOLUME II.

AUGUSTA
KENNEBEC JOURNAL PRINT
1901

Fig. 20. Sharon Sanitarium.

ELEVENTH REPORT

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF MAINE

FOR THE

Two Years Ending December 31, 1899.

1898-1899

AUGUSTA
KENNEBEC JOURNAL PRINT
1900

STATE BOARD OF HEALTH OF MAINE.

Office of the Secretary,
Augusta, Me., July 20, 1900.

To His Excellency, Llewellyn Powers, Governor, and the Honorable Executive Council:

Gentlemen:—I have the honor of submitting to you the Eleventh Report of the State Board of Health of Maine, it being the fourth biennial report and for the years 1898 and 1899.

Very respectfully,

A. G. YOUNG, M. D.,
Secretary.

MEMBERS OF THE BOARD—1898-'99.

CHARLES D. SMITH, M. D., *President*,	Portland.
E. C. JORDAN, C. E.,	Portland.
Prof. F. C. ROBINSON,	Brunswick.
A. R. G. SMITH, M. D.,	North Whitefield.
G. M. WOODCOCK, M. D.,	Bangor.
M. C. WEDGEWOOD, M. D.,	Lewiston.
A. G. YOUNG, M. D., *Secretary*,	Augusta.

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INTRODUCTORY.

In a condensed form this report records the public health work in the State during the years 1898 and 1899. It also seeks to present trustworthy information which may be helpful to local boards of health and to other persons in the prevention and avoidance of dangerous diseases.

None of the outbreaks of infectious diseases, save that of smallpox, has been deemed worthy of a special place; nevertheless the reports of the local boards of health and the chapter which begins on page 14 show that there has been abundant need of work by persons who have previously given work of this kind intelligent thought. While the ideal sanitary regime would be that under the hands of professional experts in preventive medicine, it still remains true that much excellent work can be done, and is done, by executive officers of local boards of health who are not professional men. Some of the things which render the work of local boards of health less valuable than it should be are the following: The too frequent loss from the public health service of the conscientious local officer who has carefully informed himself regarding the duties of his office and has done them well. The value of the work of such a man is so great that a town should, at any reasonable cost, retain such service when it is evident that the right man for the place has been found. The reason for many of these unfortunate changes and the appointment of unsuitable members, is, in many instances, due to the want, on the part of the municipal officers, of a full appreciation of the importance of having the right kind of men for the places. The result is that the appointment of persons as members of local boards of health is sometimes made for some other reason than that they are men who are fitted to conserve the interests of the town from both the financial and public health point of view.

The best men in the town are none too good to look out for the interests of life and health, and to do it economically,—the more likely to be done economically when it is done promptly and rightly.

Most of the questions which arise in all ordinary kinds of public health work may be decided by any intelligent member of a local board, if he will only make a careful study of the sources of information which are available to him, particularly that which the State board puts into his hands. When he does not do this, his work, and the results of his work, are not what they should be. In "Notes on Public Health Work" there are shown, particularly in the work of disinfection, some examples of complete disregard of the processes of disinfection which comparatively trustworthy modern methods have worked out and which have been made accessible to the local boards.

In the work of water analysis, as well as in many other directions the State board of health and the local boards are badly hampered in not having a fully equipped bacteriological and chemical laboratory. The need of such laboratory is continually felt. The kinds of work which could be done in it are many, and would be of the greatest value. The examination of samples of water is incomplete without the bacteriological analysis. The analysis of food supplies is the necessary first step in learning whether they are what they ought to be and in the prevention of adulterations. The little which the State board has been able to save from its small yearly appropriation, and the generosity of Professor Robinson in earlier investigations, and of Dr. Whittier for that which is published in this report, has enabled it to do some work in investigating the value of disinfectants, which has been recognized as valuable outside of our State as well as within it; but there is urgent need of much more work in the study of the value of various disinfectants for special purposes,—work which the board is now unable to do. The recent advances in the knowledge of the causes of the infectious diseases makes the bacterial diagnosis of these diseases an important part of the public health service. In its application to the early recognition and control of the ever-present malignant diseases of man and the domestic animals, or in the detection of such dangerous exotic maladies as bubonic plague, the help of the laboratory should be deemed indispensable.

Among the special papers in this report, that on "Vaccination and Vaccine Lymph" is a valuable one. It furnishes the answers to many questions relating to the nature of the vaccine virus, its modern improved methods of propagation and preservation, and its protective power which should be available to all classes of persons. Dr. Smith is the special committee of one of the board on this subject and in writing on it has the advantage of having made a careful and continued investigation of the methods which are in use in the principal vaccine laboratories and by the leading public health authorities in this country and abroad.

Tuberculosis, as the most destructive disease of modern life and now recognized as one of the most easily preventable, deserves the most serious attention, not only of medical men and public health officers, but the people at large should have thoroughly ingrained into them the facts that tuberculosis is an infectious disease and not a hereditary one; that a certain few preventive measures, intelligently, thoroughly, and generally carried out would effect within a comparatively few years a very great reduction in the tuberculosis death-rate; and that the disease, particularly in its early stage, is curable in a large proportion of the cases. The paper on "Tuberculosis" presents, it is hoped, information on just these points which has not hitherto been presented to the people of our State in a sufficiently complete and satisfactory form. The rules, regulations, and advice emanating from public health officers are often necessarily brief and dogmatic, but it is due an intelligent people that, so far as may be, the reasons for the rules of action be presented. In no other way can the coöperation of the public be secured, and in the stamping out of this disease, consumption, the help of everybody is urgently needed.

The addition of chemical preservatives to the public milk supply is generally recognized to be fraught with much danger. Our infant population, particularly, is so susceptible to deleterious influences that the milk supply especially should be guarded very carefully from adulterations and harmful conditions. Thus far we have had no legislation which is of any value in safeguarding the public health in this direction, and there are no laboratory or other facilities for making such law of use if it did exist. The paper, "Formaldehyde as a Milk Preservative," deals with the question of the danger from the use of a preservative which, there are reasons to fear, is, under various forms and under various names, already quite widely used.

SECRETARY'S REPORT.

During the two years for which this report is made there was no change in the membership of the Board. The names and addresses of the members at the end of the year 1899, with the dates of expiration of their terms of office were as follows:

Prof. F. C. Robinson, Brunswick, term ending January 31, 1901.

G. M. Woodcock, M. D., Bangor, term ending January 31, 1902.

C. D. Smith, M. D., Portland, term ending January 31, 1903.

A. R. G. Smith, M. D., North Whitefield, term ending January 31, 1904.

E. C. Jordan, C. E., Portland, term ending January 31, 1905.

M. C. Wedgewood, M. D., Lewiston, term ending January 31, 1906.

At the annual meeting in March, 1898, Dr. C. D. Smith was unanimously elected president for the ensuing year. The following committees were appointed by the President:

On Finance.—E. C. Jordan, F. C. Robinson, M. C. Wedgewood, and the Secretary.

On Circulars and Other Publications.—A. R. G. Smith, G. M. Woodcock, and the Secretary.

On Sewerage and Drainage and the Disposal of Excreta.—E. C. Jordan, F. C. Robinson, A. R. G. Smith, and G. M. Woodcock.

On Ventilation.—M. C. Wedgewood, and E. C. Jordan.

On Summer Resorts.—E. C. Jordan, M. C. Wedgewood, and the President.

On Water and Water Supplies.—F. C. Robinson, M. C. Wedgewood, and the Secretary.

On Schoolhouses and School Hygiene.—F. C. Robinson, G. M. Woodcock, and the Secretary.

On Quarantine.—The President, M. C. Wedgewood, G. M. Woodcock, and the Secretary.

On Legislation.—The Secretary, the President, and M. C. Wedgewood.

On Disinfection and Disinfectants.—F. C. Robinson, C. D. Smith, and the Secretary.

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

At the second quarterly meeting held in June the manuscript for a new circular on disinfectants and disinfection which had been prepared by the Secretary, was referred to the committee on disinfectants, and that committee was authorized to have the circular printed in such form as it might approve.

The Secretary was authorized to prepare and have published, under the approval of the committee on disinfection and the committee on circulars, new editions of the circulars on the infectious diseases.

The discussion of the question "What can our Board do for our troops in and outside of our State?" seemed to develop the fact that the opportunities for the usefulness of the Board in this direction are rather limited. The soldiers from this State who have been mustered in, and the surgeons and assistant-surgeons who accompanied them, are now under the medical and sanitary rules and regulations which have been provided by the Surgeon-General of the United States Army, and the Board feels at liberty to work only as it may be permitted to act in coöperation with the medical service of the United States Army. The Secretary was authorized to inquire of Surgeon-General Sternberg whether it can do anything in coöperation with his department in protecting the health of the boys who have gone from Maine, and to place the Board at the service of the Surgeon-General of the United States and of the Surgeon-General of the National Guard of Maine in anything which it is practicable for the Board to do in this direction.

The committee on disinfection was authorized to do such work as it deems best in the direction of determining the best methods of purifying water by chemical means,—such methods as are demanded by the exigencies of military service.

At the third quarterly meeting the Secretary made a verbal statement to the Board regarding the outbreak of diphtheria at Jackman, and the measures he had taken to help the local board by sending Dr. Bryant of Bangor. He reported, also, that there had been a small outbreak of diphtheria in Winslow, the first cases of which the attending physician had failed to report to the local board of that town.

The correspondence of the Secretary with Surgeon-General Sternberg relative to the coöperation of the Board, so far as practicable, and the reply of the Surgeon-General, were submitted. The Secretary also reported that he had visited Camp Powers several times with Adjutant-General Richards and Surgeon-General Maybury, and inspected the conditions there, and had advised regarding sanitary improvements and disinfection.

An examination was made of the rules relating to the transportation of dead bodies, which were adopted by the joint conference of representatives of State Boards of Health, General Baggage Agents Association, and National Undertakers' Association, in 1897. Some unsatisfactory features in these rules were noted but action in the matter was deferred to the next meeting.

Dr. C. D. Smith, the Committee on the Production and Use of Vaccine Lymph, Antitoxin, and other Inoculation Material, was instructed by the Board to investigate the comparative value and advantages of glycerinated vaccine lymph, and vaccine lymph on points, and to report to the Board. As a part of the work for the year 1899, the Secretary was authorized to make a study of the subject of infant hygiene and infant feeding, and of the sanitarium treatment, or out-of-door treatment of consumption.

The Secretary exhibited to the Board a sample of saprol, Dr. Knopf's sputum flask, pressed paper sputum cups, glycerinated vaccine lymph from the establishment of Dr. Richard Slee, Haaker's sanitary can, which seals without the use of solder, and Prof. Robinson exhibited a new and simplified apparatus for disinfection with formaldehyde solution, which appeared to have advantages for many purposes over other forms of apparatus.

At the fourth quarterly meeting of the Board for 1898, the National Pure Food and Drug Bill, now before Congress, was under consideration, and the Board deems it its duty, in the interest of the health of the people and of public economy, to use its influence for the support of the measure. The Secretary was instructed to have a reprint made of the bill, and to send a copy to the local boards of health of the cities and larger towns, asking them to get up petitions in favor of the bill, and to forward them to the representatives in Congress of their respective districts.

Prof. Woods of the Maine Experiment Station presented and explained to the Board the provisions of a copy of a bill which has been prepared by a committee of the Maine Agricultural Society, which provides for an inspection and control of food products in the State of Maine. As far as the Board understood the purposes of the Agricultural Society and the provisions of the bill, it could see no reason why that Society could not have the moral support and the approval of the State Board of Health.

Dr. Smith made an interesting verbal report relative to his recent visit to the vaccine establishment of New York City, Dr. Slee's laboratory at Swiftwater, Pa., and the vaccine establishment of the H. K. Mulford Company, near Philadelphia. He found that the methods employed in all of these three establishments are entirely commendable. He thinks that the product from Dr. Slee's laboratory, or from that of the Mulford Company is entirely trustworthy, and may be recommended by our Board.

At the annual meeting of the Board in March, 1899, Dr. C. D. Smith was unanimously re-elected president. The standing committees for the year were practically the same as for the preceding year.

The Secretary was requested to formulate a rule relating to the ages for vaccination and revaccination, and present it at the next meeting.

The question having been submitted to the Attorney-General whether organized plantations are legally required to establish local boards of health and to pay the necessary bills incurred by them, the Secretary read a letter from him in which he expressed the opinion that each organized plantation is under the legal obligation to appoint a local board of health, and that the plantations must pay the bills incurred by their local boards of health in doing the work which the law requires them to do.

The Board deems itself unable to send a delegate to the "Conference of State and Provincial Boards of Health" to be held at Richmond, Va., in the latter part of May, but the Secretary was instructed to submit, as a subject for discussion, the question of the desirability of holding the annual meeting of the Conference in the same place and at nearly the same time as that for the meeting of the American Public Health Association.

The opinion of the members was that it is desirable to continue the work of educating the public to the urgent need of disinfection in cases of pulmonary tuberculosis. In a case in the city of Brewer in which the head of a family refused to disinfect as the local board had advised, after a death from consumption, the Secretary of the State Board gave the following advice:

"In the case of householders who own their homes and who refuse to disinfect after death has occurred from pulmonary tuberculosis, it is at present inexpedient to take any legal action as you probably might do under sections 8 and 9 of the act establishing local boards of health. If, on the other hand, a death occurs in a rented house, it is advisable for the local board of health to have the house disinfected after the family in which the death occurs leaves the house, and before another family is permitted to occupy the tenement." This letter received the approval of the Board, and the advice therein given was deemed appropriate as a rule of action for local boards generally.

Prof. Robinson was authorized to continue his investigations into the value of formaldehyde and other agents for various disinfecting purposes. It was voted to place the sum of fifty dollars at his disposal to help pay the expenses of this work.

The Secretary was authorized to send a man to Riley village, where there have been cases of smallpox, to help the local board of health to disinfect the infected houses and their contents.

At the meeting in June, 1899, in accordance with instructions received at the last meeting of the Board, the Secretary presented the following as a draft of the rules relating to the ages for vaccination and revaccination.

"It is desirable that primary vaccination be done during early infancy,—between the third and sixth months of the child's life, if practicable,—unless the illness or the delicacy of the infant make it appear best to postpone the operation a little longer. If the infant has been exposed to smallpox, or if there is imminent danger of such exposure, vaccination should be done at once, no matter how tender the age of the infant.

"If the first vaccination was done in early infancy, it is better not to postpone the second vaccination (revaccination) later than the tenth or twelfth year of the child's life. Provided the primary vaccination was successful and the revaccination was attended with a fair degree of success, persons may be considered as probably protected for life, though it is well to determine whether the immunity is permanent by test-vaccinations at intervals of from six to twelve years, according to the apparent nearness or remoteness of danger.

"If the primary vaccination does not give full and satisfactory results, vaccination should be repeated at intervals of a few weeks until the results assure protection. These repeated vaccinations do not count as revaccinations. Revaccination signifies the repetition of vaccination some years after a previous successful vaccination.

"The greater potency and certainty of effect of the modern glycerinated lymph render it unnecessary to insert it in more than one place in the arm, and the Board deems it desirable to insert it in but one place, letting the scarifications cover a surface not exceeding one-fourth inch square."

The foregoing rules for vaccination were approved and adopted by the Board.

At the third quarterly meeting held in September, the Secretary reported upon a visit to Poland village and to Mechanic Falls, made at the request of the local board of health of the latter place. The matter under consideration was a nuisance due to the discharge of the waste water from a creamery in Poland village into a small and short brook which flows into the stream from which the village of Mechanic Falls obtains its public water supply.

A report was also made upon a visit to Norway, at the request of the local board of health, to advise them relative to a sewerage system for the village.

The Secretary reported that since the last meeting three complaints had been made to the office, of nuisances due to the improper disposal of the waste from tanneries. The three towns are Bucksport, Island Falls, and Clinton. The nuisance at Bucksport had been inspected by Dr. Wedgewood in June and again, at the call of the local board of health, by the Secretary the first of September. Relative to the tannery wastes at Bucksport, it was voted that in the opinion of this Board a condition exists which is a menace to the health of people in the immediate neighborhood, and that the local board of health be advised to have the matter remedied at the earliest possible moment. The Secretary was instructed to forward a copy of this resolution to the local board of health of Bucksport. There has as yet been no request for a visit to Island Falls, and the Board expected a representative from the local board of health of Clinton to be present at this meeting, but he was not.

Some time was given to a discussion of the use of formaldehyde as a milk preservative, which ended with the passage of the following:

Resolved:—That it is the unanimous opinion of this Board that neither formaldehyde nor any other chemical preservative should be added to milk or cream by dairymen or milk dealers. Of the therapeutic use of these things by physicians, we have nothing to say, but we are sure that their use by dairymen and milk dealers should be prohibited in this State as it is in many others.

At the fourth quarterly meeting for 1899, the Secretary reported on visits to Fairfield and the Good Will Home on account of the outbreak of scarlet fever in the Home, on a visit to South Windham to advise the local board regarding an importation of filthy assorted papers by the pulp mill, and the sending of Dr. Washburn to the Good Will Home and to Eustis.

A short discussion was given to the subject of bubonic plague and the possibility of its introduction into our seaports. The matter was left in the hands of the Committee on Quarantine.

At the request of the President, the Secretary was instructed to send a circular of inquiry to local boards of health and physicians relative to the results of vaccination last winter and spring.

With reference to a bill introduced into Congress as Senate Bill No. 34, the Secretary was instructed to send the following letter to each of the congressmen from the State of Maine:

"DEAR SIR:—At the meeting of the State Board of Health of Maine, the Secretary was instructed to write to you as follows:

"In the opinion of the Board, the advocates for the so-called bill for the 'Further Prevention of Cruelty to Animals in the District of Columbia,' for the third time introduced into Congress by Senator Gallinger, and now as Senate Bill No. 34, are actuated by a misconception of the value of modern scientific research into the causes of infectious and epidemic diseases, and of the modern means of restricting these diseases. The interests which this research conserves, are those of the health and life of our people, our commercial prosperity, and our animal industries. Within a little more than a decade and a half, the essential causes of most of the infectious diseases of man and our domestic animals have been discovered, much has been learned of the life histories of these causes, much experimental study has been devoted to determining the most trustworthy chemical and other agencies for the destruction of various pathogenic bacteria, and a very encouraging beginning has been made in the direction of the prophylactic and curative treatment of infectious diseases with antitoxins. As bearing on the question of the value of all this study and the need of encouraging it rather than fettering it, I will only remind you that the treatment of diphtheria with the antitoxic serum has already saved several million lives, that most of the British soldiers now on the way to South Africa have been treated with an immunizing dose of anti-typhoid serum, that there is reason to hope that an antitoxic serum for the control of yellow fever may be available before long, and that some of the methods of serum treatment against bubonic plague, now menacing our own territory, have been shown to be efficient. (See page 108 of the enclosed number of the *Sanitary Inspector.*)

"Without experimental work on animals,—mostly of a kind which causes less suffering to the animals than the diseases which it is sought to prevent or cure causes their human victims, —this beneficent work could not have been carried on, and without it, its further advance would be disastrously impeded. Narrowed down, it becomes a question of the outrageous policy of allowing microbic diseases to continue their murderous assaults upon our human population, or of allowing this life-saving investigation to go on untrammeled by those who do not, and do not wish to, appreciate it.

"As this Board once before wrote to you, 'this work is too valuable to the human race to be put under the stigma of the ban of the law, and to be impeded, as in the opinion of this Board it would be, if laws like that provided in Senate Bill No. 34 were in force.'

"We therefore respectfully ask you to use your influence against the passage of this bill.

"Respectfully yours,

A. G. YOUNG, *Secretary.*"

Interesting verbal reports were made to the Board by Professor Robinson as the representative of the Board at the meeting of the American Public Health Association at Minneapolis, and by the President on his observations in London, Paris, Rome, Florence, Vienna, Dresden, and Berlin on the methods pursued in those cities in propagating, preserving, and using vaccine virus, on disinfection, and in other fields of practical public health work.

SMALLPOX IN MAINE IN 1899.

After a prevalence of an acute eruptive fever for some time among the French population of Waterville and Winslow, which had gone under the name of chicken-pox, and even of "sequel of la grippe," Dr. F. C. Thayer of the former place was called on the last day of January to see one of the cases. He called it smallpox, and telephoned to Dr. C. D. Smith, President of this board, to see the case. Dr. Smith examined this case and a considerable number of others on both sides of the river, finding several cases of confluent and semi-confluent smallpox, and a larger number of cases of varioloid. He advised the local board to take immediate action. In the afternoon he reported in person to the Secretary's office the presence of smallpox and the seriousness of the situation.

The next morning the Secretary went to Waterville on the first train, spent the forenoon examining cases in Waterville with Dr. L. G. Bunker, secretary of the local board of health, and then without dinner worked until nearly five in the evening investigating the cases across the river in Winslow. As some of the doctors and many other persons denied the presence of smallpox, much time was spent in trying to get the facts regarding the clinical history of the cases. The following are the notes relating to a few cases:

P. P., a young man of 18 who worked in the cotton mill, was forced by illness to leave his work January 23. The doctor saw him on the 24th. His temperature was 104° F., and headache and backache were severe. No eruption appeared until the 27th, first on face; next day on body. Eruption now semi-confluent. Some of the vesicles distinctly umbilicated. Never vaccinated.

J. P., sister of P. P., worked in the mill until noon of the 26th when she came home sick. When seen in the evening had a severe "splitting" headache and a temperature of 103.5° F. Eruption first observed January 30. Discrete. Mild. Vaccination had never taken.

L. R., a married woman of 34, worked in the mill. January 21, felt bad in the evening. The doctor saw her on the 24th. Temperature then 104.5°, pain all over, especially severe in back. No eruption then, although the doctor looked for it. Seen again 25th. Face then swollen and red, but no papules noticed. 26th papular; then thought it was about three days more before it was distinctly vesicular. At present eruption on face very confluent, nose and lips badly swollen; encrustation, especially on forehead, temperature 101.5°.

Husband at home; 31 years old; vaccinated 23 years ago, took well; has remained perfectly well.

F. G., age 21; sick January 21. Doctor saw her the 22nd; then fever, headache, backache. No eruption then. Second visit 27th. Eruption then papular with incipient vesicles. Eruption now covers face quite thickly, in last of pustular stage. Vaccinated about ten years ago, but did not take.

C. G., her sister 23 years old. Onset of the disease January 23, mild symptoms. Eruption noticed on 25th, her brother says, then "pimples." About three days before it could be perceived that they were filled with fluid. Eruption now on face, slightly confluent. On hands and arms more scattering, but some run together and are irregular. Vaccinated ten years ago, but did not take.

A. B., a girl of 11 years, became very feverish January 28, and remained so on the 29th and 30th when the doctor saw her. Temperature then 103°, vomiting, no eruption. Eruption appeared 31st, light. Never vaccinated. All the other children had chicken-pox some years ago, and her mother thinks A. B. then had it. Says she has marks of it. One distinct pock-mark on hand.

No trustworthy facts in regard to the period of incubation were obtainable, but the history of the period of invasion and of the progress of the eruption, so far as the facts could be got, made it clear that we had to do with smallpox and not with chicken-pox or any other disease. After a disinfection and a change of clothing, the Secretary met a considerable number of physicians in the office of Dr. Bunker, the secretary of the local board of health, when from his notes he gave the results of his examination of the cases. Later in the evening he had a conference with the local boards of the two towns in regard to immediate quarantine, vaccination, and disinfection.

Both local boards accepted thus rather tardily, the diagnosis, and immediately, that evening and the next morning, placed under quarantine every house and person known to be infected or infectious, and instituted a search for unknown points of infection. The work of vaccination was carried on as rapidly as possible. At first the local boards were under a disadvantage. Those physicians who had attended most of the cases still sought to bolster up a false diagnosis. Some of the malcontents sent to Montreal for Dr. Louis Laberge, health officer of that city, hoping apparently for a diagnosis in rebuttal of that made by the State Board. He arrived in Waterville while Dr. C. D. Smith, President of the Board, was in that city. Apologetically he did not know that we have a State Board of Health. He was told that he was at liberty to see the cases if the local boards were willing for him to do so, but that his opinion, no matter what it might be, would have not the slightest influence with the State Board which had made its diagnosis, had issued its instructions, and those instructions should be carried out, come what might. Dr. Laberge, however, could not do otherwise than confirm the previous diagnosis of smallpox.

Though the treatment of cases of smallpox and varioloid for weeks without discovering that smallpox existed in the city was not creditable to those physicians who did it, the rapid and effective work of the local boards when they got in action, deserves all praise.

The whole number of cases of smallpox in Waterville was 49, in 26 houses. The last case was discharged from quarantine May 15, 1899.

In Winslow there was a total of 108 cases, and there were 33 houses infected. The epidemic was closed up in this town by the disinfection of the last house March 25.

In addition to these two towns cases of smallpox occurred in four other places,—one in Augusta, three in Auburn, five in Lewiston, and six in Jay. The origin of the outbreak in the last town was as follows: January 21, ten days before the State Board received any intimation of the presence of smallpox in the State, two Frenchmen visited a house in Winslow in which there were cases of smallpox. January 24 they went to Gardiner, and on the 28th they started for a large pulp mill in Riley village in the town of Jay where they got outdoor work. February 21 they returned to Winslow, one then convalescing from a mild case of varioloid, while the other came down with smallpox the same day. At the house in Riley village where this walking case of varioloid boarded, four men took the disease and one man in another house came down. One case subsequently developed in the village at Jay bridge.

Though some of the cases of smallpox were confluent the great majority of them were mild—of the same type which for some time has prevailed in many other states. The unusual mildness of the disease is attested by the fact that only three deaths resulted from it, those of three children in Winslow. With very few exceptions the persons attacked with smallpox belonged to our French population; other than among these people *no* cases occurred in Waterville and Winslow.

The measures carried out for the suppression of smallpox were, quarantine with a guard day and night over every infected house; vaccination very generally done in and around the infected towns; and unusually careful disinfection. The method of disinfection recommended by the State Board, and generally carried out, has been the application of steam disinfection to clothing, bedding, and everything else possible, the personal disinfection of patients before their discharge, the washing of floors with solution 7 or 6, and the disinfection of walls and other surfaces with formaldehyde gas.

NOTES ON LOCAL PUBLIC HEALTH WORK.

At the end of each year a blank form is sent by the State Board of Health to each local board calling for answers to questions relating to the health conditions of the towns and to the work of the local boards of health. The following notes give the results of a classification of the replies relating to nuisances and the principal infectious diseases for the two years 1898-99, and of those relating to the methods of disinfection in use in the year 1899. In addition to a statement of the results shown by the classification, comments are made by the secretary, which it is hoped may in some degree help local boards to avoid errors or to abandon faulty processes of disinfection in the future.

Nuisances.—In 1898 the number of local boards of health to which complaints of nuisances were made was 175, and the number which received no reports of nuisances was 286. The whole number of nuisances abated or improved under the action of local boards of health was 1,557.

In 1899, 167 local boards of health received complaints of nuisances, and 279 report no nuisances. The total number of nuisances abated by the local boards of health was 1,168.

Diphtheria.—In 1898 the reports of the local boards of health indicate that diphtheria occurred in 82 towns, and that 379 towns had no outbreak of this disease. The total number of cases of diphtheria reported was 581. Forty of the 82 local boards reporting outbreaks of diphtheria state that antitoxin was used.

In 1899, 71 local boards of health report the occurrence of cases of diphtheria, and in 376 towns no outbreaks of diphtheria are reported. The total number of cases of diphtheria reported by the boards for 1899 was 416. In the 71 towns in which diphtheria occurred, it is reported from 43 that antitoxin was used. From 31 towns we are told that the results of its use were good; four say that the results were good when used early; and from one town each the following reports come: "2 out of 3 cases died; the doctor was called late;" "in some cases a marked benefit, in others could not perceive any effect;" "antitoxin given in one case on the seventh day, died: in one case it was given within 24 hours with good results;" "in 4 cases 1 death, but antitoxin was used late in this case;" "in 7 cases three deaths six or eight hours after dose of 1,000 units." Three towns do not state the results.

Scarlet Fever.—In 1898 in 121 towns scarlet fever made its appearance, and 340 local boards report no scarlet fever. The total number of cases of scarlet fever in the State was 1,123.

In 1899, scarlet fever occurred in 160 towns, and in 287 towns it did not come to the notice of the local boards. In all, 1,706 cases of scarlet fever occurred in the State.

Typhoid Fever.—In 1898, from 178 towns typhoid fever is reported, and from 283 no cases of typhoid fever are reported. The whole number of cases of typhoid fever recorded by the local boards is 937.

In 1899, the boards of health of 177 towns report cases of typhoid fever, and in 270 towns typhoid fever is not reported. The total number of cases of typhoid fever reported for 1899 is 631.

Diphtheria and Scarlet Fever—Disinfection of Clothing.—In answer to the inquiry about the disinfecting processes employed in disinfecting clothing in 1899, 96 local boards say that steam disinfection or boiling is used exclusively or in part. Of these 96 local boards, in addition to steam or boiling, sulphur fumigation was needlessly used in 5 towns; formaldehyde was used in 21, though whether as a gas or in solution is not stated; solution 1 or 6* was an auxiliary in 15 towns.

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*The following are the formulas for the disinfecting solutions:

SOLUTION 1.

Carbolic Acid (pure liquified),	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.

Of the local boards which did not resort to steam disinfection, 11 depended upon sulphur fumigation which is entirely worthless as a disinfecting process for clothing; 24 used formaldehyde which will do very well as solution 7, (5 per cent. of formalin) but if in the gaseous form, while disinfecting the rooms, is not trustworthy; 5 used chloride of lime, a solution of which would be efficient, but it injures or ruins clothing; 2 used sulphur and chloride of lime which is not intelligent practice; and in 7 towns the attending physician was left to advise about the disinfection. The worst incident discovered in these reports is

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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 3.

Solutol (crude or pure),	1-2 pint.
Water,	2 or 3 gallons.

Mix. This is a very efficient disinfectant, for excreta, tuberculous sputum, and gross disinfection generally. If to be used in dwelling houses, or wherever the odor of the crude product would be offensive, pure solutol should be used.

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 sometime 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.

the use of "Bromo-chloralum" by two boards and of "king of germ-killer" by one. In using disinfectants, only those articles should be chosen which the rather recent experimental work of reputable and disinterested investigators have proved to be trustworthy and suitable for the particular purpose. Most of the much advertised patent proprietary preparations are next to worthless, or are far less efficient and cost more than the disinfectants recommended by the State Board of Health.

Diphtheria and Scarlet Fever—Disinfection of Rooms.—In the disinfection of rooms in connection with outbreaks of these diseases, 58 boards depend upon formaldehyde wholly or in part, and 49 use sulphur fumigation alone or with other disinfectant agents, while 7 have used both formaldehyde and sulphur fumigation. None of these 7 boards state whether, with the idea of making assurance doubly sure they use both of these disinfecting agents in the same room at the same time. That should not be done without an assurance that these gases are not mutually destructive of each other's efficiency. As an auxiliary to the gaseous disinfection, 19 local boards make use of solution 6, and seven use solution 1. There is no report of the use of solution 7 as an auxiliary in the disinfection of rooms. This solution, for the washing of floors and other surfaces before formaldehyde fumigation, is cheaper and more efficient than solution 1 and for some reasons, preferable to solution 6.

The disinfecting practice of the minority of the boards which say nothing about using gaseous disinfectants is very diverse,—some good, and some very irrational. Nine boards used nothing but solution 6. The efficient disinfection of rooms with this solution alone is practicable, and, if the washing with it is thoroughly done, is much more commendable and trustworthy than the perfunctory disinfection of rooms with a little sulphur or formaldehyde and nothing else.

In six towns it is reported that solution 4, or chloride of lime, was used. That is an efficient disinfectant for some purposes, it would be suitable for the habitations of poultry, swine, and some other animals after some diseases, but the average dwelling places of human beings would be injured by it. The use of "quicklime" by one board indicates a lack of intelligent consideration. Wood alcohol is mentioned by three boards. It was probably used in the generation of formaldehyde gas. Wood alcohol of itself is not classed among disinfectants. Paraform is used by one board. Efficient disinfections *may* be done with paraform, but the quantity which any board would feel that it could afford, or would be likely to use, would be valueless in results. One other board uses sulphur, saltpetre, and some other things (not including charcoal) thus showing no intelligent appreciation of what is and what is not trustworthy. The use of "tar and sulphur" by one local board is very discreditable to it.

Typhoid Fever—Disinfection of Discharges from the Bowels. —There were 135 answers to this question. The largest number of boards, 43, use chloride of lime; 8 use milk-of-lime; 21 solution 1, or carbolic acid; and 21 a solution of corrosive sublimate, usually as solution 6. As regards the last, the State Board has on various occasions cautioned local boards that corrosive sublimate is unsuitable for this particular purpose.

Here again the minority show many ways of doing a thing, some of which do it and some of which do not do it. Boiling water advised by three boards is efficient if added in large excess. Formalin used by four boards is probably efficient as a 5 per cent. solution (solution 7) but as yet there is no satisfactory determination of its efficacy as a disinfectant of this kind of material. Sulphate of copper, used by one board, is efficient when, as a solution, it is mixed with excreta in the proportion of one part of sulphate of copper to 100 parts of the material to be disinfected. Labarraque's solution, used by one board is probably just as efficient as chloride of lime but costs more. Two boards make use of Platt's chlorides, another much advertised thing. Some of these proprietary disinfectants are bolstered up with an abundance of testimony of a later date than the antediluvian period, but not recent enough nor of the right kind to comply with modern requirements. This particular preparation is not the best nor most economical disinfectant. Sulphate of iron, used by three, is one of the disinfectants of the past. Modern experiments have abundantly shown that it is worthless. The use of "sulphur," wood alcohol, and tar, by one each, is simply nonsense. Slaked lime, used by one, is all right, if freshly slaked and prepared as recommended by the State Board as milk-of-lime, but is worthless if long slaked or air slaked. Sulpho-naphthol, used by one board, is one kind of deodorant, but I do not know that there is any satisfactory evidence that it is a good disinfectant.

Typhoid Fever—Disinfection of Excreta in Privy Vaults.—Answered by 109 boards. The larger number, 45, very properly use chloride of lime, which is more effective in solution as solution 4. Sixteen boards use quicklime or milk-of-lime, the latter being much better. Neither chloride of lime nor quicklime should be used in lumps or as a powder. Solution 6 and solution 1 are each used by nine boards. Solution 6 is not adapted to this purpose, and the cost of solution 1 prohibits its use in large enough quantity.

Pulmonary Tuberculosis—Disinfection and Disposal of Sputum.—There were 75 statements of methods followed. It is gratifying to find that the larger number, 45, emphasize the burning of the sputa, while 15 have resorted to the use of disinfecting solutions and burning. So far as the particular chemical disinfectant used is specified, 12 used carbolic acid; 3, solution 6; 1, quicklime; 1, solution 4 and 1 formaldehyde. The choice of the largest number in using carbolic acid, our solution 1, was good, though the use of lysol, solution 2, is somewhat preferable on account of slightly greater efficiency, and it is not quite so costly. The three which use solution 6, chose a disinfectant which is very effective for some purposes, but is untrustworthy as a disinfectant of tuberculous sputum. Quicklime, or milk-of-lime, is with good reason used for some other purposes, but should not be trusted for this; and chloride of lime, or solution 4, is one of the best for the disinfection of some kinds of material, but is not one of the best for the bacillus of tuberculosis. Whether the one which used formaldehyde chose well is questionable. The question whether formaldehyde in solution is, or is not, a safe disinfectant for tuberculous sputum *en masse,* as in spittoons, has not been worked out so far as I know. For that reason the State Board has not yet advised its use for that purpose.

Pulmonary Tuberculosis—Disinfection of the Sick-Room.—There were only 55 answers. Of these 25 used formaldehyde, either alone or with disinfecting solutions, but it is to be regretted that 21 of them say nothing about the use of disinfectant washes for floors and other surfaces before using formaldehyde. Of those which specify the kind of disinfectant solutions used alone or with gaseous disinfection, 8 made use of solution 6 which is recommended by the State Board for this purpose, or the disinfection of tubercular dust, but which is not suitable for the disinfection of fresh sputum; and 7 used a solution of carbolic acid which is adapted to the disinfection of fresh sputum, and will do only fairly well for the washing of surfaces; but solutions 7 and 6 are recommended for this purpose by the State Board as more rapidly active.

Here again Platt's chlorides are used by two local boards with no trustworthy evidence that that preparation is good for anything for this purpose. For this work, the washing of surfaces, only the most rapidly acting disinfecting solutions should be used, because the exposure of the infection to the disinfectant is only mometary, or for a brief time.

One board used sulphur and solution 6. That would not be so bad if the sequence were reversed,—If everything were thoroughly washed up with solution 6 and sulphur fumigation were subsequently used to neutralize the corrosive sublimate, or rather to convert it into a harmless nuercurial combination. "Sulphur and rosin," used by just one board, takes the cake. Will that board and the few others who constitute the minority please read carefully Circulars 54 and 70. The work of disinfection requires a careful study for the purpose of determining what are the most trustworthy disinfectants for the different kinds of infection, and for special purposes. This the State Board has done as carefully as possible, and has plainly indicated the results in its circulars. Please follow the directions of the State Board unless you know for a certainty that something else is better for a given purpose, but do not resort to ancient practices, nor use *patented* preparations with no better vouchers for their efficacy than the advertising matter sent out by their manufacturers.

Formaldehyde Disinfection.—To the question: "Does your board use formaldehyde disinfection?" eighty-eight local boards answer yes, and 92, no. Of the boards which employed formeldehyde disinfection, 44 had Professor Robinson's lamp;

14 use "a lamp;" 3 have Schering's lamp; 3 resort to spraying; 1 has a Rentz generator; 1 Parke, Davis & Company's lamp.

Steam Disinfection.—Steam disinfection in some form is made use of by 53 local boards, while 82 say they have not used steam disinfection. Of the 53 resorting to steam disinfection, 17 had nothing better for apparatus than the common washing boiler; 13 had special steam disinfectors or boilers; 1 had "tanks and boilers;" 1 used steam under pressure; and 1 had resorted to steam disinfection for smallpox only.

NEW CIRCULARS.

CIRCULAR NO. 69.

SMALLPOX.

ITS DIAGNOSIS AND PREVENTION.*

Issued by the State Board of Health of Maine.

DEFINITION.

Smallpox is an acute contagious, infectious disease, characterized by an eruption which passes through the stages of macule, papule, vesicle, and pustule, ending in desiccation and desquamation.

The contagious principle, probably a microbe, has not been discovered, but it is contained in the exhalations of the skin and lungs and especially in the pustule and dried material following desiccation and desquamation, and may live for months on clothing or furniture. The contagium is tenacious, and may be conveyed by persons and by fomites, such as hair, clothing, paper, letters, furniture, etc., or it may spread through the air by means of the wind blowing the dust containing the virus. The disease is probably contagious during the first four days previous to the appearance of the eruption, but this has not been proved. A few persons seem to possess a natural immunity to the disease. No age, race, sex or climate is exempt. It attacks the fœtus in utero when the mother has the disease. It is more common among the colored races, probably on account of their condition of living in small, crowded rooms, with slight regard for cleanli-

* With the exception of the note relating to disinfection, this circular is a reprint in abstract of one issued by the Surgeon-General of the Marine-Hospital Service.

ness. It is worse in cold than in warm weather because of closed houses and aggregation of people.

SYMPTOMS.

True smallpox (*variola vera*) *incubation.*—The period of incubation varies from seven to twenty days, the average being twelve days. Inoculation, which might occur accidentally in obvious ways, shortens the time to seven or eight days. During this period there are usually no symptoms—sometimes a little malaise or gastric disturbance.

Invasion.—This is sudden, beginning with a chill which may be followed by others, severe aching in the "small of the back," and sometimes the limbs; intense headache, vomiting, and fever 39.4 to 40°C. (103 to 104°F.). The pulse is rapid and strong. Convulsions may occur in children.

Eruption—Initial rash.—When this occurs it usually appears on the second day in the form of a diffused redness—the scarlatinal form—or of a macular eruption resembling measles. More rarely it may have the form of urticaria. It appears in about 13 per cent of cases (Osler), usually on the inner surface of the thighs, the lateral thoracic regions near the axilla, lower part of the abdomen, and occasionally on the extensor surfaces of the knees and elbows.

Distinctive eruption.—In the discrete or mild form small spots are seen on the third day on the forehead near the hair, around the mouth and on the wrists, and the temperature falls, which up to this time has been continuously high.

The eruption becomes general over the body in twenty-four hours, and at this stage the disease strongly resembles measles. On the fourth and fifth days of the disease the eruption is papular and the characteristic "shotty" sensation is obtained by passing the fingers over the skin. During the next twenty-four hours the papules become vesicles, with clear summits. From the sixth to the eighth day the vesicles change to pustules with a slight depression in the center (umbilicated), each pustule being surrounded by a red border or halo. At the same time the temperature rises again, the secondary fever or *stadium suppurationis* and the general symptoms return. The pustules are especially thick on the face, which is much swollen and disfigured.

About twenty-four hours before its appearance on the skin the eruption develops on the mucous membranes of the respiratory and alimentary tracts, and may be seen on the soft palate, fauces, larynx and trachea. The inner sides of the thighs and axillary regions, the sites of the initial *rash,* are usually free from the characteristic eruption of smallpox.

Desiccation and desquamation.—After four or five days from their appearance (twelfth or thirteenth of the disease) the pustules begin to dry up. A few days later the scabs begin to fall off, first on the face and later on other parts of the body; the temperature falls to normal and convalescence begins.

Confluent form.—The initial symptoms are more intense, the eruption occurs a little earlier. The papules are discrete but the vesicles and pustules coalesce, especially on the face, hands, and feet, but usually remain discrete on the trunk. The temperature does not fall to the same degree on the appearance of the eruption as in the discrete form, and the secondary fever is higher, more prolonged, and attended by graver constitutional symptoms, such as swelling of the lymphatic glands, salivation, diarrhea, and delirium.

When death occurs it is usually in the stage of maturation, about the tenth or eleventh day. When recovery takes place, the process of desiccation and desquamation is complete in three or four weeks; sometimes it may extend to six or eight weeks.

Hemorrhagic smallpox.—This occurs in two forms:

(a) Purpura variolosa (black smallpox), in which the symptoms appear early and death may occur in from two to six days. Symptoms are the same, only more intense, and the eruption appears on the second or third day in the form of a diffuse hyperemic rash with punctiform hemorrhages, especially in the groins. The rash extends, the hemorrhagic spots increase in size, ecchymoses appear on the conjunctivae, the skin may have a uniformly purplish hue and hemorrhages may occur from the eyes, nose, stomach, lungs, urethra, and uterus.

(b) The other hemorrhagic form (variola hemorrhagica pustulosa) progresses as in ordinary smallpox to the vesicular or pustular stage, when hemorrhages take place into the pocks or from the mucous membranes. The majority of cases in which bleeding from the mucous membranes takes place die in from seven to nine days. Hemorrhage into the pocks is frequently followed by recovery.

Varioloid.—This is the modified form of smallpox which occurs in persons who have been successfully vaccinated. It is none the less smallpox because of its modified form, and the most virulent form of smallpox may arise from exposure to varioloid.

Symptoms may be severe with temperature reaching 39.3°C. (103° F.), but usually they are mild. The eruption appears on the third or fourth day and the fever falls at once, and the patient feels comfortable. The papules are few in number, scattered, and may be limited to the face and hands. Vesiculation and suppuration take place rapidly and there is no secondary fever. The eruption does not pass through the regular stages, many of the vesicles disappearing without suppuration and scars seldom result.

Complications—Respiratory organs.—As a consequence of the eruption on the mucous membranes, laryngeal ulcerations with perichondritis and œdema of the glottis, bronchitis, lobular, and sometimes lobar pneumonia may occur.

Digestive system.—The eruption in the throat is sometimes followed by purulent otitis, parotitis, and ulceration of the pharynx. The spleen is nearly always enlarged and often the liver.

Circulatory system.—Except the slight degeneration of the muscular fiber, pathological changes in the heart are rare. Pericarditis sometimes occurs and occasionally endocarditis.

Nervous system.—Convulsions frequently occur in children, and delirium in adults which may end in fatal coma. Postfebrile insanity and occasionally epilepsy occur during convalescence. Neuritis, as in diphtheria, may affect the pharynx, or it may be multiple in the extremities. Hemiplegia and aphasia, the result of encephalitis, rarely occur.

Joints.—Arthritis, which may be suppurative, and necrosis of the bone are sometimes met with.

Skin.—Boils are frequent, acne, ecthyma, and local gangrene sometimes occur, and occasionally after desquamation a secondary eruption resembling smallpox (recurrent smallpox).

Urinary organs.—Albuminuria is not uncommon, but true nephritis is rare.

Special senses.—Catarrhal and purulent conjunctivitis is common in severe cases, leading sometimes to keratitis with ulceration, perforation, and loss of the eye. Iritis and choroiditis may also occur. Otitis media is an occasional complication from extension through the Eustachian tube.

DIAGNOSIS.

The disease must not be mistaken for measles, scarlet fever, chicken-pox, impetigo contagiosa, syphilis, cerebro-spinal fever, typhus fever, or glanders. The severity of the attack, the group of symptoms, chill, backache, headache, vomiting, and high fever, 39 to 41° C. (102.1 to 105.8° F.) continuing three or four days and falling on the appearance of the eruption should excite suspicion of smallpox, especially when this disease is prevalent.

Measles.—In measles, the period of incubation is a little longer than in smallpox—about fourteen days. The stage of invasion more nearly resembles a cold, with shivering rather than a definite chill, sneezing, redness of the eyes, running at the nose, and cough. The eruption occurs about the fourth or fifth day, and the condition of the patient is not much improved until the sixth day, when the eruption is well developed. By the fifth or sixth day, at the latest, the diagnosis can be made. The eruption of measles having no tendency to become vesicular and is only slightly papular.

Scarlet fever.—The period of incubation is much shorter, one to seven days—average four—and the stage of invasion is short, with high temperature and sore throat. The eruption appears early, on the second day, first on the neck and chest and spreads rapidly over the face and body, in the form of a bright red or scarlet rash, like erythema, with a slight tendency to the formation of papules. It gradually fades after two or three days. The tongue has a characteristic appearance—the "strawberry" or "raspberry" tongue, owing to the projection of the enlarged red papillæ through the coating on the tongue. Albuminuria is a common symptom.

Chicken-pox—(Varicella).—This is more strictly a disease of children, affecting especially those under six years of age. The incubation period is rather longer than that of smallpox—ten to fifteen days. The initial symptoms are comparatively mild, with fever, vomiting, and pain in the back and legs. Sometimes convulsions occur in children. The eruption appears during the first twenty-four hours, on the back, chest, or face in the form of red papules which in a few hours become vesicles filled with a clear or turbid fluid. They are seldom umbilicated, are scattered, more superficial than the vesicles in variola, and the intervening skin is neither inflamed nor hyperemic. In three or four days the eruption dries up into scabs, which soon fall off leaving little or no scarring. Varioloid may be mistaken for this disease.

(The observation of the Marine-Hospital Bureau has been that in the majority of mistaken diagnoses with regard to smallpox the disease has been called chicken-pox. Chicken-pox is a contagious disease and many local health authorities require its isolation. Particularly when smallpox is prevalent, any case of supposed chicken-pox should be isolated and guarded as if it were smallpox, at least until the diagnosis is proven beyond doubt).

Impetigo contagiosa more nearly resembles chicken-pox than smallpox. The eruption appears without constitutional symptoms—occasionally there are slight febrile disturbances and malaise coincident with the appearance of the eruption which is found on the face, scalp, hands, fingers, and sometimes the trunk, in the form primarily small, pin head sized vesicles or vesico papules, flat or slightly raised and rapidly enlarging into blebs of the size of a split pea, or finger nail, containing clear fluid or pus. The eruption occurs in patches or groups as in herpes, the vesicles being at first discrete and usually umbilicated, but later coalescing and as desiccation takes place forming large crusted patches.

Syphilis.—The eruption of syphilis is sometimes exactly like that of smallpox with umbilicated pustules. The history, with the absence or slight character of the fever and other constitutional symptoms, serve to make the differential diagnosis.

Cerebro-spinal fever.—The temperature is usually not so high, extremely severe headache, especially in the back of the head, intolerance of light and sound, strabismus, delirium, coma, and the early appearance of stiffness with pain and contraction of the muscles of the neck and back characterize the disease.

Typhus fever.—In this disease, mental symptoms appear early, such as delirium, often maniacal, the temperature rises steadily, usually to the fifth day when it may reach 41.6° C. (106.88° F.) and the eruption appears about the third to the fifth day, first on the abdomen and chest, rapidly spreading to the extremities and face in the form of a fine irregular, dusky mottling as if beneath the skin, and distinct papular rose spots, some of which change to petechiæ from hemorrhage.

Glanders.—In glanders the eruption appears on the face and about the joints, at the same time there is ulceration, swelling, and a mucopurulent discharge from the nose. The period of incubation is short, three or four days.

VACCINATION.

The most efficient means for preventing the spread of smallpox is by vaccination. The protection, provided the virus is pure, is believed to be as complete against contagion as is that of smallpox against a second attack, though not of as long duration, but revaccination, whenever smallpox is prevalent in a community, will continue this protection indefinitely. Therefore, the first measure after isolation of a person suffering with smallpox is the immediate vaccination of all persons who have been exposed to the disease and *revaccination* in five or six days if there is no indication of the previous virus having been effective.

In order to secure pure vaccine the supply should be obtained from an accredited source, and as bovine virus only is now used the dangers which heretofore existed from arm-to-arm vaccination are eliminated. Glycerinized lymph only should be used.

The operation of vaccinating a person, although fairly well understood, may be briefly described as follows:

Usually the left arm above the middle third is selected, although in some cases the wishes of the person receiving it may be consulted. The part to be vaccinated is bared and the skin rendered aseptic by means of soap and water or alcohol, after which, if a needle or lancet is used it should first be passed through a flame or sterilized by means of alcohol, and the part scarified in one or more places; the virus is then rubbed in. Of course, it is understood that the same needle shall be used on but one person, and if a lancet is used it should be sterilized for each case. If the vaccination has been successful it will be found that in the course of three or four days a small papule will appear, which soon after becomes vesicular, and is surrounded by a circumscribed areola; this gradually increases until the seventh or eight day; in the meantime a crust forms which in due course falls off, leaving the characteristic scar resembling the pits of smallpox, the whole process occupying about three weeks.

Due care should be exercised to prevent the vaccination from being irritated or the "seal" from being broken and to prevent the wound from becoming infected. A vaccine shield is best for this purpose, and it is recommended that either one provided by the dealers or improvised be used, but if a vaccine shield is not used care should be taken, as above stated, to prevent the breaking of the "seal" and undue rubbing of the part by the clothing. Adhesive plaster should not be used for this purpose.

In the communities where compulsory vaccination is not required for children going to public schools, it will frequently be found that a large proportion of the pupils, unless an epidemic of the disease has recently occurred, have not been vaccinated, and it is among these that smallpox is more apt to be spread.

A thorough house-to-house inspection, isolation, and vaccination will soon put a stop to the epidemic.

When the disease becomes epidemic a house-to-house inspection is necessary to prevent the spread of smallpox, not only to discover isolated cases but to vaccinate and revaccinate all persons who have been exposed to the disease as well as those who have not previously been vaccinated within recent years (say two years). The house-to-house inspection may be advisable before the disease is known to be epidemic.

ISOLATION.

(1) Suspects: Cases of illness suspected of being smallpox or chicken-pox should be isolated and kept away from others until the character of the illness is determined. This applies equally to those who have been exposed to smallpox, having a fever at the end of the period of incubation, as to those suffering from an eruption.

(2) Cases: When the character of illness is determined to be smallpox, isolation of the patient should be continued so that there will be no danger of the disease spreading from the case. Isolation is best accomplished in places specially prepared for the purpose. A hospital or lazaretto for smallpox should be located at least 2,000 feet distant from habitations, and to the leeward of the prevailing winds. It is possible under the most favorable circumstances to isolate a smallpox case in a house or residence, but it is not to be recommended. Accidents usually attendant on such isolation are responsible for new foci of the disease among the adjacent residents.

(3) Provisions for treatment of cases: On removal of cases to a hospital or lazaretto, ample provision should be made for their care and treatment, and the patients should be provided with as many comforts as possible. In fact, these comforts are required by reason of the nature of the disease, and neglect of proper care will result fatally.

Cases of varioloid, or smallpox modified by vaccination, should always be treated in the same manner as the virulent type; these cases are equally dangerous, if not more so, from a sanitary standpoint.

As soon as a case of smallpox has been removed from a house or apartment, immediate steps should be taken to prevent the spread of the disease through these agencies. A disinfection of all infected material should be done at once. Those persons who have been in direct contact with the case, or have been exposed to the infection otherwise, should be immediately vaccinated, unless they have been protected by a recent successful vaccination, or have had the disease.

Persons who have been exposed to the disease should be considered under two classes—

(1) Those who have been exposed but once to the infection and are immediately vaccinated. These should be kept under observation until there are unmistakable evidences of the success of vaccination, when they can be discharged from further surveillance.

(2) Persons who have been exposed to smallpox and several days (over four) have elapsed before vaccination. These should be kept under observation until the period of incubation has

passed. The period of incubation should be considered to date from the time of vaccination. The protective effects of vaccination in these cases are of doubtful value.

Persons who have been exposed to smallpox should be kept under the observation of a physician who should inspect them at least once daily during the period of incubation. These persons are not infectious until after the initial fever appears, and then slightly so in the first forty-eight hours, that is to say, before the eruption makes its appearance on the mucous membrane and skin.

Suspects should be kept under observation. Under certain circumstances this may best be done by segregating them in observation camps or hospitals. Under other circumstances it may be done by surveillance at their residences.

Cases of smallpox under treatment should not be discharged until the process of desquamation is complete. This is variable, depending entirely on the case. A safe rule is to await the disappearance of the peculiar red specks at the bottom of the pits or scars. So long as this condition is present, desquamation is going on.

On the termination of the case in recovery, the patient should be given an antiseptic bath—1-1000 bichlorid of mercury—followed by a second bath of water, and then provided with sterile clothing.

Cases dead of the disease should be encased in sheets saturated with a strong antiseptic, preferably bichlorid of mercury—1-500—inclosed in a metallic casket hermetically sealed and immediately buried. Cremation is also recommended. It is needless to add, funerals, public or private, are interdicted.

DISINFECTION.

The rules for disinfection are essentially the same as those which are given under "Applied Disinfection" in "Circular No. 68, Disinfectants and Disinfection," and in the circulars on diphtheria and scarlet fever. Steam disinfection should be applied so far as possible to the disinfection of clothing, bedding, carpets, and rugs.

CIRCULAR NO. 70.

STATE BOARD OF HEALTH OF MAINE.

DIRECTIONS FOR THE DISINFECTION OF THE ROOMS AND THINGS USED BY CONSUMPTIVES.

Though it is believed that there is little danger of the infection of the rooms occupied by persons sick with consumption if there has, all of the time, been a strict compliance with the rules laid down in Circular No. 54, it nevertheless is the safer way to subject to a careful cleansing and disinfection all rooms that have been occupied by consumptives. Particularly in rooms where strict sanitary rules have not been observed, the need of disinfection is emphasized by the fact that the germ of tuberculosis retains its infective powers a long while, under favoring conditions.

The bacillus of tuberculosis is hard to kill: use, therefore, only those disinfectants which are the most rapidly destructive of it when it is in its dry state. In fresh sputum the bacillus requires different treatment. (See Circular No. 54).

In disinfecting a room that has previously been occupied by a consumptive, let the order of procedure be about as is recommended in the following, sorting out and disinfecting the clothing, and other smaller things first.

A. *Clothing.* Disinfect with steam or by boiling. Boiling for half an hour will disinfect any article that can be subjected to that process. Steam disinfection for one hour, properly done, is just as trustworthy, and has the advantage of wetting and shrinking fabrics less.

Steam disinfection on a small scale can be done in the common wash-boiler by supporting, above the water with two bricks or otherwise, a false flooring of laths or thin board. Pour in two or three inches of water, place the articles to be disinfected above the false flooring, put on the cover, and steam one hour after the water begins to boil, keeping the water briskly boiling all the time. To insure certainty of success there must be a brisk fire and the steam must be kept streaming through the articles all the time. After the steaming, carry the boiler into the open air and throw the things over a line to dry.

In every town and city a portable steam disinfector, such as is described on page 6 of Circular No. 68, or a better one, should be available.

Clothing can also be disinfected by soaking it twenty-four hours in Solution 6 or 7. Then rinse thoroughly.

B. *Bedding.* Disinfect sheets, blankets, pillow-cases, quilts, comforters, and spreads, as under (A). Pillows and featherbeds are preferably disinfected with steam. They need not be ripped,—the steam will penetrate. Empty straw beds, burn straw, and disinfect tick with steam as under (A). Burn cheap mattresses. A mattress worth the trouble may be disinfected with formaldehyde as follows: Make a tight box large enough to contain it. Render it air-tight by pasting up all cracks and corners with stout, firm paper. Place the mattress in it, and sprinkle or spray it with at least 4 ounces (1 gill) of formalin; put on the cover quickly; paste it up. Leave the mattress twenty-four hours.

Or a mattress may be disinfected by spraying it with formalin and quickly and tightly wrapping it in large rubber blankets.

Featherbeds and pillows may be disinfected with formalin as is advised for mattresses.

C. *Rugs* and *Carpets.* Burn old ones and all that cannot be surely disinfected. Steam disinfection is the surest; when that is impracticable, formaldehyde in concentrated doses, as for mattresses, may be used for valuable carpets or rugs.

D. *Upholstered Furniture.* If the room can be disinfected with formaldehyde, spray or sprinkle the upholstered part with Solution 7, just before the room disinfection, and leave in place. If formaldehyde gas is not available, spray or wash thoroughly with Solution 7 or 6, then expose to the action of direct sunshine three or four days,—the longer the better.

E. *Rooms.* Avoid raising a dust. If the removal of a carpet leaves dust on the floor, remove it after sprinkling wet sawdust, or with damp broom or damp cloths. With a damp cloth remove dust from furniture and other surfaces. Boil all cloths thus used. If formaldehyde disinfection is available for the room, wash in Solution 7 all surfaces of walls, or furniture that may have been soiled with sputum. Wash or spray the floor with Solution 7, letting the solution soak into the cracks well. Then fumigate with formaldehyde letting the stripped furniture remain.

If formaldehyde is not available, wash very carefully in Solution 6 or 7 the floors and all surfaces which were exposed to the danger of soiling with sputum. Complete the disinfection of the room with liquid disinfectants, repeating the washing, the interval between the two washings not necessarily exceeding half an hour.

For the disinfection of rooms with formaldehyde, the new *vaporizer* devised by Professor Robinson, in which formaldehyde solution is used, is recommended by the State Board as a simple, compact, and efficient piece of apparatus. It vaporizes solution of formaldehyde instead of wood alcohol. At least half a pint of formaldehyde solution should be used for each 1,000 cubic feet of space. Keep the room closed eight hours at least.

In preparing for formaldehyde disinfection the room must be made as tight as possible by closing the mouths of chimneys, other ventilating openings, chinking or pasting cracks, etc.

Solution 6.

Corrosive Sublimate,	1 dram.
Water,	1 gallon.

Mix and dissolve. Label, *Poison!* This is approximately a 1 : 1000 solution. Its use should always be under the direction of some intelligent and careful person. This is not trustworthy as a disinfectant of fresh sputum. Destroys metals and gilding. Must be mixed in wood, glass, or earthen ware.

Solution 7.

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

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

WATER ANALYSES.

ANALYSES OF SAMPLES OF WATER—EXPRESSED IN PARTS PER 100,000.

Number of analysis.	Origin of Sample.	Date of collection.	Total solids.	Loss on ignition.	Hardness.	Chlorine.	Free ammonia.	Organic ammonia.	Nitrites.	Nitrates.
		1897.								
1298	Water supply, Thomaston	December 31,	3.2	1.8	2.60	.6	.000	.007	None	Very slight trace.
1299	Spring, Waterville	December 28,	7.0	1.8	6.71	.4	.001	.001	None	Heavy trace.
		1898.								
1300	Well, Standish	January 3,	11.6	5.2	7.43	1.8	.003	.002	Slight trace	Much.
1301	Well, Alfred	January 7,	2.8	1.2	2.60	.4	.000	.002	Very slight trace	Trace.
1302	Well, Farmingdale	January 19,	17.0	6.6	10.30	3.2	.012	.005	Trace	Very much.
1303	Well, Augusta	January 19,	15.8	6.0	8.86	1.8	.000	.005	Trace	Very much.
1304	Well, Brunswick	January 20,	10.0	4.4	7.43	.9	.000	.005	Trace	Much.
1305	Well, Canton	January 21,	3.8	1.6	5.29	.1	.000	.002	Very slight trace	Very slight trace.
1306	Spring, Limington	February 7,	2.8	.6	1.95	.1	.000	.001	None	Very slight trace.
1307	Well, Dixfield	February 8,	7.0	2.4	6.00	.2	.000	.007	None	Very slight trace.
1308	Well, Oakland	March 1,	6.8	2.2	6.71	.6	.000	.002	Very slight trace	Much.
1309	Well, Turner Center	March 12,	29.0	15.0	16.43	8.8	.107	.022	Very slight trace	Very much.
1310	Well, Freeport	March 14,	12.4	5.4	7.43	.6	.002	.010	Much	Much.
1311	Spring, Richmond	March 26,	3.8	2.0	5.29	.4	.000	.002	Very slight trace	Slight trace.
1312	Well, Dexter	April 8,	8.8	2.0	11.05	.0	.001	.003	Very slight trace	Very slight trace.
1313	Well, Kenduskeag	April 20,	65.2	13.6	18.81	8.2	.017	.032	Heavy trace	Much.
1314	Well, South Brewer	May 17,	10.8	6.2	7.43	1.0	.003	.013	Trace	Much.
1315	Well, Mt. Vernon	March 23,	4.6	2.8	6.00	.4	.018	.002	Trace	Heavy trace.
1316	Well, Hallowell	May 26,	34.8	15.2	32.86	3.2	.031	.015	Very much	Heavy trace.
1317	Spring, Hallowell	May 23,	7.4	3.6	4.57	.6	.003	.002	Slight trace	Heavy trace.
1318	Cistern, Brunswick	May 28,	4.8	2.4	5.00	.0	.002	.022	Very slight trace	Very slight trace.
1319	Well, Raymond	May 27,	4.6	2.4	6.00	.4	.000	.005	Very slight trace	Very slight trace.
1320	Well, North Bridgton	May 12,	4.8	2.8	4.57	.2	.007	.006	Very slight trace	Very slight trace.
1321	Well, Bangor	June 7,	11.2	5.4	11.05	.3	.003	.007	Very slight trace	Very slight trace.
1322	Well, Kennebunk	June 9,	3.6	2.0	6.71	.7	.001	.005	Very slight trace	Very slight trace.
1323	Spring, Burnham	June 10,	8.6	4.4	11.80	.4	.001	.005	Very slight trace	Slight trace.
1324	Well, Manchester	June 14,	6.0	3.2	7.43	.3	.003	.003	Very slight trace	Very slight trace.

1325	Well, Belfast	June	20,	27.6	14.8	13.31	2.4	.000	.012	Very slight trace	Much.
1326	Spring, Walnut Hill	June	25,	7.4	3.2	3.90	.5	.000	.003	Slight trace	Very slight trace.
1327	Androscoggin river, Lewiston	June	27,	5.4	3.4	1.95	.1	.000	.029	Very slight trace	Very slight trace.
1328	Lake Auburn, Lewiston	June	27,	3.6	1.8	2.34	.2	.007	.021	Very slight trace	Very slight trace.
1329	Spring, Stockton Springs	June	27,	7.4	4.8	2.86	.6	.000	.002	Trace	Much.
1330	Well, Readfield Depot	July	2,	10.4	4.8	6.71	4	.113	.023	Slight trace	Very slight trace.
1331	Spring, Bangor	July	4,	18.8	8.6	13 .31	2.4	.018	.008	Trace	Much.
1332	Well, Bangor	July	6,	44.2	18.2	14 .06	4.4	.001	.002	Very slight trace	Much.
1333	Well, Augusta	July	8,	31.4	13.0	18 .81	1.0	.000	.007	None	Much.
1334	Glenwood Spring, Augusta	July	8,	-	-	11.05	2.0	.000	.002	None	Much.
1335	Spring, Waterville	July	8,	16.8	9.6	7.14	1.2	.001	.002	Very slight trace	Much.
1336	——, Foxcroft			3.2	2.8	2.21	.2	.008	.006	Very slight trace	Very slight trace.
1337	——, Foxcroft			7.8	2.6	6.71	.2	.001	.002	Very slight trace	Heavy trace.
1338	Well, Mt. Vernon	July	11,	6.6	3.4	3.90	.5	.008	.005	Slight trace	Trace.
1339	Well, East Baldwin	July	9,	3.2	1.4	1.95	.2	.001	.002	Slight trace	Very slight trace.
1340	Well, East Baldwin	July	9,	22.0	7.2	6.00	2.0	.001	.007	Very slight trace	Much.
1341	Well, Eliot	July	23,	13.2	5.2	7.43	.6	.113	.027	Much	Heavy trace.
1342	Well, Eliot	July	23,	32.2	9.2	13.31	2.4	.001	.011	Slight trace	Much.
1343	Well, North onmouth	July	25,	12.4	3.6	5.29	1.4	.000	.002	Very slight trace	Heavy trace.
1344	——, Augusta			19.4	10.2	8.14	2.2	.027	.009	Trace	Trace.
1345	Well, Prout's Neck	July	25,	11.4	5.4	6.71	1.6	.008	.002	Trace	Much.
1346	Well, Limington	July	25,	5.0	1.6	5.29	.2	.003	.002	Much	Heavy trace.
1347	Well, North Berwick	July	23,	8.4	4.2	3.90	1.2	.000	.002	Trace	Heavy trace.
1348	Well, Castine	August	5,	15.8	7.0	10.30	1.4	.008	.008	Heavy trace	Much.
1349	Well, Corinna	August	8,	88.6	34.8	45.72	5.8	.001	.012	Heavy trace	Much.
1350	Spring, Gardiner	August	7,	7.2	2.2	3.25	.3	.003	.002	Slight trace	Trace.
1351	Water supply, Auburn	August	8,	3.0	2.6	2.60	.3	.001	.009	Very slight trace	Very slight trace.
1352	Lake Auburn, Lewiston	August	8,	4.4	3.4	2.60	.2	.004	.007	Very slight trace	Very slight trace.
1353	Well, Stonington	August	10,	3.2	1.8	5.29	3.2	.002	.013	Slight trace	Much.
1354	Well, Stonington	August	10,	9.4	5.0	4.57	1.4	.002	.006	Very slight trace	Heavy trace.
1355	Well, West Bethel	August	16,	6.8	4.4	3.25	.2	.000	.002	Trace	Much.
1356	Well, Eliot	August	15,	24.6	6.2	6.00	2.4	.000	.005	Trace	Very much.
1357	Well, Peak's Island	August	15,	9.2	4.0	3.25	1.4	.000	.005	None	Slight trace.
1358	Well, Scarboro	August	16,	8.2	2.0	5.29	.6	.001	.002	Very slight trace	Very slight trace.
1359	Water supply, Sanford	August	16,	4.2	1.6	2.60	.2	.000	.000	Very slight trace	Very slight trace.
1360	Spring, Sanford	August	16,	4.4	2.0	2.60	.2	.000	.000	Very slight trace	Very slight trace.
1361	Spring, Anson	June	20,	9.4	3.4	5.57	.2	.000	.006	Very slight trace	Very slight trace.
1362	Well, Diamond Island	September	7,	6.0	4.0	3.25	1.0	.003	.006	Slight trace	Slight trace.
1363	Well, South Limington	September	12,	17.6	6.0	11.05	1.6	.005	.013	Trace	Heavy trace.
1364	Well, Limington	September	12,	5.4	1.6	3.25	.3	.006	.009	Trace	Very slight trace.
1365	Water supply, Auburn	September	12,	3.6	2.2	2.34	.2	.004	.019	None	Very slight trace.
1366	Water supply, Auburn	September	12,	2.8	1.8	2.34	.2	.003	.014	None	Very slight trace.
1367	Spring, Waterville	September	13,	7.0	3.0	3.90	.2	.001	.000	None	Very slight trace.
1368	Well, Gardiner	September	16,	48.0	18.2	22.86	5.6	.007	.005	Slight trace	Trace.
1369	Spring, Guilford	September	19,	11.2	3.2	11.05	.3	.003	.003	Slight trace	Heavy trace.
1370	Spring, Guilford	September	19,	15.0	3.6	11.05	.2	.000	.002	Heavy trace	Very slight trace.
1371	Well, Milo	September	20,	35.8	23.4	9.57	2.0	.017	.006	Slight trace	Very slight trace.

ANALYSES OF SAMPLES OF WATER—EXPRESSED IN PARTS PER 100,000—Continued.

Number of analysis.	Origin of sample.	Date of collection.	Total solids.	Loss on ignition.	Hardness.	Chlorine.	Free ammonia.	Organic ammonia.	Nitrites.	Nitrates.
1372	Spring, North New Portland	September 22,	3.8	1.6	1.95	.3	.000	.002	Slight trace	Much.
1373	Well, Hallowell	September 29,	29.2	8.8	14.84	3.0	.003	.004	Very slight trace.	Very slight trace.
1374	Well, North Berwick	September 30,	10.6	4.4	5.29	1.2	.000	.003	Trace	Much.
1375	Well, Carmel	October 1,	21.4	9.0	9.57	1.8	003	.003	Trace	Much.
1376	Well, Augusta	October 4,	18.4	8.0	8.86	1.4	.008	.007	Much	Much.
1377	Spring, Waterville	September 27,	32.2	4.4	22.02	1.4	.000	.003	Very slight trace.	Trace.
1378	——, Waldoboro	....	9.8	5.6	5.29	.4	.000	.006	Trace	Heavy trace.
1379	Spring, Hallowell	October 24,	16.2	3.4	11.05	1.0	.006	.006	Trace	Heavy trace.
1380	Well, Henderson	November 10,	23.0	12.8	9.57	2.2	.007	.006	Heavy trace	Heavy trace.
1381	Water supply, Benton	November 10,	4.4	2.2	2.99	.2	.000	.019	Very slight trace.	Very slight trace.
1382	Spring, Lisbon Falls	November 10,	10.0	5.0	3.25	.8	.003	.005	Slight trace	Much.
1383	Spring, Lisbon Falls	November 10,	3.0	.8	1.95	.3	.004	.005	Slight trace	Heavy trace.
1384	Spring, Lisbon Falls	November 10,	3.4	.8	1.95	.3	.001	.002	Slight trace	Trace.
1385	Spring, East Auburn	November 13,	3.4	1.0	1.95	.2	.000	.006	Very slight trace.	Trace.
1386	Well, Southport	November 13,	7.0	2.8	3.25	1.0	.003	.015	Very slight trace.	Very slight trace.
1387	Spring, Old Town	November 14,	2.2	1.0	.95	.1	.006	.006	Slight trace	Trace.
1388	Well, Old Town	November 14,	1.8	.8	1.27	.1	.002	.002	Slight trace	Trace.
1389	——, Fairfield	....	31.8	16.6	17.22	2.4	.008	.003	Slight trace.	Heavy trace.
1390	Well, Oxford	November 30,	7.4	3.0	4.57	.4	.000	.014	Trace	Heavy trace.
1391	Well, Oxford	November 30,	8.4	3.6	5.29	.4	.002	.014	Trace	Heavy trace.
1392	Well, Livermore Falls	November 14,	6.4	4.2	3.25	1.2	.000	.005	Very slight trace.	Heavy trace.
1393	Well, Augusta	December 7,	17.6	5.0	9.57	1.0	.001	.008	Very slight trace.	Much.
1394	Spring, Fairfield	December 7.	8.0	2.4	6.0	.3	.001	.002	Very slight trace.	Trace.
		1899.								
1395	Well, Dexter	January 5,	11.4	2.4	8.14	.7	.001	.006	Slight trace	Much.
1396	Water supply, Auburn	January 4,	2.6	1.6	2.60	.2	.001	.012	None	Very slight trace.
1397	Well, Jay	January 4,	6.4	3.2	3.90	.8	.003	.002	Trace	Much.

