PUBLIC DOCUMENTS OF MAINE

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

Public Officers and Institutions

FOR THE YEAR

1890.

VOLUME I.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE.
1892.

FIFTH ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF MAINE.

For the Fiscal Year Ending December 31, 1889.

AUGUSTA:
BURLEIGH & FLYNT, PRINTERS TO THE STATE.
1890.

MAINE STATE BOARD OF HEALTH.

OFFICE OF THE SECRETARY,
Augusta, Maine, 1890.

To His Excellency, Edwin C. Burleigh, Governor, and the Honorable Executive Council:

GENTLEMEN:—I have the honor of submitting to you the Fifth Annual Report of the State Board of Health of Maine.

Very respectfully,

A. G. YOUNG, M. D.

Secretary.

MEMBERS OF THE BOARD.

E. C. JORDAN, C. E., *President*,	Portland.
HON. LEWIS BARKER,	Bangor.
O. A. HORR, M. D.,	Lewiston.
J. O. WEBSTER, M. D.,	Augusta.
PROF. F. C. ROBINSON,	Brunswick.
CHARLES D. SMITH, M. D.,	Portland.
A. G. YOUNG, M. D., *Secretary*,	Augusta.

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INTRODUCTORY.

We have the honor to present to the people of the State the Fifth Annual Report of the State Board of Health, for the year of grace 1889. No great emergency has arisen during the year, demanding unwonted activity and expenditures for the control of some extensive and fatal epidemic; no new measures have been inaugurated to attract attention by their novelty or by other meretricious circumstances; but we have gone on in the even tenor of our way, carrying out the methods already in use for educating the people in the gospel of hygiene, and for aiding them in the control of those familiar but destructive pestilences that are always with us.

We do not undertake, in this report, to give a detailed account of all the work undertaken and accomplished by the Board. Such a report would contain a great amount of correspondence with local boards and individuals, consisting largely of repetitions of matter already published; it would make this a large volume, which would have little practical value except for those directly concerned, to whom the information that it would contain has been already communicated. Such parts of this correspondence as are of general value and interest can be better utilized in articles intended for general instruction and information, such as that presented by the Secretary under the title of Various Sanitary Topics.

Sanitary Progress. This is a time of rapid progress in sanitary matters, and we believe that the State of Maine is, in most respects, keeping well up in the procession. When we consider that only five years ago this Board was organized, and that then, as a rule, the knowledge of our people in regard to hygienic principles and practice was of the most primitive character, the present condition of things is gratifying in the extreme. A fuller knowledge of the epidemic infectious diseases, the conditions under which they may be imported and spread, and the means by which, and extent to which, they can be controlled, have taken away much of that terror born of ignorance with which they were formerly regarded. On the other hand, a fuller knowledge of the nature of our domestic pestilences, the conditions under which they are liable to be communicated, the necessity for their control by public sanitary authorities and the measures necessary for its accomplishment, have awakened the people from the supineness with which their progress was wont to be looked upon, and have made them generally ready to coöperate in those measures necessary for protection.

During the past year we have seen evidences that this work has gone on; that the people have become more enlightened in regard to the nature and dangers of infectious and contagious diseases and the practicability of securing immunity from them, and more ready to coöperate with the local health authorities in the means necessary for their restriction. But not to take too rose-colored a view of things, this is by no means yet the case universally, and the necessity for continued work by precept and example, is still sufficiently obvious.

Contagious and Infectious Diseases. Physicians are required to report promptly, to the local boards, their cases of contagious and infectious diseases, especially small-pox, diphtheria, scarlet fever and typhoid fever; and local boards are requested to make weekly reports to the State Board during the prevalence of such diseases. Such reports have been received quite promptly from a majority of the towns; but from 159 out of 434 no reports of contagious diseases have been received, either in weekly or annual reports. As there are among these several of our largest towns and one city, it is not presumable that none of them have had cases of these diseases.

In some instances, probably, the fault is primarily with physicians who neglect to report their cases. Local boards should insist that such reports be promply rendered—adopting legal measures of compulsion when necessary—and they should in turn report promptly to the State Board. The Secretary has continued to furnish weekly reports of these diseases to the newspapers of the State. The dissemination of such information has been objected to by some persons, probably on the ground that "where ignorance is bliss, 'tis folly to be wise." Not having adopted this sentiment as the motto of our Board, and not believing that it is in consonance with the spirit of this age, we have, while carefully considering such objections, unanimously decided to continue the publication of these reports.

There has been a considerable prevalence of diphtheria for the year; 543 cases having been reported from 138 towns. Unfortunately, this disease is often difficult of recognition, especially in the early stages; and the seeds of an epidemic may be widely disseminated before danger is known to exist. But besides this there is still too much carelessness in known cases of the disease. The prohibition of public funerals for its victims is not thoroughly enforced, there is still need of public education in its regard. Here, at least, *ignorance* is liable to prove something very different from *bliss*.

There does not seem to have been a great prevalence of scarlet fever during the year—there having been reported to us 236 cases from 82 towns. In this disease, as in measles, while cases occur every year, its epidemic prevalence is more or less periodical, as new crops of children grow up who have not already experienced an attack. The scarlet fever poison is so tenacious of life, and clings with such tenacity to articles of clothing, etc., that have become its habitat, that there are probably at all times, in nearly all communities, abundance of germs ready to develop whenever they can find an unexhausted soil. This is shown by the frequent appearance of sporadic cases, whose origin cannot be traced, while it is not to be doubted that each received its poison, directly or indirectly, from a preceding case of the same disease.

The occurrence of cases of typhoid fever is more of an opprobrium to a state or community than that of the diseases already mentioned. While diphtheria and scarlet fever are eminently contagious from person to person, typhoid fever probably never exhibits this quality, but is purely an infectious disease, the poison developing outside of the body from which it is excreted mainly in the intestinal discharges, and being received into a new host through the medium of the food and drink, especially the latter. We call its existence opprobrious, because the means of destroying this poison, and thereby preventing its development and the infection of others, is so well understood and so easily carried out.

To what extent the water supplies of our State may be infected by the typhoid fever germ, it is impossible to tell. Chemical analysis will give little light upon the subject; for if a stream or river has received the dejections from a case of typhoid, it cannot be considered, at any lower point, a safe source of water supply. However pure the water may be chemically, there is no certainty that it does not contain the specific cause of this disease.

Two hundred three towns have reported 566 cases of typhoid fever during the year. It will be seen that it was much more generally prevalent over the State than either of the diseases previously mentioned. The most extensive outbreak was in Bangor and Brewer, both taking their water supply from the Penobscot river. And first it is worthy of note that in the towns upon the Penobscot above Bangor, there were reported 53 cases of typhoid fever for the year against 15 in 1888, or three and one-half times as many in 1889. Almost the same ratio is preserved in Bangor—which had 51 cases in 1888 and 160 (with 40 deaths) in 1889—and in Brewer—with 8 cases in 1888 and 32 in 1889. It seems apparent that there was some common cause for the great prevalence of typhoid along the Penobscot. These figures furnish food for thought, but do not present the data upon which to build final conclusions. At the top of page 123 of this report, will be found the opinion of the Secretary of the local board of Orrington in regard to the cause of four of their cases.

Any statistics that we may be able to collect in regard to the health of the State, under present conditions, and any deductions we may draw from them, are of very slight value. We lack a substratum of positive facts on which to found scientific conclusions that are something beyond mere theories, in regard to our sanitary condition. With a view to this end, we purpose to perform one of the duties incumbent upon us by virtue of the act establishing this Board, by suggesting to the legislature the enactment of a law for

THE REGISTRATION OF VITAL STATISTICS.

Any proposal to establish and maintain, by law, a system of collecting and utilizing vital statistics, requires that claims for the need of such system must rest upon some evidence of material benefit to the community at large in its well-being and varying interests.

It is pertinent to the subject under consideration to define the object of vital statistics. Nothing can do this more clearly and concisely, than the words of Dr. John S. Billings, United States army, a recognized authority as a statistician, which affirm that "the object of vital statistics is to classify and arrange the facts relating to the quantity and character of human life under different circumstances, for the purpose of determining the effect upon it of each of these circumstances taken singly or of two or more acting together."

The Secretary and members of this Board are in almost daily receipt of communications from various official and private sources, both within and without our own State, seeking the information which such a system would afford; but with annoyance and mortification it is necessary to explain that the information cannot be furnished; and there is left the unpleasant reflection that Maine, with one of the best sanitary codes given to any State Board of Health to administer, is yet almost alone in failing to supplement the value and usefulness of such sanitary laws by an efficient system of registration of vital statistics. Apart from the general advantage of such system and the question of State pride, there is the fact, that the demand for its establishment is wide spread and constantly reïterated by a large and intelligent class of our citizens, for all kinds of purposes. Inquiries for this class of information come from professional men, manufacturers, corporations, libraries and literary societies, the various departments of municipal administrations and from officials of all kinds. Inability on the part of the Board to comply with these requests becomes a serious impediment to the accomplishment of what, it is convinced, is not the least important of its functions, and must be a serious reflection upon its efficiency in comparison with the state boards of other states.

In the January number of the *Sanitary Inspector* for 1889, some reasons for such legislative action as would establish a system of registration within our State were stated as follows:

"1st. It forms the basis of all sanitary work. In England their improved system of registration of births, marriages and deaths was begun in 1837, and since then it has served as a guide to indicate the places where there has been the greatest need of taking measures to improve the public health. If, in a given town it is found that the death rate from typhoid fever, consumption, diarrhœal diseases of children, or other diseases is higher than it ought to be, the local government board institutes an inquiry into the causes of the prevailing high rate of mortality. As the result of these inquiries local boards have been led in many of the towns to take measures which have reduced the death rate in a marked degree. Massachusetts has had its system of registration of vital statistics for many years and finds its records of the greatest value in determining general and local rates of mortality, or whether a given disease is less or more prevalent than formerly.

2nd. To prevent the concealment of crime. The indispensable provision of modern registration laws which requires a certificate from friends or the attending physician of the cause of death, and a burial permit, is an assurance of safety in this direction.

3d. To ensure the means of proof of personal identity and of right to property. One senator in our legislature of 1887 told the writer that it cost him fifty dollars to look up the proof of the date of a birth. The applicants for pensions in Massachusetts are furnished by the Commonwealth with the means of substantiating their just claims which our State does not accord its citizens.

4th. To ensure the means of the proof of age with reference to the prevention of election and other frauds.

5th. To assist the State in arriving at correct conclusions with regard to measures of internal economy, taxation, employment and commerce.

6th. To furnish a record which is always available in tracing the genealogy of persons or families.

Maine stands alone among the New England States in having no system of registration of vital statistics, and consequently is like a ship at sea without a compass as regards her knowledge of where she stands in the health scale. We think we have good reasons for *surmising* that there is no State in the Union with a lower general death rate. If this is true, the proof of the fact would be worth something. If, on the contrary, the local death rates in some of our towns were making the general death rate higher than it ought to be, the knowledge of that fact would aid in inducing them to improve their condition."

The value of a Bureau of Vital Statistics to our State Genealogical and Historical Societies in the prosecution of work, the results of which continually reflect credit upon themselves and honor upon the State, is almost self evident.

Careful inquiry among all the classes of people likely to be affected has elicited the information that although differences of opinion may exist as to the most feasible methods of securing such statistics, there is great unanimity of opinion as to the need and advantage of the information to be derived after the statistics are secured and utilized.

The city clerk of the largest municipality in the State, himself an accurate, careful and painstaking observer and member of the local health board, expresses himself substantially to the effect that:

The collection of vital statistics as it appears from the standpoint of a municipal officer and secretary of a local board of health, is an entirely practical one. "The constant inquiries at my office for the date of the birth of some individual, either to show his right to be registered as a voter, or to become a member of fire or police departments; or to establish a claim in a pension case, or in a claim to succession of property, shows the need of a registry even for those purposes alone. But outside of those considerations, are those of the growth of a community and the relative increase of population from this increment. But the present method of collecting these statistics by yearly canvass of the assessors as in Portland is entirely inadequate.

"Families are constantly changing their location and intervals of a year disclose many removals from the city of families, the births in which fail to be taken. Then our assistant assessors are too much occupied in the other part of their inquiries, as to taxable property, number of polls, etc. In this city the number of births reported by the assessors averaged about 400, but since my employment of a special canvasser I have obtained, on an average, about 800 names yearly. If a canvass is to be made for births, it should be made, at least, semi-yearly; but in my opinion the law should require some more accurate method to secure the return, weekly or monthly of births, perhaps through the coöperation of those in attendance. There is very little dependence to be made upon the birthdays as at present reported, and I fail largely to get any births of children who have died under the age of one year. In marriages I am more fortunate; for the most part both magistrates and ministers return the marriages which they solemnize, within the month; but there is a class of marriages which are seldom returned—those which are contracted by parties who leave the State for that purpose, mostly to escape the absurd delay of five days, in the issuing of a marriage license, required by our laws. There is a penalty of ten dollars attached to this violation of the law, in omission to return the marriage, but I have never known a prosecution to be made.

"A return of the cause of death should always be made by the attending physician before a burial permit is granted. I think that I get a return of every death in the city, but it is only by the most careful watchfulness that the uudertakers who return the deaths do not, now and then, drop one out. When the return was made by the assessors as required by law, it was simply worthless; the returns were so filled with inaccuracies and omissions. As it is now the *causes* of deaths as returned by the undertakers, are grotesque to say the least, and are not in the least to be depended upon where correctness is essential, as in cases of pension claims, etc.

"In all cases of births, deaths and marriages, the names of parents should be given in order to establish connection of families. This is so seldom done now, except in cases or births—and even in those with such inaccuracy as to occasion much trouble—that it is of very little service.

"That portion of the law requiring returns to be made by heads of families is of no use whatever, with one exception which I will speak of later. In the first place so many heads of families are quite unable to make any returns; they cannot write, and to make a verbal return at the office would be quite too much to expect and almost impracticable.

2d. To many who can write, the filling out of never so simple a form is a work whose magnitude appals them.

3d. These broad provisions of the law requiring returns from so large a class never are effective, especially where these provisions are not subject to police supervision.

"The one exception in returns by heads of families to which I have referred, is this:

Our records of 20 to 40 years ago are very imperfect. In making out claims, we often fail to find any records. As the law does not limit the time in which returns may be made, it is legal even at this lapse of time for the heads of families to make returns, have them recorded, and thus secure, for their legal use, certified copies of the record.

"The necessity of an accurate and careful collection of births, deaths and marriages, for the purposes of comparison of growth or the prevalence of any causes which retard or promote the growth of a community, seems to me so self-evident that argument is almost unnecessary."

Some of the most cogent reasons for the desired plan have come to us from a gentlemen of wide experience as a civil engineer, particularly interested in sanitary work, whose belief is thus expressed:

"There is a certain practical value in vital statistics that ought to appeal to everyone. The State Board and Local Board of Health are organizations to disseminate health laws. They are the authorities first appealed to when communities or individuals realize that their health is being endangered by the ignorant and wilful acts of other communities or individuals. The tracts that they are constantly putting in circulation are such as these:

"'Health is the capital of the laboring man.' 'Wealth is the income from the work which is the outcome of health.' 'Pure air, pure water and a pure soil;' and a paraphrase of the old penny and pounds' proverb recently uttered by the most eminent sanitarian in the world; 'take care of the health rate and the death rate will take care of itself.' Now what is the death rate of this or that place in the State of Maine? Certain sections are considered valuable because the land is fertile; because a water power makes manufacturing interests profitable; because the location is a favorable one for the transshipment of goods, etc., etc.; and such places become more or less thickly settled. Observing and progressive individuals, students of the causes of disease, insist upon the necessity of carrying out certain sanitary reforms; better drainage and sewerage. Agitation of the subject goes on, an engineer skilled in the solution of such problems is employed, and estimates are made of the expense of a remedy for the ascribed difficulties. The amount seems large to the tax payer and he claims that the value of or the necessity for such work is not proven to his satisfaction. It does not seem to appeal to him personally when reports of vital statistics kept in England are quoted showing that sanitary reform—principally sewerage schemes—has lowered the death rate in the city of London, or that there are 10,000 less deaths and 200,000 less cases of sickness than were wont to occur each year a comparatively short time ago.

"The experiences of a dozen places foreign to his own State may be quoted showing the lessons that may be learned from a study of the vital statistics, and yet he remains unconvinced because it is not brought home to him that his city or village has five more deaths and a hundred more cases of sickness each year for every 1,000 inhabitants than his neighboring city which has spent money to obtain pure water by an outside water supply, pure air by abating local nuisances, and a pure soil by a system of sewerage. A table showing the death and sickness rate of every locality is absolutely necessary as a guide to the *class* of work needed. A glance at it shows whether a town has been faithful to its own interests, words of approval of good work stand out all over it, and danger and warning signals are conspicuous if negligence exists. Nothing appeals to the people like the money value of things. If a glance at a table of vital statistics shows the people of a city of 10,000 inhabitants that they are less well off than a neighboring city at the end of a year by the loss of the labor that fifty people would have performed, but that death seizes them, and also by the loss of labor and money incidental to 1,000 more cases of sickness, think you then a committee would not visit the other city and bring back the receipe of sanitary reform?

"Repeatedly I have known towns to delay or put off entirely very necessary reforms, simply because the data of death and disease along the borders of a foul mill pond in their midst, or those of a coast line of exposed areas of flats covered with sewerage, could not be compared with localities either naturally free from such influences or by sewerage facilities made so.

"Give us vital statistics, and health boards and sanitary engineers can tell when, where and how to act."

SECRETARY'S REPORT.

In reporting on the work of the State Board of Health for the year 1889, it should be said in the beginning that a large part of the work of the office has been devoted to securing, under the existing laws, as complete and efficient a sanitary organization of the whole State as possible. The amount of local sanitary work required of a board of health varies much, of course, with the density of population in the community or town, and with the character and condition of the people; but even in our sparsely populated agricultural towns, where, in average years, there is but little work to be done, there is a real need of the presence of an intelligent local board of health, who, whether they have before been called upon to take charge of an outbreak of infectious disease or not, have, nevertheless, received in advance printed instructions from the State Board of Health in regard to managing accidents of this kind, and are, therefore, tolerably well prepared to act promptly, intelligently and efficiently. On account of the close business relations of the rural parts of the State with the larger centres of population, the importation of infectious diseases into these more sparsely settled parts is at any time liable to occur, and how likely to occur may be judged by referring to the statement in the "Introductory" in regard to the number of towns in which outbreaks of infectious diseases were reported. But aside from the necessity of the smaller towns protecting their own inhabitants from the disastrous consequences of neglected infection, there is a question of inter-municipal obligation and equity. If a larger town incurs the expense of controlling, as efficiently as practicable, the infectious diseases, it is doing work, primarily in its own interest, and secondarily, in the interest of every other town and the whole State; and in so doing it lays every other town under obligations to take like precautions,—to do its part, though its part be small. To how great a degree the efforts of the local boards of health of the cities may be rendered futile, may be inferred from a consideration of the fact that the aggregate of the rural population of the State is numerically much greater than that of the cities and larger villages.

The names and addresses of the members of the Board at the end of the year with the dates at which their terms of office expire are as follows:

HON. LEWIS BARKER, Bangor, term expires January 31, 1890.

CHARLES D. SMITH, M. D., Portland, term expires January 31, 1891.

J. O. WEBSTER, M. D., Augusta, term expires January 31, 1892.

E. C. JORDAN, C. E., Portland, term expires January 31, 1893.

O. A. HORR, M. D., Lewiston, term expires January 31, 1894.

PROF. F. C. ROBINSON, Brunswick, term expires January 31, 1895.

At the expiration of the term of office of Hon. Stephen J. Young, Prof. F. C. Robinson of Bowdoin College, Brunswick, was appointed by the Governor to fill the vacancy. In October, Dr. F. H. Gerrish who had, ever since the establishment of the Board, held the office of President, felt compelled by the demands of his professional work to sever his official connection with the Board. Accordingly, he sent in his resignation, and Dr. C. D. Smith of Portland was appointed to fill the unexpired term. At the quarterly meeting of the Board in January the following resolution was voted:

Resolved, That the members of the State Board of Health feel keenly the loss which both they and the State have suffered by the resignation of Dr. F. H. Gerrish, their President. A pioneer in sanitary matters in the State, he brought to the work of the Board all the enthusiasm for which he is celebrated, and we feel that any good which the Board has done is largely due to his unselfish labors in its behalf.

At the same meeting the election of President to fill the vacancy due to the resignation of Dr. Gerrish was by vote postponed to the annual meeting to be held in March, and Dr. Webster was chosen President *pro tem.* At the annual meeting in March, 1889, the following committees were appointed for the ensuing year:

On Finance—The Hon. Lewis Barker, J. O. Webster, M. D., and the Secretary.

On Publications—F. H. Gerrish, M. D., J. O. Webster, M. D., and A. G. Young, M. D.

On Disposal of Excreta—F. H. Gerrish, M. D.

On Ventilation—O. A. Horr, M. D., E. C. Jordan, C. E., and A. G. Young, M. D.

On Summer Resorts—E. C. Jordan, C. E., and A. G. Young, M. D.

On Sewerage and Drainage—E. C. Jordan, C. E., and Prof. F. C. Robinson.

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

On School Houses and School Hygiene—J. O. Webster, M. D., and A. G. Young, M. D.

VACCINATION OF OPERATIVES IN PAPER MILLS.

The law passed by the last legislature entitled "An Act to provide against the danger of the spread of small-pox from paper mills," which was printed in the last annual report, and which we reproduce in this connection, did not go into effect early enough to be put into practical operation last spring. In the fall, however, the local boards of health in those towns in which paper mills using rags are located—Westbrook, Poland, Topsham and Gardiner—attended to their duty as provided in the law, and found the owners, agents and superintendents willing to co-öperate in the work. In the following are given the special report on this subject made by each of these local boards of health to the State Board, in answer to a circular of enquiry sent from this office.

[Form 18.]

REPORT OF THE LOCAL BOARD OF HEALTH OF———ON THE VACCINATION OF OPERATIVES IN PAPER MILLS.

1. Please give the names of the paper mills in your town that use rags in the manufacture of paper.

2. Did the owners, agents or superintendents last fall comply with section 3 of the act?

3. Did your local board of health comply with the requirements of section 4 of the act?

4. Please give the number of persons whom you found employed in and about each paper mill.

5. How many persons were found who had never been vaccinated?

6. How many were found fully protected by a recent vaccination?

7. How many were found insufficiently protected by vaccination?

8 How many were vaccinated in accordance with your order?

9. Did all persons found imperfectly vaccinated comply with your requests as regards vaccination?

10. If not, what action was taken by your board and by the owners or agents of the paper mills?

WESTBROOK.

1. Cumberland and Presumpscot Mills.

2. The owners and agents complied with section 3 of the act.

3. Our local board of health attended to the duty as specified under section 4.

4. We found 219 persons employed.

5. Three persons were found who had never been vaccinated.

6. The number of persons found fully protected by recent vaccination was 195.

7. Twenty-one persons were found insufficiently protected by vaccination.

8. Twenty of these were vaccinated in accordance with our orders.

9. One person only failed to be vaccinated in compliance with our requests.

10. The attention of Mr. Warren, the agent, was called to the fact that one man employed by him declined to be vaccinated, but nothing has been done.

The examinations by this board included all persons employed in the rag-room, all drivers of teams that haul rags, all engaged in the cutter rooms, and all persons working in the mills that boarded in houses with persons who might come in contact with infected rags or persons.

Yours truly,

H. K. GRIGGS.

Secretary Local Board of Health, Westbrook.

[In reply to a letter from this office Mr. Jno. E. Warren, Agent of the Cumberland and Presumpscot Mills, writes that the retention of the unvaccinated man was an oversight, and that he has given him notice to quit, and assures us that there was no intention of evading the law. In this connection it is due Mr. Warren and the owners of the mills to say that they have always shown a ready willingness and desire to co-operate with the State Board and the local boards of health in the prevention of infection.—Secretary State Board of Health.]

POLAND.

1. The Poland Paper Company have five mills in Poland, but only one of them handles rags; I think it is called the Androscoggin Mill.

2. Section 3 of the act was complied with by the owners.

3. Our local board of health complied with the requirements of section 4 of the act.

4. I cannot give the number of persons found employed in the mill.

5. None are reported as never having been vaccinated.

6. Probably all the older workmen were found protected by recent vaccination as there was an outbreak of small-pox a few years ago.

7. Twenty-one persons were found insufficiently protected by vaccination.

8. Twenty-one persons were vaccinated in accordance with the orders of the board.

9. All persons found imperfectly vaccinated complied with our requests as regards vaccination.

10. No action was needed, as the heads of the different departments set the example by promptly complying with the request of the board and the example was readily followed by all.

These questions are answered as fully as I am able from the papers left me by Dr. Corliss, formerly the secretary of the local board of health, but who now has removed from the town. From my own personal knowledge I believe the answers are correct as far as they are given. Respectfully,

S. L. LITTLEFIELD,

Chairman of the Local Board of Health, Poland.

TOPSHAM.

1. Bowdoin Paper Manufacturing Co.

2. The owners and superintendents of the mill fulfilled the requirements of section 3 of the Act.

3. The local board of health attended to their duties as specified in section 4.

4. Eighty-seven persons were found employed in the mill.

5. Sixty-five were found who had never been vaccinated.

6. Twenty-two were found sufficiently protected by vaccination.

7. Sixty-five were found insufficiently protected by vaccination.

8. Sixty-five persons were vaccinated in accordance with our orders.

We have complied strictly with the law and by prompt attention everything was satisfactory to our board.