1398	Well, Edmunds	December	24,	6.8	2.4	4.57	.4	.005	.007	Trace	Much.
1399	Well, Stonington	January	16,	14.6	5.4	3.90	3.4	.003	.028	Slight trace.	Much.
1400	Well, Stonington	January	16,	10.8	4.0	5.00	1.8	.001	.012	Slight trace.	Much.
1401	Well, Stonington	January	16,	9.0	2.6	3.64	1.6	.006	.010	Slight trace.	Heavy trace.
1402	Well, Augusta	February	23,	10.4	4.4	5.29	.4	.006	.007	None	Much.
1403	Well, Portland	March	8,	42.2	6.2	16.43	5.4	.003	.008	Heavy trace	Much.
1404	Spring, Gray	March	10,	3.6	1.4	3.25	.2	.001	.003	Trace	Heavy trace.
1405	Well, York	April	14,	12.8	4.0	4.57	2.2	.001	.005	Very slight trace.	Heavy trace.
1406	Well, Belfast	April	26,	14.0	2.8	7.43	.8	.003	.005	Very slight trace.	Heavy trace.
1407	Well, Canton	May	4,	33.8	12.4	7.43	3.6	.000	.010	Slight trace	Heavy trace.
1408	Well, Lyman	May	10,	5.0	3.8	3.25	.3	.006	.007	Trace	Trace.
1409	Well, Stonington	May	10,	15.6	4.8	5.29	3.2	.001	.017	Very slight trace.	Trace.
1410	Spring, Lisbon	May	11,	7.8	2.2	3 25	.4	.001	.002	Slight trace	Heavy trace.
1411	Spring, Paris	May	14,	4.6	1.6	1.43	.1	.000	.000	Very slight trace.	Very slight trace.
1412	Well, South China	May	15,	10.4	2.2	3.90	.8	.006	.002	Very slight trace.	Slight trace.
1413	Well, Augusta	May	22,	4.2	1.8	2.99	.4	.145	.045	Very slight trace.	Very slight trace.
1414	Spring, Saco	May	24,	13.6	2.8	7.43	.6	.005	.002	Very slight trace.	Trace.
1415	Spring, West Brooksville	....	....	......	......	1.27	.7	.001	.007	Slight trace	Very slight trace.
1416	Spring, West Brooksville	....	....	......	......	.48	.8	.007	.014	....	Very slight trace.
1417	Well, Skowhegan	May	26,	4.4	2.8	2.60	.4	.000	.006	Very slight trace.	Very slight trace.
1418	Well, North Livermore	May	26,	7.6	2.2	2.60	1.8	.000	.003	Slight trace.	Trace.
1419	Spring, Paris Hill	May	29,	4.0	2.2	1.95	.3	.000	.005	None	Very slight trace.
1420	Well, Waterville	June	1,	15.4	7.6	7.43	.8	.000	.006	Slight trace.	Slight trace.
1421	Spring, Washington	June	6,	7.8	2.0	2.60	.8	.001	.001	Very slight trace.	Very slight trace.
1422	Spring, Augusta	June	9,	7.8	1.8	2.60	.7	.003	.005	Trace	Trace.
1423	Well, Bangor	June	12,	19.6	4.8	8.14	2.2	.012	.005	Very slight trace.	Slight trace.
1424	Spring, Eastport	June	14,	14.8	4.2	6.71	2.0	.003	.009	Very slight trace.	Much.
1425	Spring, Brooksville	June	17,	4.4	3.0	1.27	.6	.000	.002	Slight trace	Trace.
1426	Spring, Brooksville	June	17,	4.2	1.4	1.27	.6	.007	.005	Trace	Heavy trace.
1427	Spring, Hampden	June	20,	5.4	3.0	2.60	.2	.001	.002	Very slight trace.	Trace.
1428	Spring, Hammond's Grove	June	20,	6.4	2.0	2.60	.6	.007	.004	Very slight trace.	Trace.
1429	Well, Hammond's Grove	June	20,	5.6	1.8	1.95	.3	.000	.000	Very slight trace.	Trace.
1430	Well, East Fairfield	June	21,	3.0	1.4	1.27	.3	.016	.007	Heavy trace	Trace.
1431	Water supply, Lamoine	June	22,	2.6	2.2	.48	.4	.001	.016	Slight trace	Very slight trace.
1432	Well, East Hampden	June	28,	35.0	14.6	12.56	4.0	.001	.003	Heavy trace	Much.
1433	Well, Embden	July	6,	31.8	18.0	5.29	2.8	.000	.012	Trace.	Much.
1434	Well, Manchester	July	6,	3.4	1.8	1.56	.1	.000	.004	Trace	Very slight trace.
1435	Well, Canton	July	5,	37.2	18.2	9.57	5.8	.001	.019	Slight trace.	Much.
1436	Well, Bangor	July	7,	21.8	6.4	8.86	1.0	.001	.016	Very slight trace.	Heavy trace.
1437	Well, Bangor	July	7,	6.2	2.6	3.90	.4	.005	.009	Slight trace	Trace.
1438	Spring, South Berwick	July	7,	6.4	3.2	2.21	.6	.010	.009	Heavy trace	Much.
1439	Spring, Paris Hill	July	11,	5.2	3.2	2.34	.1	.001	.006	Trace	Trace.
1440	Well, Ogunquit	July	17,	21.4	5.0	3.90	4.0	.014	.016	Trace	Much.
1441	Well, Oakland	July	17,	67.0	44.2	10.30	5.4	.001	.006	Slight trace	Very much.

ANALYSES OF SAMPLES OF WATER—EXPRESSED IN PARTS PER 100,000—Concluded.

Number of analysis.	Origin of Sample.	Date of collection.	Total solids.	Loss on ignition.	Hardness.	Chlorine.	Free ammonia.	Organic ammonia.	Nitrites.	Nitrates.
1442	Spring, Saco	July 17,	6.2	3.8	1.27	.6	.001	.002	Slight trace	Much.
1443	Spring, South Monmouth	July 25,	9.6	4.4	4.29	.3	.003	.007	Slight trace	Trace.
1444	Well, South China	August 8,	10.8	3.8	4.57	.6	.009	.002	Trace	Slight trace.
1445	Well, East Hampden	August 9,	17.2	3.6	8.86	.4	.003	.002	Trace	Very slight trace.
1446	Well, Augusta	August 14,	34.0	17.8	8.86	1.6	.001	.014	Trace	Much.
1447	Spring, Old Orchard	August 15,	13.2	6.0	6.00	.8	.009	.004	Slight trace	Slight trace.
1448	Spring, Augusta	August 22,	7.8	2.8	3.25	.2	.003	.010	Slight trace	Heavy trace.
1449	Water supply, Sanford	August 28,	3.8	1.8	1.95	.2	.000	.002	Very slight trace	Very slight trace.
1450	Well, Bangor	September 5,	19.2	6.8	8.14	.7	.003	.002	Trace	Much.
1451	Well, Manchester	September 14,	110.0	32.4	14.84	15.6	.354	.039	Much	Very much.
1452	Well, Portland	September 6,	2.0	1.2	.48	.2	.003	.003	Very slight trace	Very slight trace.
1453	Well, Portland	September 6,	2.8	2.0	.79	.2	.001	.002	Very slight trace	Very slight trace.
1454	Water supply, Fairfield	September 6,	3.6	2.6	1.27	.2	.006	.018	Very slight trace	Much.
1455	Well, Howland	September 7,	15.4	5.4	3.90	2.6	.001	.007	Heavy trace	Much.
1456	Moose Hill Pond, Livermore Falls	September 8,	2.6	2.4	1.27	.2	.002	.017	Slight trace	Heavy trace.
1457	Well, East Lebanon	September 12,	6.6	1.6	2.60	.4	.008	.003	Very slight trace	Very slight trace.
1458	Spring, Camden	September 13,	5.4	2.0	2.60	.4	.031	.005	Trace	Trace.
1459	Well, Gorham	September 15,	16.4	6.4	6.00	1.6	.004	.009	Heavy trace	Much.
1460	Well, Gorham	September 16,	12.2	4.4	5.29	1.0	.021	.010	Heavy trace	Heavy trace.
1461	Well, Bridgton	September 19,	11.4	3.8	3.25	2.2	.001	.005	Slight trace	Much.
1462	Spring, Belgrade	September 28,	5.4	2.6	2.60	.4	.001	.018	Trace	Trace.
1463	Spring, Rome	September 29,	3.8	1.8	1.69	.4	.006	.011	Trace	Trace.
1464	Spring, Alewive	September 28,	12.2	4.8	3.90	1.5	.001	.006	Trace	Much.
1465	Squaw Pond, Presque Isle	October 1,	3.4	2.2	1.27	.2	.000	.015	None	Very slight trace.
1466	Water supply, Presque Isle	October 2,	9.0	4.0	5.29	.2	.001	.010	Very slight trace	Very slight trace.
1467	Well, Hollis	October 3,	5.6	2.4	2.60	.3	.003	.002	Very slight trace	Slight trace.

1468	Well, South Paris	October 19,	4.6	.8	2.60	.2	.000	.006	Trace.	Very slight trace.
1469	Well, Sabattus	November 7,	49.2	19.2	12.56	6.0	.003	.011	Trace.	Much.
1470	Well, Limington	November 4,	7.6	3.0	3.25	.3	.003	.007	Trace	Heavy trace.
1471	Spring, Fairfield	November 6,	7.0	.8	6.00	.4	.000	.002	Trace.	Heavy trace.
1472	Spring, Fairfield	November 6,	8.0	1.6	8.14	.2	.000	.002	Heavy trace	Much.
1473	Well, Lebanon	November 12,	3.6	1.2	1.27	.2	.012	.002	Trace	Very slight trace.
1474	Well, Linnekin	November 15,	7.6	3.4	2.60	1.6	.000	.015	Slight trace	Slight trace.
1475	Well, South Litchfield	November 16,	100.4	40.0	72.08	9.6	.002	.015	Trace	Very much.
1476	Spring, Winterport	November 19,	16.0	4.8	11.05	.5	.004	.002	Much	Very slight trace.

NOTES ON A FEW OF THE SAMPLES OF WATER EXAMINED.

No. 1,298. A sample from the Rockland water supply. "Reporting on the sample of water which you sent, I will say that the results which we have obtained differ very little indeed from those got in the examination of five samples in 1888. The chemical results now obtained cannot be regarded as unfavorable. Of course you understand that a water may show no indications chemically of pollution, and yet there is the possibility that it may have been infected with the germs of typhoid fever. When the question of the infection of a public water supply arises, a careful inspection of the watershed should be made to determine whether possibilities or probabilities of infection are present. This would go father in settling the question than a chemical examination."

No. 1,305. "The water is naturally very pure and good for drinking purposes, and the whole trouble appears to be due to the solution of zinc from the galvanized iron pipe. The sample which was received, however, contained but a small quantity of this."

"As to the question of the harmfulness of zinc in drinking water, the authorities differ, nevertheless, I should deem it undesirable. After galvanized iron pipes are laid down, the dissolving of the zinc is much more rapid during the first few months or years than subsequently. The time during which the zinc is noticeable in the water depends largely upon the rapidity and continuousness of the flow of the water through the pipes. It would be better to have the continuous flow, both to accelerate the solution of the zinc, and to lessen the quantity that would be partaken in each portion of water."

No. 1,306. "The analysis of the sample of water sent by you February 7, indicates that it is of very excellent quality for drinking purposes. It is almost absolutely free from organic matter, has a very small quantity of inorganic matter (total solids) and is a very soft water for a well or spring water. There is hardly a better drinking water in the State, and it will remain good if the surroundings of the spring are protected from all possible sources of pollution."

No. 1,330. "Although your description of the surroundings of the well gives no indication of the source of the pollution, the water is badly polluted and so long as it remains in its present condition, it is of course unsuitable as a drinking water. After the water had been standing some time so that the sediment had entirely settled, the clear water contained a trace of iron, and water containing a little of the sediment had a heavy trace of iron. Water which contains iron in any considerable quantity is undesirable as a continuous source of drinking water."

No. 1,346. "The fact that the well goes down to a ledge and receives its water from a crevice in the ledge, indicates more danger of the pollution of the well from possible sources in the vicinity, than if the ledge or other impermeable stratum did not exist. The privy, especially, should be so managed that soakage into the ground of polluting matter from it will be avoided so far as possible."

No. 1,347. Sample from a dug well. "Reporting on the analysis of the sample of water sent by you some time ago, I would say that the chemical results are good, and I find no explanation of the offensive odor to which you refer. According to the statement in the blank which you return, the privy and the cesspool are well within the area of drainage of the well; that is, a well 20 feet deep would drain a circular area, the radius of which would be much more than 50 feet. It is possible, therefore, that although the natural trend of the drainage is from the well, the well may, at times, feel the effect of pollution from one of these sources,—the privy or cesspool."

No. 1,368. A sample from a well 15 feet deep. The water was polluted. "A water like this may, of course, be used for years with impunity, but the use of water for drinking in its natural or unboiled condition, which is free from suspicion of pollution, is preferable. The prime significance of a polluted water is that a well to which the channels are open for the transmission of polluting organic matter, is exposed to the possibility, at any time, of infection with dangerous germs which may come from the same source from which the polluting matter comes."

No. 1,373. From a well. A slight degree of pollution rendered the water suspicious. "There is, of course, no objections to using the water for ordinary domestic purposes, including the making of tea and coffee, although the hardness of the water renders it undesirable for many of these purposes; but that small quantity which is to be used for drinking in an unboiled condition, I should deem it preferable to obtain from some source which is free from the suspicion of pollution."

No. 1,385. From a spring remote from sources of pollution. The water was found to be good and pure. "This water also has the advantage of being a soft water for a spring water. It contains a very little mineral matter. The action upon the kidneys, which you have noted, is probably due to the fact that it is a soft and pure water."

No. 1,394. From a spring on Good Will Farm. "It is a good and pure water for drinking purposes. It contains but a slight trace of organic matter, and has but a moderate degree of hardness for a spring water. The degree of hardness of the Kennebec river water is slightly less than 2, while you will notice that the degree of hardness of this water is 6."

No. 1,404. A spring water brought 110 rods through lead pipe. "The analysis shows that it is a good, soft, and pure water for drinking and for any other purpose. I do not like the idea of bringing water through such a length of lead pipe. Soft waters like this are more likely to dissolve the lead, and thus cause lead poisoning. But the test for lead in this sample gives no trace of it. It happens, however, quite frequently, that a water does not dissolve the lead for some time or for many years, and then for some reason or other, the water has the power of rendering the lead soluble and symptoms of poisoning result. If any symptoms should arise in the future among the users of the water, which indicate a suspicion of lead poisoning, it would be well for you to have another analysis made of the water.

"The symptoms of lead poisoning are very various, but they may briefly be characterized: Paleness or a dull hue of the skin, digestive derangements; at the margins of the teeth and gums a bluish line is developed; colic; palsy, especially that called 'dropped wrist.' "

No. 1,407. From a well 25 feet deep. "The analysis of the sample of water which you sent May 5, indicates neither a very good nor a positively bad water. I am, therefore, unable from the figures obtained in the analysis to give a very positive opinion as to the extent of danger or safety in using the water. Sources of pollution,—the privy and the sink drainage—are near enough to be within the area of drainage of the well. I would, therefore, urge the need of the construction and management of the privy vault so as to prevent the pollution of the ground in the vicinity of the well. The need of this precaution, and the danger from the non-observance of it, should be emphasized by the fact that the strata above the blue clay are thoroughly permeable for liquid from the surface."

No. 1,409. From a well bored 67 feet deep, the report says: "The figures obtained in the analysis of the sample of water sent by you May 10, indicate that for a deep well water it is a fairly good drinking water, and possibly that statement does not quite do justice to the water. While the condition of the sample which you sent indicates that it may be safely used, a caution appears to be called for, even if the well was drilled through solid ledge from start to finish. While that may not be true of the ledge in your town, in many places the ledges are full of cracks and seams, which sometimes carry the surface drainage great depths or great distances laterally, into wells which have been drilled through them. For example, I know of one well 65 feet through 'solid ledge,' as it was called. The well was situated close to a barn-yard. The water from the beginning tasted so strongly of the surface drainage from the barn-yard that the cattle would not use it. Another well was drilled to the same depth seventy feet farther from the barn-yard. This for a little while furnished good water, but eventually, the soakage from the barn-yard reached it. The only safe rule with drilled wells, is to keep the surface around them clean and not have it polluted with the drainage from privies and similar places. The privy vault at this place is, perhaps, all right. The safest kind is one which is kept as nearly dry as possible."

No. 1,411. From a spring, a proposed source of public supply for the village of Paris Hill. The report says:

"The analysis of the sample of water sent by you May 14, shows that it is a very good and pure drinking water. It is withal, a very soft water for a spring water; it has, indeed, a lower degree of hardness than the average hardness of the principal rivers of this State,—the Androscoggin, Kennebec, Penobscot—about 1.95 for them. There is no better and purer water in the State than this, if the results obtained in this one analysis may be received as indicative of the usual and permanent condition of the water. This board, however, does not advise, in any case, basing a decision as to the source of a public water supply upon the results of chemical analyses alone. Your description of the surroundings of the spring do not indicate probabilities of pollution."

No. 1,413. From a well 30 feet in depth, blown 20 feet into ledge. "The analysis of the sample of water which you sent some time ago, shows that it is badly polluted. Several possible sources of pollution are much too near the well, and from some of these the well receives polluting matter, probably through a vein or crack which extends from the surface of the ledge downwards. It would be unsafe to use this water as a drinking supply."

No. 1,456. From a pond proposed as a public water supply. "Neither I nor this Board would wish to give an opinion as to the suitability of a proposed source of water supply based wholly upon chemical analyses and especially upon only one analysis, but the results obtained in the examination of this sample indicate a fairly good water although there is slightly more organic matter than the average for the public supplies in this State taken from lakes and ponds. It has the advantage of being quite a soft water,—a little softer than the average for lakes and ponds. Your description of the location does not indicate sources of pollution from human excreta; if it is true that there are no dangers of this kind that is one great advantage.

ADDITIONS TO THE LIBRARY.

During the years 1898 and 1899 the following books, pamphlets, and journals were added to the library of the Board by exchange and by purchase.

BOOKS.

Abbott. The Hygiene of Transmissible Diseases. Philadelphia. 1899.
Arnould. La Desinfection Publique. Paris.
Bashore. Outlines of Rural Hygiene. Philadelphia. 1897.
Cornet. Die Tuberculose. Wien. 1899.
Currier. Outlines of Practical Hygiene. New York. 1898.
Farrington and Woll. Testing Milk and Its Products. Madison, Wis. 1899.
Fuller. The Purification of the Ohio River Water at Louisville, Ky. 1898.
Gerhard. Sanitary Engineering. New York. 1898.
Gerhard. Sanitary Engineering of Buildings. Vol. I. 1899.
Griffith. The Care of the Baby. Philadelphia. 1898.
Hill. Public Water Supplies. New York. 1898.
Mason. Examinations of Water. New York. 1899.
Meigs. Feeding in Early Infancy. Philadelphia. 1896.
Merklen. La Tuberculose, Son Traitement Hygienique. Paris.
Merriman. Elements of Sanitary Engineering. New York. 1898.
Rohé. Text-book of Hygiene. Philadelphia. 1897.
Souchon. The Sanitary Code of the Louisiana State Board of Health. 1899.
Starr. Hygiene of the Nursery. Philadelphia. 1898.
Walters. Sanatoria for Consumptives. London. 1899.
Weyl. Handbuch der Hygiene. Parasitologie. Jena. 1898.

Whipple. The Microscopy of Drinking-Water. New York. 1899.

Congres pour l'etude de la Tuberculose. Paris. 1888, 1891, 1893, 1898.

Errichtung von Heilstätten für Lungenkranke. Berlin. 1897.

Investigations of Rivers and Deep Ground Waters of Ohio. 1897-98.

Index-Catalogue of Surgeon-General's Office, U. S. A. Vol. IV.

Public Baths and Public Comfort Stations. New York. 1897.

State Board of Health of Massachusetts. Epidemic Cerebro-Spinal Meningitis. Boston. 1898.

Statistiches Jahrbuch der Stadt. Berlin. 1896.

Year Book of the Department of Agriculture. Washington, D. C. 1897.

Transactions of the American Climatological Association. XIII. 1897.

Transactions of the American Climatological Association. XV. 1899.

REPORTS.

Connecticut. Twenty-first Annual Report of the State Board of Health. 1898.

Florida. Tenth Annual Report of the State Board of Health. 1899.

Indiana. Sixteenth Annual Report of the State Board of Health. 1897.

Kansas. Fourteenth Annual Report of the State Board of Health. 1898.

Massachusetts. Twenty-ninth Annual Report of the State Board of Health. 1897.

Massachusetts. Thirtieth Annual Report of the State Board of Health. 1898.

Michigan. Twenty-fourth Annual Report of the State Board of Health.

Minnesota. Sixteenth Report of the State Board of Health. 1895-98.

New Brunswick. Eleventh Annual Report of the Provincial Board of Health. 1897.

New Brunswick. Twelfth Annual Report of the Provincial Board of Health. 1898.

New Hampshire. Thirteenth Report of the State Board of Health. 1894-5.

New Hampshire. Fifteenth Report of the State Board of Health. 1897-8.

New Jersey. Twentieth Annual Report of the State Board of Health. 1896.

New Jersey. Twenty-first Annual Report of the State Board of Health. 1897.

New Jersey. Twenty-Second Annual Report of the State Board of Health. 1898.

New York. Seventeenth Annual Report of the State Board of Health. 1896.

New York. Eighteenth Annual Report of the State Board of Health. 1897.

Ontario. Sixteenth Annual Report of the Provincial Board of Health. 1897.

Ontario. Seventeenth Annual Report of the Provincial Board of Health. 1898.

Oklahoma. Fourth Biennial Report of the Territorial Superintendent of Public Health. 1897-98.

Pennsylvania. Twelfth Annual Report of the State Board of Health. 1896.

Pennsylvania. Thirteenth Annual Report of the State Board of Health. 1897.

Quebec. Third Annual Report of the Provincial Board of Health. 1897.

Quebec. Fourth Annual Report of the Provincial Board of Health. 1898.

Rhode Island. Nineteenth Annual Report of the State Board of Health. 1896.

Rhode Island. Twentieth Annual Report of the State Board of Health. 1897.

South Carolina. Nineteenth Annual Report of the State Board of Health. 1898.

South Dakota. Second Biennial Report of the State Board of Health. 1897-98.

Vermont. Eleventh Report of the State Board of Health. 1896-97.

Wisconsin. Seventeenth Annual Report of the State Board of Health. 1897.

Michigan. Thirtieth Annual Report on Births, Marriages, and Deaths. 1896.

New Hampshire. Fifteenth Report on Births, Marriages and Deaths. 1894-95.

New Hampshire. Sixteenth Report on Births, Marriages and Deaths. 1896-97.

Ontario. Report on Births, Marriages and Deaths. 1896.

Ontario. Report on Births, Marriages and Deaths. 1897.

Rhode Island. Forty-fifth Registration Report. 1897.

Asbury Park, N. J. Annual Report of Board of Health. 1898.

Auburn, Me. Thirtieth Annual Report of Receipts and Expenditures. 1899.

Augusta, Me. Health Department Reports. 1898-99.

Boston. Twenty-fifth Annual Report of the Health Department. 1896.

Boston. Twenty-sixth Annual Report of the Health Department. 1897.

Concord, N. H. Annual Reports of Health Department. 1897.

Denver, Colo. Report of Bureau of Health. 1897-98.

Grand Rapids, Mich. Annual Report of Board of Health. 1896-97.

Grand Rapids, Mich. Annual Report of Board of Health. 1897-98.

Lanark, Scotland. Eighth Annual Report of the Health and Sanitary Condition of the County. 1898.

Leith, Scotland. Third Annual Report of the Public Health Department.

Lawrence, Mass. Twentieth Annual Report of the Board of Health. 1897.

Lowell, Mass. Twenty-first Annual Report of the Board of Health. 1898.

Lynn, Mass. Annual Report of the Board of Health. 1897.

Manchester, N. H. Annual Report of the Board of Health. 1897.

Manchester, N. H. Annual Report of the Board of Health. 1898.

Newark, N. J. Annual Report of the Department of Public Health. 1897.

Providence, R. I. Fifteenth Annual Report of the Superintendent of Health. 1897.

Providence, R. I. Sixteenth Annual Report of the Superintendent of Health. 1898.

Rochester, N. Y. Annual Report of the Board of Health. 1897.

Sacramento, Cal. Report of the Health Officer of the Health Department. 1897.

Springfield. Report of the Board of Health. 1896.

St. Paul, Minn. Annual Report of the Health Commissioner. 1897.

St. Paul, Minn. Annual Report of the Health Commissioner. 1898.

Winona, Minn. Annual Report of the Board of Health. 1899.

Annual Report of the Health Officer of the Port of New York. 1897.

New Hampshire. Seventh Report of the Board of Commissioners of Lunacy. 1898.

Annual Report of the City Engineer of the City of Providence. 1898.

Report of the Commissioner of the District of Columbia. Vol. III. 1898.

Annual Report of the Supervising Surgeon-General, M. H. S., U. S. 1898.

Fourteenth Annual Report of the Bureau of Animal Industry. 1897.

Fifteenth Annual Report of the Bureau of Animal Industry. 1898.

Report of the Sewerage Commission of the City of Baltimore. 1897.

Ninth Annual Report of the Metropolitan Sewerage Commission. 1897.

Tenth Annual Report of the Board of Metropolitan Sewerage Commissioners for the year ending September 30, 1898. Boston.

Fourteenth Annual Report of the Adirondack Cottage Sanitarium. 1898.

Thirteenth Annual Report of the Illinois Society of Engineers and Surveyors. 1898.

Rapport presente au Conseil Communal en seance du 5 Octobre, 1898, par Le College des Bourgmestre et Echevins. Bruxelles. 1898.

Second Annual Report of the Trustees of the Massachusetts Hospital for Consumptives and Tubercular Patients. 1898.

A Supplement to the Second Annual Report of the Trustees of the Massachusetts Hospital for Consumptives. 1898.

Department of Agriculture. Cape of Good Hope. Report of the Colonial Veterinary Surgeon for 1897.

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Barnes. The Great White Plague, Consumption. New York. 1897.

Barnes. The Arid Atmosphere of our Houses in Winter. Boston. 1898.

Bertillon. De la Nomenclature des Maladies. Paris. 1898.

Chittenden. A Study of Some Infant Foods in Comparison with Mother's Milk. New York. 1896.

Conn. The Present Condition of Bovine Tuberculosis in Europe. 1899.

Dinwiddie. The Relative Virulence for the Domestic Animals of Human and Bovine Tubercle. Arkansas. 1899.

Gerhard. A Half Century of Sanitation. 1850-1899.

Gerhard. Theatre Sanitation. Brooklyn. 1898.

Formaldehyde Gas as a Germicidal Agent. New York. 1897.

Hesse. Ueber einer neuen Ersatz der Muttermilch. Dresden. 1896.

How to Prevent Consumption. 1898.

Johnston and Hammond. A Note upon Serum Diagnosis by Means of Dried Blood Samples in (Experimental) Cholera. New York. 1896.

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Lilly. Formaldehyde. Indianapolis.

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Tuberculous Cattle. Boston. 1897.

Whitaker. The Milk Supply of Boston. Washington. 1898.

Wilbur. The Mortality Statistics of the Eleventh Census.

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Woodbridge. Report of Committee on Car Sanitation. Ottawa. 1898.

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Movimento de la Casa de Orates de Santiago de Chile. 1897.

Movimento de la Casa de Orates de Santiago de Chile. 1898.

Eighteenth Annual Convention of National Funeral Directors' Association. Cincinnati, Ohio. 1899.

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Report of the Metropolitan Sewerage Commission on High-Level Gravity Sewer. Boston. January. 1899.

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Proceedings and Addresses at a Sanitary Convention at Detroit, Mich. December 9-10, 1897.

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The Engineering Record. New York. 1898-99.
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Medical Times. New York. 1898-99.
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Modern Medicine. Battle Creek, Mich. 1898-99.
Occidental Medical Times. Sacramento, Cal. 1898-99.
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American Physical Educational Review. Boston. 1898-99.
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Monthly Bulletin of the Iowa State Board of Health. Des Moines. 1898-99.

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Index Medicus. Detroit and Boston. 1898-99.

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Archiv für Hygiene. Munich und Leipzig. 1898-99.

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Boletin del Consejo Superior de Salubridad. Mexico. 1898-99.

ABSTRACTS FROM THE REPORTS OF THE LOCAL BOARDS OF HEALTH.

ABBOT. 1898. No cases of infectious disease.—J. C. Dill, Sec.

1899. Two cases of scarlet fever and two of typhoid.—D. M. Kimball, Sec.

ACTON. No contagious diseases in either year except one case of typhoid fever in 1899, which was not reported as the law requires.—B. J. Grant, Sec.

ADDISON. 1898. Three cases of typhoid fever.

1899. Twelve cases of scarlet fever, but no other infectious disease.—N. W. Curtis, Sec.

ALBANY. 1898. No infectious diseases.—F. E. Bean, Sec.

1899. No contagious diseases reported.—Charles Beckler, Sec.

ALBION. 1898. No cases of infectious disease.

1899. One nuisance removed. Five cases of scarlet fever.—Dr. E. P. Day, Sec.

ALEXANDER. We are glad to report that our town has been very fortunate in regard to contagious diseases, not having had a case for the past two years.—A. H. Perkins, Sec.

ALFRED. 1898. Two nuisances removed. Six cases of diphtheria. In these cases antitoxin was used with good results.

1899. One nuisance removed. One case of typhoid fever.—Dr. C. E. Lander, H. O.

ALNA. 1898. No contagious diseases reported.

1899. Two cases of scarlet fever.—A. B. Erskine, Sec.

ALTON. 1898. No infectious diseases.

1899. Eight cases of scarlet fever in three houses. We disinfected with formaldehyde and sulphur.—H. L. McKechnie, Sec.

AMHERST. No contagious diseases in either year.—H. Watts, Sec.

AMITY. 1898. One case of typhoid fever.

1899. No infectious diseases.—Geo. E. Nickerson, Sec.

ANDOVER. 1898. No contagious diseases.

1899. Two nuisances were removed. One case of typhoid fever.—Geo. O. Huse, Sec.

ANSON. 1898. One nuisance removed. Twelve cases of scarlet fever in four houses. We shall soon make an inspection of our milk farms, especially in regard to the water which the animals drink and the cleanliness of the outbuildings.

1899. Two nuisances removed. One case of diphtheria, three of scarlet fever, and one of typhoid. In the diphtheria case, antitoxin was used with good results.—T. H. Spear, Sec.

APPLETON. No infectious diseases in either year. The death-rate for 1898 was the lowest for years.—G. B. Thompson, Sec.

ARGYLE. 1898. Four cases of typhoid fever. As a rule, we have been blessed with good health for the past year.

1899. Two nuisances removed. Four cases of scarlet fever and six of typhoid.—J. M. Freese, Sec.

ARROWSIC. No infectious diseases reported in either year.—J. McFadden, Sec.

ASHLAND. 1898. Three nuisances reported and removed. No contagious diseases.

1899. Two nuisances removed. Four cases of scarlet fever and one fatal case of cerebro-spinal meningitis. Whenever cases of pulmonary tuberculosis have occurred, Circular No. 54, on Consumption, was given to the members of the family, with instructions to guard against infection. The sick-rooms were disinfected by vaporizing formalin pastils in Schering's lamp, and by washing floors, woodwork, etc., with a solution of corrosive sublimate. Forty-three primary vaccinations were made in the spring, with only one failure.—Dr. H. L. Dobson, Sec.

ATHENS. We had four cases of typhoid fever in 1898, and two cases in 1899, but no other infectious diseases.—Dr. L. N. Ellingwood, H. O.

ATKINSON. 1898. No infectious diseases.

1899. One nuisance removed. One case of scarlet fever and a number of cases of measles.—J. C. Campbell, Sec.

AUBURN. 1898. Nineteen nuisances were removed. Fifteen cases of diphtheria, sixty of scarlet fever, and five of typhoid.

1899. Fifty-one nuisances reported, all of which were removed. Three cases of smallpox, thirty of diphtheria, fifty-eight of scarlet fever, and seven of typhoid fever. In the cases of diphtheria, antitoxin was used very generally and the results were good. In cases of pulmonary tuberculosis, we have given instructions as advised by the State Board of Health, and our board has disinfected with formaldehyde lamp.—Dr. A. M. Peables, Sec.

AUGUSTA. 1898. One hundred and sixty nuisances were reported, one hundred and forty-eight of which were removed. Nine cases of diphtheria, seven of scarlet fever, and seventy-two of typhoid fever. Our board has been aggressive in securing sewers when needed. We obtained an appropriation of $6,000 for that purpose, which has been well used. Not a case of typhoid fever existed in the city for three months prior to the advent of the soldiers, on their return from the South. Immediately upon that we had an outbreak due to sporadic infection. I am firmly convinced that the water supply of our city has been accused of more than it is guilty of. Much literature relating to preventive methods in infectious diseases has been circulated among the people.—Dr. G. M. Randall, H. O.

1899. Forty-four nuisances reported to the board, twenty-eight of which were removed. One case of smallpox, fourteen of diphtheria, eighty-five of scarlet fever, and forty-two of typhoid fever. Probably in one-half the diphtheria cases reported, antitoxin was administered with very satisfactory results when used early in the disease. Disinfection with steam and formaldehyde was used in these cases.—Dr. O. C. S. Davies, H. O.

AURORA. No infectious diseases in either year.—H. T. Silsby, Sec.

AVON. 1898. No contagious diseases reported to the board. —Fred Morton, Sec.

BAILEYVILLE. We have had no outbreaks of contagious disease in either year.—Michael Maloy, Sec.

BALDWIN. 1898. Three cases of diphtheria, two of scarlet fever, and eight of typhoid.

1899. Four cases of diphtheria, and six of typhoid fever. The diphtheria cases were in two houses which were small and crowded. We at once had all the well occupants examined by a physician, and transferred to other buildings where they were kept under quarantine until all danger was over. We used antitoxin with good results.—Ambrose Spencer, Sec.

BANCROFT. 1898. One nuisance removed. No infectious diseases.—Wm. Quimby, Sec.

1899. We have no contagious diseases to report. One nuisance removed.—Thos. Fitzpatrick, Sec.

BANGOR. 1898. One hundred and thirty nuisances were reported, all of which were removed or discontinued. Five cases of diphtheria, forty-seven of scarlet fever, and fifty-two of typhoid fever. We have built 3,897 feet of new sewers this year. Whenever we know of cases of pulmonary tuberculosis, we advise great care in disposing of the sputum, and disinfect with formaldehyde.

1899. One hundred and twenty nuisances reported and removed. Three cases of diphtheria, sixty of scarlet fever, and twelve deaths from typhoid fever. We used antitoxin in one case of diphtheria with good results. This year we constructed 9,292 feet of new sewers. A large number of old privies were removed, and water-closets connecting with the sewers were put in, which improves the sanitary condition of our city very much. —John Goldthwait, Sec.

BARING. 1898. Three cases of scarlet fever and two of typhoid fever.

1899. No contagious diseases or nuisances have been reported to our board in the past year.—Jos. Stevens, Sec.

BATH. 1898. Four nuisances reported, three of which were removed. Two cases of scarlet fever and ten of typhoid.

1899. Four nuisances removed. One case of diphtheria, thirty-six of scarlet fever, and five of typhoid fever. We used antitoxin in the case of diphtheria with fine results.—Dr. E. J. Marston, H. O.

BEDDINGTON. No nuisances or infectious diseases in either year.—A. F. Libbey, Sec.

BELFAST. 1899. Three nuisances removed. We had fourteen cases of scarlet fever and two of typhoid.—Dr. E. L. Stevens, H. O.

BELGRADE. 1898. Four cases of typhoid fever, but no other contagious disease.—H. H. Adams, Sec.

BELMONT. One case of scarlet fever in 1898, and one each of diphtheria and of scarlet fever in 1899, is all we have to report. –C. R. Andrews, Sec.

BENEDICTA. As we have had no contagious diseases for the past two years, there has been no business for the board.—T. F. Ryan, Sec.

BENTON. 1898. One nuisance removed. Three cases of diphtheria and ten of typhoid fever. Antitoxin was used with good results in the diphtheria cases.

1899. Ten cases of scarlet fever, but no other infectious diseases.—A. L. Plummer, Sec.

BERWICK. 1898. Ten nuisances removed. One case of diphtheria and two of typhoid fever.

1899. One nuisance removed. Five cases of diphtheria, three of scarlet fever, and one of typhoid. The cases of diphtheria were all in one family. Antitoxin was used, and all recovered. I believe in a *full* dose *early*. We have been having an epidemic of measles necessitating the closing of our village schools.—Dr. H. V. Noyes, Sec.

BETHEL. 1898. One case of diphtheria was all the infectious disease we had. We have advocated better sewerage and worked to that end, until, with the aid of the municipal officers, a good beginning in that direction was made the past season.—A. W. Grover, Sec.

1899. Fourteen cases of scarlet fever in eight houses.—E. C. Park, Sec.

BIDDEFORD. 1898. Forty-nine nuisances were reported to the board, thirty-seven of which were removed. Forty cases of diphtheria, seventy-six of scarlet fever, and twenty-eight of typhoid. Thirty-eight of the diphtheria cases were in the French settlement, and, so far as the board of health is informed, antitoxin was not used. The greatest need of this city to make its sanitary condition what it ought to be, is a larger expenditure of money in constructing sewers. Our system of sewerage is very defective.

1899. Of thirty-nine nuisances reported, thirty-one were removed. Thirty-three cases of diphtheria, seventy-six of scarlet fever, and thirty-seven of typhoid fever. Antitoxin has been used in nearly all cases of diphtheria occurring in American families, generally with favorable results. Disinfection with formaldehyde was done in the diphtheria and scarlet fever cases. —Dr. John Lord, Sec.

BINGHAM. We have had no infectious diseases or nuisances in either year. In 1898, good, pure, spring water was supplied to the inhabitants of the village, and quite a number of the farmers have discarded their wells for this water. In 1899, there were three cases of pulmonary tuberculosis resulting in death. These cases occurred in intelligent, well-to-do families, and every precaution to prevent infection was taken, both during the sickness and after the death of the patients.—T. F. Houghton, Sec.

BLAINE. 1898. Five cases of scarlet fever and one of typhoid. We made an improvement in the village sewer this summer, and have been more strict in having cesspools and privies cleaned and disinfected. Our observation as a board has been that since we have been careful in the matter mentioned above, we have been remarkably exempt from contagious diseases.—G. W. Young, Sec.

1899. Six cases of scarlet fever and one of typhoid. In the past three or four years, the board of health of this town has been very careful to make a tour of inspection, especially in the spring, and to compel every one to clean up the premises and dispose of all filth and garbage which, in our opinion, might be a source of infection to the community. In other ways we have tried to enforce the laws as best we could, and we think we have seen the good results in the quite general absence of epidemics of infectious diseases.—Dr. A. J. Fulton, H. O.

BLANCHARD. We have had no contagious diseases during the two years.—E. P. Blanchard, Sec.

BLUEHILL. 1898. Five cases of diphtheria and six of typhoid fever. The diphtheria cases were all in one house.

1899. One case of scarlet fever and three of typhoid. When we have had cases of pulmonary tuberculosis, we have tried to impress upon the patients the duty of a proper disposal of the sputum in order to avoid infection.—Dr. R. P. Grindle, Sec.

BOOTHBAY. 1898. Two nuisances removed. One mild case of diphtheria, one of scarlet fever, and two of typhoid fever.

1899. Three nuisances reported and removed. Three cases of typhoid fever, but no other infectious diseases.—Byron Giles, Sec.

BOOTHBAY HARBOR. 1898. Five nuisances were reported, four of which were removed. No infectious diseases.—H. Hartung, Sec.

1899. Five nuisances removed. Two cases of typhoid fever. —Dr. A. J. Stimpson, Sec.

BOWDOIN. 1898. One nuisance removed. We have had no infectious diseases, with the exception of one case of typhoid fever.

1899. One case of diphtheria and one of typhoid fever.—W. B. Chase, Sec.

BOWDOINHAM. 1898. Six cases of typhoid fever, but no other contagious disease.—Dr. I. C. Irish, Sec.

1899. Six nuisances reported, all of which were removed. Fourteen cases of scarlet fever and two of typhoid. In all cases of contagion reported, a strict quarantine has been maintained.—L. M. Fulton, Sec.

BOWERBANK PLANTATION. No infectious diseases in either year. We make an inspection every summer, visiting each house to see that sink spouts and other sources of infection are properly looked after. Otherwise the board has had nothing to do.—Almon Dow, Sec.

BRADFORD. One case of typhoid fever in 1899, but no other infectious disease in the two years.—L. W. Coy, Sec.

BRADLEY. 1898. Five nuisances reported and removed. Three cases of typhoid fever. It is believed that these cases of typhoid fever were caused by poor water.—F. M. Perkins, Sec.

1899. Four cases of scarlet fever and five of typhoid.—H. H. Bullen, Sec.

BREMEN. 1898. No contagious diseases.

1899. One case of typhoid fever.—W. B. Hilton, Sec.

BRIDGEWATER. 1898. One nuisance reported and removed. One case of typhoid fever.

1899. One nuisance removed. Two cases of scarlet fever and fourteen of typhoid.—Percy Sargent, Sec.

BRIDGTON. 1898. One nuisance removed. No contagious diseases.

1899. Two nuisances removed. Two cases of typhoid fever, two of measles, and one of whooping-cough.—I. S. Webb, Sec.

BRIGHTON PLANTATION. No infectious diseases in either year.—J. C. Adams, Sec.

BRISTOL. 1898. Five nuisances reported, four of which were removed. Two cases of typhoid fever. By way of improvement we have established a system for the removing of fish offal along the shores of New Harbor and Pemaquid Point, and have put up signs forbidding the depositing of the same within the limits of the harbor.

1899. Three nuisances removed. One case of typhoid fever. —Geo. E. Little, Sec.

BROOKLIN. 1898. Two nuisances removed. One case of scarlet fever and one of typhoid. The last of November, we had an epidemic of colds, which, in some cases, developed into pneumonia, but there were no fatalities.

1899. The past year has been a remarkably healthful one in this town, no cases of epidemic or contagious diseases having occurred. A cow, found to be tuberculous, was killed.—E. P. Cole, Sec.

BROOKS. 1898. No infectious diseases.—M. J. Dow, Sec.

1899. One case of diphtheria and one of scarlet fever.—Dr. N. R. Cook, Sec.

BROOKSVILLE. No infectious diseases in 1898. In 1899, three cases of typhoid fever which originated outside the town.—Dr. L. A. Stewart, Sec.

BROOKTON. 1898. Two cases of typhoid fever.

1899. No contagious diseases.—A. O. Fish, Sec.

BROWNFIELD. One case of typhoid fever in 1898, but no other infectious disease in the two years.—H. F. Fitch, Sec.

BROWNVILLE. 1898. Twenty nuisances reported and removed. Four cases of diphtheria, five of scarlet fever, and three of typhoid. The great need of this town is some kind of a sewer system.

1899. Five nuisances removed. Three cases of diphtheria and thirty of scarlet fever. Some of the cases of scarlet fever were not reported, as the law requires.—T. W. Pratt, Sec.

BRUNSWICK. 1898. Twelve nuisances reported to the board and nine removed. In three cases, it was found no nuisance existed. One case of diphtheria, twenty-two of scarlet fever, and three of typhoid.

1899. Fourteen nuisances removed. Twelve cases of diphtheria, nineteen of scarlet fever, and three of typhoid fever. Antitoxin was used in the diphtheria cases with uniformly good results, except in cases of laryngeal diphtheria seen late in the course of the disease. In cases of pulmonary tuberculosis, we advised care in regard to the sputum, and the disinfection of the room with formaldehyde.—Dr. C. H. Cumston, Sec.

BUCKFIELD. 1899. Two nuisances removed. No infectious diseases.—Arthur E. Cole, Sec.

BUCKSPORT. 1898. Eight nuisances reported, seven of which were removed. One case of scarlet fever. About five hundred feet of sewer pipe was laid in the central part of the village under the direction of the board of health.—P. P. Gilmore, Sec.

1899. Two cases of scarlet fever.—F. W. Smith, Sec.

BURLINGTON. Our board has very little to do, as we have had no contagious diseases for the last two years. Five nuisances were reported in 1898, and they were all removed.—Chas. Barker, Sec.

BURNHAM. 1899. One case of scarlet fever and three of typhoid. In cases of pulmonary tuberculosis, we have tried to educate the people to take every precaution advised by the State Board of Health.—N. E. Murray, Sec.

BUXTON. 1898. Five nuisances reported and removed. One case of diphtheria and two of typhoid fever.

1899. Two nuisances removed. Two cases of diphtheria, one of scarlet fever, and eight of typhoid fever. In one case of diphtheria we used antitoxin with good results. We distribute circulars on consumption to patients with pulmonary tuberculosis, and instruct them to burn the sputum.—Dr. A. H. Weeks, Sec.

BYRON. We have had no contagious diseases reported during the two years.—H. H. Richards, Sec.

CALAIS. 1898. Thirty nuisances reported, all of which were removed. Two cases of diphtheria, thirty-eight of scarlet fever, and five of typhoid fever. Quite a number of the scarlet fever cases were of so mild a type that they were not reported. This made it very difficult to get the disease under control.

1899. Eleven nuisances removed. Five cases of diphtheria, twelve of scarlet fever, and seven of typhoid fever. We used antitoxin in all the cases of diphtheria, with recovery in all but one. Beginning with last September, we have required vaccination of all pupils in the public schools.—Dr. J. R. N. Smith, Sec.

CAMBRIDGE. 1898. One case of typhoid fever and one of measles. One nuisance removed.

1899. Three cases of scarlet fever. Two nuisances reported and removed.—M. A. Thurston, Sec.

CAMDEN. 1898. Seven nuisances reported to the board, six of which were removed. Sixteen cases of scarlet fever and four of typhoid.

1899. Fourteen nuisances reported, and nearly all removed. Three cases of scarlet fever and five of typhoid.—A. Buchanan, Sec.

CANAAN. 1898. Two nuisances removed. La grippe and pneumonia have been the only diseases we have had to contend with the past year.

1899. Four cases of typhoid fever. Three nuisances removed. —Dr. L. W. Shean, Sec.

CANTON. 1898. One case of typhoid fever.

1899. Three nuisances removed. Possibly one case of typhoid fever.—R. A. Barrows, Sec.

CAPE ELIZABETH. 1898. One nuisance removed. One case of typhoid fever, and five cases of measles in April and May.

1899. Three nuisances reported, of which two were removed and one abated. One case of diphtheria, five of scarlet fever, and one of typhoid fever. Antitoxin was used with good results in the case of diphtheria.—E. F. Hill, Sec.

CARATUNK. 1898. No infectious diseases.—W. D. Moore, Sec.

1899. No diseases of any kind reported.—C. L. Witham, Sec.

CARIBOU. 1899. Five nuisances reported to the board, three of which were removed. One case of scarlet fever and nine of typhoid fever. Some progress was made in vaccinating the community.—Dr. J. Cary, Sec.

CARMEL. Two nuisances were removed in 1898. No contagious diseases in either year.—F. A. Simpson, Sec.

CARROLL. This is a very healthful town; we have had no contagious diseases for the last two years. In 1898, one nuisance was removed.—Hiram Stevens, Sec.

CARTHAGE. 1898. No contagious diseases.

1899. Six cases of diphtheria, all in one house. In five of these cases, antitoxin was used with good results.—C. F. Eaton, Sec.

CARY PLANTATION. 1898. One case of typhoid fever.—L. P. Libby, Sec.

CASCO. We have had no contagious diseases in the two years, with the exception of three cases of typhoid fever in 1898, and two in 1899. One nuisance removed each year.—Dr. Walter Corliss, Sec.

CASTINE. 1898. Eight nuisances removed. No infectious diseases. We are educating the people to see that it is to their interest to promptly report all cases of contagious and infectious diseases, and that it is best to have a case promptly quarantined and the disease stamped out, rather than to let it spread and injure their business, to say nothing of the expense for medical bills and the risk to life. We are prompt to see that all nuisances are abated at once.

1899. Three nuisances reported, all of which were removed. One case of diphtheria, but no other infectious disease. We are still extending our water-plant.—Dr. S. J. Wallace, Sec.

CASTLE HILL PLANTATION. 1898. No contagious diseases reported.

1899. One nuisance removed. Eighteen cases of scarlet fever and one of typhoid fever.—F. C. Dudley, Sec.

CASWELL PLANTATION. The only contagious disease we have had in the two years has been scarlet fever. We had thirteen cases of this in 1898, and sixteen in 1899. In the latter year, nine nuisances were removed.—Johnson Caldwell, Sec.

CENTERVILLE. No infectious diseases in the two years. One nuisance removed in 1899.—Chas. W. Caler, Sec.

CHAPMAN PLANTATION. No contagious diseases reported in the two years.—E. C. Cook, Sec.

CHARLESTON. 1898. One nuisance removed. Whooping-cough to some extent during the fall.

1899. Four cases of typhoid fever and a few cases of whooping-cough. None of the cases of typhoid fever originated here; all from abroad where the patients worked, on the Penobscot river and in Boston. The case from Boston was caused by using infected milk; the others, by drinking river water. On the whole, the sanitary condition of our town has been remarkably good.—Dr. Geo. B. Noyes, H. O.

CHARLOTTE. 1898. We have had no contagious diseases, and the board has had no business to do.—F. J. Sprague, Chr.

1899. There have been no infectious diseases in town this year.—F. J. Damon, Sec.

CHELSEA. 1898. One nuisance removed. No infectious diseases.

1899. One case of diphtheria and five of scarlet fever.—W. T. Searls, Sec.

CHERRYFIELD. 1898. No contagious diseases.

1899. Two cases of scarlet fever and six of typhoid.—Dr. W. A. Van Wart, Sec.

CHESTER. No infectious diseases in our town the past two years.—J. D. Kyle, Sec.

CHESTERVILLE. 1898. One case of diphtheria, two of scarlet fever, and two of typhoid. In the case of diphtheria, the disease was contracted in an adjoining town. We believe the prompt measures taken by the board of health in this and the scarlet fever cases prevented the further spread of these diseases.—Dr. F. E. Hoyt, Sec.

1899. No contagious diseases during the past year.—Dr. D. H. Holmes, Sec.

CHINA. 1898. One nuisance reported and removed. One case of diphtheria, two of scarlet fever, and three of typhoid fever. The case of diphtheria was in a mild form, but we used antitoxin with good results.

1899. One case of typhoid fever.—Dr. G. J. Nelson, Sec.

CLIFTON. No contagious diseases in 1898. In 1899, we had two doubtful cases of scarlet fever, but, for the safety of the public, the house was quarantined and all necessary precautions taken.—Wm. H. Parks, Sec.

CLINTON. 1898. Two nuisances removed. One case of scarlet fever and two of typhoid.

1899. One case of diphtheria and one of typhoid fever. We have had an epidemic of whooping-cough, about fifty cases in all.—Dr. A. A. Shaw, Sec.

CODYVILLE PLANTATION. There have been no cases of contagious diseases in the plantation for the two years.—Thos. O. Hill, Sec.

COLUMBIA. We have had no cases of any kind of contagious disease in our town this year, or last.—John E. Stewart, Sec.

COLUMBIA FALLS. 1898. Nothing in the way of infectious disease reported.—E. A. White, Sec.

1899. No contagious diseases this year.—G. L. Bucknam, Sec.

CONCORD. No contagious diseases, either in 1898 or in 1899. —Wm. Littlefield, Sec.

CONNOR PLANTATION. 1898. No infectious diseases reported to the board.—Louis Dionne, Sec.

COOPER. 1898. Two cases of typhoid fever.—W. G. Day, Sec.

COPLIN PLANTATION. 1898. There have not been any contagious diseases in our plantation.—F. T. Blackwell, Sec.

CORINNA. 1898. Three nuisances removed. Two cases of diphtheria and two of typhoid fever. Several sewer connections have been made with the main sewer, and, with few exceptions, the town proper is in a good sanitary condition.—Dr. J. A. Tabor, Sec.

1899. Six nuisances reported, of which five were wholly removed, and one, partially. While this report does not show that we are very much alive in regard to sanitary matters, we are making an effort to do better work each year. We have had no contagious diseases this year, but, in case we should have an outbreak, we shall undoubtedly use formaldehyde.—Dr. F. L. Redman, Sec.

CORINTH. 1898. Two cases of scarlet fever and four of typhoid. We have had quite a prevalence of whooping-cough and several cases of measles, so that most of the winter schools had to be closed.

1899. One nuisance removed. Two cases of scarlet fever and one of typhoid fever.—F. H. Skinner, Sec.

CORNISH. 1898. Eight nuisances reported, of which seven were removed. Five cases of diphtheria, four of scarlet fever, and one of typhoid fever. Antitoxin was used in the diphtheria cases with good results.—Geo. H. Parker, Sec.

CORNVILLE. We have been highly favored for the last two years, not having had a case of contagious disease. The board has not been called upon to do anv work, but we hold ourselves in readiness in case our services should be needed.—S. S. Woodman, Sec.

CRANBERRY ISLES. We have had no contagious diseases in the past two years, with the exception of a few cases of measles in 1899, but these were in a very mild form. Our sewers and drains are kept in first-class order, and our town is in a very healthful condition.—G. W. Bulger, Sec.

CRAWFORD. In 1898, we had several cases of measles and whooping-cough, so the school was closed, but no other infectious diseases in either year. One nuisance removed each year. —J. P. Jeffery, Sec.

CRIEHAVEN PLANTATION. No contagious diseases in either year. We look carefully after the cellars and sink drains, and the general health of the island is good. We had all the children vaccinated in 1899.—E. W. Crie, Sec.

CRYSTAL PLANTATION. 1898. One nuisance removed. One case of typhoid fever.

1899. Three nuisances removed. Two cases of scarlet fever and one of typhoid.—A. A. Emerson, Sec.

CUMBERLAND. One nuisance removed in 1898, but no contagious diseases. In 1899, there were eight cases of scarlet fever and two of typhoid fever.—Dr. H. M. Moulton, H. O.

CUSHING. No contagious diseases reported in the two years, except three cases of diphtheria in 1898. We try to exercise great care in the matter of drainage.—N. R. Hyler, Sec.

CUTLER. One case of scarlet fever in 1899, is all we have to report for the two years. Our town being near the seaboard is very healthful.—Lucius Davis, Sec.

DALLAS PLANTATION. 1898. No infectious diseases.—C. D. Niles, Sec.

1899. There has not been a case of contagious disease for the past year in our place.—Ella G. Adams, Sec.

DAMARISCOTTA. 1898. One case of scarlet fever is all we had in the way of contagious diseases.

1899. Two nuisances removed. No infectious diseases. A greater number availed themselves of vaccination this year than heretofore. The one thing we need now is a sewer through Main street to the river. The distance is short, straight, and all ready to grade. We have excellent water with high pressure.—A. H Snow, Sec.

DANFORTH. Seven nuisances removed each year. One case of diphtheria in 1898.—M. L. Porter, Sec.

DAYTON. 1898. One case of scarlet fever. A few cases of pseudo membranous inflammation of the throat have occurred, but no epidemic has been general in our town the past year. We have endeavored to remind all of the importance of the location of their wells, as these are the main source of the water supply.

1899. No cases of diphtheria, scarlet fever, or typhoid fever reported, but influenza and pneumonia prevailed during the months of January and February to quite an unusual extent. Measles appeared in one family. My advice to all is to keep away from contagious and infectious diseases so far as possible. —Dr. Geo. Sylvester, H. O.

DEAD RIVER PLANTATION. 1898. No infectious diseases, with the exception of one case of typhoid fever which was contracted ten miles from here at a lumber camp.—S. A. Parsons, Sec.

1899. No cases of contagious disease.—C. C. Sampson, Sec.

DEBLOIS. No infectious diseases in either year.—A. H. Wilson, Sec.

DEDHAM. 1898. One case of typhoid fever.

1899. One nuisance removed. No contagious diseases reported.—C. J. Camber, Sec.

DEERING. 1898. Fourteen nuisances reported, all of which were removed. Twenty-six cases of diphtheria, five of scarlet fever, and seven of typhoid fever. In the diphtheria cases antitoxin was used with the best of results. The secretary recalls no deaths from this disease in the city. When we have cases of pulmonary tuberculosis, care has been used to disinfect articles used by patient and nurses, and the sputum burned. In all contagious diseases, we now use formaldehyde gas instead of sulphur for disinfection.—Dr. R. F. Goodhue, Sec.

DEER ISLE. 1898. One case of diphtheria and three of scarlet fever.

1899. Sixteen cases of scarlet fever, in nine houses.—Geo. W. Small, Sec.

DENMARK. 1898. One nuisance removed. No infectious diseases.

1899. One nuisance removed. Two cases of diphtheria. In one of these cases, antitoxin was used with good results.—Dr. S. T. Brown, Sec.

DENNISTOWN PLANTATION. 1898. No contagious diseases. —Charles Stewart, Sec.

1899. There have been no cases of infectious disease this year.—James H. Wilson, Sec.

DENNYSVILLE. No contagious diseases reported to the board for the last two years.—F. L. Gardner, Sec.

DETROIT. 1898. One case of typhoid fever. Two nuisances removed.

1899. Two cases of typhoid fever. One nuisance removed. —Parker Sawyer, Sec.

DEXTER. 1898. Three nuisances removed. One case of diphtheria, four of scarlet fever, and eight of typhoid fever.

1899. Four nuisances reported and removed. One case of diphtheria, eight of scarlet fever, and ten of typhoid fever.— Edgar A. Russ, Sec.

DIXFIELD. 1898. We have been fortunate the past year in having no contagious diseases in town, with the exception of measles of which we had quite an epidemic, some cases being very severe.

1899. One case of typhoid fever is the only contagious disease we have had.—Dr. J. S. Sturtevant, Sec.

DIXMONT. Nothing in the way of infectious diseases during the last two years.—B. D. Prilay, Sec.

DOVER. 1898. Four cases of typhoid fever. Owing to the small number of cases of contagious disease, the work of this board has been very light. Five hundred feet of good sewers were laid this year. The general practice of our people has been to keep their premises in good sanitary condition; this state of affairs has been brought about very largely by the suggestions of the board of health.

1899. Two nuisances reported and removed. Six cases of scarlet fever, two of typhoid fever, and three of measles.—G. G. Downing, Sec.

DRESDEN. 1898. Two cases of scarlet fever and three of typhoid fever.

1899. One case of diphtheria and one of typhoid fever.—Dr. L. H. Dorr, Sec.

DREW PLANTATION. 1898. We have not been called upon to do any work in the year just past. All the contagious diseases in the plantation were chicken-pox in January, and whooping-cough in September and October.

1899. So far as we know, the plantation has been free from contagious diseases the last year.—Frank I. Grant, Sec.

DURHAM. No contagious diseases, with the exception of one case of diphtheria in 1899. Antitoxin was used with good success for its curative effect in this case, and for its prophylactic effect in two others. One animal, found to have tuberculosis, was killed. In 1898, one nuisance was removed.—Dr. J. L. Wright, Sec.

DYER BROOK. 1898. No infectious diseases, with the exception of measles in the early part of the summer.—A. F. Lougee, Sec.

1899. One nuisance removed. No contagious diseases.—L. S. Townsend, Sec.

E PLANTATION. 1899. No contagious diseases.—Edwin McGrey, Clerk.

EAGLE LAKE PLANTATION. No infectious diseases in the last two years.—J. M. Brown, Sec.

EASTBROOK. 1898. No cases of contagious disease.—Alden Dyer, Sec.

1899. We have not had any infectious diseases.—S. S. Butler, Sec.

EAST LIVERMORE. 1898. Four cases of scarlet fever and six of typhoid fever. Eight nuisances were reported and removed.

1899. Two cases of diphtheria and three of typhoid fever. Antitoxin was used in the diphtheria cases both for prevention and for cure.—Dr. C. H. Gibbs, Sec.

EASTPORT. 1898. About sixty nuisances were attended to. Three cases of diphtheria, three of scarlet fever, and thirteen of typhoid. In the diphtheria cases, antitoxin was used with good success. The city has now about 4,000 feet of sewerage in a section where it was most needed.

1899. Thirty-three nuisances reported, all attended to. Two cases of scarlet fever and one of typhoid.—John A. Lowe, Sec.

EDDINGTON. 1898. Two cases of scarlet fever, but no other infectious disease.—F. S. Bunker, Sec.

1899. No contagious diseases.—Geo. W. Estes, Sec.

EDEN. 1898. We are pleased to say that we have a clean report this year; have had no diseases whatever.—C. E. Connors, Sec.

1899. There have been seventy-three nuisances reported; all have received attention. Five cases of scarlet fever and four of typhoid fever. We have sent written notices to fifty-four persons, ordering certain improvements about their premises. Have prosecuted two persons who have paid fines for violation of the health laws.—S. J. Clement, Sec.

EDGECOMB. 1898. As a rule, it has been remarkably healthy this year, so we have had little work to do. Grippe has prevailed to some extent, but in a light form, and we have had a few cases of pneumonia.—Eben Chase, Sec.

1899. One case of scarlet fever, but no other contagious diseases.—Frank M. Dodge, Sec.

EDINBURG. Fourteen cases of measles in 1898, and two cases of typhoid fever in 1899. No other contagious diseases reported in the two years.—C. W. Eldredge, Sec.

EDMUNDS. 1898. One nuisance reported and removed. Four cases of typhoid fever.

1899. One nuisance removed. Three cases of typhoid fever in the winter.—Chas. E. Hayward, Sec.

ELIOT. We consider ourselves fortunate to have been exempt from contagious diseases during the two years. We are in working order, however, and ready to cope with anything that comes along. One nuisance was removed in 1898.—Dr. H. I. Durgin, Sec.

ELLIOTTSVILLE PLANTATION. No contagious diseases in either year.--H. W. Lane, Sec.

ELLSWORTH. 1898. Thirty-four nuisances reported, of which fourteen were removed. No infectious disease. This board would recommend that the State require each town and city to appropriate a fixed sum for the use of the local board of health.—Geo. A. Parcher, Sec.

1899. Thirteen nuisances reported, and eight removed. One case of typhoid fever. The city has commenced to put in a system of sewerage, which, in our judgment, will be beneficial to the health of the people. The subject of ventilation of school buildings is very much overlooked; allow a quotation from S. H. Woodbridge, published in your report of 1894-95. "The time has come to stop the too common and ill-considered question about the cost of fresh air, and to press home upon our public servants whom we elect to govern us and to whom we entrust our interests—it is time to urge home upon them the criminal costliness of bad air."—M. S. Smith, Acting Sec.

ENFIELD. 1899. Eight cases of scarlet fever, and several cases of pneumonia mostly among the aged people. The scarlet fever was contracted in another town; the houses were quarantined and every precaution taken to prevent the spread of the disease.—A. J. Darling.

ETNA. We had no contagious diseases in 1898. In 1899, five cases of scarlet fever and one of typhoid fever. One nuisance was removed.—A. R. Sylvester, Sec.

EUSTIS. 1898. One case of typhoid fever.

1899. Five cases of diphtheria, in which antitoxin was used with good results.—Dr. T. W. Brimigion, Sec.

EXETER. 1898. One case of typhoid fever; no other infectious disease.—E. J. Ames, Sec.

1899. Two cases of typhoid fever.—F. H. McLaughlin.

FAIRFIELD. 1898. Seventeen nuisances reported; all have been satisfactorily adjusted except one. That is where the house drains empty into the street, as the Secretary of the State Board has seen. Six cases of typhoid fever.

1899. Twenty nuisances were reported, all of which were removed. Forty-nine cases of scarlet fever, in twenty houses.—Geo. C. Eaton, Sec.

FALMOUTH. 1898. One nuisance reported and removed. One case of typhoid fever.

1899. One nuisance removed. Three cases of diphtheria, two of scarlet fever, and two of typhoid fever. In the cases of diphtheria antitoxin was used, but the physician was called in late and two of the patients died.—H. J. Merrill, Sec.

FARMINGDALE. 1898. Two nuisances reported and one removed. One case of diphtheria and two of scarlet fever. The board has had very little to look after.—Rinaldo Robbins, Chr.

1899. One nuisance removed. One case of typhoid fever.—D. W. Pillsbury, Sec.

FARMINGTON. 1898. Three nuisances reported; all removed. Two cases each of diphtheria, scarlet fever, and typhoid fever. Antitoxin was used with good results in the cases of diphtheria. The board is of the opinion that the town should do all the work of disinfecting after contagious diseases.

1899. Three cases of diphtheria and one of scarlet fever. Several private sewers have been laid in the village.—Dr. F. O. Lyford, Sec.

FAYETTE. 1898. No contagious diseases, except one case of typhoid fever. This town is a very healthful one; the board of health has not been called upon to do any work the past year.—H. J. Tuck, Sec.

1899. Seven cases of scarlet fever, but no other infectious disease. Some of these cases were in so mild a form that it was very doubtful if they were scarlet fever, but they were treated like the others; every precaution being taken to prevent the spread of the disease.—O. L. Basford, Sec.

FLAGSTAFF PLANTATION. One nuisance was removed in 1898, and two in 1899. No contagious diseases in either year.—Warren Wing, Sec.

FOREST CITY. No infectious diseases either year, with the exception of two cases of typhoid fever in 1898.—A. S. Robinson, Sec.

FORT FAIRFIELD. Three cases of scarlet fever in 1898, and five of the same disease in 1899, were all the contagious diseases reported for the two years. Two nuisances were removed in 1899.—R. H. Perkins, Sec.

FORT KENT. 1898. Two nuisances removed. Thirteen cases of diphtheria, but no other infectious disease. In these cases antitoxin, both to cure and to immunize, was used with the best results; not a death occurring.

1899. Three nuisances reported and all removed. Twenty-five cases of scarlet fever and two of typhoid fever.—Dr. F. G. Sirois, H. O.

FRANKFORT. 1898. Six nuisances removed. Six cases of scarlet fever and three of typhoid. We are trying to improve the sanitary condition of the village and have had a fair degree of success.

1899. Two nuisances removed. Nothing in the way of contagious diseases, except two cases of typhoid fever.—Dr. O. S. Erskine, H. O.

FRANKLIN. One nuisance was removed in 1898, and two in 1899. No infectious diseases in either year.—Geo. U. Dyer, Sec.

FRANKLIN PLANTATION. 1898. One case of typhoid fever is all the contagious disease we have had.—L. C. Putnam, Sec.

FREEDOM. 1898. One nuisance removed. One case of typhoid fever.—Dr. A. M. Small, Sec.

1899. No infectious diseases.—J. I. Watts, Sec.

FREEMAN. 1898. One case of typhoid fever, but none of diphtheria or scarlet fever.—N. H. Peterson, Sec.

FREEPORT. 1898. Nine cases of diphtheria and one case of typhoid fever. Antitoxin was used with good results in the diphtheria cases.

1899. Four nuisances removed. No infectious diseases.—Dr. J. E. Gray, Sec.

FRENCHVILLE. 1898. Eighteen cases of diphtheria and four of scarlet fever. In the diphtheria cases, antitoxin was used with good results.

1899. One case of diphtheria and one case of typhoid fever.—Dr. I. Cote, Sec.

FRIENDSHIP. 1898. No cases of contagious disease.—E. M. Cook, Sec.

FRYEBURG. 1898. One case of scarlet fever and one of typhoid fever.

1899. Two nuisances removed. No infectious diseases.—Dr. W. C. Towle, Sec.

GARDINER. 1898. Six nuisances reported, five of which were removed. Five cases of diphtheria, ten of scarlet fever, and eight of typhoid fever. Antitoxin was used in all cases of diphtheria; early and with recovery in four; after the seventh day in one, with no benefit. The case was fatal. Disinfection with steam and formaldehyde was done in connection with all cases of diphtheria and scarlet fever.

1899. Eight nuisances reported and six removed. Three cases of diphtheria, ten of scarlet fever, and five of typhoid fever. In two of the cases of diphtheria, antitoxin was used with good results.—Dr. F. E. Strout, H. O.

GARFIELD PLANTATION. 1899. No infectious diseases.—F. P. McQuarrie, Sec.

GARLAND. 1898. Two nuisances reported; one removed. One case of scarlet fever and four of typhoid.

1899. One case of typhoid fever is all the infectious disease reported this year.—Dr. F. A. C. Emerson, Sec.

GEORGETOWN. 1898. There have been no cases of contagious or infectious diseases in town.—Dr. J. A. Steadman, Sec.

1899. Two nuisances reported and removed. No infectious diseases.—John L. Berry, Sec.

GILEAD. 1898. Seven nuisances reported, all of which were removed. Eight cases of scarlet fever in two houses.

1899. One nuisance removed. Two cases of scarlet fever, but no other infectious disease. The people of this town take considerable pride in keeping clear of the causes which bring about infectious diseases.—C. H. Cole, Sec.

GLENBURN. We have been blessed with remarkably good health for the last two years, no cases of infectious diseases having occurred. As time goes on, we observe that people as a whole are making improvements in their surroundings; houses and outbuildings are repaired and painted, dooryards cleaned up, and there is a general clearing away of accumulations of other years of which formerly no notice was taken.—John F. Tolman, Sec.

GLENWOOD PLANTATION. One nuisance removed in 1898. No infectious diseases in either year.—Wm. H. Grant, Sec.

GORHAM. No contagious diseases reported in the two years. Two nuisances removed in 1898, and one removed in 1899.—Geo. W. Heath, Sec.

GOULDSBORO. One case of typhoid fever in 1898, is all the infectious disease we have had for the last two years.—S. L. Tracy, Sec.

GRAFTON. We are very glad to say that we have had no outbreak of contagious disease in either year.—J. W. Chapman, Sec.

GRAND FALLS PLANTATION. 1898. The board of health has not been called upon for any work, as we have had no infectious diseases.—A. S. Folsom, Sec.

GRAND ISLE. We have had no report of any contagious diseases, either this year or last.—Florent Sanfacon, Sec.

GRAND LAKE STREAM PLANTATION. No cases of diphtheria, scarlet fever, or typhoid fever in the plantation in 1898 or 1899. —W. B. Hoar, Sec.

GRAY. 1898. No contagious diseases, except seven cases of diphtheria. Antitoxin was used in all these with the best results. Very rapid recovery in every case.