Yours truly,

JAS. C. PURINGTON,

Secretary of the Local Board of Health, Topsham.

GARDINER.

1. Copsecook Mills owned by J. D. Warren & Co.

2 and 3. The requirements of section 3 of the Act w re complied with by the owners and superintendent of the mills, and section 4 by the local board of health.

4. At the time our visit was made we found fifty employes which is about the usual number employed.

5. No persons were found who had never been vaccinated.

6. All of the employes were found protected by recent vaccination.

7 and 8. None o' the operatives were found to require revaccination.

The reason why everything was found in so good condition as regards danger from contagion was that three years ago a case of small-pox originated from the rag-room, at which time all precautions possible were taken to prevent its spread. Great credit is due to Mr. Henry E. Merriam, the superintendent of the mills, for the great care he always takes to prevent any possible contagion from the rags used.

Yours truly,

E. E. LEWIS,

Secretary Local Board of Health, Gardiner.

Chapter 213, Laws of 1889.

An act to provide against the danger of the spread of Small-Pox from Paper Mills.

Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows:

SECT. 1. No owner, agent or superintendent of any paper mill where domestic or foreign rags are used in the manufacture of paper shall hire or admit any person to work in or about said mill who has not been successfully vaccinated or revaccinated within two years, or to the satisfaction of the local board of health.

SECT. 2. No person shall work in or about any paper mill where rags are used, who has not been successfully vaccinated or revaccinated within two years, or to the satisfaction of the local board of health.

SECT. 3. The owner, agent, or superintendent in every paper mill where rags are used shall every year in the months of February and September, make out and deliver to the local board of health, a list containing the names, ages, kind of work, and places of residence of all persons employed in or about said mill.

SECT. 4. In the months of March and October, annually, each and every person who is employed in a paper mill, shall be examined by the local board of health as to whether he or she is successfully and sufficiently protected by vaccination and the local board of health shall in all cases be the judges of the sufficiency of the protection by vaccination.

SECT. 5. Any person who shall violate any of the provisions of this act shall be guilty of a misdemeanor, and upon conviction thereof shall be subject to a fine of not more than fifty dollars.

SECT. 6. It shall be the duty of the local boards of health within their respective jurisdictions and of the State board of health, to enforce this act as far as comes within their power, and when said State board of health knows or has reason to believe that any penalty or forfeiture has been incurred by reason of neglect to comply with said act, it shall, at its discretion, give notice thereof, in writing, to the county attorney of the county in which said penalty or forfeiture has occurred, and upon receipt of such notice the county attorney shall prosecute the defaulting person or persons.

[Approved Feb. 23, 1889.]

THE HEATING AND VENTILATION OF THE STATE HOUSE.

The following letters in relation to the heating and ventilation of the State House are self explanatory.

PORTLAND, May 24, 1889.

Dr. A. G. Young, Secretary State Board of Health:

DEAR SIR—The matter of the ventilation of the State House is an important one to the State Board of Health. The amount of suffering in the old building has been immense, and it has not been at all infrequent that I have been asked: "Can't your Board of Health devise something that will give relief?" The people seem to connect us more or less with the sanitary arrangements of the State institutions as well as an advisory Board upon local nuisances, etc., and rightly so, I think, as this is the practice in other States.

While we consider ourselves experts, and possibly specialists upon certain lines, it is all the more important, especially in a matter so intricate as good ventilation, that we guard ourselves from errors.

The new building itself is only ordinarily difficult to arrange for, but to plan in a manner that the old part may be provided for by the new plant, as would be the part of wisdom, requires the service of a specialist. I consider it unsafe to be guided by an interested advocate of this or that system.

Professor Woodbridge is a specialist who knows the law under which good heating and ventilation may be had and would be capable of advising the State as to the system and its modifications that is applicable to the conditions to be met with. His opinion would not be warped by interest, and his experience and acquirements make him a valuable man.

I think we should urge the Commission to send for him before deciding upon any particular scheme.

Yours truly,

E. C. JORDAN, C. E.,

Member of State Board of Health.

MAINE STATE BOARD OF HEALTH,
AUGUSTA, May 25, 1889.

The undersigned Standing Committee on Ventilation of the State Board of Health would respectfully make the following recommendations to the State House Commissioners on the heating and ventilation of the State House.

1. The adoption of a system of heating and ventilation in which the warmed air is forced into the building and the various rooms by means of a fan.

2. The employment of a specialist to advise in regard to the plans and specifications for the application of such a system of ventilation.

3. The choice of Prof. S. H. Woodbridge of the Massachusetts Institute of Technology as such specialist.

O. A. HORR, M. D.,
E. C. JORDAN, C. E.,
A. G. YOUNG, M. D.,
Committee on Ventilation.

In accordance with the recommendations of the Committee on Ventilation of the State Board of Health, the State House Commissioners sent for Prof. Woodbridge to confer with them and advise in regard to the heating and ventilation of the building. The following report was subsequently made by him to the Governor, as chairman of the State House Commissioners:

MY DEAR SIR:—I beg leave to present a re-statement of my opinion, informally rendered before the commissioners on Friday of last week, in regard to the heating and ventilation of the capitol. In the absence of any definite statement, either as to the nature of the plans which had been previously proposed, or as to the amount of ventilation it was desired to effect, I gave the time available before meeting the commissioners to a study of the present capitol building and also the plans of the extension.

AIR SUPPLY REQUIRED.—All the rooms requiring ventilation may be classified under three heads: offices, committee rooms, and assembly rooms. To insure freshness of air in offices, including the library, I advise an air supply equal to their cubic contents once in twenty minutes. For the committee rooms I assume that provision should be made for a maximum attendance of from twenty-five for the smallest to fifty for the largest rooms, and I place 1000 cubic feet of air supply per capita an hour as the limit of safety for these rooms when full, if the danger of draughts is to be avoided. The larger per capita space in the assembly rooms makes it safe to put the rate of supply at 1500 cubic feet for each occupant per hour.

Seventeen rooms in the extension require continuous ventilation, and during the sessions of the legislature nine committee rooms in the extension require ventilation, while the legislative halls are not in use, and vice versa. Adding to these such rooms in the present building as may be continuously used or devoted to committees, the air volume which a ventilating system including the entire and completed capitol should be capaple of supplying, may be stated thus: (a) for continuous ventilation, 500,000 cubic feet per hour; (b) for committee rooms, 450,000 cubic feet per hour; (c) for assembly rooms, 1,050,000 cubic feet per hour; or, since (b) and (c) are used alternately, 1,550,000 cubic feet per hour.

METHOD OF SUPPLYING THE AIR.—Such a volume of air can be moved through ordinary wall flues without mechanical assistance only when the conditions of weather and of working are exceptionally favorable—as in very cold weather and by the use of large and short course flues. But the system must be able to move the air demanded though the most unfavorable conditions of weather during which artificial ventilation is called for. The general character of the building and the impractibility of carrying vertical flues of sufficient size through its interior walls for ventilation by natural currents, make the use of mechanical means advisable, if not imperative. The simplest, most effective, and economical mechanism for moving air for ventilation purposes is a properly adapted fan. The fuel required to run it is very small, if steam is used, and the exhaust steam is passed into the heating system. Furthermore, the use of a fan, because of its effect in producing rapid movement of air over the steam pipes, and the resulting increased rate of steam condensation within them, may so reduce the needed amount of heating surface as to affect a saving more than enough to meet the cost of the fan.

THE VACUUM AND THE PLENUM METHODS.—The Vacuum method effects a movement of air into a room by creating a partial vacuum within it. The air then flows into the room through every available channel, both provided and accidental. Just as air supplied to a room under slight pressure will find its escape in large quantity from the room, though sealed as tight as putty, paint, paste and paper can seal it, so outside air will as freely leak into such a room when a vacuum condition is maintained within it. The undesirable results are several.

1. The inward leakage of cold outside air, settling to the bottom of the room, tends to produce a chilly floor. This in turn makes it necessary to heat the air of the room sufficiently high to bring the temperature of the floor up to the point of comfort, or a superheating of the air in the upper part of the room for the sake of comfortable warmth in the lower part. This results in a greater temperature difference between the ceiling and the floor than would exist without the inward leakage of cold air. That is, the chilly floor necessitates the maintaining of a higher mean temperature within the room for the purpose of raising the floor temperature to the point of comfort than would be otherwise required. The consequence is an increased consumption of fuel over that which would be required were the temperature uniform from floor to ceiling. This defect with the exhaust method is identical with that peculiar to and inseparable from the use of the old fashioned fire-place. It is the more defective as the climate in which it is used is colder and the maintained vacuum greater.

2. Another result attending the use of the vacuum method is that, unless all outlets including fire-places, etc., are connected with the exhaust system, the vacuum condition within the room tends to retard and to reverse the desired flow through such flues. Fire-places are more likely to smoke, and the action of other independent flues to be weakened or reversed.

3. The source of a room's supply is not as completely under the control of the occupant as in the plenum method. The air moves from a greater and toward a lesser pressure. From whatever point, therefore, the pressure may be greater than in a room ventilated by a vacuum method, from that point it will move toward the room. A reduction of the vacuum, or what is the same thing, an increasing of the pressure in adjacent rooms or parts of the building, as by the opening of windows or the shutting of the exhaust flues taking air from them results in air movements toward the room in which the vacuum is maintained. Each room is therefore, more or less at the mercy of its surroundings, and of conditions beyond the control of its occupant.

4. Inrushing air is felt as a current by those within a room very much more than an out-rushing current of the same volume. An

in-rushing current is concentrated in volume, diverging slowly, and maintaining its high velocity to a considerable distance from the point of inlet. An out-rushing current, being strongly convergent toward the outlet in its movement from every possible point of approach, becomes sensible as a draught only on near approach to the outlet.

Because of the relatively large volume of air to be moved through an audience room, and the necessary energetic action of the exhausting apparatus, the vacuum within it is generally greater than that in corridors or rooms outside it, when the ventilation is by other method. The opening of doors into the corridors or lobbies is then attended by an in-rush of air.

The Plenum method of ventilation on the other hand, puts each room under a slight pressure, and retards or prevents inward leakage of cold air, and renders more possible that uniformity of temperature within a room which is essential to the highest economy in the use of heat; it tends to accelerate rather than retard the flow of air through other vents, including fire-places, etc; it gives an occupant of a room control over the source of his air supply; and it results in an outward flow through open doors.

For these reasons I have no hesitation in recommending the Plenum rather than the vacuum method for your use in the proposed ventilation of the capitol.

The vacuum method is as much better for certain kinds of work as is the Plenum for others, as in the production of concentrated ventilated draughts through hoods, etc., or in giving direction to slowly moving air freely supplied to a building for distribution by means of corridors, stair wells and open doors. The greater vivacity sometimes attributed to air supplied by the vacuum method, if it exists at all, may be due in part to the process going on within the room of the mixing of cold inward leakage with the warmer air of the room. Monotony is as depressing as variety is refreshing. Uniformly warmed and quietly moving air at 70 degrees will doubtless have a different and less pleasing effect than bodies of air at 65 degrees and 75 degrees imperfectly mixed and in active movement. The depressing effect said by its opponents to be inseparable from Plenum ventilation is, however, more likely due to the faulty way in which the air supply is heated.

METHOD OF HEATING.—If a room is heated by the ventilating air, it can be heated only when ventilated. To heat the room the air may be supplied either in large volume at low temperature, or in small volume at high temperature. If a large air supply is wanted, its temperature must be low; and if the supply is small, its temperature must be high. Such a variable range of temperature requires special means for effecting it, either a dual system of supply by which hot and cold air can be mixed in such quantities as may be required for each room, or else a separate supplementary indirect heater for each room with by-pass arrangement.

Besides being somewhat cumbersome and expensive, these methods have still the failing that heating is dependent on ventilation to a greater or less extent. By the most efficient means heating can doubtless be done more cheaply by the direct than by the indirect method, since ventilation, by the very movement of warm air out of a building, carries heat with its discharge. Since during the session of the legislature, the committee rooms, the assembly halls, etc., are to be kept continuously warm, and need ventilation but one-half the time, and no ventilation except when the legislature is in session, and as their ventilation must vary with the number using them, I would recommend the distribution of air warmed only to seventy degrees or so to all rooms to be ventilated, and the placing of direct radiators within the rooms to furnish the supplementary heat required, the steam to be admitted to the radiators by such automatic means that the temperature of the room shall be kept at the desired point. Then, when the room is empty and the air supply small, or entirely shut off, the duty of heating will fall on the radiators; and when the room is crowded and the air supply large, the steam will be automatically shut off from the radiators.

All things considered, this is the most perfect arrangement I am able to suggest.

For the ventilation of the Hall of Representatives I would recommend that the supply of air be passed through the floor, and its slow diffusive movement into the room be effected through a large surface to be obtained by a special adaption of either the members' desks or the chairs to the purpose. The discharge I would effect through some suitable opening in the dome and by large outlets over the galleries and thence through the attic and dome and lantern.

Without further study of plans and conference with the architect, any detailed statement of method is impossible. In general it would include a fan in the basement with 1,000 square feet of steampipe heating surface, an air duct running along the ceiling through the corridor of the extension basement, with branches to the flues in the corridor walls, and another air duct running to the basement corridor of the old building with large branches to the Senate and Representative halls, and smaller ducts to other rooms to be reached. The discharge would be by means of suitably sized flues in the corridor walls of the extension and by fire-place flues, and such other ducts as might be found necessary in the building, all ducts being properly carried up and terminated in the roof.

For extreme weather (–20° F.), for which the system must be provided, and when the system is doing full duty the coal combustion for warming the ventilating air will reach 250 pounds per hour, and the grate area provided for this purpose alone should be about 25 square feet. For heating the extension, aside from the ventilation of both the buildings, some 20 square feet of grate should be provided. This is found to be considerably more than double the present boiler power. The chimney should have a sectional area of 9 square feet for the total area of grate required.

The cost of using the proposed ventilating system to its full extent in mean winter weather would be from ten to fifteen tons of coal per month, or eighty tons if the system were so used continuously from the first of October to the last of May.

A rough estimate of the cost of fan, engine, steam heating surface, and return pumps to boiler, and large air pipes, for the vents of the entire building, is $2,200. For supplementary steam heating surface, vent pipes from top of wall and other flues to and through the roof, register faces, etc., $2075. For automatic electric apparatus for the control of steam to radiators, $1000. This does not include boilers and extra cost in refitting the Senate and Representative halls with new or altered desks, or chairs, etc.

If provision is to be made for the extension only, the estimate would be considerably reduced.

DOUBLE TUBE RADIATORS AND VENTILATION.

The use of these radiators, in connection with an exhaust method of discharge, removes none of the objections already mentioned as inhering in the vacuum method of ventilation. Its use as a means of supply is, in some important respects, faulty. Area of inlet, or quantity of supply, can be had only by correspondingly increasing the heating surface. For an audience room, small or great, such as committee or assembly rooms, the required inlet area can be had only by an accompanying excess of heating surface, and that where heating surface is least needed. In a crowded room, even in severe weather, the heat of the audience is often more than sufficient to maintain a comfortable temperature, if the air supply is passed in at a temperature of only seventy degrees. But, under unusually favorable conditions, these radiators require two tubes per occupant for supplying air, and they are reported by their maker to so increase the temperature of the air flowing over them as to raise its temperature from sixty degrees to eighty degrees. In warmer weather—when more air is required at yet lower temperature than in cold—the supply through the tubes will be less in quantity and at a higher temperature. The larger the hourly air volume used, or the more rapid the change of air within a room, the lower must be its temperature, if it is the vehicle of heat also, and the warmer the outside air the less the temperature increment in the supply must be. The method of ventilation by double tube radiators seems therefore, faulty in principle and defective in the flexibility of its adaptation to the varied requirements a ventilating system is called on to meet.

Furthermore, the passing of air into rooms through wall apertures is not to be recommended, and for reasons among which are the following: Each aperture must have its valve to be opened and closed each day. Each of the thirty odd rooms in the extension would require for the purpose of ventilation, if not of heating, from one to three or more inlets, or the manipulation of from fifty to sixty dampers twice a day when all the rooms are in use. The almost inevitable tendency will be to a disuse of the dampers through the indifference of occupants and janitorial neglect, and the danger of exposure to freezing through either or both of these causes will be large and, perhaps, welcomed by a neglectful janitor as reasons for their permanent closing. The most serious objection to the use of wall apertures for supply is to be found however, in the disturbing, interfering and fitful action of the wind, forcing in excessive volumes of underheated air on the windward side, and not infrequently forcing out warm air on the leeward side, the system which is least disturbed by wind action is that of internal supply, and especially that whose motive power is independent of wind and weather.

Respectfully submitted,

S. H. WOODBRIDGE.

To His Excellency the Governor, Hon. Edwin C. Burleigh, *Chairman of the Board of State House Commissioners, Augusta, Maine.*

Boston, June 8, 1889.

A little later in June a special committee of the Commissioners, consisting of Hon. Lewis Barker and Hon. Henry Ingalls, accompanied by the Secretary of the State Board of Health, visited Boston and examined various systems of ventilation there employed. After a careful examination of the questions involved, this committee recommended to the full board of Commissioners, the adoption of such a system of ventilation as Prof. Woodbridge had already advised in a general way, and he was employed to draw up the full plans for this part of the work on the building.

CONTAGIOUS DISEASES.

The condition of the State as regards the prevalence of the infectious diseases, small-pox, diphtheria, scarlet fever and typhoid fever within the year has been very satisfactory indeed, with the exception of a very few towns, as may be gathered from a cursory examination of the reports of the local boards of health. In the following instances towns have been visited, on account of outbreaks of infectious diseases, by the Secretary or other members of the Board:

But one case of small-pox occurred, a case of varioloid at Readfield. Its origin was wholly unknown, though the patient, a young lady, had been to Portland in the cars ten or twelve days before the attack. She was isolated in her own home, the rest of the family were vaccinated, and there was no spread of the infection.

There has been a smaller number than usual of outbreaks of diphtheria, scarlet fever, and typhoid fever, uncontrolled and assuming alarming proportions. The Secretary went to Jonesport in July where diphtheria had been prevalent for some time. Considerable complaint had been made in the town, partly, that the local board of health did not do enough, and partly, that it did too much, meanwhile there was not so much disposition shown as there ought to have been, to put the shoulder to the wheel and help and encourage the Board, and the afflicted families.

In April, scarlet fever broke out among the students of the seminary at Kent's Hill, Readfield, and, unfortunately, the first cases were not isolated so promptly as they should have been. The result was an outbreak of moderate proportions which spread the disease to some other towns. In the fall another outbreak of the same disease occurred in the same institution and was confined to the first two cases by prompt and praiseworthy action on the part of the local board of health and the school officers. Meanwhile the school continued its course without interruption.

In May, the Secretary was called to Winthrop on account of a small outbreak of scarlet fever. The disease was confined to a single family, but the father worked in the neighboring mill where many other persons worked, thus incurring the danger of spreading the infection broadcast. A talk was had with the man, and he agreed to remain isolated with his family. No new cases occurred until after the release from isolation when cases occurred in the family of a relative.

A small outbreak of typhoid fever occurred at Green's Landing, Deer Isle, due to bad water. The soil is thin and the wells as a general thing, go down to the underlying granite ledge and take their water from its surface, and as the privies and house drainage are, in many cases much too near, the conditions are extremely favorable for the soakage of polluting or infectious matter into the wells. A new water supply taken from outside the village is much needed.

Fairfield was visited by Dr. J. O. Webster, on account of typhoid fever in a tenement house, and another outbreak of the same disease in a similar institution, was seen by Dr. O. A. Horr. In both instances the outbreak seemed to be due to faulty sanitary arrangements.

INSPECTIONS OF SCHOOL-HOUSES.

North School—Portland.

The city authorities, having made a praiseworthy attempt to remedy some of the evils connected with this building, described in the Third Annual Report, invited the members of the board to inspect their improvements on December 27, 1889,—but only Drs. Webster and Smith were able to be present. It was found that the schools were not in session at the time, so that no examination of the condition of the air was possible. The heating apparatus, however, was in operation, so that some measurements of the air supply could be made; but as the fires were only started that morning, it was thought that the results might not be equal to those ordinarily attainable,—therefore Dr. Smith was requested to make further examinations, when the schools were in session. The improvements

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made concerned only the heating and ventilation, and are well described in the following report of Dr Smith. For its better understanding, it may be said that an air movement of 500 ft., a minute through the inlets, or 200 ft. a minute through the outlets, would represent an air supply of 1500 cubic feet an hour for each pupil, at 40 pupils per room, a very satisfactory amount.

We were sorry to find that the privy arrangements connected with this building were in the same deplorable condition that was described two years ago. We hope to hear ere long, that this nuisance has been abated.

Dr. Smith's report is as follows:

PORTLAND, February 14th, 1890.

Dr. A. G. Young, Secretary State Board of Health of Maine:

DEAR SIR: In accordance with your request, on Monday, January 13th, I visited the North school-house in this city and made an examination of the provisions for ventilation and have the honor to submit the following report:

Air Supply: Fresh air is admitted to the rooms through registers 6x20 inches in the window seats, being taken through an aperture in the outer brick wall 5x26 inches, which may be closed by a shutter, pivoted in the middle at each end, and manipulated by a chain passing up over the sills and into the room through a groove in the bottom of the sash. There are two of these apertures for each room. The cold air thus admitted comes in contact with a "Goldpin" radiator, situated immediately beneath each window seat, and having an area of 40 square feet of heating surface at each window serving or intending to serve the double purpose of inducing more draft through the inlet and warming the admitted air.

Each of the two windows in each room, has in its seat a register surface of 120 square inches, allowing a deduction of one-third for the iron lattice work, there would be for each window an inlet aperture of 80 square inches and for the room 160 square inches.

The "Goldpin" radiators beneath the window seats are not enclosed, but are in a space cut out of the wall communicating freely with the out door air through the 5x20 opening, and with the spaces in the walls and beneath the flooring. This space is separated from the school-room only by sheathing which forms the wainscotting of the rooms. As near as may be estimated the space beneath each window is about 30x18x24.

Air Outlet: Provision has been made for removing the vitiated air from the rooms by brick flues, each taking the air at the floor level through a coarsely grated aperture 19x35 inches square, and leading directly to the roof parallel and adjacent to the chimneys which are in the center of the wings. Each room has an independent flue, making in all twelve, which terminate by galvanized iron tops, surmounted by a hood 9 inches above them. The chimney flue passes directly through the hood, and three or four feet above it.

The method depended upon to create a current in these flues is different in the north and south wings.

Those in the north wing next Congress street are provided with steam pipes running up from 25 to 30 ft. above the attic floor.

Those in the south wing next Federal street have no steam pipes but depend upon the heat from the smoke flue of the chimney from which they are separated by a brick chimney wall.

On the occasion of my visit, the temperature out of doors was 30°, wind northeast, light, and weather foggy with drizzle of rain. Every one of the twenty-four rooms was examined with the following results.

North Wing—1st Floor: Air was entering each room at an average rate of 450 feet per minute, through *two* registers, each of an area of 120 square inches (no allowance made for lattice work.)

Air was leaving each room through one outlet of 665 square inches at an average rate of 268 ft. per minute.

The temperature of the rooms was uniformly 70°. The air was tested for CO_2 in two of these rooms on the side next the wind with a result of 12.5 per 10,000 for one, and 11 for the other. The average number of scholars for each room when all were present would be 34. The average of those present was 22, many being absent by reason of the prevailing influenza.

	Average velocity at inlets. (2)	Average velocity at outlet. (1)	Temperature.	Proportion of CO_2 in 10,000 pts. of air.	Average attendance.	
North Wing, 2d Floor ..	421	221+	70°	12—one room.	35 to 40	Flues with steam pipes.
North Wing, 3d Floor .	450	143+	70°	10, 11, 14	38 to 40	
South Wing, 1st Floor..	491+	253+	70°	-	35 to 40	Flues with no steam pipes.
South Wing, 2d Floor ..	475	201+	70°	16	35 to 42	
South Wing, 3d Floor ..	450	191+	70°	11	35 to 42	

It was stated to me by the janitor that in all four flues in the north wing there was 1200 feet of 1-inch circulation.

The steam for heating is furnished by 2 boilers each 3ft. 6 in. by 16 ft.

With the temperature at 0° from 4 to 5 lbs. are required to maintain the temperature of the rooms at 70°. In ordinary weather 2 lbs. suffices.

A few days later I was requested by the mayor, Hon. H. M. Melcher to make a further test of the south wing inasmuch as there had been no fires in the building during the Saturday and Sunday preceding my visit, and the flues in the south wing had not received the benefit of the heat.

February 14th I again visited the school with the following result:

South wing.	Average velocity at inlets. (2)	Average velocity at outlets.	Temperature.	Proportion of CO_2 to 10,000.	Average attendance.	Temperature out of door, 30°; wind, S. W. fresh air moist.
First floor...... (on N. E. side.)	2 rooms. 470 2 rooms. 153+	2 rooms, N. E. side. 157+ 2 rooms on windward side had a strong downward draft—one 135 feet, the other 75 feet. One could feel cold air about the floor.	70°	10.0	38	Each number in CO_2 column represents one room.
Second floor....	470	141+	70°	14.0 12.5 14.0 10.5	40	
Third floor.....	450	131+	70°	12.0	40	

The air in most of the rooms was perceptibly close and ill-smelling, and in several, windows and doors were found freely open. This is constantly necessary (said to be done by reason of heat) and it is usually necessary to place large card-board charts in front of the exit apertures to keep from the floors strong downward currents, especially in those rooms next the wind.