1899. Three nuisances reported and removed. Eight cases of diphtheria, one of scarlet fever, and one of typhoid fever. We used antitoxin again this year with good results.—Geo. W. Osgood, Sec.

GREENBUSH. 1899. No infectious diseases.—H. F. Harris, Sec.

GREENE. 1898. No contagious diseases, so the board has little to do.

1899. One nuisance removed. Two cases of scarlet fever.—Geo. E. Parker, Sec.

GREENVALE PLANTATION. 1898. No infectious diseases this year.—Frank A. Hight, Sec.

GREENVILLE. 1898. No cases of diphtheria, scarlet fever, or typhoid fever.—G. W. Brown, Chr.

1899. No contagious diseases, with the exception of two cases of scarlet fever.—Dr. H. Hunt, H. O.

GREENWOOD. 1898. One nuisance removed. Two cases of diphtheria and one of typhoid fever.

1899. No infectious diseases, except one case of typhoid fever.—A. C. Libby, Sec.

GUILFORD. 1898. One nuisance reported and removed. Three cases of scarlet fever and three of typhoid.—John Scales, Sec.

1899. One nuisance removed. Four cases of scarlet fever and three cases of typhoid fever.—Dr. Q. A. Bridges, Sec.

HALLOWELL. 1898. Seven nuisances reported, all of which were removed. One case of diphtheria and six of typhoid fever.

We have enlarged our sewers and put in a complete water system.—Frank Atkins, Sec.

1899. Two cases of diphtheria and three of typhoid fever are all the infectious diseases which came to the knowledge of the board this year—E. M. Henderson, Sec.

HAMMOND PLANTATION. One nuisance was removed in 1898. No contagious diseases in either year.—J. W. Davidson, Sec.

HAMPDEN. 1898. One nuisance removed. Two cases of scarlet fever and four of typhoid fever. At the last town meeting we tried for an appropriation for a general vaccination, but failed through the opposition of some of the people. It is something that is needed greatly; not one-tenth under twenty years of age have been vaccinated, and not one-half older than that.—Dr. W. H. Nason, Sec.

1899. One nuisance reported and removed. No contagious diseases, except three cases of typhoid fever.—Dr. F. S. Murch, H. O.

HANCOCK. We have had no contagious diseases, with the exception of one case of typhoid fever in 1898, and a few cases of grippe this last year.—Benj. Shute, Sec.

HANOVER. One case of typhoid fever in 1899, is all the infectious disease we have had for the last two years. We hold ourselves in readiness to attend to them at once if any should be present.—E. H. Barker, Sec.

HARMONY. Four nuisances were removed in 1898, and six in 1899. One case of typhoid fever each year, but no other infectious disease.—W. W. Jacobs, Sec.

HARPSWELL. 1898. Three nuisances were reported, and six were removed. No contagious diseases, except one case of scarlet fever. The board has had very little to do, with the exception of abating or investigating nuisances. Vaccination is needed in the town, as it has been about ten years since anything of the kind was done.—Augustus Sylvester, Sec.

HARRINGTON. 1898. One case of typhoid fever. In September and October, there was quite an epidemic of so-called "cholera," mostly in one section of the town. There was no apparent local cause for this outbreak.

1899. One case each of diphtheria, scarlet fever, and typhoid fever.—E. R. McKenzie, Sec.

HARRISON. 1898. Four nuisances reported, all of which were removed. Twenty-eight cases of scarlet fever and one of typhoid fever. When we had the outbreak of scarlet fever last fall, we had a steam disinfector made according to the directions given by the State Board of Health, and we found it a great help in the work of disinfecting.—Dr. J. P. Blake, H. O.

1899. We have no contagious diseases to report, except a single case of scarlet fever which was isolated at once, and no further infection resulted. The water supply of the town is extremely poor. It may be taken as a proof of our good sanitary condition that during the past season we have had so little contagion reported, while the ponds, rivers, wells, and springs are, in most instances, lower than they have been for years.—Dr. E. A. Wight, Sec.

HARTFORD. 1898. Nothing in the way of infectious diseases this year.

1899. No contagious diseases, except measles and chicken-pox.—T. B. W. Stetson, Sec.

HARTLAND. 1898. Three nuisances removed. No contagious diseases.—A. H. Buck, Sec.

1899. Ten nuisances reported, all of which were removed. Two cases of typhoid fever, but none of diphtheria or scarlet fever.—E. K. Fuller, Sec.

HAYNESVILLE. No infectious diseases in 1898. In 1899, there were six cases of scarlet fever and one of typhoid fever.—James F. Bryson, Sec.

HEBRON. 1898. One nuisance reported and removed. One case of diphtheria, but none of scarlet fever or typhoid.—Sylvanus Bearce, Sec.

1899. No contagious diseases. The smallpox scare resulted in about thirty being vaccinated at the expense of the town.—L. L. Phillips, Sec.

HERMON. 1898. One nuisance removed. Two cases of typhoid fever.

1899. No infectious diseases, except five cases of scarlet fever.—Dr. F. P. Whitaker, Sec.

HERSEY. 1898. Two cases of scarlet fever and one of typhoid fever.—G. E. Tozier, Sec.

1899. We have had no contagious disease in our town this year.—L. M. Davis, Sec.

HIGHLAND PLANTATION. There have been no cases of contagious diseases in this place in either year.—J. R. Ryant, Sec.

HIRAM. 1898. No infectious diseases.—D. C. E. Wilson, Sec.

1899. Four cases of typhoid fever, eight cases of measles, and a few mild cases of grippe. The cases of measles were contracted in an adjoining town.—L. A. Wadsworth, Sec.

HODGDON. No cases of contagious diseases reported in town for the last two years.—Moses Benn, Sec.

HOLDEN. 1898. Six nuisances reported, all of which were removed. One case of typhoid fever.

1899. Four nuisances removed. Eight cases of typhoid fever, seven of which were in the same house.—G. W. Clark, Sec.

HOLLIS. Eight cases of typhoid fever in 1898, but no other infectious disease in either year. In 1899, two nuisances were removed.—S. G. Rumery, Sec.

HOPE. 1898. No contagious diseases, with the exception of two cases of scarlet fever.—H. H. Payson, Sec.

1899. No cases of contagious disease.—Geo. F. Taylor, Sec.

HOULTON. 1898. Forty nuisances reported, all of which were removed. Six cases of scarlet fever and twenty-two of typhoid. The water and sewer systems have been extended. We observe that the great percentage of typhoid fever cases occur outside of the limit of public water supply.

1899. About fifty nuisances have been reported and all have been removed. Forty-five cases of scarlet fever and thirteen of typhoid fever. When we have cases of pulmonary tuberculosis, we give personal instruction as to the care and disinfection of sputa.—Dr. C. E. Williams, Sec.

HOWLAND. 1899. Two nuisances removed. No infectious diseases, except two cases of typhoid fever.—Dr. F. D. Weymouth, Sec.

HUDSON. 1898. No contagious diseases.—C. R. Keezer.

1899. One case of scarlet fever and one of typhoid fever.—J. B. Southard, Sec.

HURRICANE ISLE. No cases of contagious disease in 1898 or 1899.—E. P. Patterson, Sec.

INDUSTRY. There have been no contagious diseases in town either year. One nuisance removed in 1899.—W. L. Rackliff, Sec.

ISLAND FALLS. 1898. Three nuisances reported and removed. No infectious diseases, except two cases of typhoid fever.

1899. Fifty-nine cases of scarlet fever and five cases of typhoid fever. We try in the spring to have all filthy places cleaned up.—W. S. Leavitt, Sec.

ISLE AU HAUT. 1898. Five cases of scarlet fever.—Edwin Rich, Sec.

1899. No contagious diseases.—Asa Hopkins, Sec.

ISLESBORO. No infectious diseases reported in either year. One nuisance removed each year.—Dr. E. D. Williams, H. O.

JACKMAN PLANTATION. 1898. Twenty-one cases of diphtheria, four of scarlet fever, and fourteen of typhoid fever. Antitoxin was used in ten cases of diphtheria with excellent results.—Dr. R. J. Henderson, H. O.

1899. We seem to be very healthy at present. There have been no contagious diseases during the year.—Dr. H. V. Tweedie.

JACKSON. The board has not been called upon for the last two years, as we have had no contagious diseases.—M. S. Stiles, Sec.

JAY. 1898. One case of scarlet fever and ten of typhoid fever.—H. H. Allen, Sec.

1899. Six cases of smallpox, nine of diphtheria, six of scarlet fever, and two of typhoid fever. Antitoxin was used with good results when it was given early in the cases of diphtheria. When we have cases of pulmonary tuberculosis, we have advised the patients and their friends to follow the instructions given in the circular on consumption issued by the State Board of Health.—Dr. F. W. Merritt, H. O.

JEFFERSON. 1898. We have had no cases of diphtheria, scarlet fever, or typhoid, but there have been a few cases of la grippe and pneumonia.

1899. Twenty-four cases of scarlet fever, and three of typhoid fever. The cases of scarlet fever were in a very mild form and there were no deaths. The houses were placarded and schools closed, so the disease did not spread beyond the limits of two school districts.—J. J. Bond, Sec.

JONESBORO. 1898. No infectious diseases.

1899. One nuisance removed. No contagious diseases, with the exception of a few cases of measles.—D. C. Marston, Sec.

JONESPORT. 1898. One nuisance removed. No cases of infectious disease.—E. B. Sawyer, Sec.

1899. Three nuisances removed. Ten cases of scarlet fever and two of typhoid fever.—F. B. Adams, Sec.

KENDUSKEAG. No contagious diseases in the two years, with the exception of one case of typhoid fever in 1898. One nuisance removed in 1899.—Dr. J. F. Benjamin, H. O.

KENNEBUNK. 1898. Twelve nuisances removed. Four cases of diphtheria, twelve of scarlet fever, and six of typhoid.

1899. Twenty nuisances reported, all of which were removed. Five cases of diphtheria, six of scarlet fever, and four of typhoid fever. We have been fortunate in controlling our cases of diphtheria and scarlet fever, so that we have had no serious epidemics. Our greatest trouble has been with nuisances, but in abating these we find the public usually very willing to coöperate with us.—Dr. F. M. Ross, H. O.

KENNEBUNKPORT. 1898. Seven nuisances reported, five of which were removed. Two cases of diphtheria, five of scarlet fever, and one of typhoid fever.—Dr. A. W. Langley, Sec.

1899. Four nuisances removed. Four cases of diphtheria, but no other contagious diseases. Antitoxin was used in these cases with good results. We try to look carefully after all sink drains and cesspools, and to see that the sanitary conditions of the Indians who camp here during the summer are what they should be. The necessity of a complete system of sewerage has been intensified since the village has been supplied with public water works.—Wm. H. Cluff, Sec.

KINGFIELD. 1898. Four nuisances reported and removed. Two cases of typhoid fever. An up-to-date system of public water supply has been put in.

1899. No infectious diseases, except one case of typhoid fever. We have every reason to believe that the supplying of pure water has done much to improve the health of the town. We find the people very ready to comply with the suggestions of the board. For instance, the one case of typhoid fever which we had was clearly due to a defective cesspool. We reported this to the owner of the property, and he immediately did everything necessary to correct this condition by removing the cesspool and putting in a sewer. In every case where we have called the attention of property owners to objectionable places about their premises, they have cheerfully remedied such places.—Dr. O. W. Simmons, H. O.

KINGMAN. 1898. No cases of infectious or contagious diseases have been reported during the year, and very little has been done by the board excepting the providing of free vaccination for all who chose to avail themselves of it.—Dr. B. R. Somerville, Sec.

KINGSBURY PLANTATION. One nuisance removed in 1898. No infectious diseases in either year.—Chas. Strickland, Sec.

KITTERY. 1898. Four nuisances removed. No infectious diseases, except four cases of whooping-cough.

1899. Twenty nuisances reported, all of which were removed. No contagious diseases.—Frank O. Kuse, Sec.

KNOX. 1898. Two cases of typhoid fever, one of which was fatal. These cases of typhoid fever occurred in a house in which there were two cases of the same disease three years ago.

1899. Sixteen cases of scarlet fever in seven houses.—J. H. Brown, Sec.

LAGRANGE. 1898. One nuisance reported and removed. Three cases of typhoid fever.

1899. No infectious diseases, except one case of scarlet fever. —P. E. Speed, Sec.

LAKE VIEW PLANTATION. 1898. We have had no contagious diseases in our plantation this year. We offered free vaccination, and fifteen were vaccinated.—R. H. Hoskins, Sec.

1899. Six cases of measles, but no other infectious disease.—I. F. Thompson, Sec.

LAKEVILLE PLANTATION. 1898. No cases of infectious disease.—A. E. Gowell, Sec.

1899. Nothing in the way of contagious diseases reported this year.—James Ham, Sec.

LAMOINE. There have been no infectious diseases in the two years, with the exception of six cases of diphtheria in 1899.—John F. Lear, Sec.

LANG PLANTATION. As we have had no contagious diseases the past two years, there has been nothing for the board to do.—J. L. Harris, Sec.

LEBANON. 1898. One case of diphtheria, one of scarlet fever, and three of typhoid fever.

1899. No infectious diseases.—S. D. Lord, Sec.

LEE. Seven cases of scarlet fever in 1898, and ten cases in 1899, but no other contagious diseases.—Dr. Geo. F. Way, Sec.

LEEDS. 1898. One nuisance removed. No infectious diseases, except two cases of diphtheria in February.

1899. One case of typhoid fever, but no other contagious disease.—E. A. Mills, Sec.

LEVANT. No infectious diseases, except four cases of scarlet fever. These cases were in two houses and were in a very mild form.—Mark Batchelder, Sec.

1899. No contagious diseases this year.—John White, Sec.

LEWISTON. 1898. Seventy-five nuisances were reported, all of which were removed. Ninety-seven cases of diphtheria, one hundred and four of scarlet fever, and four of typhoid fever. Antitoxin was used in nearly every case of diphtheria and the results were perfectly satisfactory. Some new sewers have been put in. We believe an appropriation should be made by the city so that an inspector may be employed to examine plumbing and other defects in houses. We are of the opinion that the death-rate might be materially reduced by preventive measures.—Geo. A. Callahan, Sec.

1899. Over seventy-five nuisances were reported to the board, sixty-eight of which were removed or remedied. Five cases of smallpox, ninety-three of diphtheria, eighteen of scarlet fever, and two of typhoid fever. Antitoxin was used in 33 per cent. of the cases of diphtheria; only one death occurred. One very important step taken by the board this year was the adoption of plumbing rules. We have had no inspector of plumbing, but, as Mr. Scott of the board is a practical plumber and a student of plumbing, all work done has been inspected by him twice; before the pipes were laid, by plans, and again when all work was completed and the whole job tried by water test. In all sewer connections "back vent" was required. We had no trouble in enforcing these rules, except in one case and that was finally righted to the satisfaction of the board. Another total change was the requiring of air-tight cans for garbage, and cards were given to the people telling them on what days and at what hour garbage would be called for. "Soap men" were required to have air-tight barrels or carts. Until this summer, many ways had been tried to dispose of garbage from burning it to dumping it in the river. We now have a large trench dug in the city field, six feet deep by five feet across, and bury all garbage. Special attention has been given to have all cases of contagion reported. A large number of vaults have been taken out and water-closets put in by order of the board, and the understanding given that all vaults within city limits shall be taken out next spring.—A. T. L'Heureux, Sec.

LEXINGTON PLANTATION. 1898. No infectious diseases.—A. J. Lane, Sec.

LIBERTY. 1898. No cases of contagious disease.—W. H. Moody, Sec.

1899. One case of diphtheria and two cases of typhoid fever. —Dr. C. B. Hoit, Sec.

LIMERICK. No infectious diseases this year.—W. T. Libby, Sec.

1899. No contagious diseases, except one case of scarlet fever. —N. B. Pease.

LIMESTONE. No infectious diseases reported either year.—A. D. Hatfield, Sec.

LIMINGTON. No contagious diseases in 1898. In 1899, there was one case of typhoid fever, and one nuisance was reported and removed. Our town is very much interested in preventive measures and wishes the local board to look after all causes of sickness and to enforce quarantine thoroughly in cases of contagious diseases.—Dr. J. F. Moulton, H. O.

LINCOLN. 1898. Six nuisances removed.

1899. Eight nuisances were reported, all of which were removed. No contagious diseases in either year.—Dr. C. Fuller, Sec.

LINCOLN PLANTATION. 1898. No infectious diseases in the plantation this year.—N. K. Bennett, Sec.

1899. No contagious diseases so there has been no occasion for any action on the part of the board of health for the past year.—H. G. Bennett, Sec.

LINCOLNVILLE. 1898. Three nuisances removed. Eight cases of typhoid fever, in five houses.

1899. Four nuisances removed. Two cases of diphtheria, fifteen of scarlet fever, and twelve of typhoid fever.—Dr. E. F. Brown, Sec.

LINNEUS. 1898. No infectious diseases, except one case of typhoid fever.

1899. Five cases of scarlet fever and two of typhoid fever.—Dr. Robt. Boyd, Sec.

LISBON. 1898. Sixteen nuisances reported, all of which were removed. One case of diphtheria and four of scarlet fever.

1899. Ten nuisances removed. Thirty-nine cases of diphtheria and eleven of typhoid fever. Antitoxin was used in every case of diphtheria and the results were good.—F. A. Jordan, Sec.

LITCHFIELD. 1898. Three cases of typhoid fever.

1899. One nuisance removed. Two cases of typhoid fever.—Gardiner Roberts, Jr., Sec.

LITTLETON. One case of typhoid fever in 1898, and one of scarlet fever in 1899, but no other infectious diseases.—W. P. Curtis, Sec.

LIVERMORE. 1898. No contagious diseases this year, with the exception of la grippe, but no fatal cases of this.

1899. One nuisance removed. No infectious diseases. Last spring we had a smallpox scare, but no cases. Free vaccination was offered, and the people generally availed themselves of the opportunity.—F. H. Boothby, Sec.

LONG ISLAND PLANTATION. There were no contagious diseases in the plantation either in 1898, or in 1899.—Wm. S. Rich, Sec.

LOVELL. 1898. One doubtful case of scarlet fever.

1899. Four cases of scarlet fever and two cases of typhoid fever. The cases of scarlet fever were in a very mild form, but the two houses in which they occurred were thoroughly disinfected with formaldehyde, and every precaution taken against the spread of the disease.—Dr. C. P. Hubbard, Sec.

LOWELL. 1898. Two cases of scarlet fever.—F. L. Scammon, Sec.

1899. No cases of contagious disease.—L. B. Edgecomb, Sec.

LUBEC. 1898. One nuisance removed. One case of diphtheria was all the infectious disease we had.

1899. Three nuisances reported, all of which were removed. One case of typhoid fever.—F. W. Fanning, Sec.

LUDLOW. One case of diphtheria in 1898, but no other infectious disease in the two years.—R. H. Thompson, Sec.

LYMAN. 1898. Two cases of scarlet fever and one of typhoid fever. A few cases of whooping-cough.

1899. Four cases of scarlet fever and one of typhoid fever.—F. E. Tripp, Sec.

MACHIAS. 1898. We have been particularly exempt from contagious diseases this year, six cases of typhoid fever being all that was reported to the board. Our town is well supplied with a fine water-plant, and the drainage is good.—Dr. F. H. Crocker, Sec.

1899. Five cases of scarlet fever and twelve cases of typhoid fever.—Dr. S. B. Hunter.

MACHIASPORT. No infectious diseases in 1898, with the exception of one case of scarlet fever.

1899. Twenty cases of scarlet fever and two cases of typhoid fever.—C. W. Robinson, Sec.

MACWAHOC PLANTATION. 1898. One nuisance reported and removed. No contagious diseases.—D. Alexander, Sec.

1899. Nothing in the way of infectious diseases.—G. D. O'Roak, Sec.

MADISON. 1898. Two nuisances removed. Two cases of typhoid fever.

1899. Nine nuisances were reported, six of which were removed. No contagious diseases, except one case of typhoid fever.—E. C. Town, Sec.

MADRID. There have been no cases of infectious disease reported during the two years.—L. C. Witham, Sec.

MANCHESTER. 1898. Six cases of scarlet fever, but none of diphtheria or typhoid fever.

1899. There was nothing for the board of health to do this year, as there was not a case of contagious disease reported.—G. M. Knowles, Sec.

MAPLETON. 1898. One nuisance removed. Seven cases of scarlet fever and three of typhoid fever.

1899. Five nuisances reported and all were removed. Sixteen cases of scarlet fever, in six houses, but no other cases of contagious disease.—O. J. Higgins, Sec.

MARIAVILLE. 1898. No cases of diphtheria, scarlet fever, or typhoid fever.—Geo. W. Black, Sec.

1899. No infectious diseases.—Chas. E. Brimmer, Sec.

MARION. No contagious diseases during the two years, so there has been nothing for the board to do.—Benj. L. Smith, Sec.

MARSHFIELD. 1898. One case of scarlet fever and one case of typhoid fever.

1899. Our town has been free from contagious diseases this year, with the exception of whooping-cough in the fall.—L. B. Thaxter, Sec.

MARS HILL. 1898. No infectious diseases, except four cases of typhoid fever.

1899. One case of scarlet fever and seven of typhoid fever.—B. F. Pierce, Sec.

MASARDIS. 1898. One nuisance removed. One case of typhoid fever, which was all the contagious disease we had.—N. D. Smith, Sec.

1899. Two cases of scarlet fever and two cases of typhoid fever.—F. H. Knowlen, Chr.

MASON. 1898. One nuisance reported and removed. No contagious diseases.

1899. No infectious diseases, with the exception of five cases of scarlet fever. These cases were all in one house. A strict quarantine was maintained, and every precaution taken so that the disease did not spread.—Addison S. Bean, Sec.

MATINICUS ISLE PLANTATION. 1898. One case of typhoid fever, but none of scarlet fever or diphtheria.

1899. No contagious diseases, except one case of typhoid fever.—E. E. Ames, Sec.

MATTAMISCONTIS. No cases of contagious diseases in either year.—H. C. Roberts, Sec.

MATTAWAMKEAG. 1898. No infectious diseases reported this year.—A. L. Thompson, Sec.

1899. Three nuisances removed. No contagious diseases, except one case of typhoid fever.—W. E. Haynes, Sec.

MAXFIELD. 1898. As a general thing this town has been quite healthful. There have been a few cases of la grippe, measles, and whooping-cough, but no other contagious diseases.

1899. No infectious disease, with the exception of a few mild cases of measles. One nuisance was removed.—James Wiley, Sec.

MAYFIELD PLANTATION. 1898. There have been no contagious diseases reported to the board.

1899. One nuisance removed. We have had no contagious diseases, with the exception of measles in the spring. Prompt measures were taken to prevent the spread of the disease.—S. A. Chamberlain, Sec.

MECHANIC FALLS. 1898. Four nuisances removed. Eight cases of scarlet fever and one of typhoid fever. The experience of our board has been that the people are coming more and more each year to understand the importance of observing the health laws, and coöperate more cheerfully with the board in enforcing the laws.

1899. Six nuisances reported, all of which were removed. Seven cases of diphtheria, four of scarlet fever, and one of typhoid fever. Antitoxin was used in all the cases of diphtheria, and all recovered except the first case, a child who had been sick about a week before calling a physician.—M. N. Royal, Sec.

MEDDYBEMPS. 1898. No contagious diseases this year.—A. J. Allen, Sec.

MEDFORD. 1898. No infectious diseases.—A. A. Bailey.

1899. This has been an uneventful year with us. The town has been free from diseases of a serious nature.—E. G. Lovejoy, Sec.

MEDWAY. 1898. We have had no contagious diseases in town this year.—Allen Hathaway, Sec.

1899. One case of measles was all the disease reported.—C. E. Hathaway, Sec.

MERCER. 1898. No cases of diphtheria, scarlet fever, or typhoid fever.—C. H. Girdler, Sec.

1899. One nuisance removed. One case of typhoid fever, but no other infectious disease.—I. C. Tracy, Sec.

MERRILL PLANTATION. 1898. Three cases of typhoid fever, but none of diphtheria or scarlet fever.

1899. Three cases of scarlet fever and one of typhoid.—Dr. A. B. Libby, H. O.

MEXICO. 1898. One nuisance removed. No infectious diseases, except measles of which we had quite an epidemic, so that the schools were closed for several weeks. This disease was brought to us from adjoining towns where no attempt was made to prevent its spread. We believe that measles should be as strictly quarantined as the other contagious diseases.

1899. One nuisance reported and removed. Four cases of typhoid fever, in one house.—Dr. H. J. Binford, Sec.

MILBRIDGE. 1898. Four nuisances reported, all of which were removed. One case of diphtheria and three of typhoid fever. When a contagious disease occurs, we quarantine the case at once and carefully disinfect.—Dr. Geo. Googins, Sec.

1899. Sixteen cases of diphtheria, thirty of scarlet fever, and one of typhoid fever. Antitoxin was used in most of the cases of diphtheria; in some with marked benefit, in others we could not perceive any effect.—Dr. J. A. Walling, Sec.

MILFORD. 1898. One doubtful case of typhoid fever.

1899. Two nuisances removed. Four cases of scarlet fever and two of typhoid fever.—Albion Oakes, Sec.

MILO. 1898. Two cases of scarlet fever and one of typhoid fever.—B. B. Kimball, Sec.

1899. No contagious diseases, with the exception of two cases of typhoid fever.—A. W. Murray, Sec.

MILTON PLANTATION. 1898. Our board has not had any work for the year, as we have had no infectious diseases.—Geo. E. Brown, Sec.

MINOT. Our town has been remarkably healthful during the past two years, there having been no contagious diseases except one case of typhoid fever in 1898. Two nuisances were removed in 1899.—J. M. Harris, Sec.

MONHEGAN PLANTATION. 1898. No contagious diseases.—W. S. Humphrey, Sec.

1899. There has been no sickness of a contagious nature this year. There is a good water supply on the island, the dwellings are kept clean and tidy, and the surf keeps the shore in good condition.—Wm. S. Stanley, Sec.

MONMOUTH. 1898. One nuisance removed. Fourteen cases of diphtheria and four of typhoid fever. The cases of diphtheria were in three families; antitoxin was used with very beneficial results.

1899. One nuisance removed. One case of typhoid fever was all the contagious disease reported.—J. L. Orcutt, Sec.

MONROE. 1898. We have been very healthy the past year; no infectious diseases.—Franklin Chase, Sec.

1899. No contagious diseases, with the exception of seven cases of scarlet fever.—Dr. H. A. Holt, H. O.

MONSON. 1898. No cases of diphtheria, scarlet fever, or typhoid fever.—Albert W. Chapin, Sec.

MONTICELLO. 1898. One nuisance reported and removed. Two cases of typhoid fever.

1899. Our town has been very free from contagious diseases. We had four cases of scarlet fever in a very mild form, and one case of typhoid fever.—L. E. Stackpole, Sec.

MOOSE RIVER PLANTATION. 1899. Eight cases of scarlet fever, but no other contagious disease.—David Hughey, Sec.

MORO PLANTATION. 1899. One nuisance removed. No infectious diseases.—Daniel Darling, Sec.

MORRILL. 1898. We had some cases of measles in the spring, but no other infectious disease. We have built a new schoolhouse with all the modern improvements. Our people are up to date in trying to guard against infectious diseases.—J. R. Mears, Sec.

1899. No contagious diseases reported this year.—Dr. T. N. Pearson, H. O.

MOSCOW. Our town has been remarkably free from contagious diseases for the last two years. No cases of diphtheria, scarlet fever, or typhoid fever have been reported. We had several cases of grippe and pneumonia in 1899. There has been much improvement in the sanitary condition of the place, but a good water supply is needed. When a man has his well or spring so located that the drainings from the barn or stable can run into it, that man has something yet to learn.—Albert Burke, Sec.

MOUNT CHASE. No infectious diseases during the last two years.—James W. Steen.

MOUNT DESERT. 1898. Five nuisances reported, four of which were removed. Seven cases of typhoid fever, but no other contagious disease. Last spring we furnished free vaccination and nearly four hundred were vaccinated; most of them young people who had never been before.

1899. Three nuisances reported and removed. The board of health has had but very little to do in this town for the past year for several reasons. Perhaps the most important one is that we attend to our duties *sharp*, and the people understand that no nuisances will be permitted to continue. And, furthermore, we have been lucky in having no outbreak of contagious disease. Considerable has been done in the extension of public and private sewerage.—J. C. Hill, Sec.

MOUNT VERNON. We are happy to be able to report that we have had no cases of contagious disease in town in the last two years. We have kept a watchful eye on outhouses and privies, and have often recommended that they be kept in better order. In February, 1899, we arranged with our local physicians to go through the town from house to house and supply free vaccination, and the result was about one hundred and seventy-five were vaccinated.—Albion P. Cram, Sec.

NAPLES. 1898. One case of typhoid fever, but none of diphtheria or scarlet fever.—P. O. Cannell, Sec.

1899. No cases of infectious disease reported this year.—J. L. Meserve, Sec.

NEWBURGH. No contagious diseases during the two years, so our board has had nothing to do.—Dr. E. C. Newcomb, H. O.

NEW CANADA PLANTATION. 1898. Six cases of diphtheria and eight of scarlet fever. Antitoxin was used in every case of diphtheria with good results.—Dr. J. A. Archambault.

1899. One case of scarlet fever, but no other contagious diseases.—Thos. Daigle, Sec.

NEWCASTLE. 1898. One nuisance removed. Eight cases of scarlet fever and two of typhoid fever.

1899. No infectious diseases.—D. S. Glidden, Sec.

NEWFIELD. 1898. No contagious diseases reported to the board.—Dr. E. O. Chellis, H. O.

1899. No cases of diphtheria, scarlet fever, or typhoid fever. —Dr. E. C. Jenigor, Sec.

NEW GLOUCESTER. 1898. Five cases of diphtheria and two of typhoid fever. The second case of diphtheria in one family did not appear until over a month after the first patient had recovered and the house had been disinfected. We had some fears that the disinfection had not been thoroughly done, but some facts learned later seemed to put the matter in a different light. The first patient, a boy about fourteen years old, about ten days before being taken sick visited a family who had not lived long in the neighborhood. When the second case of diphtheria occurred, two other children were sent to board in this same family. The day these children came home, after the recovery of the second child, one of them was taken with diphtheria. An investigation showed that there had been diphtheria in this family before they moved here, and we are led to believe that all these children contracted diphtheria from this house where they visited.

1899. No infectious diseases.—E. J. Mitchell, Sec.

NEWPORT. No contagious diseases reported in either year. Two nuisances were reported in 1899, and both were removed. Our drainage is good, and we are well supplied with good, pure water.—F. M. Shaw, Sec.

NEW PORTLAND. 1898. One case of scarlet fever and one of typhoid fever.

1899. Five nuisances reported, all of which were removed. Nine cases of scarlet fever and one of typhoid.—Elias Hutchins, Sec.

NEWRY. 1898. No cases of diphtheria, scarlet fever, or typhoid fever.—S. A. Eames, Sec.

NEW SHARON. 1898. One case of diphtheria and two of typhoid fever. In the case of diphtheria, antitoxin was used with good results.

1899. No contagious diseases. One nuisance removed.—Fred C. Hale, Sec.

NEW VINEYARD. One nuisance removed in 1898. No infectious diseases in either year.—W. A. Lee, Sec.

NOBLEBORO. No contagious diseases during the two years, with the exception of one case of typhoid fever in 1898, and two cases of scarlet fever in 1899.—A. S. Winchenbauch, Sec.

NORRIDGEWOCK. 1898. One case of typhoid fever, but no other infectious disease.

1899. Nine cases of scarlet fever and two of typhoid fever.—F. C. Holt, Sec.

NORTH BERWICK. 1898. Five nuisances reported, all of which were removed. Six cases of diphtheria, thirteen of scarlet fever, and three of typhoid fever. Improvement has been made in the public sewerage system and the private drains entering therein. The board has required the mains and service pipes of the public water supply system to be frequently cleansed, and the source of supply to be carefully guarded against pollution.

1899. Three nuisances removed. One case of diphtheria, twelve of scarlet fever, and one of typhoid fever. From years of experience and observation as secretary of the board, it seems to me that physicians are often less observant of strict precautionary measures to insure immunity from contagious diseases than they should be.—H. A. Butler, Sec.

NORTH HAVEN. No infectious diseases during the two years, with the exception of five cases of scarlet fever in 1898.—S. W. Crockett, Sec.

NORTHPORT. 1898. Two nuisances removed. No contagious diseases.

1899. Three nuisances removed. Eight cases of scarlet fever, but no other contagious diseases. Our sanitary conditions in town are excellent. With the exception of looking after a few public places, as this is a summer resort, the board has had but little to do.—F. A. Rhodes, Sec.

NORTH YARMOUTH. 1898. One nuisance removed. Two cases of typhoid fever, but none of diphtheria or scarlet fever.

1899. Six cases of scarlet fever in a very mild form, but no other infectious disease.—E. D. Loring, Sec.

NORWAY. 1898. Fourteen nuisances were reported, twelve of which were removed. Three cases of scarlet fever and five of typhoid fever. The sanitary condition of the village would be greatly improved by a better system of sewerage.

1899. Twelve nuisances reported and removed. No contagious diseases, with the exception of six cases of scarlet fever. Whenever notice has been given by the board that a nuisance exists, we have found the people very willing to remove the same.—S. A. Bennett, Sec.

NO. 8 PLANTATION. 1899. No infectious diseases reported during the year.—Hiram E. Archer, Sec.

NO. 14 PLANTATION. 1898. One case of typhoid fever, but no cases of diphtheria or scarlet fever.—E. R. Phipps, Sec.

NO. 21 PLANTATION. 1898. Nothing in the way of infectious diseases this year.—C. H. Yates, Sec.

NO. 33 PLANTATION. We have had no contagious diseases for the last two years, with the exception of six cases of typhoid fever in 1899.—J. R. Shuman, Sec.

OAKFIELD. 1898. No cases of infectious disease.—C. A. Risteen, Sec.

1899. No cases of diphtheria or typhoid fever, but there were fourteen cases of scarlet fever.—Ezekiel Benn, Sec.

OAKLAND. 1898. Six nuisances reported, all of which were removed. Four cases of diphtheria and nine of typhoid fever. Antitoxin was used with good results in three cases of diphtheria. A system of waterworks is in process of construction.

1899. Seven nuisances removed. One case of scarlet fever and five of typhoid fever. There has been quite an extensive epidemic of whooping-cough. More stringent measure should be taken to prevent the spread of this disease. Some private sewers have been constructed.—Dr. A. W. Plummer, Sec.

OLD ORCHARD. 1898. About sixty nuisances were reported and nearly all of them were removed. One case each of diphtheria, scarlet fever, and typhoid fever. We are extending our sewerage system as fast as possible.—Dr. J. A. Randall, H. O.

1899. Sixty nuisances reported, all of which were removed. No infectious diseases. Our main line of work during the year has been on the sewers.—R. F. Chalk, Sec.

OLD TOWN. 1898. Twenty nuisances reported, eighteen of which were removed. Two cases of diphtheria, seventy-five of scarlet fever, and twenty-four of typhoid fever. In the diphtheria cases antitoxin was used with good results.

1899. Twelve nuisances were reported to the board, and all were removed. Fifty-three cases of scarlet fever and forty-four of typhoid fever. We have laid 5,740 feet of sewer pipe this year, and the water pipe has been extended nearly as much.—H. M. Dickey, Sec.

ORIENT. 1898. No cases of diphtheria, scarlet fever, or typhoid fever.—Daniel Maxwell, Sec.

1899. No infectious diseases.—L. H. Dunning, Sec.

ORLAND. 1898. Thirteen cases of scarlet fever and one of typhoid fever.

1899. There were two cases of scarlet fever reported, and one of typhoid fever.—Frank Buck, Sec.

ORNEVILLE. No contagious diseases reported during the two years.—Llewellyn Sanborn, Sec.

ORONO. 1898. Fourteen cases of scarlet fever and one of typhoid. In the latter part of September, forty-nine children were vaccinated. Seven nuisances were reported, all of which were removed.

1899. Two cases of diphtheria, forty-two of scarlet fever, and five of typhoid fever. Antitoxin was used with good results in the cases of diphtheria. We have discarded all other disinfectants but formaldehyde. Three nuisances were reported, and two removed.—W. C. Taylor, Sec.

ORRINGTON. 1899. Five cases of scarlet fever and one of typhoid fever. There were no nuisances reported, but two came to the observation of the board and we had them removed.—G. B. Tibbetts, Sec.

OTIS. One case of typhoid fever in 1898, which was all the infectious disease during the two years.—J. R. Grant, Sec.

OTISFIELD. 1898. No contagious diseases.

1899. One case of diphtheria, but none of scarlet fever or of typhoid fever. Two nuisances were reported and removed.—E. B. Jillson, Sec.

OXFORD. 1899. Seven nuisances reported, all of which were removed. Three cases of typhoid fever.—W. L. Mont, Sec.

PALMYRA. With the exception of measles of which we had five cases in 1898, and twenty cases in 1899, there have been no infectious diseases.—G. W. Applebee, Sec.

PARKMAN. One nuisance was removed in 1898, and three in 1899. No contagious diseases reported in either year.—N. M. Cobb, Sec.

PARSONSFIELD. No infectious diseases either in 1898, or in 1899.—Dr. F. G. Devereux, Sec.

PASSADUMKEAG. 1898. No contagious diseases this year. Three nuisances reported and removed.

1899. Eleven cases of scarlet fever, in five houses, but no other infectious diseases. Three nuisances removed.—Luther Haynes, Sec.

PATTEN. 1898. One nuisance removed. Nine cases of scarlet fever and five of typhoid fever. We have endeavored to keep a strict watch of all places that would be liable to become sources of infection, and to take all necessary precautionary measures in such cases.—Dr. B. C. Woodbury, Sec.

1899. Five cases of scarlet fever and seven of typhoid fever. Six nuisances were reported, five of which were removed.—John Jackman, Sec.

PEMBROKE. 1898. Five cases of scarlet fever and six of typhoid fever.

1899. No cases of diphtheria, scarlet fever, or typhoid fever. —Dr. J. C. Rogers, Sec.

PENOBSCOT. 1898. Two cases of scarlet fever and six cases of typhoid fever. One nuisance removed.

1899. Two cases of scarlet fever and four of typhoid fever. Three nuisances reported and removed.—J. H. Littlefield, Sec.

PERHAM. Four cases of scarlet fever in 1898, but no other contagious diseases in either year.—F. L. McIntire, Sec.

PERKINS. We are glad to say that we have had no infectious diseases in the town for the last two years.—F. L. Call, Sec.

PERU. 1898. No infectious diseases during the year.

1899. One case of scarlet fever and one of typhoid fever.—O. O. Tracy, Sec.

PHILLIPS. 1898. No cases of infectious diseases reported to the board.—A. Weatherbee, Sec.

1899. One nuisance removed. Two cases of diphtheria and one of typhoid fever. In one case of diphtheria, antitoxin was used the first day with good results; in the other case, it was not used until the seventh day and the patient died.—Dr. E. B. Currier, Sec.

PHIPPSBURG. 1898. Two nuisances removed. No infectious diseases.

1899. One nuisance removed. No contagious diseases, with the exception of two cases of diphtheria. The diphtheria cases occurred in a summer hotel where there were about one hundred guests. We had the patients removed at once to an improvised hospital; thoroughly disinfected the rooms; and thus prevented any further spread of the disease.—Dr. A. F. Williams, Sec.

PITTSFIELD. 1898. Two cases of diphtheria, five of scarlet fever, and fifteen of typhoid fever. Antitoxin was used in both cases of diphtheria, with recovery in one case. Two nuisances were removed.

1899. Three cases of scarlet fever and five of typhoid fever.—Dr. T. N. Drake, Sec.

PITTSTON. 1898. One case of typhoid fever, but none of the other infectious diseases.—F. B. Gould, Sec.

1899. No contagious diseases have come to the knowledge of the board.—J. A. Kenney, Sec.

PLYMOUTH. 1898. No infectious disease, with the exception of one case of typhoid fever.—Dr. Arthur Macomber, Sec.

POLAND. 1898. Two cases of scarlet fever, but none of diphtheria or typhoid fever. On account of unusual difficulties, one nuisance which was reported to the board was not removed.

1899. Two cases of diphtheria and two of scarlet fever. Antitoxin was used in these two cases of diphtheria, when the symptoms were becoming alarming, with the result of arresting the disease at once and a speedy recovery ensued.—Dr. Jason Walker, Sec.

PORTAGE LAKE PLANTATION. 1899. We have not had any contagious diseases this year.—Fred Bolstridge, Sec.

PORTER. 1899. Three cases of scarlet fever and one of typhoid fever. One nuisance removed.—Dr. E. R. Chellis, Sec.

PORTLAND. 1898. Three hundred and seventy-five nuisances were reported to the board; three hundred and forty of these were removed. One hundred and fifty cases of diphtheria, forty-one of scarlet fever, and one hundred and seventy-four of typhoid fever. Antitoxin was used in most of the diphtheria cases, and the results were good.—Edwin L. Dyer, Sec.

POWNAL. One case of diphtheria in 1898, in which antitoxin was used with good results. No other infectious diseases in the two years.—Dr. S. A. Vosmus, Sec.

PRENTISS. There have been no contagious diseases for the last two years, with the exception of mumps in 1899.—W. H. Thompson, Sec.

PRESQUE ISLE. 1898. Three nuisances reported and removed. Fifteen cases of scarlet fever and thirteen of typhoid fever. The water company made quite extensive improvements in the pond or reservoir by removing a large amount of vegetable matter from the shores and bottom of the pond. The reservoir is situated about one mile from the village on high ground, and quite away from any source of pollution. Two of the sewers have been extended.

1899. Three nuisances removed. We had quite an epidemic of scarlet fever, about two hundred cases, and five cases of typhoid fever.—Dr. Frank Kilburn, Sec.

PRINCETON. 1898. One nuisance was removed. One case of typhoid fever, but no other contagious disease. The board called the attention of the town to the defectiveness of the drainage, and it was looked after. We also insisted on cleaning vaults, which was in nearly every case attended to without serious trouble.

1899. Two cases of typhoid fever, contracted outside the town. Whooping-cough has been very prevalent, over one hundred cases in all.—Dr. S. G. Spooner, Sec.

PROSPECT. 1898. No contagious diseases reported to the board.—J. A. Gray, Sec.

1899. Three cases of scarlet fever and one of typhoid fever. C. K. Harriman, Sec.

RANDOLPH. 1898. One case of scarlet fever, which was all the infectious disease we had. Three nuisances were reported, two of which were removed.

1899. Two cases of scarlet fever, but none of diphtheria or typhoid fever. Six nuisances removed.—Dr. B. E. Lamb, Sec.

RANGELEY. 1898. One case of diphtheria and two of scarlet fever.

1899. No infectious diseases, with the exception of two cases of typhoid fever. Three nuisances reported and removed. We vaccinated one hundred persons, the serum taking the first time in all but one case.—Dr. E. A. Libbey, H. O.

RANGELEY PLANTATION. There have been no contagious diseases in 1898, or in 1899. One nuisance removed each year.—E. M. Gile, Sec.

RAYMOND. 1898. One nuisance removed. No contagious diseases in town the past year.

1899. One case of diphtheria and four of typhoid fever.—Geo. M. Leach, Sec.

READFIELD. 1898. One case of scarlet fever and two of typhoid fever. One nuisance was removed.

1899. We had again this year one case of scarlet fever and two cases of typhoid fever. Two nuisances reported and removed.—Dr. W. A. Wright, H. O.

REED PLANTATION. 1898. One supposed case of scarlet fever was reported, but it proved not to be that disease. In the late fall there were quite a number of cases of whooping-cough.

1899. One nuisance was removed. No infectious diseases.—John S. Clifford, Sec.

RICHMOND. 1898. Five nuisances reported, all of which were removed. Two cases of diphtheria and six of typhoid fever. The selectmen have been fully in accord with the board in making additional and more efficient drainage facilities, and have been successful to an extent worthy of mention. The manifest increasing appreciation of the work of the board of health by the citizens of the village has been very gratifying.—Dr. D. S. Richards, Sec.

RIPLEY. 1898. No cases of infectious disease reported. Our schoolhouses and grounds are in good condition.

1899. One case of typhoid fever was all the infectious disease this year.—A. G. Farrar, Sec.

ROBBINSTON. 1898. Three nuisances reported and all were removed. No infectious diseases, except one case of typhoid fever.—Frank R. Leach, Sec.

ROCKLAND. 1899. Twenty-two nuisances reported, all of which were removed. Twelve cases of scarlet fever and one of typhoid fever. We think that the absence of any form of an epidemic and the very few cases of contagious diseases during the past year, is worthy of particular notice. We doubt if a town of equal population in the State or, in fact, any state, can honestly show a like record. The one case of typhoid fever was contracted in a neighboring town. Dr. E. H. Wheeler, Sec.

ROCKPORT. 1898. Eight nuisances removed. Eighteen cases of scarlet fever and four of typhoid fever.—Dr. J. F. Norwood, Sec.

1899. Two nuisances reported, one of which was removed. Two cases of scarlet fever and one of typhoid fever. As we have had so few cases of contagious diseases to contend with, our board has had but little to do. We are trying to get the town to put in sewers of which we stand greatly in need.—Dr. S. Y. Weidman, H. O.

ROME. 1898. No cases of diphtheria, scarlet fever, or typhoid.—E. T. Foster, Sec.

1899. We have not had any contagious diseases during the year.—H. M. Hooper, Sec.

ROQUE BLUFFS. 1898. Two cases of typhoid fever in one house, but no other infectious diseases.—G. W. Schoppee, Sec.

1899. No contagious diseases, with the exception of one case of typhoid fever.—A. L. Tupper, Chr.

ROXBURY. No contagious diseases of any kind in town for the last two years.—A. W. Robbins, Sec.

RUMFORD. 1898. Five nuisances reported, all of which were removed. Thirteen cases of typhoid fever, but no other infectious diseases.

1899. Four nuisances removed. Two cases of diphtheria and seventeen of typhoid fever.—F. A. Porter, Sec.

SACO. 1898. One case of diphtheria, seventeen of scarlet fever, and nine of typhoid fever. Seventeen nuisances were reported and were all removed.

1899. Seven cases of diphtheria, twelve of scarlet fever, and eleven of typhoid fever. Antitoxin was used in every case of diphtheria. There were three deaths in the seven cases. Fifteen nuisances were reported, thirteen of which were removed.—Dr. H. A. Weymouth, H. O.

SALEM. 1898. Two cases of typhoid fever, but none of diphtheria or scarlet fever.—Geo. E. Willis, Sec.

1899. No infectious diseases, with the exception of two cases of diphtheria.—W. S. Lovejoy, Sec.

SANFORD. 1898. Three nuisances reported and removed. Two cases of measles, seven of diphtheria, four of scarlet fever, and four of typhoid fever. Our town has been remarkably free from infectious, contagious, and malarial diseases the past year. We attribute this to a better appreciation and observance of the common laws of sanitation.

1899. Two nuisances removed. Twenty cases of scarlet fever and six of typhoid fever. We also had one case of cerebro-spinal meningitis and six of whooping-cough.—Geo. E. Allen, Sec.

SANGERVILLE. 1898. One nuisance removed. No infectious diseases. A system of sewerage is much needed and a movement is on foot to begin that work.

1899. Nineteen cases of scarlet fever, but no other contagious diseases. Two nuisances were removed.—Dr. C. W. Ray, H. O.

SCARBORO. 1898. Twenty-three nuisances were reported, all of which were removed. Three cases of typhoid fever, but no other contagious diseases.

1899. Seven nuisances removed. One case of diphtheria and three of scarlet fever.—Dr. B. F. Wentworth, H. O.

SEARSMONT. 1898. No contagious diseases, with the exception of two cases of scarlet fever.—C. S. Adams, Sec.

1899. One case of typhoid fever was all we had in the way of contagious diseases.—A. G. Caswell, Sec.

SEARSPORT. 1899. One case of diphtheria and eight of scarlet fever. Two nuisances were removed.—H. H. Sellers, Sec.

SEBAGO. 1898. Two cases of typhoid fever, one of which was contracted out of the place. We had one case reported as scarlet fever, but it did not prove to be that.—Abram J. Ward, Sec.

1899. One nuisance reported and removed. Two cases of typhoid fever, but none of diphtheria or scarlet fever.—Loren Bacheldor, Sec.

SEBEC. Two cases of scarlet fever and three of typhoid fever in 1899, but no other contagious diseases during the two years.—C. Parker, Sec.

SEBOEIS PLANTATION. 1898. No contagious diseases reported. —J. E. Smart, Jr., Sec.

1899. There were no infectious diseases this year.—C. L. Smart, Sec.

SEDGWICK. 1898. Five cases of diphtheria, but no other infectious diseases.—M. L. Elwell, Sec.

1899. Our town has been very healthful the past year, one case of typhoid fever being the only infectious disease reported. J. N. Sargent, Sec.

SHAPLEIGH. No infectious diseases in 1898. In 1899, the only disease reported was one case of typhoid fever. Two nuisances were removed.—H. A. Stanley, Sec.

SHERMAN. 1898. One nuisance was reported and partially removed. Fifteen cases of scarlet fever, two of typhoid fever, and several cases of measles. We try to be ready at all times to meet and combat any outbreak of contagious disease as soon as we have knowledge of it.

1899. Three nuisances removed. Ten cases of scarlet fever and two of typhoid fever. We have, with few exceptions, the hearty coöperation of the citizens in our work, and what in our judgment was required for the good sanitary condition of the place has been accomplished.—L. C. Caldwell, Sec.

SHIRLEY. 1898. Nothing in the way of contagious diseases reported.—Jacob Huff.

1899. One nuisance removed. Our town is an exceptionally healthful one; no cases of infectious disease.—W. W. Sawtelle, Sec.

SIDNEY. 1898. One nuisance removed. One case of diphtheria and seven of typhoid fever. Antitoxin was used in the case of diphtheria with good results. More attention is being given to the water supply.

1899. Two nuisances removed. No infectious diseases, with the exception of one case of typhoid fever. As health officer, I have tried to impress upon our people the danger of neglected sink drains and privy vaults, and have succeeded in many cases in causing more frequent cleaning of outhouses and better attention to sink spouts. The disinfection of rooms occupied by consumptives has not received proper attention. I hope with the help of the new circulars sent out by the State Board of Health that the people will realize the danger of non-attention to the advice of the local board in such cases.—Dr. G. R. Campbell, H. O.

SILVER RIDGE PLANTATION. 1898. No infectious diseases.—Thos. Clark, Sec.

1899. We have enjoyed remarkably good health; no contagious diseases among us during the year. The homes are kept neat, and every measure for good sanitary conditions is taken.—G. H. Bowie, Sec.

SKOWHEGAN. 1898. Eight cases of scarlet fever and seven of typhoid fever. The first case of scarlet fever was brought into town by a summer boarder and the other cases spread from this. We find it requires persistent watching to properly quarantine mild cases of this disease, but not a single case has been found to have spread from a family under the surveillance of the health officer. Only one case of typhoid fever originated in the place. Nine nuisances were reported, all of which were removed.

1899. Five cases of diphtheria, fifty of scarlet fever, and five of typhoid fever. Antitoxin was used in four of the diphtheria cases: one, a child about one year old, died. The disease was far advanced before antitoxin was used and little or no benefit was derived in this case, but there was immediate relief in the other cases. Some of the cases of scarlet fever were in so mild a form that they were not reported to the board, and this was the prime cause of our having such an outbreak. Ten nuisances were reported and removed. A little additional work has been done in extending the sewers.—Dr. J. N. Merrill, H. O.

SOLON. 1898. No cases of contagious disease.—Dr. S. F. Greene, H. O.

SOMERVILLE. The town has been unusually free from diseases of all kinds. With the exception of one case of typhoid fever in 1898, there have been no infectious diseases during the two years. —L. W. Soule, Sec.

SORRENTO. One nuisance removed in 1899. No contagious diseases in the two years.—L. T. Havey, Sec.

SOUTH BERWICK. 1898. Fourteen nuisances removed. Three cases of diphtheria and four of typhoid fever. Antitoxin was used in all three cases of diphtheria with remarkable success.

1899. Forty-six nuisances were reported, all of which were removed. One case of scarlet fever and six of typhoid fever.—Geo. F. Clough, Sec.

SOUTHPORT. 1899. This town is very healthful; no contagious diseases reported. We have good, pure water, which we think is very important.—Wm. Cameron, Sec.

SOUTH PORTLAND. 1898. Three cases of diphtheria and three of typhoid fever. One nuisance reported and removed.—T. B. Haskell, Sec.

SOUTH THOMASTON. 1898. Two nuisances removed. No infectious diseases, with the exception of two cases of scarlet fever.

1899. One case of diphtheria in which antitoxin was used with marked success, and one case of typhoid fever.—Dr. Geo. C. Horn, Sec.

SPRINGFIELD. Two cases of scarlet fever and one of typhoid fever in 1899, were all the contagious diseases reported during the two years.—Dr. J. R. Varney, H. O.

STACYVILLE PLANTATION. 1898. One nuisance removed. No infectious diseases. In June we laid about 300 feet of sewers.—John Robinson, Sec.

STANDISH. 1899. No cases of diphtheria, scarlet fever, or typhoid fever have been reported.—Dr. W. S. Thompson, Sec.

STARK. 1898. One case of diphtheria, but none of scarlet fever or typhoid fever.—W. W. Moore, Sec.

1899. There have been no infectious diseases this year.—D. H. Bartlett, Sec.

STETSON. 1898. One case of typhoid fever, but no other infectious disease.—G. M. Bond, Sec.

1899. We have enjoyed good health and prosperity in our town during the past year.—S. J. Ridlon, Sec.

STEUBEN. 1898. No contagious diseases, except two cases of scarlet fever.

1899. Two cases of diphtheria and three cases of scarlet fever.—G. W. Moore, Sec.

ST. ALBANS. 1898. Two cases of typhoid fever, but none of diphtheria or scarlet fever. One nuisance reported and removed. —S. B. Prescott, Sec.

1899. Three cases of scarlet fever and one of typhoid fever. —Dr. J. H. Murphy, H. O.

ST. GEORGE. 1898. One case of diphtheria, eleven of scarlet fever, and two of typhoid fever. When we have cases of pulmonary tuberculosis, the patients and friends are instructed in accordance with the advice given by the State Board of Health.

1899. One case of typhoid fever is the only disease reported this year. We have made a decided improvement in our school-houses, having discarded two old and poorly ventilated buildings, and built a large, three-room schoolhouse with modern conveniences.—Dr. F. O. Bartlett, Sec.

ST. JOHN PLANTATION. 1898. Five cases of scarlet fever in two houses. No other contagious diseases.—W. M. Cyr, Sec.

STOCKHOLM PLANTATION. 1898. No infectious diseases.—Erik A. Larson, Sec.

1899. No contagious diseases, with the exception of a few cases of measles.—Alfred Tall, Sec.

STOCKTON SPRINGS. 1898. One nuisance removed. Three cases of scarlet fever and one of typhoid fever.

1899. Five cases of scarlet fever, but no other infectious diseases.—Dr. J. A. Pierce, H. O.

STONEHAM. No infectious diseases either in 1898, or in 1899.—N. M. Russell, Sec.

STONINGTON. 1898. Five nuisances reported, all of which were removed. Ten cases of scarlet fever, in a very light form; and eight cases of typhoid fever. The sanitary condition of the village would be greatly improved if we had a good sewerage system.

1899. Four nuisances were removed. One case of scarlet fever and four cases of typhoid fever.—R. B. Judkins, Sec.

STRONG. No contagious diseases during the two years, except one case of scarlet fever in 1898. One nuisance was removed in 1899.—W. L. Jones, Sec.

SULLIVAN. 1898. Two cases were reported as scarlet fever, but they proved not to be that; no other infectious disease.

1899. One nuisance removed. No contagious diseases, with the exception of two cases of typhoid fever.—Dr. F. W. Bridgham, H. O.

SUMNER. 1898. Three cases of diphtheria; no other infectious diseases.—Sharon Robinson, Sec.

1899. We have been very free from contagious diseases the past year; only one case of typhoid fever. We established free vaccination last spring and a large number improved the opportunity. Two new schoolhouses have been built, and we have endeavored to the best of our ability to have the sanitary arrangements just what they should be.—Dr. E. H. Andrews, H. O.

SURRY. 1898. One nuisance which came to the knowledge of the board was removed. One case of typhoid fever, and whooping-cough has been quite prevalent during the year.

1899. Two nuisances were removed. No contagious diseases.—Henry J. Milliken, Sec.

SWAN'S ISLAND. 1898. One nuisance was removed. No contagious diseases in town this year, unless the grippe may be so regarded. That was quite prevalent and severe the latter part of the year. We have seen to it that privies connected with schoolhouses have been kept clean and thoroughly disinfected.

1899. Two cases of typhoid fever, but no other disease reported.—Dr. H. W. Small, Sec.

SWANVILLE. 1898. One case of diphtheria and six of scarlet fever.

1899. Twenty-one cases of scarlet fever, but no other infectious diseases.—A. T. Nickerson, Sec.

SWEDEN. One case of scarlet fever in each year, but no other contagious diseases. One nuisance was removed in 1899.—C. W. Bennett, Sec.

TALMAGE. We have not had any contagious diseases of any kind for the last two years.—F. R. Neal, Sec.

TEMPLE. 1898. One nuisance removed. No infectious diseases.

1899. No contagious diseases, with the exception of three cases of diphtheria in which antitoxin was used with satisfactory results.—Geo. F. Blodgett, Sec.

THE FORKS PLANTATION. Six cases of scarlet fever in 1899, but no other infectious diseases during the two years.—C. H. Young, Sec.

THORNDIKE. 1898. Nothing in the way of infectious diseases this year.—J. C. Whiting, Sec.

TOPSFIELD. There was one case of typhoid fever in 1898, and a few cases of measles in 1899, but no other contagious diseases during the two years.—John J. Kneeland, Sec.

TOPSHAM. 1898. One case of diphtheria, one of scarlet fever, and eight of typhoid fever. One horse which had the glanders was killed. Six nuisances were reported, five of which were removed.

1899. One case of diphtheria, five of scarlet fever, and six of typhoid fever. Six nuisances reported, all of which were abated. Dr. H. O. Curtis, H. O.

TREMONT. 1898. Five nuisances reported and all removed. No infectious diseases.—E. L. Higgins, Chr.

TRENTON. 1899. No cases of diphtheria, scarlet fever, or typhoid fever.—L. B. Smith, Sec.

TRESCOTT. There were no infectious diseases during the two years, with the exception of three cases of diphtheria in 1898.—John Saunders, Sec.

TROY. 1898. Two cases of scarlet fever and three cases of typhoid fever.

1899. We have had no contagious diseases this year.—Dr. Mark T. Dodge, Sec.

TURNER. 1898. Two nuisances reported, one of which was removed. Two cases of scarlet fever, but none of diphtheria or typhoid fever.

1899. Two nuisances were reported to the board, and two of them were removed. No cases of contagious disease.—J. P. Waterman, Sec.

UNION. 1898. No infectious diseases, with the exception of one case of diphtheria. In this case antitoxin was used with satisfactory results, although not given until the fifth day.—Dr. D. M. Wood, H. O.

1899. Five cases of typhoid fever, but none of diphtheria or scarlet fever.—L. W. Hadley, Sec.

UNITY. 1898. One case of diphtheria and one of typhoid fever. Antitoxin was used in the diphtheria case with good success.—A. R. Myrick, Sec.

1899. One case of scarlet fever was all the infectious disease reported this year.—Dr. C. M. Whitney, H. O.

UNITY PLANTATION. 1898. No contagious diseases.—James A. Brown, Sec.

1899. One case of scarlet fever and one case of measles.—Wm. J. Getchell, Sec.

UPTON. There have been no cases of contagious disease reported in town during the last two years, with the exception of one case of scarlet fever in 1898.—H. I. Abbott, Sec.

VAN BUREN. 1898. We have been free from infectious diseases this year.—Remi Cyr, Sec.

VANCEBORO. The board has not been called upon to do any work, as there have been no contagious diseases reported for the last two years.—G. W. Eales, Sec.

VASSALBORO. 1898. Three cases of scarlet fever and one of typhoid fever. Two nuisances were reported, and one was removed. In no case has there been any spread of infectious diseases since the use of the formaldehyde generator.

1899. One case of diphtheria, one of scarlet fever, and two of typhoid fever. We used antitoxin in our case of diphtheria, and the results were good.—E. H. Cook, Sec.

VEAZIE. 1898. One nuisance was removed. Ninety-six cases of scarlet fever and two of typhoid fever.

1899. There have been no contagious diseases in our town this year, except two cases of typhoid fever.—Albert J. Spencer, Sec.

VERONA. Ten cases of scarlet fever in 1898, and two cases of the same disease in 1899, but no other contagious disease.—A. H. Whitmore, Sec.

VIENNA. Two nuisances were removed in 1898. No infectious diseases, except one case of diphtheria in 1899.—E. N. Allen, Sec.

VINALHAVEN. 1899. Eleven nuisances reported, all of which were removed. Six cases of scarlet fever, but none of the other diseases.—Dr. E. H. Lyford, Sec.

WADE PLANTATION. 1898. One nuisance removed. No contagious diseases.—Llewellyn Curtis, Sec.

WAITE. 1899. There have been no infectious diseases reported.—J. C. Neale, Sec.

WALDO. 1898. Two cases of scarlet fever, but none of diphtheria, or of typhoid fever.

1899. One case of scarlet fever and one case of typhoid fever. —J. G. Harding, Sec.

WALDOBORO. 1898. One nuisance was reported, but was not removed. No contagious diseases, except one case of diphtheria in which antitoxin was used with good results.—Dr. J. T. Sanborn, Sec.

1899. One case of diphtheria and three of typhoid fever. We used antitoxin in the case of diphtheria, and the results were satisfactory.—Dr. Geo. H. Coombs, H. O.

WALES. 1898. No infectious diseases have been reported.—J. W. Frost, Sec.

1899. Whooping-cough and measles have been the only contagious diseases that have appeared in our town the past year.—W. A. Alexander, Sec.

WALLAGRASS PLANTATION. No infectious diseases reported in the last two years.—Peter Saucier, Sec.

WALTHAM. 1898. No cases of diphtheria, scarlet fever, or typhoid fever.—E. W. DeBeck, Sec.

1899. We have had no contagious diseases this last year.—Alden K. Haslem, Sec.

WARREN. 1898. One doubtful case of diphtheria and three cases of typhoid fever.

1899. Four cases of diphtheria and one of typhoid fever. The village has been supplied with a good water system which will prove of great benefit.—Dr. J. M. Wakefield, H. O.

WASHBURN. 1898. One nuisance was reported and removed. No infectious diseases. Twenty-five children were vaccinated in March.

1899. We have been very free from contagious diseases during the year, having had but two cases of scarlet fever reported, and a few cases of measles. Two nuisances reported and removed.—E. M. Hines, Sec.

WASHINGTON. Our town is in a very healthy condition; no infectious diseases, except a few cases of whooping-cough in 1899.—Dr. S. P. Strickland, H. O.

WATERBORO. One nuisance was removed in 1898, and two in 1899. No contagious diseases in either year.—J. L. Chadbourne, Sec.

WATERFORD. 1899. Two cases of typhoid fever, but nothing else in the way of infectious diseases.—Dr. A. B. Libby, Sec.

WATERVILLE. 1898. Ninety nuisances were removed. Two cases of diphtheria, twelve of scarlet fever, and fifteen of typhoid fever. Antitoxin was used in both cases of diphtheria with good results. Quite a number of houses have been connected with the sewer this year. The attention of the board has been called to two cases of glanders in horses, and six cases of tuberculosis in cows.—Dr. L. G. Bunker, Sec.

1899. About forty nuisances were reported, and all were removed. One case of smallpox, one of diphtheria.

WAYNE. In 1898, we had no infectious diseases; and in 1899, only one case of diphtheria and one of typhoid fever. In the case of diphtheria we used antitoxin which was injected twice, 1,000 units each time. After second injection the fever abated, throat cleared up, and all symptoms improved.—Dr. F. L. Chenery, H. O.

WEBSTER. 1898. Four nuisances reported, three of which were removed. Twenty cases of scarlet fever, in nine houses.—C. A. Dinsmore, Sec.

1899. No contagious diseases reported to the local board of health this year.—James G. Jordan, Sec.

WEBSTER PLANTATION. 1898. No cases of diphtheria, scarlet fever, or typhoid fever.—A. S. Leighton, Sec.

WELD. 1899. No infectious diseases, except seven cases of diphtheria. Antitoxin was used in all these cases with the most satisfactory results.—E. S. Twaddle, Sec.

WELLINGTON. We have had no outbreaks of contagious diseases reported during the two years.—O. B. Davis, Sec.

WESLEY. The only contagious disease we have had for the two years is one case of typhoid fever in 1898, hence the board has had little to do.—Samuel Hawkins, Sec.

WEST BATH. 1898. The board has had no official work to do as no diseases were reported, except one case of mumps and one of whooping-cough.—C. W. Campbell.

WESTBROOK. 1898. Six nuisances reported, five of which were removed. Twelve cases of diphtheria, one of scarlet fever, and nine of typhoid fever. Antitoxin was used in eleven of the cases of diphtheria with satisfactory results.

1899. One nuisance removed. Eleven cases of diphtheria, eight of scarlet fever, and seven of typhoid fever. Antitoxin was used in each case of diphtheria, and the physicians report good results. At the request of the local board, the municipal officers have constructed a sewer to drain certain ditches that have been a source of complaint for years. We had one case of death from tuberculosis, which the attending physician was quite sure the patient contracted from his wife who died from that disease.—H. K. Griggs, Sec.

WESTFIELD PLANTATION. 1898. Several cases of scarlet fever in a very mild form, and two cases of typhoid fever. Both cases of typhoid fever were contracted outside the plantation.

1899. We have been very free from contagious diseases during the year; only two cases of scarlet fever.—J. Frank Taylor, Sec.

WEST FORKS PLANTATION. Two cases of scarlet fever were reported in 1899, but no other contagious diseases in the two years.—Frank J. Durgin, Sec.

WEST GARDINER. No cases of infectious disease, either in 1898 or in 1899.—F. E. Towle, Sec.

WESTMANLAND PLANTATION. 1899. No cases of diphtheria, scarlet fever, or typhoid fever.—Lars P. Storm, Sec.

WESTON. No cases of contagious disease have come to the knowledge of the board in either year.—Varney W. Putnam, Sec.

WHITEFIELD. This town has been remarkably free from all contagious diseases for the last two years, so that the board has had but little to attend to. In 1898, one nuisance was reported to the board, but, although notice was given for its removal, it was not done.—Marcellus Philbrick, Sec.

WHITING. 1899. One case of typhoid fever, but no other infectious diseases.—W. H. Leighton, Sec.

WHITNEYVILLE. No contagious diseases, except one case of scarlet fever in 1899. One nuisance removed each year. The first of April in each year, we go through the place and see that all premises are cleaned up.—W. M. Flynn, Sec.

WILLIAMSBURG. No infectious diseases in 1898 or in 1899.—R. J. Williams, Sec.

WILLIAMANTIC. One nuisance was removed in 1898, and three in 1899. No contagious diseases in either year.—C. C. Norton, Sec.

WILTON. 1898. One case of diphtheria and six of typhoid fever. One nuisance was removed.

1899. Four cases of typhoid fever, and in the spring German measles prevailed to quite an extent.—A. B. Adams, Sec.

WINDHAM. 1898. Two nuisances were reported to the board, both of which were removed. One very mild case of scarlet fever was all the infectious disease we had.—Dr. R. B. Jordan, Sec.

1899. Ten cases of scarlet fever and one of typhoid fever.—Dr. I. D. Harper, Sec.

WINDSOR. Three nuisances were reported in 1899, and all were removed. No contagious diseases in either year.—C. F. Donnell, Sec.

WINN. We have been free from infectious diseases for the last two years. Two nuisances were removed in 1899.—P. J. Mulherin, Sec.

WINSLOW. 1898. Two nuisances removed. Eight cases of diphtheria, one of scarlet fever, and four of typhoid fever. Antitoxin was used in three of the cases of diphtheria: two of the patients to whom it was administered the first day of the disease recovered. In the third case the antitoxin was not given until the third day, and the patient died.

1899. One hundred and eight cases of smallpox, six of scarlet fever, and one of typhoid fever. The smallpox cases were in twenty-five houses, and we quarantined three more on suspicion. Experience has taught that vaccination, a strict quarantine, and thorough disinfection can immediately stop the spread of such an epidemic. Also a hospital is indispensable.—Geo. W. Patterson, Sec.

WINTER HARBOR. No infectious diseases for the two years, with the exception of one case of typhoid fever in 1898. Three nuisances removed each year.—R. M. Torrey, Sec.

WINTERPORT. 1898. One nuisance was reported, but on account of want of agreement on the part of the board it was not removed. No infectious diseases, except twenty-six cases of scarlet fever.

1899. One case of scarlet fever was all the contagious disease reported this year.—Dr. C. F. Atwood, Sec.

WINTHROP. 1898. Two cases of diphtheria, two of scarlet fever, and two of typhoid fever. Six nuisances were removed.

1899. Three cases of diphtheria, four of scarlet fever, and two of typhoid fever. Six nuisances were reported, all of which were removed.—Dr. C. A. Cochrane, Sec.

WISCASSET. 1898. No cases of contagious disease.—Dr. C. A. Peaslee, Sec.

WOODLAND. 1898. There have been no contagious diseases reported. I think the law should be a little stronger so that all physicians would report contagious diseases. There was one death from consumption which was not reported to the board.—Moses P. Abbott, Sec.

WOODSTOCK. 1898. One case of diphtheria and five of typhoid fever. All these typhoid fever cases were contracted in other places. We are furnishing free vaccination at present, and nearly all the citizens of the place are being vaccinated.

1899. No infectious diseases in town.—Geo. L. Stephens, Sec.

WOODVILLE. 1898. No cases of infectious diseases in the town during the year.—R. A. Rush, Sec.

1899. One case of consumption was reported, but none of diphtheria, scarlet fever, or typhoid fever.—W. O. Ireland, Sec.

YARMOUTH. 1898. Nine nuisances reported, all of which were removed. No infectious diseases, except one case of diphtheria in which antitoxin was used with good results. We think very highly of formaldehyde disinfection.

1899. Eight nuisances were removed. Four cases of diphtheria, five of scarlet fever, and one of typhoid fever. Antitoxin was used in every case of diphtheria with satisfactory results.—L. R. Cook, Sec.

YORK. 1898. No contagious diseases reported; the health of the town has been almost perfect. One nuisance was removed.—Dr. W. L. Hawkes, H. O.

1899. No cases of infectious diseases. Two nuisances were reported and removed.—Dr. J. C. Stewart, Sec.

SPECIAL PAPERS.

EXPERIMENTS WITH DISINFECTANTS.

By F. N. Whittier, M. D., Instructor in Bacteriology and Pathological Histology in Bowdoin College.

During the summer of 1899 experimental work was continued at the Searles Laboratory. The Bowdoin vaporizer was tested upon Bacillus coli communis and Bacillus subtilis. Some preliminary experiments were made for determining the sterilizing effect of formaldehyde upon the tubercle bacillus. Other experiments were made for determining the effect of solutol upon the same bacillus both in pure culture and in tuberculous pus. It is proposed to continue these three lines of work during the summer of 1900.