While the system employed is by no means perfect or most desirable it has secured a vast improvement over the condition of affairs existing before its introduction. The committee in charge of the matter seem to have done the best they knew with the sum of money placed at their disposal by the city government. It is a matter of regret that the "Goldpen" radiators could not have been enclosed in galvanized iron boxes, and that the flues which diminish in size for each floor toward the roof, could not have been larger and those in the south wing provided with steam heat. What the system will accomplish in weather without the aid of artificial heat is conjecture. Doubtless it will have to be supplemented by open windows.

I send you card diagrams showing the exact rate of exit for every outlet in the building. The inlet rate is very uniform. The attendance in January did not average over two-thirds or three-fourths of the number belonging to each room. In February it was nearly up to the normal.

Very respectfully submitted,

CHARLES D. SMITH.

OAK STREET SCHOOL—LEWISTON.

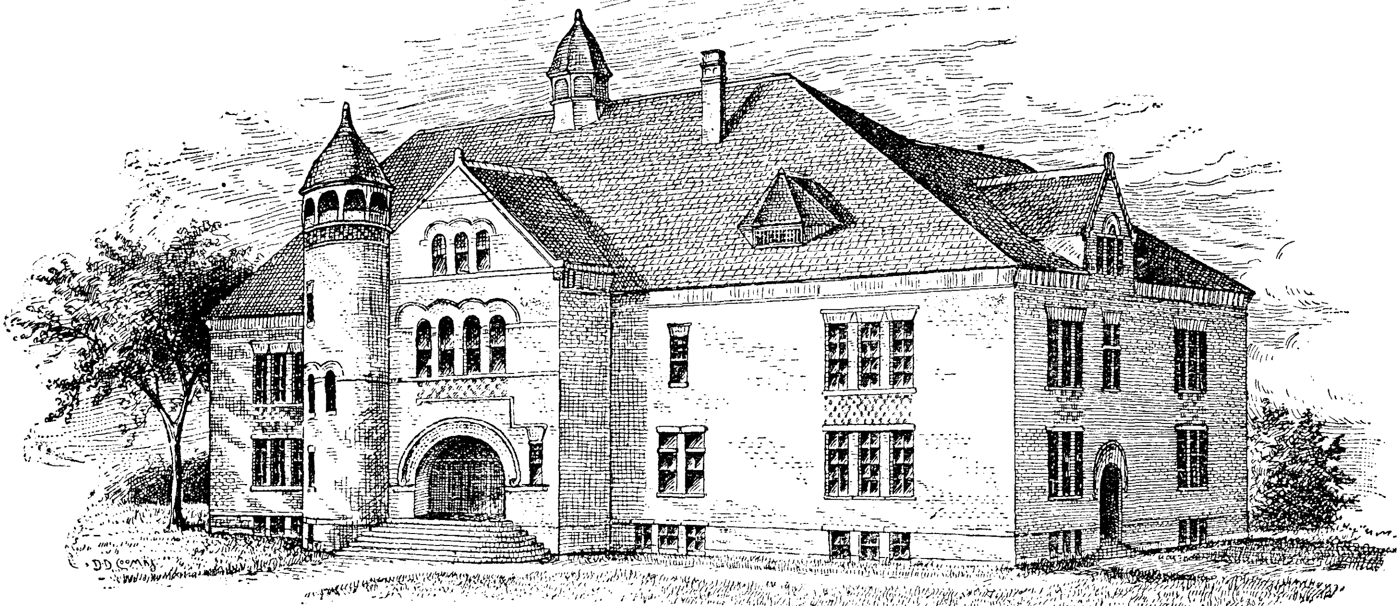
The report on the examination of the building was made by Dr. J. O. Webster, member of the Board:

On the 7th of January, 1890, several members of the Board visited Lewiston, for the purpose of inspecting the new Oak street school-house, with special reference to its arrangements for heating and ventilation.

In these respects the city authorities have made a praiseworthy attempt to attain the best possible results,—an attempt that cannot be said to have conspicuously failed, neither to have met with perfect success.

The credit is due to them of having, first in this State, applied to a school-house an apparatus for mechanical ventilation,—the only method of ventilation that can be depended upon for exact results and is independent of wind and weather; and whatever criticism we find it our duty to make upon the details of the work, should not detract from the credit due its inception.

This is a fine specimen of school-house architecture, and the arrangement of its rooms and its general hygienic condition are unexceptionable. The basement is high and airy, and contains, instead of separate water-closets, one of the forms of school sinks, with an automatic flush-tank; the boys' urinal is of slate slabs with



OAK STREET SCHOOL—LEWISTON.

constantly flowing water; the closets are ventilated, the soil-pipes are properly arranged and all traps are ventilated; in short, we found here a model job of plumbing.

Especially worthy of notice in this connection are the toilet sinks for pupils, with soap and towels, in the corridors, and the toilet-rooms for teachers' use.

There are ten school-rooms, each 23x33ft., and of proper height. Each room is lighted by six windows, each containing eight lights of 18x22 glass, giving a glass surface equal to one-sixth the area of the floor, just the proportion that is considered most desirable. In two rooms the lighting is from the left alone, in eight from the left and rear of the pupils.

All the school-room windows are double, both outer and inner sashes sliding up and down. This is an important point in school-house architecture in our climate. It will be seen that it is a very fortunate arrangement for this house.

The school-rooms are heated by radiators with double tubes; the inner tube being open at top and bottom to allow the air to pass through, the outer closed and containing the steam.* An opening through the outer wall of the building below the floor level, conveys air to the bottom of each radiator, in passing through which, it becomes heated and enters the school-room. There are three radiators in each room. The area of each air inlet is 36 square inches, or 108 square inches per room; and we found the air entering them at an average rate of 300 feet a minute. This is probably as great velocity as it is practicable to get, and is the maximum rate at which it is considered advisable to allow air to enter an occupied room. A little calculation will show that, at this rate, 13,500 cubic feet of air an hour will enter each school-room through these openings. As this is only one-fourth or one-fifth the needed amount, it is not surprising that the teachers had found practically—what our measurements demonstrated scientifically—that it was necessary to keep the windows constantly open. By dropping the inner sash at the top and raising the outer at the bottom, this could be done without inconvenience in the mild weather that had prevailed.

Turning to the ventilating apparatus proper, we are able to commend it in the highest terms. At the bottom of each room are three ventilating registers each of about one square foot available area. From each of these a galvanized iron pipe leads to the attic

* See "Double Tube Radiators," page 14.

where the pipes gradually unite and finally all combine into a five foot pipe, containing a five foot fan which drives the air into a ventilating tower above the roof. The fan is run by a water-motor. It was making 252 revolutions a minute and drawing the air through the ventilating registers at the rate of 200 feet a minute. It was, however, easily run at a speed which gave a rate of 300 feet a minute through the registers. At the latter rate it affords very good ventilation; but at the former it is very deficient, as shown by the analysis made of the air in a primary room, which showed ten parts of carbon dioxide per 10,000. By closing the windows and doors of any room, leaving a chance for the air to enter only through the radiators, the rapidity of its exit was much reduced.

We conclude, that if the fan be run constantly during school hours at such a rate as shall maintain a flow through the ventilating registers of 300 feet a minute, the rooms will be very well ventilated —that with the present arrangement of inlets, it will be necessary to take a part of the air supply through the windows—that to make the system perfect, the ventilating apparatus should be complemented by some form of heating apparatus that would supply to each room, 50,000 to 60,000 cubic feet per hour of *warmed* air whenever heat is needed—not *hot* or partly hot and partly cold.

In warm weather, the fan run by a water-motor has a great advantage over the systems of ventilation dependent upon heated flues or a motor run by steam, because it can be kept running when heat is not needed, and will insure a proper change of air at the time when, from the slight difference between the external and internal temperature, natural ventilation is least efficient. Therefore the fan should be run when school is in session, all the year round and not simply when artificial warmth is necessary.

While in Lewiston we visited, by request of the committee, the other principal school-houses in the city.

The Bates street house is in an equally bad condition as when reported on two years ago,—it is inefficiently warmed by furnaces, has no proper ventilation, and the water-closets in the basement are abominable. It should be heated by indirect steam radiators, sufficient to furnish an air supply, supplemented by direct radiation for additional heat if needed. At the same time, some steam pipe should be put into the ventilating flues to cause an upward draft, and new flues should be added. About the same can be said of the Grammar school-house, except that it is already heated by direct steam,—it should be supplied with sufficient indirect radiation and ventilation. Both of these buildings should have new water-closets or school-sinks at once, and all their plumbing should be thoroughly overhauled. They are in a very unsafe condition at present.

The Main street school-house is in excellent condition and a credit to the city; is nearly new and is in many respects a model building; but it suffers from the same entire lack of air supply and ventilation—a lack with which the High school-house is also afflicted. We hope the work begun this year will be continued until Lewiston can point with pride to all her school-houses.

North Grammar School—Waterville.

Dr. Webster of the Board, visited Waterville on February 11, 1890, and inspected the North Grammar school building—a new school-house erected some two years ago—and reports as follows:

This is a two-story brick school-house containing eight rooms, four on each floor, with large cloak-rooms adjoining, and spacious halls. It would well serve as a model for school buildings of this size.

Each school-room is 28x35 feet, twelve feet high. The windows are 36x76 inches glass surface. Two rooms have five windows on the left, the others four on the left and two in the rear. The glass surface is below the standard; though on the day of my visit, the lighting was satisfactory. Each room has a door opening into the hall and one into the cloak-room, both with transoms over them; and from each cloak-room there is also a door to the hall.

In the basement are short-hopper water-closets with a very fair flush, worked by the seat—not the best of closets, but kept in good condition by great care. On the boys side are slate-slab urinals with constantly running water. An abundant supply of umbrella racks is found in the dry, light and well cemented basement.

The heating is by steam with indirect radiation for air-supply, supplemented by direct for additional heating when needed. The indirect radiator boxes, air-supply pipes and hot-air flues are of galvanized iron, separate for each register.

The inner corner of each school-room is cut off, and the hot-air and ventilating flues run in the space thus formed. The warmed air enters near the top of the room, through a register 12x18 inches. The ventilating register of the same size is near the floor. In the cloak-rooms, on the contrary, the hot-air register is in the floor, the ventilating register at the top of the room.

From each ventilating register a galvanized iron pipe leads directly to the attic where all enter a wooden box, six and one-half feet square and about the same height, situated under, and opening into the cupola which rises from the center of the roof. This box has three runs of one and one-half inch steam pipe around it on the inside, to create a current in the ventilating pipes.

Careful measurements were made of the air-flow in four of the rooms,—two on each floor; and it was found pretty uniform.

The average in-flow of warmed air was 520 ft. a minute, which would give some 45,000 cubic feet of air an hour to each school-room. The rates as measured at the outlets were considerably less; but as no more air can enter a room than goes out, and *vice versa*, the larger number represents the amount of air actually supplied. If the doors between school-room and cloak-room are kept open, considerably more air—perhaps nearly twice as much—is available; for each cloak-room has the same air supply as a school-room.

For want of time, the air could be tested in but two rooms, and that just before noon. In one, with all doors, windows and transoms closed, the CO_2 rate was 9.5; in the other, which had the door into cloak-room open, 8.3 per 10,000. The temperature was very uniform, ranging from 70° to 74° in the center of the room. There are, on an average, about 40 pupils in a room.

The results here attained are so far superior to those found, as a rule. in our best school-houses, that we feel like bestowing only praise; and while, in future building, we should recommend an increased area of air-inlets and outlets in the school-rooms, we consider the conditions here highly satisfactory.

New Mills School—Gardiner.

On the 12th of the same month, Dr. Webster also visited Gardiner, and reports as follows:

The new school-house erected the past year at New Mills, Gardiner having been reported to be a model in respect to heating and ventilation, it was thought best to ascertain, by inspection, the truth of these reports. It is a two-story wooden school-house, of quite a pretentious outside appearance. The halls are spacious, stairs wide with short runs, two cloak-rooms to each school-room open from the hall, and entrance to the school-rooms is only to be gained through these,—this part of the building is admirably arranged.

On entering a school-room, however, disappointment awaits one. The rooms are some 32 ft. wide, 30 ft. deep, and 12 ft. high, being much too wide for their depth. The lighting is from three sides, by 16 windows, 12 lights, 9x18 inches, six on each side and 4 in the rear. The heating is by direct steam, 4 runs of circulation pipe along the three outer walls. There are no air-inlets, and no attempt at an air supply. There are ventilating registers behind the teacher's desk, opening into flues in the chimney that carries the smoke-flue from the boiler. The lower registers are 11x15 inches. There are upper registers, for hot weather, now properly kept closed.

The rate of outflow was through register on first floor, 145 feet, on second floor, 230 feet a minute, carrying in the former case about 8,700 and in the latter 13,800 cubic feet of air an hour. The doors have to be kept open to supply fresh air. The air was tested in the lower room just after recess and found to contain 8.3 CO_2 per 10,000. With the doors closed it must soon become very foul, as is said to be the case.

It would be very easy to furnish an air-supply for these rooms by putting two indirect radiators into the cellar with about a sixteen inch supply and hot-air pipe to each, one of the latter opening by a large register into each school-room at some convenient place. Then if the ventilating flues be not efficient they can be heated by coils of steam-pipe. It is unfortunate that the windows on the pupils' right were not omitted a part of them being added to those on the left and in the rear. With the changes indicated, this would be—what it is not now—a healthful school-house.

We are glad to know that the architect was not responsible for these faults. His plans provided for just the things that we suggest, but they were well-nigh spoiled by the ill-advised changes made by the building committee.

CIRCULARS.

The following new circulars were published within the year. Circular No. 53 was written at the request of the school officers of several towns. The advance of our khowledge regarding the causes and possibilities of preventing that most destructive of all diseases, consumption, made the publication of Circular No. 54 a necessity. It is believed that a wide diffusion of the information which it contains would result in the saving of many lives every year.

CIRCULAR NO. 53.

STATE BOARD OF HEALTH OF MAINE.

CHARACTERISTICS OF THE INFECTIOUS DISEASES.

The purpose of this circular is to set forth, for the use of teachers, school officers, and non-medical members of local boards of health, the principal characteristics of the infectious diseases and of their infection, and to give brief hints in regard to preventing their spread.

Note of Definition.—The *period of incubation* is the time which elapses after the reception of the infection until the first, or premonitory symptoms occur. *Period of invasion*, time from the first symptoms until the disease is declared, or, in the eruptive fevers, till the appearance of the eruption. *Vesicle*, an elevation of the cuticle containing clear watery fluid. *Pustule*, same as "vesicle" excepting it contains pus or colored serum.

Chicken-pox. Period of incubation, 13–14 days, may be shorter or may be prolonged to 18 or 19 days. Period of invasion very short. A disease of childhood, but occasionally occurring in adults. The eruption consists of clear watery blisters or vesicles, scattered irregularly over the body. The eruption is often the first thing noticed. Premonitory symptoms are often overlooked as also are often the small red spots preceding the vesicles. The "blisters" reach their full development in 24 or 36 hours. Successive crops of vesicles and unequal development of them on the same parts of the body. With the appearance of the eruption, the fever increases. (Compare small-pox.)

Consumption (Pulmonary Tuberculosis.) The investigations of the last few years make it certain that this is an infectious disease, and also make it likely that the only serious source of danger is the sputum, or expectoration. While the sputum is moist it is practically harmless; after it is dried, pulverized, and floated in the atmosphere, so that it may be inhaled, it is dangerous. Avoid, therefore, spitting upon floors, in handkerchiefs, or upon other things within doors, where the infectious sputum will be dried and pulverized. Use a spit-cup. Tuberculous or consumptive children should not be allowed to attend school, and persons with this disease should not teach. (See Circular No. 54, Prevention of Consumption.)

Croup. Membraneous croup is now generally regarded as diphtheria of the air passages, and the same precautions are applicable to it as in ordinary diphtheria.

Diphtheria. Period of incubation 2–7 days, but may be longer or shorter. The distinctive feature of the disease is the false membrane which invades the mucous membrane, more frequently of the throat. The false membrane appears at first as a whitish patch, or there may be several such spots, which may gradually or rapidly increase in size and coalesce. The condition and appearance of the false membrane, as first discovered, may remain stationary for awhile, or gradually disappear. Occasionally in cases of diphtheria the false membrane is absent, or in localities where it is not to be seen. When diphtheria is prevalent, it is safer to regard all cases of sore throat as diphtheria, and to require a reasonable amount of care until they are pronounced non-diphtheritic, and non-infectious by a physician. "Diphtheritic sore throat" is diphtheria.

The diptheritic infection is much more dangerous to children than to adults. Many persons are not susceptible to it; and, on the other hand, articles and rooms infected with it may retain their dangerous qualities for a long while. Children who have had diphtheria should not be re-admitted to school earlier than three or four weeks after recovery, or not until precautions in the way of thorough disinfection, etc., have been taken which are satisfactory to the local board of health. The infection may be carried by those who have not had the disease. (See Circular No. 44, Diphtheria.)

Dysentery. Some forms at least of this disease appear to be infectious. The infection is undoubtedly given off in the discharges from the bowels, and it is often spread, as typhoid fever is, by the contamination of drinking water. Period of infection, said to be from 3–7 days.

Erysipelas. Infection usually gains admission to the system through a wound or abrasion of the skin or mucous membranes. The infection may be carried by the clothing, or the hands of attendants. The period of incubation is very short.

German Measles (Rotheln.) This eruptive disease has no relation to measles and scarlet fever with which it is sometimes confounded. Its period of incubation is long, two to three weeks.

The eruption appears earlier than in measles, often within 24 hours after the first symptoms. The rash fades about the third day or earlier and the fever gradually disappears with the rash. Desquamation is absent or very slight. The eruption is not so "blotchy" as that of measles; sometimes resembles that of scarlet fever. Incubation is longer than that of measles, and much longer than that of scarlet fever. Period of invasion, shorter than that of measles. Catarrhal symptoms not so severe as in measles. Throat symptoms not so marked a feature as in scarlet fever. Patient should not return to school until two weeks after recovery. (Compare further Measles and Scarlet Fever.)

Glanders. An infectious disease of horses which may be communicated to man. A horse with glanders is too dangerous to be permitted to live. Period of incubation from three days to several months.

Measles. Period of incubation 8 days on an average, or 12 days to the appearance of the rash. Eruption preceded by catarrhal symptoms, like those of a severe cold. Fever falls rapidly after the eruption is fully out. Rash usually begins on the face as slightly raised red spots which form crescentic groups, coalescing into patches of irregular outline. Eruption more distinctly "blotchy" than in scarlet fever and a duller red instead of scarlet. Measles is infectious in its earliest stages before the rash has appeared. The infection may be carried by clothing. Children should not return to school for at least two weeks after recovery. (Compare German Measles, Scarlet Fever and Small-pox.)

Mumps. In most cases the period of incubation is from 14 to 21 days, but may be shorter. The distinctive characteristics of the disease are the fever, and the swelling and tenderness of the glands just below and in front of the ear. The swelling often extends upon the face or down upon the neck. The history of a possible infection should be taken into account. The patient is infectious for at least three weeks after the swelling of the glands, and possibly sometimes before the swelling begins.

Pneumonia. Many observations seem to show that pneumonia, at least sometimes, is contagious. In all cases it would be prudent to receive the sputum in a cup or vessel so that it may all be destroyed or disinfected. The sputum is undoubtedly the sole source of infection.

Scarlet Fever, (Scarlatina, Scarlet Rash, Canker Rash, "Rash.") Period of incubation 2–5 days. The onset of the symptoms is usually sudden. The rash appears within 24 or 48 hours after the first symptoms (earlier than in measles and small-pox), usually coming out first on the neck and chest, afterward extending to the limbs. The fever does not abate suddenly, after the appearance of the eruption, as in measles and small-pox. Rash consists of a multitude of fine red or scarlet points, the color of which is diffused over the whole surface. Sore throat is almost always an early and prominent symptom. The tongue usually presents a peculiar appearance designated as "strawberry tongue." Cases are infectious as soon as the eruption has appeared, and until the completion of the desquamation, or peeling, which is often not before 6 or 8 weeks. The infection may come directly from the patient, or be carried upon the person or in the clothing of those who have not had the disease. Infected clothing, furniture, rooms, etc., may retain their dangerous qualities for a long while, unless very careful disinfection is done. Children from 2 to 7 years of age are more likely to take the disease, and when they do, are more endangered by it, than persons at other stages of life. After 10 or 12 years of age there is a rapid diminution of susceptibility to the infection of scarlet fever. (See Circular No. 48, Scarlet Fever.)

Small-pox. Period of incubation 10 to 12 days. In about three days more (sometimes on the second) the eruption begins to show as small red spots or specks, and then as pimples or papules, at first on the face and wrists, gradually passing over the body. Sometimes at this stage a diffused rash appears. The papules are changed in about 24 hours into vesicles, which, when they are sufficiently developed, show a characteristic depression in the center, that is, are "unbilicated." The contents of the vesicles gradually become yellow, and the eruption has then become pustular. In varioloid, the eruption aborts at various stages. Severe pain in the back is somewhat characteristic of small-pox. There is usually a marked diminution of the fever after the eruption is out. Small-pox is intensely infectious, but less so in the earlier stages of the eruption. The small-pox patient is infectious until the skin is cleared of all crusts and careful disinfection is done.

Vaccination not only lightens small-pox, if one happens to take it, but, when well done and not too remotely, insures almost absolute protection from taking the disease. (Compare Chicken-pox, Scarlet Fever and Measles.)

Typhoid Fever. Period of incubation 14 to 21 days, but may be shorter, especially in cases with a severe and rapid course. The natural duration of the disease is 3 or 4 weeks, but severe cases may end fatally even in 10 or 12 days, or mild cases may recover in two or three weeks. The infection is given off by the patient principally in the dejections, therefore, if a proper disinfection and disposition of these is secured, the patient will not endanger others. Typhoid fever is usually "caught" by drinking water contaminated with the infectious matter of the typhoid discharges, or by breathing the air from privy vaults or other places which are similarly polluted and infected. (See Circular No. 46, Typhoid Fever.)

Whooping Cough. May be communicated either directly from the patient or through the medium of infected clothing, etc. Period of incubation about 6 days. The peculiar cough is characterized by a series of quick, short, forcible expirations with flushed face, then recovery of the breath with a long, shrill whoop, or a succession of such. The "whooping" begins in the second week of the disease; sometimes later. The earlier symptoms are like those of a common cold with a cough of ordinary character. Infection lasts 6 or 8 weeks after the disease is declared.

NOTE.—Children, who have been exposed to infectious diseases, should be excluded from schools and other gatherings for a period exceeding by a little, at least, the period of incubation for the given disease. For instance, if the disease is measles, children who have never had this disease, but who have been exposed to its infection, should be kept from school for two weeks after the last exposure; or, if it is scarlet fever, one week, at least.

One attack of diphtheria does not exempt from subsequent attacks.

PRESERVE THIS FOR FUTURE REFERENCE.

CIRCULAR NO. 54.

STATE BOARD OF HEALTH OF MAINE.

ON THE PREVENTION OF CONSUMPTION.

That insidious disease, which we call Consumption, Phthisis, or Tuberculosis of the lungs, is the most terrible destroyer of lives with which civilization has to contend.

Centuries ago consumption was regarded as an infectious disease in Southern Europe, and extravagantly rigorous laws were in existence regulating communication with consumptive patients.

At the present time the fact of the infectiousness of consumption is firmly established in a scientific way, and enough is known of the natural history of the infective agent, the *bacillus of tuberculosis*, and of the ways in which it is communicated to man, to enable us to lay down rules with more positiveness than hitherto for the prevention of the disease.

The source of infection is twofold: from tuberculous animals to man, and from one human being to another. The tuberculosis of animals and human consumption are of the same nature.

From domestic animals there is danger of contracting the disease by the use of flesh, and especially by the use of milk from those which are tuberculous. Many children die in their earlier years from various tubercular diseases, tubercular inflammation of the brain, "consumption of the bowels," etc., and it is now assumed with much probability that the great majority of these die from infection received in the milk from tuberculous cows, or in that from mothers suffering from tuberculosis in some form.

By far the greatest source of infection, however, is consumptive human beings, but fortunately the ways in which the contagion is disseminated are but few, and by intelligent care they may be effectually controlled.

Practically, from the human source, we may consider the expectoration (the sputum) as the only serious danger. The consumptive sputum usually contains an abundance of the infection, the *bacilli*, and these microscopic organisms are found to be capable of retaining their vitality and their infectious qualities for a long while, even after the sputum has been thoroughly dried.

It has long been known that tuberculosis may be communicated to animals experimentally by feeding them with tuberculous matter, by injecting it into their tissues, or by causing them to breathe air into which tuberculous sputum had been atomized. More recently, since the discovery of the *bacillus tuberculosis*, it has been found that the bacilli may be cultivated upon artificial media, and that when thus cultivated and freed from all other matter which might possibly be infective, tuberculosis may still be communicated to animals in the ways which have been mentioned above, and with great certainty.

Experiments, the conclusions from which can hardly be questioned, have shown that the breath of the consumptive patient is not infectious, *and that the same may be said of the sputum so long as it remains moist.*

Another line of investigation has proved that *the careless consumptive patient is a focus of infection, and a danger to all persons who come much in proximity to him*, especially to those who dwell in the same rooms with him.

The reason of this is that the expectoration of the patient, spit upon floors, carpets, pocket handkerchiefs or clothing, becomes dried and pulverized and, floated in the air, still contains the infectious germs, and cannot be inhaled without great danger.