EXPERIMENTS WITH FORMALDEHYDE GAS.

A. Upon Bacillus coli communis (colon bacillus) and Bacillus subtilis (hay bacillus).

The object of these experiments was to determine the resisting power of pure cultures when smeared upon platinum, wood or cloth.

Pure cultures of colon or subtilis, from 48 hour agar slants, were smeared upon sterile bits of platinum, wood and cloth. These bits were then placed in sterile Petri dishes and exposed to the action of formaldehyde gas. After such exposure the smeared objects were placed in bouillon tubes and incubated at 37.5 C. for 24 hours. They were afterwards kept under observation for ten days. Two sets of controls were made. The first set, for controlling the technic, was carried through the same process as the regular test objects except smearing with organisms and exposure to the gas. These are called technic controls. The second set, for controlling the cultures, were smeared like the test objects and carried through the same process with the exception that they were not exposed to the gas. These are called culture controls.

The cultures of colon and subtilis were obtained from Harvard Medical School. For purposes of comparison with former experiments, silk threads soaked in 24 hour bouillon cultures were treated in the same manner as the other smeared test objects.

1.

Thirty-two test objects were smeared with pure cultures. Sixteen were smeared with colon and sixteen with subtilis. Of the sixteen smears of each organism, four were upon platinum, four upon wood, four upon cloth and four were silk threads as described above. The Bowdoin vaporizer was used. About one Kg. of formalin was evaporated in a room containing 2,170 cubic feet of space. The time of exposure was 24 hours. One pint of kerosene was used. Sixteen of the test objects were exposed to the fumes of ammonia after exposure to the formaldehyde gas. All the tubes were kept under observation for eleven days. All remained sterile. Eight technic controls sterile. Eight culture controls showed heavy growths after the 24 hours in the incubator.

2.

Thirty-two test objects smeared as in former experiment. Bowdoin vaporizer was used. .824 Kg. of formalin was evaporated with one pint of kerosene. Other conditions were the same as in former experiment. Tubes were kept under observation for two weeks. All remained sterile. Eight technic controls were sterile. Eight culture controls gave heavy growths. Sixteen of the test objects exposed to the fumes of ammonia after exposure to formaldehyde.

B. Experiments with Formaldehyde Gas upon Pure Cultures of Tubercle Bacillus.

The object was to determine the resisting power of pure cultures of tubercle bacillus when exposed to formaldehyde gas. Two cultures of tubercle bacillus were used. No. 1 was obtained from Harvard Medical School. No. 2 was obtained from H. K. Mulford Company. No. 1 grew much more readily than No. 2 upon glycerin agar and glycerin bouillon.

The test objects were platinum, wood and cloth. The technic was the same as was used in the tests upon colon and subtilis.

The culture medium was a five per cent glycerin bouillon. The Bowdoin vaporizer was used and the test objects exposed in a room containing 2,170 cubic feet of space.

1.

Twelve test objects were smeared with pure culture from tubercle No. 1. Four smears were upon platinum, four upon wood and four upon cloth. 1.044 Kg. of formalin was evaporated with one pint of kerosene. The tubes were sealed with wax, put in the incubator at a temperature of 37.5 C. and kept under observation for two months. The growths were then examined and tested for the tubercle bacillus with differential stain. Of the four smears upon platinum, three showed growths of tubercle bacillus, one was sterile. Of four on wood, two showed growths, two sterile. Of four on cloth, one showed growth, three sterile. Four culture controls gave growths. Four technic controls were sterile.

2.

Twelve test objects were smeared with pure culture from tubercle No. 2. Four smears on platinum, four on wood and four on cloth. Exposure was made at the same time as preceding experiment. Technic the same. Of four smears upon platinum, two showed growths, two were sterile. Four on wood were all sterile. Of the smears on cloth, one showed growth of tubercle bacillus, two were sterile and one was contaminated. Three technic controls were sterile. Two culture controls gave growths, one was sterile.

EXPERIMENTS WITH SOLUTOL.

The object of these experiments was to determine the efficacy of solutol as a means of destroying tubercle bacilli in pure culture and in tuberculous pus. A solution of one part of crude solutol to thirty-two parts of water was used at a temperature of about 37.5 C. The solution was added to the material to be sterilized in the proportion of two or three parts of solution to one part of such material. The time of exposure was one hour. A loop-drop of the sterilized material was then added to each tube of sterilized bouillon. The tubes were stoppered with wax and kept in the incubator for two months at a temperature of 37.5 C.

The usual culture controls were made. Other controls were made to determine whether there might be a possibility of carrying over with the loop-drop of sterilized material enough of the solutol to inhibit the growth of any living bacteria that might be present. From one to four loop-drops of the solutol solution were added to sterile bouillon tubes. The tubes were then inoculated by adding a single loop-drop of the infected material. These were called inhibition controls. The culture medium was five per cent glycerin bouillon.

1.

Single loop-drops from a culture of tubercle No. 1 which had been exposed to the action of solutol were added to four tubes of bouillon. After two months in the incubator the tubes showed no growths. A culture control showed heavy growth. Three inhibition controls showed growths that were apparently just as vigorous.

2.

Single loop-drops of tuberculous sputum which had been exposed to the action of solutol were added to four sterile bouillon tubes. After two months in the incubator the tubes remained sterile. The controls showed heavy growths.

CONCLUSIONS.

1. Bacteria as resistant as colon or subtilis may be destroyed by evaporating with the Bowdoin vaporizer ½ Kg., or less, of formalin per 1,000 cubic feet of space.

2. The tubercle bacillus is more resistant to formalin than the colon bacillus or bacillus subtilis.

3. Solutol, as used in the above experiments, is an efficient agent for sterilizing tuberculous sputum.

VACCINATION AND VACCINE LYMPH.

By C. D. Smith, M. D., President of the Board.

What is vaccination? What is its object? These questions may be answered as follows: First. Vaccination is the introduction into the system of the specific cause of a condition known as "Vaccinia," following which introduction, if this condition be thereby induced, the individual exhibits a train of well defined symptoms, accompanied by the development, at the point of insertion, after two or three days, of a red papule which increases in area but not in height and becomes paler and raised about the edges, the marginal portion becoming filled with a clear fluid lymph giving it a pearly appearance. From the eighth to the tenth day the lymph becomes thick, opaque, and yellow in color and surrounded by a reddened area due to congestion of the skin and known as the areola, five or six times the size of the vesicle. This disappears in a few hours fading from the vesicle outward.

The vesicle gradually dries, crusts or scabs over, and is exfoliated or shed between the fifteenth and thirty-fifth day, leaving a characteristic shining oval or round scar slightly depressed, and pitted about the margin or marked with radiating lines. The scar is usually persistent through life. This typical vesicle is evidence that inoculation has been successful. Its appearance at the site of inoculation is a peculiarity of the disease. Any lesion which does not follow this typical course is open to suspicion.

Second, the object sought is the protection of the individual so treated, against the infection of variola or smallpox. Associated with these two topics are many others bearing upon the scientific reasons for the procedure, the demonstration of the protective nature of vaccination; the relation of the induced disease to the one which we aim to prevent; the nature of the material used, in its different forms; the technique of its preparation, preservation, and introduction; the assumed dangers of its employment; the variations in the appearance of the resulting vesicle; and conditions or diseases which are sometimes concomitants or sequelæ.

The aim of this report is to set forth the most recently accepted facts relative to these different topics with the hope that such statement may be of interest to the people of this State whose intelligent coöperation has indicated their appreciation of the efforts of this board to conserve the public health, and to the medical profession upon whose immediate care in the treatment and prevention of disease all the people rely.

What is Vaccinia?

It is smallpox which has been robbed of its virulence, or attenuated, by passage through the resistant tissues of the cow through successive generations of animals.

Modern study of the nature of those micro-organisms called bacteria in their causative relation to disease has furnished the explanation, not only of the nature of vaccinia or cowpox, but also of why it protects against smallpox.

A little over a hundred years ago Edward Jenner, an English physician, demonstrated the fact; modern science furnishes its explanation.

It has long been known that one attack of certain infectious diseases practically protects the individual against subsequent attacks of the same disease, in other words renders him immune.

It is now found possible after inducing some of these diseases in certain animals to obtain from those animals material, which introduced into the body of another animal produces in it a milder form of the original disease, by which, protection against future attacks is secured as surely as though the disease with its usual virulence had been experienced. It is possible to weaken the virus by the inoculation from one to another of several animals without destroying its protective nature. Practically this is accomplished by the cultivation of vaccine lymph in bovine tissues.

The Protective Power of Vaccination.

It would seem almost needless to conduct in this State a discussion as to the protection against smallpox conferred by vaccination. The character and intelligence of our population is such that no evidence of opposition to vaccination has ever assumed organized form. There is reason to believe that none of any account exists, and the judgment of the medical profession has been unhesitatingly accepted and followed by the people for many generations, consequently we are a well protected community. Good evidence of this is seen in the facts that during the severe epidemic in Canada in 1885, and that at Waterville and Winslow in 1898-99, the disease was confined to a comparatively unvaccinated population. It is possible under the law to continue this beneficent order of things by keeping up the vaccination rate, by taking advantage of the free vaccination everywhere available yearly.

It is for the encouragement of those upon whom rests the responsibility for this vaccination, and particularly of those having the care and rearing of children, that a few pertinent facts are here briefly presented.

The German law of 1874 makes vaccination obligatory in the first year of life, and revaccination also obligatory at the tenth year. This law in Germany resulted from the epidemic of 1871, with its 143,000 deaths among a population in which vaccination had been allowed to die out. Prior to 1874, the yearly loss was 15,000 to 25,000. The present rate is less than 116 per year, and these cases occur on her borders where there is constant mingling with the poorly vaccinated of other countries.

The disease does not spread or become epidemic among well vaccinated people. It does so develop among the unvaccinated. During the Franco-German war, the inevitable mingling of the two peoples spread smallpox which was epidemic. The Germans, had vaccination optional for its civil population, but compulsory for its army; the French, having it optional alike for army and population. The French army lost from smallpox 23,000 men; the German, 278. Occupying the same hospital tents, with the same surroundings, the French wounded lost many from smallpox; the Germans, not any. The French prisoners of war died by the hundreds; their German guards who had been vaccinated and revaccinated, suffered not at all.

Germany is surrounded by countries where smallpox is almost always present, and in which the death ratio is large, yet in the

German states it is extremely rare, almost unknown, and so great is the confidence of the German people in their immunity that when sporadic cases occur they excite no apprehension whatever.

Similar official statistics are obtainable from other European governments. In countries with optional vaccination, the annual death-rate from smallpox varies from 150 to 600 per million of the population.

In Denmark, Sweden, and Norway, where, as well as in Germany, vaccination is compulsory, the annual death-rate is from 1 to 3 for each million. In England and Wales, before the introduction of vaccination, the mortality was 3,000 per million; since the introduction of vaccination it has been reduced 75 per cent. (During the year 1890, there were but 15 deaths from smallpox in all England).

There has been from the earliest collections of statistics an unvarying confirmation of facts as to the ravages of the disease in unvaccinated communities, and the fall of the rate of prevalence, as well as of the death-rate, after vaccination has been introduced and practiced. Certain facts are conclusively demonstrated by statistical and other evidence to the satisfaction of those not blinded by prejudice or ignorance. They are these:

In unprotected communities, as among savage races, unmodified by vaccination smallpox attacks with few exceptions all who are exposed to its infection. Of these, by far the greater proportion succumb to its attack; especially is it fatal to child life.

When it attacks a partially protected community, the unvaccinated are the selected victims. This has been shown the world over, time and again, by the immunity of vaccinated Americans and Europeans in the midst of epidemics so severe as to practically extinguish native populations.

When a general epidemic prevails, and vaccinated people are affected, as they sometimes are, it is invariably found that the disease in them is modified in its virulence, varying with the period of time which has elapsed since their vaccination, the longer the time, the severer the disease. Personal experience and observation have enabled the writer to verify this many times. It was conspicuously so in the Portland epidemic of 1871, and in the Waterville and Winslow epidemic of 1898-99.

Properly performed, before and after puberty, and resulting in the typical vaccine lesion, the vaccination will confer practically as much protection against smallpox as will an attack of the disease itself.

We have for contemplation the accumulated experience of a little over one hundred years during which vaccination has been used.

While not invariably an absolute preventive, it is always a controller and modifier of the disease if it be contracted. The vast majority of the vaccinated are protected. With the minority, its danger to life, and its disfiguring scars are removed. It is changed from a severe and unusually fatal disease into a mild and comparatively unimportant one, attended by little or no danger.

Mr. Ernest Hart, late editor of the *British Medical Journal,* called attention to the fact that the antivaccinationists have professed to derive much satisfaction from the fact that English hospital statistics show an actually greater number of cases of smallpox (three times as many) occurring in vaccinated people than in the unvaccinated. The other side of the story, which is significant, they do not tell. It is, that, first, the vaccinated are at least twenty-four times as numerous as the unvaccinated. Second, the absolute number of deaths among the unvaccinated is twice as great as among the vaccinated, and, in a community all attacked by smallpox the death-rate among the unvaccinated will be six times as great as that in vaccinated cases.

An analysis of 10,181 cases in the Metropolitan hospitals of England 1871-1878, shows that 7,674 had been vaccinated; 2,507 unvaccinated. Doubtful cases were excluded. 1,833 of the total number died; of these, 1,205 were among the unvaccinated, 628 among the vaccinated. The death-rate among the vaccinated was 82 per thousand; among the unvaccinated 481 per thousand.

Third.—The fact that much vaccination has been inefficient is totally ignored.

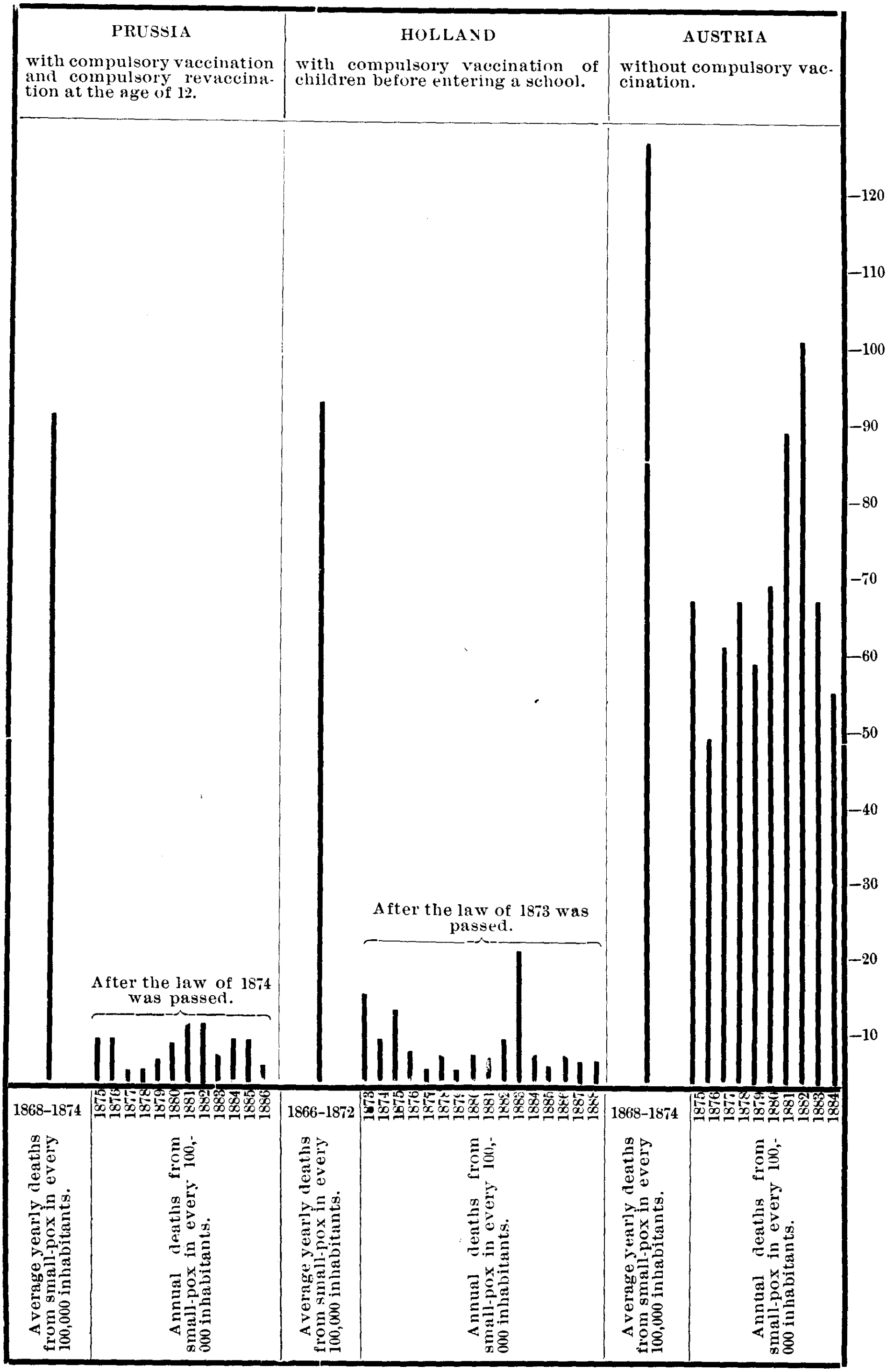
Fourth.—The rate of mortality among the vaccinated cases is in exact proportion to the number and quality of the scars which are evidence of the degree of the probable protection.

For example, to summarize one table of hospital statistics:

	Admissions.	Deaths.	Death-rate per 1,000.	
CLASS I.—VACCINATION WELL MARKED.				
With 4 marks or more,	263	4	15	
" 3 " "	396	12	30	
" 2 " "	532	17	32	33
" 1 " "	435	21	39	
CLASS II.—VACCINATION INDIFFERENTLY MARKED.				
With 4 marks or more,	344	19	55	
" 3 " "	540	42	77	
" 2 " "	952	104	109	111
" 1 " "	821	158	158	
CLASS III.—SAID TO HAVE BEEN VACCINATED BUT BEARING NO MARKS.				
	793	216	272	272
CLASS IV.—UNVACCINATED.				
	1,477	676	452	452

These statistics might be multiplied to an amount too voluminous to warrant either printing or reading. Those introduced have been selected because typical.

The following chart has been employed by the *Melbourne Argus* and later by the *Practitioner,* and the *Philadelphia Medical Journal,* which shows at a glance in a most graphic manner the behavior of the disease in relation to vaccination and revaccination.


PRUSSIA
with compulsory vaccination and compulsory revaccination at the age of 12.
HOLLAND
with compulsory vaccination of children before entering a school.
AUSTRIA
without compulsory vaccination.
—120
—110
—100
—90
—80
—70
—60
—50
—40
—30
—20
—10
After the law of 1874 was passed.
After the law of 1873 was passed.
1868–1874
Average yearly deaths from small-pox in every 100,000 inhabitants.
1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886
Annual deaths from small-pox in every 100,000 inhabitants.
1866–1872
Average yearly deaths from small-pox in every 100,000 inhabitants.
1874 1875 1876 1884 1887
Annual deaths from small-pox in every 100,000 inhabitants.
1868–1874
Average yearly deaths from small-pox in every 100,000 inhabitants.
1875 1876 1881 1882 1883 1884
Annual deaths from small-pox in every 100,000 inhabitants.

Revaccination.

It is not enough for complete and permanent protection that a single vaccination be relied upon. Nor is it possible to answer accurately the questions so often asked—how long does it last? or, how often should it be repeated?

There are certain periods of life when all the bodily tissues are the subject of marked changes, when waste and repair are most active, and when permanent impressions, upon the tissues, of induced immunity, are not to be expected.

The German law recognizes and provides for these conditions by insisting upon vaccination during the first year of life and again at the age of ten years. When the age of puberty has been attained it is recognized that there have taken place marked physical changes, which may have disturbed the existing immunity and the operation is repeated. If then successful, it is usually regarded as lasting practically for life. This should not, however, be assumed, and an occasional trial will do no harm and may result successfully. The necessity of the attempt during the prevalence of smallpox is, of course, apparent and has already been pointed out. Under the influence of vaccination, while there has been a fall in mortality in child life, there has been a slight rise with increasing age, which doubtless corresponds to gradual loss of immunity. That is, as has been pointed out, (Edwardes, London, 1892) in protected communities smallpox is practically an adult disease.

Revaccination is, therefore, almost as essential for the assured protection of the adult as is primary vaccination for the child. The protection of thorough revaccination is as good as that of smallpox itself. The community representing an aggregation of individual units will be a protected community, and interference with its prosperity and health will be reduced to a minimum because of the improbability of occurrence of the disease.

The Essential Nature of the Material Used.

What the active principle of the contents of the vaccine vesicle is has not yet been definitely settled. It is believed to be some form of micro-organism. Whatever its nature, it is a fact that the greatest amount of it is contained in the pulp or granulation layer at the base of the vesicles, less in the lymph immediately overlying it and comparatively little in the clear lymph next the superficial surface.

Besides this active vaccinal material, lymph invariably contains other micro-organisms, the presence of which it is absolutely impossible to avoid by any safe process of skin sterilization, or methods of preparation now known. The claim that any lymph is produced free from bacteria is a perversion of fact, and abundantly disproved. As a matter of fact the vaccine material is implanted and cultivated in the skin of a calf, from the hair follicles and deep layers of which it is impossible to completely exclude the staphylococcus aureus, always present. It is possible by intelligent control of the surroundings to eliminate or reduce to a minimum the presence of the hay bacillus and other irritating bacteria. There are certain air borne micro-organisms which cannot be excluded by any means yet devised. There is no such thing as a naturally sterile lymph. It is, however, possible to render practically harmless, if not to destroy the germs which are present, by special methods of preparation and storage.

Different Forms of Lymph.

Dried lymph upon points or quills is the natural exudate found in the vesicle, and transferred to these quills or points by dipping or wiping, with no other specially applied protective methods than come from an antiseptic management of the animal and its surroundings, and the manipulation of the points and the lymph. Crusts are masses of died exudate mixed with blood corpuscles and epithelial cells, produced under the same circumstances as the lymph borne upon points and quills. Fluid glycerinated lymph in capillary tubes and dried, and moist glycerinated lymph upon points are the products of special methods of management, and the appearance of this kind of lymph in this State dates back only to the winter of 1898-99.

It is probable that no comparative new article was ever more quickly and easily introduced or more universally adopted than was fluid lymph in capillary tubes, by the profession in this State. Because its use has not been altogether satisfactory in some quarters, and yet because there are good reasons for believing it to be an ideal form of lymph, the effort will be made to give such information in regard to it as is accessible.

Glycerinated lymph is sold in two forms, sealed in tubes and smeared upon points, dried or moist. The addition of the glycerine is based upon the facts that as, at first obtained, the lymph contains many organisms, some pus producing, some not, and that it is possible to destroy some of these and inhibit the growth of others by keeping the lymph in contact for some time with a germicidal agent which, however, is itself innocuous when applied to the denuded skin. The agent selected is chemically pure glycerine, and its effect is to purify and preserve the lymph. Lymph not so treated is a favorable culture medium for bacterial growth which at the same time also tends to destroy the potency of the specific vaccine material. Glycerinated lymph is not new. Copeman states that in 1850, Mr. R. Cheyne advocated the superiority of lymph kept in the fluid state by the addition of glycerine, over that which had been dried upon points.

Three years later (1853), Mr. Cheyne showed to the presidents of the Royal Colleges of Physicians and Surgeons a child whom he had successfully vaccinated with lymph which he had previously kept for six months after treatment with glycerine.

In 1869, Müller, of Berlin, demonstrated that the quantity of material available could be increased by the addition of glycerine without affecting injuriously the potency of the mixture, even if diluted with three times its bulk.

The fact that the preservation of the lymph is due to bacterial destruction by the glycerine is one of comparatively recent discovery made possible by advances in bacteriological study. Such, however, seems to be the demonstrated fact as will, perhaps, be apparent from a description of the modern process of producing lymph from the time of inoculation till it is placed in the hands of the user.

Method of Producing Glycerinated Lymph.

Great care is exercised in the selection of the animals: female calves under 6 months of age are selected, and kept under observation for at least a week, meanwhile being carefully examined to determine the presence or absence of tubercular or other disease. The fact that they are of any particular breed is of no consequence in comparison with their having a healthy constitution. When ready for inoculation the animal is placed upon an oper-

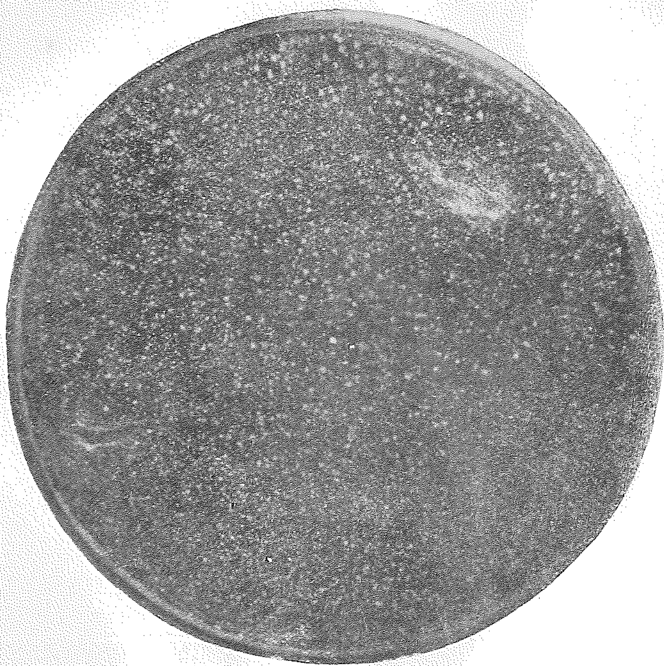


Fig. 1. Photograph of agar plate incubated for seven days subsequent to inoculation, with one loopful of rubbed-up vaccine pulp, immediately after glycerination. The number of colonies is very large.

[Through the courtesy of the Macmillan Company we are permitted to reproduce these five plates from Dr. Copeman's excellent work on vaccination.]

ating table, and the surface of the lower abdomen is washed, shaved, washed with antiseptic solutions mixed with sterilized water, and carefully dried with sterilized towels. Every detail is carried out with as much care as in the ampitheatre of a hospital, and during all the manipulations the utmost care is taken to prevent undue excitement or any injury of the animal.

Inoculation of this clean area is made by making a series of short parallel incisions through the epidermis without drawing blood. Into these incisions glycerinated calf lymph, which by bacterial examination has been proven to be free from septic organisms, is thoroughly rubbed by a sterilized blunt or flat spatula. A careful clinical record of the animal's condition, including a temperature chart, is kept from the first. On the 5th or 6th day, this vaccinated surface is again carefully cleansed with sterile soap and water and warm sterile water, and all moisture carefully dried away. There will then appear parallel rows of linear vesicles from a quarter to half an inch apart. All crusts and the summit of the vesicles are carefully removed, and the pulp layer at the bottom of the vesicle is removed by a sterilized Curette or Volkman spoon and transferred to a sterilized glass receptacle of known weight. The surface is carefully dressed, and the animal subsequently killed and subjected to a veterinary examination before the product is marketed. Should any diseased condition be present, the entire product is rejected.

The vaccine pulp is carefully weighed in the laboratory, amounting on an average to 18 to 24 grams, (4½ to 6 drams). It is then carefully rubbed up in a sterilized mortar, or triturated by machines devised for this express purpose, the most common of which are the tube machine of Dr. Chalybäus, of Dresden, or the glass roller machine of Döring, of Berlin, or modifications of them. When sufficiently ground, it is further mixed by the same means with 6 times its weight of a sterilized solution of 50% chemically pure glycerine in distilled water.

The object of this painstaking trituration is to secure the most intimate mixing of the glycerine with the pulp. The result is a creamy syrupy emulsion which is then transferred to large sterilized tubes, aseptically sealed, and stored secure from the deleterious influences of high temperatures or light, a portion being reserved for bacteriological examination. This is begun by inoculating from the reserved portion plates of nutrient agar, a suitable medium for the growth of micro-organisms. At the end of a week abundant colonies will have developed. (See Plate I.) The process is repeated from week to week, the number of colonies and the exuberance of growth steadily diminishing (Plates II, III) until at the end of four weeks the inoculation of plates gives no growth. (Plate IV.) If another and final plate culture is negative, it means that the organisms are practically absent and the lymph is ready for capillary tubing and distribution.

The other stored tubes are, of course, now in the same aseptic condition as the last test plates, and the lymph is drawn by air or water pressure into sterilized capillary tubes which are sealed in a flame, at both ends, and are ready for packing and distribution. Every package is marked with the number of the calf, and the date limit of usefulness. The former affords ready means of identification in case untoward results are reported from the use of any particular lot of tubes.

The method described is substantially that in use in England at the Government Lymph Laboratories, Chelsea Bridge, London, where by the courtesy of Sir Richard Thorne-Thorne, late medical officer of the Local Government Board, and Doctor Frank Blaxall, the bacteriologist in charge, the writer had an opportunity to observe the methods of preparation there in vogue in September, 1899. It is practically the same on the continent wherever glycerinated lymph is used, and is substantially the procedure followed by the producers in this country. There are slight variations in technic and in the forms of apparatus for triturating the lymph and filling the tubes, but these have no practical influence upon the quality of the material as a vaccine lymph; the same result is secured by all. Besides as an emulsion, glycerinated pulp is also furnished moist in tubes, upon points protected by special devices intended to prevent drying and infection. It is also procurable *dried* upon points. This form is for sale in this State and is to be distinguished from the ordinary dried lymph. It has all the advantages in use of the old point form but has greater efficiency, possessing all the advantages of the emulsion in tubes. It dries upon the scarified area more rapidly than the moist forms. Another form of glycerinated

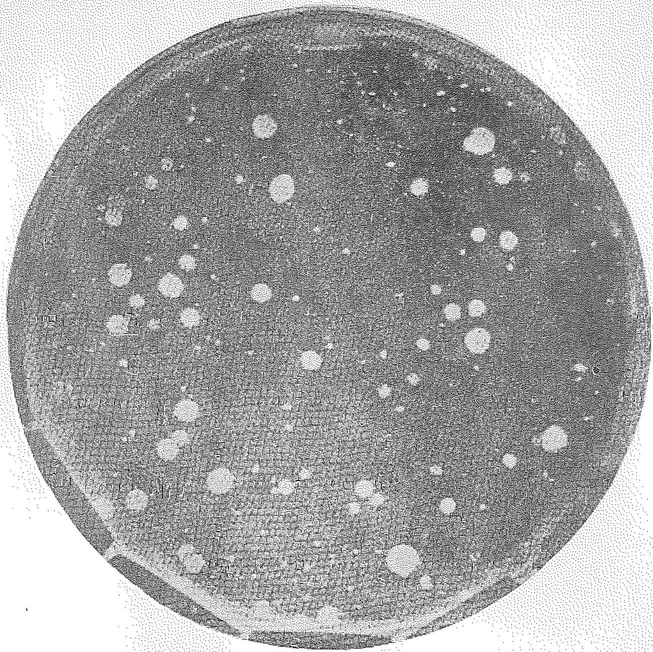


Fig. 2. Photograph of agar plate prepared with similar quantity of vaccine material *one week* after glycerination. The number of colonies is considerably diminished.

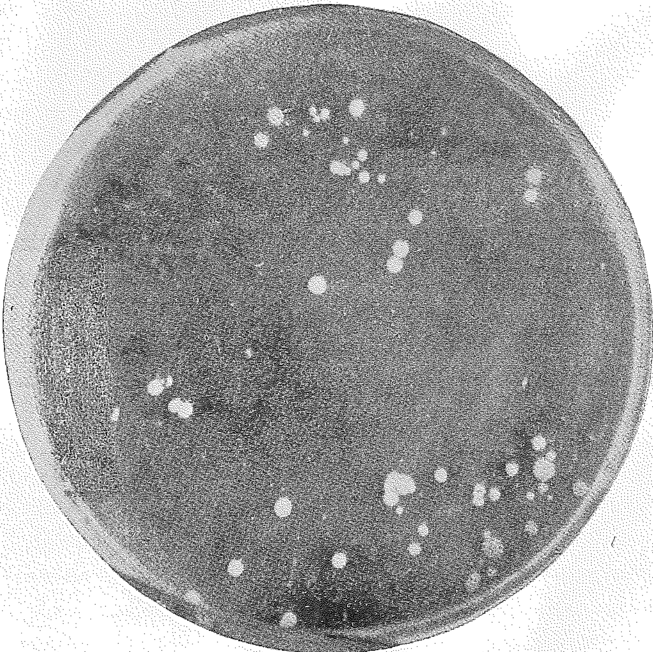


Fig. 3. Photograph of similar agar plate prepared with vaccine material *two weeks* after glycerination. A further decrease in the number of colonies is now conspicuous.

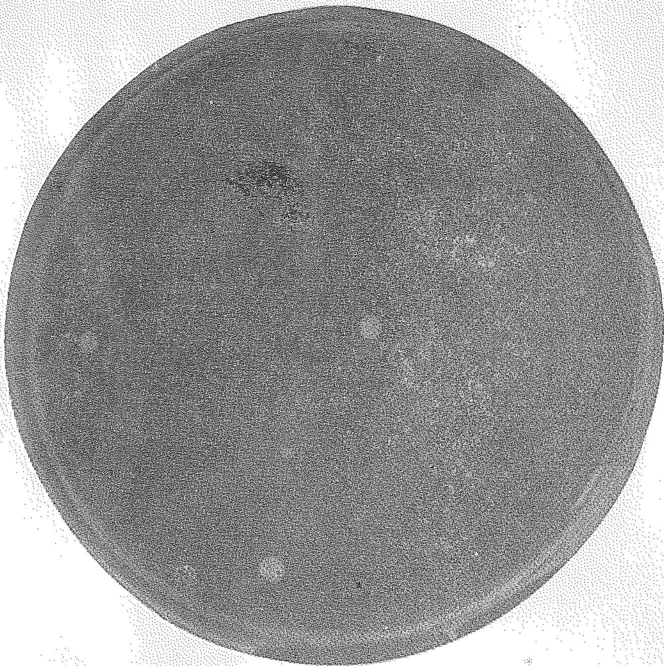


Fig. 4. Photograph of similar agar plate prepared *three weeks* after glycerination. The decrease in the number of colonies is still more marked than in the former plates.

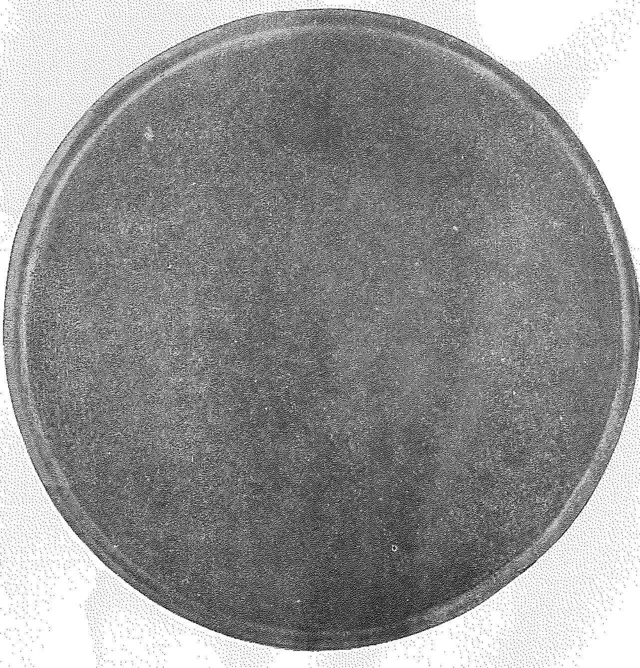


Fig. 5. Photograph of similar agar plate prepared with vaccine material *four weeks* after glycerination. No growth whatever has occurred.

lymph is on the market, but is prepared *not* from the pulp, but from the same clear lymph exuding after removal of crust and vesicle wall, as is used to coat the old form of points. The claim is made for it that it is not so likely to resist the bacterial influence of the glycerine as is the pulp layer.

The evidence is conclusive that properly manipulated the germs in the pulp layer do *not* resist four weeks' contact with glycerine, and this layer is of greater vaccinal potency.

Evidence of Asepticity of Glycerinated Lymph.

What evidence do we possess that vaccine lymph, admittedly infected when formed in the skin of the calf, is made practically aseptic by being stored mixed with glycerine? A general answer would be: the experience of every laboratory where vaccine lymph is tested, and its official adoption by the governments and health authorities of the United States, Great Britain, Germany, France, Belgium, and Russia; but, to be more specific, let us see what are the forms of bacteria commonly found in all lymph, and then read the description and results of its admixture with glycerine.

In 1897, Drs. S. Moncton Copeman and Frank Blaxall carried on a series of investigations to determine the nature of the bacterial forms commonly found in calf lymph, and these were shown to be extraneous and not at all concerned with its specific action. These were:

Group 1	Staphylococcus cereus flavus. " " albus.
Group 2	Large yeast, orange colored. Small " light brown colored. Small " pale salmon color, slow growing.
Group 3	Staphylococcus pyogenes albus.
Group 4	" " aureus.
Group 5	" " citreus.
Group 6	Bacillus mesentericus vulgatus (accidental.)
Group 7	Bacillus subtilis.
Group 8	Various molds and sarcinæ.

Some members of groups 1 and 2 were always present.

Of the two pus producing organisms, Staphylococcus pyogenes albus was frequently present; Staphylococcus aureus less frequently.

The presence of Bacillus subtilis as well as that of the molds seemed to depend upon the care exercised in cleansing the skin and in the collection of the lymph. It is probable also that the number and character of the organisms will vary with the surroundings of the animals. If care be exercised in the collection of the lymph and in the management of the stables, usually the lymph will contain only one or more of the staphylococci, usually a white one, and some of the yeasts.

Copeman shows conclusively that the mere fact that vaccine lymph or vaccine pulp contains, sometimes, organisms which under some circumstances cause suppuration does not stamp that as a purulent lymph, nor if such lymph were used would suppuration necessarily occur.

The pus-producing streptococcus is rarely found in calf lymph. The Berlin Commission never found it at all, in an exhaustive examination of 64 samples of lymph. There is not on record a single instance of the bacillus of tubercle having been found in lymph, human or bovine.

At a meeting of the British Medical Association in 1896, Drs. Blaxall and Copeman, than the latter of whom there is no more distinguished authority upon all that pertains to the subject of vaccination, made a report upon the subject of the "Influence of Glycerine upon the Growth of Bacteria" in which the germicidal and inhibitive action of glycerine upon pathogenic and non-pathogenic organisms is exhaustively set forth.

The organisms were taken from pure cultures and were purposely added to various media as well as to vaccine lymph and exposed to the action of glycerine under culture environment most suitable for their growth.

By the courtesy of Dr. Blaxall, the collective results are herein given.

In all, hundreds of inoculations were made. Quantities of glycerine were added to tubes of peptone bouillon, the tubes then inoculated with equal quantities of pure cultures and incubated at blood heat and at room temperature. Other inoculations were made upon solid media to give the different organisms every opportunity of development. Control cultures were made in bouillon. The organisms tested were: Staphylococcus pyogenes aureus, Staphylococcus pyogenes albus, Streptococcus pyogenes, Bacillus pyocyaneus, Bacillus subtilis, Bacillus coli communis, Bacillus diphtheriæ, and Bacillus tuberculosis. Smallpox crusts and vaccine lymph were also employed.

Statement of results:

1. No development of any organisms occurred when the glycerine was present in a proportion of more than 30 per cent.

2. After exposure for a month to the action of from 30 to 40 per cent. glycerine, none survived except Bacillus coli communis and Bacillus subtilis kept in cold.

3. Complete sterilization of both vaccine lymph and smallpox crusts, so far as outward organisms were concerned, occurred at the end of a week in 40 per cent. glycerine.

4. The yeasts ordinarily found in vaccine material were easily killed except the pink yeast which resisted even 50 per cent. glycerine indefinitely.

Special experimentation has been made by them since upon Bacillus tuberculosis purposely added to vacine lymph.

The experiments which were painstaking, and it must seem were a severe test, are detailed by Dr. Copeman in his work on vaccination. (Macmillan, London, 1899.)

Vaccine material was rubbed up with sterilized mixture of 50 per cent. glycerine and water. The emulsion thus resulting contained 42 per cent. of glycerine and was stored in small tubes of a capacity of 3 grams each. To the residue, about 4 cc., was added a large amount of a pure culture of active tubercle bacilli. After thorough mixing, this infected lymph was placed in two 1-gram test tubes, corked and set aside in a cupboard kept at 15° C. At the same time control cultures were made from the non-glycerinated tubercle culture in tubes of 6 per cent. glycerine-agar, and in tubes of 6 per cent. glycerine peptone beef broth (Roux's) and incubated at 37° C.

At the end of a month, the glycerinated vaccine lymph was demonstrated to be free from extraneous organisms, and also plate cultures from the small tubes containing tubercle bacilli showed no growth.

Inoculations also made from these small tubes upon 6 per cent. glycerine-agar, and tubes of solidified blood serum incubated at 37° C. for a month, showed absolutely no growth.

Inoculations were made in sterile beef broth and these after a month at 37° C. were likewise sterile.

The control tubes, however, inoculated with the same tubercle culture as that employed for all the other experiments and incubated at the same temperature for the same length of time all showed an exuberant growth, and successive cultures to several generations were successfully made. These experiments have been confirmed by Klein.

Not content to rest upon the assurance afforded by culture experiments, Drs. Blaxall and Copeman carried out a series of experiments upon guinea pigs, animals known to be most susceptible to tubercular infection. The material employed was glycerinated vaccine lymph to which a month before, at the time of its preparation, had been added virulent tubercle bacilli in large quantities. Certain guinea pigs were inoculated with the glycerinated lymph-tubercle mixture, and certain others with the pure tubercle culture as controls.

The latter developed, locally, tuberculosis, which afterward became general. The former, inoculated with the glycerinated tubercle vaccine emulsion, showed no result local or general.

Dried Non-glycerinated Lymph.

The dried lymph upon points has enjoyed the confidence of the profession and had been almost universally employed in this country for many years, is prepared from the clear exuding lymph and is the result of no special method of protection against extraneous organisms, other than those employed to keep clean and free from bacteria the stables, laboratories, bodies of the animals, and hands and clothing of the attendants, and all the other aseptic methods including care in packing, except the mixing with glycerine and storage for at least four weeks.

Crusts are now used almost not at all, and arm to arm vaccination is practically obsolete, as it ought to be, since we have at our command a pure source in the calf by which any possible transmission from one individual to another of undesirable or dangerous systemic or local diseases is absolutely avoidable.

The Best Form of Lymph.

The question then arises, which is the best form of lymph to use? It is, perhaps, impossible to indicate this by argument which will be universally acceptable. A lymph, practically aseptic and non-irritating when it leaves the hands of the propagator, may and often does prove to be inert, or its use is accompanied or followed by phenomena which are severe, sometimes clearly septic. The influences that may bring about such results are so many, apart from the lymph, and vaccine lymph is so susceptible to injury from light, and changes of temperature, that one will be justified in hesitating to hold a particular specimen of lymph responsible for ill results or unsuccessful inoculation.

By far the most general preference at the present time in the United States, the British Isles, and on the continent is for the glycerinated pulp, and this is so general, and based upon proof of its greater desirability so convincing, that the experience to the contrary of a comparatively small number of observers must be regarded as such an unusual exception to the general rule as to have little or no weight in determining the value of glycerinated lymph in itself.

As compared with the dried non-glycerinated lymph upon points, there are certain facts with reference to which accurate information is much desired. The profession naturally inquires: Is it better so far as guaranteeing a greater proportion of successful inoculations? How does it compare in the intensity of its local and constitutional effects? How long a time relatively, will it retain its vaccinal power? What is the relative frequency of septic complications? What special points of excellence are to be conceded to either form of lymph? What evidence is offered of the superiority claimed for the stored glycerinated lymph?

In answer it may be said, its use shows a greater percentage of successful results in all cases than with lymph not so treated.

Accumulated statistics from all sources in the United States and abroad, from government officials, public vaccinators, and physicians in private practice, show an average of from 90 to 95 per cent. successful primary inoculations. Many observers, absolutely free from bias, report series of hundreds of cases with no failures.

In *Pediatrics,* March 1, 1900, are given: One series of 500 primary cases, no failures; another 100 mixed cases with no failures. Naturally the records of the official vaccinators of the health departments of our large cities furnish valuable evidence, since they are as free from error as it is possible to make collective reports.

From several of these has been selected one by the Health Department of New York City, based on the number of primary vaccinations not only performed, but afterward inspected and the *results verified*, a procedure not always to be expected in the case of reports from private sources.

In eight months there were made 20,804 primary vaccinations. The percentage of success was 98.106, there being but 384 failures. By means of careful record of the laboratory numbers of the virus used, it was possible to determine the samples of lymph responsible for the failures. These were practically limited to the product from two calves. Of the 384 failures, these two animals were responsible for 241, or 63 per cent., leaving 143 failures, or 37 per cent., distributed among 28 other lots. If the cases vaccinated with the poor virus are excluded, the percentage of successes is 99.29. The report says in effect, that, judging by the ages of at least fifteen cases, it is likely they were revaccinations, instead of primaries; and that, without these, the successful percentage would be brought up to 99.36. However, without this betterment by exclusion, the original percentage of 98.106 ought to be satisfactory. The verified 241 failures due to poor virus may properly be disregarded, and the percentage of 99.36 be accepted as something remarkable and never attained by dried non-glycerinated points, in so large a series of cases.

The summary in tabular form given by Dr. F. S. Fielder, Inspector of the Department, in *Medical News*, October 8, 1898, is as follows:

November 1, 1896 to December 1, 1897.	Successful.	Failed.	Total.	Per cent. success.
All cases included	20,420	384	20,804	98.106
Two lots of virus excluded	19,991	143	20,134	99.29
Fifteen probably revaccinations, excluded	19,991	128	20,119	99.36

By far the most complete tabulation of comparative results yet published, including as it does reports from widely separated sections of the country and from physicians in private practice, is by Dr. Albert C. Barnes, of Philadelphia, in the *American Gynaecological and Obstetrical Journal* for September, 1899.

His returns cover, in round numbers, 250,000 vaccinations. The proportion of successful inoculations in primary cases was over 95 per cent. Many series of cases showed a greater percentage than this. Eight hundred cases were reported by four observers with a percentage of 100. The ratio of successful vaccinations in secondary cases was surprising, from 60 to 75 per cent. being an average. The number of "bad arms" was reported as less than 1 per cent.

In Porto Rico, where dried non-glycerinated points failed altogether, 90 per cent. of successful vaccinations in all cases was secured with glycerinated lymph. The average of successful vaccinations with dried non-glycerinated lymph is stated to be not over 60 per cent. in primary cases.

The percentages obtainable from foreign sources are as high, in some instances higher. At the government vaccination station, at Lamb's Conduit street, London, 6,336 persons were vaccinated by three observers with resulting percentages of 90.53, 95.49, 98.56 respectively. The successful percentages in revaccinations were 98.30, 98.15, and 98.43, out of 407 cases. In all, 49 cases returned after "inspection" on account of some abnormality of the vaccination, the majority of which were for sore arms; Dr. Cory stating that these were almost invariably the result of ignorant treatment of the vesicle or of the scab. There were included in these, seven cases of transient eruption and five cases of axillary abscess. This number is considerably less than 1 per cent.

Collective Investigation in Maine.

Early in the present year the writer, by direction of this Board, made a collective investigation among the physicians in this State to ascertain certain facts relative to the use of glycerinated and dried non-glycerinated lymph since January 1, 1899, prior to which time vaccination had been confined to dried lymph. It was believed that an unusual opportunity offered because of the very general vaccination and revaccination which followed the outbreaks of smallpox at Waterville, Winslow, Riley, Portland, and in the province of New Brunswick on our eastern border.

A special reason also, was to learn, if possible, how far the general impression of the superiority of this glycerinated lymph in both primary and secondary cases would be borne out by the experience of the profession in this State.

A circular letter, of which the following is a copy, was sent from the office of the Board to every physician in the State, of both the regular and homœopathic schools. The reports were not so numerous as it was hoped they would be, probably because, for various reasons easily appreciated, the exact data were not obtainable. In making a summary and figuring the percentages of results, only exact statements have been used; all others, to the number of 83 reports, have been excluded. Those used, it is a pleasure to say, are from the best sources in all parts of the State.

OFFICE OF STATE BOARD OF HEALTH,
AUGUSTA, MAINE.

February 20, 1900.

Dear Sir:—

The State Board of Health wishes to include in its forthcoming report the most recently accepted facts relative to vaccination and vaccine lymph. In addition to information already accessible, it desires to avail itself of the experience of the medical profession in this State since the introduction of glycerinated vaccine pulp.

Your personal assistance is respectfully solicited, by a brief reply to the queries upon this blank, to be forwarded at your earliest convenience to the President of the Board.

CHAS. D. SMITH, M. D.,
126 Free St., Portland, Maine.

1. Name, ...Residence, ...
2. Number of vaccinations since Jan. 1, 1899,...............
3. Form of lymph used,.................................
4. Proportion of successful inoculations
   In primary cases
      With glycerinated lymph,..........................
      With dried lymph,...............................
   In secondary cases
      With glycerinated lymph,..........................
      With dried lymph,...............................

5. Relative proportion of so-called bad arms
   With glycerinated lymph,........................
   With dried lymph,..............................
6. Were most of these severe conditions
   Before appearance of vesicle,......................
   Coincident with,................................
   Or after its development,.........................
7. In the use of glycerinated lymph did you notice any difference in the results obtained with that from different producers? If so, what?............................
8. What form of lymph do you prefer, dried or glycerinated?..
9. Note any observed variations from the usual history of the vesicles, such as peculiarities in form, number or size of vesicles; delay in appearance; local or general eruptions; severity of constitutional symptoms,..................

Summary of results from answers to above inquiries:

1. Number of reporters. 127.
2. Total number of vaccinations from January 1, 1899, to July 1, 1900, 18,925.
3. Form of lymph used. Glycerinated, 16,320; dried, (non-glycerinated,) 2,605.
4. Proportion of successful inoculations,
   In primary cases
   With glycerinated lymph, 90 per cent.
   With dried lymph, 66.4 per cent.
   In secondary cases
   With glycerinated lymph, 62 per cent.
   With dried lymph, 60 per cent.
5. Relative proportion of so-called bad arms,
   With glycerinated lymph, 18 per cent. (Excluding 1,610 cases at Lewiston and Auburn, 8 per cent.)
   With dried lymph, 13 per cent.
6. Time of occurrence of severe conditions,
   Before appearance of vesicle, 3 per cent.
   Coincident with, 21 per cent.
   After its development, 76 per cent.
7. Expression of preference for dried or glycerinated lymph. Glycerinated, 73 per cent. Dried, 25 per cent. No preference, 2 per cent.

In reviewing the reports from which this summary is made, it appears that twenty-five report 100 per cent. successful vaccinations in primary cases with glycerinated lymph; and forty-nine report 90 per cent. and over, ranging from 90 to 99. Out of this number of forty-nine, three reported series of from 100 to 200 cases; six, series of from 200 to 300; four, of from 300 to 400; one, a series of 400; one, of 575; one, of 670; one, of 685; one, of 860; one, of 1,000, and one, of 1,550. In secondary cases, seven report 100 per cent. successes; and fourteen report 75 per cent. or over.

With dried lymph, seven report in primary cases 100 per cent. successful inoculations; and twenty-one, 70 per cent. or over. In secondary cases, four report 100 per cent. successful; and six give 50 per cent. or over.

The largest series reported by one observer having a percentage of 99, was 300. Another was of 556, with a percentage of 93.

These percentages after the use of glycerinated lymph coincide closely with those reported from other sources, and many of them taken in connection with the number of cases in a series, are better than most, anywhere recorded.

Unusual appearances, complications, undue severity of symptoms are scarcely mentioned, except in some of the reports from Lewiston and Auburn from which cities came very general complaints. Notwithstanding these facts, the evidence furnished from these cities is corroborative of the general excellence of the results of glycerinated lymph.

The number of definite reports received from these cities, was ten, representing 3,010 vaccinations with an average of successful inoculations in primary cases of 96.6 per cent. In secondary cases, 70 per cent. Of this number, seven observers, representing 1,610 cases, report severe complications, 53.8 of all their cases. Three observers, with 1,400 cases, report little or nothing unusual in the after histories.

Dried lymph was so little used as to make the return of its results of no importance.

If we deduct from the total number of cases in which glycerinated lymph was used, 1,610 cases in these cities in which uniformly bad results were obtained, we have 14,710 cases from all other sources, and the percentage of bad arms is reduced to 8.3 for all cases reported. This being less for the glycerinated than for the dried.

It is probable that few of the great number of bad arms reported were more than a marked or severe erythema due to the large scarifications such as were formerly used with dried lymph, since the reports of unusual complications from the State at large is almost nothing. Therefore I am satisfied that the actual percentage of really severe inflammatory or septic complications outside of Lewiston and Auburn was much smaller than this 8 per cent.

In this series of Lewiston and Auburn cases, none report any evidence of sepsis or inflammatory complication before the appearance of the vesicle. Three hundred and thirty-eight cases, or 2 per cent., are reported as showing severe complications coincidently with its development, and 5.4 per cent. after its development; which shows that even admitting the lymph used was characterized by an especially energetic action, the contention that in a majority of cases sepsis is due to post-infection, is borne out.

The complaints of the results from use of glycerinated lymph from Lewiston and Auburn, and surrounding communities evidently drawing their supply from the same source, were not confined to those whose figures have been quoted. Information given the representative of this Board from all sources shows a very general complaint of complications quite beyond the usual experience, even in times of very general vaccination. Making all due allowance for secondary infection, and faulty technique attending the hurried vaccination of large numbers at a time, I am satisfied that the lymph was in a large number of the cases responsible.

It is a matter for regret that the laboratory numbers of the packages were not recorded so that the bacterial testing of the particular lymph might have been referred to. This was not done, so far as I have been able to learn.

Special effort has been made by personal interview with the producers of the lymph in question to account for the exceptional activity of this material. They have assured this Board that all their output sent to Maine had been subjected to the same careful preparation and testing which characterizes all of their lymph, a statement which there is not the slightest reason to doubt; and they are at a loss to account for it, unless the lymph finding its way to the dealers in that section of the State was put out by mistake earlier than usual. The explanation was offered that complaint had come from the tropics that the lymph sent there had deteriorated in strength from the effect of high temperature, having been kept stored for the full time in this country before shipping. Accordingly some lymph was specially prepared to be shipped before the completion of the usual time for storage, so that the inhibitive power of the glycerine might be actively going on while in transit, and the lymph arrive at about the completion of the usual time of storage. This lymph would, of course, possess considerable irritative properties, if used before the completion of the usual time for storage. Complaint came from a city in northern New York similar to that from Lewiston and Auburn, and on investigation it was found that some of this extra strong lymph had by an oversight found its way into the shipment for that place.

This statement was made to the writer on June 1, of this year, and is included as being the explanation of the firm and the only one obtainable. The experience was exceptional, and I have never known a similar complaint on so large a scale made against the lymph of this firm which probably constituted 90 per cent. of all used in this State, or the glycerinated lymph furnished by any of the other producers in this country. From the evidence of those having the most trouble, many of the undesirable conditions were clearly due to infection after the formation of the vesicle. It is possible that the lymph was as freely used and upon as large scarifications as has been customary with the dried lymph, with no allowance for the fact that the glycerinated product contains many times the normal vaccinal strength of the dried lymph.

But from the fact that the men reporting these untoward results are among the best observers in the profession of this State, and are known to the writer as scrupulously exact in their attentions to careful and aseptic technique, I feel that the responsibility must be divided between an irritating character of some of the lymph and post-infection. The fact that thousands of other vaccinations with no bad results were made with lymph from the same laboratories all over the State, at the same time, upon all classes of population, and by operators with doubtless diverse methods of procedure, warrants me in the conclusion that glycerinated lymph is not to be condemned as invariably productive of complications. The great mass of reliable evidence is quite to the contrary.

In the reports from the whole State, the proportion of bad arms is larger for the glycerinated lymph than reported elsewhere, yet this is, perhaps, not surprising in view of the fact that the suggested methods of using the glycerinated lymph by blowing it from the tube with the lips, or applying by the wooden spatula were both more likely to convey infection than the simpler and more cleanly method of expelling it by rubber bulb and rubbing in by the sacrifying instrument. It may be also a factor in accounting for this that the profession had not then learned to appreciate the fact that a large sacrified area is undesirable, and that normally glycerinated pulp is many times more powerful than any dried form.

Relative Advantages of Glycerinated and Non-glycerinated Lymphs.

There are certain things to be said as bearing upon the relative desirability of the glycerinated and dried non-glycerinated lymphs.

1. The glycerinated form is prepared from the pulp at the base of the vesicle which admittedly contains the greatest amount of the active vaccine principle, of whatever nature it may prove to be.

The ordinary dried lymph is lymph which has exuded through this pulp layer and contains only such amount of the vaccine matter as it has taken up in its passage.

Hence the former is primarily the stronger and most potent. Supposing both to be equally aseptic, one has the choice of a strong or comparatively weak lymph. Both forms of lymph are produced from vesicles in a skin which can not by any method at present known, be rendered absolutely sterile, and both at the start contain extraneous organisms. These are destroyed by storage for at least four weeks with the admixture of glycerine.

No aseptic treatment is given the dried non-glycerinated lymph except its protection from further contamination.

2. The admixture of glycerine preserves lymph for many months without destroying its vaccinal properties. The tendency of dried non-glycerinated lymph is to lose in strength from the beginning of the drying process onward. Both are injuriously affected by strong light and high temperatures. Glycerinated lymph improves in desirability up to a certain limit as time goes on. Dried lymph gradually deteriorates.

3. The glycerinated lymph after testing is hermetically sealed, and the chances of contamination up to the moment of its application reduced to a minimum. The dried lymph is not free from all chance of such contamination from the time it begins to exude until packed for shipping, and may suffer further infection by contact with the fingers or infected surfaces. It is not meant to convey the idea that it always does. The statement is one of relative possibilities.

The dried lymph dries more quickly: does not secure so large a percentage of successful takes: is more likely to be contaminated: deteriorates most rapidly.

Glycerinated lymph, except when dried on points, dries slowly: is more nearly aseptic: retains its potency for months: gives the greatest percentage of successful takes in all cases: is likely to be energetic in its action, particularly if the denuded surface is large.

So far as ease of application goes, it would seem as though there is practically little difference between the two forms.

As to the use of the glycerinated tube-form requiring so much more time when large numbers are to be vaccinated, it may be said that intelligent division of labor between three or more operators will secure disinfection, scarification, and inoculation with considerable rapidity and practically no loss of time.

Comparative excellence of the different products.

It is manifestly improper for any board to discriminate in favor of any particular individual or firm when others are equally worthy. It has been the aim of this Board, by personal inspection of the plants and methods of the producers whose lymph is brought into this State for sale, to assure itself of the value and reliability of the lymph, and state the facts impartially.

In this State, both dry and fluid lymph may be procured from the following laboratories:

The Pocono Laboratory of Dr. Richard Slee, at Swiftwater, Penn.

The New England Vaccine Company, at Chelsea, Mass., under the direction of Dr. Chas. N. Cutler.

The Lancaster County Vaccine Farms of Dr. H. M. Alexander, Lancaster, Penn.

The Mulford Company of Philadelphia.

Park, Davis and Company, Detroit, Mich.

The National Vaccine Establishment of Dr. Ralph Walsh, Washington, D. C.

This may be said as equally true of all these establishments: their methods are the best which modern ingenuity can devise.

Their laboratories are constructed with a view to securing the best hygenic and aseptic conditions, and are equipped with modern appliances and are in charge of skillful bacteriologists.

The most scrupulous care is bestowed upon the selection of their animals and their inspection for the exclusion of disease.

The handling, collection, and storage of the lymph are surrounded by every safeguard intended to assure the production of pure and efficient material.

These statements are made as a result of personal inspections, and familiarity with the existing conditions and methods at each of these stations. All are reliable and entitled to the confidence of the profession. This Board does not undertake to guarantee the invariable purity of any lymph, but it does not hesitate to say that so far as any known methods can be applied, they are applied and utilized by the producers named, to secure such purity as is obtainable.

This question of purity of lymph is constantly bringing up the proposition for the propagation by the State of its own lymph. As a matter of fact, the sentimental idea must yield to the practical. The practicability of various measures of public sanitation must always determine such questions. At the present time there is little doubt that in this country lymph can be produced of better quality and far more economically to the community by private enterprise.

For many years lymph was obtainable, the product of private interests, some, but by no means all, of which, was the result of a desire to produce and sell the greatest amount of material with little regard to other considerations.

The public interest now demands that the health boards of the different states shall be in a position to guarantee some information relative to the purity of the lymph offered for sale within their jurisdictions, and the character and methods of the producers.

Such investigation and inspection is invited, and always cordially welcomed and facilitated by those whose names have been given, and it should be remembered that self interest and the competition of trade would impel firms of established reputation to produce material of the highest attainable excellence, if no higher motive influenced them.

There are many possibilities of failure or infection which must be reckoned with, and over which the producer has not the slightest control. Proximity to hot steam pipes in express cars, carrying in the pocket of the physician, storage in a warm office or upon the shelves of a drug store are all conducive to rapid deterioration of an otherwise pure lymph. It should be kept in a cool, dark place, carried in a bag or instrument case, and in the summer kept in a refrigerator until used.

Every reputable producer now guarantees to keep the local druggist in possession of pure, fresh stock, and there is no excuse for the sale of inferior material.

It should be also borne in mind, that lymph produced in winter is more abundant, of greater potency, and preserves its power longer than that produced in summer; and from weak and old attenuated lymphs we may expect irregular or incomplete results.

Moreover, while most if not all of the objections to humanized lymph may be practically rendered nil by the use of bovine lymph, yet the fact remains, that the local disturbance and constitutional symptoms of a typical vaccination by calf lymph are much more severe than from vaccination from humanized lymph twice removed.

The Technique of Vaccination.

It has been thought advisable to offer the following suggestions as to certain points to be observed in the actual use of the lymph, and stress should be laid upon the observance of certain requirements; first, because any person whom we inoculate with the virus of an infectious disease, though an attenuated one, is entitled to all the protection from possible ill results which careful management can secure for him; and, second, because as simple a matter as vaccination is, it requires a knowledge of the technic of the operation, and the observance of certain precautions, which, if wanting, may result in non-success or in an abnormal course of the vaccinal disease.

Use only animal lymph, as fresh as possible and only from producers of known reliability.

Dried lymph upon points, glycerinated lymph in tubes, or upon points, and the glycerinated pulp in tubes and upon points are all serviceable.

The glycerinated forms are least likely to be contaminated by undesirable organisms and give the greatest percentage of successful results in all cases.

Points should be used as soon after coating as possible, and all kinds should be kept in a cool dry place and carefully protected from the light.

Use no form that does not bear the date of collection if attainable, the number of the animal from which it was taken, and the date limiting its use. Never use lymph which has in it even the slightest admixture of blood.

Before handling either points or tubes, have the hands scrupulously clean.

In opening and handling points, avoid any contact of their dipped ends with the fingers, or any thing else that may convey foreign matter to them.

Usually it is unnecessary to sterilize the site of the vaccination by chemical germicides. They are likely to destroy the efficiency of the lymph.

A prerequisite is a clean skin, and this may usually be secured by the application, when necessary, of soap and water, followed by alcohol to remove all traces of the soap.

If circumstances seem to demand the use of a germicide, use alcohol and boiled water freely to remove all trace of it, before vaccinating.

Avoid the use of any but the simplest instrument for the denudation of the skin. Needles are cheap and efficient and may be easily sterilized before using by passing through a flame. A fresh needle should be used for each person vaccinated. If a scalpel is used, scrape the epidermis, do not cut it.

It is only necessary to produce a denuded surface through which serum will ooze. Bleeding is to be avoided.

Do not scarify large areas. Intensity of inflammatory action is thereby favored. Make the denudation not over one-quarter of an inch square and if glycerinated lymph is used, even smaller. Make two or three of them, especially if it is a revaccination. Make them an inch or more apart, and so avoid coalescence of the vesicles.

If dried lymph on points is used, moisten it by dipping the point in water that has been boiled, and lay it aside for the lymph to soften while the denudation is being made. Wipe the lymph from the point upon the raw surface, and then rub it in with the flat side of the point.

If moist glycerinated lymph on points is used, apply in the same manner, omitting the preliminary softening, or the scarifying may be made with the charged point.

If glycerinated lymph or pulp in tubes is to be used, wipe the tube with a clean damp cloth or bit of absorbent cotton. Insert it through the rubber bulb furnished for that purpose, break off one end and draw the tube back till the bulb is over the open end; then break off the other end and express the lymph, by compressing the bulb, allowing it to drop upon the denuded surfaces. Do not expel the lymph by blowing. Salivary infection of the wound is a possibility. Rub the lymph in thoroughly with the needle, the flat surface of the scalpel, or a sterilized wooden spatula, or it may be pricked in, as in tattooing.

Allow nothing to come in contact with the vaccinated area until it is dry. If the underclothing is clean, the sleeve may be drawn down without further delay. Otherwise, a soft covering of sterilized gauze or some one of the ventilated shields may be laid lightly over the arm without pressure and held in place by an adhesive strip. The leg is an undesirable location for vaccination because of the greater liability of infection.

If possible, inspect each vaccinated child by the seventh day. If unsuccessful or atypical, revaccinate. Repeated vaccination in primary cases rarely fails eventually to secure a typical vesicle.

Caution the vaccinated person, or if a child, its parent, to guard against premature rupture of the vesicle. Experience shows that the great proportion of septic inflammations and eroding ulcers is due to infection introduced *after* the development of the vesicle.

Note every thing which bears upon the purity and reliability of the lymph. If untoward effects, irregularities or abnormalities occur in other cases vaccinated with the same lymph, change to some other product.

Vaccinate every child during its first year of life, again between the age of ten and fourteen, and once again after puberty.

Always vaccinate anyone exposed to smallpox, regardless of the previous vaccinal history. Advise it generally during any prevalence of the disease.

Record the names of all persons vaccinated, the date of vaccination, the results and the number of the package used. These facts are useful for reference, especially the latter, if question arises as to the purity of the material used.

Abnormalities of Vaccination.

The subject of abnormalities of vaccination may have an interest for those members of the medical profession who have been unfortunate enough to have been confronted by irate parents with the charge of using lymph of inferior character, or of having transmitted eczema or syphilis to the vaccinated subject.

When arm to arm vaccination was practised, there was a possibility, although remote, of both these accidents; with bovine lymph, there is none whatever. The resentment at untoward results is natural enough, but it ought to be tempered by the reflection that no physician would knowingly or wilfully do anything to prejudice his own reputation.

There are, however, many possibilities of irregularity, and curiously enough there is accessible almost nothing in the way of literature bearing upon this subject. Some of the English authors ascribe this to a fear of providing the antivaccinationists with ammunition. It would seem that the conclusion of Dr. Lee, in *British Medical Journal,* 1884, is by far the wisest, that we should recognize that "vaccination may case certain eruptions which we ought not to disregard, but rather to explain. Thus the prejudices which have of late been increasing against vaccination will be diminished and the cause for them prevented."

As a matter of fact, one reason, probably the principal one, why there is so little at command is because the unusual appearances are not common.

Among the most interesting of normal vaccinal curiosities are those associated with variations in the number of the vesicles and the time of their appearance and in their character.

Extra vesicles, that is, the appearance of one or more than are accounted for by the number of scarifications, may be explained by accidental but unobserved pricking or nicking of the skin, usually in children, by reason of their restlessness. Sometimes more vesicles appear than can be accounted for by the number of scarifications when it is known absolutely that only a certain number of insertions were made. These exhibit themselves as a group of vesicles on the areola about the vaccinated spot, frequently accompanied by other vesicles on different parts of the body. Such a phenomenon is regarded as due to the systemic absorption of the lymph, and not to auto-inoculation, although this undoubtedly sometimes occurs. The supernumerary vesicles appear on areas of skin of low vitality and therefore most favorable to their development. Such vesicles are usually dry, i. e., have little or no lymph, because it has been mostly absorbed, or else diffused through the cutaneous tissues.

Delayed vesicles, and vesicles developing earlier than the normal, or abnormally formed, are not uncommon, and usually appear in the persons of adults or in those whose vaccinal protection has nearly but not quite run out, or very likely are the result of an old lymph or one attenuated. These are such exhibitions as when the vesicle starts in as though for a normal course, and aborts, or when it forms only a scab with no resulting typical cicatrix. The strawberry or mulberry form excresence sometimes observed is a striking example.

There are on record in 1862, 1877, and 1881, respectively, cases in which there was a remarkable delay in the appearance of the vesicles although otherwise normal; that is, instead of the appearance of the vesicles on the second or third day, they were delayed not only for days, but years. This is so extraordinary that I quote the cases and the authority from "Vaccination Eruptions," Poole, Edinburg, 1893.

"Mr. Bryerly (*Medical imes*, 1862, p. 442) cited an instance in his own practice in which the vesicles appeared in just *two months* after a child then suffering from whooping-cough had been vaccinated."

"Dr. Geo. Hardy (*Medical Times*, 1881, II, p. 572) mentions a case where the vesicles did not develop until *one year* after vaccination."

"A case is quoted by Sir Thomas Watson (*Medical Times*, 1877, II, p. 621) in which the vesicles did not appear till *fourteen years* after vaccination. It was a girl 14 years of age who when attacked with influenza began to complain of pain in each arm at the spots where, when an infant, she had been vaccinated; and in these places vaccine vesicles now became perfectly developed. An elder sister was revaccinated with lymph thence obtained and beautiful vesicles resulted."

Doctor M. C. Wedgewood, of Lewiston, a member of this Board, reports to me a case quite as worthy of record as any of these. Mrs. S. was vaccinated in November, 1898. The vaccination did not take, and beyond a little itching nothing occurred. In December, 1899, there appeared at the site of the previous inoculation, a true vaccine vesicle with typical areola, and attended by the usual constitutional symptoms. This vesicle pursued a normal course, ending in a crust which in due course of time was shed, leaving the typical scar.

Delay in appearance and general slowness of development are more frequent with calf than with humanized lymph.

A condition similar to this delayed development of vesicles is the appearance after some subsequent inoculation, of vesicles at the site of a previous and apparently unsuccessful vaccination.

For example, "Dr. H. J. Ilott (*British Medical Journal*, 1885, II, p. 1,017) relates a case of a child who was vaccinated on October 27; at inspection November 2, no vesicles were found: it was therefore again vaccinated on November 2, and on the third day following, three out of the four vesicles began to develop at the site of the vaccinations of October 27. They were all well marked on November 9, and pocks developed at the site of the second vaccination."

In the *Lancet*, 1881, I, p. 978, "Mr. T. A. J. Shepherd records a case of revivifying of vaccination after *four* years. He vaccinated on the left arm a nurse who had been vaccinated on the right arm four years previously: *one* of the left arm insertions (four in number) was successful, and the vesicle typical.

"The four places on the right arm where she had been vaccinated four years previously, became distinctly vesicular, exuded an appreciable amount of lymph, and were characteristic of secondary vaccination." The explanation concurred in by different authorities is that the active principle of the lymph lies dormant in the skin at the site of previous vaccination and is kindled into activity by the stimulus received from the later inoculation.