Though infection may be regarded as the principal, *the essential* cause of consumption, there are nevertheless various untoward influences which have much to do with increasing the death-rate from this disease, and should never be disregarded. The most important of these are the breathing of impure air, particularly that of unventilated sleeping rooms and living rooms, the use of food not sufficiently nutritious, and dwelling upon a soil that is damp.

How far heredity is a cause of consumption, is, from the nature of the question, hard to determine. Since the infectiousness of the disease has been shown, many family groups of consumption, "house epidemics," may fairly be assumed to be from infection rather than from hereditary influence. Some able writers would discard heredity as one of the causes of tuberculous disease, but others, more conservative in their views, while believing that direct inheritance is rare, think that certain peculiarities of constitution, favoring susceptibility, are transmissible from parent to child.

RESUME.—1. Tuberculosis is an infectious disease.

2. The breath of the consumptive patient is not infectious.

3. The sputum is harmless as long as it remains moist.

4. Tuberculous infection is produced, in the great majority of cases, by the inhalation of dried and pulverized tuberculous sputum.

PREVENTION.

The restriction of infection.

It should be impressed upon consumptive patients and other persons living with them, that *the sputum* (*what they cough up*) *is dangerous and must be properly disposed of.*

The sputum should be received in a spit-cup or spittoon containing a little water or disinfecting fluid, and must never be spit upon floors, carpets, or received in handkerchiefs. If a disinfecting solution is used, corrosive sublimate is unsuitable, chloride of lime is efficient but irritates the air passages, carbolic acid (Solution E.) with 5 per cent. of tartaric acid or hydrochloric acid, will be the best disinfectant generally available.

If occasionally it is necessary to have handkerchiefs or cloths soiled with the sputum they should be boiled as soon as possible, and before drying.

The spittoon should be of such shape that the sputum may easily fall into the water without soiling the sides of the vessel. For patients not able to sit up, a small spit-cup with a handle should be used. When flies are present, it should be covered.

Spit-cups and spittoons should be emptied and cleansed often with boiling water and potash soap. When the house has a drainage system, the contents may be poured down the water-closet or slop-hopper; when it has not, they should be buried in ground which will not be turned up soon.

The sputum should not be thrown out upon the surface of the ground near inhabited places, nor on manure heaps, nor where animals may get it, nor where it may soil animal food.

Boxes filled with sand or sawdust should not be used. Cheap wooden and pasteboard spit-cups are now on the market, one of which may be burned daily or oftener with its contents as a convenient way of disposing of the sputa.

A pocket spit flask of small size has been devised, which may be used while away from home.

The floors, wood-work and furniture of rooms in which consumptive patients stay, should be wiped with a damp cloth, not dusted in the usual way.

The patient's clothing should be kept by itself and thoroughly boiled at the washing.

The patient should be made to understand that in neglecting these measures, he is imperiling his friends, and at the same time diminishing very much his own chances of recovery by re-infecting himself with the inhalation of his own dried and pulverized sputum.

After a death from this disease has occurred, the patient's room, clothing, and bed should be disinfected. For this purpose, boil all bed and personal clothing, or disinfect them when practicable in a steam disinfector; wash furniture, wood-work, walls, and floors with carbolic acid solution (Solution E), and thoroughly expose the rooms to light and air.

If raw milk is used as food, especially if it is to be given to children, an assurance should be had that the cows which produce it are perfectly healthy and subjected to healthful treatment.

When there is any doubt as to the health of the cows which furnish the supply, the milk should be boiled before use.

Thorough cooking will remove all danger of tuberculosis through the medium of the meat supply.

Tuberculous mothers and those inclined to consumption should, under no conditions, nurse their babies.

To guard against contracting the disease.

By observing the rules which are expressed and suggested in the foregoing, the principal, if not all, danger of infection may be avoided.

Whatever has a tendency to undermine the general health increases the susceptibility to the infection and diminishes the power of recovery from incipient tuberculosis.

A fact abundantly shown in the dissecting room is, that many persons dying of other diseases, have had tuberculosis and have recovered in its early stages.

This tendency to recover is greatly strengthened by the habitual breathing of pure air. Means should be provided for the abundant ventilation of inhabited rooms, particularly of sleeping rooms, school-rooms, and churches.

The open air treatment of consumptives and those who are threatened with tuberculous disease, has given much better results than any other. Particularly in Germany, and to some extent in this country, such treatment has been systematized in "sanitaria" for consumptives. Here the patients have the advantage of a regular life, nutritious food and such exercise as they can bear without fatigue; but the chief curative agent is an abundance of fresh air. Even in the coldest of winter weather, patients, after a period of gradual habituation, and always guided by the judgment of the physician, pass the whole day walking in the open air, or sitting or lying on resting places wrapped comfortably in blankets. Usually no claim is made for advantages of climate. *An abundance of pure air is the all important thing.*

DISINFECTANTS.

For convenience of reference this list of disinfectants is re-printed in this connection.

SOLUTION A.—For excreta, privy vault, woodwork and other surfaces.

SOLUTION B.—For excreta, privy vaults.

SOLUTION C.—For clothing, the hands, excreta, vaults, furniture, and woodwork.

SOLUTION D.—For the person, the hands.

SOLUTION E.—For clothing, the hands, the person, excreta.

BOILING.—For clothing.—SULPHUR FUMIGATION.—For use only where liquid disinfectants cannot be used or to supplement other methods.

SOLUTION A.

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

Mix. Cost about three cents, or seventy-five cents a barrel. (Decolorizes and destroys fabrics.)

SOLUTION B. "*Purple Solution.*"

Corrosive Sublimate,	2 drachms.
Permanganate of Potash,	2 drachms.
Water,	1 gallon.

Mix and dissolve. Label, *Poison!* Cost, two or three cents a gallon, when the chemicals are bought by the pound. (Stains fabrics, etc.)

The permanganate of potassium in this solution is used to give it color as a precaution against mistakes. It also, in this quantity, increases the deodorizing qualities of the solution. This is approximately a 1 : 500 solution of the sublimate; therefore, mixed with an equal quantity of water or liquids to be disinfected, it gives us a 1 : 1000 mixture. One ounce of this solution contains very nearly one grain of the corrosive sublimate.

SOLUTION C. "*Blue Solution.*"

Corrosive Sublimate,	4 ounces.
Sulphate of Copper,	1 pound.
Water,	1 gallon.

Mix and dissolve. Label, *Poison!*

This is sixteen times stronger than Solution B, and is intended as a standard solution from which, by dilution with water, a solution of the proper strength for use may be made. To make from it a solution of the proportion of

1 : 500, add 8 ozs. to 1 gallon of water.
1 : 1000, add 4 ozs. to 1 gallon of water.
1 : 2000, add 2 ozs. to 1 gallon of water.

SOLUTION D.

Labarraque's Solution,	1 pint.
Water,	1 gallon.

Mix. Cost about twenty-five cents.

SOLUTION E.

Carbolic Acid (90 per cent)	7 ounces.
Water,	1 gallon.

Mix. This is approximately a five per cent solution, or in the proportion of 1 : 21.

Sulphur Fumigation. To use this effectively three pounds of sulphur should be burned in a room ten feet square. Every opening into the room, flues, doors, windows, cracks and crevices, must be closed, except the door by which the disinfector is to escape. The sulphur is to be burned in an iron kettle or other vessel set in a tub containing a little water to guard against fire. Ignite the sulphur with a few live coals or with a little alcohol or kerosene and a match. Leave the room quickly, for the fumes are highly poisonous when breathed, and close the door tightly. Let the room remain closed twenty-four hours or more. Then air thoroughly for several days.

Boiling for at least half an hour is a sure way to destroy infection. Immersion in Solution C, three or four ounces to one gallon of water, or in Solution E, one-half strength, will lessen the danger from infected clothing until it can be boiled.

WATER ANALYSIS.

During the year 1889, the work in the laboratory of water analysis was directed principally to meeting the demands of the people of the State for advice in regard to existing or proposed water supplies, public and private. The whole number of samples examined was 178, of which 104 were from wells, 41 from springs, 6 from public water supplies, 16 from sources of proposed public water supplies, 2 from cisterns, and 10 from miscellaneous sources. In this classification, one of the samples is placed in two classes.

Among the well waters, 30 could be pronounced good, 39 suspicious, and 35 bad. Of the spring waters, 28 were good, 7 suspicious, and 6 bad. It should be borne in mind, however, that the results of the examinations of private sources of water supply, as given in this and preceding reports are not to be taken as representative of the general character of the well and spring water in the State. Most of the samples of water examined in the laboratory are sent because the owners of the wells and springs have already a suspicion that the water is not what it should be, or because typhoid fever or other disease has appeared under circumstances which render it probable that pollution of the water supply exists. It will be noticed, however, that 30 of the samples of well water, or nearly 29 per cent of them are designated as good, and an examination of the descriptions of the location and surroundings of the wells whence these good samples were derived, shows, in the great majority of instances, that the wells are favorably situated, or at least more favorably located than those from which the "bad" and "suspicious" samples came. We believe that some authorities are going much too far in making a sweeping condemnation of all wells as sources of drinking water supply. We, on the other side, as the work of examining samples of well and spring water in this State has gone on, have become more firmly convinced that wells and springs when favorably located, and in the case of wells, when properly constructed, are the very best of sources of water supply; but, at the same time, we are quite willing to concede that the great majority of wells are improperly constructed or badly located, and that therefore the water which they furnish is not of good quality. Almost everywhere in this State, the under-ground water where it issues from the earth in its normal condition, or where it is tapped by means of suitably constructed wells in suitable places, is almost invariably good and pure as a drinking water.

The truth of this is shown more clearly by the following information in regard to the spring waters examined in the laboratory. Of the 41 springs represented, 24 were shown to be favorably located, that is, far enough from houses, barn-yards, privies and the other usual sources of contamination, and of these every one was pronounced good. Among 13 samples from springs unfavorably located, one only supplied water chemically good, while 6 were pronounced suspicious, and 6 bad. Eight of the 13 unfavorably situated springs were in cities, and the other five in villages where they are exposed to drainage. Four springs are excluded from the classification because information is wanting as to their location; 3 of these were judged good and 1 suspicious.

The following is the tabulation of the results of the examinations of water made in 1889, analyses No. 292 to No. 469 inclusive.

MISCELLANEOUS ANALYSES—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.
292	Well, Chebeague	Jan. 25	16.2	4.8	3.25	6.2	.001	.005	None.	Slight trace.
293	Well, Portland	Feb. 13	3.6	1.4	1.27	.6	.006	.013	None.	Trace.
294	Grass brook, Fort Fairfield	" 13	12.4	2.8	11.80	.1	.000	.001	None.	Slight trace.
295	Aroostook River, Fort Fairfield	" 13	7.4	4.6	3.25	.0	.003	.028	None.	Trace.
296	Town pump, Fort Fairfield	" 13	24.2	8.0	21.19	.4	.001	.002	None	Heavy trace.
297	Spring, Rockland	" 18	2.8	1.2	1.27	.8	.000	.001	None.	Slight trace.
298	Silver lake, Dexter	Mar. 4	3.4	1.8	2.60	.2	.003	.014	None.	None.
299	Well, North Newburgh	" 4	41.2	20.8	21.19	6.4	.010	.004	Much.	Much.
300	Well, Springvale	" 6	36.0	22.0	13.31	7.2	.010	.015		
301	Spring, Fort Fairfield	" 5	15.0	5.6	14.06	.1	.001	.000	None.	Trace.
302	Well, Fort Fairfield	" 5	36.4	17.2	22.02	3 8	.001	.001	None.	Much.
303	River, Machias	" 7	3.0	2.2	1.11	.5	.001	.008	None.	None.
304	Lake, East Machias	" 7	3.0	1.8	.79	.4	.000	.007	None.	None.
305	Well, Cornish	" 7	2.8	1.2	3.25	.2	.010	.013	None.	V'y sl. trace
306	Well, Cornish	" 7	3.8	1.8	2.60	.2	.008	.012	None.	Trace
307	Well, East Eddington	" 25	10.8	4.4	8.14	1.2	.000	.003	None.	Heavy trace.
308	Well, East Eddington	" 25	8.2	4.0	3.51	1.4	.000	.005	None.	Much.
309	Well, East Eddington	" 25	15.0	7.0	7.14	2.0	.003	.037	Slight trace.	Much.
310	Spring, Portland	" 27	2.2	1.0	1.69	.2	.000	.000	....	Slight trace.
311	Public water supply, Seneca Falls, N. Y.	Apr. 3	20.8	6.0	13.31	3.6	.001	.014	None.	Trace.
312	Public water supply, Seneca Falls, N. Y.	" 3	20.4	5.8	13.76	3.6	.003	.014	None.	Trace.
313	Well, Washburn	" 16	27.0	13.0	29.0	1.2	.001	.003	None.	Much.
314	Well, Augusta	" 20	20.0	6.0	10.30	2.2	.003	.008	None.	Heavy trace.
315	Grass Brook, Fort Fairfield	" 19	11.2	3.8	10.30	.2	.000	.002	None.	Heavy trace.

316	Spring, Augusta	"	23	11.6	5.8	7.86	.6	.000	.000	None.	Heavy trace.
317	Spring, Augusta	"	23	12.0	4.6	7.0	.6	.000	.001	None.	Much.
318	Spring, Augusta	"	23	20.0	4.6	7.71	.6	.000	.000	None.	Much.
319	Spring, Danforth	May	3	15.8	9.0	6.71	1.6	.000	.014	None.	Much.
320	Well, Waterville	"	13	9.8	2.2	6.71	2.0	.000	.002	None.	Heavy trace.
321	Public water supply, Waterville	"	13	3.0	1.8	1.95	.2	.001	.013	None.	V'y sl. trace.
322	Well, Waterville	"	13	8.4	4.2	4.29	.6	.000	.002	None.	Much.
323	Kennebec River, Augusta	"	17	4.0	3.6	1.69	.1	.000	.015	None.	V'y sl. trace.
324	Kennebec River, Augusta	"	17	4.0	2.4	1.69	.1	.001	.013	None.	None.
325	Well, Newry Corner	"	16	39.2	10.4	8.14	5.8	.001	.061	None.	Much
326	Well, Augusta	"	18	47.0	25.0	16.11	3.2	.001	.008	Trace.	Very much.
327	Well, Limerick	"	17	35.6	17.0	15.32	4.4	.007	.006	Heavy trace.	Much.
328	Well, Kennebunk	"	20	26.6	13.0	5.29	5.2	.006	.008	Trace	V'y sl trace.
329	Spring, Kennebunk	"	20	5.8	2.4	1.95	1.8	.001	.002	None.	V'y sl trace.
330	Well, Milford	"	20	23.6	7.8	8.14	2.2	.091	.048	V'y sl. trace.	V'y sl. trace.
331	Well, Augusta	"	27	14.2	3.2	7.43	.9	.002	.000	None.	Slight trace.
332	Well, Sherman	"	27	25.8	8.4	8.14	2.8	.217	.166	Very much.	Much.
333	Well, Kennebunkport	"	28	14.6	4.4	8.14	1.4	.005	.007	None.	V'y sl. trace.
334	Well, Hampden	June	3	29.6	12.2	7.43	1.6	.001	.004	Slight trace.	Heavy trace.
335	Well, Wilton	"	10	46.6	29.8	14.37	4.0	.095	.008	Trace.	Very much.
336	Well, Belfast	"	10	14.4	4.0	4.57	1.6	.000	.004	None.	Heavy trace.
337	Spring, Castine	"	12	3.4	1.0	1.69	.4	.001	.002	None.	V'y sl. trace.
338	Well, Eliot	"	14	6.6	1.8	2.60	.4	.001	.001	None.	Heavy trace.
339	Well, Eliot	"	14	25.4	5.6	6.71	3.4	.020	.049	Slight trace.	Heavy trace.
340	Spring, West Baldwin	"	14	3.0	2.0	1.69	.1	.000	.002	None.	V'y sl. trace.
341	Public water supply, Bath	"	15	3.6	1.0	.95	.4	.000	.001	None.	Slight trace.
342	Well, Turner	"	14	6.4	2.0	2.60	.2	.003	.009	None.	Trace.
343	Spring, Old Town	"	18	20.2	6.4	11.05	1.8	.008	.015	Trace.	Slight trace.
344	Well, Portland	"	18	6.8	3.0	3.25	.8	.000	.000	None.	Heavy trace.
345	River, Bangor	"	20	4.2	2.8	1.95	.2	.000	.024	None.	Slight trace.
346	Well, Standish	"	20	6.6	3.0	1.95	1.0	.000	.002	None.	Heavy trace.
347	Spring, Livermore Falls	"	24	5.8	1.8	2.99	.0	.002	.003	....	V'y sl. trace.
348	Lake, Machias	"	26	6.4	4.2	.48	.6	.003	.049	None.	None.
349	River, Machias	"	26	2.8	2.2	.48	.2	.000	.015	None.	V'y sl. trace.
350	Well, Eliot	July	1	5.8	2.2	.95	.4	.003	.004	None.	Trace.
351	Well, Eliot	"	1	13.8	2.6	4.57	.8	.000	.004	None.	Much.
352	Well, Wilton	"	3	32.6	18.6	8.14	3.2	.000	.004	None.	Much.
353	Well, Augusta	"	10	58.0	35.8	25.12	4.8	.000	.002	V'y sl. trace.	Very much
354	Spring, Kennebunk	"	10	7.6	2.6	3.25	1.4	.000	.000	None.	Slight trace.

MISCELLANEOUS ANALYSES—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.
355	Well, South Livermore	July 11	7.2	3.0	3.64	.3	.000	.005	None.	Heavy trace.
356	Well, Kennebunkport	" 14	38.8	9.0	9.57	7.4	.001	.012	None	Trace.
357	Well, Sanford	" 17	6.2	3.8	1.95	.5	.000	.000	None.	Heavy trace.
358	Well, Machias	" 14	58.0	17.8	11.80	5.4	.149	.007	Very much.	Very much.
359	Well, Machias	" 14	18.6	7.4	3.25	1.8	.004	.013	Trace.	Much.
360	Well, Machias	" 14	26.8	6.4	7.43	3.2	.000	.001	V'y sl. trace.	Much.
361	Well, Machias	" 14	28.2	10.4	5.00	4.0	.000	.006	Heavy trace.	Much
362	Well, Litchfield Corners	" 18	10.0	3.0	6.00	.4	.004	.006	None.	Slight trace.
363	Well, Litchfield Corners	" 18	43.0	14.0	16.43	5.2	.012	.008	Trace.	Heavy trace.
364	Spring, Temple	" 19	6.6	1.4	2.60	.0	.000	.000	None.	V'y sl. trace.
365	Spring, Temple	" 19	4.0	1.0	1.95	.0	.000	.000	None.	V'y sl. trace.
366	Spring, Temple	" 19	3.2	.6	1.95	.0	.000	.001	None	V'y sl. trace.
367	Public water supply, Skowhegan	" 23	7.0	5.2	1.27	.2	.007	.026	None.	V'y sl. trace.
368	Well, Bowdoinham	" 27	90.0	30.8	19.60	29.8	.006	.023	None.	Much.
369	Well, Hanover	" 31	7.4	3.6	2.34	.4	.003	.004	None.	Heavy trace.
370	Well, Hanover	" 31	6.0	2.8	2.34	.2	.049	.016	None.	Trace.
371	Well, Plymouth	Aug. 4	17.0	5.2	9.57	1.6	.000	.005	None.	Much.
372	Well, Plymouth	" 4	15.6	8.4	5.73	1.6	.000	.005	None.	Heavy trace.
373	Well, Augusta	" 7	28.6	12.2	10.00	2.2	.004	.015	Much.	Much.
374	Well, Augusta	" 7	22.4	7.4	9.57	2.8	.002	.007	None.	Heavy trace.
375	Water supply, Presque Isle	" 7	18.4	4.6	14.84	.0	.002	.014	None.	Trace.
376	Well, Winslow	" 8	20.6	12.4	14.52	2.8	.000	.000	None.	Heavy trace.
377	Well, Springvale	" 9	[illegible]4.0	7.0	3.25	1.4	.001	.002	None.	Very much.
378	Well, Springvale	" 9	6.6	3.4	2.34	.4	.003	.002	Trace.	Heavy trace.

379	Long Creek, Cape Elizabeth	"	9	9.8	8.8	3.90	.8	.006	.043	V'y sl. trace.	V'y sl. trace.
380	Mitchell brook, Portland	"	9	8.0	6.4	1.27	.7	.009	.051	Slight trace.	None.
381	Well, Greenville	"	12	4.0	2.4	2.60	.2	.001	.002	None.	Slight trace.
382	Spring, Bangor	"	12	14.4	6.2	7.43	1.5	.000	.003	None.	V'y sl. trace.
383	Spring, Augusta	"	15	42.0	14.8	18.81	4.0	.000	.005	None.	Very much.
384	Well, Springvale	"	20	10.8	5.6	4.57	1.0	.000	.001	None.	Much.
385	Well, Crystal	"	19	93.2	21.8	45.72	4.8	.025	.030	Heavy trace.	Very much.
386	Spring, Augusta	"	26	14.2	4.6	9.57	.8	.001	.001	Trace.	Trace.
387	Well, Green's Landing	"	27	18.4	10.2	3.25	3.8	.000	.004	Heavy trace	Trace.
388	Well, Green's Landing	"	27	27.8	12.6	5.29	6.4	.005	.005	Heavy trace	Heavy trace.
389	Well, Waldoboro'	"	27	11.4	5.0	6.0	.4	.000	.001	Trace.	Slight trace.
390	Well, North Newburgh	"	27	13.6	4.4	5.71	.8	.000	.001	V'y sl. trace.	Slight trace.
391	Well, North Newburgh	"	28	56.0	20.0	32.22	4.4	.000	.001	Much.	Heavy trace.
392	Spring, Calais	"	28	6.6	4.8	1.95	.4	.000	.003	None.	Trace
393	Well, Brooks	"	29	6.0	2.8	4.57	.5	.000	.000	Slight trace.	Slight trace.
394	Well, Winthrop	"	30	12.0	3.4	1.95	.4	.001	.002	None.	Heavy trace.
395	Well, Parsonsfield	Sept.	3	22.0	4.8	4.57	3.0	.000	.011	None.	Slight trace.
396	Spring, Springvale	"	3	14.2	7.6	3.25	1.2	.000	.005	Slight trace.	Heavy trace.
397	Well, Richmond	"	9	17.8	2.8	7.43	1.6	.003	.003	V'y sl. trace.	Trace.
398	Water supply, Richmond	"	9	7.2	4.0	1.95	1.2	.000	.013	None.	Slight trace.
399	Well, Machias	"	7	9.6	5.6	2.60	1.0	.003	.002	V'y sl. trace	Trace.
400	Well, Machias	"	7	11.0	5.0	3.90	1.2	.000	.002	None.	Heavy trace.
401	Spring, Lewiston	"	9	3.8	3.6	1.95	.2	.000	.001	None.	Slight trace.
402	Well, Popham Beach	Aug.	28	10.2	4.4	4.57	1.6	.000	.000	Trace.	Trace.
403	Spring, Andover	Sept.	11	7.0	3.2	2.60	.0	.000	.002	None.	Trace.
404	Well, Kineo	"	16	9.0	3.0	3.90	.8	.001	.003	Trace.	Heavy trace.
405	Well, Eliot	"	16	10.8	5.6	3.90	1.0	.000	.002	None.	Heavy trace.
406	Well, Eliot	"	16	31.6	7.2	6.0	5.4	.007	.037	None.	Much.
407	Spring, Yarmouthville	"	21	6.8	1.4	2.60	.6	.003	.009	Trace.	Heavy trace.
408	Well, St Albans	"	20	204.8	63.2	81.60	38.4	.043	.010	Much.	Slight trace.
409	Well, Livermore Falls	"	20	45.4	9.2	11.80	12.2	.012	.013	Much.	Slight trace.
410	Well, Augusta	"	24	15.6	4.0	9.57	.8	.004	.007	None.	Trace.
411	Well, Randolph	"	24	10.6	5.0	5.29	.4	.029	.005	Trace.	V'y sl trace.
412	Well, Augusta	"	25	21.0	9.4	26.62	4.4	.268	.014	Much.	Very much.
413	Well, Curtis Corner	"	25	4.8	1.6	2.60	.2	.001	.003	None.	Trace.
414	Spring, Curtis Corner	"	25	4.6	2.0	3.25	.2	.000	.001	None.	Trace.
415	Spring, Portland	"	27	7.8	3.2	2.60	.7	.055	.008	Much.	Heavy trace
416	Spring, Portland	"	27	28.2	12.8	11.05	4.8	.000	.006	None.	Heavy trace.
417	Well, Gorham	"	29	11.6	2.4	4.57	1.4	.010	.008	Heavy trace.	Trace.