The normal vaccine vesicle sometimes extends from its original site, running and forming a crust like impetigo. Vaccinal ulcers are usually the result of infection after the premature rupture of the vesicle. They were not infrequent with the use of lymph on points before the need of aseptic precautions in the preparation of the lymph became generally recognized, and when arm to arm vaccination was common. They are likely to follow vaccination upon a dirty skin imperfectly cleansed, the use of non-sterilized scalpel, lancet, or needle in scarifying, the contact of dirty clothing with the fresh scarified area, or scratching with dirty finger nails, and are extremely common in children of low vitality especially the type prone to struma or eczema. There is deep inflammatory induration; the areola looks suspiciously like erysipelas; there may be suppuration in skin or adjacent glands; and the ulcer is deeply excavated; the healing is tedious, and the resulting scar large and often of low vitality. Many estimate the degree of their immunity by the degree of constitutional disturbance and the size of the scar, but the fact that successful revaccinations in the immediate vicinity of these scars, within a comparatively short time after, have been not infrequently secured, may be regarded as evidence that such scars, and especially such a septic history throw doubt upon any immunity. It is quite possible that the vaccinal organisms may have been overpowered by the sepsis and the resulting destructive processes.

Accidental vaccinations are chiefly interesting from the fact that their situation on any of the mucous membranes sometimes raises the question of chancre, and if about the eyes may result in practical or complete blindness. The cause is simple. They have been reported as occurring on or near the eye, on the mouth and cheek, one on the labium, one on the lip, one on the breast, and one on the buttocks. In all these cases there was absence of specific history or suspicion, and the anatomical features of chancroidal ulcer were absent.

A case of vaccine vesicle on the tongue has been reported by Buckell (*British Medical Journal*, 1889, I, p. 1,405). The mother had pricked her tongue with a fish bone, and afterward kissed the vaccinated arm of her child. The vesicle pursued a typical course.

Like certain drugs, the pure lymph is frequently the cause of certain eruptive conditions, more frequently possible than we have supposed or been willing to admit. This is, however, no argument either against the practice of vaccination, or as indicating impurity of the material used. Indeed the better we recognize this fact, and the closer our acquaintance with these irregularities, the better we shall be equipped to manage them, and the more readily can we utilize that knowledge in removing unreasonable prejudice.

This possibility is not to be wondered at, since a poison which in its virulent form is eliminated largely from the surface of the body may reasonably be expected, even in its attenuated form, to exercise irritative properties which exhibit themselves, according to the predisposition and weakened nutrition of the skin which is attacked. Among the commonest precursors of true smallpox are rashes closely resembling the maculæ of measles and the diffuse blush of scarlatina, and instances are not unknown where the initial symptoms of variola have been accompanied by these eruptions, with consequent remission of the fear of the suspected disease, and a relaxation of precautions against spread of the infection, only to be followed later by the characteristic eruption of papule, vesicle, and pustule, to the chagrin of the diagnostician and the detriment of the community.

The reasons why they do not follow or accompany all vaccinations are to be found in the curious phases of idiosyncrasy, such as obtain with chloral, copaiva, bromides, iodides, quinine, arsenic, and certain articles of food. This personal element in the production of these rashes is a well known fact, and another which points strikingly toward the relationship of vaccinia to variola is, that these eruptions occur rarely after the use of humanized lymph: more frequently after calf lymph: and most often with variolous lymph, such as is the cause of the eruption of discrete varioloid, an affection in which the variolous lymph is attenuated.

There is no classification of these vaccinal eruptions entirely free from objections.

There are a variety of eruptive affections produced by the irritation of pure lymph. The most common is roseola, usually appearing from the 8th to 11th day or about the time of the maturation of the pustule: it has been detected as early as the third day. It has been frequently mistaken for measles which it closely resembles. The spots are discrete or confluent. There is no accompanying fever: it usually appears near the vaccinal pustule and spreads to other parts of the body and fades by the end of the third day. There is not present the itching of urticaria, nor desquamation. It is distinguished from measles by the absence of acute fever and catarrhal symptoms.

It resembles closely the roseola which is a precursor of smallpox. There is ground for apprehension in this fact when smallpox is prevailing, and it emphasizes the necessity for strict isolation and observation of the clinical symptoms for three or four days. The fact of an existing vaccination cannot free us absolutely from care in these cases, since often the smallpox poison which has invaded the system will produce its characteristic symptoms and eruption, having gained the start of the lymph. The absence of the invading symptoms of smallpox is a strong factor in the differential diagnosis, but these are cases which are perplexing, and invite extraordinary vigilance.

In 1886, I saw two cases in consultation with a practitioner of this city. He had vaccinated the children four days previously, and the situation was complicated by the fact that a friend from Cumberland Mills, where smallpox was then prevailing, had recently visited the family. The eruption on one child was confined to the trunk; on the other child it appeared suspiciously first upon the forehead and neck, spreading to the arms and trunk. It was a bright red macular eruption attended with much pain in limbs, with headache and backache, doubtless from the invading vaccinia. In forty-eight hours it had disappeared, and no other rash appeared within the five days during which he kept the children isolated. Both had typical vesicles.

This physician was a man of a wide army and civil experience with smallpox, yet he expressed himself to me as being exceedingly apprehensive as to what might follow this rash.

Erythema multiform and scarlatiniform erythema may make their appearance before the appearance of a vesicle. Rarely a true itching urticaria may appear when the vesicle is at its height of development, or later. These eruptions are transitory and amount to little. If, before the vesicle appears, the question of scarlatina arises, the absence of fever, of angina, and of a history of scarlatinal exposure will clear the air. I have seen an urticaria over the legs, and back, and abdomen, with raised spots from the size of a flea bite to several which could not be covered by a half dollar.

Vaccinal miliaria is a vesicular eruption identical in appearance with the common heat eruption, appearing between the 8th and 12th days after vaccination. It is rare and is indistinguishable from miliaria from other cases. The distribution is irregular. The fluid in the vesicles, pin-head in size, is at first clear; in twenty-four hours becomes purulent and dries up after 48 hours. There is no itching. Such an eruption, while rare as a general phenomenon, is not infrequently seen about the vaccine vesicles.

Sometimes this eruption begins as minute papules. My colleague, Dr. A. G. Young, Secretary of the State Board of Health, has acquainted me with the following fact of interest: On the night of February 1, 1899, having been with me after my return from Waterville, he vaccinated his family, including a relative who was visiting him. Ten days later this gentleman awoke one morning with a papular eruption, all over the body and face, which looked like a multitude of comedos mixed with acne. He was promptly isolated: in 48 hours not a trace remained.

Cases have been recorded of pemphigus, as well as psoriasis, following normal vaccination. German dermatologists describe it as likely to occur in rachitic or anæmic children. The bullous eruption sometimes appears in successive crops like varicella, drying into little crusts which in their turn leave small red ulcers. Occurring in a cachectic infant it may be fatal; but recovery is said to be the rule. Labric, Childrens' Hospital, Paris, 1879, reports a case of general confluent pemphigoid eruption following a change of the typical vesicle of the 7th day into a large blister containing serosanguinolent fluid.

Purpura sometimes shows itself after vaccination in subjects of feeble vitality and hemorrhagic tendencies just as under similar systemic conditions it sometimes complicates smallpox. The prognosis is said to be good.

Vaccination is to be associated with eczema as an exciting cause. It almost always aggravates it if present at the time of inoculation, and is recorded as curing it. It has even been recommended as one of the cures for this frequently obstinate affection.

The gouty, rheumatic, and scrofulous diathesis predispose to eczema and in these subjects vaccination is likely to excite it.

In 1896, I vaccinated four children, in one family, with lymph of unquestionable quality: three of them had pustular eczema. A previous history of infantile eczema was subsequently acknowledged, but no apology has ever been offered for the abuse I received at the time. Like all those I have found recorded, the eruption appeared late.

Vaccinal vesicles in scrofulous subjects are liable to ulceration and these ulcers are favorite sites for the commencement of eczema. The onset is usually sudden; it may be spread over the body by autoinoculation. Except during the prevalence of smallpox, vaccination is best deferred until the eczema has disappeared. The risk of exciting a new outbreak is less than that of aggravating an existing one. In this connection it may be said that the existence of scabies is sometimes responsible for an outbreak, after vaccination, of a most persistent and intractable eczema.

In the French classifications, mention is made of a generalized vesicular eruption known as vaccine généralissée, due to blood infection.

In this country it has been common practice, with a disregard of any systematic study of the points of difference, to speak of any general eruption associated with vaccination as "Vaccinia." That this is incorrect must be apparent from a review of the painstaking studies of our English and French confrères. I do not wish to do more than outline as briefly as may be, the facts with reference to the characteristics of a true "vaccinia," or, more properly speaking, vaccinal eruption, due to the introduction into the blood of the specific vaccine virus.

It appears in two forms: spontaneous, when due to the absorption into the general circulation of the active principle of vaccine lymph. This is noted as a very rare affection; its tendency being to remain localized. It apparently results from the fact that the lymph loses its fixed character, and the organisms instead of following the rule seen in normal vaccination and producing their peculiar phenomena in a localized area, are diffused. It is confined almost wholly, though not invariably, to infants or young children. It may appear with the vesicles or later.

When the infection results from taking the virus into the alimentary canal, as by sucking, the period of incubation is from four to eight days, and the symptoms and eruption appear identical with true variola. Sometimes the secondary vesicles appear at the same time as those on the vaccinated arm and follow the same time of development.

When the symptoms appear suddenly, there is marked fever, and the appearance in the areola of papules developing in two or three days into vesicles, being most closely grouped in the center, often confluent, and becoming fewer and smaller and less markedly developed toward the periphery.

At once or soon after (a few days), there appear in other areas of the body, isolated, or in irregularly disposed patches, similar papules having the same shotty feel as in smallpox. These have an affinity for weak places in the skin (near original mark) and when occurring on the extremities select the flexor surfaces. The vesicles become scabs in a fortnight or a little more, sometimes in severer cases extending over three weeks and are not followed by pits, nor does the eruption attack the mucous surfaces.

The other form due to outo-inoculation is less rare, and is usually accompanied by some cutaneous affection such as eczema, erythema, or one of the papulo-vesicular eruptions. It occurs from the third to the eighteenth day after vaccination: it is conveyed from one to another part of the body by scratching, and, as might be supposed from its mode of transference, frequently exhibits much inflammatory action and ulceration. There is no typical mark when the vesicles terminate without septic complications, and their duration is the same as in the spontaneous form.

The chief interest in these two forms of eruption, apart from their rarity, lies in their complication of a diagnosis during the prevalence of smallpox.

From varicella, they are to be distinguished by the larger size of vesicle; their irregularities of shape, and the fact of vaccination, and the length of time elapsing before their appearance, and the absence of any regularity or order of appearance.

In variola, the vesicles are as a rule equal in size. The clinical features are, with rare exceptions, uniform and they are evenly distributed. Rarely in variola or varioloid are lesions absent from the mouth or pharynx.

One who has had any experience with smallpox will readily, I think, admit the perplexities offered by the problem of deciding between this eruption and varioloid, as he would also between a mild varioloid and varicella. Safety always lies in prompt and rigid isolation till doubt is removed.

The group of eruptions due to an additional infection introduced either at the time of inoculation or subsequently through the wound or through the ruptured vesicle, would include local skin diseases, certain constitutional affections and inflammatory conditions involving destructive tissue changes.

Under the first heading are contagious impetigo and erythema. Of these, the first is so rare that it can almost always be connected with the near presence of the disease in the patient, in some associate, or with some connection of the vaccinator with a case in a third person. It shows itself by a profusion of scabs near the vaccine marks, from which it may be conveyed to other parts of the body, particularly head, face, and neck, by rubbing, scratching, or careless bathing. Like the other excitable eruptions of ill nourished skins it is most likely to develop in strumous and underfed children.

With reference to inoculated erythema, it is difficult to separate it from the degrees of erythema attending any infected wound. As compared with the two varieties of erythema already mentioned, it may be said to be practically confined to the vaccinated area, and ranges in shade from a faint blush to a deep damson colored hue, attended by much constitutional disturbance and cellulitis. It is undoubtedly due to the infection of micrococci, from the skin, the instrument of the vaccinator, possibly the lymph itself, though this last relationship is one exceedingly difficult to prove, since from the time the lymph leaves the calf so many opportunities of contamination from so many people and things offer themselves.

However, considering the fact that it frequently happens that out of a great number of people vaccinated with lymph from the same animal most of them may show no signs of any of these severe inflammatory lesions, while some will, it is not unreasonable in these latter cases to suspect the integrity of the technique or the after care of the vesicle. The condition is essentially infective, due to capillary embolisms from the presence of micrococci.

The three constitutional diseases which have been recorded as vaccinal possibilities are syphilis, leprosy, and tuberculosis.

The first two need claim little attention now that arm to arm vaccination is practically superseded by the use of bovine lymph. Even when the use of humanized virus was common, they were regarded as pathologic curiosities of extreme rarity, since no decently responsible man would think of using lymph from an individual upon whom rested the slightest taint of suspicion.

A distinction should be made between vaccino-syphilis, or syphilis resulting from infection carried from one infected to the arm of another, and syphilitic eruptions after vaccination occurring in a person already tainted. A child with hereditary syphilis, or an individual in whom the disease is latent, will sometimes develop a pustular syphilide, as the result of the irritation of vaccination, and the same condition is not infrequently seen in an individual suffering from varioloid or smallpox, a condition which has afforded grounds for a dispute as to the correctness of the diagnosis.

One of the recent cases of varioloid in this State was so complicated, and made no end of trouble for the authorities who were endeavoring to enforce isolation. The syphilitic eruption followed the variolous; it was pustular from the first; other specific symptoms were present; and there was behind the child an admitted family history of syphilis. Moreover, the time, location, and appearance of the variolous eruption and its invasive stage were typical.

Tuberculosis has yet to be demonstrated as having been communicated by vaccination, either from the arms of tuberculous patients or by lymph from tuberculous animals. Experimentation upon this point has been extensive and painstaking. One in particular is suggestive. "Five persons whose sputum contained multitudes of tubercle bacilli were vaccinated, and no lymph taken until the seventh day, allowing plenty of time for leucocytes to have taken up the bacilli. Cover glass preparations were made from all of the vesicles up to the 13th day. Forty-eight were made in all, and subjected to all of the different methods of staining, but in no preparation was a single tubercle bacillus found. The tubercle bacillus is rarely found in the blood and then in cases of acute miliary tuberculosis" (Poole); the probability of its conveyance to the skin and its appearance in lymph is even more remote. It is said that tubercular inoculation must be deep, not superficial as in vaccination. To successfully inoculate the guinea-pig, one of the most susceptible of animals, it is necessary to introduce the culture material into the peritoneal cavity. Even supposing the lymph to contain the organism, for this reason and the fact that the temperature of the skin is too low for its growth, there is no reasonable probability of its inoculation. In the experiments upon glycerinated lymph already referred to, tubercle bacilli were purposely mixed with lymph before its incorporation with the glycerine and they perished before the eighth day of observation, cultures from that time on, being negative.

No case is on record during the hundred years of vaccination of the appearance at any point of vaccination of any lesion of a tuberculous nature.

Infective conditions induced by material introduced subsequently to vaccination would include as having been reported: erysipelas, cellulitis, furunculosis, gangrene, pyæmia.

Erysipelas would require a streptococcus infection and is explainable by faulty technique, or infection from a case of erysipelas. Erysipelas conveyed by vaccine lymph is practically unknown. When it has occurred it has been *after* the vaccination. The other four are attributable, of course, to the same cause, yet represent conditions resulting from the introduction in any way, of any pyogenic organisms: fortunately, such serious results are rare.

The conclusions to be drawn may be summarized as follows:

1. That vaccination with normal lymph and no suspicion of faulty operation may excite various eruptions, usually due to predisposition, or an irritable, poorly nourished skin. Rarely as a generalized true vaccine vesicular eruption.

2. Existing eruptions are likely to be aggravated and are prone to spread by auto-inoculation.

3. Normal vaccination frequently exhibits marked irregularities in the character of the vesicle and in the time and place of its appearance.

4. The behavior of some of the rashes with relation to the irritation of the vaccination is excellent evidence, because of the relation of identical rashes to varioloid and variola, of the identity of the vaccine poison with that of smallpox, differing only in the fact of attenuation.

5. That certain inflammatory conditions, clearly the result of some form of sepsis, do occur, and that in the majority of cases the sepsis is not in the lymph but is introduced at the time of vaccination, or after rupture of the vesicle, and may be avoided, as a rule, by more care in technique and subsequent treatment.

6. That the probability of inoculation with serious constitutional diseases by vaccination is practically nothing.

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TUBERCULOSIS—INFECTION, HEREDITY, PREVENTION, HYGIENIC TREATMENT.

By A. G. YOUNG, M. D., Secretary.

Introductory.

The purpose of the following paper is to teach that tuberculosis is a preventable disease, and that, in the early stage particularly, it is curable. The mortuary statistics which have been compiled in various places since the significance of the discovery of Koch's bacillus has received general recognition by medical men, show very clearly the preventability of tuberculosis. At the last congress for the study of tuberculosis held in Paris, Professor Grancher[1] declared that pulmonary tuberculosis is the most curable of chronic maladies; and M. Jaccoud,[2] the eminent professor of the Ecole de Médécine, Paris, long recognized as one of the best authorities on pulmonary diseases, taught that, "curable as tuberculosis is by the fibroplastic process while in the crude state, and during the whole period of softening, it is so also when ulceration occurs and caverns form. The knowledge that recovery is possible under these circumstances dates from ancient times; the facts which established both the truth of this statement and the anatomical mechanism by which it occurs are classical, and there is no need to insist now upon these points."

But before the full significance of the truth of the preventability and the curability of this disease can permeate the mind of the lay or professional thinker and can move communities to more than half-hearted and half-successful efforts to stamp out the pestilence, correct ideas must prevail in relation to the questions of infection and of heredity. The full truth about the infectivity of tuberculosis and the limitations of the influence of infection, can have no other than an assuring and helpful influence. The continuation of the erroneous dogma of heredity as a predominant factor in the causation of the disease is an incubus

1. Congres pour l 'Etude de la Tuberculose, 1898, p. LV.
2. Curability and Treatment of Pulmonary Phthisis, p. 18. 1885.

which paralyzes the patient's hope of cure, and stays the hand of private and public benefaction.

The Mortality from Tuberculosis.

Among all the infectious, epidemic, or pestilential diseases, tuberculosis is the most terrible destroyer of human lives: in most civilized countries it is, indeed, the cause of a larger number of deaths than are caused by all the other infectious or so-called zymotic diseases combined. In the State of Maine, while the mortality from the whole list of the other infectious diseases* was 6,266 deaths during the seven years 1892-98, the disease tuberculosis alone, in its various forms, destroyed 9,735 lives in the same period.

The Social and Economic Aspect.

Of the 9,735 deaths from tuberculosis, 8,429 of them fell victims to pulmonary tuberculosis, popularly called consumption. Of these 8,429 persons who died of consumption, there were about 6,480 between the ages 15 and 60.† These persons may therefore be said to have died during their industrial or productive age when death entails the greatest loss upon the family and the State. How serious the financial and social burden of tuberculosis is but few persons stop to think. Assuming that the average value of each of these 6,480 persons would have been only $500 each if they had not been cut down, we find that over $3,000,000 of the State's productive capital has been swept away,—more than enough to cancel the whole indebtedness of the State. Add to this the loss of labor due to partial or total disability for a prolonged period before death, the loss of labor by relatives and friends, the cost of medical attendance and nurses and medicines, during illness; the value of the other 3,255 lives lost by tuberculosis and not included in the foregoing conservative estimate, and the incidental expenses of their illness, and the cost runs so high into the

*Smallpox, chicken-pox, measles, German measles, scarlet fever, typhus fever, influenza, whooping-cough, mumps, diphtheria, croup, tonsilitis, cerebro-spinal-meningitis, tetanus, typhoid fever, simple continued fever, malarial diseases, and other specific febrile diseases.

†Five thousand seven hundred and six died between the ages 20 and 60, and statistical study elsewhere than in this State render it probable that as many as 774 of the 1,033 persons who died of consumption between the years 10 and 20 had reached their 15th year: hence the number 6,480.

millions that it should serve to "stagger humanity," as a present much-quoted prediction puts it. And even this is not the whole tax levied and collected by that one disease, tuberculosis. It has been estimated that for every person who dies of tuberculosis five recover.

INFECTIVITY.

The Question of Infectivity.

As to the fact that tuberculosis is an infectious, or communicable disease, there should no longer be a question even among the non-professional classes. Most intelligent persons know something of the infectiousness of tuberculosis, although few understand the full significance of the fact,—that practically the whole terrible prevalence of the disease in the human race is due to infection. On the other hand, much which is now known of the infective agent and of the ways in which infection occurs, is assuring. Of the extent of the danger of infection and of the limitations of the danger, it will be the object of the next following pages to explain.

The Infective Agent.

The essential cause of this disease is the bacillus of tuberculosis. It is a micro-organism of slow growth, whether inoculated into artificial culture media by the bacteriologist, or implanted in the human body through inhalation or otherwise. This characteristic favors the infected body in affording time for the rallying of the defensive forces of the organism. On the other hand, the germ of tuberculosis has, in quite a marked degree, the power of resisting, or surviving the action of many natural and artificial agencies which have a tendency to destroy most disease germs. This increases the sphere of mischief of the bacillus by prolonging the period during which rooms or clothing, for instance, may remain infectious and dangerous, after they have once become infected. How long the bacillus will retain its virulence in dried sputum is a question of much practical importance. In the experiments of Schill and Fischer[1] its infectiousness was retained 95 days; in other experiments its virulence was partly lost in 186 days, and wholly gone in 226 days, or seven months and a half. Dr. Pietro De Toma[2]

1. Mittheil. a. d. Kaiserl. Gesundheitsamt II., 133. 1884.
2. Giorn. della Reale Societa Ital. D'Igiene IX., 375. 1887.

found that dried sputum preserved its virulence nine or ten months under favoring conditions, but that under less favorable conditions the life of the tubercle bacillus was destroyed in a much shorter time. The conclusions of Sormani[1] are that the bacillus, whether dry or moist, retains its virulence for at least two months. Cornet[2] believes that we may assume that the bacillus of tuberculosis in dried sputum loses its virulence within three months on the average, but may retain its infectious attributes six or eight months under some circumstances. An observation of Dr. H. C. Ernst[3] indicates the possibility that the virulence of this germ may sometimes be preserved much longer than is suggested by the work of the preceding investigators. Tuberculous sputum stood in jars in his laboratory nearly four years. The dried up sputum, nevertheless, still contained living virulent bacilli.

Other Questions.

The answers to some other questions also serve as a guide in choosing unobjectionable methods of disposing of tuberculous matter. As a general rule the infectivity of the tubercle bacillus is lost more quickly in moist than in dried sputum. The bacillus is overrun and destroyed by the ordinary bacteria of putrefaction. Falk, Baumgarten, Fischer and Toma found that its vitality was lost in water in a few days at ordinary temperatures. Galtier,[4] however, learned that the virulence of the bacillus in small fragments of putrefying tubercular tissue in water was maintained from 8 to 17 days. Low temperatures merely inhibit the development of the tubercle bacillus, but its vitality remains unimpaired after exposure to intense cold, or prolonged freezing and thawing. The most potent of natural agencies in the destruction of tubercular infection is light. Exposed to direct sunlight the bacillus in sputum is, according to Koch, destroyed in from a few minutes to a few hours depending upon the thickness of the layer of material to be acted upon. Dr. Migneco, of Italy, and Ransome and Delepine fully confirm the statement that light, particularly direct sunshine, is a rapid

1. Uffelmann's Sup. 4th year, 146. 1887.
2. Die Tuberculose, p. 27. 1899.
3. Mass. Assoc. of Boards of Health, IV., 7. 1894.
4. Congres pour l 'Etude de la Tuberculose, 1888, p. 306.

disinfectant of tubercular matter. Diffused light has an influence in the same direction, but acts much more slowly.

Infection as a Cause of Tuberculosis.

Infection is not only the predominant cause of tuberculosis, but, so far as concerns the prevention of the disease or the prognosis of recovery from it, infection may be considered as the exclusive cause. In the past, heredity was assigned a prominent position among the causes of tuberculosis, but now a large majority of the most eminent medical practitioners and teachers are convinced that direct heredity is but a small etiologic factor, while most of the cases of tuberculosis are referable to infection.

Of the ways in which the tubercular parasite finds an entrance into its host, and starts a new infection, only the most important,—the most frequent,—will be mentioned in this paper. By far the greatest number of infections are the result of inhaling the bacillus in dried tuberculous sputum.

The Danger of Infection by Inhalation and Its Limitations.

The prodigality of nature in her provisions for the perpetuation of the lower species of organisms is nowhere more apparent than among the bacteria. "Dr. George A. Evans, in a paper read before the Kings County Medical Society in 1894, gives the result of some experiments made by Dr. George F. Nuttall, of Johns Hopkins University, that in the sputum of three cases undergoing the Koch treatment the number of bacilli expectorated in the first case in twenty-four hours was 2,000,000,000, in the second case the number varied between 20,000,000 and 165,000,000 on the days preceding the Koch inoculations. In another case not undergoing the Koch treatment the number of bacilli varied between 300,000,000 and 4,000,000,000. According to Bollinger, one cubic centimetre of phthisical sputum contains from 810,000 to 960,000 bacilli; the average consumptive therefore expectorates between thirty and forty millions of these parasites a day."[1] According to a statement of Dr. Netter[2] some phthisical patients expel from their lungs in the course of a day as many as 720,000,000 bacilli.

It is fortunate for the human race that limitations are imposed upon the infectivity of the bacillus of tuberculosis and upon the

1. Rpt. of Special Com. to N. Y. Legis., 1899, p. 16. (Dr. Geo. W. Brush, Chr.)
2. Revue de la Tuberculose, III., 35. 1895.

chances of infection. Many tuberculous persons are not dangerous to their associates, for the reason that the bacilli remain within enclosed cavities, or are so discharged that there is no liability of entering other bodies through the usual portals. But among patients expectorating infection in plentiful quantities, the character of the patient increases or lessens the danger of infection. While the careless and dirty patient who spits upon the floor or into his handkerchief endangers all persons who are much with him, the presence of the cleanly person who is scrupulously careful in the disposal of his sputum may endanger not even his most intimate associates. And even with careless persons the intensity of infectiousness, or the concentration of infection, diminishes very rapidly with the increasing distance from the patient, even within the same house or room.

In the process of tubercular infection there are two contending factors which must be taken into account. One is the morbific capabilities of the slowly developing tubercle bacillus. The opposing force in the struggle is the resisting power of the organism which is invaded,—the power of the system to destroy the invading parasites and cast them forth. The infection of the living organism and the extension of the infection is not the mere implantation of germs in an indifferent culture medium: it is a struggle for supremacy between the invading parasites and their host. In the majority of cases, as pathological studies indicate, the infected human organism is victorious and rids itself of an incipient tuberculosis which is often never suspected.

The outcome of the struggle depends not alone upon the resisting powers of the person who has received the infection, but it is largely influenced by the quantity of infection received and by the virulence of the bacilli. Thus it is that the occasional visitor to an infectious patient is but little endangered, while there is much danger of the development of tuberculosis among his more constant associates. As to the virulence of the bacilli, investigation has shown that it is modified in various ways. It is intensified or lessened according to the media or host in which it had previously developed. It is diminished and finally destroyed with age and especially by the action of light, as has already been said.

The Ubiquity of the Bacillus.

Some persons who should know better have assumed that the danger from the germ of tuberculosis is almost everywhere present,—in our streets, in our places of business. The truth is that, in the open air, the danger of infection does not exist. The tubercle bacilli are quickly destroyed by natural agencies as we have seen. It would seem that, if any class of persons were exposed to infection from the dust of the streets of our cities, it would be the street-sweepers. Yet, the proof has been adduced that that particular class of persons, in the city of Berlin, have a greater degree of immunity than the average citizen. Years ago Cornet showed very conclusively that the bacillus of tuberculosis may, for all practical purposes, be considered absent in our streets and in all buildings not habitually occupied by consumptive patients. Even in rooms occupied by a careless consumptive patient, the patient is himself endangered more than anyone else. He surrounds himself with a halo of infectious dust which lessens his chance of recovery.

Emphasizing the fact that pulmonary tuberculosis is essentially a result of exposure to infection in enclosed spaces, we advance to a consideration of some of the special conditions under which infection occurs.

House Epidemics.

The observation that successive cases of consumption occur in the same family or the same home is coextensive with the historic period. At different epochs and in different lands these observations have not received the same interpretation. While some of the fathers of medicine believed firmly in the contagion of consumption, and strict regulations were enforced in various places at later dates, the medical profession of more modern times, until within the last decade or two, has generally acquiesced in the impression that hereditary influence explains the matter. While the doctrine of the infectiousness of tuberculosis is not the daughter of bacteriology, as has been remarked, the exact methods of modern research have confirmed the conclusions of the earlier "contagionists" and have pushed forward the doctrine of infection as the more rational explanation of such house epidemics of tuberculosis as the following:

In a paper on "Tubercular Infective Areas," Dr. Arthur Ransome[1] of England gives, among others, these three illustrative cases:

I. McI., aged 21, student, son of healthy parents, both living, no family history of phthisis; took ill with a cough while studying in Glasgow in 1870, neglected it, came home at the end of the session, cough got worse, found both lungs tuberculous, died of phthisis in nine months. Had one sister, 19, and one brother, 17. The former a perfectly healthy girl, nursed her brother closely; ill shortly after his death, and was dead in five months after him of phthisis. The brother, who slept with I. McI. during part of his illness, and wore his clothes after his death, showed symptoms of failing health before the sister died, and in about eighteen months died of phthisis.

A young man of the Indian navy came home suffering from phthisis. In a few months two of his sisters were taken with the same complaint, and died. A third sister married, and soon afterwards died of the same complaint; the young man also died. Later on the father was similarly affected, and died. After his death the widow became phthisical, and died also. Four years covered the whole outbreak, that is, from the arrival of this young man from India. The father was originally a very strong, healthy man, and all the children healthy up to about twenty or twenty-one, or even later. One sister still lives, and is now between forty and fifty.

In 1880 the Sisters' Convent, in the village of Ferdinand, was entirely free from consumption; it is well ventilated, is high and dry, and is well drained. In the autumn of 1880, a girl of 18 was found to be consumptive. She continued to sleep in the general dormitory. One sister after another now commenced with similar symptoms, and in four months after the first case began there were nine cases in sisters who had been thought to be exceptionally healthy. Four sisters died in the course of a year. After complete isolation of the sick, the epidemic was stopped.

Dr. E. O. Otis,[2] of Boston, refers to the following case narrated by Dr. Marsh, which illustrates very well the influence of

1. Transactions Epidemiological Soc. VI., 128. 1886-87.

2. The Causes and Conditions of Pulmonary Tuberculosis, and how to avoid them, p. 6. 1898.

massive doses of the infection in causing pulmonary consumption to assume a specially rapid and malignant form:

A German, aged sixty-two years, weighing two hundred pounds, of good family and personal history, came to him in a state of advanced consumption. Two years before he had lost a son, aged twenty-three years, from the same disease. Three months later his wife, who had nursed the son, began to sicken. She was a German, aged fifty-nine years, strong, robust, and well preserved, weighing more than 220 pounds, with a good family history. She died within twenty months, having had frequent hemorrhages from the lungs and intestines and almost constant diarrhea. Within five months the husband was in the condition just described; while a daughter, aged twenty-two years, worn out from constant attention to the sick, was in a fair way to become phthisical, if not already so. It was learned that all three had expectorated on the walls, floors, and in the corners of the apartment, the man preferring to expectorate under his bed. The daughter slept in the same room with the sick man, and slept beside her mother during her illness.

Dr. Otis also refers to the late history of the Apache Indians as an example of domiciliary infection.

In a community of 400 of them, taken from a free nomadic life in Arizona and New Mexico and transferred to Alabama, where for four years they occupied log cabins badly constructed and situated in a low, damp hollow, and in which filth gradually accumulated "until they became veritable incubators of disease," the deaths from tuberculosis in five years were seventy-eight, or 43⅓ per cent. of the total number of deaths.

Jaccoud,[1] of Paris, among other evidences of the infectiousness of consumption presents the following case:

In the autumn of 1872 an artisan, his wife and five children (four sons between the ages of three and a half and fourteen, and a daughter fifteen years old) went to live in a village of Denmark, where they inhabited a small room already occupied by another family, consisting of a man, his wife, and a grown-up son affected by febrile phthisis. They remained in this crowded and confined abode, in which the air was rendered truly poisonous by the presence of the patient, until January 3, 1873, when

1. Curability and Treatment of Pulmonary Phthisis, p. 76. 1885.

they left the place for a more healthy dwelling. Before this, however, at the time of Christmas, the five children, who had been previously in good health, and unaffected by scrofula, suffered from pulmonary disease, and the evolution of the complaint was so rapid that they all died after the respective periods of seven weeks, three months, three months and a half, and seven months. The daughter, whose age was fifteen years, and who had only remained during one day in the infected room, was attacked like her brothers, and it was her death which occurred at the end of three months and a half.

In a lately published work by Prof. Cornet,[1] of Berlin, he presents indubitable proof of the infectivity of pulmonary consumption, particularly among the occupants of infected rooms. In connection with about 800 cases of consumption, he has carefully traced out all the available facts which have a bearing upon the questions of infectivity, heredity, or predisposition, not limiting his inquiry to the patient and his nearest relatives, but extending it to all of his available connections, fellow workmen and associates, sometimes making a physical examination of as many as thirty persons in getting at the history of a single case. Notwithstanding the well-known difficulty in fixing the exact sources of infection which occurred months or years previously, he was able to trace out its source in more than half of his cases.

Cornet says that when a large number of apparently hereditary cases of tuberculosis are examined it must occur to the unprejudiced mind that the parents of many of the patients did not show the first symptoms of tuberculosis until after the birth of the child in question and sometimes not for many years after, or that the death of the parent from tuberculosis occurred remarkably near the time of the death of the child.

In many cases it will be found that the single cases of tuberculosis are separated by almost a generation, but careful investigation shows that in the majority of these cases a brother or sister, or other near relative who stood in intimate relation with the family, served as a connecting link between the disease of the parents and that of the child. The following case illustrates this:

Case 136. Admitted, 1892. Auguste Vil., 31 years, married. Her father died in 1887 at the age of 64 of senile debility and

1. Die Tuberculose, Berlin. 1899.

asthma (?). The father's parents were very aged; her mother's parents died young. The collateral line of relatives of the father were all well, but on the mother's side all had died of tuberculosis. The mother died of tuberculosis in 1877, at the age of 47 years.

One year after the death of the mother a 16-year-old brother who had been constantly in the house, died of tuberculosis; a sister 25 years old who had been married 3 years, but who was infected before leaving her mother's home, died in 1897. In 1883 an 18-year-old brother died, and in 1886 another brother, 24 years of age who slept with the other brother, died of consumption. In 1887 a brother 35 years of age died after coughing and expectorating 14 years.

The patient, Auguste Vil., showed symptoms of the disease in 1889. These children had been much together. The elder sister, 39 years of age, long absent from the paternal home, nursed Auguste Vil. eight months, and after that coughed and raised, and shows by physical investigation, signs of consumption.

From the point of view of heredity it is hard to reconcile the fact that only a part of the children of tuberculous parents are affected, but from the point of view of infection, the fact will often be developed from a careful investigation of the family history that some of these children were at home more than others, either on account of their tender age, incapacity for working, or from other causes, and that those members of the family who remained well were away from their home more of the time. The following case illustrates this:

Case 8. Admitted, 1892. Auguste C., single, 24 years of age. The mother died of hemorrhage from the lungs in 1885. The mother's father died at the age of 84; one sister, living and well; mother's mother died of cancer. Of the brothers and sisters of the patient who lived in the same room with the mother, one only, a brother 15 years of age, remains well. On the other hand, two brothers, one of 16 and the other of 14 years of age have lately died of consumption. The patient Auguste C., became tuberculous in 1885, and in 1889 went to live with another sister 25 years of age who is now also tuberculous.

A married sister, 26 years of age, who was away from home at the time of the illness of her mother, is well and strong, and the same is true of her children. The same is also true of a brother 22 years of age, who at the same time was away from home. A 16-year-old sister who slept in another room remains well, and so does the father, who during the illness of the mother, slept in another room and at night was away from home at his work.

The investigations of the prevalence of tuberculosis in some of the sections of New York City show that, of the infected houses, 28.2 per cent. contained 55.8 per cent. of the cases, and these occurred in only 10.2 per cent. of all the houses in the ward.

Many of the houses have had one or more cases every year for three consecutive years, some of them having had as many as eight or eleven cases during this period. Several houses, in which one or more cases of tuberculosis have been reported in the last three years, have had deaths from the same disease in them for eight or nine years, viz., five houses, in which 22 cases have been reported since 1893, have had 36 deaths from tuberculosis from 1888 to 1893, inclusive.

As Dr. Tracy, the registrar of the city remarks: It would appear that there is no question as to the infectious nature of the disease. Though tuberculosis causes from 14 to 15 per cent. of the total number of deaths in the city, yet it is confined within narrow limits and to a small number of houses.*

The Children of Tubercular Homes.

Children in homes where there are cases of consumption, particularly children in the first months of life, are especially subject to the danger of infection, both on account of their feeble power of resistance, and for other reasons now to be mentioned.

The bacilli of tuberculosis, like other bacteria are forms of particulate matter, and, obeying the law of gravitation in common with other matter, fall toward the earth when unsupported. The gravitation of the bacteria in a room towards the floor, especially in still air, is more rapid than might be supposed.

Neumann found in the Moabit hospital near Berlin, between half-past 7 and 8 in the morning, very soon after the patients had left their beds and the wards had been swept, from 80 to 140 germs in 10 liters of air. At 9 o'clock the number had sunk to 68; between 10 and 12 o'clock the number ranged from 22 to 42;

*Quoted from Brush. Rpt. of Special Com. to N. Y. Legis. 1899.

in the early part of the afternoon about 20. At night, from an hour and a half to two hours after the patients had gone to bed and the ward had become quiet, there were only from 4 to 13 germs in each 10 liters of air.

According to Stern after the dust had been disturbed in a room, and the room is again closed up, the greater part of the bacteria have fallen to the floor in from 20 to 30 minutes. After from one to two hours the air still contains a very few bacteria; leaving the room closed and undisturbed still longer, the air is found almost entirely free from germs.

Thus it results that, in rooms infected with dried tuberculous sputum, the floor serves as the lodging place for the larger part of the infective agent, and before complete subsidence has occurred the stratum of air near the floor contains a much larger proportion of the infection than does any other part of the air of the room. The breathing line of the young child, while on his feet, or upon his hands and knees, is lower than that of older persons. When, therefore, there is danger of respiratory infection the child receives a proportionally larger dose of it than does his elders. An added danger threatens the creeping child on account of its inclination to thrust everything into its mouth. His chubby little hand moistened with his own saliva sweeps the bacilli from the floor and returns to his mouth. The pathologic result is the frequent occurrence in these tubercular homes of the protean forms of tuberculosis,—tuberculosis of the lungs, of the intestinal tract and the mesenteric glands, of the cerebral membranes, of the bones, "scrofula," etc. As the recognition of many cases of tuberculosis among children is not easy, the actual number of deaths from tubercular infection exceeds considerably the number shown by any registration system.

In the State of Maine during the seven years 1892-98, there were 442 deaths from "cerebral" tuberculosis. Of those deaths 283 were of children under five years of age. There were also 1,869 deaths from "inflammation" of the brain or "its membranes," 1,113 of which were of children under five years of age. Many of these 1,113 deaths undoubtedly were due to tubercular meningitis.

There were also registered in the same seven years 2,522 deaths from "ill-defined diseases of infancy," 406 from atrophy and inanition, 655 from "debility and exhaustion," 292 from "anæmia," and 3,761 from the "diarrheal diseases of infancy." A correct diagnosis would have placed many of these under the various forms of tuberculosis as the cause of death.

Dr. W. H. Chapin,* of Springfield, Massachusetts, has made a careful and extended study of tuberculosis in that city. The following are a few of his family histories which show the frequency of obscure brain affections in tubercular houses.

For instance, in the L. family there was in January, 1871, a death from consumption, and no more until 1879, when there was a child six months old died from marasmus; but two years later, in 1881, a person died of consumption again. The same year, two months later, another child died of marasmus. In 1884 there was a case of convulsions.

Another family history began in 1875. They had deaths in 1875, '78, '79, and 1881. The first was from hydrocephalus, the next from convulsions. The third was an uncle of the preceding two, and he died from consumption. The fourth was an aunt, and she died from consumption. The fifth was a child, and died from meningitis about four months later than the last case of consumption. They inherited their tuberculosis from the aunt who lived in the family! The mother and father are still living, and are not tuberculous.

Another family, in 1878, 1879, 1880, and 1883, had deaths as follows: The first from consumption, the second from tubercular meningitis, the third from consumption, and the fourth from convulsions.

Another family in 1871 had a death from consumption. That was the grandfather. In 1876 there was a case of death from convulsions, a child only one year old died five years later than the grandfather did. It may have inherited convulsions from the grandfather, but just two months later the father died from consumption.

Another family began in 1870. In March, 1870, there was a child three years old who died of meningitis, in 1871 another one, two months old, died of cerebral congestion, and July, 1873, one died of cerebro-spinal meningitis. While those cases were going

* Tr. Mass. Assoc. of Bds. of Health, IV., 3. 1894.

on, the father was actually tubercular; but he afterwards recovered.

Here is a family which lost four members in one year and six months. On the 18th of February, 1884, one died, three years of age, of cerebral effusion. On August 7, the same year, one died of meningitis at the age of eleven years. On September 1, 1885, one died, aged thirty-seven, from consumption. She was the mother; and on November 1, 1885, the same year, two months later, a child three years and four months old died of meningitis. In that instance the case of consumption occupied the middle position, and cases of brain disease the others. Tuberculosis was not diagnosticated, although the woman must have been tubercular all the time. I have seen members of the family since; and they assured me the mother had tuberculosis, lasting about four years.

Here is a case August 13, 1882, where a child two years of age died of convulsions. May 1, 1885, an infant two months old died of exhaustion. September 28, 1885, a child four years old died of convulsions. April 30, 1886, a child two years and two months old died of marasmus. No more about the family except last year I was called in to see the people, and found that they had three surviving children, all in good health,—the father and mother in perfect health. I was asked to examine the mother's lungs, and I found signs of healed tubercular cavities. While these children were dying of various convulsive disorders, she was then coughing and spitting about the house. It seemed to me then that our statistics of tuberculosis should include almost all cases of brain disorder in children; that, when as physicians we meet a case of brain disorder in a child, we should think of tuberculosis. And in the two histories that I have read the physical record shows us that, unless there is a person in the family who is actually tubercular (I mean by that excreating tubercular pus), the children do not inherit it from their parents; and, if there is that condition of things, then children do inherit it.

During childhood, says Cornet, infection from inhalation shows itself as a primary tubercular development in the bronchial glands, while in later years it gives rise to primary tubercular deposits in the lungs themselves. The same author produces evidence that even among children, tuberculosis is much more frequently caused by inhalation of the infection than otherwise.

Infection from Husband to Wife and vice versa.

Behnke[1] relates the following case: A man with a phthisical tendency married a well and strong young woman. He died in five months from their marriage. After his death the widow began to show signs of consumption; nevertheless, she married again and died of consumption a year and a half from the time of her second marriage. This second husband married a widow, but soon showed unmistakable symptoms of lung disease. He died of consumption a year and a half later. About a year afterward the twice widowed woman married a well and robust man. Three years later he died of consumption. Though the widow was well-to-do, the foregoing history was so remarkable that no man would marry her.

A large number of cases of conjugal tuberculosis might be cited here but it must suffice to remark that the transmission of tuberculosis from husband to wife or from wife to husband is of quite frequent occurrence. On the other hand the instances are many in which infection does not occur.

Because it often happens, says Cornet, that tuberculosis is not transmitted from tuberculous husbands to their wives, or vice versa, it is illogical to adduce these facts as evidence of the non-infectiousness of the disease. The closeness of the association of married life is often overestimated. The work of the husband often keeps him away from his home more than half the time. In many cases separate beds or separate rooms are occupied. In many cases of consumption too, expectoration is slight or absent during the hours of rest, but is greatly increased during the hours of exertion. The husband may, therefore, expose his fellow workmen, in shop or in factory, to much greater danger than he does the members of his own family. The exposure of the younger children to household infection is usually much greater than that between husband and wife.

Infection in Offices, Shops, and Factories.

At the last French congress on tuberculosis, Dr. Oberthur[2] asserted that, tuberculous contagion among the workmen in offices, workshops, and factories, is very frequent; much more

1. Die Verbreitung der Lungentuberkulose durch Contagion, p. 17. 1884—Königsberg.

2. Congres pour l'Etude de la Tuberculose, p. 405, 1898.

frequent than is often believed. Energetic masures are taken to preserve the lives of workmen from toxic products which surround them. It is none the less necessary to introduce measures against tuberculosis which causes among the working population far greater ravages in a single year than phosphorous, lead, mercury, fire damp, and machinery in a century.

The next two following cases, selected from the many investigated by Cornet,[1] illustrate clearly the great danger to the fellow workmen of consumptives who spit upon the floor of their workshops or places of indoor business.

Case 295. Admitted to the hospital in 1892. Bernard B., 29 years, single, a turner. The mother died in 1870 in childbed at the age of 42 years. The father died in 1875 from a disease of the stomach. Neither among the grandparents nor the brothers or sisters of the parents had there been a case of tuberculosis. A brother 25 years of age died of disease of the heart, and six brothers and sisters whose ages range from 32 to 50, are well.

In the shop where the patient worked from 1887 to 1892, a man O. died of consumption in 1889; then another workman who was much with O. died of the same disease. In 1889 the patient Bernard B. was troubled with spitting blood. Since 1891 his master, whose father died at the age of 61 of senile debility, and whose mother is well, died of tuberculosis. In the autumn of 1892 Fritz St. who had worked for four years as an apprentice in the shop became tuberculous. The workshop is large and well ventilated, but these tuberculous persons had spit upon the floor, and the floor was swept dry.

Case 347. Admitted, 1892. Emil K., 40 years, married, a cabinet maker. His father and mother are both living and well, the former at the age of 76 and the latter at the age of 75 years. The grandparents died at the ages of 66 and 69 from other causes than pulmonary. A brother and sister, 47 and 49 years of age respectively, are well. One brother 26 years old, died of an unknown disease. This patient Emil K. works in the shop of a man by the name of Basch.

From 1869 to 1878 Basch worked in his small shop with Heymann. Heymann died of tuberculosis in 1878. Basch, with no hereditary tendency showed symptoms of the disease in 1878,

1. Die Tuberculose, p. 223, 1899.

and died in 1889. A workman by the name of Gold died in 1880; another, Belke in 1885. All of these persons died of consumption. Emil K., whose case led to the investigation of the history of this workshop, was supposed, early in life, to be scrofulous. He worked near Belke, and showed signs of infection in 1886 at the age of 34. He died in 1892. Hanof, in whose family there previously was no history of tuberculosis, and has worked in the same shop since 1886, is now tuberculous. The eldest son of the master Basch who took charge of the business after the death of his father is, according to the testimony of his fellow workmen, suffering from consumption.

Emil K., warned by his attending physician, and because his wife would not allow him to do otherwise, always spit, while at home, into a vessel containing water. His wife at the time of the investigation was 46 years of age, in good health as were also her two children 12 and 16 years of age.

In this workshop where in the later years as many as thirteen persons worked, there were no spittoons, and it was their practice to spit upon the floor which was always swept in the dry way. As in many other cases, there was here at first no indication of the sources of contagion of these patients. That was made evident only after an investigation of the condition of the workshop, and the conditions under which these persons worked, took place.

Tubercle bacilli are found, as a rule, only in those places in which a careless or uncleanly consumptive lives or works, but, in the absence of knowledge of the chances of infection, we cannot rationally conclude that a man has not been exposed to infection. Many consumptives still at work, expectorating large numbers of bacilli, are unthought of by the laity as sources of infection, and are unknown to the physician until a careful investigation has been made.

Cornet presents statistics on the death-rates of various classes of workmen in confirmation of his statement that the consumptive patient, while he is able to work, endangers his fellow workmen much more than he does his family, particularly, when he and his fellow workmen do their work in closed rooms.

As related by Professor Marfan,* he was consulted about the prevalence of pulmonary tuberculosis in an office in Paris in

* Rev. de la Tuberculose, V., 322. 1897.

which 22 employees worked. In 1878 one of the number died of consumption, and since then deaths from phthisis followed each other in rapid succession. In four years ending in 1889, 13 employees succumbed to tuberculosis. Investigation showed that the hygienic conditions were bad,—there were insufficient light and air supply. But the essential cause of the prevalence of the disease was attributable to the fact that the employees were in the habit of spitting upon the floor, and dried and pulverized sputum was put into motion in the air by the daily sweeping. The sweeping had been done in the morning, and the employees often arrived before the sweeping was finished, thus they were forced to inhale this infectious dust when it was most plentifully present in the air. In accordance with the advice of Dr. Marfan the old floor was taken up and burned, the place was repainted and otherwise renovated, a plentiful supply of spittoons were put in, and the use and care of these were kept under strict surveillance. The result was that, at the end of eight years, no new case of consumption had appeared among the employees.

Infection from Transitory Cases.

Infection is sometimes transmitted from transitory cases which may not be recognized as tuberculous.

Dr. Ducor* gives the history of two cases of infection from such a tuberculous attack in the mother. There was no history of tuberculosis on either side. The father, a man of 41 years, had always been hale and hearty. The mother, 40 years of age, suffered for a year from bronchitis which followed exposure to tubercular infection. She recovered, but the next to the youngest child, a girl of 3 years, had two tuberculous swellings, one of the hand and one of the knee. The youngest child at the same time had tubercular swellings of the cervical glands. By means of surgical and other help the children recovered. The seven older children in the family remained unaffected. Thus the only persons affected were the youngest two who were naturally more exposed to the infection than their elder brothers and sisters with ages ranging from six to fifteen.

* Congres pour l 'Etude de la Tuberculose, 1893, p. 48.

Outbreaks of Tuberculosis in Isolated Communities.

In a few places tuberculosis is unknown; in some other places its introduction has occurred within the period of trustworthy history; in a larger number the movements of population have carried with them an increasing wave of tuberculous disease to the earlier or aboriginal peoples among whom hitherto there had been but a slight prevalence of the disease.

Dr. Frederick A. Cook who accompanied Lieutenant Peary's Arctic Expedition, says that tuberculosis is very prevalent among the Esquimaux of South Greenland. In the Arctic Highlanders, however, tuberculosis is unknown, simply because the bacillus has never been carried to them.

In Terra del Fuego phthisis was absolutely unknown until an English missionary station was established in that district. The wife of the missionary, a consumptive, opened a school, and soon many of the children succumbed to her disease.[1]

At the last meeting of the Congress of Tuberculosis in Paris, Dr. Ricochon[2] communicated the history of an outbreak of tuberculosis in a village where that disease had hitherto been of rare occurrence. He knew of three cases only before this outbreak, and they occurred more than fifteen years before. The village is situated on elevated and permeable, calcareous ground. The houses are neat and well ventilated. The water supply comes from springs, and is of excellent quality. The people are cultivators of the soil, habituated to a life in the open air.

Case 1. In 1894, a young woman of 30 years of age had a swelling of her foot which eventuated in an ulceration which resisted repeated cauterization and other treatment and which assumed a character of a tuberculous ulceration. In 1896 she was attacked with pulmonary tuberculosis and died one year later. Thus far neither her husband, her two children, nor the domestics of her house, have shown signs of contamination; but the neighboring houses have presented cases of tuberculosis.

Cases 2 and 3. In the next house, a young woman of 28 years had a dry pleurisy of the right side in 1896 which came on insidiously and which threw her into a condition of marasmus for three months which appeared to be of tuberculous origin. Dur-

1. Revue D'Hygiene, XII., 50. 1890.
2. Congres pour l 'Etude de la Tuberculose, 1898, p. 773.

ing this same period of time, a child 6 years old who had measles two months previously, and who had remained in a feeble condition since then, was attacked with tubercular meningitis and died.

Cases 4 and 5. In the house situated next in order, a woman of 38 was attacked in March, 1896, with a grave form of tuberculosis of the cervical vertebræ from which she died in November. Meanwhile, one of her children, a little girl of 10 years, was attacked with dry pleurisy of the right side, from which she recovered.

Case 6. In the next house on the same street, a child of 5 years died after an illness of eight days of tuberculous meningitis. Some months before it had measles.

Cases 7 and 8. In a house upon another street near the cases 2 and 3, a woman 49 years of age, whose health hitherto had been perfect, began to cough at the end of the year 1895, and died of pulmonary phthisis, July, 1896. Some months afterward, her husband, previously strong and vigorous, began to cough, and died of pulmonary phthisis in May, 1897.

Case 9. The sister-in-law of these last two patients, one of the most robust women of the country, who, off and on, took care of them during their illness was attacked with a dry cough and a pain back of her shoulders. There were signs of the dry pleurisy over the posterior superior two-thirds of lungs. Her condition at the end of two years still remained serious though there was slight amelioration. She had profuse sweats, hectic fever, and other evidences of tuberculosis.

Case 10. A girl 18 years of age, whose paternal line had a slight tuberculous taint (an uncle died of tuberculosis at the age of 22 years) but the health of this young woman had always been good until she contracted bronchitis in the course of which she had two very pronounced attacks of hemoptysis. Submitted to a vigorous treatment, she improved and has gained in weight.

Case 11. A woman of 30 years, who had had but one child, and whose health had always been excellent, and whose parents died of old age, as most of the parents of the preceding patients had, has for some weeks past had a serous effusion into the left pleura, which I have already tapped twice. Disseminated bronchial rales on the right side are of a suspicious nature.

Case 12. A young man of 32 years living near the first case, whose health had habitually been good, began to cough and had a serious hemoptysis last May. Upon examination there were already crackling rales at the summit of the right lung. He became emaciated and lost strength. He was submitted to an intensive treatment with creosotol, phosphate of lime, and chlorid of sodium. There has been an improvement in his appetite, and, in the last few weeks, an improvement in weight.

Here, says Dr. Ricochon, are the facts. After an absence of tuberculosis for fifteen years in a village, and after the reappearance of a case of that disease, ten or twelve other cases followed in the houses of the nearest neighbors in less than a year. The map of the village which the doctor presents, showing the location of the infected houses adds to the interest of his paper. The cases all appeared upon or near one line of streets, while no cases appeared in the houses grouped along the one other street.

At another of the congresses held in Paris for the study of tuberculosis, Dr. D'Hotel* gave the results of the study of outbreaks of tuberculosis in country villages in the northern part of France. This study was begun by his father and had been continued by the younger Dr. D'Hotel. The observations covered a period of more than half a century. It is in the country that one can advantageously study tuberculosis with reference to the questions of infection, and heredity, particularly in isolated country villages, where the inhabitants rarely change their habitations, and where there is but little communication with the outside world. Under these conditions the studies of the Drs. D'Hotel were carried out. The following are a very few of the series of cases of tuberculosis recorded by them:

Observation 1. The family X., father, mother, and three children, lived in a two-story house. Previously no case of tuberculosis in the family nor in the house.

In 1884 a consumptive came to live on the second floor where he occupied two rooms, there dying at the end of six months. These rooms remained unoccupied. The owner's son stored wheat in them, and from time to time handled it.

In 1884, this young man, 23 years old, very strong, became tuberculous and died in seven months.

*Congres pour l'Etude de la Tuberculose, 1893, p. 64.

In 1886, thirteen months after, a younger sister who had taken special care of him, and who had drank and eaten with him, became consumptive and died in ten months.

In 1885, the eldest daughter of the proprietor, who was married and lived elsewhere, came to live in these apartments where the consumptive had died. She had four children, one boy and three girls; her husband was a strong man. During six months their health was exceedingly good, then the youngest child, a little boy of twelve months, strong and robust, who until then had been healthy, but who spent one-half of his time on the contaminated chamber floor, now became sickly, and I observed an enlargement of the abdominal glands and diarrhea. The child improved little by little, but the abdomen remained enlarged. The child had his teeth and walked, but remained delicate and was subject from time to time to stridulous laryngitis. At times he coughed continuously and his mother said that for three months at a time he would be well and then he would have relapses.

When two years of age, I observed that the child had an enlargement of the left wrist and at two and one-half years the left ankle became swollen. White swellings developed rapidly and suppuration occurred in three months. At the same time, the child became emaciated, coughed more and more, and died at three years, fifteen months after his uncle.

In 1886, a little sister, who sometimes lived in the apartments where the consumptive died, and sometimes in her sick uncle's room, had keratitis which lasted for six months before any improvement. The next year keratitis appeared again, but was cured in two months. Since then her health has been good.

The other two children have remained well.

In 1890, the husband of the eldest daughter of the proprietor, with no hereditary history, had a continuous fever with pains in the joints, cough, oppression, on auscultation dispersed and transitory signs, diarrhea, night sweats, hemorrhages, emaciation. This condition lasted four or five months, then his appetite and health returned. This man, however, remained very pale.

Obs. 3. L. X., married a woman who became tuberculous and died in three or four years. One year later contracted a second marriage with D. X. in whose family there is no previous history of tuberculosis.

There was born to her one child who lived. L. X. died of pulmonary tuberculosis at the end of four years. He suffered about one year.

The second wife, D. X., had occasional febrile attacks in the year following her husband's death. In the second year of widowhood she married B. Z. Her health was rather poor, she had a husky voice without coughing much, and she took particularly good care of herself. Her husband had bronchitis and catarrh without any former history of these diseases in his family. He was an alcoholic. The son by her first husband lived to be 25 years old. He was brought up at home, but slept in the upper story.

All the succeeding tenants occupied the same sleeping room, used the same bedding, and the furniture was not changed.

Obs. 6. Two tenements composed of two rooms under the roof. Two of the rooms were exceedingly low studded; there were beds in all four rooms. By the doors being always open these four rooms were really but one. The family was composed of the father, a strong man; the mother, a healthy woman, and nine children, all strong and well except two who died, one of diarrhea at four months; the other, from the results of whooping- cough, all of which occurred a long time ago. Their maternal grandfather and grandmother died at 64 and 65 years of age, one of heart disease and the other of typhoid pneumonia. The paternal grandfather died at 67 years, and the grandmother of typhoid.

No. 1. It was in the midst of this family that a young commercial traveller died of consumption. He suffered from eighteen months to two years. He was the brother of the mother of these nine children.

No. 2. During this young man's sickness a little boy two years old, who played continuously on the ground where the consumptive expectorated, was taken with tuberculous disease of the tibia and of the wrist which suppurated for six months leaving cicatrices adherent to the bone, and destruction of a part of the second left metacarpal bone.

No. 3. During the last five months of the uncle's sickness, a little girl was born. The invalid took particular care of this child. This child at three months began to have swellings on its wrists, shoulder, and thighs which terminated in suppuration in three or four weeks each, white cicatrices remaining. At five months abscesses recurred on the wrist, on the back of the hand, and on the scalp. These ulcers suppurated in about four months, leaving cicatrices adherent to the bone. There is partial loss of the fourth and fifth left metacarpal bones. This child had diarrhea for two years; then was cured and now is six years old.

No. 4. A girl, 21 years old, apparently in good health. One year after the uncle's arrival in the house she was taken with enlargement of the sub-maxillary and cervical glands, with a cough and fistulas. She recovered and now her general health is good.

No. 5. A son, 23 years old, well developed, hitherto perfectly strong, had hemorrhages for three years. He has since died.

Obs. 45. X. and his wife, 74 and 70 years of age, had three children.

The first, a young seamstress 16 or 17 years of age who had lived in the house mentioned in the 5th observation died of consumption in twelve or fifteen months.

The second, a son 20 years old, died in five or six years, several years after the death of his sister.

During this interval the second brother died of consumption also.

The father of these children, who had until then had robust health, suffered a great deal after his children's death. He had a number of attacks of hemorrhage and there were crackling rales at the apex of the right lung. His sickness lasted between ten and fifteen years, commencing from the death of his children. He has been well now for ten years. His father and mother died of old age.

This house consisted of a kitchen chamber with a dark closet attached, where each patient had slept in turn.

Is the Breath of the Consumptive Infectious?

Cornet in 1888, and, before him, various investigators were apparently fully justified in their conclusion that the breath of the consumptive patient is free from infection. That was accepted as an established truth until the year 1897, when Professor

Flügge[1] asserted that the most frequent media of infection are particles, or minute vesicles, of fresh sputum thrown into the air during the act of coughing.

He also declared that the opinion that the principal agent in the transmission of consumption is dried and pulverized tuberculous sputum does not rest upon experimental investigation which is not open to criticism. It has not really been shown, he says, that the inhalation of dried sputum by healthy persons can produce tuberculosis.

One of the pupils of Flügge, Dr. Laschtschenko, found that in experiments with fluid cultures of bacillus prodigiosus held in the mouth, this germ was diffused in the surrounding air considerable distances.

Neisser[2] and others in subjecting animals to the inhalation of dried tuberculous sputum have had many negative results, due apparently to the fact that their methods were faulty in differing widely from the usual conditions present in the accidental infection of human beings.

Sticher,[3] on the other hand, succeeded almost without exception in giving animals tuberculosis by rubbing perfectly dry tuberculous sputum upon a piece of cloth or board and blowing it into the room where the animals were confined.

A year and a half after the publication of his first paper Flügge[4] admitted that the infection of pulverized tuberculous sputum succeeds if certain conditions are observed. But he criticises the successful experiments as deviating too much from the conditions in dwelling houses, where so strong currents of air are not present to send the dried sputum into the air, forgetting apparently the efficiency of certain prevailing household methods of raising a dust, particularly dry sweeping and dusting.

Heymann,[5] another pupil of Flügge, experimented with 35 consumptive paients by having them cough in the direction of glass slides. Tubercle bacilli were found on the slides placed before 14 of these patients, 40 per cent. of them, at a distance of ½ meter (nearly 20 inches).

1. Deutsche Med. Woch., XXIII., 665. 1897.
2. Zeit. für Hyg. XXVII., 175. 1898.
3. Zeit. für Hyg. XXX., 163. 1899.
4. Zeit. für Hyg., XXX., 107. 1899.
5. Zeit. für Hyg., XXX., 139. 1899.

Engelmann made similar experiments with eight patients and found that tubercle bacilli were projected to a distance of one meter.

After the publication of Flügge's first paper on this subject Dr. Wissemann[1] criticised it rather severely and suggested as a crucial test the suspending of guinea pigs in cages near consumptive patients.

Heymann adopted the suggestion with precautions against the infection of the animals from infectious dust or otherwise than with the particles of sputum sprayed from the patient's mouth in coughing. From six to ten animals were used at a time suspended in cages so constructed that the heads of the animals were constantly directed toward the coughing patient. The distance between the mouth of the coughing person and the animals' heads was only from 20 to 45 centimeters (8 to 18 inches). The animals were coughed at three hours every other day by "suitably chosen patients" (expert coughers probably) and the ordeal of each animal was extended from several weeks to several months. The result was that of 25 animals which had not succumbed to other causes, 6 showed symptoms of inhalation tuberculosis, but Flügge, referring to the results, remarks that, the exceedingly slow course of the disease in these animals was surprising; and further he says that, in some of the animals, nothing was found but partially caseous bronchial glands, and that it was impossible to find the bacillus of tuberculosis in many of these glands. We may safely assume, therefore, that the dose of infection received by these animals was exceedingly small, in spite of their long and intimate exposure. Flügge thinks that there is, therefore, sufficient proof of the infectious capability of the particles of fresh sputum sprayed from the consumptive's mouth in the act of coughing.

Experiments made by Cornet[2] show that, in the act of coughing, the bacillus of tuberculosis is strewn only by patients in an advanced stage of consumption whose expectoration contains an abundance of bacilli, and who have a hard explosive cough. But it is only a minority of these patients who thus scatter infectious particles of sputum.

1. Deutsche Med. Woch., XXIII., 726. 1897.
2. Die Tuberculose, p. 209. 1899.

Dr. J. J. Curry,[1] of Boston, made some experiments with twelve consumptive patients in accordance with the suggestions of Flügge for further investigations. He found a comparatively small number of bacilli in the mouth fluid, but a much larger number in the larger drops of the sputum which came from the trachea in open-mouth, hard coughing. In experiments with glass plates suspended from one to three feet before the mouths of the patients, one-half of the patients gave negative results. "It is worthy of note that *all* these cases had a low cough and kept the lips closed during coughing. Of the others, six positive cases, every one had a loud cough and kept the mouth open while coughing."

To decide the question anew which Flügge had raised, Cornet instituted an experiment which should be as nearly as possible like those conditions under which infection is all the time going on in the houses of uncleanly consumptives who spit upon the floor. The sputum of a patient in an advanced stage of pulmonary tuberculosis was thrown upon the carpet of a good sized room. It was left to dry two days. Guinea pigs were placed in the room, some on the floor and others at various heights in the room. Then with a coarse broom the carpet was swept so as to put the infectious dust in motion. Of 48 animals thus treated, 46 were infected.[2]

Dr. Hermann Koeniger[3] has just published the results of his experiments at the Hygienic Institute of the University of Halle. They indicate that in ordinary breathing, no germs are thrown into the air, but that in loud speaking and in coughing they are. The enunciation of the vowels gave negative results, and the number of bacteria projected into the air depends upon the sharpness with which the consonants are uttered. In forceful speech or in coughing the germs reach all parts of the room, laterally and at the rear of the speaker as well as in front of him; but the time during which they remained suspended in the air was surprisingly short, much shorter than was indicated by the experiments of Flügge. In ten minutes there was a diminution in the number of germs in the still air of rooms, and in one hour their complete absence was verified by many of the experiments.

1. Boston Med. and Surg. Jr., CXXXIX., 368. 1898.
2. Revue de la Tuberculose, VI., 167. 1898.
3. Zeit. für Hygiene, XXXIV., 119. 1900.

To the unprejudiced student of the older and the newer literature on this subject, the conclusion seems irresistible that, while Flügge and his assistants have shown that there is a possibility of infection from particles of fresh sputum in the immediate vicinity of a coughing consumptive, this danger is not great. On the other hand, the recent as well as the older observations indicate the great danger of infection in the rooms of patients who deposit their sputum where it may become dried and pulverized.

The question of the infectiousness of the breath of consumptive patients in ordinary respiration may be answered as it was before Flügge reopened the discussion. In ordinary breathing the breath never gives off the bacilli; but in coughing, and particularly in hard open-mouthed coughing, minute particles of infective sputum are projected into the air. To Flügge is due the credit for the elucidation of this possible danger. It has been shown that this danger may very effectually be obviated by holding something before the lips during coughing,—a paper napkin, the handkerchief, or the hand.

Infection Through the Digestive Tract.

The danger from the use of milk and meat from tuberculous animals is sufficient to justify the enactment of efficient laws to protect the public against the danger, and the careful execution of such laws, nevertheless, those persons who assume that the use of tuberculous food products is the prime factor in the causation of human tuberculosis are deeply in error. In the State of Maine in the seven years 1892-98, only 266 deaths were recorded as due to abdominal or mesenteric tuberculosis, while from tuberculosis of the lungs 8,429 persons died.

It is not here contended that every fatal tubercular infection which has its starting point in the intestinal tract, presents a symptom-complex which eventuates in a death returned as from abdominal tuberculosis. Dr. Woodhead,* of London, says:

"I have seen in case after case in children, and in animals fed on tuberculous material, the lungs markedly affected, but in a large proportion of these cases it has been possible to trace the course of invasion back from a caseous or old calcareous mesen-

* The Lancet, II., 1894, 960.

teric gland through the chain of retro-peritoneal glands up, through the diaphragm to the posterior mediastinal and bronchial glands, and so on to the lung. I have not seen this in a few cases only, but in dozens of children, in a few adults, and in many animals."

Tuberculosis of the intestinal tract and of the mesenteric glands is much more frequent among children than among adults, but even among children, these forms of tuberculosis, due principally to the use of milk from a tuberculous source, are much less prevalent than is primary tuberculosis of the bronchial glands and of the lungs. Biedert, quoting the results of the post-mortem examination of the bodies of 1,346 cases of tuberculosis states that, in 79.6% of them there was a localization of the disease in the lungs; in 78%, in the bronchial glands; in 31.6%, in the intestines; in 40%, in the mesenteric glands.

In a paper by Dr. L. E. Holt, of New York, giving the results of the autopsies on 119 tuberculous children, tubercular lesions were found in the lungs in 99%, in the bronchial lymph nodes in 96%, in the intestines in 37%, and in the mesenteric lymph nodes in 35% of the subjects. He says:

"The source of primary infection of the alimentary tract may be either the milk of a tuberculous nurse, or tuberculous cow, or tuberculous meat.

"All of these I believe to be extremely rare. Their importance in the etiology of tuberculosis in infancy I think has been very greatly exaggerated. In the series of autopsies above given, there was not one in which a careful study of the lesions made it at all probable that the primary lesions were of the stomach or intestines, and in sixty-three per cent. of these cases the intestines were not affected at all. In the cases where the stomach and intestines were the seat of tuberculosis, with very few exceptions, the disease has been only slightly marked in that locality, while very advanced in the lungs and bronchial lymph-nodes.

"The great infrequency of primary infection through the alimentary tract is also shown by the experience of Northrup, who, in a series of 125 autopsies upon tuberculous children, mainly infants, found but a single case in which the infection appeared to have occurred in this manner, as against eighty-eight, in which it was clearly through the bronchial lymph-nodes.

"That bacilli may pass the mucous membrane of the intestine without producing disease in it, is not impossible. I have been looking for years for a case where the mesenteric glands were manifestly tuberculous, without tuberculous ulceration of the intestine, and I have yet to find the first one.

"Considering how extremely susceptible are the intestines of infants to other forms of infection, this contrast is rather surprising. The explanation of the difference seems to me to be this: Intestinal infection is nearly always secondary to disease of the lungs. Infants usually died from the more rapid tuberculous processes in the lungs or brain before there has been time or opportunity for intestinal infection to occur. The opportunities for such infection depend upon the number of bacilli which are coughed into the pharynx and swallowed. In infancy this number is small, because so many die of tuberculous pneumonia or meningitis before extensive softening in the lungs has taken place. In older children the slower course of the pulmonary disease gives ample time for intestinal infection, while the more extensive softening and excavation are accompanied by discharge of a much larger number of bacilli.

"I believe most strongly that all cows whose milk is used for food, whether for infants or older children, should pass the tuberculin test; and further, that when the milk supply is from a doubtful source, milk should be heated to a sufficient degree—167° F.—to destroy such bacilli, should they be present.

"Vastly more important is the enforcing of stringent rules regarding the isolation of persons with active tuberculosis, both in the home and the hospital, the careful destruction of the bacilli in the sputum from such cases, the disinfection of apartments after attacks, and most of all the early diagnosis of the disease in all persons who are brought into close contact with children, whether as nurses, teachers, or companions."

The Milk from Tuberculous Cows.

The matter under the preceding subheading is presented for the purpose of correcting the erroneous impression which is somewhat current, that the use of tuberculous milk and meat exerts a preponderating influence in the causation of tuberculosis. But, on the other hand, the object of that which is here presented is the correction of the opposite extreme opinion that there is practically no danger of infection from tuberculous milk, and that there is no evidence indicating that human beings have suffered infection from the use of such milk.