MISCELLANEOUS ANALYSES—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.
418	Spring, Cornish	Sept. 26	5.8	1.8	3.90	.1	.000	.002	Slight trace.	V'y sl trace.
419	Well, Sebago	" 29	2.6	2.2	3.90	.2	.000	.002	None.	V'y sl. trace.
420	Well, Gorham	Oct. 4	11.8	3.4	8.86	.4	.001	.000	None.	Slight trace.
421	Well, Gorham	" 4	9.6	3.4	5.00	1.5	.003	.004	None.	Heavy trace.
422	Well, Presque Isle	" 1	25.6	6.0	22.10	1.0	.000	.002	None	Heavy trace.
423	Spring, Guilford	" 4	14.2	4.8	15.32	.0	.000	.000	Trace.	Heavy trace.
424	Well, Machias	" 2	26 8	13.2	8.14	3.8	.173	.010	Very much.	Much.
425	Cistern, Skowhegan	" 12	3.0	2.2	2.60	.1	.015	.009	None.	Trace.
426	Well, Farmington	" 12	38.2	18.0	14.52	6.2	.000	.003	None.	Very much.
427	Spring, Portland	" 14	41.2	12.6	14.84	3.6	.042	.024	Much.	Heavy trace.
428	Spring, Portland	" 14	78.4	25.2	22.86	9.4	.001	.012	None.	Very much.
429	Spring, Portland	" 14	34.2	20.2	14.84	4.8	.000	.005	Heavy trace.	Very much.
430	Spring, Portland	" 14	4.2	1.6	1.95	.8	.003	.006	None.	V'y sl. trace.
431	Spring, Cape Elizabeth	" 15	8.4	4.0	5.29	1.1	.003	.007	None.	V'y sl. trace.
432	Spring, Green's Landing	" 13	5.0	1.8	1.56	1.2	.002	.004	None.	V'y sl. trace.
433	Pond, Green's Landing	" 13	4.4	3.8	.48	1.2	.002	.024	None.	V'y sl. trace.
434	Well, Bethel	" 15	13.6	7.0	3.90	1.9	.000	.012	None.	Much.
435	Well, Bethel	" 15	7.2	2.6	3.25	.6	.000	.004	V'y sl. trace.	Trace
436	Well, Sedgwick	" 17	9.6	3.6	5.71	1.0	.020	.007	Trace.	Trace.
437	Well, Machias	" 16	9.0	3.4	4.29	1.6	.000	.001	None.	Heavy trace.
438	Well, Jay	" 20	3.6	1.2	1.95	.2	.000	.003	V'y sl. trace	Trace.
439	Spring, Jay	" 20	2.8	2.2	.95	.2	.000	.001	None.	Slight trace.
440	Brook, Portland	" 28	16.4	7.0	5.71	1.2	.000	.050	None.	Slight trace.
441	Brook, Cape Elizabeth	" 26	10.0	3.6	4.29	.9	.017	.039	None.	V'y sl. trace.

442	Brook, Cape Elizabeth	"	26	10.2	3.0	4 57	.9	.020	.033	None.	Slight trace.
443	Spring, Waldoboro'	"	28	6.4	1.8	3.25	.6	.000	.002	None.	Slight trace.
444	Well, Lisbon Falls	"	27	29.6	16.0	11.05	3.6	.005	.016	None.	Heavy trace.
445	Cistern, Augusta	"	31	367.38	18.30	88.40	2570.0	.010	.106	None.	V'y sl. trace.
446	Distilled water, Augusta	"	31	1.4	1.2	.00	.0	.003	.003	None.	None.
447	Well, Mercer	"	28	3.2	1.6	1.95	.3	.001	.002	None.	Trace.
448	Cistern, Cape Elizabeth	"	30	5.8	3.4	3.90	.2	.002	.007	None.	Slight trace.
449	Well, Gorham	Nov.	2	10.8	3.0	4.57	1.4	.000	.004	None.	Heavy trace.
450	Spring, Yarmouthville	"	8	17.6	8.4	7.43	2 4	.001	.006	None.	Heavy trace.
451	Spring, Yarmouthville	"	7	10.8	4.2	4.29	1.6	.001	.006	None.	Heavy trace.
452	Well, Clinton	"	11	18.0	9.4	10.0	1.0	.002	.002	None.	Very much.
453	Well, South Portland	"	12	6.0	2.2	3.25	.8	.000	.003	None.	V'y sl. trace.
454	Well, Eliot	"	14	40.0	15.2	16.90	3.0	.003	.003	None.	Heavy trace.
455	Well, Eliot	"	16	21.6	9.0	9.57	3.6	.000	.009	None.	Very much.
456	Well, South Portland	"	18	16.6	10.0	6.0	2.8	.014	.005	Slight trace.	Much.
457	Spring, South Portland	"	18	6.4	3.2	4.57	1.0	.001	.009	None.	V'y sl. trace.
458	Well, Clifton	"	21	23.6	6.8	6.29	4.2	.040	.011	Much.	Heavy trace.
459	Spring, Eliot	"	23	10.0	4.4	7.43	.6	.000	.001	None.	V'y sl. trace.
460	Well, Eliot	"	23	23.6	5.8	6.00	3.6	.000	.003	None.	Heavy trace.
461	Well, Hartland	Dec.	3	16.4	6.0	6.00	1.6	.001	.006	None.	Heavy trace.
462	Spring, Bethel	"	3	2.0	.4	.48	.2	.000	.003	None.	V'y sl. trace.
463	Well, North Vassalboro'	"	6	345.0	52.4	82.15	174.4	.030	.018	None.	Much.
464	Well, North Vassalboro'	"	6	39.2	16.2	22.86	3.4	.000	.010	None.	Heavy trace.
465	Well, North Vassalboro'	"	5	21.4	6.8	12.26	1.6	.000	.003	None.	Heavy trace.
466	Spring, Westbrook	"	5	3.2	2.0	1.95	.4	.000	.000	None.	V'y sl. trace.
467	Well, Deering	"	5	8.8	3.8	5.29	.8	.001	.014	None.	Trace.
468	Well, Verona	"	10	37.4	18.6	11.80	4.6	.015	.018	None.	Much.
469	Well, Clinton	"	21	26.6	11.0	14.06	1.6	.003	.035	None.	Much.

NOTES ON SOME OF THE SAMPLES OF WATER EXAMINED IN THE LABORATORY.

No. 293. This sample was taken from a well around which various sources of pollution were grouped too near—the sink drain was at a distance of sixty feet, the privy thirty-five feet, and the stable, barn-yard and pig-pen from twenty-five to thirty feet. The analysis gives evidence of pollution with organic matter.

Nos. 294 and 315. Grass Brook, Fort Fairfield. The analyses were made to determine the suitability of the water as a village supply. Both analyses show that the water is organically very pure. The brook arises from springs. The degree of hardness of the water is much below that which is obtained from wells in all that region.

No. 295. This sample was taken from the Aroostook river about midway between the two shores at Fort Fairfield for the purpose of comparing the results of its examination with that of No. 294.

No. 297. From the report to the sender: "You will notice that the total solids is very low in quantity, that it is a very soft water, and that the indications of organic matter as represented by the amount of chlorine, and free and organic ammonia are very slight indeed. It is apparently a very good spring water for drinking purposes."

No. 298. Silver lake, Dexter. The following report was made: "I enclose the results of the analysis of the sample of water from Silver lake. In these results there is nothing which would justify me in pronouncing the water unsuitable for the purposes of a public water supply. There is, however, rather a larger quantity of free ammonia and also of organic ammonia than is found in the best of lake waters in the State. The average free ammonia in twenty-nine analyses of public water supplies, taken from lakes and ponds in this State, is only .001, and the average free ammonia in the supplies taken from rivers is only slightly greater. The organic ammonia in the lake supplies is .010. I should like further information in regard to your method of taking the sample,—that is, the distance from the shore, etc. What is the nature of the growth around the lake?"

Nos. 299 and 391. These two samples were taken from a deep well drilled through ledge and the results are not so favorable as would generally be expected, but are quite like what we have somewhat frequently found in deep wells drilled through rock. Pending further examinations of samples from this well, a positive opinion was not given as to the quality of the water. It will be noticed that the results obtained from the two samples are quite different, and the difference may have been due in part to the fact that the bottle in which No. 299 came was not free from suspicion. We may add that sources of pollution were within fifty feet of the well,—the privy, stable, barn-yard, and pig-pen.

No. 300. From a well situated fifty feet from sink drain and privy. There was a suspicion that the bottle in which the sample was sent had not been made chemically clean. Another sample received later in the season in a bottle sent from this office yielded different results, as will be seen in the tabulation. (See No. 384.)

No. 301. A spring water of good quality for drinking purposes.

No. 302. A well situated in gravelly soil, about thirty feet from a privy and forty feet from a barn-yard. The chemical results make it apparent that the organic matter is quite thoroughly oxidized in passing through the soil, but the chlorine and nitrate results show that the water is to be regarded with suspicion, notwithstanding the small amount of organic matter present.

Nos. 303 and 304. "I enclose the results of the analyses of the last two samples of water which you sent, Nos. 303 and 304, and also a blank showing the results of the examination of No. 217 which you sent last fall, report of which has already been made. As I telegraphed to you, the differences which are found in the character of the water by means of the chemical processes are so small, that the chemical examinations will not help you much in making a decision as to which source would furnish the more suitable supply. It is never well to base a decision upon a single chemical analysis, for the reason that the character of certain sources of supply varies very much at different times, but, as far as can be judged from the examinations which I have made, any of the three sources of which you have submitted samples to me would furnish a good water, judging, of course, from the chemical point of view alone. You should make a careful examination of all the surroundings of the proposed sources of supply and take into account all present and prospective possibilities of pollution and choose accordingly. It is noteworthy that all of the samples are very soft waters, especially the sample which you sent last fall, and No. 304, or the one from Lily lake, which are just alike as regards their degree of hardness. As regards the organic ammonia figures, it will perhaps interest you to know that the average for the samples (twenty-nine) from the public water supplies which are taken from lakes and ponds is .010, and of the samples from the supplies taken from rivers is .016. No. 304, from the chemical point of view alone, is slightly the best of the three, but the advantage from this point of view might be outweighed by other considerations.

Nos. 305 and 306. We copy a part of the report on the samples as a repetition of the caution which has repeatedly been given to notify the secretary, when a slight delay is not objectionable, and to await the receipt of a bottle from this office, which we know has been made chemically clean.

"I have repeatedly cautioned in the *Sanitary Inspector* against sending samples before notifying this office and waiting for instructions. I have done this for the reason that most of the samples which are taken without instructions in regard to collecting are worthless. It was evident that the samples in the three jugs which you sent were not collected with sufficient care, or at least that sufficient care was not taken to have the vessels which contained them chemically clean. One of the jugs contained several fragments of straw of considerable length, apparently some of the packing in which they were originally shipped by the manufacturer. This seemed to me to indicate that the jugs had not been rinsed out so thoroughly as is enjoined in the little circular which I enclose. Another one of the jugs, apparently one which had seen previous use, contained an old corn-cob stopper two inches and a half long. This last sample I threw away for the reason that it was useless to waste half a day in analyzing it. I enclose blanks which give the results of Nos. 1 and 2. From the want of assurance that the jugs were clean I cannot pronounce upon the character of the waters. I would, however, venture the opinion that they are taken from ground which naturally supplies a good water."

No. 307. This sample of water is chemically good, though the well is badly located, namely, in the cellar beneath the house.

Nos. 308 and 309. "No. 308, from a well twenty-two feet deep through dark gravelly soil, and gravelly sub-soil intermingled with clay, close to the only door of a house where the people throw a large amount of slops. In spite of the very unfavorable location of this well I find that the water is chemically much better than I should have expected; in fact, there is nothing against the water excepting a large quantity of nitrates, the result undoubtedly of a pretty thorough oxidation and nitrification of the organic matter before it reaches the water bearing stratum. But no matter what results this analysis shows, the well must be regarded as a very unsafe one to use for a drinking supply, for, though the polluting matter appears to be pretty thoroughly filtered out by the soil now, it may not be at all times." No. 309. From a well eleven feet deep, soil, a dark, swampy, gravelly loam; subsoil, compact gravel, resting on a clay slate ledge, located very near the house and close to the back door. "The chemical results with this sample, show it to be badly polluted with two or three times as much free ammonia as there ought to be in well water, and five or six times as much organic ammonia as there should be, together with an excess of chlorine and nitrates.

The difference in the character of the two waters from a chemical point of view is due largely undoubtedly to the difference in the depth of the well, and the difference in the character of soils through which the polluting matter has to pass before reaching the well."

No. 310. From Wescustogo spring, North Yarmouth. "The analysis shows the water to be of very superior quality for drinking purposes. The total solids is very small in quantity, it is a very soft water, and there is an entire absence of both free and organic ammonia quite remarkable, even among the purest of spring waters."

Nos. 311 and 312. These two samples are from the water supply of Seneca Falls, N. Y., filtered and unfiltered, and the examinations were made for the purpose of determining the chemical changes effected by the system of filtration which is there employed, that of the Hegeman Oliphant Company. No. 311 is the filtered water, No. 312 the unfiltered. Both samples showed some turbidity and the degree of it hardly differed in the two. There was a slight amount of sediment in each, and a second determination of the total solids was made for each sample after shaking it up, resulting in filtered, 21.2; unfiltered, 22.4.

No. 313. From a drilled well, sixty-two feet in depth, the lower two-thirds being through rock.

Nos. 316, 317 and 318. These samples were taken from three of the so-called Diamond Springs in Augusta.

No. 319. From a spring situated at the foot of a hill, with a hotel and its back buildings on the top of the hill from forty to fifty feet distant. The results of the analysis are not favorable, and the relative location of the spring and buildings is still more unfavorable.

No. 321. From the city water supply, Messalonskee stream, Waterville.

Nos. 323 and 324, were taken from the Kennebec river, No. 323 from the canal whence the city supply is taken, and No. 324 from the river channel above the dam.

No. 325. From a well twenty-two feet deep, from fifty to sixty feet from sink drainage, privy, stable, barn-yard, etc., and 100 feet from a small pond filled with sawdust. Ten feet from the surface there is a hard-pan described as "pin gravel hard as iron," and 12 feet farther through this formation, we come to a white sand in which the water is found. The results of the analysis of this sample of water illustrates the fact which comes to light quite frequently in the work of the laboratory, that an impermeable stratum through which wells pass a little distance below the surface is very likely to collect polluted soakage, if any exists in the neighborhood, and run it into the well. Such wells are much more likely to become polluted than those which pass all their depth through ordinary soil.

No. 326. A good example of a city well with sources of pollution too near, and chlorine quantity greater than is normal for the unpolluted soil in the locality, and excess of nitrates and a slight excess of organic ammonia. "A moderate amount of pollution is indicated, and while it is so moderate in quantity that I should not feel justified in condemning the water as absolutely dangerous, on the other hand I could not give an assurance that the water will remain at all times absolutely free from danger. This is not very definite, but from the nature of the case it is impossible to be more positive."

No. 327. This sample is from a well drilled its whole depth, fifty-nine feet. From the description given, the location of the well appears to be favorable. The results are interesting and we hope in the near future to give the wells of this particular kind in the State a fuller study.

Nos. 328 and 329. Were sent for the purpose of determining which of the two is the better for a private water supply. A comparative glance at the results suffices to answer.

No. 330. "This water is wholly unfit to use for drinking purposes." The sink drainage, privy, stable, barn-yard and pig-pen were all at distances ranging from ten to twenty-two feet from the well.

No. 332. From a well thirty feet deep dug through sandy soil and gravelly subsoil, with three feet of red ledge, twelve feet from the surface. The sink drainage, privy, stable and barn-yard are at distances of from ninety to one hundred and thirty feet from the well. Dr. Owen who forwarded the sample, reported the general health of the users of the water good, but that strangers never try it a second time. The following is the report on the sample:

"The sample of water which you send is a curiosity. As you will see by the enclosed blank, giving the results of the analysis, it is a very bad water, in fact, it is one of the worse which has been received in this office. It is also about as bad microscopically as it is chemically. It contained a large quantity of sediment, which, upon examination, was found to be the micelium of one of the fungi. Infusoria were very abundant, especially rotifers and vorticellæ. Putrefaction bacteria were also plentiful. It seems to me that it must be a curious sort of people who will drink such water. A dirty German doctor drank sewage for some time as a matter of experiment, and did not think his health was injured by so doing. The persons who use water from this well may possibly do so with impunity. Some samples of humanity are tough. There is always danger, however, that disease germs may find access to such polluted wells, with the other filth, and then the immunity from harm might end suddenly. Some people, however, are so fastidious that they do not like to drink the soakage from barn-yards or other polluted water, even if the probabilities were that in so doing they would not receive physical harm.

"The question is, how does the polluting matter reach the well and from what source? From the history which you give I cannot answer, and it is a mystery to me. I am inclined to think, though, that that red ledge has something to do with it; that the ledge is inclined in such a direction that it catches the soakage from some of the sources of pollution and runs it directly into the well. I know of one other well in Aroostook, near Presque Isle, in which the barn-yard is situated about ninety feet from the well and cannot send its surface drainage into the well, but yet the well is badly polluted and there have been two outbreaks of typhoid fever in the houses using the water from that well within a few years. In that case there was a ledge a few feet below the surface, and the soakage from the barn-yard sinking down through the soil until it reaches it undoubtedly runs along its surface directly into the well. I am very much interested in the well from which this sample is taken and I should be very glad if you could learn anything about the probabilities of how it is polluted."

No. 333. "An examination of the description of the surroundings of the well as given in the blank which you filled, shows that, especially for a sandy soil, the distance of the sink-drain and privy (35 to 40 feet) is not so great as it should be; that is, not far enough to avoid all possibilities of the soakage of pollution into the well. The chemical examination, however, does not give results which would condemn the water, but they show that there is a slight pollution from some source. The free ammonia should not be represented by a larger figure than .001 or .002, but, as you will see by referring to the accompanying blank, it is .005. The organic ammonia is represented by a figure which is about as large as is permissible in a well water which we would call good.

If you should happen to have cases of typhoid fever in your house, the intervening thickness of soil between the sink-drain and privy would not be sufficient to protect the well from infection. I would therefore recommend either the removal of the vault to a greater distance, or the use of some form of conservancy which will not permit of soakage into the soil, and would also recommend the carrying of the sink drainage farther from the well through a tight pipe drain if necessary. If the rock cesspool is within thirty-five or forty feet of the well it is much too near."

No. 335. A well sixteen feet deep through a clayey loam and subsoil of hard gravel. Its distance from the usual sources of pollution is from thirty-five to fifty feet. "The water is very bad, and the analysis would indicate pollution with a large quantity of organic matter, probably derived by soakage from neighboring privies and sink drainage. To help you to judge how badly the water is polluted, I would say that good well water does not contain more than .001 or .002 of free ammonia, while this has .095. This water should not be used at all."

No. 337. A good example of spring water, desirable for drinking purposes. The spring is on a side hill 1,000 feet from any source of pollution.

No. 338. From a well sixteen feet deep; soil, gravel; subsoil, hard clay; sink drainage and privy about thirty feet distant. "Chemically there is nothing against the water, excepting the very slight suspicion which the heavy trace of nitric acid might give. The results are much better than I should anticipate with the sink-drain and privy so near, and is probably due, in part at least, to the care which you took in constructing the sink-drain. I notice for the first time while making this report, that there is a case of typhoid fever in the house. Under those circumstances, I would not trust myself for a moment, to use the water from that well, no matter how good the chemical results may be. The infection of typhoid fever is a living germ, which is supposed to be capable of development outside of the human body. A mere trace of this infection finding its way into the well, might multiply sufficiently to make the water dangerous to the users of it, and the way for the transportation of the infection is not as difficult through a gravelly soil as through ordinary loam. I should therefore advise not using the water from this well for a long time unless it has been boiled previously. If the cesspool is only two rods from the well it is dangerously near."

No. 344. This sample was taken from a well dug some twelve feet through gravel and then drilled six feet through rock. There are no sources of pollution near it, excepting a cesspool recently established. "The chemical results show the water to be very good for drinking purposes; indeed it could hardly be better."

No. 345. The sample was taken from the Penobscot river above the dam at Bangor.

No. 346. A well sixteen feet deep through a light, sandy soil and subsoil. The sink drainage, privy, and stable are within from thirty to fifty feet. "Chemically, there is nothing whatever against the water, but as regards the location of the well, I should say that there is much against it, the sources of contamination are all so near, and I should feel afraid that at times pollution would reach the well. That would be favored by the sandy soil. I should advise, keeping the sink drainage at a good distance from the well, carrying it in a tight iron pipe if necessary, and either removing the privy to a greater distance if possible, or using a perfectly tight superficial vault, the use of the earth closet, or Prof. Angell's sanitary closet. The accompanying circulars may be of interest to you."

No. 347. A spring water, containing slightly more organic matter than is found in the very best of spring waters, and due, undoubtedly, to the somewhat mucky soil whence it issues, and to some microscopic fresh water algæ which it contains.

No. 348. Contains much too large a quantity of organic matter for a public water supply, if we are to judge from this single analysis.

No. 352. From a well seventeen feet deep through gravelly loam and hard gravel subsoil. The sink drainage is twenty-seven feet distant and the privy and stable forty feet away. The water is not so bad as could be expected, but the excess of chlorine and nitrates show that the well feels the influence of the neighboring sources of pollution.

No. 355. From a well eighteen feet deep; soil, gravelly loam; subsoil, "pin gravel;" sink drainage, privy and stable from thirty to sixty-five feet distant; dry earth is used in the box vault.

No. 357. From a driven well, twenty feet deep, located in a cellar.

Nos. 358, 359, 360 and 361. From Machias—No. 358, ten feet deep, located in a cellar; sink-drain, fifty feet, and privy, stable, barn-yard and pig-pen from 100 to 135 feet distant; soil, clay and loam. "This well is represented by all the figures on the enclosed blank as, chemically, a very bad water. It should not be used for drinking purposes." No. 359. From a well thirteen feet deep in level ground; soil, clay and loam; sink-drain, 216, privy, 110, stable, barn-yard and pig-pen from sixty to seventy feet distant. "This water is not so bad chemically as No. 358, but it is not good drinking water." No. 360. Well twelve feet deep in cellar; soil, clay and loam; sink-drain and privy seventy-five feet, and stable, barn-yard, and pig-pen from 100 to 125 feet distant. This water is much better than either of the preceding, and is chemically good. "This well has much less organic matter in it than either of the preceding, and from a chemical point of view might be considered free from suspicion if it were not for an excess of chlorine and of nitric acid, indicating apparently a slight pollution which has probably come a considerable distance through the soil." No. 361. Well twelve feet deep, water coming in from the top of a ledge; soil, same as in the preceding: 150 feet above level of the river, and four miles from the sea shoie; sink-drain, 105, and privy 120 feet distant. This cannot be pronounced a bad water, but at the same time the excess of chlorine and the nitrates render it slightly suspicious.

Nos. 362 and 363. No. 362. Well about sixteen feet deep, entering ledge two or three feet below the surface; sink-drain, fifty, privy and stable seventy-five, and barn-yard twenty feet distant. "This is by far the better sample of the two, judging by the chemical results, though the excess of free ammonia would make the water somewhat supicious even if the well were not so near the barn-yard." No. 363. From a well, depth not known; sink-drain fifty and privy thirty-five feet away. "The general results of the analysis indicate that the water of this well is quite badly polluted."

Nos. 364, 365, and 366. Samples from three different springs in Temple; all are remote from polluting influences and all are remarkable for their great organic purity, and especially for the complete absence of chlorine in any of them.

No. 368. Well thirty feet in a clayey soil; sink-drain twenty-five, privy twenty-six, stable only four feet distant, and chemical results accordingly. "The total solids alone would condemn the water the amount is so excessive. It is also a very hard water, the chlorine is exceedingly high, and both the free and organic ammonia are in great excess. The water is wholly unfit for use for drinking purposes."

No. 373. A city well.

No. 374. Another city well; chemically, not absolutely bad, but deserving suspicion.

No. 376. Well ten feet deep and water taken from gravel on top of ledge; nearest source of pollution, sink-drain sixty-six, and privy ninety feet distant. A tolerably good drinking water.

No. 377. From a well dug sixteen feet, then a pipe driven four feet; soil, sandy and rocky; sink-drain thirty-five feet; privy and stable forty feet distant.

No. 378. A driven well twenty feet deep; ground sandy, sink-drain, a wooden pipe, passes within two feet, and privy twenty feet distant.

No. 381. From a well situated on a hillside above the buildings, ninety feet distant from the sink-drain, and forty to sixty-five feet from the privy, stable and pig-pen. A very good well water.

No. 383. From a spring in the cellar of a business block on Water street. An excess of chlorine and nitrates. It is supposed the water comes from beneath the clay underlying the city.

No. 385. From a drilled well thirty feet deep, twenty-eight feet of which is through ledge supposed to be solid; sink-drain seventy, and pig-pen and privy forty-eight, barn-yard fourteen feet distant.

"I enclose a blank which will give you the results of the chemical examination of the sample of water which you sent. The water is badly polluted and bad in every way. This is also an extremely hard water. The Aroostook waters generally ranging from twenty to twenty-five degrees of hardness, while this as you will notice is over forty-five. This extreme hardness, taken with the great excess of total solids, would condemn the water without the evidence of pollution which we get in the figures representing the chlorine, free and organic ammonia, nitrites and nitrates."

No. 387. A well seven one-half feet deep with only six inches of water, situated lower than the street and the nearest house; thin soil underlain with granite; forty feet distant from one sink-drain, and sixty feet from another; privy ninety feet distant. Cases of typhoid fever may have originated from the well.

No. 388. From a well eighteen feet deep, in gravelly soil; and much lower than the house; all waste matter and refuse are dumped within twenty-five feet. Cases of typhoid fever in the nearest house.

No. 389. From a "test-well" dug one-third of a mile east of the village on a hill at least fifty feet above it, and 2,000 feet distant from the nearest building. The well was dug for the purpose of finding a suitable supply for the village. "The figures indicating chlorine, free ammonia, organic ammonia and nitrites and nitrates are all very low and as we base our conclusions mostly upon these results there could be no question as regards the chemical purity of this water. The water from this well is of medium hardness, or perhaps it would be better if I say as regards the hardness that for drinking purposes it would be entirely unexceptionable, but that for washing purposes there would probably be some complaint of its hardness."

No. 390. From a drilled well forty feet deep and cemented down to the ledge; sink-drain fifty, barn-yard twenty-five, and privy, stable, and pig-pen fifteen feet distant. The water from the well is said to have an unpleasant taste and reddish appearance sometimes after rains. This well is situated very close to that from which samples No. 299 and 391 were taken. At the time this sample was taken the well was evidently supplying good water, but the history of the well makes it quite certain that sometimes during rainy weather polluting matter gains access to it, notwithstanding the fact that it is a drilled well.

No. 393. A drilled well, thirty-seven feet deep, the ledge coming to within seven feet of the surface. The well is cemented from the top of the ledge to the surface of the ground. This is organically a good and pure drinking water. It is drawn through 125 feet of lead pipe. "No lead was found upon testing, nevertheless I should advise pumping out one pailful each time before taking any for drinking or cooking purposes. A sample taken in the morning before the pipe is pumped out might contain lead."

No. 395. From a well sixteen feet deep; distance of sink-drain, privy and stable, forty, fifty and seventy-five feet respectively.

No. 396. Taken from a tap of the Butler Spring water supply, Springvale.

No. 397. From a well in a yard between two houses, eight or ten feet from a cemented sink-drain, fifty and sixty feet from two privies, and twenty-five feet from a barn. The well passes through blue clay and finds water in a quicksand. The slope of the land is favorable as regards the surface drainage.

No. 403. From a spring in a cellar; sink-drain forty feet, and privy 100 feet distant. The surroundings are kept in good condition. The water is of excellent quality.

No. 404. From a well at Kineo, twenty-three feet deep, and twenty feet above the lake, water coming through gravel. No sources of pollution within 150 or 200 feet. "The water is of good quality for drinking purposes."

No. 405. From a well twenty feet deep, sink-drain twelve and privy twenty-five feet distant; soil "sandy with clay mixed with quicksand." "The chemical results from the sample are better than are usually obtained with sources of pollution so near, indeed, from the chemical results alone we should have to call the water quite pure, but the proximity of the privy and sink-drain would always make the water highly suspicious. I should advise great care in disposing of the sink drainage, and in managing the privy. The water, though now found to be pure, is liable at any time with the present arrangements to become infected so as to give rise to typhoid fever or other disease."

No. 406. From a well in the corner of a barn-yard, and three and one-half rods from sink-drain and privy. The soil is hard gravel. "The results show that the water is badly polluted and it is totally unfit to use as a drinking water supply."

No. 407. From a spring ten feet from a hen-pen, and eighty-five and 110 feet respectively from privy and sink-drain. "This water though comparing unfavorably with the best of spring waters in point of purity is not polluted enough to be called absolutely bad.

I send you a copy of the Fourth Annual Report, and the paragraphs "free ammonia" and "organic ammonia" on pages thirty-five and thirty-six will help you to judge of the standing of the sample of water which is now in question."

No. 408. From a well eighteen feet deep; sink-drain ten, privy forty-five, and stable fifty feet distant; soil gravelly The odor and taste of the water is sometimes unpleasant. "The sample of water which you sent for analysis is entirely unfit to be used as a drinking water, as the figures on the enclosed blank will show you. The water contains a higher total solids, and I believe a larger quantity of chlorine, than we have found in any sample before. The organic ammonia is in excess, and the free ammonia and nitrites, indicating a large quantity of putrefying organic matter, are in enormous excess." Further information about this well makes it quite certain that the large excess of chlorine is derived from a basement where salt has been stored for the past eight years. The salt bin is about 100 feet from the well and on higher ground.

No. 409. From a well twelve feet deep, bricked up and cemented to the top; sink-drain and stable thirty; privy and manure heap eighty feet distant. The water tastes and smells badly. This well is used much.

"The examination shows that the water is badly polluted from some source, and I should judge that it is more likely that the source of pollution is the sink drainage, though the distance of the privy, not to say anything of the stable, is not sufficient to exclude possibilities of bad effects from those directions. You felt quite certain that the well could not be polluted from the places which I have mentioned. I would say, however, that no matter in what direction the surface drainage goes we could not be quite so sure of the direction of flow beneath the surface; moreover a well, especially one which is used considerably, acts powerfully upon the surrounding soil in sucking or drawing the drainage toward itself. The water is not safe for drinking purposes."

No. 411. From a well thirteen feet deep; sink drain forty-one, privy forty, stable thirty, and barn-yard thirty-six feet distant; soil clayey loam, and subsoil clay.

No. 412. Another city well, on the most thickly built part of State St. The water is badly polluted and utterly unfit for drinking purposes.

Nos. 413 and 414. "It is a relief to find, as I do in these two samples, excellent drinking waters; the water from the spring particularly is chemically very nice and pure. From a chemical point of view there is no fault to find with the water from the well, but I would add that the distance of sixty and seventy-five feet which represents that of the privy and stable is not always sufficient to permanently protect the well from the soakage of polluting matter." The spring is in a pasture twenty-five rods from any building.

Nos. 415 and 416. No. 415. From a spring in a sand-bank on the side of a hill. Privies are situated twenty and thirty feet from it and slops are thrown out indiscriminately around it. "In this sample there is an excess of organic ammonia for a spring water and an enormous excess of free ammonia, and these results, taken together with the large quantity of nitrites and nitrates indicate unmistakably a serious pollution of the spring." No. 416. From a spring below No. 415 and on the shore of Back Bay not far from high water mark. "Taking into consideration the fact that the close proximity of this spring to the salt water margin would account for the excess of chlorine, this water is much better than that from No. 415, in fact, from a chemical point of view alone, disregarding the unfavorable location of the spring, it would be considered a fairly good drinking water Situated as these two springs are, I should look on them with a suspicion of probable bad results if they should continue to be used as sources of drinking water supply, no matter what the chemical results might be. From what has been told me, I should feel very certain that these springs have had something to do with the late prevalence of typhoid fever in your city."

No. 418. Sample of water brought in iron pipe from a spring 150 rods from any building. The location of the spring would justify the applicant in thinking that "it was a beautiful water" and the analysis confirms his belief.

No. 419. From a well twenty-five feet deep; sink-drain fifteen, privy thirty-five, stable and barn-yard seventy and eighty feet distant; soil, loam and clay.

"Enclosed you will find given on a separate sheet, the results of the analysis of the sample of water which you sent. Chemically the water is good and pure, but nevertheless I should not by any means feel certain that the water is safe to drink, particularly since you have had a case of typhoid fever in the house. It is a fact of which there can be no doubt that a water may prove very satisfactory upon chemical examination and yet may be dangerously infected with the germs of typhoid fever, so minute are they that the total mass of their organic matter cannot be detected by chemical processes which are competent to estimate even parts per million of organic matter. The sink drainage passes much too near the well for safety, and I would urge carrying it past the well in a perfectly tight drain. The privy is also much too near, and it should so be managed that there will be no soakage from it into the earth. With these suggested precautions there is nothing to prevent the well from furnishing water of excellent quality."

Nos. 420 and 421. Shortly after the beginning of the fall term of the Normal School at Gorham, a case of typhoid fever appeared in one of the students. As this student had been out of town during the vacation, and the time between the opening of this term and the beginning of the sickness was less than the usual period of incubation of typhoid fever, it appeared very probable that the infection had been received while away. Nevertheless, there had been some prevalence of diarrhœal diseases, the cause of which was possibly referable to the water supply. No. 420. From the well at Normal Hall, twenty-five feet deep, the last ten feet of which is in a ledge; distance from sink drainage, fifty feet, but it is carried through a tight iron pipe; from privy 120 ft. No. 421. From a well twelve feet deep, situated between two houses, and distance from the sink-drain thirty, privy forty, and stable and barn-yard fifty feet. The water from this well was used by the scholars while at the school building, and when the diarrhœal trouble began, but at the time the sample was taken for analysis recent rains had raised the water. The results of the examinations were not favorable, and the location of the well was such as to justly cast suspicion upon the water.

No. 422. From a well fifty-six feet deep and drilled through ledge over forty feet; house twenty, and privy, stable, and barn-yard fifty feet distant. This is a pure water for drinking purposes, though like most of the Aroostook waters it has a high degree of hardness due to the presence of carbonate of lime.

No. 423. From a spring one-third of a mile from sources of pollution. The water is brought to the house through a lead pipe.

"The enclosed blank will show you that the sample of water which you sent was chemically very pure. The test for lead showed none.

The water is quite hard (15.32, the river waters in the State generally being about 1.95,) and this hardness would be to a certain extent an assurance against lead poisoning, though we cannot say that it is a complete protection against such accidents. As a general thing, hard waters are much less likely to dissolve lead than soft waters are, but occasionally hard waters for one reason and another will take up lead in dangerous quantities. A continuous flow through the pipe as you have is much better and safer than an intermitting flow."

No. 426. From a well eighteen feet deep with three feet of water; sink-drain thirty, privy twenty, and stable ten feet away; soil sandy. In the case of this well sources of pollution are much too near, but nevertheless in the sandy soil the organic matter appears to be pretty thoroughly oxidized. On the other hand we get a large quantity of nitrates into which the organic matter is changed by the process of oxidation, and a much larger quantity of chlorine than there is usually in a soil not polluted. In a well situated as this one is, there is a possibilitiy that at times, this destruction of organic matter by the action of the soil, may not be so well performed, and, consequently, the water will become dangerous to the users.

Nos. 427, 428, 429, and 430. These four samples were from springs in the city of Portland and they were forwarded by the local board of health of that place. The following report was made:

No. 427. From a spring in the corner of the new reservoir. "This water is badly polluted with organic matter, as you will quickly observe by referring to the figures on the appropriate blank. The sample contained much sediment which was left in the bottom of the bottle after decantation. The decanted portion of water used for the analysis was perfectly clear. An examination of the sediment showed that it was very fine sand without a trace of living organic matter which I expected to find. No examination was made with high powers for bacteria."

"No. 428. From a spring in a garden plot below privies, a stable, and a hen-yard. This water is also badly polluted, especially if the proximity of the spring to the salt water did not in part account for the large excess of chlorine. It is also a very hard water, and the total solids is large. Without any chemical examination, the location and surroundings of the spring would be sufficient to render your suspicion of pollution almost a certainty."

No. 429. From a spring in a sand-bank formed by the excavation of the whole side of a hill. Distance from sink-drains and privies above, about 100 feet. The evidences of pollution in this sample are not so marked as in the preceding two, the excess of chlorine, taken together with the large quantity of nitrites and nitrates, would render the spring suspicious, not to say anything of its surroundings.

No. 430. From a spring at the foot of a hill and at the edge of a roadway. None of the usual sources of pollution are very near this spring. This is a much better water than any other of the four, yet the free ammonia is about twice as much as is permissible in water that we would call first-class spring water. The organic ammonia is slightly in access. If it were legally practicable I should think that it would be a measure in the interest of the public health to close up all or nearly all the springs and wells in the city of Portland.

No. 434. From a shallow well thirty-five feet from the sink-drain, sixty feet from the privy, and thirty and fifty feet respectively from stable and pig-pen; the ground is sandy. Cases of typhoid fever had occurred in the house.

No. 435. From a well thirty feet deep, in sandy loam, and situated at a distance of from twenty-five to forty feet from all the usual sources of pollution about farm buildings. There were cases of typhoid fever in the house.

No. 436. From a well in the cellar beneath the house. The well is about seven feet deep; distance of privy, stable, barn-yard and pig-pen forty-four feet. At times an offensive taste and smell. The chemical results show this water to have been badly polluted.

No. 437. From a well ten feet deep; soil clayey; distance of sink-drain 100 feet, and privy, stable, barn-yard and pig-pen thirty feet. Chemically this water is very good and pure,—much better, in fact, than we usually find where sources of pollution are so near, and better, I should be afraid, than we should find if a sample were taken when the water is low in the well.

No. 438. From a well on the side of a granite hill about fifteen rods above the house and other sources of pollution.

No. 439. From a reservoir about seven feet square and seven feet deep in a swale about four rods below a spring where cattle drink during the summer season. This and No. 438, the analyses show are chemically good and pure waters for drinking purposes.

The samples were sent for examination on account of the prevalence of typhoid fever.

No. 443. From a spring three-fourths of a mile from the village and remote from all buildings. "From the results of the analysis of the sample and from your description of the spring and its location I do not see why it would not make an excellent source of supply of drinking water as far as quality is concerned. You will see from the figures which are enclosed that the results are good, and that the water is tolerably soft, perhaps I ought to say quite soft for a spring water. If you wish to determine whether there are seasonal variations in the quality of the water we will make the examinations for you."

No. 444. From a well four feet deep in sandy soil with clayey subsoil; the distance from sink-drain is thirty, privy twenty-five, stable ten, and pig-pen ten feet. "The enclosed blank will give you the results of the analysis of the sample of water. The well is very unfavorably situated and the analysis shows that the water is badly polluted." The health of the family is said not to have been good since using the water and sickness now exists.

Nos. 445 and 446. The former sample is cistern water purposely polluted with common salt, and the latter is the same water after distillation in a patented apparatus, the first portion being rejected.

No. 447. From a well eighteen feet deep in a gravelly soil, distance from sink-drain twenty-two feet; from privy forty, stable sixty-five, barn-yard and pig-pen forty-five feet.

No. 448. A cistern water, decidedly better than the average cistern water.

No. 449. From a driven well, situated twenty feet from the sink-drain, forty-five from the privy, fifteen from the stable. The ground is sandy. This well is badly located even for a "driven" well. The chemical examination disclosed no marked pollution, though it is probable that at times there has been a slight soakage of sewage into the well, since the family has complained that an odor is sometimes perceived "somewhat like dish-water."

Nos. 450 and 451. These samples were taken from two springs, situated in clayey ground. These waters are not of first-class quality, neither are they so bad as to warrant their condemnation without keeping them under observation longer.

No. 452. From a well situated between two houses, one of which is only eight feet from it. The sink-drain and privy are twenty and twenty-five feet respectively from it. The water is said to come from a vein in the ledge at the bottom of the well. "I should therefore advise, if you are to continue to use the water, the taking of measures to guard against the danger of soakage, especially from the sink-drain and privy. Sink drainage should be carried to a safe distance through pipes which are not leaky, and the best management of the privy would be to adopt some of the dry methods. I send circulars to your address which may be of help to you."

No. 453. From a well fifteen feet deep and ten inches across, bored in swampy ground near a running stream. No sources of pollution are near. "The results are very satisfactory. The water appears to be a very good one indeed for drinking purposes. It is, moreover, a tolerably soft water."

No. 454. From a well twenty-seven feet deep through solid gravel, and ledge for the last ten feet. As possible sources of pollution are the sink-drain, privy, stable, barn-yard, and pig-pen, all within distances ranging from thirty to 120 feet. The water is not really good and pure well water on account of a moderate pollution and quite a high degree of hardness.

No. 455. From a well eighteen feet deep and from two and one-half rods to three and one-half rods from a barn celler, sink-drain, and privy. The ground is very hard gravel.

No. 456. From a well in ground which is gravelly; distance from sink-drain forty feet, privy twenty, and stable seventeen feet. The water is badly polluted.

No. 458. Well twenty feet deep, through "heavy, dark loam"; subsoil, hardpan of yellowish gravel, very fine, but so hard that a pick will hardly penetrate it. Distance of sink-drain and privy thirty-nine and thirty-eight feet respectively, and of stable, barn-yard and pig-pen sixty to seventy feet. "The water is badly polluted and each of the several processes in the analysis shows this. It happens quite frequently that I find that samples of well water from wells passing through a subsoil of very hard gravel or of clay are badly polluted, probably on account of the surface soakage passing downward to the impermeable layer which forms the hardpan and then along the surface of this directly into the well. The sink-drain and privy, however, are both nearer to the well than would be safe with any soil, though there would not be so much danger with some kinds of ground."

No. 459. From a spring 800 feet from the buildings. "The doctors were right in recommending this water to you for drinking purposes. The results show that the water is good and pure, notwithstanding the rotten log and the frogs which troubled you in getting the sample. If you are to use the spring as a source of drinking water supply, the muck ought to be taken out, in and around the spring, and the spring stoned up, or better, walled up with brick and cemented so that the water would come in only from the quicksand at the bottom. No examination was made of the sample to determine whether it has any medicinal qualities. I only determine that if it is properly taken care of, the spring will furnish good, pure water for drinking purposes."

No. 460. From a well twenty feet deep, taking its water from the surface of a ledge with clayey subsoil and gravelly soil above; distance of sink-drain fifteen, privy twenty, stable and barn-yard thirty, and pig-pen seventy-five feet. Eight feet of water when the sample was taken. When the water is low it does not taste right.

No. 461. Well eighteen feet deep; ground sandy; distance of sink-drain ten, privy twenty-seven, stable and pig-pen forty, and barn-yard twenty-five feet; typhoid fever present. Water has a bad odor at times.

No. 462. From an aqueduct bringing water from a spring one-third of a mile away from the buildings. The water is good and pure for drinking purposes.

Nos. 463 and 464. No. 463 from a well in a cellar, three feet from the sink-drain, twenty-five feet from privy and stable, and thirty feet from pig-pen. The results show that the water is very badly polluted, and it should not be used for any drinking or culinary purposes. It is no wonder that it has "a slick" taste. No. 464. From a well by the roadside containing the town pump. The town drain runs within fifty feet of the well. "You will see that this is a much better water than the other sample, but it is a very hard water and the excess of chlorine, organic ammonia and nitrates show that the water is polluted. As far as its pollution is concerned there could be no objection to using the water after it is thoroughly boiled, and it might be used for a long while unboiled without doing any harm, but there is of course always danger in using such water.

No. 465. From a well in clayey soil; distance of privy fifty, of pig-pen thirty feet; land slopes from the well in all directions. "Chemically it is a fairly good well water, though rather hard."

Nos. 466 and 467. "No. 466. From a spring in a pasture near the edge of a swamp surrounded by pines, maples and alders. The spring is about ten feet in diameter, and four feet deep; it is not affected by rain or drought. This is a very good spring water. The absence of organic matter and the low total solids make it very probable that the supposed medicinal qualities of the spring are due to the chemical purity of the water." No. 467. From a driven well seven feet deep in low, wet ground: distance of sink-drain twelve, privy and stable twenty-five, pig-pen thirty feet. "You will see that the results of this analysis are not so favorable as in the case of the spring water. The organic matter is in excess and, from the location of the well, I should feel very certain that at times the water might be found considerably worse than this examination shows. There would, however, be no objection to your using this well water after it is boiled, and, of course, it might be used for a lengthened period unboiled without harm, but there is always danger from using polluted water."

No 468. From a well drilled forty-two feet in a "solid" ledge,—the solid ledge, however, is somewhat seamy, and the "grain" is perpendicular. The different strata of rock varied much in hardness; thus one day only three and one-half feet were drilled and another day eleven feet. One vein of water was struck at twenty-four feet and another at forty feet; water stands thirty-two feet high in it; water drawn through an iron pipe cemented at the surface of the ledge. The sink-drain and privy are respectively 170 and 200 feet away, but the pig-pen and manure shed are only twelve feet distant.

No. 469. From a well twenty-two feet deep, stoned from the bottom twelve feet, thence upward the wall is of brick laid in cement; distance from stable three feet, sink-drain forty feet, privy thirty-five feet. The ground is very hard clay. Two children in the family were threatened with typhoid fever. The water is not good and at times would undoubtedly be much worse than is here shown. The family was advised not to use the water for drinking purposes.

ADDITIONS TO THE LIBRARY.

During the year 1889 the following books, journals and pamphlets were added to the library of the Board by exchange and purchase.

Books.

Reports and Papers of the American Public Health Association. Vol. XIV.

Transactions of the Sanitary Institute of Great Britain. Vol. VII. 1885-6.

Transactions of the Epidemiological Society of London. New Series. Vols. VI and VII.

Simon. Public Health Reports. Edited for the Sanitary Institute of Great Britain, by Dr. Seaton. London. 1887.

Wanklyn. Water Analysis. London. 1884.

Leffmann and Beam. Examination of Water for Sanitary and Technical Purposes. Philadelphia. 1889.

Sajous. Annual of the Universal Medical Sciences for 1889. 5 vols. Philadelphia.

Starr. Hygiene of the Nursery. Philadelphia.

Index Catalogue of the Library of the Surgeon-General's Office. Vol. X. Washington. 1889.

Medical and Surgical History of the War of the Rebellion. Part Third. 2 vols. Washington.

Lawrence. Accidents and Emergencies. Philadelphia.

Dulles. What to do First in Emergencies.

Morrison. The Ventilation and Warming of School Buildings. New York. 1887.

Arbeiten aus dem Kaiserlichen Gesundheitsamte. Funfter Band. Berlin. 1889.

Liebermeister. The Infectious Diseases. 2 vols. Detroit. 1887.

Francotte. Die Diphtherie. Leipzig. 1886.

Minnich. Ueber den Croup und seine Stellung zur Diphtheritis. Wien und Leipzig. 1889.

Lancry. De la Contagione de la Diphtherie. Paris. 1886.

Hinträger. Der Bau und die innere Einrichtung von Schulgebäuden. Wien. 1887.

Strohmberg. Das Dorpater Gymnasium in Gesundheitlicher Beziehung. Dorpat. 1888.

Key. Schulhygienische Untersuchungen. German translation by Burgerstein. Hamburg und Leipzig. 1889.

Arnould. Noveaux Elements de la Hygiene. Paris.

Riedel. Die Cholera. Berlin. 1887.

Thoinot et Masselin. Precis de Microbie Medicale et Veterinaire. Paris. 1889.

Verhandlungen und Mittheilungen des Veriens für öffentliche Gesundheitspflege in Magdeburg. 1888.

Verhandlungen der Deutschen Gesellchaft fur öffentliche Gesundheitspflege zu Berlin. 1884–1885–1886–1887.

Karmarsch. Technologisches Wörterbuch. Wiesbaden.

Transactions of the Maine Medical Association for 1889.

Transactions of the 56th Annual Session of the Medical Society of Tennessee. Nashville. 1889.

Transactions of the Medical Association of Missouri for 1888.

Transactions of the New Hampshire Medical Society for 1889. Concord.

Transactions of the Vermont State Medical Society. 1887.

Reports.

Twentieth Annual Report of the State Board of Health of Massachusetts. 1888.

Eleventh Annual Report of the State Board of Health of Connecticut. 1888.

Eleventh Annual Report of the State Board of Health of Rhode Island. 1888.

Twelfth Annual Report of the State Board of Health of New Jersey. 1888.

Third Annual Report of the State Board of Health of Ohio. 1888.

Seventh Annual Report of the State Board of Health of Indiana. 1888.

Sixteenth Annual Report of the State Board of Health of Michigan. 1888.

Twelfth Report of the State Board of Health of Minnesota. 1886-88.

Ninth Annual Report of the State Board of Health of Illinois. 1886.

Twelfth Annual Report of the State Board of Health of Wisconsin. 1888.

Fourth Annual Report of the State Board of Health of Kansas.

Second Biennial Report of the State Board of Health of North Carolina.

Ninth Annual Report of the State Board of Health of South Carolina, 1888.

Second Annual Report of the Provincial Board of Health of New Brunswick. 1888.

Sixth Annual Report of the Provincial Board of Health of Ontario. 1888.

Forty-Seventh Registration Report of Massachusetts. 1888.

Report of the Commissioner of Education for 1887 and 1888.

Fourth Annual Report of the Local Board of Health of Portland.

Seventeenth Annual Report of the Board of Health of Boston. 1888.

Annual Report of the Board of Health of Fall River, Mass.

Annual Report of the Board of Health of Taunton, Mass.

Annual Report of the Board of Health of Newburgh, N. Y.

Fourth Annual Report of the Board of Health of Newport, R. I.

Fourth Annual Report of the Board of Health of Hartford, Conn.

Annual Report of the Board of Health of Scranton, Pa. 1888.

Second Annual Report of the Board of Health of Hartford, Conn.

Annual Report of the Board of Health of Lowell, Mass. 1888.

Ninth Annual Report of the Board of Health of Lynn, Mass. 1888.

Eleventh Annual Report of the Board of Health of Augusta, Ga. 1888.

First Annual Report of the Board of Health of Alameda, Cal. 1888.

Thirteenth Annual Report of the Board of Health of Utica, N. Y. 1888.

Annual Report of the Board of Health of Columbus, Ohio. 1889.

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

Annual Report of the Board of Health of Newton, Mass. 1888.

Twelfth Annual Report of the Health Commissioner of St. Louis, Missouri.

Sanitary and other Journals for 1889.

Index Medicus. Detroit and Boston.

The Sanitarian. Brooklyn, N. Y.

The Sanitary News. Chicago.

The Annals of Hygiene. Philadelphia.

The Engineering and Building Record. New York.

The Health Journal. Ottawa.

The Sanitary Record. London.

Public Health. London.

Brooklyn Medical Journal, Brooklyn. N. Y.
Boston Medical and Surgical Journal.
Medical News. Philadelphia.
The Lancet. London.
The Microscope, Trenton. N. J.
The American Monthly Microscopical Journal. Washington.
Archives of Pediatrics. Philadelphia.
Building. New York.
Science. New York.
The Medical Standard. Chicago.
Occidental Medical Times. Sacramento, Cal.
The Satellite. Philadelphia.
The New York Medical Times.
Journal of Comparative Medicine and Surgery. Philadelphia.
The Microscopical Bulletin. Philadelphia.
The Anti-Adulteration Journal. Philadelphia.
Revue D'Hygiene. Paris.
Zeitschrift für Hygiene. Berlin.
Vierteljahrsschrift für öffent. Gesundheitspflege. Braunschweig.
Deutsche Medicinische Wochenschrift. Berlin.
Zeitschrift für Schulgesundheitspflege. Hamburg.
Centralblatt für Bakteriologie und Parasitenkunde. Jena.
Schweizerische Blätter für Gesundheitspflegeg. Zurich.
Giornale della Reale Societa Italiana D'Igiene. Milano.
La Salute Pubblica. Perugia.
The Sanitary Volunteer. Concord, N. H.
Public Health in Minnesota. Red Wing.
Monthly Bulletin of the Iowa State Board of Health.
Bulletin of the North Carolina Board of Health.
Bulletin of the State Board of Health of Tennessee.
Monthly Bulletin of the Connecticut State Board of Health.
Monthly Bulletin of the State Board of Health of Rhode Island.
Monthly Sanitary Record, State Board of Health of Ohio.
Abstract of Sanitary Reports. Washington.
Bulletin of the Agricultural Experiment Station of Nebraska. June. 1889.