In a family of 9 or 10 children in Norway, Europe, two of the younger ones, aged one and three years respectively, died of tuberculosis, the younger one first showing mesenteric disease and died of tubercular meningitis, the other sixteen years of age died of phthisis. There was no other history of tuberculosis in the family. The one cow, which supplied the whole family with milk, was slaughtered and found to have tuberculosis of all the organs, the udder included.

Gosse, of Geneva, lost a daughter from intestinal and mesenteric tuberculosis. There was no family history of tuberculosis. Suspicion fell upon some of the cows whose milk the girl used to drink fresh from the udder. Four out of the five cows on the estate reacted to tuberculin, and were slaughtered. Two of them showed tubercular disease of the udder.

Professor Ropp,* of the Iowa State College, cites the following cases of transmission of tuberculosis by the use of the milk from tuberculous cows:

"Olivier reports that in a young ladies' boarding school 5 girls, the children of healthy parents, died of tuberculosis of the intestines. The cow which had for years supplied the school with milk was found to have generalized tuberculosis including the udder.

"Two daughters of a Scotch family of good health who were brought up on milk of tuberculous cows died of tuberculosis. Two sons in the same family who did not use the milk remained healthy.

"Stang reports the case of a five-years-old boy of sound parentage and ancestry who died of tuberculosis. The cow whose milk this boy used was found badly tuberculous.

"Demme reports the cases of four infants in the Children's Hospital at Berne, the offspring of sound parents, that died of intestinal and mesenteric tuberculosis. He was able to exclude all other sources of infection and to decide that they had been infected by the ingestion of the milk of tuberculous cows.

*Philadelphia Med. Jr., VI., 253. 1900.

"Hills mentions the case of a child 21 months old, of a friend of his, which drank the milk of a highly tuberculous cow for one week while on a visit to his uncle, and three months later this child died of intestinal tuberculosis. Other sources of infection could be excluded. A second child brought up on sterilized milk is still healthy.

"Hills also reports the death of a boy 4 years old at Yonkers, New York, from tubercular meningitis. The infection was traced to the milk of 2 cows of whose milk this boy had drunk and which proved on autopsy to be tuberculous.

"Ernst reports the death of 3 children of one family from tuberculosis. These children had used the milk of a cow which later died of advanced tuberculosis including the udder.

"Stalker and Niles report that 5 persons between 20 and 30 years of age of healthy ancestry died of tuberculosis within a period of two years. On the farm where these deaths occurred they found 17 cattle suffering from tuberculosis and other cattle had previously died of this disease.

"Leonhardt reports the death from tuberculosis of the meninges, intestines, and mesentery of 2 children fed on milk of a tuberculous cow.

"Sontag reports the case of a six-months-old child of healthy parents which died of tuberculosis and which had been fed on the milk of a tuberculous cow.

"Hermsdorf has reported the case of a child dead of intestinal tuberculosis which had been fed on the milk of a tuberculous cow.

"Rich reports that a young man of healthy parents, who died of tuberculosis, had used plentifully of the milk of a herd of 74 cattle, 65 of which were tuberculous, some of them markedly so. Also, another young man died of tuberculosis. Two months later Rich destroyed 80 cattle out of the herd of the family, that is, about 90% of the entire herd. Also, a young woman died of tuberculosis, and a month later the cow whose milk she had used died of advanced tuberculosis.

"Thorne reports that 22 physicians out of 339 practising in Ohio replied in the affirmative to the question, 'Have you been able to trace any cases of tubercular disease to the milk of unhealthy cows?,' and that 33 replied affirmatively to the question, 'Have you had reason to suspect the origin of tubercular disease in older children or adults to be in the milk or meat supply?'

"This series of experiments and observations has been selected from literature with the greatest care. Any reports which appeared not to be well authenticated or of a doubtful nature have been excluded. Besides this mass of positive evidence there is much more, that, while not so positive, is not less convincing. It appears that the evidence collected by Thorne from physicians in Ohio is especially valuable, not only in itself, but because it indicates what might be learned by addressing the same series of questions to the physicians of all the states of the Union."

The numerous experiments of feeding animals with tuberculous food or other matter, establish firmly the reality of the danger from the ingestion of such material, so far as animals are concerned. Tuberculosis has thus been transmitted to animals, dogs for instance, which have a greater power than man of resisting tuberculous infection.

In this country and in many European countries there has been a greatly increased prevalence of tuberculosis among cattle. This fact was brought out by Professor Bollinger* at the Congress on tuberculosis which was held in Berlin last May. In connection with this matter he referred to the large increase in the prevalence of tuberculosis among swine, which is due largely to the feeding of the milk and milk-products of tuberculous cows, particularly the separator slime from creameries. In recent years from 60 to 70% of some herds of swine in Northern Germany fed on this material have become tuberculous. Bollinger also says that in a large percentage—nearly one-half—of the cases in which the milk from tuberculous cows has been inoculated into animals, the milk has been found to be infectious. The virulence of the milk is in general proportional to the stage of the disease in the animal furnishing the milk. It is not only in generalized tuberculosis of the cow that the milk is infectious but in many cases of localized tuberculosis it has also been shown to be infectious.

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* Bericht über den Kongress zur Bekämpfung der Tuberkulose als Volkskrankheit, p. 104. 1899.

Mosler[1] touches the same subject with these words: "Observation has shown that the distribution of tuberculosis among cattle and swine runs parallel with the development of the dairy business. In Denmark and Schleswig-Holstein there is the greatest development of this industry, and at the same time tuberculosis among animals and men is the most prevalent. There is apparently a casual relation between this excessive prevalence of tuberculosis and the feeding to animals of the waste products of the dairies. In swine, particularly, tuberculosis of the liver is very frequent (tuberculosis of the intestines). In scarcely ten years the per cent. of animals which are affected with tuberculosis has risen from 2 or 3 per cent. to 30 per cent. The most potent factor in this increase of tuberculosis among swine has been the feeding of separator slime."

The Danger from Dirty Hands.

Hands infected with the bacillus of tuberculosis are dangerous to their owners and to others.

Dr. E. R. Baldwin,[2] of Saranac Lake, examined the fingers of 10 private consumptive patients, and 18 sanatorium patients with reference to the presence of tubercle bacilli.

"Fully one-half of the private patients were using cuspidors and occasionally their handkerchiefs. The rest used either cuspidors only or cloths. Two used handkerchiefs only and these of finest fabric. The sanitarium patients uniformly denied using handkerchiefs."

A larger proportion of the private patients were found to have their fingers infected with the bacilli and the bacilli were found in larger numbers than among the sanatorium patients.

"It is significant to note that the two negative results among private patients concerned ladies who were scrupulously careful by the use of cloths and cuspidors, and frequent washing to keep their hands from being soiled. On the other hand, the two who used handkerchiefs only, were found to furnish infection readily."

One of the most explicit works from this point of view is that of Vollande who found among the 108 phthisical patients examined, that 101 presented in the submaxillary region indurated

1. Über Enstehung und Verhutung der Tuberkulose als Volkskrankheit, p. 25, 1899.

2. Philadelphia Med. Jr., II., 1198. 1898.

glands more or less voluminous, and apparently containing tubercle bacilli. According to this author, tubercular infection is very frequently conveyed to the mouth by infectious objects, for example, dirty hands carried to the mouth, particularly in the case of children.

HEREDITY.

The Question of Heredity.

Whether we shall believe in the heredity or the infectivity of tuberculosis as the leading cause of the disease is far from being an unimportant question to those presons who are affected with the disease, and to the persons who are inquiring into the practicability of preventing and curing tuberculosis. Dr. Vallin, of Paris, touches the matter with the following words:

"One fears to terrorize patients by revealing to them the fact that their malady is transmissible, but is it a more despairing announcement than the dogma of the heredity of tuberculosis? What sorrow is comparable to that of a phthisical mother whose life is sacrificed, and who regrets leaving behind her a number of children with the hereditary vice fastened upon them, and who must become tuberculous in their turn? If one says to her, on the contrary, which we now believe to be the truth, at least in the majority of cases, that she is a victim of an accidental contagion, and that the disease is transmissible only by the negligence of scrupulous neatness and free ventilation—by the non-observance of precautions which are simple and easily carried out and which do not forbid the habitual care and attendance between mother and child, she will be very much comforted and consoled."

During the last few years, it has seemed to the writer, that the ranks of those medical men who have stood for heredity, have rapidly been thinning. That was very noticeable at the Congress on tuberculosis held in Berlin last year, and which was truly an international assemblage of the most eminent authorities on the subject. There Dr. Virchow, the world's most eminent pathologist, declared: "I deny emphatically the heredity of tuberculosis." Professor Heubner, of Berlin, admitted the possibility of the prenatal transmission of the infection from the mother to the child, but this so rarely happens that in our practical work it may be left out of consideration altogether. Professor Loeffler, of Greifswald, affirmed that, in the causation of tuberculosis, hereditary transmission has practically no part. Professor Wolff, of Berlin, while disbelieving that the father ever transmits tuberculosis, admits the possibility of transplacental transmission from the mother, but that occurrence is exceedingly rare.

In France, due perhaps to the work of Professor Landouzy, the brilliant champion of heredity, the belief in the direct transmission of tuberculosis, or of tubercular infection from parents to child has disappeared less rapidly than in Germany, but M. Peter has happily expressed the present tendency of thought in that country in the words "One is not born tuberculous, but tuberculisable."

In England, Dr. Woodhead says that "heredity plays an altogether unimportant part in the spread of tuberculosis;" and in Scotland the eminent public health officer, Dr. Russell, says that, as regards pulmonary consumption, the bacillus is not inherited.

In a summary of testimony given before the Legislature of Massachusetts on consumptive hospitals, signed by Dr. R. H. Fitz, Dr. H. C. Ernst, Dr. S. H. Durgin, and many other physicians of that state, it is stated that, "Consumption is not an inherited malady, as was formerly supposed, but it is an infectious disease." Probably almost every leader of medical thought in this country would desire little or no modification of this statement.

The foregoing quotations relative to the heredity of tuberculosis are merely expressions of opinion. In the few pages which follow, a necessarily imperfect presentation will be made of the reasons for believing that heredity has but little to do with the spread of tuberculosis.

Some Statistical Data.

In the following table Cornet* presents the mortality from tuberculosis according to age and sex. The table covers a period of sixteen years in Prussia, and is based upon a population of about seven millions. A correct idea of the significance of the tuberculosis mortality, he says, can be obtained only when the number of deaths from tuberculosis at different age periods is compared with the number of living persons of the same age periods.

* Die Tuberkulose, p. 233. 1899.

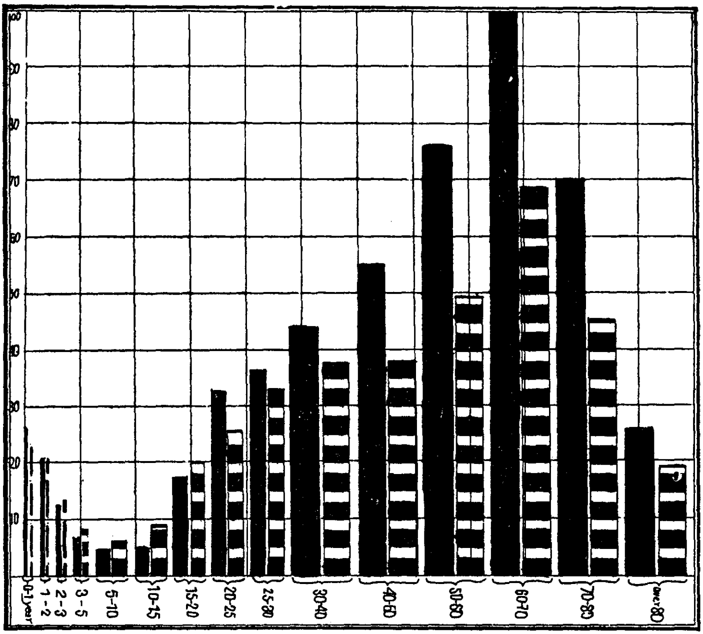


FIG. 1. Diagramatic Presentation of the Prussian Death-Rate from Tuberculosis. The unbroken black columns show the male death-rate, and the broken ones the female.

In the first years of life, when the relation between mother and child is most intimate and the chances for infection from the mother are the most threatening, we find the tuberculosis mortality of the child nearly corresponding with that of women at the child-bearing period of life. It should be borne in mind that, in the early months of infancy, tuberculosis runs a very rapid course,—it is usually a disease of only a few months' duration.

In the second year when the child has gained a little in its freedom of motion and has begun to move around, the closeness of the association between mother and child has been diminished. The mortality has then fallen to 20 per 10,000 and is practically the same for both sexes.

During the 3rd year there is a still greater falling off in the infant tuberculosis mortality. At this time, it will be noted that the mortality rate is greater with the girls than with the boys for the reason that the latter are more inclined to get out with other children while the girls still remain with their mothers. As childhood advances this difference in the tuberculosis death-rate of the sexes becomes still more marked, for the boys are upon the street or in the open air with their playmates, while custom and inclination confine the girls more to the house and to the company of their mothers. A reference to the table shows that between the ages of 10 and 15 the death-rate of the girls is nearly twice that of the boys.

From the 15th to the 20th year there is a marked rise in the tuberculosis death-rate, and the rate for the two sexes has a tendency to be equalized. At this period of life a new factor is felt. The period of industrial activity has begun. Of the boys 897 out of a thousand have begun their work, mostly in factories and workshops, while, among the girls, 667 of the thousand have entered the industrial class, many as housemaids.

From this point the influence of the factories and workshops, especially those in which a number or many persons work together, makes itself felt more and more. From the 20th year on the tuberculosis death-rate of the men is much greater than that of the women, and the reversed conditions in the mortality according to sex become greater and greater.

From the 60th to the 70th year the industrial life of the men becomes less active. The tuberculosis mortality, however, of the men as compared with that of the women does not rapidly fall, for the reason that infection received during the later years of the industrial period destroys its victims only slowly.

After the 70th year, when the individual life is quieter and not associated so much with that of others, there is a greater falling off in the death-rate from tuberculosis, so that after the 80th year it has sunk to nearly that of the period of adolescence.

If tuberculosis were an inherited disease, says Heubner,* it must be particularly frequent in the earliest periods of infantile life. That, however, according to the unanimous testimony of all observers, is not the case. In my clinic in the course of the last five years there were:

844 infants,	ages 3 months or under,		none tuberculous.	
218 children,	ages 3-6 months,		3.6%	tuberculous.
93 "	"	6-9 "	11.8%	"
75 "	"	9-12 "	26.6%	"

Thus the percentage of children affected with tuberculosis increases from birth with the ages of the children. In experi-

* Bericht uber den Kongress zur Bekampfung der Tuberkulose als Volkskrankheit, p. 283. 1899.

ments upon animals we know that the time which elapses after the inoculation of the bacillus of tuberculosis until gross pathologic changes of the internal glands take place, is from two to three months. Now, new-born children, in general, remain free from visible signs of tuberculosis just these three months. No more striking proof could be presented that the tuberculosis of young children is acquired, and not brought with them into their post-natal life.

If the child is sheltered from the presence of the infectious agent of tuberculosis, the most delicate child, or the one which apparently has the greatest predisposition to the disease, will remain free from it. We know the danger which is to be avoided. From whom is the child threatened? The greatest danger for the child is in his own parents, or brothers and sisters, when those are already affected with tuberculous disease. Family infection is largely the rational explanation of "family predisposition." Under ordinary circumstances the child does not associate so intimately with any one else as with the other members of its own family, and from these other members of the family, there are hundreds of ways in which infection may be acquired.

From the age of one year Heubner continues his statistical statement as follows:

Of 458	children	in 2nd	year	of	life,	14.2%	were	tuberculous.
Of 367	"	3rd	"		"	13.4%	"	"
Of 306	"	4th	"		"	11.1%	"	"
Of 470	"	5th & 6th	"		"	7.4%	"	"
Of 682	"	from 7-10th	"		"	5.0%	"	"

Thus from the age of one year when the intimacy of the association between the child and its mother and other attendants is more and more lessened, the death-rate from tuberculosis diminishes.

The earlier statistics of infantile tuberculosis were arranged by years and not by months. The large prevalence of tuberculosis among children in the first year of life strengthened the erroneous assumption of hereditary influence as a controlling factor in the propagation of tuberculosis; but the newer method of tabulation, in showing the slight incidence of the disease in the earlier months has helped to expose the fallacy of the assumption.

According to Boltz, as quoted by Berger,[1] the tuberculosis mortality among children is:

0-4	months	0%
5-10	"	0.9%
6-12	"	18.3%
1-2	years	26.8%
2-3	"	33.0%
3-4	"	29.6%
4-5	"	31.8%
5-10	"	34.3%
10-15	"	30.1%

Through the courtesy of Professor Virchow, Cornet[2] has had an examination made of the records of the autopsies done in the Berlin Pathological Institute during the years from 1876-1891, of all children which had died under the age of five years. The following table shows the result:

	Under 1 day, including stillbirths.	1 day to 4 weeks.	1—2 months.	2—3 months.	3—6 months.	6—9 months.	9—12 months.	Total for the first year.	1—2 years.	2—3 years.	3—4 years.	4—5 years.	Totals.
Number of autopsies of children	184	250	52	33	76	88	65	748	311	189	160	134	1542
Number with tuberculous lesions.........	....	....	...	2	8	15	18	43	83	56	51	30	263

From this table, Cornet remarks, we can assume with certainty only that tuberculosis almost never occurs in the first three or four weeks of infancy, and is extremely rare in the first months of life.

The statistics of the Pathological Institute of Kiel show likewise the absence of tuberculosis during the first weeks of life and an almost complete absence of the disease before the third month. In more than 2,500 autopsies of children who died in the first four years of life, tuberculosis was found as follows:

1. Bericht über den Kongress zur Bekämpfung der Tuberkulose als Volkskrankheit, p. 648. 1899.

2. Die Tuberculose, p. 261. 1899.

0-4 weeks, 617 autopsies, 0 tuberculous=0.0%
4 weeks to 3 months, 235 autopsies, 2 tuberculous=0.8%
3 months to 1 year, 586 autopsies, 62 tuberculous=15.0%
1 year to 2 years, 331 autopsies, 77 tuberculous=28.0%

Among 300 stillborn children examined by Heller, none were tuberculous, and among all children which presented tuberculous symptoms at a later stage, a sufficient period of time had elapsed for the development of post-partum infection.*

The Teachings of Veterinary Records.

The extreme rarity of tuberculosis among calves during those few weeks before postnatal infection has time to develop the tubercular lesions, is abundantly shown by the official veterinary records, particularly in those countries where an inspection of all animals slaughtered for food is obligatory. Thus, in Bavaria the percentage of infected animals at different ages was as follows: Calves, 0.03%; young cattle, 1.5%; bulls and steers, 3.1%; oxen, 4.0%, cows, 11.0%.

Among cows it was observed in 1888 in Kiel, that 13 per cent. of them were tuberculous, and that 5 per cent. of the fattened calves and no per cent. of those which were slaughtered previous to fattening were tuberculous.

In Saxony the percentage of tuberculous animals at various ages was as follows:

120,490 calves under 6 weeks, 3=0.002%
665 calves 6 weeks to 1 year 1=0.15%
6,328 cattle 1 to 3 years 440=6.9%
13,307 cattle 3 to 6 years 1,285=9.7%
11,101 cattle over 6 years 1,881=16.9%

Leclerc found only five cases of tuberculosis among 400,000 veals in the abattoirs of Lyons.

The extreme rarity of tuberculous lesions of the new-born comes out still more clearly in the autopsies of the new-born which are the issue of tuberculous mothers. The veterinarians have put this fact beyond dispute. Kockel and Lungwitz found tuberculous lesions only twice in more than 200 fetuses of tuberculous cows. Koch, Gaertner, Maffucci, Max Wolf, Baumgarten, have had almost constantly negative results in the examina-

* Quoted from Liebe, über Volksheilstätten für Lungenkranke, p. 11. 1895.

tion of the young of guinea pigs and rabbits inoculated with tuberculosis during pregnancy.

No Exposure to Infection, No "Hereditary" Tuberculosis.

After making an extended study of the prevalence of tuberculosis in certain families, Bernheim* says that he has always noticed that when infants are removed from their tuberculous progenitors immediately after birth, these infants, menaced by the law of heredity, always remain exempt from tuberculosis. No matter how far advanced the disease may have been in the parents, if the child was removed early and kept away from the parental home, there has been no inheritance of tuberculosis.

The following are given as examples of his observations in this direction.

The family B. was composed of five children, a father who died of consumption, and a mother who was well. The second child was removed from its home immediately after its birth, reared by a healthy nurse until he was thirteen years of age, and then put into a school. He is now a healthy man of thirty-six. He has never lived with his parents. The four other children lived with their parents. Two of them have died of pulmonary tuberculosis, and the other two have the disease in an advanced stage.

In another family of seven children the father and the mother were both tuberculous. The second and the fifth child were removed from their parents and their brothers and sisters, and never lived with them. The five children reared by their parents have all died of tuberculosis. The two who were isolated remained well, are now both married, and have fine healthy children of their own.

Bernheim has three times had an opportunity to observe the history of twins born while their mothers were affected with pulmonary tuberculosis. In each instance one of the children was reared in its own home, being nourished by a healthy wet-nurse, while the other child was sent from its home and reared in the country. The three children which remained at home died; one of consumption, the two others from tuberculous meningitis. Two of the nurses also died of tuberculosis. On the other hand,

* Cong. pour l 'etude de la Tuberculose, 1891. p. 357.

the three children which were removed from their homes and reared in the country under healthful hygienic conditions are all still living and well.[1]

Epstein and others have also observed that the children of consumptive mothers, remained well if removed from the mother and reared by a healthy wet-nurse, while those children who remained with their tubercular mothers became infected.

In many foundling and orphan asylums to which most of the infants are brought very soon after birth and in which the hygienic conditions are good, cases of tuberculosis are rare. Here also, where the chances of exposure to infection after birth are nearly excluded, tuberculosis is rare.

Among 613 children in the Munich Orphan Asylum, observed by Schnizlein from 1866-88, only one case of tuberculosis was found, although there was a "hereditary" history of tuberculosis for 266 of them, and with 42 of them both parents had been affected or were then tuberculous.

In the Nuremberg orphan asylum, the sanitary arrangements of which were good, Stich saw only one case in eight years, although the parents of many of the children must have been tubercular.

In the foundling hospital of St. Petersburg, Froebelius in ten years found only six cases of tuberculosis among children less than one year of age; and Yvan Honl in the foundling hospital of Prague, Müller of Munich, Epstein of Prague, Kossel of Berlin, Dennig of Tübingen, and Brandenberg of Basle have never found a single case.[2]

Here again the observations of the veterinarians support those of the physicians that infection plays the major part and that heredity has but little to do with the spread of tuberculosis. Speaking of the feeble part which heredity plays in the propagation of bovine tuberculosis Professor Nocard[3] says that, wherever he has examined herds, the calves which the tuberculin test has shown to be free from disease have remained exempt if they were removed from their tuberculous dams and from all other tuberculous animals. For instance, he submitted to the tuberculin test 42 young animals in the north of France. Of these 33

1. Centralbl. für Bak., XV., 656. 1894.
2. Mosny—Revue de la Tuberculose, VI., 306. 1898.
3. Cong. pour l'etude de la Tub., 1893, p. 29.

showed no reaction. Six months later he was able to test 20 of these animals again. None reacted. Twelve of them were the calves of tuberculous mothers. None of the thirty-three had shown any symptoms of tuberculosis.

In Denmark it has been shown on a large scale that when the calves of those cows which show by the tuberculin reaction that they are tuberculous, are removed from their mothers, and from the infected stalls, and fed with sterilized milk, they remain free from tuberculosis in spite of every supposed hereditary predisposition.

Bang, of Copenhagen, particularly, has had a very instructive experience. In one herd of 208 cattle subjected by him to the tuberculin test 80% of the cows, 40% of the bulls, and also 40% of the young stock reacted. He immediately separated all of those animals which were found to be free from the disease from the diseased ones, and the calves subsequently born, including those from tuberculous cows were put with the sound animals. Twice a year these cattle that had not reacted to the first test were tested with tuberculin. At the end of two years none of these animals and none of the calves mostly from tuberculous mothers reacted to the tuberculin tests.

Experimental Results.

Although much evidence of great value bearing on the question of the hereditary transmission of tuberculosis has come from experiments with animals, the want of space forbids even the briefest reference to the most of it. The greater mass of the testimony thus derived indicates that the heredity of tuberculosis, or more correctly prenatal infection, though possible, is infrequent.

Baumgarten's Theory.

Impressed with the infrequency of tuberculosis in the first weeks and months of infantile life, and with the progressive increase of the relative frequency of the disease in after years, Baumgarten, to explain this fact, broached the theory of the possibility of the indefinite persistence of the tubercle bacilli in the organism in a latent state. It is true that he was not the originator of this idea, but he has, perhaps, been the most prominent of the modern defenders of it. To support this primary theory of the prolonged period of latency, or inactivity of the germ, Baumgarten found it necessary to propose a second theory to support the former one, that the tissues of the child before birth and for some time afterward are endowed with a special resistance to the action of the bacillus of tuberculosis.

The fallacy of these assumptions has abundantly been shown. The hypothesis of the greater power of resistance during prenatal and early infantile life runs counter to the general observation that infants and infantile tissues have a comparatively feeble power of resisting the action of infectious germs, and by the observation of careful students of the question that the tuberculosis of infants which is the result of infection soon after birth usually runs a rapid and malignant course.

Numerous instances have been cited in the preceding pages in which the children of tuberculous mothers, removed from their infected homes, remain permanently free from tuberculosis. The absence of tubercular infection in infants thus guarded from post-natal infection has repeatedly been shown by the tuberculin test.

In the experiments of Hauser both male and female animals were inoculated, and after they had developed tuberculosis they were allowed to breed, in order to see whether any tuberculous offspring would result. Twelve rabbits were produced from parents both of which were tuberculous, fourteen guinea pigs were produced by healthy mothers from tuberculous fathers, and four guinea pigs were born of tuberculous mothers by healthy fathers.

Eight of these thirty animals died in from one to sixty-three days, but neither by anatomical nor bacteriological methods could any traces of tuberculosis be found. The other twenty-two animals lived from four to thirty-two months without showing any signs of tuberculous infection, although careful autopsies were made of every animal. This painstaking investigation did not demonstrate a single instance of hereditary tuberculosis.

In order to further test Baumgarten's theory that the bacilli may remain latent for a generation and break out afresh in the third generation, he bred a portion of the stock raised from the animals originally inoculated. The animals thus produced represented the second generation from tuberculous parents, but not one of them developed tuberculosis.[1]

Resume and Addenda.

For many years the true answer to the important question of the hereditary transmission of tuberculosis has eagerly been sought in all parts of the world. In each of many medical institutions the records have been kept of the results of the post-mortem examination of hundreds or of thousands of the products of gestation born at or before term. Many of the mothers were tuberculous. To the present time in only about 20 of these cases have there been found reasons for believing that the children were tuberculous, or contained the bacilli of tuberculosis. In veterinary medicine a larger number of cases of congenital tuberculosis are recorded. But the observations relative to many of these cases are open to doubt and criticism. Wassermann,[2] writing six years ago, says: To the present time there exist in human pathology only two certain cases of congenital tuberculosis, and in veterinary medicine only nine cases have been recorded. This number in comparison with the immensely large number of children born of tuberculous parents is very small indeed.

The possibility and the reality of congenital tuberculosis must be admitted; but when we consider the small number of certain cases which have been found, and that the most eminent of pathologists, like Virchow, whose devoted service to medical service has extended through a long series of years, have never seen a case of congenital tuberculosis, the conclusion is irresistible that inherited tuberculosis is exceedingly infrequent.

Paternal Inheritance Unknown.

In all of the cases of congenital tuberculosis thus far known, the prenatal infection has been derived from the mother. That the mother should so infrequently transmit the infection to her unborn offspring, there are both anatomic and pathologic reasons which admit of but slight elucidation here. Referring to the latter it may be said, however, that in some infectious diseases the blood of the affected persons is surcharged with the specific germ of the disease. In tuberculosis this is rarely true, but on the

1. Maryland Med. Jr., XLIII., 3. 1900.
2. Zeit. für Hygiene, XVII., 348. 1894.

contrary, the bacilli are localized, and fixed in the infected centers. In exceptional cases only, and in the very latest stage of the disease, do they reach the general circulation. There are still more insurmountable safeguards against the transmission of tuberculosis by the father, no matter what the stage of his malady or the location of it. After years of searching for cases of the kind, the result is that not a case of hereditary transmission from the father is known. It may be added that there is no reason to believe that true heredity,—conceptional heredity,—ever occurs.

Hereditary Tendency.

With the waning of the theory of the hereditary transmission of tuberculosis a pretty large proportion of medical practitioners have clung to the idea of "hereditary tendency," or hereditary disposition as a sort of compromise with the inevitable correctional tendency of modern scientific research. It is probable that this remnant of the idea of the heredity of tuberculosis holds more than its legitimate place in the minds of some physicians. We have already had, in this paper, the presentation of the fact that the children of tuberculous parents, removed promptly from their infected homes remain free from tuberculosis and in due time beget healthy offspring. The same fact that the theory of the hereditary tendency to tuberculosis is largely mythical is brought out strongly among animals in the laboratories by the experimental breeding from parents, one or both of which are tuberculous. The same truth—the absence or the feebleness of hereditary disposition—has, of late years, been forced strongly upon the convictions of the veterinarians. The experience in Denmark on a large scale negatives the idea of hereditary tendency. As regards the influence of presumptive hereditary predisposition over the course of pulmonary tuberculosis, experience in the sanatoriums indicates that the consumptive with an unfavorable family history stands on the same footing with the patient in whose family there is no history of consumption. Other conditions being equal the prospect of a cure in one is just as good as in the other.

In comparing the opinions of many authors who have in the past sought to estimate the influence of hereditary disposition to tuberculosis, Cornet found that the proportion of cases ascribed to hereditary tendency ranges all the way from 10 to 85%. So great are the differences that Cornet assumes that the meaning of the term has been a very elastic one and not based upon matters of fact but that the subjective judgment of the observers has influenced the estimates. While one assumes a hereditary origin of the disease only when the mother or at least one of the parents has suffered with tuberculosis, others include in their estimate the grandparents, and still others the brothers and sisters of the patient and even the brothers and sisters of the parents.

The percentages thus obtained can be accepted as merely an approximate expression of how frequently more than one case of tuberculosis occurs in the family. Such statements in no way correspond to the requirements of modern statistics. The resumé of Cornet's consideration of this question is that hereditary disposition exercises no appreciable influence on the development and extension of tuberculosis.

Dr. Bernheim,[1] of Paris, says of hereditary predisposition that the children born of tuberculous parents are no more likely to contract tuberculosis than are children born with a like feeble constitution due to advanced age, alcoholism, neuropathism, cancer, diabetes, or other disease of the parents.

As touching the question of predisposition there may be opposed to it the idea that there is transmitted to the children of tuberculous parents a partial immunity to tuberculosis. Of immunity against tuberculosis we know next to nothing, says Professor Loeffler. "The fact is that persons may recover from tuberculous processes. Perhaps in these processes of recovery there is a sort of immunization process." Dr. Edward Stubbert,[2] director of the Loomis Sanitarium, referring to the results of his therapeutic use of antitubercle serum says: "*Apparently* there is established an immunity, the duration of which is as yet not determined, and can only be measured by years of observation."

In an interesting paper on "Immunity as against Heredity in Tuberculosis," Dr. Lawrence F. Flick,[3] of Philadelphia, says:

"Looking at the subject from the broadest point of view possible and gathering in all the facts now available, one is driven

1. Congres pour l 'etude de la Tuberculose, 1891, p. 358.
2. Med. News, LXXVII., 245. 1900.
3. The Journal of Tuberculosis, I., 193. 1899.

to the conclusion that tuberculosis does establish a comparative immunity. First of all this comes out in the history of the disease as it affects peoples and nations. Wherever history records the entrance of tuberculosis into a new territory or among a new people, we find the disease of the most virulent and malignant type; until after the exhaustion of the richness of the soil, when it becomes less virulent and affects a smaller number of people. Immunity alone can give a rational explanation of such phenomena. While with the introduction of preventive measures the decrease in the death-rate can be easily understood we find that even where no preventive measures have been practiced there has been a gradual reduction in all countries where the disease has existed for a long period of time.

"The truth which stands out so strongly in the history of tuberculosis as it affects peoples and nations also is borne testimony to by the clinical history of families in which the disease occurs. According to my own observations, which I have carefully made over a long period of time, the first victims of the disease in a family are usually the most acute sufferers. I have frequently had opportunity of watching the ravages of tuberculosis in families where four and five members of the same family have consecutively come under my observation and invariably there has been a gradually decreasing malignancy from the first case downwards. These phenomena are observed in all contagious diseases. What is the explanation if not an acquisition of a partial immunity by those who succumb to the disease last? It may, of course, be a deterioration or degeneration of the bacillus producing the disease due to exhaustion of soil, but immunity fits in better with our present views about disease. Immunity is also more in consonance with the best of our knowledge about disease and of the laws which govern plant life.

"From certain cases that I have seen I am led to think that we may even go farther and say that tuberculosis in certain tissues of the body, if recovery takes place, may set up an absolute immunity against future attacks of the disease. I will relate one such case. In a family consisting of seven members one of the children in early life developed caries of the spine with softening and complete collapse, so that he never developed in body and remained in stature and bodily form a helpless child. Although bright and active in mind he was compelled to content himself with the most restricted locomotion unless it could be given to him by others. While in the house he generally sat upon the floor and succeeded fairly well in moving from one part of the house to another with a sliding motion, for which he used his arms as a motive power. Outside of the house he had to depend entirely upon others for locomotion and for this reason most of his life had to be spent indoors and generally in the kitchen in the company of his mother or sister. The family lived in a small house in a blind alley under the worst possible environment except in so far as these could be improved by cleanliness and a good moral life. First, the youngest daughter, then the mother, then the father, then the youngest son, then the oldest daughter, and then the oldest son all consecutively contracted tuberculosis, and during the course of about ten years passed away. During those ten years there was always some one in that kitchen suffering from tuberculosis, for the kitchen had to serve as a sitting-room, dining-room, and infirmary as well, and during the greater part of the ten years all the food of that house was prepared by an advanced consumptive. During two or three years the person preparing the food had tuberculosis of the fingers and had almost every organ in the body affected by the disease. The little cripple was housed in that kitchen during all those years and spent the greater part of his time sliding over the floor, but in spite of the intense exposure he remained immune to tuberculosis.

"If immunity is created by tuberculosis, can that immunity be transmitted from parent to offspring? This question opens up a great field for observation and in the working out of its answer there will be encountered a stifling burden of prejudice. So far as we can see now, either by the aid of philosophy or of accumulated knowledge and observation we must incline to the affirmative.

"What limited observation I have been able to make on individual cases of tuberculosis would lead me to the same conclusion as is indicated by our knowledge of biology and the lessons of history. Whilst as yet I have no statistics to offer on the subject which would be of any value, my case books will, I think, warrant my conclusions. Of the cases in which I have carefully inquired into the family history, vastly the majority have had no tuberculosis in their ancestry for at least two generations. In a fair number of cases the parents, one or the other or both, have had tuberculosis, but they contracted it from one of their own children, they themselves not being the first cases in the family. In this connection it may be well to observe that there is a difference between family predisposition to tuberculosis, existing in the parents and children alike and possibly due to the running out of family immunity, and family predisposition existing in the children alone and due to a tuberculous taint existing in the parents and grandparents. The family predisposition in parents and children alike exists very often, but where it does exist it will almost invariably be found that back of the parents the family was free from tuberculosis for some generations. It would look as though in such cases the family immunity had died out. Instances of family predisposition in children in which the tendency can be traced to the existence of the disease in parent, grandparent or great-grandparent prior to procreation in the immediate descendant are exceedingly rare, and I cannot recall ever having seen a case. Of course this is all negative testimony, and yet it is of some value when taken at its worth and weighed with other testimony.

"The proper cases on which to work out the question of parental transmissibility of predisposition or immunity are those in which the parent is tuberculous when the child is procreated. Such cases are, however, unfortunately difficult to get at. So far as my opportunities for observation along this line will permit of conclusions, the preponderance of evidence is very strongly in favor of the transmission of partial immunity. I have repeatedly seen the children of tuberculous father or mother remain healthy and free from tuberculosis in spite of the most intimate exposure to the disease. I have seen but one or two of such cases die of tuberculosis. Of course the answer to this statement is that my observations are incomplete as it would require a lifetime to determine whether or not such children are immune to tuberculosis. But even the temporary resistance under intense exposure must weigh something in summing up evidence.

"There is a vast field for observations along this line and, until such observations have been made, the subject must remain open. So far as a conclusion can be foreshadowed by partial evidence it will, however, be that tuberculosis in the parent establishes immunity instead of predisposition to the disease, and that the much dreaded heredity of tuberculosis of the past has been a myth."

PREVENTION.

The Practicability of Preventing Tuberculosis.

In the seven years from 1892 to 1898 inclusive, during which a trustworthy system of registration of vital statistics has been in operation in Maine, and for which the returns are available, the number of deaths from pulmonary consumption for those years were respectively 1,352, 1,299, 1,262, 1,195, 1,172, 1,128, 1,021. It will be observed that, in each succeeding year, thus far, there has been a smaller number of deaths from this disease than in the preceding year. Thus, in that short space of time, the mortality from this disease has been lowered about one-fourth,—the death-rate per 10,000 of population has fallen from 20.4 to 15.4. In the total mortality from tuberculosis in the same years, the diminution of it has not been quite so great, but in each succeeding year the number of deaths has been lower than in the preceding year. This lessening of the mortality from consumption is undoubtedly largely due to the fact that correct ideas in regard to the prevention of the disease are more widely diffused than a few years ago. In 1889 the State Board of Health published its "Circular No. 54, The Prevention of Consumption." This has been printed in large editions and has had a wide and repeated distribution through local boards of health and otherwise. This lessening of the mortality from consumption is gratifying, but we should be satisfied to regard it as only the mere beginning of what is practicable. The results thus far have come in spite of the facts that the working of the leaven has affected only the more intelligent mass of the public, that in many homes where there are cases of consumption the members of the household receive no clear instruction from the attending physician or anybody else about guarding against the danger of infection, that in many towns neither the local board of health, the attending physician, nor the public has demanded nor advised the disinfection of the rooms, the bedding, and the clothing of deceased consumptives.

In the city of Copenhagen from 1835 to 1879—three years before the announcement of Koch's discovery of the bacillus of tuberculosis—there was but little diminution of the death-rate from consumption. It ranged from 29.6 to 36.2 per 10,000 living population. In the last five years of this period 1875-1879, it was 31.4. Since then the death-rate from consumption has been as follows:

1880-1884, 28.9
1885-1889, 25.1
1890-1894, 20.5
1895-1898, 18.6

There was therefore from the first of these periods beginning with 1880 to the last, a lowering of the consumptive death-rate of more than one-third.

In the Kingdom of Prussia the death-rate from tuberculosis from 1876 to 1885 ranged from 30.8 to 32.5 per 10,000 living population. In the next three years there was a slight diminution, in the years 1890-1897, the figures were respectively, 28.1, 26.7, 25.0, 25.0, 23.9, 23.3, 22.1, 21.8.

In the city of Hamburg where the sanitary organization is excellent, the death-rate from consumption has declined from 30.9 in 1888 to 20.1 in 1897.

In Massachusetts the death-rate from pulmonary tuberculosis has declined from 30.3 per 10,000 in 1884 and from 24.5 in 1892 to 18.4 in 1898. In New Hampshire the death-rate from this disease was 24.1 in 1884, 19.2 in 1892, and 17.5 in 1897.

In many other places there has been a marked lowering of the tuberculosis death-rate, particularly notable in those cities and states in which intelligent and zealous efforts have been made to prevent the disease.

Formerly, says Cornet, the annual mortality from tuberculosis among the Catholic orders was from 150 to 160 per 10,000 living nurses, but since prophylactic measures have been adopted in the hospitals, the number of deaths has fallen to from 50 to 70 per 10,000. How else can this diminution in the death-rate be explained than through the influence of the precautionary measures which are taken against infection, while everything else in the service has remained the same?

The War Against the Bacillus.

"As there can be no tuberculosis without the specific bacillus," says Dr. Otis, "the great contest against the disease must be fought out with this micro-organism, and, first it must be clearly understood that *it is possible* so to restrict the germ that in the future the disease may be as rare as it is now common."* By far the greatest source of bacillary infection is from the sputum of consumptives, and the greatest danger from this is after it is dried, pulverized, and floated in the air, particularly of dwelling houses, workshops, factories, and other rooms. The prime task, therefore, is to burn the sputum or otherwise safely to dispose of it before it dries. There are various ways of doing this."

Spittoons.

To lessen the danger of accidental overturning, spittoons should have a broad base and should be rather low in shape. In case of overturning, the danger of the spilling of its contents is diminished if the spittoon has a slight constriction of its center, suggestive of the hour-glass form. Its surface should be smooth.

Each spittoon in use should contain a quantity of liquid. Its main purpose is to keep the sputum from drying. Water suffices for that, but disinfecting solutions are sometimes preferable. The quantity of liquid to add to spittoons and its character should depend upon the final methods of disinfection and disposal of the sputum. When practicable, destruction by heat is preferable. In private practice, cremation, as is advised in Circular No. 54: "(A) In a small fire outdoors. (B) In the house heater, using a stout sheet iron box with a handle three feet long. Partly fill the box with sawdust, or fold a paper inside it; pour in the contents of the spit-cup or cuspidor; with the direct draft of the heater open, invert the box over the fire-pot, holding the box in place a moment until the flame or the heat sterilizes it." When burning is to be practised, but a small quantity of water should be put in the spittoon. The quantity should be small if the final disinfection of the sputum is to be done by setting the spittoon aside, filling it with boiling water and letting it stand until it is cooled.

* Reprint from Amer. Jr. Med. Sciences, Nov. 1898.

When disinfection of the sputum by heat is not practicable an efficient disinfectant solution should be used in the spittoon,—carbolic acid, a 5% solution; lysol, 4% (5 ounces to a gallon of water); or a 2% solution of formaldehyde (5 ounces of the 40% solution in a gallon of water). Before the spittoon is emptied twenty-four hours should elapse after the use of it has ceased. This necessitates two spittoons for each patient. In houses with water carriage and sewer connections, spittoons may be emptied down the water-closets. The use of spittoons for consumptive patients, especially when the spittoons are placed upon the floor should be discouraged. Sputum flasks and paper spit-cups are more cleanly and safer.

Glass, Porcelain, or Metal Spit-Cups.

A spit-cup of very good shape is shown in Fig. 2. Another shown in Fig. 3 is still better for being easily cleansed, low and thus not likely to be overturned, and in having its cover lifted by means of a thumb-press. This is in use at the Leysin Sanatorium. All spit-cups and spittoons should have covers in fly-time.

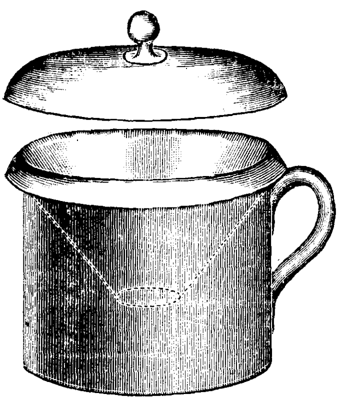


FIG. 2.

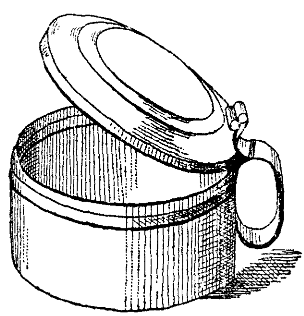
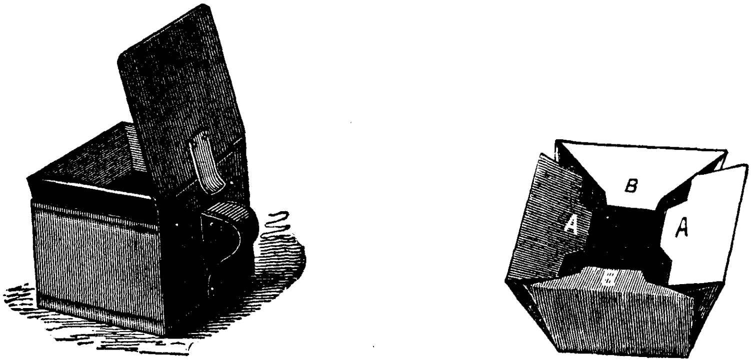


FIG. 3.

Destructible Spit-Cups.

There are at least two kinds of paper spit-cups upon the market.

One kind, that of Seabury & Johnson, of New York, is made of folded paper supported in a metallic frame. After it has been used, the folded paper and its contents are slipped out of the metal frame and burned. See Fig. 4. It has a spring-cover and a thumb-press so as to be conveniently handled with one hand.



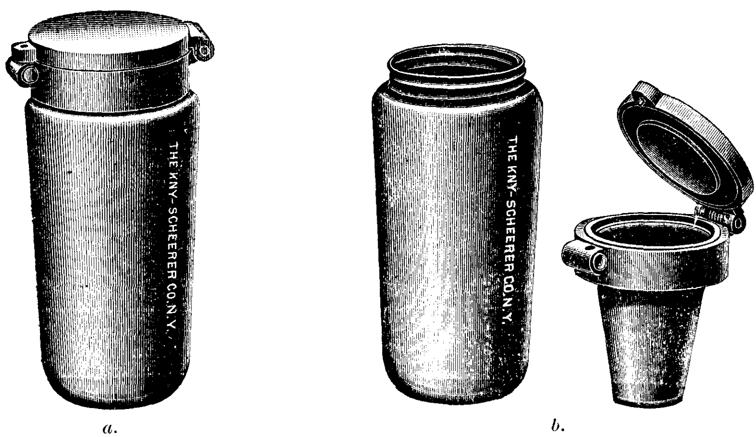
a. b.

FIG. 4. Seabury and Johnson's Paper Spit-cup. *a.* The paper cup in its metal frame. *b.* The folded paper cup.

Another kind of sputum cup is made of firm, rather thick pressed paper. It has a cover of the same material. After use, the cup, cover, and contents are to be burned. For the bed-ridden patient this is not quite so conveniently used as the former, but the patient may be taught to pick up the cover with the first two fingers while the thumb and the remaining fingers of the same hand raise the cup. Its disadvantage is the danger of upsetting it.

Sputum Flasks.

The best sputum flask is undoubtedly that devised by Dr. S. A. Knopf and shown in Fig. 5. It is made of aluminum, is



a. b.

FIG. 5. Dr. Knopf's Pocket Sputum Flask. *a.* Closed. *b.* Taken apart for cleaning.

light, and is of a convenient size for the pocket. The funnel shaped part, to which the cover is attached, is unscrewed from the flask part of the device when it is wished to empty it. Pressure upon a button at one side of the cover throws it open when the patient wishes to use it. By pouring into the flask a teaspoonful or less of a weak solution of formaldehyde each time after the flask is emptied, the sputum is partly disinfected, at least, and offensive odors are avoided. It may be had of the Kny-Scheerer Company.

This little apparatus deserves an extended use among consumptives at their homes and in their places of daily employment, as well as when traveling. Concealed in the folds of a handkerchief its use is not so obtrusive as otherwise, but so far as possible patients should be urged to overcome any feeling of delicacy which would deter them from using it.

Another sputum flask, manufactured by the Poncet Glashütten-Werke of Berlin, Germany, is shown in Fig. 6. The flask itself is of blue glass. A metal collar to which the cover is hinged screws onto the neck of the flask. The cost, one mark in Germany, or 24 cents of our money, places this sputum flask more easily within the reach of the poor than are some of the other sputum flasks.

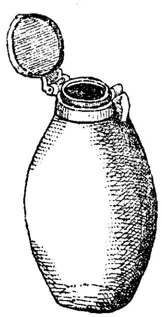


FIG. 6.
A German Sputum Flask.

Paper Napkins, etc.

The consumptive patients under the care of some physicians are taught to provide themselves with paper napkins, cheesecloth, or soft, cheap muslin cut into squares into which the sputum is received. The pieces thus soiled are tucked into a rubber pouch to be burned as soon as an opportunity occurs. If the material chosen for these squares is too thin, too rapidly permeable—as is cheese-cloth, the patient's fingers will be soiled

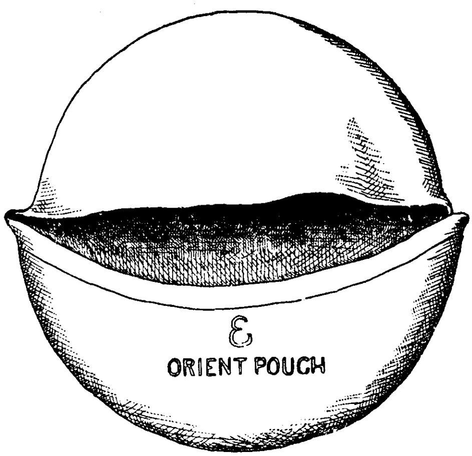


FIG. 7. Rubber Pouch.

in using them. That should be avoided. A rubber pouch is shown in Fig. 7, an Orient tobacco-pouch. Each patient should be provided with at least two of these pouches so that when one is emptied it may be immersed in a disinfectant solution.

The use of the paper napkins as thus indicated is commendable, particularly when the patient is away from home.

Spittoons for Workshops, Schools, Hospitals, etc.

A spittoon placed upon the floor exposes the floor and its vicinity to the danger of being soiled with infectious sputum. To obviate this danger spittoons to be placed at a convenient elevation have been devised particularly for use in public places. Fig. 8 and Fig. 9 represent Dr. Knopf's elevated spittoon for hospital and sanatorium use. In the walls of parlors, halls, and galleries, etc., at appropriate distances, are constructed niches or cupboards 3 or 3½ feet from the floor. They are large enough to hold a spittoon eight inches high and about the same diameter.

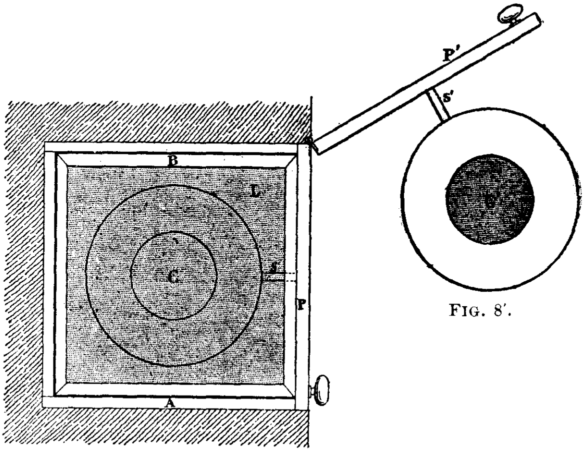


FIG. 8'.

FIG. 8.

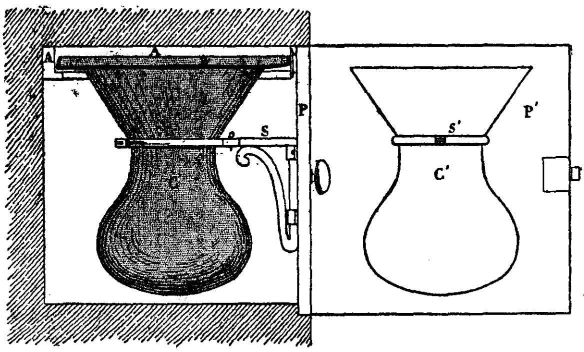


FIG. 9. FIG. 9'.

FIGS. 8 and 9. Spittoon, elevated three feet or three feet and six inches from the floor, and inclosed in the wall.

FIGS. 8 and 8', plan; 9 and 9', elevation. 8 and 9 represent the door closed; 8' and 9', the door open. A, frame. B, cover. C, spittoon. P, door. S, hinged support. L, lineoleum cover.

Not to expose the person intrusted with cleaning these vessels to the possible danger of inoculation by breakage of porcelain, Dr. Knopf favors metal spittoons. Blue enameled iron seems to be the most practicable of all. The dark blue color makes the contents less visible. The cuspidor is supported by a metal ring attached to the door of the cupboard. The patient desiring to expectorate opens the little door, thus bringing the spittoon within his reach, and closes it again when he gets through. An automatically closing extra cover makes it impossible for flies or other insects to sojourn in the interior.

Fig. 10 shows Dr. Knopf's spittoon mounted upon a stand.

The Use of Handkerchiefs.

The practice of spitting into handkerchiefs should be absolutely forbidden. By so doing the patient soils his hands, contaminates his pocket and his clothing, and, after the drying of his handkerchief has occurred, he infects the air of his room. Some physicians compromise so far as to permit the patient to use his handkerchief as a substitute for the spittoon, with the proviso that the handkerchiefs thus used be boiled before the sputum becomes dry. It is, however, much better to induce

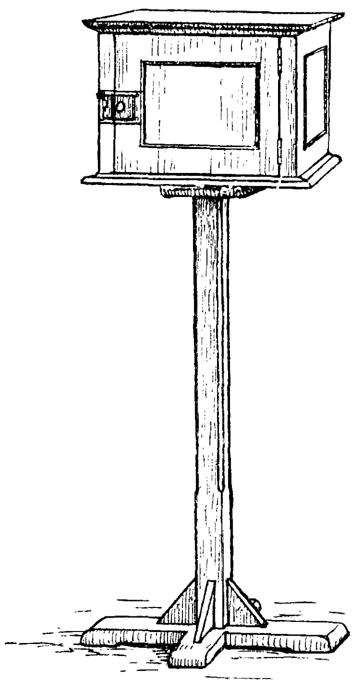


FIG. 10. Elevated Stand for Dr. Knopf's Spittoon.

patients to resort to some of the expedients already described, whether at home or away from home. Dr. C. W. Ingraham* strongly urges the consumptive patient to discard entirely the use of handkerchiefs, and to use instead muslin, costing five cents a yard, cut into squares the size of small handkerchiefs, the pieces not to be washed but to be burned promptly before the

* Don'ts for Consumptives, p. 26, 1896.

sputum dries. These muslin clothes can be very much improved in appearance by stitching the borders and ironing. For the removal of sputum from the lips or beard, paper napkins or the muslin squares are appropriate.

Disinfection of Fresh Tuberculous Sputum.

The most trustworthy agent for the disinfection of fresh tuberculous sputum is heat,—burning, boiling, or steam. Schill and Fischer[1] found that the tubercle bacillus in fresh sputum was destroyed in ten minutes in boiling water, or in fifteen minutes in flowing steam at 212° F. The experiments of Grancher and Gennes[2] showed them that water brought to a boiling temperature disinfected with certainty tuberculous sputum floating upon it. Other investigators confirm these results.

The disinfection of tuberculous sputum with moist heat is not so easy a matter as the destruction of the bacillus when suspended in a homogenous fluid, free from the admixture of air. In milk, for instance, the bacillus is killed in ten minutes at 70° C. (158° F.). But the sterilization of tuberculous sputum with heat is not so nearly impracticable, as some ill-advised statements indicate. In boiling water it is safe to assume that the virulence of the bacilli is lost when the boiling is continued ten minutes or more,—say twenty minutes to make assurance doubly sure. When soda is added to the water in spittoons it facilitates their cleansing when they are disinfected with heat.

In some hospitals a small metallic disinfecting chamber is used inside of which the spit-cups or spittoons with their contents are placed and into which steam is turned.

But few chemical agents are efficient disinfectants of fresh tuberculous sputum. Since Schill and Fischer determined that a 5% solution of carbolic acid suffices for the destruction of the bacillus, this solution has been much used for that purpose. The results of experimental investigation have, however, shown that lysol is a little more efficient than carbolic acid and that solutol is slightly more efficient than either of the others. For the disinfection of tuberculous sputum in spittoons, or spit-cups a 5 per cent. solution of lysol, of carbolic acid, or of solutol when available, may be used. To the above list we may probably

1. Mittheil. aus dem Kais. Ges. II., 131. 1884.
2. Revue D'Hygiene, X., 193. 1888.

safely add a solution of formaldehyde made by adding from five to ten ounces of the 40% solution of formaldehyde to a gallon of water.[1] In my opinion, these four chemical disinfectants, lysol, carbolic acid, solutol, and probably formaldehyde, may be trusted to disinfect tuberculous sputum, and no other chemical agents should be used. Whichever of these is used should be allowed to act upon the sputum 24 hours, if possible, before the spittoons are emptied. Each patient, therefore, needs more than one spittoon. Corrosive sublimate is altogether unsuitable as a disinfectant of this kind of material.

Disinfection of Tuberculous Dust.

In the disinfection of dried tuberculous sputum, or tuberculous dust, two chemical agents only are wholly suitable,—corrosive sublimate and formaldehyde. The whole work may, indeed, be done with the latter, though for some of it, moist heat is desirable when available.

To disinfect a sleeping-room, for instance, lately occupied by a consumptive, we may proceed as follows, sorting out and disinfecting the clothing and other movable things first.

A. *Clothing.* Disinfect, preferably with steam or by boiling. Boiling for half an hour[2] will disinfect any article of clothing that can be subjected to that process. Steam disinfection for one hour, properly done, is just as trustworthy, and has the advantage of wetting and shrinking fabrics less. Clothing may also be disinfected by soaking it twenty-four hours in Solution 7 or Solution 6.[3] Then rinse thoroughly.

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1. Further experimental work is needed to determine the value of formaldehyde for the disinfection of tuberculous matter.

2. The devitalization of tubercle bacilli in dried sputum, as in clothing, requires a longer exposure to heat than when in fresh sputum.

3. The following are the formulæ for these two disinfectant solutions:

SOLUTION 6.

Corrosive Sublimate,	1 dram.
Water,	1 gallon.

Mix and dissolve. Label, *Poison!* This is approximately a 1:1000 solution. Its use should always be under the direction of some intelligent and careful person. This is not trustworthy as a disinfectant of fresh sputum. Destroys metals and gilding. Must be mixed in wood, glass, or earthen ware.

SOLUTION 7.

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

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

B. *Bedding.* Disinfect sheets, blankets, pillow-cases, quilts, comforters, and spreads, as under (A). Pillows and feather beds are preferably disinfected with steam. Thev need not be ripped,—the steam will penetrate. Empty straw beds, burn straw, and disinfect tick with steam as under (A). Burn cheap mattresses. A mattress worth the trouble may be disinfected with formaldehyde as follows: Make a tight box large enough to contain it. Render it air-tight by pasting up all cracks and corners with stout, firm paper. Place the mattress in it, and sprinkle or spray it with at least four ounces (one gill) of formalin; put on the cover quickly; paste it up. Leave the mattress twenty-four hours.

Or a mattress may be disinfected by spraying it with formalin and quickly and tightly wrapping it in large rubber blankets.

Feather beds and pillows may be disinfected with formalin as is advised for mattresses.

C. *Rugs and Carpets.* Burn old ones and all that cannot be surely disinfected. Steam disinfection is the surest; when that is impracticable, formaldehyde in concentrated doses, as for mattresses, may be used for valuable carpets or rugs.

D. *Upholstered Furniture.* If the room can be disinfected with formaldehyde, spray or sprinkle the upholstered part with Solution 7, just before the room disinfection, and leave in place. If formaldehyde gas is not available, spray or wash thoroughly with Solution 7 or 6, then expose to the action of direct sunshine three or four days,—the longer the better.

E. *Rooms.* Avoid raising a dust. If the removal of a carpet leaves dust on the floor, remove it after sprinkling wet sawdust, or with damp broom or damp cloths. With a damp cloth remove dust from furniture and other surfaces. Boil all cloths thus used. If formaldehyde disinfection is available for the room, wash in Solution 7 all surfaces of walls, or furniture that may have been soiled with sputum. Wash or spray the floor with Solution 7, letting the solution soak into the cracks well. Then fumigate with formaldehyde letting the stripped furniture remain.

If formaldehyde is not available, wash very carefully in Solution 6 or 7 the floors and all surfaces which were exposed to the danger of soiling with sputum. Complete the disinfection of the room with liquid disinfectants, repeating the washing, the interval between the two washings not necessarily exceeding half an hour.

In the disinfection of rooms with formaldehyde gas not less than a pint (or pound) of the 40% solution should be vaporized for each 1,000 cubic feet of space. Keep the room closed eight hours at least. In preparing for formaldehyde disinfection the room must be made as tight as possible by closing the mouths of chimneys, other ventilating openings, chinking or pasting cracks, etc.

Coughing as a Fine Art.

There are reasons affecting both the patient and those associated with him why cough should be suppressed by the voluntary effort of the patient, so far as is practicable. How far this is possible has often been noted with surprise by visitors to properly conducted sanatoriums for consumptives. At the dinner-table or anywhere else where large numbers of patients are found together, hardly a cough is heard. Unnecessary coughing is bad for the patient; loud and opened-mouthed coughing subjects other persons in the same room to the possibility of infection.* When obliged to cough, the patient should do so as lightly as possible and with lips closed as much as he can. Even when the cough is hard, experiments have shown that the diffusion of particles of infectious sputum into the air can be easily prevented by holding something before the mouth. The open hand will quite effectually arrest all particles, but the rule to keep the hand as clean and as free from infection as possible, forbids the use of the hand for this purpose. A suitable object is a paper napkin, or a square of muslin, to be burned after it has been in use a short time. Professor Leube, of Würzburg, has his patients, when confined to the house, keep upon their table in a suitable dish a bunch of cotton twice as large as the fist, to be held before the mouth while coughing. A handkerchief may be used for this purpose and no other, but when so used it presents the same danger in a minor degree as when the handkerchief is used as a receptacle for the sputum.

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* See pages 191-195.

Some Words to the Patient.

Two things you should always bear in mind: not to reinfect, or further infect yourself, and not to infect anybody else. If you have consumption, or tuberculosis of the lungs, it is the result of infection, that is, you simply caught it; you were not born to it, nor with it. There is no hereditary influence barring your road to recovery. The intrinsic tendency of consumption is toward recovery when the sanitary conditions of the affected person do not forbid that favorable termination of the disease. The one principal reason why so many do not recover their health is that they reinfect themselves. There are two ways in which this may occur.

First. A careless and uncleanly patient spits upon floors, carpets, or handkerchiefs, and the sputum, after it is dried, becomes reduced to an infectious, invisible dust which permeates the air and is breathed in by the sick one. Thus, while the patient may be coughing up and freeing himself from the broken down lung tissue and the infectious bacilli in the part of the lung primarily affected, he is continually rebreathing, as infectious dust, the infectious matter which he has previously coughed up. The result is a continual series of new infections, and the setting up of the diseased process in other parts of the lungs. Hence the vital importance to you to have the sputum destroyed before it dries and becomes pulverized.

Fix in your mind the following words of the distinguished Professor Vallin, of Paris:

"That which is of prime importance, that which must be prevented at any price, is the generalization of the disease through successive reinfections with infectious dust by its penetration into the respiratory and digestive passages."

Second. By swallowing what you cough up, tubercular disease of the intestinal tract and its mesenteric glands is started. Thus, While the natural curative powers of your system, under the favoring influences of pure air for breathing and other decent sanitary conditions, might suffice to bring about a cure of the original lung trouble, the abdominal disease, "consumption of the bowels," renders cure impossible. Therefore, it should be the invariable rule never to swallow the sputum, no matter where you are. Wherever you go, have with you paper napkins, or a spit-flask, to enable you to dispose of the sputum so it will subsequently be harmless to you and to others.

The hands if soiled with sputum infect your food, clothing, bedding, and anything else you handle. Be scrupulously careful to keep the hands clean by frequent washing, using a soap which does not roughen the hands, or, occasionally, when the hands have been soiled in an unusual degree, Park, Davis & Co.'s "Germicidal Soap" may be used, or the hands may be washed in Solution 7. Closely clipped mustache and beard should be the rule with male patients who wear them at all.

In the open air there is less need of hampering you with precautions. In all places freely accessible to direct sunshine the tubercle bacilli in sputum are rapidly destroyed. There should be no objection to expectoration in the open street, but simple decency should spare the sidewalk from pollution. Do not infect the immediate surroundings of the home, nor spit upon hay, grass, nor anywhere else where the sputum may be eaten by animals. Cattle, swine, fowls, cats, dogs, and other animals have thus received tuberculosis.

For advice relating to the cure of your trouble see the chapter on "The Hygienic Treatment of Consumption."

Rules for Attendants.

Nurses or attendants of a consumptive patient and those who live with him should insist that approved methods of caring for the sputum—some of these which have been described in the preceding pages—be carried out constantly and with care. That is the *one* thing before all others to be urged upon the patient and, if need be, demanded. There are only two small classes of consumptive patients whom any good authority on sanitary control of tuberculosis would favor isolating or quarantining,—those who are too idiotic to be amenable to any rules, and those who refuse to observe the necessary precautions.

The room of the consumptive should have no carpets—a few rugs may be used instead, and these should be carried into the open air and exposed to the action of direct sunshine at frequent intervals. For the disinfection of rugs, clothing, bedding, and room, see pages 229-230. The floors, woodwork, and furniture of rooms in which a consumptive patient lives should be cleansed in the damp way. Dry sweeping and dusting increases the danger to patient and to others in the room. It is a good plan to disinfect the room every few weeks, during the temporary absence of the patient, by washing the floor in Solution 7, and then by formaldehyde fumigation. If the floors or other surfaces are accidentally soiled with sputum disinfect the places, or spots immediately by soaking them thoroughly with Solution 7 (see page 229 for formula). The 40 per cent. solution of formaldehyde should be kept on hand, and from this Solution 7 can be made.

The tableware of the patient, the knife, fork, cup, and spoons, particularly, should be kept separate and washed by themselves in scalding water.

Attendants as well as patients, should bear in mind that infected hands may spread contagion. See preceding advice to patients on this point. When handling spittoons, and at other times, guard against inoculating cuts and abrasions with the sputum.

HYGIENIC TREATMENT.

The Curability of Consumption.

"Pulmonary phthisis is curable in all its stages. When the existence of tubercles in the lung is recognized, it should not be inferred from that moment that he who has them is doomed to death in consequence of their presence. Should it be found that the tubercles soften and a cavern forms, it should not be believed on this account that all is lost. It has been shown that this is not the case, and the natural tendency which tubercle has to fibrous transformation, that is to recovery, should never be forgotten. Before being discouraged, the physician should search and examine incessantly whether the patient is in the requisite conditions for such favorable evolution to occur. If all hope of absolute recovery must be abandoned, a relative cure should be sought, and every exertion be made to place the patient in such conditions that he can live notwithstanding lesions which are now irreparable; in a word, the plan adopted should be to strive and strive always with the unshaken confidence which may be drawn from the notion that recovery is possible. The enemy *can* be conquered; that is the idea which should engender and sustain every effort. It is certain that this conviction is the first condition of success, since it is absence of faith in the possibility of cure which prevents the adoption of all the therapeutic treatment."

These words were written some years ago by Professor Jaccoud, of Paris, for many years one of the world's eminent authorities on pulmonary diseases. The same belief in practically the same words—"tuberculosis is curable in all is stages"—was expressed last year by Professor Von Schrötter, of Vienna, at the International Congress on Tuberculosis in Berlin.

These words are not intended to express the idea that all cases of consumption are curable, but rather that the general tendency of tuberculosis is toward recovery, when the hygienic conditions under which the patient is placed are congenial. Though convalescence sets in and eventuates in complete recovery in some advanced cases of consumption, the chances for this happy termination of this malady are very much greater in the early stage of the disease. The following words of Dr. Dettweiler, now for many years director of the sanatorium for consumptives at Falkenstein, Germany, and who was formerly a patient and later an assistant in the first sanatorium for the cure of consumptives established in Germany, are of interest here. "If it is of interest or of value to hear the testimony of a physician who has lived for over fifteen years among phthisical patients, and who has suffered himself from the disease for even a longer period, but who is now so far cured that even with the most careful examinations bacilli can not be found, I formulate my opinion as follows: Under appropriate treatment, if the disease has not made too much progress, and if the treatment is continued a sufficient length of time, more than one-half of all cases of bacillary phthisis should be cured, and they will remain so if the patient will live accordingly afterward." In some of the following pages statistical reports will be given which are indicative of the degree of success which has followed the treatment of consumptives by the modern hygienic methods as the cases come for treatment, many of them much later than they should come.

Aside from evidence such as that to which I have referred, the records of post-mortem examinations of persons who have died of diseases other than tuberculosis, give striking proof of the curability of consumption.

In 784 such cases examined by Osler[1] over 5 per cent. presented undoubted tuberculous lesions in the lungs. In the lungs of persons dying of non-tubercular diseases, Loomis[2] found that 8 per cent. presented changes indicative of cured tuberculosis. In 1943 necropsies made by Dr. Fowler[3] as pathologist to the Middlesex Hospital from 1879 to 1886, there were found 177 cases of obsolete tubercle in 1943 necropsies, or 9 per cent. No case was included in which death was due to pulmonary tuberculosis. In 103 post-mortems of persons not dying of tuberculosis made by Dr. Joseph Coats[4] in Glasgow, 23 per cent. showed the presence of healed tuberculosis.

Birch-Hirschfeld[5] mentions that among the 196 apparently healthy persons suddenly destroyed by accident, examined from 1896-98 in the pathological institute of Leipzig, 42 of the bodies, or 21.4 per cent. were found to have tuberculous deposits in the lungs. Of these, 29 cases were healed, and 13 were found to be latent, or progressively developing deposits. At the same congress on tuberculosis, Heubner[6] referred to the work of two French physicians, Briault and Frenkel, in the hospital of Lyons, who examined with great care the bodies of 83 persons dead of other diseases than tuberculosis. In 67 of the cases, or in 80%, unsuspected deposits of tuberculous matter were found. In other words, aside from those that were known to be tuberculous, four-fifths of the population which supplied these hospitals with patients were infected with tuberculosis, but apparently had sufficient power to resist successfully the parasite which had penetrated their systems.

As a result of observations made in the post-mortem room of the Manchester Royal Infirmary during twelve months, Dr. Harris[7] found not less than 38.84 per cent. of the cases of persons above twenty years of age presented tuberculous lesions. "In other words, 38.84 per cent. of all the bodies over twenty years of age which were examined had had one or more foci of

1. The Climatologist, II., 151. 1892.
2. The Climatologist, I., 330. 1891.
3. Lancet, II., 1899, p. 400.
4. Lancet, II., 1891, p. 937.
5. Bericht über den Kongress zur Bekämpfung der Tuberkulose als Volkskrankheit, p. 213. 1899. Berlin.
6. Ibid, p. 287.
7. The Lancet, I., 1891, 973

active tubercular disease which had become quiescent, and in the majority of instances such lesions had nothing to do with the cause of death."

The Imperial Board of Health of Germany states that in that country from one-fourth to one-third of the corpses examined, show traces of healed tuberculous lesions which had nothing to do with causing death and which in most cases probably had not seriously impaired the function of the organs affected.

This rather tiresome presentation of statistics seems to be justifiable, in view of the need of correcting the popular fallacy that the cures of consumption are rare and exceptional.

The Urgency of an Early Diagnosis.