PAMPHLETS.

Brush. Acute Milk Poisoning.
———. Bovine Tuberculosis. Mt. Vernon, N. Y., 1888.

Kretzschmar. Public Health Resorts vs. Institutions for the Treatment of Bacillary Phthisis. Philadelphia. 1888.

———. Dr. Dettweiler's Method of Treating Pulmonary Consumption. Brooklyn. 1888.

Massachusetts Institute of Technology. Laboratory Experiments. Boston. 1888.

Nelson. Extent and Distribution of Consumption in New Hampshire. 1888.

Baker. Recent Advances in State Medicine. Lansing. 1888.

———. The Causation of Cold Weather Diseases.

Spring. Mark Hopkins, Teacher. New York. 1888.

Weigert. Consumption and Its Cure. New York. 1889.

Chadwick. The Present and General Condition of Sanitary Science. London. 1889.

Crampton. Record of Experiments at Des Lignes Sugar Experiment Station. Baldwin, La., 1888.

Wiley. Foods and Food Adulterations. 1889.

Rauch. Water Supplies of Illinois and the Pollution of its Streams. Springfield. 1889.

Hewitt. Public Health a Public Duty. 1888.

Richards, Mrs. Sanitary Science in the Home. 1888.

McClellan. Sewer Gas Traps. Philadelphia. 1888.

Davis. Impurities in Potable Water. Des Moines, Ia. 1889.

Russell. Common Lodging Houses. Glasgow. 1889.

———. The Sanitary Requirements of a Dairy Farm. Glasgow. 1889.

———. Sanitation and Social Economics. Glasgow. 1889.

———. Ticketed Houses of Glasgow.

———. City of Glasgow Fever and Small-Pox Hospital. Belvidere, 1888.

Taylor. Food Products. Washington, 1889.

Currier. The efficacy of Filters and other Means employed to Purify Drinking Water. 1889.

Canfield. Some Complications of Chronic Endarteritis. Baltimore. 1889.

———. The Bacterial History of Pneumonia.

———. Relation of Dusty Occupations to Pulmonary Phthisis. Baltimore, 1889.

Treat. Sanitary Entombment.

Hardy. Fresh Water Algae of Maine.

Ziegler. Die Analyse des Wassers.

Kraepelin. Die Fauna der Hamburger Wasserleitung.

Seitz. Der Abdominal typhus nach langjahriger Beobachtung. Stuttgart, 1888.

Heubner. Die Expeimentelle Diphtherie. Leipzig, 1883.

Koch. De Bekampfung der Infectionskrankheiten. Berlin, 1888.

Verhandlungen des Internat. Kongress für Ferienkolonien. Zurich. 1888.

Friere. Statistique des Vaccinations. Paris. 1887.

Gesunde Nahrung. Zurich. 1889.

Moore. Water, Its Impurities, gathered from the Air and Earth, San Francisco. 1888.

Gerhard. Sanitary Condition of Watch Hill.

Clark. Prevention of Consumption. Lansing. 1889.

———. Nuisances. What they are and How to Abate Them. Lansing. 1889.

Mallory. Rafter and Line. On Volvox Globator. As the cause of the fishy taste and odor of the Hemlock Lake water in 1888. Rochester, N. Y.

Bryce. Venereal Disease Among Horses. 1889.

Bibber. Prevention of Yellow Fever in Florida and the South. Baltimore, 1889.

By-Laws of the Local Board of Health of Randolph.

Lowell Water Board. Annual Report for 1888.

Annual Report of the Superintendent of Public Buildings. Chelsea, Mass. 1888.

Report of the Trustees of the Cambridge Hospital. 1888.

Annual Report of the Hatch Experiment Station. Amherst, Mass. 1889.

Thirteenth Annual Report of the Water Commissioners. Taunton, Mass. 1888.

Reports on the Physical Condition of the Police Force of St. Louis.

Report of the State Dairy Commissioner upon Food Adulterations in Minnesota. 1888.

Report of the State Board of Health of Massachusetts on Water Supply and Sewerage. 1888.

Annual Report of the City Physician. Lynn, Mass. 1888.

Public Health Laws. Frankfort, Ky. 1886.

Proceedings of the Quarantine Conference. Montgomery, Ala. March 5, 6 and 7. 1889.

Proceedings and Addresses at the Sanitary Convention. Hastings, Mich. 1888.

Proceedings and Addresses at the Sanitary Convention at Manistee, Mich. 1888.

Report of the Proceedings of the State Board of Health of Kentucky. Annual Meeting. Louisville. May 7, 1889.

Third Annual Report of the Maine Eye and Ear Infirmary. 1888.

Proceedings of the National Conference of the State Boards of Health for 1888.

EXPENSES OF THE BOARD.

The amount and character of the expenditures of the Board for the year 1889 were as follows:

Engraving and drawing	$18 96
Books and sanitary journals	399 34
Instruments	12 00
Paper and stationery	184 75
Postage	175 00
Printing and binding	883 75
Secretary's salary	2000 00
Expenses of members	298 63
Express and telegraph	170 18
Expenses of secretary	81 69
Clerical help	613 00
Chemical and microscopical supplies	33 35
Extra chemical and microscopical work,	53 00
Miscellaneous	71 10
Total	$4994 75

LOCAL BOARDS OF HEALTH

AND

EXTRACTS FROM THEIR REPORTS.

ABBOTT.

Members of the board: A. P. Race, Secretary; Washington W. Delano, Chairman; Charles Foss.

No cases of the infectious diseases have occurred.

ACTON.

Members of the board: O. C. Titcomb, Secretary; C. N. Brackett, Chairman; B. J. Grant.

We had one case of diphtheria.

ADDISON.

Members of the board: Dr. Fred A. Chandler, Secretary; H. N. Ingersoll, Chairman; U. W. Curtis.

We had three cases of typhoid fever.

ALBANY.

Members of the board: Daniel Clark, Secretary; Otis Hayford, Chairman; W. York.

One nuisance was reported and it was removed.

ALBION.

Members of the board: Dr. C. W. Abbott, Secretary and Health Officer; Otis Meader, Esq., Chairman; R. L. Baker.

One nuisance was removed and three cases of typhoid fever have occurred, one of which ended fatally.

Alexander.

Members of the board: George B. Berry, Secretary; Jones A. Bohanan, Chairman; C. M. Huff.

The secretary reports that he has been on the watch tower, but there have been no infectious diseases.

Alfred.

Members of the board: Dr. F. W. Smith, Secretary; S. M. Came, Chairman; Dr. J. F. Day.

Alna.

Members of the board: Dr. A. M. Card, Secretary; Benj. W. Donald, Chairman; A. B. Erskine.

Four nuisances were reported, all of which were removed. No cases of the infectious diseases were reported.

Alton.

Members of the board: Dr. A. H. Twitchell, Secretary; Charles Clayton, Chairman; A. J. Hatch.

Ten cases of typhoid fever occurred, two of which were fatal. Three of these cases were brought from the boom house on the river where they had been running logs to another house containing a family of father, mother and seven children. The mother and six children contracted the fever. The fever showed much irregularity in its course and symptoms. My horse and several others in the neighborhood had a disease resembling very much influenza in human subjects.

Amherst.

Members of the board: Dr. Geo. A. Lord, Secretary; Nathan Sumner, Chairman; Frank Foster.

No cases of the more serious contagious diseases have occurred.

Andover.

Members of the board: Geo. O. Huse, Secretary; Dr. W. W. Barnes, Chairman; Stephen Cabot.

We had one fatal case of typhoid fever.

Anson.

Members of the board: Reuben Fairbrother, Secretary; Dr. C. M. Wing, Chairman; Byron Hutchins.

About ten nuisances were abated under the direction of the board. We had three cases of scarlet fever, all ending in recovery, and three cases of typhoid fever, one of which ended fatally.

Appleton.

Members of the board: Dr. Frank A. Gushee, Secretary; A. A. Linnekin, Chairman; S. B. Ripley.

Two cases of typhoid fever occurred.

Argyle.

Members of the board: J. N. Tracy, Secretary: S. J. Bussell, Chairman; S. L. Freese.

Three nuisances were removed. We have had nine cases of typhoid fever.

Arrowsic.

Members of the board: J. McFadden, Secretary; T. J. Rairden, Chairman; C. T. Willis.

Ashland.

Members of the board: Charles L. Dunn, Secretary; Dr. E. A. Duren, Chairman; J. H. Carter.

Seven cases of typhoid fever have occurred.

Athens.

Members of the board: Howard C. Taggart, Secretary; Dr. Jas. S. Tobey, Chairman; L. N. Ellingwood.

We have had no cases of the infectious diseases. Our health officers are ready and willing to act in case of need, but it has been quite a healthful year.

Auburn.

Members of the board: Dr. J. W. Beede, Secretary; H. Lowell, Chairman; Daniel Lara.

Augusta.

Members of the board: Dr. R. J. Martin, Secretary and Health Officer; Dr. J. O. Webster, Chairman; E. R. Bean.

Several sewers have been added or extended and some imperfect ones re-laid. Seventy-five nuisances have been reported to the board, and sixty have been abated. There have been reported to the board forty cases of diphtheria, of which four ended fatally, and eighteen cases of typhoid fever with two deaths. One primary and intermediate school was closed on account of diphtheria in that district.

The French district is unhealthy on account of the crowded condition of the tenements. The sanitary measures which are desirable are increased sewerage facilities, and the enforcement of the law regarding crowded tenements.

Aurora.

Members of the board: A. E. Mace, Secretary; G. T. Giles, Chairman; George R. Crosby; Dr. Geo. A. Lord, Health Officer.

We had two cases of typhoid fever.

Avon.

Members of the board: J. A. Badger, Secretary; Joel Wilbur, Chairman; N. E. Gould.

Two cases of typhoid fever occurred with one death.

Baileyville.

Members of the board: John D. Lawler, Secretary; George W. Libby, Chairman; James G. Smith.

There were no cases of the infectious diseases.

Baldwin.

Members of the board: Dr. L. Norton, Secretary; I. S. Chase, Chairman; Charles Rounds.

We have had no cases of the infectious diseases.

Bangor.

Members of the board: John Goldthwaite, Secretary; Dr. D. A. Robinson, Chairman; Dr. A. R. Taney.

About seven thousand feet of sewers have been laid during the year, and about one hundred nuisances have been reported and abated. We have had four mild cases of scarlet fever; twenty-eight cases of diphtheria with ten deaths, and one hundred and sixty cases of typhoid fever with forty deaths.

BARING.

Members of the board: Joseph Stevens, Secretary; Jas. B. Woodcock, Chairman; Jas. Tyler.

One case of typhoid fever occurred.

BATH.

Members of the board: Dr. E. M Fuller, Secretary; Dr. R. D. Bibber, Chairman.

Since the introduction of Thompson's brook water, typhoid fever has almost entirely disappeared from our midst. In the majority of cases which have occurred, the disease has been contracted from some source foreign to our city.

Many nuisances have been abated, and, in most cases, there has been pleasant and speedy co-operations on the part of all in the correction of conditions detrimental to health. The citizens are paying more attention to their out buildings, and general surroundings and shown many instances of thoughtful care in endeavoring to throw around themselves and others better conditions of sanitation. A few streets have been well drained, and many citizens, in conjunction with the Street Commissioner have improved the sanitary conditions of their premises and the streets in a marked degree.

The Street Commissioner has always worked in harmony with the board in endeavoring to abate all nuisances coming under his jurisdiction. If the same policy is maintained every year, many of the streets will be drained, so that the individual expense will be comparatively small, and the health of the city will be improved.

The number of deaths which occurred in Bath in 1889 was 160, making a death-rate on a basis of 8,000 inhabitants, of 20 per thousand. The following are some of the causes of deaths with the number that occurred from each: consumption, 22; pneumonia, 14; typhoid fever, 5; diphtheria, 2; cholera infantum, 13; cancer, 8; heart disease, 12; paralysis, 11; accident, 7; old age, 5; tetanus, 1.

The deaths per each month were as follows: January, 11; February, 11; March, 19; April, 4; May, 20; June, 9; July, 14; August, 20; September, 13; October, 8; November, 17; December, 14.

BEDDINGTON.

Members of the board: Asa F. Libby, Secretary; Wm. A. Coffin, Chairman; Eli Oakes; Dr. S. J. Milliken, Health Officer.

Six cases of diphtheria occurred with one death. The schools and meetings were stopped and infected houses were placarded.

BELFAST.

Members of the board: L. T. Shales, Secretary; H. P. Thompson, Chairman; Dr. S. W. Johnson, Health Officer.

A plan for the sewerage of the city has lately been received and work will probably begin in the spring. Twelve nuisances have been reported, all of which have been removed.

Of contagious diseases we have had one case of diphtheria, two of scarlet fever, and three of typhoid fever, but no deaths resulted.

BELGRADE.

Members of the board: Dr. L. E. Reynolds, Secretary; E. F. Yeaton, Chairman; Greenleaf Hersom.

We have had two cases of diphtheria and three of typhoid fever, with no deaths from either disease.

BELMONT.

Members of the board: Miles Pease, Secretary; N. B. Allenwood, Chairman; D. A. Greer.

We had one case of scarlet fever; the house was placarded and every precaution was taken.

BENEDICTA.

Members of the board: John Rush, Secretary; J. J. Curran, Chairman; John Sullivan.

We have had no cases of the infectious diseases.

BERWICK.

Members of the board: Dr. P. B. Young, Secretary; Dr. H. V. Noyes, Chairman; C. M. Guptill.

Seven nuisances were reported to the board, all of which were removed. Three cases of typhoid fever occurred.

Bethel.

Members of the board: Dr. C. D. Hill, Secretary; E. B Goddard, Chairman; A. B. Goddard.

Biddeford.

Members of the board: Daniel Cote, Secretary; James Beaumont, Chairman; Arthur Simpson.

Bingham.

Members of the board: T. F. Houghton, Secretary; J. D. Merrill, Chairman; Dr. A. A. Piper, Health Officer.

We had one case of diphtheria and four cases of typhoid fever, with one death from the latter cause.

Blaine.

Members of the board: Fred F. Lowell, Secretary; Jona. Hersom, Chairman; J. M. Ramsey.

Three cases of typhoid fever, one of which was supposed to have been caused by well water polluted by the barn-yard. The disinfectants recommended by the State Board of Health were freely used and the circulars were distributed to the families. There has been but little work for the board, but it is ready to act promptly when required.

Blanchard.

Members of the board: E. P. Blanchard, Secretary; C. B. Packard, Chairman; W. H. Knapp.

There have been no cases of contagious diseases.

Bluehill.

Members of the board: Dr. R. P. Grindle, Secretary; A. C. Osgood, Chairman; R. G. Lord.

Three nuisances were reported to the board, one of which was abated, and the other two were not in the opinion of the board found to be nuisances.

There have been one fatal case of diphtheria, seventeen cases of scarlet fever, all recovering, and fourteen cases of typhoid fever, two of which died. Scarlet fever broke out in the district of South

Bluehill in January. Before our board of health was aware of it, the disease had extended into four or five families. The board at once took measures as directed to confine it, and the people in the district, particularly the parents of the children that were sick, assisted greatly, which prevented it from spreading into other districts in town. For the prevalence of typhoid fever we are unable to assign a cause.

BOOTHBAY.

Members of the board: Dr. Alden Blossom, Secretary; J. R. McDougal, Chairman; Byron Giles.

This town has been highly favored in having but a very few cases of contagious diseases. There have been one case of scarlet fever and five of "scarlet rash" in one family. We have never had a season before with so few cases of bowel complaint.

BOOTHBAY HARBOR.

Members of the board: Dr. F. H. Crocker, Secretary; Dr. J. A. Carter, Chairman; W. H. Reed.

We have had no prevailing epidemic of any of the contagious diseases. A few cases of diphtheria and scarlet fever appeared at widely separated periods. The origin was difficult to determine. Generally the cases were not fatal: by proper management and precautions they were limited to the localities in which they were discovered. There have been a few cases of typhoid fever, most of which were imported from the large cities where poor drinking water was, no doubt, the cause. Our sanitary and hygienic conditions compare favorably with other coast towns and the death rate has been about the average as for a number of years past.

BOWDOIN.

Members of the board: A. P. Small, Secretary; T. W. Skelton, Chairman; D. A. Coombs.

We have had two cases of typhoid fever with one death.

BOWDOINHAM.

Members of the board: Dr. I. C. Irish, Secretary; Dr. Charles ———, Chairman; L. B. Small.

Bradley.

Members of the board: A. E. Perkins, Secretary; Eugene Lenfest; Fred C. Barton.

We had four cases of typhoid fever with three deaths. One of the boys in the affected family with his father had worked a part of the time in Oldtown, and it was uncertain whether the infection was contracted there or from the well water at home.

Bremen.

Members of the board: Wm. B. Hilton, Secretary; Warren Weston, Chairman; Solomon Genthner.

No cases of infectious diseases have been reported.

Brewer.

Members of the board: W. H. Gardner, Secretary; Dr. C. P. Thomas, Chairman; E. A. Stanley.

During the year there was an extension of the water supply system by the addition of two or more miles of pipe, and the sewers were extended about three thousand feet. Several nuisances were reported to the board, all of which were removed.

We have had twenty cases of diphtheria with one death, and thirty-two cases of typhoid fever, one only of which ended fatally.

Bridgewater.

Members of the board: R. H. Perkins, Secretary; T. G. Durgin, Chairman; Charles Kidder.

Three nuisances were reported to the board, all of which were removed. Five or six cases of typhoid fever, but no deaths resulted. The cases of fever were mild.

Bridgton.

Members of the board: M. Gleason, Secretary; G. G. Wight, Chairman; Dr. F. A. Mitchell.

Brighton.

Members of the board: L. D. Matthews, Secretary; Asa Strickland, Chairman; G. C. Davenport.

No cases of contagious diseases have been reported.

BRISTOL.

Members of the board: S N Smith, Secretary; George Johnson, Chairman; Dr. Samuel W. Johnson.

We have had one case of diphtheria and three of scarlet fever.

BROOKLIN.

Members of the board: E. P. Cole, Secretary; G. R. Allen, Chairman; Dr. F. S. Herrick.

Three nuisances were reported to the board, and these were abated as soon as the attention of the owners was called to them. No cases of contagious diseases have occurred.

BROOKSVILLE.

Members of the board: Jerry Jones, Acting Secretary and Chairman; S. D. Gray.

Two nuisances were removed by the board. We had one case of typhoid fever contracted out of town which ended in recovery. The house was found in good sanitary condition. One family had a diarrhœal disease of a typhoid form. It was contracted by a young son on board a vessel in New York, and affected the other members of the family, causing one death. The case was not reported to the board and no sanitary measures were used. The board is getting better acquainted with its duties and the people with some exceptions are beginning to estimate fairly the value of the health laws, and in most cases show a readiness to comply with the wishes of the local board.

BROWNFIELD.

Members of the board: S. B. Bean, Secretary; A. Blake, Chairman; Dr. H. F. Fitch, third member and Health Officer.

We had one non-fatal case of typhoid fever, and in this, the well was within ten feet of the barn-yard.

BROWNVILLE.

Members of the board: T. W. Pratt, Chairman; M. S. Berry.

There were three cases of diphtheria with one death, and three of typhoid fever in a light form. The report is made by the chairman, as the secretary had resigned on account of illness.

Brunswick.

Members of the board: Dr. M. V. Adams, Secretary; H. J. Given, F. H. Wilson.

About the usual number of nuisances have been removed. I cannot give the number of cases of infectious diseases for they have not been reported to me. A system of sewerage is much needed.

Buckfield.

Members of the board: Dr. J. F. DeCoster, Secretary; Dr. J. C. Caldwell, Chairman; Henry D. Irish.

Bucksport.

Members of the board: Geo. H. Emerson, Secretary; G. W. McAllister, Chairman; E. A. Crocker.

Water has been brought to the village from Great Pond one mile distant and now supplies a part of the village. The system will be extended another year. Several minor nuisances have been reported and removed. We had one case of diphtheria and fifteen of typhoid fever with one death from the latter cause. A proper system of drainage and sewerage is needed.

Burlington.

Members of the board: J. W. Bradbury, Secretary; Mellen Strickland, Chairman; Thomas Shorey.

We have had two cases of scarlet fever and three of typhoid, but no deaths from either cause. Colds among the scholars and teachers in our schools are very common, and we believe as the result of the faulty method of heating and ventilating the houses. A fatal accident occurred in felling trees. Five cases of anthrax in cattle so pronounced by Dr. Bailey, Veterinary Surgeon, occurred. Death resulted very suddenly.

Burnham.

Members of the board: A. W. Fletcher, Secretary; Dr. N. E. Murray, Chairman; Dr. W. H. Merrill, Health Officer.

Four nuisances were removed. We had five cases of typhoid fever, three of pulmonary phthisis, and one of acute tuberculosis. Disinfection was practiced in all cases of typhoid fever, and no two cases occurred in the same family or on any adjacent premises. We would recommend that all school-houses be banked in the fall to prevent the scholars having cold feet and resulting sickness.

Buxton.

Members of the board: Dr. F. A. Southwick, Secretary; Charles Hodgdon, Chairman; J. H. Waterman.

Three nuisances were reported and all were removed. We have had fourteen cases of diphtheria with four deaths, two of scarlet fever, and two of typhoid fever, with one death.

Byron.

Members of the board: H. H. Richards, Secretary; George F. Thomas, Chairman; A. S. Young.

There have been no infectious diseases during the year.

Calais.

Members of the board: Dr. D. E. Seymore, Secretary and Health Officer; C. Ellis, Chairman; Dr. E. H. Vose.

Our water supply is good with an increased number of takers. Thirteen nuisances were reported to the board, and the whole number of nuisances removed, including ill kept privies discovered as the result of the inspections, was eighty-five.

We have had forty-six cases of diphtheria, with twenty deaths, three cases of scarlet fever, and thirteen of typhoid fever. Two cases of typhoid fever resulted from polluted water, the use of which was promptly suppressed and the disease was checked.

Cambridge.

Members of the board: J. B. LaBree, Secretary; J. W. Cole, Chairman; G. E. Bailey.

One case of diphtheria and one of typhoid fever, both in a mild form, occurred.

Camden.

Members of the board: J. P. Wellman, Secretary; Abel Merriam, Chairman; A. Leach.

Five nuisances have been removed. We have had three cases of typhoid fever, of which one proved fatal.

Canaan.

Members of the board: Dr. L. W. Shean, Secretary; David Nason, Chairman; Dr. Ivory Lowe.

Five nuisances were reported to the board, all of which were removed. Two cases of typhoid fever, one a child of six years.

Cape Elizabeth.

Members of the board: Chas. B. Haskell, Secretary; Dr. S. B. Thombs, Chairman; Dr. J. W. Lowell.

One nuisance reported to the board was removed. Eight cases of diphtheria with one death.

Caribou.

Members of the board: Dr. J. Cary, Secretary; Rev. C. E. Young, Chairman; C. B. Roberts, Esq.

A new and complete system of water works has been put in since the last report. Water is pumped from the Aroostook River to an elevated stand-pipe from which a supply is distributed to the village. Eleven nuisances reported were all removed upon notice from the board.

Three cases of diphtheria and one of typhoid fever, with one death from the latter cause. A spring in the village near Caribou Stream has furnished germs of typhoid for about every case for the past two years. The spring was so located as to be accessible to surface pollution, and in addition to this, one or two privies are near. The spring gave no trouble during the drought, but the outbreak of typhoid occurred after the first rain.

Carmel.

Members of the board: F. A. Simpson, Secretary: Henry Kimball, Chairman; W. A. Swan.

We had one case of typhoid fever. As for disease of animals, a two-years-old heifer running alone in the pasture was taken with running sores on the back part of the fore leg. The discharge lasted for a few days and the animal became so weak that she could not walk, and after remaining in that condition for two days more, died. Some other animals were attacked in another part of the town, but they recovered.

CARROLL.

Members of the board: Albion Gates, Secretary; H. A. Larrabee, Chairman; W. A. Farrar.

We have had no cases of contagious disease.

CARTHAGE.

Members of the board: S. C. Morse, Secretary; W. W. Goodwin, Chairman; John S. Swett.

No cases of the infectious diseases came to our knowledge.

CASCO.

Members of the board: L. W. Holden, Secretary; H. B. Harmon, Chairman; J. D. Spiller.

We have had one case of diphtheria and one case of scarlet fever with no deaths from either disease.

CASTINE.

Members of the board: Dr. G. A. Wheeler, Secretary; Curtis Stevens, Chairman; Dr. E. E. Philbrook.

One nuisance reported to the board was abated. It has been the healthiest year for eighteen years in this town. One case of typhoid fever is all we have to report.

We ought to have public sewers, and there is an urgent need for pure water. An inspection of all the premises in the village was made in June by the president of the board. [A house to house inspection is one of the best pieces of work that could be done by a local board of health, and many other villages that have not already done so would do well to adopt the same practice.—Sec. St. Bd. of Health.]