The question of an early or a delayed diagnosis of tuberculosis of the lungs is very often a question of life or death with the patient. Dr. S. G. Bonney,[1] of Denver, Colorado, says on this subject:

"The unfortunate fact remains that thousands of lives are being sacrificed annually on account of mistaken or delayed diagnosis. It is now generally accepted that consumption is a curable disease, in the sense of its permanent arrest; that the earlier the diagnosis the better the prognosis; and that only in early cases are genuinely satisfactory results obtained. * * * Early diagnosis, then, assumes a position in the general consideration of pulmonary tuberculosis of vastly more practical importance than climatic change, general management, or prophylaxis."

At an earlier meeting of the same association, Dr. H. B. Moore,[2] of Colorado Springs, referring to this same fault of late diagnosis said:

"One error probably oftener fallen into than any other, even by physicians, is the idea that a person who looks well, or fairly so, cannot have tuberculosis. They cannot harmonize the appearance of an apparently healthy person before them with their conception of the pale and wan tuberculous patient, and forget that tuberculosis is an infective disease, which, like other diseases, has a beginning as well as an end, and if the symptoms are suspicious they think their science is at fault and call the

1. Trans. Amer. Climatological Assoc., XV., 30. 1899.
2. Trans. Amer. Climatological Assoc. II., 43. 1895.

disease 'bronchitis' or a 'cold that lingers,' instead of by its right name."

The same complaint comes from public and private sanatoriums for the cure of consumptives the world over, that so many patients come to them late, after the time for speedy and easy cure has passed. The fault is not by any means altogether with the physicians. Many patients ailing with a malady which even non-medical persons of intelligence should recognize as probably the beginning of consumption, do not have the advice of a physician until very late.

In view of the great importance of early seeking medical counsel for symptoms which may foreshadow the coming of consumption or indicate its actual presence, the following advice to the non-medical public seems called for.

In the first place rid yourself of two false notions which are prevalent:

1st. Do not think that it is unlikely that a person has consumption because he has no family history of that disease. The one predominant cause of consumption is infection. Heredity has but little to do with it. If, however, there have been previous cases of the disease in the family, that fact, ordinarily increases the probability of tubercular infection.

2nd. Do not wait for the wan and emaciated appearance characteristic of the advanced stage of the disease before entertaining the possibility of tubercular infection. At the very beginning of pulmonary tuberculosis there is often nothing in the appearance of the patient which is characteristic of the disease. Gradually certain symptoms develop, which taken alone hardly justify a guess as to the character of the trouble, but when several of them are present, or have appeared, they should suggest the need of professional help in determining, without further delay, the nature of the disease. Some of them are the following:

(a) There is often at first only an almost indefinable change in the condition of the patient. He is merely ailing, or as the horsemen say "off his feed," or "out of condition."

(b) Cough for some time may be slight or hardly noticeable. Cough, even if but slight, persisting for a considerable period of time, especially when accompanied by a slight deterioration of the general condition otherwise inexplicable, should excite suspicion of tuberculosis.

(c) Expectoration when there is some cough may be slight or absent.

(d) Hemorrhage from the lungs, slight or considerable, may occur early. Its occurrence without readily assignable cause, should furnish, even in the absence of any other symptoms, a strong suggestive indication that a focus of tubercular infection already exists in the lung. Preceded by a period of cough, says Dr. E. F. Wells, hemorrhage from the lungs is practically pathognomonic of tubercle in the lungs. "It is true that there may be spitting of blood from spongy gums, from hemorrhage from the posterior nares, throat, etc., but, clinically, these cases are easily properly classified."

At a later stage of the disease other symptoms, marked loss of weight, elevation of temperature, particularly in the evening (hectic fever), night sweats, more abundant and purulent expectoration, etc., present a picture the significance of which is apparent to all; but, long before this stage of the disease has come, the patient should have had the advice of a physician to whom other resources are available in making a diagnosis.

Shall the Patient be told that he has Consumption?

This is now something more than a strictly professional question to be decided for himself by each individual practitioner, whether he is or is not still under the dominance of old traditions, or whether he has or has not the courage to make a truthful statement of an unpleasant fact, but which need not fall as a paralyzing shock if the physician is tactful. The patient and his friends should be informed of the true nature of the trouble, because, to cure him, some radical changes in his ways of living must be made, and they will not be made without the intelligent coöperation of patient and friends; and because a patient who has consumption and does not know it will endanger others.

The propriety of frankly telling the patient the nature of his disease has been strongly expressed at the meetings of the American Climatological Association, many of the members of which are eminent authorities on pulmonary diseases. Dr. Knight[1] said on one occasion:

1. Trans. Amer. Climatological Assoc. X., 290. 1893-94.

"It will, I think, be admitted by those familiar with the treatment of these cases that those patients with tuberculosis have always done best who have been apprised of the gravity of their condition, especially when this was done early. The late Dr. Henry Bennet, of Mentone, insisted upon this, and then encouraged his patients to make a hard, intelligent fight."

In a discussion on this same question Dr. H. F. Vickery[1] said:

"If a man's house has caught fire, for heaven's sake tell him before it is burned down; and, if there is only one member of the family sick and the others can be saved, let them know it. To be forewarned is to be forearmed. If there is one sick, and it is evident that the others will inevitably get the disease and die, I think perhaps it would be cruel to tell them that they are going to catch it; but, as long as there is hope for them, then the question is whether it is not kinder and better to let them know.

"My custom is to be very frank, and tell the family my diagnosis and the means that should be taken to endeavor to cure the disease and prevent its spread; and I assure them, believing it myself, that it is a curable disease, that the old view of its incurability dates from a time when the diagnosis could not be made so early, and that, if the individual who is diseased is careful about the sputum, in case he gets better he will avoid reinfection from his own sputum. Here is a man who has just had the disease. Perhaps he has killed out that lot of germs which had got into him, and at that minute he has breathed in some more, and he is in a state to make a second colony settle. I tell him and his family, and I do not find that they feel badly about it. Some of them have thanked me with tears in their eyes, and one said, 'Doctor, if only I had learned this a year ago, I would have acted very differently.' They do not seem despondent, if it is told them with sympathy and kindness; and then, if it were going to save ninety-nine, and one single man had his feelings hurt, as I say, I would not hesitate."

The Hygienic, or Open-Air Treatment of Consumption.

To-day the one and only rational method of treatment is the hygienic method, the aim of which is so to augment the natural powers of resistance of the organism against tubercular infection that the extension of the local disease in the lungs may be

1. Mass. Assoc. of Boards of Health, IV., 19. 1894.

arrested and that, ultimately, a complete cure may result. The patient is placed under the most favorable conditions available, so that the natural healing power of the system may effect the cure. The requisite conditions are as close an approximation as possible to a continual life in the open air, an abundance of good nutritious food, an intelligent prescription of rest and exercise, and the regulation of various other details of the life of the patient. Some of these will now be considered.

Life in the Open Air.

The most important remedial measure is the breathing of pure air all the time,—day and night, summer and winter, whether in the climate of Maine or of California. The patient should be in the open air practically all the time during the day in almost all kinds of weather, and by means of widely open windows he should be the same as in the open air during the night. To many readers the proposition to carry out this treatment in its entirety during the winter weather in this State will undoubtedly seem harsh, but under intelligent medical supervision, as it always should be, it is practicable, is safe, and in cases which admit of a cure, is more efficient than any other method of treatment.

As to danger to the patient, that lies in breathing the air of closed rooms. The only safety, the only chance of cure, is in getting into the open air. The change, however, from an indoor life to exposure to inclement weather should be made gradually and after the patient has been prepared for it by a period of hardening to be described in the next section.

The beneficial effect of the breathing of pure, free air is remarkable in many cases. Usually the general condition of the patient is improved in a very short time; cough is lessened, appetite increases, night sweats disappear, sleep is less disturbed, the fever abates, and there is a gain in weight. In sanatoriums for the cure of consumptives it is customary to carry feeble patients out upon sheltered verandas where they rest upon a lounge, steamer chair, or reclining chair, protected from chill by an abundance of clothing and wrappings. Patients who arrive at these institutions with much febrile movement are put to bed, and in the colder season of the year, particularly, they are gradually accustomed to the cold air by opening the windows more and more, then by moving the bed nearer to the window, and later they are carried on a movable bed out upon a sheltered balcony or veranda. It is not until the temperature has fallen to near the normal that these patients are allowed to exercise in any way, not even to walk out upon the veranda or ascend a flight of steps. Under the influence of the fresh air treatment, in many of these cases, coming to the sanatoriums much later than they should, there is a remarkably rapid disappearance of hectic fever and night sweats, with a corresponding improvement in the general condition.

The Process of Hardening.

In the process of hardening, one of the first things is to improve the cutaneous circulation so that the skin may safely react upon exposure to cold. This may be begun by rubbing the skin with a dry towel or bathing mitten morning and evening. After a few days the bathing mitten may be moistened while the patient is in bed. The friction may be applied with it to only a part of the surface, to the neck, or chest, or back, or to a single limb. The moist rubbing should be done rapidly, until the skin is reddened, then the patient should again be covered and allowed to rest awhile. Gradually the extent of the surface to which the bathing is applied may become more extended until finally, for patients who are not too weak and in rooms not too chilly, the full sponge bath may be administered. The bathing must be rapid, must not last more than one or two minutes, then the patient must be rubbed dry and clothed promptly, or, if weak, may return to bed for a rest. In all cases it is imperatively necessary that the patient react after his bath or moist rubbing so as to have a comfortable feeling of warmth. If chilliness follows, or a feeling of depression, or headache, it indicates that the temperature of the water used for the bathing, or of the room, or the duration of the bath was not adapted to the individual patient. The carrying out of this part of the treatment should be entrusted to intelligent persons only, and preferably to those who have had a special training in this kind of work. Only those patients who are in the incipient stage of the disease and are still strong, should do any part of the work of dry or moist rubbing of the skin. For many patients the exercise would be dangerous. In some of the sanatoriums no systematic process of hardening is observed other than gradually habituating the patients to the action of cool or cold air.

Light.

The beneficial action of light in tuberculosis is two-fold: it is destructive of the bacillus of tuberculosis, as has already been shown, and it has a salutary influence upon the human organism. "Then, too," says Dr. C. F. Gardiner,[1] "the direct solar rays are now known to penetrate live tissue and exert their influence as germicides. Experiments by Koch, Downs, Blunt, Duclaux, Esmarch, and Arloing are cited by Abrams—all tending to show the power and penetration of solar rays, their effect as a stimulant of cellular life of plants and animals in health and disease, and their power as a cure. There is also good reason to believe that the solar rays pass through ordinary clothing and have a stimulating effect upon capillary circulation, and nerve endings."

In a paper by Dr. W. D. Robinson,[2] of Philadelphia, he makes a plea for the utilization of the curative influence of sunlight in the treatment of diseased conditions, and the use of clothing which will admit light more freely to the surface of the body. He says: "Although the use of direct sunlight on the diseased human body is certainly advancing, yet some of the otherwise best papers on the treatment of tuberculosis are defective in not giving any special accent to sunlight, while pure air and altitude are largely dwelt upon. These without light fail, while with light they succeed in curing this disease in its earlier stages."

Though light is so beneficial, the congestive action of direct sunshine in the hot season is injurious to the consumptive patient and should be avoided.

Climate.

Of late years there has been a decided reaction from the idea that, to find a suitable climate for the cure of consumptives, it is necessary to seek places outside of the New England States,—that they must be sent, particularly in winter, to milder climates like that of Florida or California, or to elevated regions like those of Colorado. The excellent results obtained in sanato-

1. Medical News, LXXV., 106. 1899.
2. Trans. Amer. Climatological Assoc., XV., 128. 1899.

riums for the treatment of consumptives, very differently situated as regards latitude, altitude, humidity, and the other conditions which tend to diversify climates, have done much to show that the curative influence of climate has been greatly overrated. The preponderance of testimony of late years indicates that the cold climates have some advantages over the milder climates so far as curative action is concerned, though in home treatment, particularly, there are often serious inconveniences in arranging for the proper care and comfort of patients while taking their "air cure" in the cold season.

In sanatoriums properly equipped and intelligently managed in northern climates—the Adirondacks, Canada, Central Massachusetts, Norway, Sweden, Scotland, Northern Germany—the results obtained are very gratifying,—as favorable, probably, as are attained in any other part of the world. While visiting these institutions I have been told by the physicians in charge, that when a doubtful case enters the sanatorium during the warm season, and can be made to hold his own until the advent of the cold season, there is much greater hope of curing him.

There is one great advantage in curing consumptive patients in their own climate. He who is cured at home is much more likely to remain cured. Many of those who are cured in California, Colorado, or under other climatic conditions differing much from those of their home, are permanently expatriated. They must remain away from home or suffer a relapse.

The following quotations from medical men whose opportunities and experience have qualified them to speak with authority, are of interest as bearing on the question of climate.

Before a meeting of the American Climatological Association, Dr. E. O. Otis, of Boston, expressed his views as follows: "Whereas climate is a most valuable factor in the treatment of phthisis, as we would all confess, yet I believe that, both by the profession and the laity, its influence has been, if not entirely overrated, at least quite misunderstood. We have been trying to make it do the whole work rather than its own appropriate part. We have looked upon it too much as a specific. A study of the sanatoria abroad makes it evident, I think, that it is not a peculiar variety or even excellence of climate which has pro-

1. Trans. Amer. Climatological Assoc , XII., 29. 1896.

duced the favorable results, but rather the admirable *regime* of the sanatorium itself, and the exact precision with which the whole life of the invalid is governed. It is the perfect hygienic environment."

In a discussion at another meeting of the same association, Dr. Leonard Weber,[1] of New York, spoke as follows: "I think it is safe to say after listening to this paper, that the medical profession, both in this country and on the other side of the Atlantic, are all agreed that what the consumptive wants is pure air, and I think the time is approaching when high altitude will not be considered of such paramount importance in this connection as it was some years ago. This change of opinion has been brought about by the fact that good results in the treatment of phthisis are being obtained in sanitaria situated at altitudes of only 300 feet, or even less, above the sea level."

To the question: "What climatic conditions are most favorable for its treatment," submitted to each of many physicians at a hearing before a committee of the New York Legislature, on the establishment of a sanatorium for consumptives, Dr. Trudeau, Director of the Cottage Sanitarium, at Saranac Lake, replied: "Moderate altitude, sandy soil, absence of high winds, purity of the atmosphere."

Dr. Stubbert, physician-in-charge of the Loomis Sanitarium, Liberty, N. Y., answered: "Altitude in the vicinity of from 2,000 to 2,500 feet. Open country with sparse vegetation, freely exposed to sunshine and currents of air—remote from rivers and any large bodies of water; with a winter temperature ranging between 10 degrees above and 10 degrees below 0. All patients with a fair amount of resisting power do better in a cold climate than in a warm one."

The answer of Dr. J. H. Pryor, of New York, was: "I think purity is probably the most practical point; but the fact remains that you will have, in certain localities, an air that is probably perfectly pure, and patients won't do nearly as well as in some other place where the air is perfectly pure, so that it cannot be purity *alone*. Certainly it cannot be claimed for the Adirondacks that the air there is dry, because there is a great deal of moisture there; there is a great deal of rain. Now, I think also,

1. Trans. Amer. Climatological Assoc., XV., 92. 1899.

that it is temperature that has a good deal to do with it, because the experience of almost every physician who sends cases away, particularly to the Adirondacks, is that they gain just about twice as fast in the winter months, with a very low temperature, as they do in the summer months, when the temperature is high. I believe it is not so much the quality of the air or temperature of the air or purity, as it is treatment; and I think where we are making the error to-day is in the treatment. The treatment of tuberculosis is not alone in the matter of climate. It is rest, open-air treatment, and good food. The mistake has been for years past that the patient was allowed and obliged to exercise, which has been proven to be a mistake."

"The indiscriminate prescription of climatic change, without due regard to the exigencies of the individual case," declares Dr. Arrowsmith,[1] "has probably done more harm, shortened more lives, and destroyed more possible chances of recovery among consumptives, than ignorance or faulty application of any other remedy that has ever been employed in the treatment of phthisis.

"I believe that the ideal climate for the average consumptive is not at any special station nor at any given altitude, but where is found pure air free from contamination, in a reasonably equable, moderate climate, with good drainage, and where the percentage of moisture is approximately normal and not subject to great variation."

Dr. Walters, physician to the North London Hospital for Consumption, and author of "Sanatoria for Consumptives," says:[2] "Warm sunny lands are extremely pleasant and are very useful in tempting people out-of-doors; but where there are sufficient powers of reaction a colder climate is more likely to cure. There is a mistaken impression in certain quarters that an equable climate is essential to the cure of phthisis."

Dr. Dettweiler, of Germany, Director of the celebrated sanatorium at Falkenstein, says:[3] "There is no specific climate. Consumption is no climatic disease, and it is, therefore, not cured through specific action of any particular climate. The disease may be treated with good results in any climate free from

1. Medical News, LXX., 68. 1897.
2. The Lancet, II., 1310. 1897.
3. Bericht über den Kongress zur Bekämpfung der Tuberkulose als Volkskrankheit, p. 401. 1899.

extremes. Of course, the disease may be treated more conveniently in some climates than in others, but it is a matter of more or less care in arranging for the treatment of the patients and in the supervision of them."

Food.

In the treatment of consumptive patients they should have good, nutritious food in abundance, but some medical authors are in error in emphasizing full feeding and even hyperalimentation without duly inculcating the indispensable need of pure air and an abundance of it. All of the hygienic resources should be utilized, but if a statement of the comparative value of those particular two remedial measures is at all justifiable, it may be said that an abundance of fresh, free air all the time with only an ordinarily nutritious dietary, is preferable to a food supply, abundant and nutritious, without special and intelligent care in carrying out the "air cure."

On the dietetic management of pulmonary tuberculosis, Dr. S. A. Knopf,[1] gives the following good and explicit advice:

"To nourish the patient, to feed him well with good food, or rather overfeed him so that he assimilates more than he expends, forms an important part of the treatment of phthisis. The patient should have an abundance of proteids, carbohydrates, and fats, but in proper proportion; thus the menu for a tuberculous invalid should be much varied. He should never have a diet exclusively of meat, nor of vegetables; a mixed diet, with some eclecticism as to the more digestible substances, should be the rule. Meat, milk, fat, eggs, vegetables, bread (cereals), fruits, especially grapes, should all contribute to the diet of the patient.

"Consumptives, as a rule, have small appetites, and it requires sometimes no little art to make them eat. The one important truth that they should be made to understand is that their digestive powers are far greater than their appetite indicates. Leaving exceptional cases aside, such as absolute anorexia, hyperacidity, or lack of gastric secretion, of which we will speak later, one usually succeeds in making the patients eat by persistent persuasion, and by offering them a variety of food arranged as appetizingly as possible.

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1. Prophylaxis and Treatment of Pulmonary Tuberculosis, p. 237. 1899.

"To eat a great deal of butter and cream is especially to be recommended to pulmonary invalids, and milk should be allowed at anv time without restriction. However, some patients, in their eagerness to get fat, overdo in this respect. When drinking numerous glasses of milk between meals interferes with the proper appetite at meal-times, the number of glasses should be reduced accordingly.

"The pulmonary invalid must be treated and fed in accordance with what he was accustomed to before being taken sick, for meal-times and number of meals differ among most nationalities.

"For average cases I would suggest the following regimen, to be adhered to as nearly as possible during the course of the disease: As soon as the patient awakes in the morning, while yet in bed, a glass of hot milk, half milk and tea, or half coffee and milk, with a slice of milk-toast, should be given him. After a little while he will rise to prepare for his douche, friction, or massage, whatever the physician's prescription may call for. After this it will probably be nine o'clock, and the patient may take his ordinary breakfast. He should have eggs, and may have his choice as to the wav they may be prepared or served. If he is accustomed to a meat breakfast, he should have broiled steak, chops, poultry, sweetbread, etc., or raw chopped beef. Bread a day old,—preferably whole-wheat bread or French rolls, but not hot,—with plenty of butter or honey, either milk, cocoa, coffee with milk, but not too strong, or a cup of bouillon, should also form part of the meal. Whether the patient likes to have his mush (cereals) for breakfast or supper, may be left to his choice; some fruit should always precede his eggs or meat in the morning. If fish is served in the morning it should be either broiled, boiled, or baked.

"The patient should take the heartiest meal between the hours of twelve and two o'clock (four hours after his breakfast). Broths or soups should be the first course. Oysters and clams are most easily digested raw. Any kind of fresh fish may be served again at dinner, and in any form except fried; and there will be, of course, roast meat of some kind, rare roast beef, mutton, poultry, etc. Of vegetables, spinach is particularly to be recommended on account of the large proportion of digestible and assimilable iron. Next to this in nutritive power come lentils, peas, beans, cauliflower, potatoes. Fresh vegetables should be given whenever it is possible to have them. Lettuce and other salads, preferably prepared with lemon-juice instead of with vinegar, are permitted. Light puddings, fruits, and nuts may constitute the dessert.

"At about four or five o'clock some milk with toast may be taken, or, if the patient cares for it, he should have a cheese or meat sandwich. At this time the milk may be replaced by bouillon or chocolate.

"The supper should not be quite as voluminous as the dinner. Cold or warm meats, rice with milk or gruel, with jellies, fruits, etc. At bed-time again a glass of milk or some milk-toast.

"It is, of course, impossible to lay down an absolute rule of what to allow and what not to allow. One must consider the patient's likes and dislikes; there are idiosyncrasies for certain dishes as well as for certain medicines. I have learned to allow my patients occasionally such things as ham, smoked tongue, and even pickled or salt herring, sardines, and sardelles, and I have not yet found any occasion to regret this practice, for they seem at times to stimulate the appetite."

Rest and Exercise.

An important part of the treatment of pulmonary tuberculosis is a judicious supervision of the patient as regards rest and exercise. The prescription of exercise adapted to the requirements of each individual case should not be neglected, but, in this direction, the most urgent need of medical control is saving the patient from the deleterious results of over-exertion, or of ill-advised exercise. How important this is is shown in the following clinical histories selected from a larger number narrated by Dr. Karl von Ruck,[1] of Asheville, N. C.:

"Case 1. Gentleman in early stage of pulmonary tuberculosis: had been free from fever for over five weeks, during which the pulse rate had not been recorded above eighty-eight, he had gained eleven pounds in flesh, and his general condition, as well as the local state of his lungs, were highly satisfactory. He had thus arrived at a period where, by reason of conscious-

1 Sanitarian, XXVII., 17. 1891.

ness of returning health, the tendency to over-exertion is particularly manifest. Contrary to his general directions, he exceeded the amount of exercise allowed him, by a walk of over six miles, returning much fatigued. He had no appetite for his next meal, and the record for the evening shows, temperature one hundred, pulse one hundred and twenty, respirations twenty-eight. It was a week before his previous condition was restored, with the less of five pounds in weight, which it took him a month to regain.

"Case 3. Married lady; pulmonary tuberculosis: had just passed through stage of softening in righ upper lobe, but was now improving in all her symptoms, being, however, still forbidden all active exercise, for which massage was substituted. Believing herself strong enough, and desirous of a change, she walked down-stairs and upon the piazza and returned to her room within half an hour, when her temperature had risen two and a half degrees Fahrenheit and her pulse rate increased thirty beats per minute, above any record for three weeks previous. She had no appetite for several days, lost two pounds of flesh that week, whereas the week previous she had shown a gain of three pounds.

"Case 4. Same patient: about two months later she had made much further improvement, fever was now practically absent, pulse one hundred, respirations eighteen, had been allowed short carriage rides with apparent benefit. Limited to half an hour, on the present occasion she was out two and one-half hours, and also stopped in town for some shopping. She returned so tired that she had to be carried to her room, chill occurred twenty minutes later, high fever and loss of appetite set in, she relapsed in every way and never again reached the improvement at which she had arrived before this last ride.

"Case 6. Gentleman with tubercular phthisis: entire right lung involved and circumscribed breaking down in upper lobe; he made a moderate sized cavity in the course of a month, during which he had kept his room most of the time. Although he had much fever and little appetite, he maintained his weight through this period. Improving thereafter rapidly, he was kept out-of-doors almost continuously, but his exercise was limited to repeated short walks upon the level grounds and to short carriage rides. He, however, soon began to extend his walks to distances of a mile or two, which were followed each time by a slight return of fever and increase in cough and expectoration, and as soon as he had recovered from one reverse he was sure to produce another by his indomitable desire to take long walks, and no amount of remonstrance seemed to bring him to his senses, until I informed him that unless he desisted our relation as physician and patient would cease.

"At this time he had lost thirteen pounds of flesh, had regular evening fever, with continuously rapid pulse and profuse expectoration.

"Henceforth we had no further trouble, and as by returning improvement he recognized his previous folly, he became not only a most exemplary patient, but grew actually timid, so that I had frequently occasion to urge him to increase physical exertion.

"Case 12. (From private practice). Gentleman with pulmonary tuberculosis: entire right lung involved and slight excavation in upper lobe. Called upon me on account of continuous loss of flesh and strength, fever, and almost daily bloody expectoration.

"He had lost fourteen pounds in the six weeks since he had left home, had high temperature and rapid pulse, frequently vomited his food on account of severe cough, and was very much exhausted. His physician had advised him to go to Asheville, let doctors alone, get a horse and ride through the country, if he wanted to save his life! ! ! He had followed this advice, and was unwilling to give it up, and although he now restricted his exercise somewhat, he was worse after a month, during which he consulted me several times. He had lost six more pounds of flesh, and an acute pleurisy now intervening, laid him up and stopped his folly! After partial recovery he confessed himself ready and willing to do whatever I thought best for him, and he kept his word. Neither had we any further trouble; he improved rapidly and returned home with his cavity cicatrized, all rales had disappeared, he had gained nine pounds in flesh, fever, cough, and expectoration were improved, he was able to walk a mile or two without fatigue or injury, and this without ever again having mounted a horse.

"I could now go on and relate many such cases, more or less striking, and all showing the same relation of over-exertion to unfavorable progress. In my practice, I am now most unwilling to abandon inquiry for this indiscretion, when relapses occur that are not otherwise referable. Any physician who cares to can make similar observations for himself, to do which, however, requires the careful keeping of records of frequent observations of temperature, pulse rate, respiration, cough, and expectoration, conditions of the digestive organs, body weight, etc., and also of the local findings of frequently repeated physical examinations, but which, unfortunately, in private practice seem seldom possible, on account of the amount of professional attendance required which few practitioners are able to give and fewer patients would be able to appreciate.

"I freely confess that before I was interested in this work as I now am, I allowed myself to be satisfied with the explanation that a patient had taken cold, or with the supposed natural downward tendency of the disease, and it seems strange to me now that the great importance of this matter escaped my attention for so many years of my earlier practice. I know now that relapses from taking cold occur infrequently, and the supposed downward tendency does in fact exist in a diminutive fraction of cases only, in which the disease runs an unusually acute course, but that, on the contrary, there is a strong tendency to repair, improvement and recovery in the great majority of cases, even in such as are well advanced in the disease."

Dr. S. A. Fisk,[1] of Denver, Colorado, refers in the following words to the injudicious advice which even physicians sometimes give their patients: "How commonly patients are told: 'Oh, you don't need any medical advice; go West, get a horse and lead a life in the saddle, and you will be all right.' Only we, who see the dire results of such advice, know. I recall instance after instance of just such counsel, and very bad counsel it is."

"Speaking broadly," says Dr. S. E. Solly,[2] "it may be said that when the disease is becoming arrested, rest, which has been the most desirable, begins to give place in importance to exercise. Most patients are too active at first and later too lazy."

1. Trans. Amer. Climatological Assoc., XII., 68. 1896.
2. The Climatologist, I., 358. 1892.

Dr. Jaruntowsky,[1] formerly an assistant in Dr. Brehmer's sanatorium at Görbersdorf, refers to the question of rest and exercise in the following words and tells how the rest treatment may be conducted in the open air:

"Some authors, Dettweiler, for instance, lay the chief stress in the treatment of consumptive patients upon lying down in the open air, while others, and notably Brehmer, attach great importance to methodical hill-climbing. * * * Treatment by rest in the open air may be best carried out in the summer time amongst pine trees, either on comfortably padded deck chairs or in hammocks, but during unfavorable weather, and also in winter, on covered balconies, in pavilions or in lounges (Liegehalle) specially fitted up for the purpose. In sanatoria, which do not possess such arrangements, the serious cases with febrile symptoms, should recline in bad weather and in winter in a room with open windows—which may remain partly, or wide open during the night also, according to the conditions of the weather. This system of rest treatment has been brought, especially by Dettweiler, to such a pitch of perfection, that his patients are able with a few exceptions, to spend from seven to eleven hours daily in the open air, viz: from early morning till late evening, and that in spite of rain, fog and snow, and of cold reaching to—12°."

Clothing.

"It is no ways unlikely, it seems to me, that too much and too heavy clothing has been one of the predisposing factors to the disease far more frequently than insufficient clothing," says Dr. Otis. "The old idea is still commonly entertained that a consumptive must be smothered in clothing and incarcerated in a tight, superheated room. The neck-muffler and chest-protector are still in common use. The only safety for weak lungs is to develop and strengthen them by use in pure, out-of-door air, and to promote a vigorous condition of the whole body by exercise, cold bathing, and exposure in the air; heavy clothing and inactive indoor life only increase the existing local and general weakness. Woolen underclothing is advised, for it preserves an

1. Sanatoria for Consumptives (translated by Beale) p. 16. London.

equable skin temperature better than other fabrics; but it should not be too thick or heavy." [1]

At the meeting of the American Climatological Association last year Dr. Judd,[2] of Philadelphia, warmly advocated underwear of porous linen, loosely woven in the manner of a fine mesh. It is, he says, alike applicable to the most delicate or to the so-called "cold-blooded" people—those of spare habit with a lowered vitality—in the coldest as well as in the hottest climate. In the discussion which followed there was no complete unanimity, but other members were favorably impressed with this underwear after personal experience with it. In cold weather some of the speakers deemed it best to wear outside of the linen mesh a light suit of woolen underclothing.

In one thing there is, however, full agreement. The consumptive patient, while taking his "air cure" in cold weather must be made comfortable with a plentiful supply of clothing; and when he is taking his "rest cure" in the cold air, an abundance of fur and other wrappings must keep him from becoming chilled. How this is done is best indicated in some of the illustrations which accompany this paper, showing how the patients at the sanatoriums take the "air cure."

Pulmonary Gymnastics.

Breathing exercises of various kinds have been recommended for both the prevention, and as a help in the cure of consumption. Under the close supervision of the medical attendant respiratory exercises are undoubtedly a useful auxiliary in the treatment of pulmonary tuberculosis. But without careful medical oversight there is great danger that these pulmonary gymnastics may seriously harm the patient.

"Truly, this lung gymnastic is a two-edged sword which must be used judiciously. Many persons recommend deep breathing: the sound part of the lung is exercised for the purpose of improving the general condition, and the thought appears to be logical that the disease process in the portion of the lung in which the respiratory process is well performed has a similar prospect of progression.

1. The Causes and Conditions of Pulmonary Tuberculosis, and how to avoid them—Reprint from Am. Jr. Med. Sc. 1898.

2. Trans. Amer. Climat. Assoc. XV., 118. 1899.

"Only fever and pulmonary hemorrhage contraindicate pulmonary gymnastics. On the other side of the question it is claimed that new tubercle foci in the sound portions of the lung are established by the aspiration of tuberculous matter from the diseased portion. Vollande compares a diseased lung to a surgically diseased limb, both of which require rest. Between the superficial and altogether insufficient breathing of most persons, and the excessive exertion of the lungs recommended by Liebermeister and others, there is a medium course which the physician with the necessary tact and knowledge is able to choose for his individual patient. Entire individualization and non nocere is, I believe, necessary * * * each phthisical patient is a case *sui generis*." Thus advises Liebe.[1]

"I have made the assertion," says Dr. W. M. Strickler,[2] "that the only way nature ever brings about an arrest of phthisis is by imprisoning the bacilli through the fibrosis process. Those men who believe in that process, nevertheless, advise—some of them —mountain climbing and active exercise; and others, while they advocate rest, advise lung gymnastics. Now, then, how is it that the disease spreads in the lungs? There may be more ways than one. At the same time I believe it is generally admitted that the bacilli are carried from the affected part, in a large measure, through the respiratory currents. It would seem, therefore, that in order to prevent the spread of the disease, the greater quiet that is enforced upon the patients the less likely the disease is to spread by that means. On the other hand, the efforts which give rise to rapidity of respiration are more likely to carry the germs into the unaffected parts."

Cornet[3] is equally emphatic in insisting upon caution in the use of respiratory exercises. He says: "Forced inspirations, widely recommended and much practised, I have for years condemned as dangerous and injurious." He also refers to the danger that forced, and especially sudden inspirations may aspirate infectious sputum into hitherto healthy parts of the lungs.

"From my point of view," says Jaruntowsky,[4] "lung gymnastics are particularly indicated for individuals who are disposed

1. Ueber Volksheilstätten für Lungenkranke, p. 38. 1895.
2. The Climatologist, I., 361. 1892.
3. Die Tuberculose, p. 505. 1899.
4. Sanatoria for Consumptives. Translated by Beale, p. 18.

to tuberculosis before the appearance of any morbid signs in the lungs, and for convalescents in whom one may fairly assume that cicatrisation or encapsulation of the affected part of the lung has taken place. One must invariably prescribe for the patient how he is to carry out the forced respiration. According to Dettweiler, it is the best way, during quite steady walking, to take five or six deep breaths through the nose every 100 or 150 paces, or, when lying down in the open air, 10 or 12 breaths every five or ten minutes."

The swing of the pendulum in the direction of rest instead of exercise for the diseased lung is shown by the recent practice of immobilizing the diseased lung by the intrapleural injection of nitrogen. In cases thus treated and lately reported by Dr. H. P. Loomis, of New York, pulmonary hemorrhage ceased, and cough and the general condition were improved.

Oral Hygiene.

As a small part of the tuberculous expectoration remains in the mouth and may there give rise to new infections of the patient, the hygiene of the mouth should not be neglected. The bacilli remaining in the mouth, through defects of the mucous membrane, sometimes, though rarely, start tuberculous ulcers of the lips, gums, or the inside of the cheeks. The remnant of sputum which is retained in the mouth much more frequently is the cause of tuberculous changes in other parts. In the act of swallowing the material is pressed against the tonsils and has a tendency to enter the tonsillar crypts, thus favoring infection of these glands. Many cases of pulmonary consumption, and most cases in the advanced stage, are complicated with tuberculosis of the tonsils, and from them, there may be a further transplantation of the infection. There is also danger of intestinal infection from the same source.

There is, therefore, a reason for keeping the mouth clean by the frequent use of mouth-washes and the tooth-brush. As it is difficult to find chemical agents which are efficient germicides and at the same time non-irritating to the mucous membrane and not injurious to the teeth, it is probably as well to choose only mild or neutral solutions as, for example, a teaspoonful of common salt in a pint of water. With this or some other liquid the mouth should frequently be rinsed, particularly after expectoration.

"The first problem," says Mosler,[1] "in battling with the tubercle bacillus is the withdrawal of its culture media. This we do by exercising strict cleanliness and by careful cleansing of the teeth and the whole mouth by brush, toothpick, and careful rinsing. One who has not time to do this after each meal should particularly attend to it before bedtime. In my clinic all patients, and particularly the tuberculous patients, are required to care for the cleansing of the mouth and nasopharyngeal space. The regular use of the tooth-brush is a required duty with the patient."

The solution which he uses is a warmed three or five per cent. solution of cooking salt or boric acid. Knopf[2] says that the brushing of the teeth and the rinsing of the mouth after meals is seemingly a small matter, but he has found that it helps much in his dealings with the bad eaters among his patients. Of all preparations he gives the following tooth wash the preference. It leaves a pleasant freshness in the mouth.

R. · Essence of peppermint....................10 minims.
Oil of wintergreen.......................15 minims.
Thymol ....15 grains.
Benzoic acid.............................3 drams.
Tr. of eucalyptus.........................2 ounces.
Alcohol ....15 ounces.

M. Sig.—One-half teaspoonful to be diluted in a tumblerful of water.

Methods of Home Treatment.

There are difficulties in carrying the treatment of consumptive patients to a successful issue in their own homes. With some patients in their unfavorable surroundings it is impossible to do so. Sick persons of this class are notional and prone to excesses which often retard their cure or render it impossible. Many patients need all the time the restraining influence of the ever-present medical attendant and his trained assistants, and often

1. Uber Enstehung und Verhutung der Tuberkulose als Volkskrankheit, p. 14. 1899.
2. Prophylaxis and Treatment of Pulmonary Tuberculosis, p. 241. 1899.

their encouragement to persist. Again the facilities for carrying out the fresh air treatment are not so favorable as in sanatoriums, and usually in the home treatment time does not pass so agreeably and entertainingly. But many intelligent and tractable persons whose home conditions are not too unfavorable may be saved in their own homes. How it may be done is indicated in the following history of a case which was narrated by Dr. Osler,* of Johns Hopkins University, Baltimore, at a meeting of the Medical and Chirurgical Faculty of Maryland:

"In December last a young woman came to me from one of the towns in the State with well-marked tuberculosis. Her grandmother and two of her father's brothers had died of consumption. She had a cough off and on for three years, and for more than a year she had a great deal of fever, had lost very much in weight and had had profuse night sweats. She never had had any vomiting. When I saw her she had high fever (temperature 103°), and there were signs of extensive disease at the right apex—flattening, dullness on percussion with resonant rales as low as the fourth rib. There were signs of involvement of the right apex behind, and there were a few crackling râles at the apex of the lower lobe on the left side behind. She was short of breath, and looked thin and pale. Her weight was 109 pounds. I gave her directions such as I have indicated, and she has given me a brief statement in her own words of her progress in the eleven months. She writes as follows (November 10):

" 'When I began treatment, the first day I sat out was December 11, 1898; don't know just how cold it was, but could see the river from our porch and they were skating. In winter usually had breakfast about 8 and went outdoors about 9. When I began was not well enough to walk much, was so short of breath; after sitting out for some weeks would walk up and down porch an hour before sitting down. I spent a good deal of my time reading; became so interested in my book at times forgot how cold it was. The first two weeks I took three eggs a day, one at 10 A. M., another at 3 and another before going to bed; then six a day, two at a time, and continued to increase till I got up to fifteen a day; continued that number for two months or more, then took twelve a day for three months, then nine.

* Maryland Med. Jr., XLIII., 10. 1900.

For breakfast I had oatmeal and cream and toast, or small piece of beefsteak and coffee; dinner at 12, drank one glass of milk and ate anything that was on the table in the line of meats or vegetables (provided I liked them); seldom if ever eat desserts. Went out immediately after dinner and remained there until sundown; more eggs at three and supper at 6; another glass of milk, and with that a small piece of meat, as a rule, and bread. Eggs again at 9, and go to bed between 9 and 10. Was sitting out one day when the thermometer registered 10 below zero. When it felt like snow or rain remained indoors. I kept this up till the weather was warm and then went driving, took eggs along and stayed out in country till dinner time; drove out again late in evening, and after my return home would sit out till after 10 o'clock. When I began treatment had bad cough, expectorated a great deal and no appetite. The cough began to get better, and after about four months I coughed very little; now, so rarely and expectorate so very seldom that it is hardly worth mentioning. When I consulted you last December weighed 109 pounds; now tip the scales at 132 pounds. I have improved steadily and gained in flesh gradually from the above date.'

"This very practical story illustrates what could be done by many patients. Last spring I happened to be in the town in which this girl lived, and I fortunately thought of her and paid her a visit. She lived in a small two-story house, with a narrow balcony on the first story behind, and here at half-past eleven one morning I found her carefully wrapped up. She looked a different girl, and the report indicates that she has done remarkably well. At the time of my visit she was without fever, but there were still numerous moist rales at the right apex.

"Since writing the above I have seen this patient (December 1), who looks remarkably well, has a good color, is free from fever, has no cough, no expectoration and weighs 133 pounds. Luckily I dictated a note on the condition of the lung at the time of her first visit, otherwise I should not have believed the extent of the change. The resonance is still impaired, the flattening is marked beneath the right clavicle, the breath sounds are harsh, the expiration prolonged, but there are only a few dry crackling rales on coughing or on deep breathing. There were no signs at the apex of the lower lobe of the left lung behind."

"The quality of the fresh air in our large cities," Dr. Osler says, "may not be very good, but it is the best a large proportion of our patients can possibly get to breathe, and it is a great deal better than the atmosphere of the overheated, ill-ventilated rooms in which a majority of them live.

"I give the following directions: Take the almanac and count off the hours of sunshine. In winter cut off two hours in the morning and an hour in the evening, and for the rest of the day the patient is to be out of doors. If there is no possible arrangement for life out of doors, the patient is to be in a room with a southern exposure with the windows wide open. The bed is to be moved into the sunshine. If there is a balcony or a veranda with a good outlook towards the south, it should be arranged for the patient; if not, a sheltered protection can be put up in the yard at a very moderate cost. On a well-padded lounge covered with a couple of thick blankets, well wrapped up, the patient sits or reclines all day, coming in only to attend to the calls of nature. Only on blustering, stormy or very rainy days is the patient to remain in the house. No degree of cold is a contraindication. This continuous open-air life, at rest, is the most powerful influence we possess to-day against the fever of tuberculosis. It may take a month, it may take two or even three months before the temperature reaches normal, but it has been one of the many valuable lessons which we have learned from Dr. Trudeau, that in the fever of consumption the patient should not only be out of doors, but at rest, taking no exercise. The bedroom of the patient should be thoroughly ventilated, and the patient should be accustomed gradually to sleep with the window open.

"Secondly, *Food.*—The stomach controls the situation in pulmonary tuberculosis. In any long series of cases the patients who do well are those who can take plenty of food. An important cause of the lack of appetite and feeble digestion is the persistent fever, and we often find that as the temperature falls the appetite improves. It is easy to lay down rules; very hard to carry them out. Each case must be dealt with separately, but as large a quantity of food as possible should be given. Overfeeding or stuffing, when possible, should be practised, and the patient should be encouraged to pay as little attention to his subjective gastric sensations as possible. We rarely can carry out the autocratic, cast-iron method followed at Nordrach, which insists that a patient who has vomited a meal shall, *nolens volens,* eat another very shortly of the same character. For some time I have been urging the patients to accustom themselves to taking raw eggs, beginning with one three times a day, and increasing one a week until they took, if possible, twenty or twenty-four daily. For the hyperalimentation this is probably the simplest and most satisfactory diet. It has been carried out with marked success by Dr. Ely of Rochester, who literally prescribes eggs by the dozen. Broken into the egg-cup, sprinkled with a little pepper and salt, the egg can be readily swallowed without breaking the yolk. It is most important to get the patient accustomed to taking the natural foods. Milk and cream and butter, meat and eggs and oysters should constitute the main part of the diet."

Before the same society, Dr. C. S. Millett, of Brockton, Mass., read a paper on *"The Night Air of New England in the Treatment of Consumption,"* which is valuable because it is a narrative of successful results under climatic and social conditions not the most favorable. Dr. Millett says:

"The New England climate has, I think, a national reputation for insalubrity. Its variability and bleak east winds are commented upon alike by both natives and foreigners, and its faults and peculiarities have been perpetuated in story by Mark Twain's incomparable satire. In this region, within a few miles of the ocean, on a flat, low-lying country, with a clayey subsoil, my resources have been sorely taxed in the search for some way to combat a disease which during the past ten years has caused one-fourth of all the deaths in the community. How at last a little ray of light has been thrown upon the subject, the history of the following cases will, I hope, bring out.

"It is now nearly two years since I was called to see a young man whose family history is most remarkable, his brother, father, grandfather, two aunts, one on either side, and an uncle all having died of chronic phthisis. He was suffering from cough, wheezing and dyspenea, and had a temperature of 100.5°. At that time there were no marked physical signs, only diminished respiration over the left lower lobe, where he had pleurisy or pneumonia years before. Throughout that winter he continued to lose ground, in spite of the remedies ordinarily used in such cases, until in the spring he had lost nearly fifteen pounds, and had become so weak that he could not bring in a hod of coal without extreme shortness of breath.

"I urged my patient to try sleeping out of doors. He began the last of June, 1898, and slept with no awning or roof over his head for five consecutive months, with the exception of only nine nights, when rainy weather prevented. Within the first two weeks one could see that he was making progress in the right direction. At the end of a month his temperature was normal, his cough and wheezing had almost disappeared, and he was apparently on the road to recovery.

"At Thanksgiving time, on the day before the great November storm of 1898, when he came into my office, his weight was 144 pounds, he having gained twenty-two pounds in four months. The only medicine which he took was tincture of nux vomica. He has continued perfectly well ever since, and now tips the scale at 147. The photograph (Fig. 11) shows how he arranged

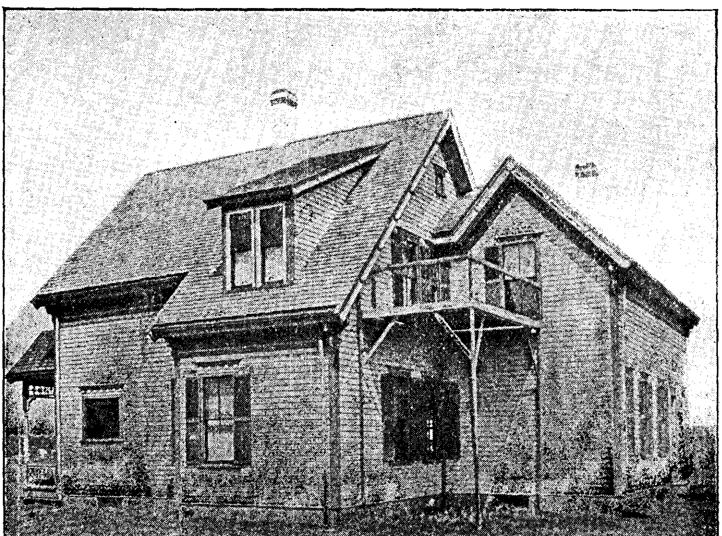

FIG. 11.

his sleeping place, so as to obtain a southwest exposure. His home is located about twelve miles from the seacoast, and only

100 feet above the sea-level. This man has worked in a shoe factory nine hours a day without the loss of a day since his treatment began. While sleeping out of doors he wore a soft felt hat and cotton night shirt, and was covered with the ordinary bed clothes. He usually went to bed early, at 9 P. M., because the sun awakened him early in the morning.

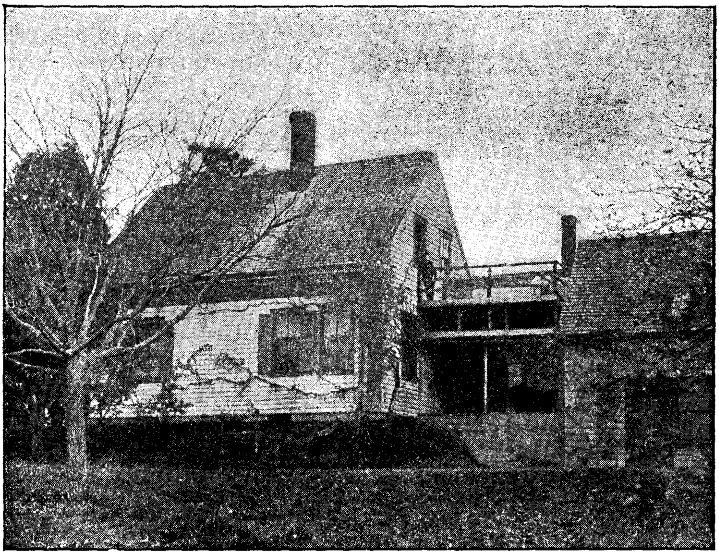

FIG. 12.

"The third picture (Fig. 12) shows where a boy of twelve has rested during the last six months. A careful consideration of the boy's heredity and environment gave no clew to the probable source of his infection until an autopsy of his father's cow, whose cream he had eaten to excess all winter, brought to light the fact that she was infected with tuberculosis. The amount of lung tissue involved in this boy's case is too extensive to justify the expectation of permanent arrest, but he has gained nineteen and one-half pounds during the summer. I have, for several reasons, not allowed this boy to attend school. He has felt so well that it has been difficult to restrain him enough to keep his temperature below 99.5°, and in order to do this it has been necessary to put him to bed on his platform almost every afternoon. His mother has slept at night on another cot beside him, and has herself gained very decidedly in weight, strengtn and color.

"Neither in his case or any other have I insisted on any particular kind of bed clothing. I have simply told them all to keep warm, and in order to do this during the cooler months some of them have found it necessary to use woolen nightgowns and sheets. In regard to diet, the instructions have been to eat all they could of whatever they wanted. Some of the patients have had two baths a day; one has a cold sponge in the morning, and another a tepid bath at night, followed by a good rub. When not at work, they have spent the greater part of the day in the open air.

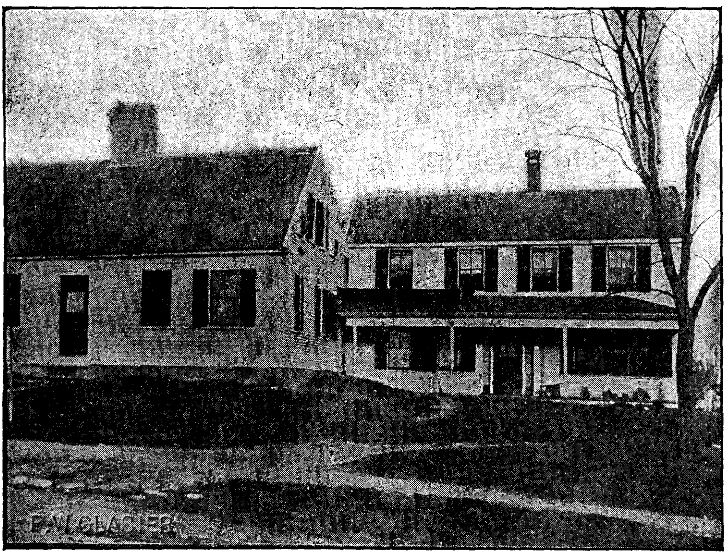

FIG. 13.

"Photograph No. 4 (Fig. 13) shows how another of my patients has prepared a place to sleep. The man who lives here had a slight pulmonary hemorrhage last June, and rapidly lost several pounds of flesh. When I saw him on the first of July he only complained of a feeling of weakness and a slight cough, and I thought that he was strong enough to continue at work. An examination of his chest, however, brought to light a small area, slightly solidified, just beneath the left clavicle. At this time he was running a machine in a shoe factory. Attached to this machine was an alcohol lamp, which was used to keep wax in a fluid state, and he was forced to work, winter and summer, with the window in front of his bench closed down tight, for fear of putting out the lamp.

"At night he slept on the ground floor, in a small east room, where the windows were so near the bed that he was afraid to open them on account of the draught, so that for at least eighteen out of every twenty-four hours he was completely shut in. I advised him to give up working in the factory and to sleep out of doors. With the help of a little medicine, this treatment brought his weight up to 150 pounds, which is an increase of twelve pounds, and the physical signs have nearly all disappeared. He has an excellent family history, and I cannot help suspecting that his infection came from a person who died of tuberculosis in this same house about fifteen years before.

"One word about those cabalistic terms 'dampness' and 'draughts.' They are bugbears, that is all, and need not be considered for a moment. Many times these patients have found their bed coverings and night clothes wet with dew, and once in a while a summer's rain has disturbed their healthful slumbers, but with no harm, beyond the necessity of drying the bed clothes before another bedtime.

"I am quite ready to believe that if people could be taught to fear impure air and overheated rooms as they now dread a slight increase of moisture or a little air stirring in the house, tuberculosis would become as infrequent as smallpox.

"The essentials of the treatment which I have tried rigidly to enforce are as follows:

"First.—The patient, having bought a clinical thermometer, is taught how to use it and told to take his own temperature at 9 A. M., 1, 4 and 8 P. M., and to make careful records for the physician's inspection when he makes his visit, which is usually twice a week. The 1 o'clock register, if 99° or below, generally indicates that the patient need not be closely confined to his bed in the afternoon; but the 8 o'clock temperature will decide whether he has taken too much exercise or not. The rule is, rest in bed during the day long enough to keep the temperature below 99.5°, or better, 99°. I am in the habit of telling these invalids that I don't like 100°, but am encouraged by anything below that. A subnormal temperature is of no importance unless it should be so low in the morning as to indicate a reaction from a much higher rise on the previous evening. The patient who has improved most rapidly, and who uses the platform seen in the picture, Fig. 13, has almost constantly exhibited a subnormal temperature.

"Second.—The patient is instructed to keep a record of the number of hours which he spends in the house, and to give good reasons for not having spent them out of doors.

"Third.—He is urged to eat all he can at the three ordinary meals. No hard and fast restrictions are placed upon the diet. Milk, eggs and vegetables are recommended, and the use of pastry and confectionery discouraged."

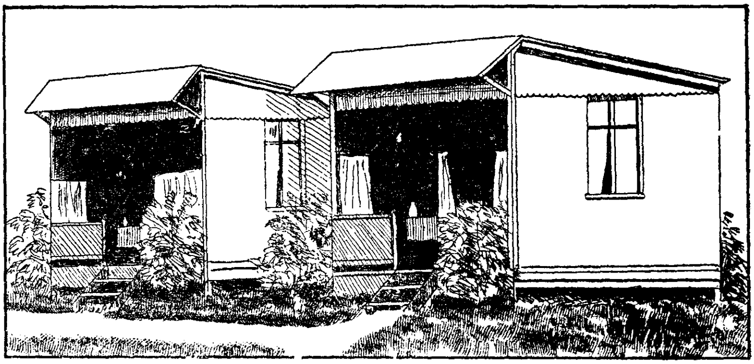

FIG. 14.

Fig. 14 is presented as suggestive of an arrangement in home treatment for continuing the outdoor air cure through the night. It illustrates the sleeping boxes in use at a sanatorium near Dresden, Germany. A veranda of a dwelling house may easily be arranged to answer the same purpose with curtains which leave a free circulation of air above them.

SANATORIUMS.

A Brief History of the Sanatorium Movement.

One of the most helpful forms of public and private benefaction is the strong movement in so many parts of the world in favor of providing sanatoriums for the cure of pulmonary tuberculosis. Hospitals for consumptive patients have existed in England since 1814; but the first sanatorium in the modern sense of the word for the treatment of consumptives by hygienic measures was founded at Goerbersdorf, Germany, in 1859, by Dr. Hermann Brehmer. The second institution of the kind, established in 1874, was that at Falkenstein, which has for many years been under the charge of Dr. Dettweiler, formerly an assistant at the Goerbersdorf sanatorium which he first entered as a patient. The favorable results attained in these two sanatoriums have made them centres from which convincing reasons have constantly been diffused in favor of the building of such in all parts of the civilized world, that many thousands might be saved who must otherwise die of consumption. The result has been that a large number of sanatoriums in various parts of the world are in operation, while others are proposed or are under construction.

In Germany new sanatoriums are being built so rapidly that, at any given time, it is difficult to determine the actual number. There are now probably 40 or 50 of them. The congress which was held in Berlin last year under the patronage of the Empress Augusta Victoria for the suppression of tuberculosis was a truly international assembly, and its influence in quickening the interest in the work of preventing and curing consumption has been much more far-reaching than the confines of Germany.

In England there are seventeen hospitals, homes, and sanatoriums for consumptives. A national society for the prevention of consumption is organized with the Prince of Wales as president. France has several sanatoriums while others are planned. A notable feature of the charitable work in that country is the seaside establishments for the treatment of scrofulous or tuberculous children. One sanatorium exists near Vienna, and in both Austria and Hungary there is a wide-spread interest in extending the usefulness of this form of charity. Switzerland has four for the poor and others are proposed. King Oscar of Sweden donated over half a million dollars for the building of sanatoriums for needy consumptives. Two had already been in operation some time. Besides some for paying patients, Norway has one for the consumptive poor near the seaside and another is building in the mountains. In Finland there is one at least. In Russia there are a dozen or more sanatoriums for the consumptive poor aside from the one the building of which was made feasible by the gift from the Czar of $300,000 and a large tract of land near St. Petersburg. A society for the erection of sanatoriums exists, wealthy individuals have done much, and collections for this work are made twice a year in all of the churches of the capital. Spain is about to build two; under the patronage of the Empress of Japan, one is to be built in that country; and in Denmark, Holland, Belgium, Bulgaria, Roumania, and other countries there are associations for the erection of sanatoriums for the consumptive poor.

In the large sanatorium in Cairo, Egypt, erected and maintained by Dr. Moharrem-Bey, there exists a notable instance of private munificence rarely equalled. With his whole capital of more than $1,000,000 he is devoting himself to the cure of consumptives by the sanatorium method, and his wife, whose fortune is still greater than his, has consecrated all of her means to the same purpose.

Through the exertions of Dr. E. L. Trudeau, of Saranac Lake, in soliciting funds he was enabled to erect the first of a series of buildings in 1884, of what constitutes the Adirondack Cottage Sanitarium. Another sanatorium in the Adirondacks has lately been built at Paul Smith's, and at Liberty, N. Y., one was opened in 1896. This was built as a memorial to the late Dr. Alfred L. Loomis who for many years hoped to see a sanatorium in that locality, Mr. J. Pierpont Morgan furnishing the means to erect the Administration Building as the first structure. The last legislature of New York made an appropriation for a state sanatorium for consumptives.

At Sharon, Mass., near Boston, a neat little sanatorium was opened in 1891, which has been supported by the generosity of wealthy persons in Boston. The credit of its establishment and supervision is due to Dr. V. Y. Bowditch of Boston. For a year and a half a State Sanatorium for the treatment of consumption has been doing excellent work at Rutland, Mass.

At Fort Stanton, New Mexico, the Marine Hospital Service has established a sanatorium for the treatment of tuberculous patients, and one for the treatment of consumptive soldiers has been fitted out at Fort Bayard, N. M. A considerably larger number of hospitals and homes for consumptives exist in this country, some of which show good results with the modern hygienic methods of treatment. Several associations are doing good work, and planning to erect sanatoriums, notably, the Pennsylvania Society for the Prevention of Consumption.

In Canada there are two sanatoriums, one on the shores of Lake Muskoka, Ontario, which is the first of several which are to be built by the National Sanitarium Association, and another was built in 1898 near St. Agathe des Monts, sixty-four miles from Montreal.

A Plea for a Sanatorium in Maine.

Not long ago the idea which ruled medical thought, as well as that of the public generally, was that tuberculosis is largely due to heredity, and that the percentage of curable cases is comparatively small. There were, furthermore, no clearly defined rules for its prevention. Since that time it has been firmly established that heredity plays but a small part in the causation of tuberculosis; that it is an infectious, or communicable disease of parasitic origin; that intelligently applied prophylactic measures are remarkably successful in limiting its prevalence; and that the lives of a large percentage of persons affected with pulmonary consumption might be saved here in our own State if the modern hygienic treatment for that disease were applied to them, and if the facilities for its application were rendered available.

This advance in what we know about the disease, tuberculosis, presents some questions relating to the duty of the State, of municipalities, and of society generally, in an entirely new light. So long as it was believed that a large death-rate from consumption is an unavoidable concomitant of our modern civilization, there was no clear presentation of duty; but since it is shown that thousands of lives are wasted in this State which might be saved, the enormity of the dereliction of duty is easily apparent if no effort is made to save these lives.

It is only a truthful statement of a fact to say that thousands of persons are dying, inch by inch, through many months of suffering, just because they are unable to pay the cost of their cure. So far as may be, this wrong should be righted in the name of humanity. But in the death of these citizens, needed in the industrial and social development of the State we annually lose hundreds of thousands of dollars. Added to this is the increase in the burden of State and municipal expenditure due to the poverty and pauperism which often follow in the wake of this malady.

It is not alone the poor who are helpless upon the advent of consumption. In many fairly well-to-do homes, when the head of the family is stricken with a disease which, for so many months, makes him an invalid and rapidly consumes his savings, the household often comes to feel the bitter bite of straightened circumstances, whether the patient does or does not make a fight for life by climatic change or in other ways which necessitate unusual expenditures during a period of lessened earnings.

Aside from the pathetic spectacle of so large a number of persons perishing for the want of temporary help which would save many of them, another serious incident of the situation presents itself. In many homes where there are cases of consumption, the sick persons are a source of grave danger to their helpless families, and even to the general public. Each person removed from his unfavorable home surroundings lessens the number of foci of infection by one, and by preventing the communication of the disease to others multiple sources of infection are often avoided.

Thus a sanatorium which might save the lives of fifty persons annually would have a much farther-reaching influence for good than the mere saving of that number of lives. Each person who has been an inmate of a modern sanatorium for consumptives, whether he goes home cured or not, goes as a sanitary missionary. Through the discipline of the sanatorium he has had instilled into his mind, by precept and by the example of the other patients, that he must for his own recovery breathe fresh air and otherwise lead an hygienic life, and that he must at home, at his work, and at all times, avoid endangering others,—and just how to fulfill his duty to himself and to others in this respect he has been thoroughly taught. The beneficent moral influence in the State of these sanatorium graduates would be very great. Thus the value of the educative influence of a sanatorium would be inestimable.

The "public health," as Lord Beaconsfield said, "is the foundation on which reposes the happiness of the people and the power of a country." The duty of the State which is of paramount importance is the preservation of the lives and the health of its citizens. Everything else—industrial and commercial development, education, the refinements of civilization—palls in significance to this.

That every civilized state recognizes its obligation to protect the lives of its citizens, and to succor its unfortunate, is evident. Its hospitals for the insane, its general hospitals, its orphan asylums, its provisions for the blind and for the deaf and dumb, its care of the feeble minded and the idiotic, its support of paupers, attest this. All are provided for except the unfortunate consumptive—he alone remains without help. New exigencies have been thrust forth by an advancing pathology. Many general hospitals are now closed against him. In the hotels at many health resorts he is not wanted.

Much of the large expenditure now made for unfortunates is for persons for whose future usefulness as citizens there is little or no hope. It is made, and rightly made, in the name of humanity. The great majority of consumptives, on the other hand, are persons within those age-periods when they are of the greatest value to the State, their intellect and all their special senses are intact; but it is their misfortune to be the victims of an infection which, in its early stage, is curable in the majority of cases but which, untreated, will drag them down. Many of them could be put well on the road to recovery in their own State at a cost which would barely defray their travelling expenses to and from Colorado or Arizona.

The dictates of humanity urge that they be helped. The material prosperity of the State demands it. Municipal and state boards of trade exert themselves to attract new citizens of a desirable kind and to increase business. Meanwhile the well-to-do as well as the needy, employers as well as employees, the educated as well as the unschooled, are dying of a preventable and curable disease.

Through immigration commissions expenditures are made for the same purpose. Thirty years ago this State made a fortunate investment of money and of land to bring foreign colonists to us, but in the years which have passed since that time, about 40,000 of our own people have died of tuberculosis,—a loss of $20,000,000 in human lives not to mention the inestimable burden of sorrow, poverty, and expenditure which has accompanied and followed this calamity. As a mere matter of business it would be an unprofitable policy and an inconsistent one to continue to let this numerous class of unfortunates die without giving the curable cases a chance to be saved.

In the words of the report of the committee on hygiene, presented to the Medical Society of the state of New York, "on the grounds then of economy, prophylaxis, and humanity, treatment and care should be afforded the poor, suffering from consumption."

The Results of Sanatorium Treatment.

In examining the statistics relating to the treatment of consumptive patients in sanatoriums, two facts should be borne in mind: that a large proportion of the patients have not entered these institutions during the incipiency of their disease when it is the most easily and rapidly curable; and that many of them leave the sanatorium after a comparatively short stay,—much too short for many of the cases. Many of the patients have only been put fairly well on the road to recovery. This is particularly true of European sanatoriums for the poor, in many of which the average period of treatment has been for only ten or twelve weeks.

Of the 309 patients discharged from the Adirondack Cottage Sanitarium in 1898 and 1899, 28 per cent. were apparently cured, 29 per cent. went home with the disease arrested, 29 per cent. were improved, 10 per cent. were unimproved or had failed, and 4 per cent. died or remained less than one week.

"If," says Dr. Trudeau,[1] "we study the gross results on the 1,200 patients admitted during the past fifteen years, the result is as follows:

1. Tr. Assoc. of Amer. Physicians, 1900.

Fig. 15. Adirondack Cottage Sanitarium—Recreation Pavilion, Main Building, and Cottages.

Fig. 16. Adirondack Cottage Sanitarium—Infirmary, Cottages, and Library.

23 per cent. were discharged as apparently cured.

56 per cent. were discharged with the disease arrested or much improved.

19 per cent. were discharged as stationary or unimproved.

2 per cent. died in the institution."

At one of the late meetings of the American Climatological Association, Dr. Edward R. Baldwin of Saranac Lake, stated that the authorities at the Adirondack Sanitarium are in constant correspondence with 115 patients who have been discharged during the past ten years. Most of these are in fairly good health. Some have relapsed slightly, but the majority are able to reside at their old homes and continue their usual occupations.[1]

In Dr. Bowditch's little sanatorium at Sharon, Mass., 25% of the patients have had their disease arrested, or apparently cured, and there has been a much greater percentage of improvements.

At the meeting of the American Climatological Association, last year, Dr. Bowditch gave the subsequent histories of the patients who had left this sanatorium with their disease arrested, or apparently cured. There were 36 of them in all, but as the last two of these were at Sharon only a comparatively short time, and a year had not elapsed since their discharge, they were not included in his paper. Of the 34 remaining cases, 6 have died, 1 has not been heard from lately, 24 are living and in active work and apparently well, and 3 have had a slight return of their symptoms, but are still active and from outward appearances well after adopting similar methods to those of the sanatorium. Of these 34 patients, 6 had been away from the sanatorium from 6½ to 7 years; 10 from 4 to 5 years; 4 from 2 to 3½ years, and 8 less than 2 years. Of the six cases which have died since leaving the sanatorium, one was considered rather a hopeless case on admission. The accidental swallowing of ammonia and the development of other diseases apparently contributed to the return of the disease. Case 2 left entirely against urgent advice and resumed her teaching in a badly ventilated schoolroom. Case 3 left against advice and resumed very hard work as a seamstress. Case 4 left after a stay of eleven months the picture of health. For eight months she remained in a healthful, sunny home in the country apparently perfectly well. Finally against

1. Trans. Amer. Clim. Assoc., XV., 67. 1899.

the most urgent advice of the doctor, she returned to her home near the sea and its dampness and lack of sunshine. Case 5 had to undergo twice, after leaving the sanatorium, severe surgical operations. After the second of these, the patient suddenly died from an unknown cause and no autopsy was allowed. In case 6 the cough and physical signs disappeared completely, and the patient insisted upon leaving against urgent advice and resuming her previous hard, confining work as a domestic. As an offset to these fatal cases are the histories of the continued good health of quite a large number of these discharged patients, although remaining in their former homes and engaging in hard work, sometimes under adverse conditions.

The report of the visiting physicians of the Massachusetts Sanatorium for Consumptives for the first year's treatment of patients is encouraging. Of the patients under Dr. Bowditch's service, the results are given as: arrested, 30.9%; improved, 46.1%; not improved, 21.2%. The average stay in the sanatorium was 4 months; the average gain in weight of the "arrested" cases was 15 3-5 pounds; the largest gain was 45 pounds.

Of the patients treated by Dr. Clapp, the disease was apparently cured, or arrested in 37%; improved in 32%; stationary in 6%; worse in 24%. Of the incipient cases in the sanatorium more than one month, 64% were apparently cured, and of the moderately advanced cases, 13% were apparently cured. The greatest gain made by any one patient was 44½ pounds. The greatest gain in one week was 12½ pounds. Two other patients gained in one week 7½ and 7 pounds respectively. Eighty-nine per cent. of the patients discharged had gained in weight. The average gain was 11 pounds.

Of the patients discharged from the Loomis Sanitarium during the year ending November 1, 1899, 20% were apparently cured; 10% had the disease arrested; 47% were improved; 17% had not improved, and 6% had died. Of 145 patients who entered the sanitarium during, or in it at the beginning of the year, 53 were in the incipient stage, with 77 the disease was in an advanced stage, and in 15 it was far advanced.

At the Loomis Sanitarium, Dr. Stubbert[1] states that from its opening, June 15, 1896, to November 1, 1898, 47 patients

1. Med. News, LXXIV., 150. 1899.

Fig. 17. Adirondack Cottage Sanitarium—Open-air Recreation Pavilion and Cottages.

were discharged cured. Of these he has lost trace of 13; of 33, or 70%, he has positive evidence that they have remained cured, and 1 has redeveloped the disease. In the absence of contrary evidence, 46 of the patients, or 98% of them, may be assumed to have remained well. Of the improved, or arrested cases, there were 25. Of these he has lost trace of 13, and 3 have redeveloped the disease. In the absence of contrary information, the disease may be assumed to have remained arrested in 88%, while in 36% of the cases he has positive evidence that it is so. In the same period, 77 patients were discharged unimproved.

In the Muskoka Cottage Sanatorium in Canada 99 patients were discharged in the year ending September 30, 1899. With these 99 patients the results when they left the sanatorium were:

Discharged apparently cured	21
Discharged with disease arrested	32
Discharged with marked improvement	17
Discharged unimproved	19
Discharged failed	6
Died	4
	99

Of these patients 46 stayed at the sanatorium less than three months, and 53 stayed more than three months. The average period of treatment for the 99 patients was 126 days. The condition of the patients on admission was, incipient cases, 25; advanced, 39; far advanced, 32; doubtful evidence of phthisis, 2. The following table gives the results with the 53 patients who were at the sanatorium more than three months.

Condition on Admission.	Condition on Discharge.						
	Number.	Apparently cured.	Disease arrested.	Much improved.	Stationary.	Failed.	Died.
Incipient cases	14	12	1	1	–	–	–
Advanced	26	4	16	–	4	2	–
Far advanced	13	1	4	3	3	2	–
Doubtful evidence of phthisis	–	–	–	–	–	–	–
Total	53	17	21	4	7	4	–

Of these 53 patients, 46 gained in weight an average of 11 pounds, the weight of 2 remained stationary, and 4 lost weight. The greatest gain in weight in one month was 18 pounds, and the greatest total gain was 43 pounds (during a stay of four months).

At the Tuberculosis Congress in Berlin, last year, Dr. Weicker[1] presented some interesting statistics from his "Krankenheim," which is a sanatorium for the poorer classes of patients. The average stay in the sanatorium has been only about ten weeks. There was no sorting out of patients: advanced cases with a very short stay, and cases suitable for sanatorium treatment which remained five or six months, are all included. Of the 546 persons discharged in the year 1898, 93% were improved. When leaving the sanatorium, 63% of them were capable of resuming their work, 15% were able to engage in light work, and 21% were not able to resume their work. In 1899 a careful inquiry was made into the condition of all of the patients who had left the home in the preceding years. Only 8% were not heard from.

Of the	1898	patients,	48%	could work,	18%	were dead.
"	1897	"	44%	"	30%	"
"	1896	"	30%	"	50%	"
"	1895	"	33%	"	50%	"

Much more satisfactory were the results with the patients who were in the first stage of the disease upon entry, and who were capable of resuming their work when they left the sanatorium. Of these patients discharged in 1898, 95% were still able to work; in 1897, 97% were still able to work; in 1896, 100% were still able to work. This shows the need of choosing suitable material for treatment in sanatoria. It is, declares Dr. Weicker, a false humanity to send inappropriate cases to an institution of this kind. They rob curable cases of the places which they should have.

As was stated by Dr. Schultzen, of Berlin, at the same congress, the Imperial Insurance Office of Germany has issued a report in which it is shown that 8,200 persons received the hygienic treatment for pulmonary tuberculosis in the years 1897 and

1. Bericht über den Kongress zur Bekämpfung der Tuberkulose als Volkskrankheit, p. 553. 1899.

Fig. 18. Adirondack Cottage Sanitarium—Cottages.

1898, under the regulations of the insurance companies of that country. Almost all of these patients were treated in sanatoria. Of these persons, 5,848 of them, or 71%, gained so as to be able to resume their work. The subsequent history of 2,159 of these improved patients was as follows: In one year after their return home 91% of them report a continuance of the improvement, and 66% after the lapse of two years.

In Germany some of the life insurance companies find that, as a pure matter of business, it costs less to cure consumptives than to let them die. Some of these companies have built their own sanatoria. The recent development of this aspect of sanatorium treatment has been remarkable. An investigation of the results made by the Imperial Board of Health shows that of 2,259 patients discharged from treatment, 65.7% were fully able to continue their former work; 6.5% were capable of resuming work, but of a different character; 12.8% returned to their work with a partial disability; and 15.1% upon discharge were unable to continue their work.

A small contribution to the solution of the question of the permanence of the cures in sanatoriums comes from the sanatorium at Grabowsee, an institution established by the Red Cross Society of Germany. Of 68 persons discharged from this sanatorium in 1896, as fully or partially capable of continuing their former work, 51% had, up to March, 1899, been able to continue their work regularly; and 17% more of the patients had worked most of the time. The figures for the patients discharged in the two succeeding years were somewhat more favorable at the same date.

Dr. Schultzen, who was formerly physician in chief of the sanatorium at Grabowsee, emphasizes the necessity of exercising better judgment in the choice of patients for treatment in sanatoria, and deplores the fact that so many inappropriate cases with advanced lesions of the lungs have hitherto been received for treatment. He alludes to the fact that the duration of treatment of many of the patients is much too short, for, according to his experience, an average stay in the sanatorium of three months even for the incipient cases does not suffice. One of the principal reasons for the premature return of the patients to their homes is their solicitude for their families who are deprived of the help of their earnings.[1]

Dr. Jaruntowsky[2] gives the following statistics relating to sanatorium treatment:

"In Dr. Brehmer's Sanatorium at Goerbersdorf, 5,440 patients were treated during the eleven years from 1876-1886. Of these, no detailed reports are available of 408—there remain therefore 5,032 which may be tabulated from Dr. Brehmer's notes as follows:

Stage of Disease.	Number.	Cured.	Nearly cured.	Total.
I	1390 (27.62%)	387 (27.8%)	430 (31%)	817 (58.8%)
II	2225 (44.21%)	152 (6.83%)	325 (14.6%)	477 (21.43%)
III	1517 (28.17%)	12 (0.84%)	33 (2.3%)	45 (3.14%)
	5032	551 (11%)	788 (15.6%)	1339 (26.6%)

"In order to make sure how long the cure lasted in the case of those discharged from the institution as cured or nearly cured, special inquiries were instituted in the year 1890 which went to prove that in five cases the cure had lasted for twenty to twenty-nine years, in fifty-two cases from twelve to twenty-one years, in thirty-eight cases from seven to twelve years. It was further ascertained that of forty patients who were discharged from the sanatorium in the year 1876 as cured or nearly cured, and of whom particulars could be obtained, there were in 1890, or fourteen years afterwards, still twenty-five persons living in good health, one suffered from fibroid phthisis, one died in 1886 from phthisis, while thirteen others had died from unknown causes.

"In the Falkenstein Sanatorium 132 out of a total of 1,022 patients were discharged as cured—13.2 per cent.; 110 as nearly cured—11.0 per cent., giving a total of 242—24.2 per cent. Later investigations have shown that of 99 patients who had left the institution as cured, 72 were still living from three to nine years afterwards in perfect health while in fifteen cases there had been a relapse. (Of these, twelve were subsequently cured).

"In Dr. Haufe's Sanatorium at St. Blasien corresponding inquiries into the fate of 324 patients who had been treated in

1. Bericht über den Kongress zur Bekämpfung der Tuberkulose als Volkskrankheit, p. 516. 1899.

2. Sanatoria for Consumptives, p. 36.

Fig. 19. Adirondack Cottage Sanitarium—"Taking the Cure" in Winter.

the sanatorium during the years 1878 to 1889 showed that of 288, about whom information could be obtained, 72 were living in good health from three to twelve years later, 201 had suffered more or less from pulmonary catarrh from two to twelve years, without however having had to suspend their ordinary business; in twelve cases the health had got worse and five patients had died.

"Finally a statistical statement from Dr. Driver's Sanatorium in Reiboldsgrün of 2,000 cases gave the following results: 13.66 per cent. cured, 28.02 per cent. materially improved, 28.60 per cent. improved, 25.20 per cent. unimproved, and 4.52 per cent. died.

"The foregoing figures and those especially emanating from Goerbersdorf and Falkenstein which relate to over 6,000 cases prove, on the average, 25 per cent. of cures, without having regard to the cases of improvement which often are equivalent to cure in the long run. Equally important also is the information derived from the Goerbersdorf Sanatorium that of all patients who stayed more than a month in the sanatorium, more than eight per cent. were still in good health at the end of fourteen years."

At the Bremen Sanatorium for patients who are not well-to-do, 334 patients have been received; of these, in 37 cases diagnosis was not clearly of tuberculosis. These are excluded in this summary of results says Dr. Michaelis[1]. Of the remaining 297, in 23.9% the disease was in a light form, in 32.7% it was of medium severity, and in 43% the disease was at an advanced stage. With 85.2% of these patients, the general condition was improved; with 8.1% they were not so well as when admitted and the condition of 6.7% remained the same.

Physical examination showed that in 65.3% the condition of the patients remained the same; in 21.2% there was an improvement; and in 13.5% the condition was less favorable.

As to weight, 81.8% had gained in weight upon an average 9.8 pounds; with 8.8% there had been an average loss of 8.3 pounds per person; and with 9.4% the weight remained practically the same.

Of these patients there are now living 184 which equals 62%; and 113 have died, or 38%.

1. Kommunale Wohlfahrtseinrichtungen, Nr. 12, p. 138. 1897.

The average length of time of residence at the sanitarium, says Dr. Michaelis, was 80 days. "These results are not very remarkable, but they are worthy of note. The wish of the director of an institution of this kind is that he might receive the most favorable material, but I should find myself in a difficult place if I would undertake to sort out the curable cases. Many patients in the early stage of the disease have pulmonary tuberculosis in the acute form and are incurable. Other patients in the second stage of the disease have held their own fairly well for successive years. Many cases are incurable, but these even can be improved."

Objections Against Sanatoriums.

Drs. Stubbert and Wells, of the Loomis Sanitarium, referring to the extravagant statements of one medical writer, about the "intolerably tedious and obnoxious life of sanitariums," say:[1]

"Such surprising statements show a lamentable ignorance of the life in a sanitarium. No one familiar with the noble work carried on for years by Dr. Trudeau in the Adirondack Sanitarium would give a second or serious thought to such perversions of facts. We can easily imagine the unanimous protests of the hundreds of grateful patients who have enjoyed the privilege of a sojourn at that sanitarium, of the large number who have returned thence to their homes greatly improved, and of the many actually cured under its judicious and scientific management.

"At the Loomis Sanitarium, since June, 1896, we have admitted 330 patients. From this number we can recall but three among the more intelligent who complained on account of 'hospitalism or institutionalism.' We find three classes of patients: 1. Those of exceedingly nervous temperament, lacking in self-control, who would not remain long on any spot in the civilized world; these leave a sanitarium. 2. The dissipated, quarrelsome, or otherwise objectionable, who possess neither moral stamina nor consideration for the comfort and welfare of self and neighbors; this class, if not discharged as 'objectionable features,' leave of their own free will to avoid attempting recovery of their health. 3. Those realizing their condition, are

1. Reprint from St. Louis Med. Gaz., December. 1898.

imbued with a full sense of responsibility to themselves and their families, and come here for the single purpose of regaining their health. Whether rich or poor, they are possessed of innate refinement of character and action, and their universal testimony is always in favor of sanitarium life and surroundings; they consider it a home. Two charming young girls, a patient accompanied by her cousin as companion, made this remark: 'If we must be absent from home, there is no place so attractive as this for a sojourn.' These young persons, on account of an idea of 'hospitalism,' had previously spent some months in the largest hotel in the town and at a comfortable boarding-house in the suburbs. One male patient who went away for a few days on business, remarked on returning, 'I am glad to get back; it seems like home.'"

Dr. V. Y. Bowditch has this to say about the erroneous idea that consumptive patients in sanatoriums are depressed by associating with others afflicted with the same disease:[1]

"It may be well for me to refer to what I have alluded to in previous papers, namely, the idea that the presence of others who are ill in the same institution has a deleterious mental effect upon the patients. As a matter of fact, this objection, which doubtless exists in the minds of many, amounts, not only in my experience, but in that of every physician who has had control of a properly regulated sanitarium, to practically nothing when compared with the advantage to be gained. It has surprised me frequently to see how soon patients become wonted to their changed method of life after the first inevitable sense of strangeness and homesickness wears off, and how quickly they become cheerful and often happy in their surroundings. Depression comes usually from some outside source or from a cause other than the mere presence of other invalids."

Dr. Edward O. Otis, who has made a careful study of the sanatorium treatment of consumptives, says, in telling about a visit to Dr. Dettweiler's Sanatorium at Falkenstein:

"I was struck with the appearance of the patients as I saw them at dinner: they hardly differed from the persons one would see in the dining-room of an ordinary hotel; and presented but little, if any, the appearance one usually associates

1. Boston Med. and Surg. Jr., CXXXV., 125. 1896.

with a consumptive. During the entire meal I hardly heard a cough. Moreover it was as contented and happy a looking assemblage as one would see anywhere."[1]

Dr. Otis refers to a private letter to Dr. Trudeau, of the Saranac Cottage Sanitarium, from one who had spent some days in his institution as indicative of the spirit prevailing there: "Your patients there," it says, "are fortunate indeed; and I guess they all know it, for a happier set of invalids I never saw. At my table none looked ill, and were as intelligent, and refined and jolly a crowd as I have seen all summer. I have visited in my time many hospitals, asylums and homes, but none like this."

Sanatoriums vs. Open Health Resorts.[2]

"The more intimate our knowledge of the disease and the multiplicity of its pathological conditions, and of the character of the average phthisical individual himself," affirms Dr. Otis,[3] "the more hopeless seems the task of properly treating him, under however favorable a climate, without absolute control both of his body and of his mind. 'It is upon a multitude of small details most frequently that the cure depends. In appearance they may seem trifling, but in reality they are of capital importance.' The treatment, in a large measure, must consist in causing the patient to give up his bad hygienic habits and replacing them by good ones. The phthisical patient is a sick entity, sick in body and mind. He distorts the true relations of things, and when left to himself frequently acts disastrously from this distorted point of view. His moral and mental condition requires a vast deal of study and observation, which is only possible when he is immediately and constantly under his physician's eye. You, who practice in health resorts, I think, will corroborate these statements, and could doubtless adduce many cases in your own experience as illustrative of them. 'A consumptive,' says Leon-Petit, 'given up to the care of those about him will be at the mercy of anything that may happen. In spite of the frequent visits of his physician, he will have to contend with his own peculiar weakness; he will commit with the best of intentions the gravest faults. His establishment may be

1. Boston Med. and Surg. Jr., CXXXVIII., 316. 1898.
2. See "Rest and Exercise," p. 127.
3. Trans. Amer. Clim. Assoc., XII., 12. 1896.

Fig. 21 Massachusetts State Sanatorium.

perfect and the climate irreproachable, but he lacks the principal factor of treatment, without which all the others are rendered powerless—namely, the guide which he feels watches him constantly, in whom he has confidence, and who knows how to remove from his path the obstacles which can cause him to stumble.' It is emphatically the case, as Dettweiler says, that the individual *in toto* has to be treated, and the moral education is quite as important as the bodily treatment. A consumptive is in a peculiar mental condition as a rule, possibly not different from that which is the concomitant of any chronic depressing disease, but which renders constant supervision and inspiration necessary. He lacks perseverance and power to concentrate the mind and will upon a definite object. In brief, as some one has said, a typical case of phthisis embraces little less than the whole field of pathology."

The late Dr. Paul H. Kretzschmar made a careful study of the question of the best places and the most favorable conditions for the treatment of consumptive patients, and, basing his judgment upon his personal experiences gathered while visiting health resorts both here and abroad, he gives the sanatoriums a decided preference over the open health resorts. He cites a few striking examples which must necessarily appeal to the intelligence of everyone:[1]

"The second day of my stay in Davos I met an old friend, who invited me to visit him at his hotel—Schweizerhof—during the afternoon. On my arrival I found my friend, with three others—all of them phthisical patients—playing cards, smoking and drinking beer in the guest-room, where others could be found enjoying themselves in the same or similar manner. To my own knowledge the party kept up the interesting and somewhat exciting game of scat from 4.30 to 8.30 P. M., and one or two of them drank as many as five litres of Bavarian beer.

"A gentleman who had been in Davos about eight months, and had been improving considerably, informed me that about ten days previously he had joined a party of friends—not patients—and had climbed one of the neighboring mountains, the Schatzalp; that he felt entirely exhausted after his return home. The following day he had a slight hemorrhage, and has had fever ever since.

1. Reprint from *Medical Register*, October 20, 1888.

"During my recent visit to the Adirondacks I saw a gentleman, who had informed me that he had lost twenty-three pounds within six months, and whose constant coughing plainly indicated the source of his wasting away, standing in front of the bar and drinking one bottle of English stout, the bar-room at that time being filled with from fifteen to twenty guides smoking cheap cigars or poor tobacco from pipes. After drinking the porter the gentleman went from the hot and close bar-room a short distance through the yard into another building containing the billiard-room, and there he played pool for two hours, he and the other two players smoking. Before retiring the party once more crossed the yard and took another drink. It may be stated that the writer was informed that the gentleman just spoken of had been advised by his physician to drink stout for his health.

"At Paul Smith's, in the Adirondacks, a place which deserves the reputation it enjoys as a summer and pleasure resort, many faces bear the evidence of pulmonary troubles. But dancing is going on every night in the week, and many young women who visit that famous region of the state of New York in search of restoration to health, indulge. They become excessively hot, breathe the dust caused by dancing, and, resting on the arm of the gallant cavalier, they afterwards take a walk in the chilly night air.

"A personal friend of the writer, who stays now at Rainbow, near Saranac Lake, told him that he had been improving right along until a short time ago, when, after rowing fifteen miles, he felt very much exhausted, and that he had been losing ground since then.

"Is it necessary to say that such errors as observed in open health resorts could not very easily be committed in any properly conducted sanatorium?"

"Incipient cases," says Dr. Stubbert, "all do better within a sanitarium—*i. e.*, one built on the cottage plan. A certain smaller percentage do well outside, but in any given case the recovery is more rapid within a sanitarium. Statistics show that about 86 per cent. of the patients treated in a sanitarium improve, but only 58 per cent. outside; that in 41 per cent. the disease is arrested and cured within, but in fewer outside.

Fig. 22. Massachusetts State Sanatorium—The "Air Cure" in Winter.

Fig. 23. Massachusetts State Sanatorium—A Patient in Winter Attire.

"Prudence on the part of the patient is essential, as is shown by the fact that 68 per cent. of wise patients in the first stage recover, and but 31 per cent. of the unwise in the same stage of the disease."

On another occasion Dr. Stubbert drew for comparison these two pictures:[1]

"A sanitarium patient lives in a snug cottage, charmingly arranged and luxuriously appointed, every group of four to eight having their private parlor and bath. The bedrooms are retired and bright, the reception rooms homelike; every cottage has electric lights, most have a modern hot-water heating plant and broad verandas facing the south. A complete telephone system connects all cottages with the administration building. A capacious casino provides a place for lounging and amusement, and a large, carefully selected library, pianos, billiard-room, etc., furnish recreation. In the administration building are found all the appliances for the most modern and scientific treatment of cases, including an infirmary, solarium, laboratory, and throat room. At any time during the day or night physicians and nurses are available, but, excepting on regular examination days or in an emergency, patients need not speak to any one professionally; they simply know that such help is available; and yet so thorough is the unobtrusive oversight maintained that if a patient is likely to harm himself by well-meant but injudicious action, a word in time saves subsequent trouble and sickness. The rules and restrictions are few; regular hours for meals and retiring, out-of-door life during the daytime, no smoking indoors, absolute care *regarding disposal of sputa,* haemorrhagic and fever cases not to walk beyond certain limits. Aside from these rules patients come and go at pleasure. Some walk miles at a time over the hills, and think little of the trip to the village and return, a distance of seven miles. They fish, hunt, play croquet, and ride bicycles in the summer, while during the winter months tobogganing and sleighing take the place of other sports. During evening hours debating societies and social functions in the different cottages are frequent, and many a happy hour is wiled away with mandolin, guitar, or piano. Is there any 'all-prevailing and ever-present depressing effect of hospitalism' in this picture?

1. N. Y. Medical Jr., LXVIII., 160. 1898.

"Look at the other side: A patient locates in a farmhouse where he obtains but one thing—good, plain food, and not too much of that. The rooms are arranged, not for light, ventilation, warmth, or comfort, but with the single idea of crowding in as many boarders as possible. The patient may spend his evenings in the common family room, heated from 75° to 85° F. by a large stove, and not ventilated. Then, after the social and intellectual feast to be expected, he goes to his cheerless room, passing on the way through cold, dreary halls. His room is likewise cold, or else is heated by that abomination of civilization, a stove. Does he require to visit a closet before retiring or during the night (such emergencies *do* occur with consumptives), he may wander down stairs and out through the snow. However, this may toughen him. Does he require a nurse? There are none. A physician? Instead of telephoning from his cottage to the main building, as at this sanitarium, and receiving immediate attention of both physician and nurse, he must arouse one of the familv, wandering again through cold hallways to do so, and wait from one to four hours until the doctor arrives. If the patient is in a large boarding-house or hotel, his surroundings are better, but not inspiring. From the vantage ground of a busy practice among both sanitarium patients and private cases distributed among hotels, boarding and farm houses, I am certain that the life in a sanitarium is less depressing; there is more real happiness and less consideration of self among the patients; there is infinitely less conversation relative to disease; I hear far more complaints from my outside patients of 'disgusting familiarity' in discussing symptoms than from those within the sanitarium. The reasons are self-evident: In the sanitarium the patients are grouped in small cottages, and, having the entire surrounding country over which to roam, are scattered during the day. In boarding places they are herded on a common veranda or in a parlor; and when they walk out are constantly meeting with others more ill, perhaps, than themselves.

"In the Loomis Sanitarium, out of seventy-five patients to-day, all excepting nine are able to walk at pleasure from one to five miles at a time, up hill and down. In a town at least forty per cent. of patients congregated will not be able to walk more than half a mile. Among the seventy-five patients at the sanitarium

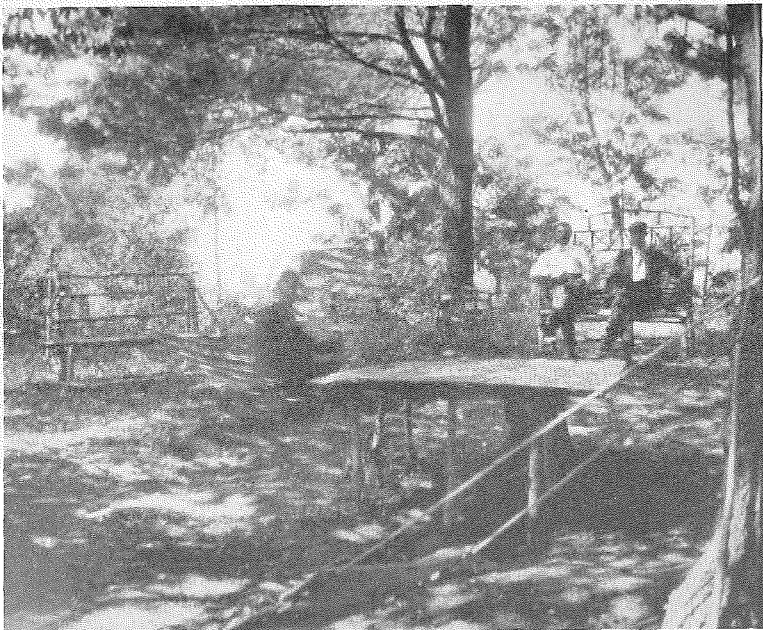

Fig. 24. Massachusetts State Sanatorium—A Summer Camping Place.

Fig. 25. Massachusetts State Sanatorium —A Group of Patients in the Woods.

a stranger would pass by at least eighty per cent. as healthy people. In town, fully sixty per cent. of the sick show traces of their sad illness. Where, then, are comparatively depressing influences to be found—within or without the sanitarium?"

The Question of Danger from Sanatoriums.

It has been suggested that there is danger in bringing a large number of consumptives together in a single institution,—first, that the patients endanger each other, and secondly, that the people in the surrounding country are endangered. These ideas, however, are the fantasies of misapprehension. Buildings occupied by consumptives who are under no intelligent control are not safe places for other persons to occupy. In some open health resorts the visits of large numbers of consumptives have caused a marked increase in the prevalence of tuberculosis among the native population. When, however, the incoming patients have been kept under strict discipline, so far as the care of their sputum is concerned, there have been no evidences of danger to fellow patients and attendants, nor to the inhabitants of the surrounding country.

"Römpler investigated the mortality from consumption from 1790 to 1889 in the village of Görbersdorf, which is close to several large sanatoria, with an aggregate of 500 to 600 beds. Before the establishment of the oldest sanitorium the deaths from consumption in the village were at the rate of 0.83 per annum; whereas since that time the rate was 0.47; and yet the population had doubled in twenty-five years, and in forty years some 25,000 consumptives had been treated in the different sanatoria. Nahm, who made similar investigations in the village of Falkenstein, obtained corresponding results. During the twenty years preceding the establishment of Dettweiler's institution an average of 4 per 1,000 of the inhabitants died annually of consumption. After the sanatorium was opened the average annual mortality from this disease fell to 2.4 per 1,000. Dr. Römpler has had five servants for twenty-three years at his large sanatorium, and seven more than five years, out of twenty-three in his present staff; not one of these twenty-three is consumptive, nor any whom he can trace who have been in his employ, although they necessarily come freely in contact with the patients. Dr. Achtermann, for many years connected with the

Brehmer Sanatorium, and now at Laubbach, states that he was for years in the habit of testing by inoculation the dust from the corridors, saloons, W. C.s, and patients' rooms. Only once did he find evidence of the existence of tubercle bacilli, on a washing board where a spitcup had stood." [1]

Dr. Knopf says: "I have lived myself for months in the midst of 150 tuberculous patients in all stages of the disease, taken my meals with them, slept in a room that had been occupied by some of them, and associated for days and weeks with no other persons than these and my three colleagues, one of whom was a convalescent consumptive himself. I can assure you I felt safer from the danger of inhaling the tuberculous bacillus while serving there as assistant physician in the Falkenstein Sanatorium, than I feel here in our streets, churches, theaters, hotels, and Pullman cars."

"In a sanatorium worthy of the name," says Professor Netter,[2] "there will always be found all of the conditions destined to render absolutely innocuous all of the elements of danger coming from consumptive patients. What a difference from this point of view when compared with the conditions found in families or in hotels. A well directed sanatorium should present no danger to its vicinity. That is the decision of scientists and all legislators in all countries."

The Site for a Sanatorium.

A sanatorium for consumptives should be so located that it may conveniently be reached from the most populous parts of the State. It should be easily accessible from the main railway lines, but not directly on them. An interior location, rather than proximity to the ocean is preferable. As relative purity of atmosphere is important, the sanitarium should not be in the immediate vicinity of a city nor near industrial establishments which contaminate the air. There should be an absence of insect pests which abound in some places certain seasons of the year. The outlook should be interesting, and the surrounding country, accessible to the patients, should present the opportunities for pleasant walks. Abundant sunshine in and around the sanato-

1. Walters. Sanatoria for Consumptives, p. 66. 1899.
2. Revue de la Tuberculose, III., 39. 1895.

rium is a necessity, but surrounding woodlands serve to ameliorate the inclemency of the cold season.

The ground for the sanatorium and that which will surround it, should be porous and have good natural drainage. It should slope to the south or southeast, and should be protected by hills or forest growth from cold northerly and westerly winds. There should be available a plentiful supply of good water for all purposes, and an unobjectionable outlet for the necessary sewerage system. Many excellent locations for sanatoriums exist in the large strip of territory, somewhat remote from the seacoast, extending across the State from Oxford to Aroostook counties. Convenience of reaching the place, and a combination of the other advantages which have been mentioned, rather than any light which comparative mortality rates are supposed to diffuse, should guide in the selection.

NOTES ON SOME AMERICAN SANATORIUMS.

In the few following pages brief descriptions will be given of some of the sanatoriums for consumptives in the United States and Canada together with the methods of treatment carried out in these institutions.

The Adirondack Cottage Sanitarium.

To Dr. E. L. Trudeau belongs the credit of having established the first sanatorium in this country for the treatment of consumptives by those hygienic methods which Brehmer and Dettweiler of Germany had demonstrated to be so effective in the cure of phthisis. This sanatorium is situated near Saranac Lake, in the Adirondack region in the northeastern part of the State of New York. It is about a mile and a half from the village of Saranac Lake upon a hillside which slopes to the east, and from which an inspiring view of forests and of distant mountains is had. The surrounding forest is mostly of hard wood, though an abundance of coniferous growth is to be seen upon some of the surrounding hills. The sandy or gravelly character of the ground insures good drainage and obviates the dangers of a damp soil. The place is protected from the cold winds of the west and northwest by the hills and forest growth in those directions.

This sanatorium is slightly farther north than the capital of Maine and this, with its altitude of 1,700 or 1,800 feet above the sea, gives it at least as prolonged and severe a cold season as is to be found in any of the central part of this State. The winter weather, however, is dry and exhilarating, and in summer is comparatively cool. The air is pure and free from dust.

The buildings consist of a central administration building; a recreation building, all of the sides of which are arranged to be open or enclosed with glass according to the exigencies of the weather and the direction of the winds; a library, an infirmary, a chapel, and cottages for the patients. (See Figs. 15-18). Most of the buildings are of wood, but the walls of the central building, the library, the chapel, and a new cottage are built wholly or in part of stone. The surface of the walls of the buildings is of hard finish. The floors are of hard wood, are easily cleansed, and are without carpets, but are covered in part by rugs which are easily removable for cleansing.

The furnishing of the rooms is comfortable with a suggestion of luxury, although there is an exclusion of draperies and all unnecessary things which might serve to harbor infection. The cottages consist of one story structures with a central sitting-room communicating with the veranda in front and with the sleeping rooms of the patients on the other side of the building. The sleeping rooms are occupied by only one person. To facilitate the movement of air through the rooms, the partition walls between the general sitting-room and the sleeping rooms extend to a height of only seven feet. The ventilation is through a large open fireplace in the sitting-room, and at night through open windows, principally those of the central room. The buildings are warmed with hot water, each cottage having its own separate heating apparatus. Most, if not all of the cottages have been built and furnished by persons who have appreciated the work which Dr. Trudeau has been doing. Their cost has varied, but that of the last, and one of the best that has been built was between $3,500 and $4,000. One of the most generous benefactors of the institution is a lady who authorized the doctor to build and equip at her expense a laboratory for the study of tuberculosis and its bacillus. The laboratory is now in running order and valuable work is being done in it. The weekly cost of keeping the patients is between seven and eight dollars a week for each person, but they are charged only five dollars a week. The deficiency thus incurred is made up in various ways but principally from the proceeds of fairs held each summer at the Saranac Lake Inn and Paul Smith's Hotel, and by donations. So far as is possible the beneficient work of this sanatorium is extended to the worthy poor. In 1899, 46 out of the 254 persons treated were non-paying. The stay of the patients at the sanatorium is now limited to six months, although the time may be extended in some cases.

In the care of the sputum the paper spit-cups are used day and night. Each patient puts the paper of his spit-cup, at given intervals, into a receptacle in which it is carried to the crematory. Spitting into handkerchiefs is strictly prohibited. Spittoons are not in use, but larger paper spit-cups are placed in niches in various places in the buildings and outside. The frequent washing and disinfection of rooms does not appear to be so prominent a part of the management as at some of the other sanatoriums; due perhaps to the negative results of the investigations of Dr. Hance.

The patients arise at seven o'clock and retire to their rooms at nine. Lights must be out at half past ten. From ten to twelve hours a day in the open air is deemed desirable, but in winter it is difficult to put in more than eight hours this way. The outdoor life is practically unlimited by the weather. In cold weather heavy sweaters, coonskin coats, and blankets when not exercising ensure comfort. (See Fig. 19). The amount of exercise is prescribed for each patient. Resting places are found at frequent intervals along walks and paths so that over-exertion may be avoided. Rest for febrile patients is the rule. "Absolute rest, so long as it is in the open air," says Dr. Trudeau, "is the best measure at our command to reduce the pyrexia of tuberculosis, to conserve the patients' energies, to abort the activity of the process, and encourage the formation of fibrous tissue about it." Special lung exercises, such as forced breathing, are not prescribed. It is deemed best not to use them. Headache sometimes, and occasionally an increase of the patient's temperature are observed to follow exposure to intense sunlight, but the most frequent complaint from the patients at the sanatoriums is that the direct sunlight is hard on their eyes. The testimony here, as well as elsewhere, is that the therapeutic influence of the cold weather is decidedly better than that of the warm season. Patients contract colds very rarely. No special processes of "hardening" are prescribed for newly arrived patients. Drugs are used but very little. They do not form an essential part of the treatment, but are prescribed as needed for intercurrent affections.

The patients have three principal meals—at 8 A. M., and at 1 and 6 P. M.—with lunches in between at times to suit each individual patient. The diet is varied but is largely composed of meat, eggs, and milk. For some patients eggs are used up to five or six daily. Milk is taken at and between meals. Cream, other than that upon the milk, is not used.

The Sharon Sanitarium.

It is located in the town of Sharon, Mass., a mile and a half from the village of the same name and eighteen miles from Boston, at an altitude of only 300 or 400 feet above sea level. While the climatic conditions are those which are generally prevalent in the eastern part of the State, its favorable local conditions tend to mitigate in a degree some of the asperities of the climate. For example, its distance of a dozen miles or so from the seacoast and the sandy or gravelly soil of its site protect it in some degree from the harshness of the dreaded "east winds," and ensure less fog and more sunshine than immediately upon the coast. From the cold north and northwest winds the building is well protected by higher ground in those directions and by wooded growth in which pine predominates.

Until the present season this institution, aside from a small infirmary, consisted of only one building containing beds for nine patients, but this year an addition has been made to the building comprising not only a new wing, which contains ten additional bedrooms, a bathroom and treatment rooms, and a large sun-parlor, but also an official building containing a suite of rooms for the matron and a resident physician, the whole system of buildings being connected by a subway. The sanatorium faces the south and upon that side of the building upon a roomy piazza protected from rain or the too intense action of direct sunshine, and from the east and west winds by projecting wings

Fig. 26. Loomis Sanitarium——Bird's-eye View in Summer.

on either side, the patients have ample room for their outdoor air cure. (See Fig. 20).

Thus far there have been facilities for only female patients. They are generally an intelligent class of young women of limited means. Each has a sleeping room to herself. Although the cost of support and treatment is greater than that, each patient is required to pay only $5.00 a week which includes everything but laundering.

In the cleansing of the rooms no dry sweeping is allowed. The walls of the rooms are painted so as to admit of washing, and they and the smoothly finished floors of hard pine are washed or wiped very frequently in a disinfectant solution. Pieces of carpeting serve as rugs and they too are often subjected to the action of a disinfectant solution.

The patients retire at 9 in the evening. During the night the heat is shut off from their rooms and the windows are open. They arise at 7 A. M. and spend most of the time during the day upon the piazza or elsewhere in the open air.

In the care of the sputum the paper spit-cup in the metallic frame shown in Fig. 4 is used by the patients during the night, but during the day the sputum is received in paper napkins which are tucked into rubber pouches after expectoration. Paper napkins are used for wiping the lips, and handkerchiefs are not to be used for that purpose. When away from the sanatorium each patient has a leather bag in which the napkins and rubber pouch are carried. The final disposal is by burning the soiled napkins and paper cups in a stove.

The hours for meals are 8 A. M., and 12.15, and 6 P. M. Between these, lunches come in at 10 A. M. and 3 and 8 P. M. The diet is varied including a good proportion of meat, eggs, cream, and milk, the last particularly at lunches.

The following "Suggestions for the use of Patients" are put into the hands of each new patient:

The Sanitarium is intended to be a happy home for the inmates to regain their health in. It rests largely with the patients that it shall be so.

Adherence to certain simple rules is essential.

By so doing no one need feel, because he has trouble with the lungs, that he is a source of danger to others.

When coughing or sneezing, always hold the hand or, better, a Japanese paper napkin before the mouth.

Abstain from coughing as much as possible, especially in the presence of others. It is very easy to acquire the habit of coughing or constantly clearing the throat, which is bad for the throat and not pleasant to hear.

If a paroxysm of cough comes on, leave the room until it has passed, especially at the meal table.

Under no conditions whatever expectorate into anything other than the Japanese napkins or sputa cups provided for the purpose.

Never use handkerchiefs or washbowls or sinks for this purpose.

Never expectorate upon the ground.

These rules are *imperative* for the health of all, and must be strictly adhered to.

The chief essentials for regaining health are constant fresh air, good food, cleanliness, cheerfulness.

Therefore avoid sitting in the house when you can perfectly well be out on the piazzas or on the grounds. *Seven* hours, at least, out of doors, sitting, reclining, or walking in winter, and *nine* hours, at least, in the summer, should be the rule. If stormy, go out for a walk, even if clothes have to be changed upon returning.

Avoid congregating closely about the tables when in the parlors.

Avoid closing the windows in the parlors or in the bedrooms. If you feel cool, put on more clothing. You defeat the object of your coming to the Sanitarium by disregarding this rule.

Avoid sitting over the radiators or registers.

Avoid leaving the meal table without eating sufficiently.

Eat even if you do not feel much appetite. As you gain in strength, your appetite and digestion will improve.

Cleanliness is essential for health.

Always wash the hands thoroughly before meals.

Bathe the whole body twice a week at least.

Sponge the chest with cold water every day, and rub briskly with a rough towel.

Fig. 27. Loomis Sanitarium—Administration Building. Built by J. Pierpont Morgan.

Brush the teeth twice a day, keeping the brush in a disinfectant solution.

Rinse the mouth and gargle with cleansing solution twice a day.

Avoid handling dogs, cats, or other pets.

Avoid kissing on the mouth.

Cheerfulness and hope are great aids in getting well. Therefore avoid thinking of small ailments, but speak to the physician if anything special troubles you.

Avoid talking of your symptoms with others. If you feel depressed, try to do something for somebody else.

Exercise. Follow the advice of the physician and matron on this point carefully, for much harm may come from over-exercise.

In walking, always stop *before* you are tired. Two short walks are better than one long one if you get easily tired. If you feel feverish, do not exercise, but *rest* in the open air unless otherwise ordered.

Every day take five long deep breaths with the mouth closed, holding each breath a few seconds. Then force the air out of the chest as far as possible. Do this, when sitting or standing erect, four times a day,—just before breakfast, just before dinner, just before supper, just before going to bed, and as much oftener as you can during the day, unless advised to the contrary by the physician or matron.

When you leave the Sanitarium, do not forget to practice the rules taught you, but teach them to your family and friends. By so doing you will become a missionary, and can help others to keep well.

Massachusetts State Sanatorium.

This institution is located in the town of Rutland almost exactly in the geographical center of the state at an altitude of 1,200 feet. The grounds consist of 200 acres, 40 acres of which are covered by a young growth of deciduous trees. The soil is sandy and porous. The climate is that of New England generally back from the seacoast. As no manufacturing establishments are near and the sanatorium is at some distance from a public highway, the air is remarkably free from dust. There is an excellent water supply the source of which is a pond not far away. A good sewerage system conducts the sewage to filter beds three-fourths of a mile distant. This institution was built by the state and is supported by annual legislative appropriations. It accommodates 175 patients nearly equally divided between the sexes. It is intended for the treatment of incipient cases, but many of the patients admitted have passed the earliest stage of the disease. Representatives of the various classes of life are present, though the great majority are intelligent and respectable wage earners.

A general view of the Sanatorium is given in Fig. 21. The plan consists of a corridor which describes a curve with its convexity to the south and from which the several pavilions radiate to the southeast, south, and southwest, as the spokes of a wheel radiate from its hub. To each building, or pavilion there is therefore assured a free admission of air and sunlight. The buildings for the patients are one story wooden structures the outside of which is covered with cement, or staff. At the south end of each is a solarium surrounded by a so-called piazza which has no roof and in which the patients can take their air treatment protected from the winds by the buildings back of them and by a sort of protecting bulkhead which encloses them. (See Fig. 22). The larger part of each pavilion constitutes a ward containing beds for from 6 to 24 patients. A minority of the patients occupy rooms with a single bed. These smaller rooms are occupied by patients who by their coughing or otherwise might keep the other patients awake or might be disturbed by other patients. These smaller rooms also serve for the reception of acute or critical cases, or for the temporary isolation of rare cases of pneumonia or other disease.

Each patient is required to pay $4.00 a week. There are no extra charges. The whole cost of maintenance, however, has been $8.40 a week for each patient. Some non-paying patients are admitted.

The principal measure for the avoidance of infection here, as in other sanatoriums, is a systematic care of the sputum and its

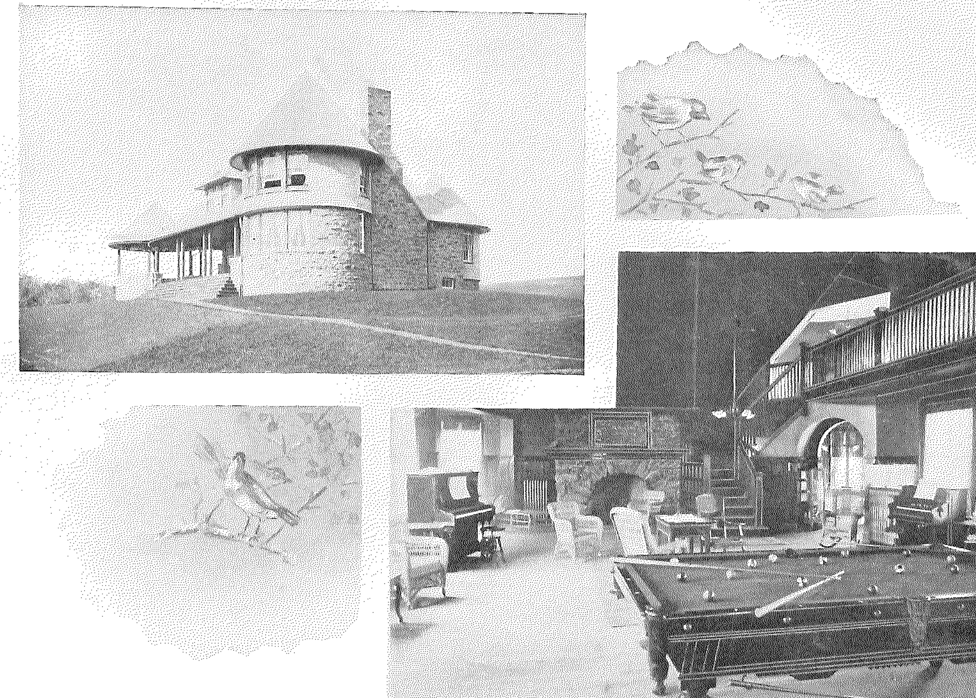

Fig. 23. Loomis Sanitarium—Casino, Exterior and Interior—Built by Mrs. George Lewis.

destruction before it becomes dry. Each patient is supplied with the paper spit-cup shown in Fig. 4 and his expectoration must invariably go into this while he is at the sanatorium or anywhere upon its grounds. The sputum in the soiled cups is collected twice daily and burned in a special furnace. The handkerchiefs, after they have been used by the patients, are kept in a disinfectant solution until they are sent to the laundry. Carbolic acid and corrosive sublimate solutions are the disinfectants most largely used. The hard pine floors receive a dressing of turpentine and wax at short and regular periods and are washed at intervals with hot soapsuds. The hard-finished walls are washed in corrosive sublimate solution, and sunlight and fresh air in abundance exert their purifying action.

The treatment of the patients is essentially hygienic. But little medicine is required. Febrile patients and those in which hemorrhage is imminent have absolute rest with an abundance of fresh, preferably cool air. Exercise or rest is prescribed according to the requirements of each case. The patients go to bed at half past nine. In cold weather the windows are closed and the steam is turned into the pipes before the time of retiring until the chill is taken off the rooms. After the patients are safe in bed the many windows on both sides of the room are opened and the heat is turned off. During the night the temperature of the rooms is practically that of the open air. Colds are rarely contracted, less frequently than by healthy persons at home. Patients, particularly at first, are protected from the draughts from the windows at their heads by wrapping or spreading a blanket over their heads and when a driving storm occurs the windows on the windward side only are closed. To the question how many cases of pneumonia there had been among the 175 patients during the year the answer was "just two."

The time for rising is a quarter of seven. Then again, in cold weather, the heat is turned on so that the patients may avoid a chill while dressing. After breakfast the day's life in the open air begins,—from eight to twelve hours, eight hours daily being required. Better results in winter than in summer are obtained here, as in the other sanatoriums.

The hours for meals are 7.30, 12.30, and 5.45 and lunches are had at 10.30, 3.30, and 8.30. The diet is generous and varied, meat, eggs, and milk forming a large part of it. Eggs are taken *ad libitum* when they can be obtained, and as much milk hot or cold is given six times a day as the patients will consume. Cream is not given, but Dr. Marcley, the physician-in-charge, says it would be if they could afford it.

In the way of pulmonary gymnastics, breathing exercises and light arm movements, as in the Sharon Sanitarium are used. For amusements there are concerts, mostly by home talent among patients and employes, and games on the verandas and grounds. A library of 1,500 volumes has been donated by friends. One has the impression that the patients are a happy and contented lot.

An interesting part of the sanatorium life here is to be seen in the camps which the patients have built in various lean-to and other unclassical styles of architecture upon the southern slope of the wooded hill north of the sanatorium. Here the owners of the camps pass many hours reading to themselves or to one another, at light games, or basking in the sunshine as it flickers through the trees. Even winter does not put a stop to this open-air life in the woods. Fig. 24 shows one of these camping places in the summer, and Fig. 25 a group of patients in the woods in winter.

The Loomis Sanitarium.

It is situated in the town of Liberty, Sullivan county, N. Y., is two miles and a half from Liberty village, and about four hours by rail from New York City. This is a cottage sanatorium built upon dry and rather stony and rocky land which lies at an altitude of 2,300 feet above the sea. The ground slopes to the south, is protected on the north by hills, but it has the full sweep of the westerly winds. The climate is cold and dry in winter and cool in summer. Visited while New York and other cities were suffering from intense heat, the air of this place was found to offer an agreeable change. The water supply comes from two mountain springs. The sewage, conducted through a Waring sewerage system, is disposed of by filtration a quarter of a mile from the buildings. The initial step in erecting this sanatorium was made possible by Mr. J. Pierpont Morgan, who built the principal, the Administration Building. This was burned in the fall of 1899, and is now being rebuilt. Cottages have been

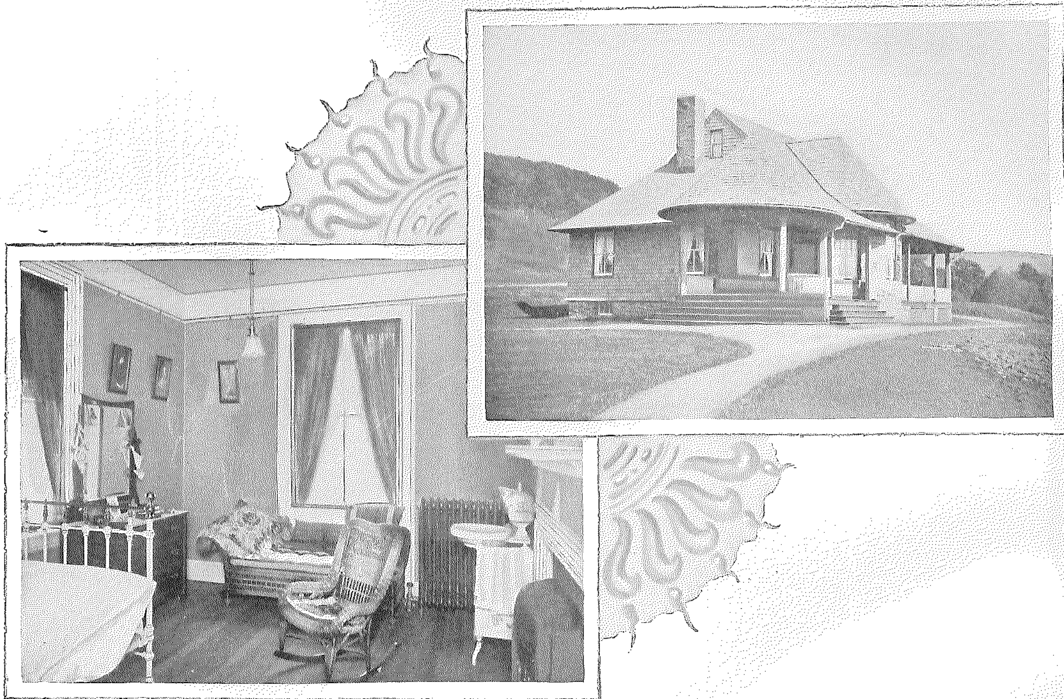

Fig. 29. Loomis Sanitarium—Sloane Cottage. Built by Mrs. W. D. Sloane.

built from time to time by different persons until the present number of buildings is fifteen. (See Figs. 26-29).

This institution now has accommodations for 100 patients. It is now said to be upon a self-supporting basis. The rates are 15, 20 and 25 dollars a week. This pays for room, board, and medical treatment. Medicines are charged at wholesale rates. A few non-paying patients. The directors are now planning to build upon the distant slope of a hill in full view of the present buildings, a sanatorium on the pavilion plan for the treatment of poorer patients.

The disposal of the sputum is by means of paper spit-cups which are subsequently burned. These must be carried and used until the patients are outside the sanatorium grounds. No rules relative to handkerchiefs, only not to spit in them. No spittoons are in use. The floors are covered with rugs only. The floors are disinfected by washing in a solution of carbolic acid or corrosive sublimate; less frequently with formaldehyde. Clothing is disinfected with carbolic acid and steam.

In summer the patients' day is from 6.30 A. M. to 10 P. M. In winter they arise half an hour later. The time spent out doors averages eight hours a day. No other weather conditions excepting rain interferes with their outdoor life. In winter the patients wear fur lined coats and out upon the verandas have an abundance of wraps. Windows are kept wide open. Colds are very infrequent. Patients with elevated temperature simply rest, have cool spongings, and breathe fresh air. If in bed, the bed is wheeled to an open window or the couch of the patient is carried out on the open veranda or balcony. (See Fig. 30). Exercise and rest are graduated to the needs of the patient. Pulmonary gymnastics are used but little. Instead of exercise the lung is sometimes given rest by compression with nitrogen. The influence of direct sunshine is found very useful. Patients do much better in winter than in summer. Friends may visit at any time, but here, as well as in some other sanatoria elevation of the patient's temperature sometimes results.

Here there is a little more latitude than in most of the sanatoriums in the times for meals. The first meal is from 7 to 8.30 A. M., the second from 12.30 to 2 P. M., and the third from 5.45 to 7 P. M. Besides these about half the patients have "special diets" which come at the hours of 10, 3, and 8. The taking of an abundance of good nutritious food is insisted upon. Meat is supplied rather plentifully, two eggs are taken with or after each meal and the number is greatly increased for some of the patients, and large quantities of milk, averaging nine glasses a day. Cream and egg albumen are also used, but many patients cannot bear large quantities of cream,—five or six ounces. Tropon is found to give good results as a food.

The Laurentian Sanatorium.

This institution which was opened for the reception of patients in July, 1899, is in the Laurentian mountains near the village of St. Agatha des Monts, sixty-four miles northwest from Montreal, farther north than the central part of the State of Maine. The land upon which it is situated lies at an altitude of 1,600 feet and is sandy and porous underlaid with rocks of granitic formation. The surrounding forest growth is mostly coniferous. An abundant supply of water is piped from a spring. As yet only the main building has been built, a three-story structure, with piazzas and balconies for the two lower floors. Fig. 31 gives a view of this building.* This accommodates twenty-three patients, a few only of whom are non-paying. The weekly charges are from $5 to $15.

In the sanitary management of the institution, the sputum is burned, being collected in paper sputum cups which are carried by the patients when away from the building as well as when in it. Knopf's elevated cuspidors (Figs. 8-10) are placed in the halls and various other places. Rooms are cleaned by washing with a weak solution of corrosive sublimate. Clothing is disinfected with steam or formaldehyde, and bedding with the latter. Rugs easily removable are in each room.

The patients arising at 7.30 and retiring at 9.30, spend ten hours daily in the open air as a general rule,—the time being practically unlimited by the weather. In cold weather fleece lined and woolen underclothing and fur coats and rugs protect against the cold. At night the patients are gradually accustomed to sleep with open windows. During the winter days the patients are exposed to the direct sunshine, but in summer they

*This cut gives an idea of the surrounding country, but as the view is from the rear of the building it does not do it justice.

Fig. 30. Loomis Sanitarium—Balcony, Second Floor of Cottage.

Fig. 31. Laurentian Sanatorium.

are protected from it. Febrile cases are treated by rest in bed, cool sponging, and antipyretics. No exercise is allowed until the disease is quiescent. Generally absolute rest is enforced for the first six weeks at least. Pulmonary exercises are not used to any extent. The use of drugs constitutes but a small part of the routine treatment. Colds are seldom contracted. Dr. Richer, the director of the sanatorium, says that his patients do better in the winter than in the summer. Light games, music, and reading constitute the chief amusements. A supervision of the reading matter excludes that which is too emotional.

Three principal meals come at 8 A. M. and 12.30 and 6.15 P. M.; and lunches at 10.30, 3.30 and 9. The food is plain but nutritious, consisting largely of meat, eggs, and fats. From three to ten eggs and from one to six pints of milk daily are taken. Cream is used when tolerated. Vegetables are used rather sparingly. The lunches consist principally of milk, cocoa, fruit, biscuits, etc.

Muskoka Cottage Sanatorium.

The Muskoka Cottage Sanatorium is the first of a series of institutions of the kind which the National Sanitarium Association hopes to build in Canada for the treatment of consumptives. It is situated in a beautifully wooded natural park of some 50 acres, sheltered from north and northwest winds by rocky ridges and pine forests, on the shores of Lake Muskoka. It is near the town of Gravenhurst, and 115 miles from Toronto. This region has an elevation of about 800 feet above sea level, and has for some years been favorably known as a place for the cure of persons suffering from consumption. "The district is very rocky and the soil porous and dry, the rocky formation is entirely Laurentian, the water is soft and free from lime. The air is dry and bracing, and contains relatively a small amount of moisture."

A fine large administration building costing nearly $40,000 was made possible by the gift of $50,000 from two of the philanthropic citizens of Canada, and benevolently inclined persons, who appreciate the value of the movement for saving the lives of tuberculous patients, have, from time to time, since the opening of the institution in 1897, contributed funds for the building of cottages, so that in 1899 the sanatorium had accommodations for 50 patients. Each cottage has a large piazza facing the south, which is so arranged that it may be partially enclosed with glass, thus protecting the patients from wind and rain while admitting air and sunlight. Each patient has a separate room. All rooms admit the direct rays of the sun some part of the day.

Among the rules for the guidance of the patients are the following:

As a sanitary precaution, patients are not allowed to occupy their rooms during the day, except by permission of the house physician.

Patients should accustom themselves to leading an out-of-door life. Little by little the sittings on the piazzas or the walks are to be increased until the entire day is spent out of doors. In stormy weather the sheltered parts of the piazza should be used. In summer the patients are expected to spend a part of each day in boating. Boats are provided.

Warm and dry foot wear should be provided. Patients should, if possible, procure fur garments for winter wear. Rugs are necessary for sitting out of doors in winter.

Meals are served at 8, 1, and 6, and lunches (when ordered by the physician) at 10.30, 3.30, and 9. Milk will be found in the dining-room at all times. The purity of the milk supply is assured by frequent tests. The absence of tuberculosis among the cows is determined by the tuberculin test.

Patients must understand that gain depends very much on willingness to eat. Food should be taken as a duty even when there is no desire to eat.

Dr. J. H. Elliott, superintendent of the sanatorium, thus describes the method of caring for the sputum:

"Patients are strictly forbidden to expectorate outside the cuspidors or paper handkerchiefs provided, either on the grounds of the sanatorium or elsewhere. The cuspidors in use for the collection of sputa are the spitting-cups supplied by Seabury & Johnson, made of waterproof paper, so folded as not to spill the contents should they be accidentally overturned. These are carried in a special holder, made after the pattern of the one supplied by the above firm, but which I have modified by putting on a solid bottom, converting it into a watertight box, so that should any of the papers be imperfect, or should there be leakage from any other cause, there will be no contamination of any object on which the box may be placed, as there must be in the original, which possesses only a bar across the bottom. As often as necessary these are renewed, the patient removing the paper containing the sputum, wrapping it securely in paper and tying with twine. This is then deposited in a receptacle capable of holding the day's collection; from this they are removed daily and cremated. While walking, these boxes are found rather inconvenient for patients who have but little expectoration. In their place the patient carries a supply of Japanese paper handkerchiefs. They are cautioned after once using a handkerchief never to open it to use a second time, but always to use another. They are disposed of in the same way as the boxes, by wrapping securely in paper and burning."

FORMALDEHYDE AS A MILK PRESERVATIVE.*

By A. G. Young, M. D.,

Secretary State Board of Health, Augusta, Maine.

A local newspaper discussion of this subject led me to address a circular to the secretary of nearly all the state boards of health, to the department of health of fifty-six of our larger American cities, and to every agricultural experiment station in the country. The letter contained the following questions:

I. What is your opinion or that of your board regarding the use, by dairymen and milk dealers, of formaldehyde as a preservative of milk?

II. Do you believe that, used as a preservative, formaldehyde impairs, or has a tendency to impair, the nutritive value of milk?

III. Do you think that, when thus used in milk, formaldehyde has a tendency to interfere with the digestive processes?

IV. Kindly let me know whether your board is taking any action, or adopting measures to prevent the use of formaldehyde as a preservative of milk, and if so, what action.

The last question was omitted in the letter sent to the experiment stations.

Tabulating the answers to the first question, or the opinions as to whether it is right for dairymen to add formaldehyde, as a preservative to the milk which they sell, from 15 state boards a distinct negative was received, from one an inclination to an affirmative, and from seven there was no reply to this first question.

Of the city boards, 24 are opposed to the use of the agent in question as a preservative, three did not answer, and one gave an equivocal answer.

From the experiment stations 30 answers were positively against the use of formaldehyde in milk, none countenanced its use, seven letters did not answer this question.

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*Read before the American Public Health Association at the Minneapolis meeting in 1899.

Of all the officials heard from, state, municipal, and experiment station, only one answer indicated that the writer deems it right or expedient to encourage or to allow dairymen to use formaldehyde in milk. This expression of opinion is of interest and of some value as an indication of the sentiment of public health officers and the experiment stations on this question. Many of the letters contain strong and positive statements of the convictions of the writers that formaldehyde should not be added to milk and why it should not. That these opinions come from men in the best positions to answer this question understandingly, and that they represent both sides of the question, the economic as well as the public health side of it, should add weight to what they say.

As to the action of formaldehyde on the nutritive value of milk, or its influence on the digestive and assimilative processes, or what effect its prolonged ingestion, even in small quantities, has upon the excretory organs, our knowledge is incomplete, though experimental work and clinical observation have put up a few finger-boards.

Experience of late years in laboratory and anatomical work has abundantly shown that formaldehyde in solution or as a free gas, hardens albuminous matter and converts it into a substance with a leathery appearance. The object of some European experiments has been to determine whether solutions of formaldehyde might not be used for the preservation of meat and fish; but these articles have been injured and rendered unfit to use as food products. Gottstein[1] determined that such food products, hardened by the use of formaldehyde, cannot again be softened by boiling. Though not proving the fact conclusively, we would naturally infer, that used in milk, even in small quantities, the tendency at least of its action on the proteids would be in the same direction.

One of the bulletins[2] of the Cornell University Agricultural Experiment Station says: "The behavior in the Babcock test of milk which had been preserved by formalin shows that its composition is in some way affected. Ordinarily the curd of milk is dissolved by the sulphuric acid that is used in the test.

1. Deutsche Med. Woch., XXII, 797. 1896.
2. Bulletin 118, July, 1897.

Where formalin is used the curd often fails to dissolve and becomes a compact mass. If this preservative can so alter milk that sulphuric acid may fail to dissolve its curd, is it not at least probable that the action of the gastric juice in the stomach may be rendered less effective?"

The investigations of T. H. Weigle and S. Merkel[1] showed them that the casein of milk which has been treated with formalin should never be added to milk intended for children. They also state distinctly that formalin interferes with the digestion of milk.

Bliss and Novy conclude from an extensive study of this problem that the casein of milk, on contact with formaldehyde, undergoes very rapid alteration and is, as a result, not coagulated by rennet, or but very slowly. Such altered casein, like similar fibrin, is not readily digested by the proteolytic ferments. These experimenters found that fibrin is altered bv formaldehyde and is less easily digested by pepsin and by trypsin. They found also that trypsin is altered to such an extent by contact with formaldehyde that it does not digest fibrin at all, or very slowly.[2]

As bearing on the question of the toxic possibilities of formaldehyde the following observations may be introduced:

In the experience of a large number of experimenters and public health officers the inhalation of formaldehyde in ordinary doses, or in the case of animals in large doses, has appeared to be harmless in its results, or productive of no serious harm. This, however, has not uniformly been the case. Dr. Charles Harrington,[3] speaking of the results produced by formaldehyde gas on two rabbits used in his experiments, says that they were sufficiently certain to demonstrate the falsity of the theory that formaldehyde exerts no deleterious action on higher organisms and to render further experiments on his part in this direction unnecessary. Dr. Brough,[4] referring to the results of his investigations for the municipal board of health of Boston, says: "Dogs and cats which have been left in rooms were found killed."

Mosse and Paoletti stated that: "Intravascular injection profoundly modifies the blood, so that hemoglobin passes out

1. Forschungsber. ueber Lebensimttel und ihre Beziehungen zur Hygiene, 1895, 91 to 94. Quoted by Dr. H. J. Wheeler, Chemist, R. I. Exper. Sta.

2. Jr. of Experimental Medicine, IV., 47. 1899.

3. Amer. Jr. Med. Sciences, CXV., 69. 1898.

4. Formaldehyde Gas as a Disinfectant, p. 14 1898.

from the corpuscles into the plasma. The blood-vessels contract when in contact with formaldehyde, their walls being altered, and their corpuscular elements escaping into the tissues. These points were ascertained by experiments on the renal circulation." A. H. Pilliet states that: "To cause fatal results it must be given subcutaneously in doses of 0.25 gramme per kilogram of body-weight. The lesions consisted principally of intense congestion, with evidence of cellular irritation and vacuolization, but no necrosis. These conditions were noted generally in the stomach, intestines, kidney, liver, spleen, and suprarenal corpuscles."[1]

Graziani[2] injected daily half a gram of formalin diluted into a rabbit. After eighteen days the animal died having lost 183 grams in weight. There was no albumen in the urine, but on section there were present hyperemia of liver and kidneys, and a little swelling of the epithelium of the uriniferous tubules. Another rabbit after receiving from 10 to 15 drops daily, died in ten days. There was hyperemia of the stomach and liver and small erosions of the former.

As the experiments of Rideal and Faulerton on a small number of adult animals gave no positive results, Dr. Annett[3] arranged a large number of experiments on young kittens. The results were that, the younger the animals the more susceptible they proved to the action of formalin. Compared with the control animals, in Group A which had one part of formalin to 50,000 parts of milk, the formalin retarded the nutrition of the animals, as indicated by their rate of increase in weight, to the extent of about 29 per cent.; in Group B, with one in 25,000 of formalin, nearly 40 per cent.; and in Group C, with one in 12,500, about 69 per cent. From his experiments with formaldehyde and boric acid, he is forced to conclude that these chemicals, used as preservatives of milk, are very injurious to the health of the consumer, and particularly so to the health of young infants.

Dr. Charles Bock, resident physician to the Indiana School for Feeble-Minded Youth, reports that, on the farm connected with the school, a man was treating seed potatoes with four per cent. solution of formaldehyde. During this man's temporary ab-

1. Merck's Archives, Vol. 1, 10.
2. La Riforma Med.—Centr. für Bak., XXV., 683. 1899.
3. Lancet, 11, 1899, 1284.

sence, one of the inmates, a "low grade imbecile," twenty-six years old, strong and healthy, drank from an ounce to three ounces of the solution. He immediately complained of pain in the stomach and began to vomit. The vomited matter was stained with blood. Large quantities of albumen water were given at once, and he had but little difficulty in swallowing it. Free vomiting was produced with a tenth of a grain of apomorphine given subcutaneously. At the end of two hours the man seemed but little the worse for his rash act, although he was somewhat weak and complained of slight pain in the stomach. The administration of albuminous drinks was continued and he seemed to improve until the sixteenth hour, when his pulse began to flag. It continued to grow weak and rose to 92 in frequency, in spite of repeated large doses of strychnine given subcutaneously, together with one dose of nitroglycerine and several doses of sparteine by the mouth. At the twenty-ninth hour his respiration was 40, he was getting restless, and his heart was failing. Seventeen ounces of normal saline solution were injected under the skin, and two hours later sixteen ounces were thrown into a vein, but he presently died. During the last hour of his life there was occasional slight cyanosis.

At the post-mortem examination the upper and middle thirds of the œsophagus showed slight signs of inflammation. The stomach contained four ounces of dark fluid free from formalin. Its walls were in some places more than an inch and a half thick and very œdematous. The cardiac end was very red and highly inflamed. The remainder of the organ was necrotic, dark, and tough and cut like old leather. In the duodenum there was an inflamed area confined chiefly to the valvulæ conniventes.[1]

As bearing on the other side of the question, the experience of Dr. J. N. Hurty, Secretary of the State Board of Health of Indiana, may be cited. He says: "I have found that 5 to 10 drops of the 40 per cent. solution of formaldehyde will preserve a gallon of milk quite satisfactorily and I do not believe that such an amount of the agent can in any way detract from nutritive value. Neither do I believe it will disturb the digestion. I have conducted some physiological experiments which seem to abundantly support the belief expressed. For instance, I have

1. New York Medical Jr., LXX., 309. 1899.

myself for five months daily taken as lunch, a bowl of bread and milk and have placed in said food 10 drops of 40 per cent. formaldehyde. I cannot by the closest scrutiny discover any ill effect, but on the contrary am inclined to believe that the milk agrees with me better because of the chemical. I have also prescribed a drop of formaldehyde in each bottle of milk in the case of some infants suffering from intestinal disorders and my observations were to the effect that good resulted."

He also states, through the columns of a pharmaceutical journal,[1] that he took the formaldehyde in milk as a preventive of the fermentation which caused acid indigestion. Thus far there is no adverse criticism from the hygienic point of view. That is the therapeutic side of the question. But when from such experiments the conclusion is drawn that it would be a good thing to allow the dairymen to use it—that is an entirely different matter.

Aside from the findings of experimental work and clinical observation there are other considerations which should have due weight when the question comes up whether one shall encourage the general use of formaldehyde or any other chemical preservative in milk.

I. It is a question of encouraging and abetting the addition of potent chemicals to a food supply by persons, not all of whom are intelligent and conscientious. If allowed to use it at all, unskilled persons will often add it in unreasonable quantities, granting that any quantity is reasonable and legitimate; and sometimes after the dairyman has added it, the middleman, with milk left on his hands, will pour in more of the preservative to keep it for the next day's sale. At one time some of the foreign adulterators added as much as one gram per litre of salicylic acid, but after restrictive legislation was introduced, they would be content if they might use one-twentieth of that quantity. In a paper read this year by Dr. Alfred Hill, Medical Officer of Health, Birmingham, England, he says that in 5 per cent. of 1,360 samples of milk examined by him, boric acid was found in quantities varying from 130 grains per gallon to 3 grains or less. When the former case came before the magistrates the

1. American Druggist.—Sanitarian, XXXIX., 318. 1897.

defendant admitted that he had added a *solid* preservative to the milk.[1]

These incidents are illustrative of the statement of Professor Soule of the Experiment Station of Tennessee, that, "In the greatest number of cases these chemicals would be used by inexperienced and unscientific people who do not appreciate the importance of using just the right amount, hence the use of these preservatives indiscriminately is very dangerous."

II. In the absence of legal prohibition, preservatives enable slovenly and dishonest persons to put upon the market dirty milk, and milk in which the fermentative changes have gone so far before the antiseptic is added that they are unfit as food and dangerous, especially to infants. Preservatives should not be an alternative for cleanliness. Professor Hills, Director of the Vermont Experiment Station, says: "Certain it is that the use of any material of this kind tends to discourage rather than to encourage the making of milk under sanitary conditions. I strenuously oppose any method for the preservation of milk which will tend to make dirty milk more readily kept."

Dr. Frear, Vice-Director and Chemist to the Experiment Station of Pennsylvania, put the matter as follows: "Men coming to feel that they may rely upon chemical antiseptics grow neglectful of conditions of cleanliness which are essential to the production of a healthful article of food. On this second ground of policy, therefore, I object to the general use of any antiseptic."

III. There is no real need of using chemical preservatives in milk. Under unfavorable or ordinary dairy methods, milk contains from a few to many million bacteria to the cubic centimeter and the quantity of dirt is correspondingly great, but with the more careful and cleanly conditions under which some dairymen now have their milking done and the milk handled, the number of germs is reduced to a few hundred and without chemical preservatives or pasteurization, its keeping quality is considerably superior to that of ordinary milk.

IV. When one man, or a few of them, take antisepticized milk for a while and come to the conclusion that the continuous milk supply of the multitude, invalids, babies, and all, may safely

1. Public Health, XI., 529. 1899.

be doctored with formaldehyde, their conclusions should be swallowed with a pinch of chlorid of sodium. Von Pettenkofer and others proved that not every person who swallows cholera spirilla develops a malignant or a typical attack of cholera. They proved nothing else. We should remember that we have to reckon with idiosyncrasies and with personal dispositions and immunities in toxicologic as well as in epidemiologic matters.

V. In the earlier years of their use boric acid and salicylic acid were deemed innocuous. Now it is known that, when continuously administered, the by-effects are often undesirable and dangerous. Even boric acid, less dangerous than salicylic acid, is far from being entirely safe when freely used in surgical practice or as a food adulterant. Professor Dixon Mann, of England, reports as follows: "I have seen several cases in which a purpuric eruption, with nausea, loss of appetite, and depression, followed the dressing of open wounds with boric ointment. * * * I can remember two cases in which thrush in infants was treated with honey and borax, and the application continued long after the aphthæ had disappeared. Nutrition was so much impaired as to cause great emaciation, with intestinal irritation and diarrhœa. * * * I am strongly of opinion that the most stringent restrictions are needed in respect of milk, as being the food of infants and young children, whose nutrition would be seriously impaired by the prolonged ingestion of boric acid, or its compounds, even in small amount." Professor Leach, of Manchester, has expressed the following opinion: "It appears to me that many patients can take either boric acid or borax for a long time in very large doses with impunity, but that, in some people, the unpleasant results are produced by comparatively small quantities, and it is quite possible that serious harm might in these cases follow its ingestion in the quantities in which it is used in the preservation of food. There can be no doubt that it should not be used in the preservation of milk."[1] Concerning formaldehyde it is probable that the opinion of persons who now look upon the prolonged use of small doses of formaldehyde as entirely innocuous may pass through a transitional stage similar to that which professional opinion has lately experienced in regard to the use of the older preservatives.

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1. Public Health, XI., 529. 1899.

VI. One of my correspondents, though not advocating the use of formaldehyde as a milk preservative, is under the impression that it speedily evaporates after it is added to it. Those, however, who have had much experience with formaldehyde in the disinfection of clothing or in subjecting various kinds of organic matter to its action would be inclined to believe that this correspondent is mistaken. Formaldehyde appears to enter into some kind of combination with fabrics and with many other kinds of organic matter so that it is not easily dissipated. The recommendation has been made to heat milk to which formaldehyde has been added to drive off the chemical; but pasteurization or sterilization in the first place would be the preferable alternative, if heat is to be applied at all. In connection with infant feeding we hear something of the devitalizing influence of heat on the milk, but it is questionable whether the influence of formaldehyde in this direction is not the greater of the two evils, irrespective of the influence of formaldehyde on the digestive and other vital processes. Professor S. M. Babcock, Chief Chemist of the Experiment Station of the University of Wisconsin, writes: "Formaldehyde not only renders the proteids of milk less digestible but, when added in sufficient quantities to suppress bacterial growth, destroys the proteolytic enzymes contained in the milk."

L. M. Tolman, Chemist to the Board of Health of Oakland, California, says: "The action of formalin in milk increases the total solids, probably in two ways, by hydrolysis of the sugar, and by formation of polymerids of formaldehyde which are non-volatile, therefore the argument that formalin is a good preservative and suitable to preserve foods because it can be driven from the foods by warming or other means, may not be true."

VII. One correspondent suggested that the use of formaldehyde might, perhaps, be allowed under a law establishing a legal maximum. That, it seems to me, would be very nearly equivalent to a complete surrender to the adulterators. It would, further, entail upon the State a costly inspection service which but few of our commonwealths would support. In this connection the words of Dr. H. W. Hill, Director of the laboratory of the Department of Health of Boston, are of interest: "Until the exact amount which may be preservative without being in any way harmful is determined (if any such amount there be) official commendation should, I think, be withheld. Moreover, the authorities are agreed that the qualitative tests are so delicate as to allow the recognition of one part of formalin in 500,000. But they are also agreed that *quantitative* tests are unreliable. It would seem then that it is at present unwise to sanction the addition by untrained or irresponsible parties of formalin, even in small amounts, when the actual amount added cannot be determined by analytical tests. Such sanction permits the addition of a possibly dangerous substance while taking out of the hands of the authorities the power to determine in any given case how much has been added."

CONCLUSIONS. The results of my examination of all the available printed and other reports regarding the action of formaldehyde seem to me to justify and require the following conclusions: That used as a preservative it *tends* at least to impair the nutritive value of milk; that its tendency is also to interfere with the digestive processes—in either case it is only a question of dosage, and the limit of safety is difficult to determine; that, though the inhalation of formaldehyde gas is much less dangerous than the breathing of the other gaseous agents much used as disinfectants, the results of tests upon animals and one case of accidental poisoning of a human being, indicate that formaldehyde, taken into the digestive system may produce dangerous and even fatal results; that it would be unwise and unsafe to encourage or to suffer the use of formaldehyde in the public milk supply, even under any possible restrictive regulations; that in every state, as there are now in many, there should be a law prohibiting with effective penalties the use in milk of any chemical preservative whatsoever.

These, at present, are the only rational and safe conclusions. If new light arises in the future we can take our bearings anew, and correct our course if need be.

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