CENTERVILLE.

Members of the board: Jas. H. Floyd, Secretary; Bion L. Drisko, Chairman; Henry W. Foster.

One nuisance was removed. Six cases of scarlet fever, one of which was fatal.

CHARLESTON.

Members of the board; O. L. Smith, Secretary; Dr. George D. Cook, Chairman and Health Officer; Wm. E. Dunning.

We have had no cases of infectious disease.

Charlotte.

Members of the board: B. J. Fisher, Secretary; Enoch Fisher, Chairman; F. J. Sprague.

No cases of infectious diseases reported.

Chelsea.

Members of the board; A. N. Douglass, Secretary; W. T. Searles, Chairman; A. A. Sampson.

Eleven cases of scarlet fever with one death, and two of typhoid, also with one death.

Cherryfield.

Members of the board: Dr. C. J. Milliken, Secretary; Daniel Willey, Chairman; Samuel Ray.

We have had one case of diphtheria and one fatal case of typhoid fever.

Chester.

Members of the board: A. B. Brown, Secretary; E. L. Kenn, Chairman; Abram Libby.

We have had no infectious diseases except whooping-cough, and this caused the death of two infants.

Chesterville.

Members of the board: Dr. B. F. Makepeace, Secretary; Edward A. Hall, Chairman; T. J. Clough.

Three nuisances reported to the board were all removed. There were four cases of typhoid fever with one death.

China.

Members of the board: Dr. G. J. Nelson, Secretary; E. M. Dowe, Chairman; C. E. Dutton.

The one nuisance reported to the board was removed. We had two cases of typhoid fever causing one death. In one school unhealthy conditions exist owing to a poor school-house and its unsanitary location.

Clifton.

Members of the board: W. D. Campbell, Secretary; S. W. Bowden, Chairman; H. G. Doble.

We had two cases of diphtheria one of which was fatal.

Columbia.

Members of the board: John E. Stewart, Secretary; Asoph Leighton, Chairman; A. J. Tabbott.

One nuisance was abated, but there have been no cases of contagious diseases. It has been a very healthful year.

Columbia Falls.

Members of the board: E. F. Allen, Secretary; J. F. Pineo, Chairman; C. C. Bucknam.

Three nuisances reported to the board were removed. We had ten cases of diphtheria with three deaths, and two cases of typhoid fever, both of which were fatal.

Concord

Members of the board: E. O. Vitton; C. R. Ellis; Amon Savage.

Cooper.

Members of the board: Edwin C. Leland, Secretary; David Howe, Chairman; Wm. W. Sadler.

No cases of infectious diseases occurred.

Corinna.

Members of the board: A. K. Currier, Secretary; E. Folsom, Chairman; J. C. Pease.

There were six cases of typhoid fever, but no deaths resulted.

Corinth.

Members of the board: Dr. E. H. Stanhope, Secretary and Health Officer; Dr. C. S. Philbrick, Chairman; Ira W. Davis.

One case of typhoid fever ending in recovery.

Cornish.

Members of the board: F. C. Small, Secretary; Dr. Wm. B. Swasey, Chairman; B. F. Haley; Dr. Wm. H. Pendexter, Health Officer.

We have the best of opportunities for sewerage and that is what we need very much, and, if the town would put it in, our sanitary condition would be first-class.

Cornville.

Members of the board: D. S. Willey, Secretary; C. E. Smith, Chairman; C. C. Kinsman.

We had four cases of scarlet fever, but no deaths from this cause.

Cranberry Isles.

Members of the board: Wm. P. Preble, Secretary; Wm. E. Hadlock; John Gilley.

We had three mild cases of diphtheria. One cow died from a disease causing swellings in the head. It is generally very healthful here.

Crawford.

Members of the board: J. P. Jeffrey, Secretary; M. S. Fenlason, Chairman; Robert Wallace.

One fatal case of typhoid fever occurred. There have been a few cases of swine disease in which the animals are taken with red spots, weakness and costiveness.

Cumberland.

Members of the board: Dr. C. T. Moulton, Secretary and Health Officer; Albert H. Grannell, Chairman; L H. Merrill.

Three nuisances reported to the board were removed. All the specified contagious diseases have been absent.

Cushing.

Members of the board: A. R. Rivers, Secretary; W. A. Rivers, Chairman; F. C. Hathorn.

We had two fatal cases of typhoid fever. Drainage is needed in some places and the wells should be better protected against surface soakage.

Cutler.

Members of the board: C. G. Aldrich, Secretary; M. W. Ackley, Chairman; O. A. Davis.

We have had no infectious diseases except one case of scarlet fever.

Damariscotta.

Members of the board: Dr. J. M. King, Secretary; Asa H. Snow, Chairman; Dr. E. F. Stetson.

None of the specified contagious diseases have come to our attention, excepting sixteen cases of scarlet fever, all of which recovered.

DANFORTH.

Members of the board: Dr. M. L. Porter, Secretary; Dr. J. P. Ker, Chairman; James Carson.

Eleven nuisances were reported to the board, ten of which were abated. Four cases of typhoid fever, two fatal.

DAYTON.

Members of the board: Dr. George Sylvester, Secretary; Albert Dow, Chairman; Cyrus Ricker.

We had one fatal case of diphtheria which assumed the croupous form, and one non-fatal case of scarlet fever. We had also one fatal case of cerebro-spinal meningitis. The ventilation of the school-houses in this town is bad.

DEERING.

Members of the board: Geo. P. Sherwood, Secretary; Dr. A. P. Topliff, Chairman; Andrew Hawes.

Eight nuisances were reported to the board, all of which were abated. We have had six cases of diphtheria, one of which ended fatally, and eleven cases of typhoid fever, with three deaths from this cause. In all cases of infectious diseases, the premises have been inspected by the executive officer and the necessary precautions taken.

DEER ISLE.

Members of the board: Andrew J. Beck, Secretary; Seth Webb, Chairman; Wilmot B. Thurlow.

We have had during the year forty-five cases of scarlet fever, with one death, and nineteen cases of typhoid fever, two of which ended fatally. The schools were closed on account of the prevalence of scarlet fever. There is need of a better water supply at Green's Landing.

DENMARK.

Members of the board: Isaac H. Berry, Secretary; Dr. S. T. Brown, Chairman; Jos. W. Colby.

No cases of the infectious diseases were reported.

Dennysville.

Members of the board: Dr. A. R. Lincoln, Secretary and Health Officer; Benj. Lincoln, Chairman; Geo. W. Kilby.

Two nuisances were abated. One non-fatal case of scarlet fever occurred.

Detroit.

Members of the board: Orville J. Dorman, Secretary; David F. Libby, Chairman; Parker Sawyer.

One nuisance was abated. We had one case of diphtheria and one of typhoid fever, but no deaths resulted from either cause. J. W. Bean has lost some hogs from a disease supposed to be hog cholera, and others are sick at the time of making this report.

Dexter.

Members of the board: G. E. Farnham, Secretary; C. H. Hayden, Chairman; Dr. C. M. Foss, member and Health Officer. Four nuisances were removed. We have had no case of infectious diseases. Better sewerage is needed.

Dixmont.

Members of the board: W. M. Chapman, Secretary; W. H. Toothaker, Chairman; Dr. Homer Benson, third member and Health Officer.

Dover.

Members of the board: Geo. E. Howard, Secretary; J. Q. Lander, Chairman; Dr. J. B. Cochrane.

Durham.

Members of the board: Dr. J. L. Wright, Secretary; J. E. Hasty, Chairman; C. A. Goddard.

One nuisance was removed without the interference of the board. We have had four non-fatal cases of scarlet fever. The cases of scarlet fever were isolated, and no one allowed to pass or repass except the physician in attendance. Complete disinfection was carried out by burning and otherwise, in accordance with the rules laid down by the State Board of Health. The patients were not allowed to mingle with outside people for five weeks after the disappearance of the eruption.

EASTBROOK.

Members of the board: A. P. Bunker, Secretary; A. W. Googins, Chairman; L. W. Bunker.

We had seven cases of typhoid fever, but no deaths from this cause. These cases all appeared in one family and we provided nurses and kept the public away, and the fever did not spread.

EAST LIVERMORE.

Members of the board: Dr. C. H. Gibbs, Secretary; A. D. Cole, Chairman; C. H. Severy.

Eight nuisances reported to the board were removed. We had four cases of typhoid fever. One case of tuberculosis occurred in a cow.

EAST MACHIAS.

Members of the board: Dr. J. E. Tuell, Secretary; A. J. Hanscom, Chairman; F. H. Wiswell.

Of the specified infectious diseases, we had only one case of non-fatal typhoid fever. In connection with this case of typhoid fever the following conditions were found: A privy made by digging a square hole three feet deep in the ground and building a light frame house over it, was found situated just at the head of a small ravine leading to the river. This ravine carried the surface drainage to the river, and the privy was not more than five rods from the river bank, near which, and just at the foot of the ravine, a spring broke through the ground. From this spring the family procured water for drinking purposes. A strict quarantine was placed on that spring, the proper precautions in regard to the excreta were observed, the patient recovered, and no other case of the disease occurred.

EASTON.

Members of the board: Dr. D. G. Luce, Secretary; Dura Stanchfield, Chairman; W. H. Rackliffe.

We had one fatal case of diphtheria, and two non-fatal cases of typhiod fever. In addition whooping cough and rötheln were prevalent.

During August and September we had an unusual epidemic of diarrhœal diseases; there were about thirty cases of acute ileo-colitis, cholera infantum, and dysentery. Four deaths resulted from dysentery and this disease appeared to be of a very malignant type. I should advise disinfection of the stools in cases of dysentery. In one family where I attended eight cases of this disease, the first was in a grown-up daughter who came from a neighboring town; she had no medical attendance for a few days, and the discharges were thrown into the privy vault. I could account for the subsequent cases in no other way. The water, while not above suspicion, was used by other famllies with no ill results. My experience, during the past year, will lead me to require as much care in the disinfection of the stools in dysentery as in typhoid fever.

EDDINGTON.

Members of the board: John J. Temple, Secretary; Daniel S. Stevens, Chairman; W. W. Eddy.

Two nuisances have been removed by the board. We had one light case of diphtheria and one fatal case of typhoid fever. A horse found to have glanders was ordered by the Cattle Commission to be killed.

EDEN.

Members of the board; Willard C. Higgins, Secretary; O. B. Knowles, Chairman; Chas. R. Clark.

About fifty nuisances were reported to the board and about all of them were promptly removed. There were three cases of diphtheria with one death from this cause, and three cases of scarlet fever, none of which proved fatal. There were a few cases of typhoid fever not reported to the board, and I believe one or two deaths.

EDGECOMB.

Members of the board: Eben Chase, Jr., Secretary; J. A. Merry, Chairman; A. M. Burnham.

EDINBURG.

Members of the board: C. M. Farnham, Secretary; C. W. Eldridge, Chairman; G. H. Eldridge.

There have been no cases of the infectious diseases.

ELIOT.

Members of the board: Albert Lord, Secretary; J. L. M. Willis, Chairman; H. I. Durgin.

One nuisance was abated. Seven cases of diphtheria occurred with five deaths, one case of scarlet fever, and six of typhoid fever with one death. The cases of diphtheria are believed to have originated from a mild case brought from Portsmouth. It is difficult to account for the origin of the typhoid cases as the health conditions were generally favorable. In many places the location of the wells is such that the water supply must be polluted.

ELLSWORTH.

Members of the board: Dr. J. H. Patten, Secretary; Dr. W. M. Haines, Chairman; Dr. J. F. Manning.

Pipes were laid during the season for a water supply. Twenty nuisances were reported to the board, of which fifteen were removed or remedied. We had four cases of diphtheria, two of scarlet fever, and three of typhoid fever, but no deaths resulted from any of these diseases. The water-closet of one of the schools was found in a filthy condition and in accordance with our order a new one was built. We need a system of sewerage.

During the latter part of the summer and early part of the fall, after the streets had been opened in laying the water pipes, many cases of fever occurred more or less of a typhoid type, and cases of fever of the same character occurred through November and December. More cases of typhoid fever or cases presenting more or less typhoid symptoms occurred during the summer and fall of 1889 than for the previous ten years together. We attribute this to the digging up of the streets whereby old drains were laid open. We have now an excellent supply of pure water, and, with a few main sewers which will probably be built the coming season, we think we can still claim in the future, what we have certainly been in the past, one of the healthiest cities in the State. [On account of the resignation of the secretary in the fall, the foregoing report was made by the president.—A. G. Y.]

EMBDEN.

Members of the board: Cephas Walker, Secretary; R. F. Durrell, Chairman; J. W. Morin.

Three nuisances reported to the board were all removed. We have had no cases of the infectious diseases.

ENFIELD.

Members of the board: A. J. Darling, Secretary; P. S. Laing, Chairman; J. R. N. Gilman.

Four cases of nuisance were reported to the board and all of them were removed. We had six cases of diphtheria, with one death, and five cases of typhoid fever. The first case of diphtheria appeared to have been imported from Bangor, and the child died. The funeral services were held in the school-house, and as soon as the board of health were aware what they had to contend with, the school was stopped and the school-house was fumigated. The two houses in which the remaining cases occurred were placarded, the inmates isolated as much as possible, and other precautions taken, and we learned of no further spread of the pest.

The five last cases of diphtheria were undoubtedly all contracted directly from the first, for the two families mingled together constantly, and all the persons subsequently taken sick were present at the sickness and death of the child. All the cases after the first became sick nearly at the same time.

Etna.

Members of the board: S. J. Locke, Secretary; E. E. Sylvester; James Goodell.

One nuisance reported to the board was removed. We have had no cases of infectious diseases. There have been but six deaths in town during the year; one was a suicide, one died of liver disease, and four of old age, the average age of the last four being eighty-five years.

I believe there should be a law requiring every householder or next of kin to report to the secretary of the local board of health the name, age and cause of death of every person dying. Physicians should also be required to report all deaths of persons attended by them, and a report should be made to the State Board of Health every year. The additional expense would not be much and the benefits would be great.

Eustis.

Members of the board: O. A. Hutchins, Secretary; C. D. Stevens, Chairman; F. W. Porter.

The only nuisance reported to the board was abated. We have had no cases of the infectious diseases.

Exeter.

Members of the board: Dr. S. W. L. Chase, Secretary; E. A. Chandler, Chairman; W. L. Hart.

We have had one case of diphtheria ending in recovery, and seven cases of typhoid fever which caused three deaths.

Falmouth.

Members of the board: A. S. Noyes, Secretary; W. K. Swett; H. J. Merrill; Dr. I. E. Hobart, Health Officer.

We have had two cases of diphtheria, three of scarlet fever, and two of typhoid fever, but no deaths have resulted from these causes. All these cases of infectious diseases have occurred on high ground where there is good drainage. Tuberculosis appeared among the stock of one man, but the matter was taken in charge by the Cattle Commissioners.

Farmingdale.

Members of the board: Dr. F. M. Putnam, Secretary; A. C. Stilphen, Chairman; A. McCausland.

Two nuisances were reported to the board, and, in all, five were abated. We had one non-fatal case of diphtheria. Upon the whole the town has been remarkably free from contagious diseases.

Farmington.

Members of the board: Dr. F. O. Lyford, Secretary; S. R. Leland, Chairman; H. W. Lowell.

A local company for domestic water supply has enlarged its works. Some improvements in our sewerage were made. Three nuisances were reported and all were removed. We had one case of diphtheria and one of typhoid fever, both recovering. We need a better system of disposing of the drainage from sinks, and a more frequent removal of the contents of vaults.

Fayette.

Members of the board: H. T. Wing, Secretary; J. H. True, Chairman; A. A. Campbell.

We had three cases of scarlet fever and one of typhoid fever, but with no deaths from either disease. The three cases of scarlet fever were all in one family. Precautions were taken by the local board of health, and we are happy to say that there was no further spread of this much dreaded disease.

FOREST CITY.

Members of the board: Samuel Hatch, Secretary; J. E. Haley, Chairman; Fred Brannen.

We had one case of typhoid fever, ending in recovery.

FORT FAIRFIELD.

Members of the board: A. C. Cary, Secretary; J. S. Smith, Chairman; L. N. Richards; Dr. A. D. Sawyer, Health Officer.

(This board was re-organized with the present membership February 1, 1890.)

FRANKLIN.

Members of the board: G. H. Rutter, Secretary; O. C. Donnell, Chairman; Henry T. Whittaker.

We have had no cases of contagious diseases.

FREEDOM.

Members of the board: Dr. J. W. Mitchell, Secretary.

FREEMAN.

Members of the board: Abner W. Mayo, Secretary; Nelson Peterson, Chairman; John B. Carville.

One nuisance was removed and we had one case of typhoid fever.

FREEPORT.

Members of the board: E. E. Pinkham, Secretary; J. P. Merrill, Chairman; B. P. Soule.

FRIENDSHIP.

Members of the board: Dr. E. E. Baker, Secretary; Nelson Thompson, Chairman; Cyrus Delano.

FRYEBURG.

Members of the board: E. Ballard, Secretary; Dr. D. L. Lamson, Chairman; Irving Mabry.

One nuisance was removed. We have had no cases of the infectious diseases.

Gardiner.

Members of the board: E. E. Lewis, Secretary; V R. Beedle.

Twenty-eight nuisances were reported, and all but two were removed. We have had eighteen cases of diphtheria with two deaths, and six fatal cases of typhoid fever have come to the knowledge of the board. Cases of diphtheria are isolated and an officer is put in charge of the case until after the fumigation of the premises, which is done under the personal supervision of the secretary in all cases. As regards the schools, we did not know with certainty that any of the diphtheria cases originated in or around the school buildings, but, for fear it might be so, a part of the schools were closed for one week, and the buildings were thoroughly cleansed and fumigated under our immediate supervision. Our school-houses are not as well heated and ventilated as they should or might be.

A complete system of sewerage is becoming absolutely necessary and must be had; without it, the removal of a certain class of nuisances is impossible.

Garland.

Members of the board: Dr. F. A. C. Emerson, Secretary and Health Officer; E. L. Oak, Chairman; D. H. Robinson.

We have had two cases of nuisances both of which were removed.

Gilead.

Members of the board: A. M. Whitman, Secretary; P. Harriman, Chairman; E. Harriman.

Four cases of nuisance were reported and all were removed. For infectious diseases we have had only two non-fatal cases of typhoid fever. One very bad old house was ordered vacated by the board on account of its insanitary condition. There was a swampy frog pond back of it, and the water supply was very badly polluted. A woman who had been living in the house, and whose health was very poor, recovered after leaving it. That dwelling is now unoccupied.

Glenburn.

Members of the board: John F. Tolman, Secretary; Elisha Hill, Chairman; Hiram N. Parker.

We have had four cases of diphtheria with one death, and one non-fatal case each of scarlet fever and typhoid fever. This town has been very careless in regard to the care of the privies and vaults at the school-houses.

Glenwood Plantation.

Members of the board: Alonzo Springer, Secretary; John E. Pierce, Chairman; Aaron Austin.

No cases of the infectious diseases have been reported.

Gorham.

Members of the board: G. W. Heath, Secretary; Dr. A. W. Lincoln; C. G. Carver.

Seven cases of nuisances have been reported, all of which have been removed. We have had three non-fatal cases of typhoid fever. To improve the sanitary condition of the town, drainage should be attended to and the water supply from wells should be guarded from pollution by sink-drains, etc.

Gouldsboro'.

Members of the board: T. R. Hammond, Secretary; R. R. Joy, Chairman; Dr. C. C. Larrabee, Health Officer.

We have had no cases of the infectious diseases.

Gray.

Members of the board: Dr. J. F. Rowell, Secretary; Dr. E. T. Andrews, Chairman; Dr. E. A. McCollister.

Four nuisances reported to the board were all removed. We had one non-fatal case of diphtheria and one fatal case of typhoid fever.

Greenbush.

Members of the board: H. F. Harris, Secretary; W. W. Harris, Chairman; M. J. Harris.

We have had nine cases of typhoid fever, with two deaths from this cause. Polluted water was the cause. All the cases of typhoid fever have occurred in the village part of the town, where the soil is sandy and most of the privies are but a short distance away. Many of the wells are under the houses.

Greene.

Members of the board: John E. Sawyer, Secretary; Alden Sawyer, Chairman; Dr. A. Pierce.

We have had no cases of the infectious diseases, excepting one of scarlet fever.

Greenfield.

Members of the board: M. C. White, Secretary; James Doyle; J. Avery.

Greenwood.

Members of the board: W. B. Rand, Secretary; J. A. Fairbanks, Chairman; Wm. Richards.

We have had one fatal case of diphtheria, and two non-fatal cases of scarlet fever.

Guilford.

Members of the board: Z. L. Turner, Secretary; L. H. Whittier, Chairman; Henry Straw.

There have been no cases of infectious diseases.

Hallowell.

Members of the board: Dr. J. M. Eveleth, Secretary; E. W. Maddocks, Chairman; Ira M. True.

No changes or improvements were made in drainage or sewerage; our city government every year appropriates $500.00 or more for sewers, and during the year transfers it to something else. No formal complaints of nuisances have been made to the board, but informal ones have come in, which have been attended to.

There have been twenty cases of diphtheria with four deaths, and three cases of typhoid fever. The experience of the past three years has proved to the board the necessity of putting a watchman over every house where there is a case of diphtheria, and this we have done during the last three months of the year. A better water supply and a good system of sewers are needed.

Hampden.

Members of the board: Dr. W. H. Nason, Secretary and Health Officer; C. F. Cowan, Chairman; W. H. Mayo, Esq.

One nuisance reported to the board was removed. We had eight cases of diphtheria with four deaths, and two cases of typhoid fever, ending in recovery. One death occurred from drowning, in the case of a young man who was taken with cramps while in bathing. The local board of health instructed its health officer to see the agents of school districts and to have the privy vaults cleansed and kept so.

Hancock.

Members of the board: Alfred B. Crabtree, Secretary; Marcus Mullen, Chairman; Rufus H. Young.

No cases of the infectious diseases were reported.

Hanover.

Members of the board: J. B. Roberts, Secretary; A. T. Powers, Chairman; J. R. Howard.

The water supply has been somewhat improved by a new aqueduct in the village. We have had no cases of the contagious diseases, except chicken-pox which was quite prevalent in the village.

Harmony.

Members of the board: L. S. Reed, Secretary; F. R. Hurd, Chairman; S. Leighton, Dr. F. O. Turner, Health Officer.

We have had no cases of the infectious diseases. A little more care in regard to sanitary conditions around dwellings, I might suggest as a means of improving the healthy conditions of the town, for some are very negligent in this respect. [Noticing that the report of the local board of health of Harmony was not included in last year's annual report, the secretary writes that he certainly made and forwarded a report. We are glad to make this note. —A. G. Y.]

Harpswell.

Members of the board: J. S. Farr, Secretary; G. H. Dearbon, Chairman; John M Stinson.

Three nuisances were removed. There were two case of typhoid fever, one in a mild form and one ending fatally. Our schoolrooms are heated by stoves with the funnel running overhead. When the heat becomes unbearable windows are thrown open and the cold air rushes in, the scholars are attacked with colds and coughs, and, as the result in many cases, have to stay at home, thus losing schooling.

Harrington.

Members of the board: Dr. G. H. Walling, Secretary.

There have been no cases of small-pox, diphtheria, scarlet fever or typhoid fever that I know of in town.

HARRISON.

Members of the board: Alphonso Moulton, Secretary; S. L. Weston, Chairman; H. H. Cole.

There has been one case of scarlet fever. The case was isolated and thorough fumigation was done after complete recovery.

One tenement house is unhealthy on account of bad drainage and poor water supply. The trouble has been limited in part, but more remains to be done. Among diseases of animals, we had one case of tuberculosis and two cases of emphysema.

HARTLAND.

Members of the board: A. W. Miller, Secretary; Dr. E. A. Bean, Chairman; Dr. J. F. Brown.

We had two cases of diphtheria. These two cases of diphtheria occurred on a street running through a low, wet section which appears to affect the water supply, and the people residing there are more subject to ill health than in other places.

HERMON.

Members of the board: Dr. F. P. Whittaker, Secretary; F. A. Bishop, Chairman; Joshua Tuseley.

Five cases of scarlet fever, ending in recovery, and ten of typhoid fever, one of which died.

HERSEY.

Members of the board: E. E. Morse, Secretary; L. M. Davis, Chairman; Seth Allen; Dr. B. C. Woodbury, Health Officer.

We have had no cases of the specified infectious diseases.

HIRAM.

Members of the board: John Pierce, Secretary; A. R. P. Googins, Chairman; Samuel D. Wadsworth.

One nuisance was removed. We have had two cases of diphtheria, one of which was fatal, and one case of typhoid fever, ending in recovery.

HODGDON.

Members of the board: Moses Benn, Secretary; Dr. J. V. Tabor, Chairman; Wm. Atherton.

We have had one fatal case of diphtheria and one case of typhoid fever. Diarrhœal diseases prevailed to quite an extent. Our town is very healthy generally.

Holden.

Members of the board: P. L. Pond, Secretary; A. Tirrill, Chairman; George C. Wiswell.

One nuisance was removed. A dead horse was put into a brook which has been used for seventy-five years or more as a public watering place. We have had nine cases of diphtheria and three of typhoid fever, with one death from each cause.

Hollis.

Members of the board: T. J. Carle, Secretary; J. L. Smith, Chairman; Charles Randell.

We have had one case of diphtheria, and one of typhoid fever, fatal. Mumps prevailed to quite an extent in the schools. The infected ones were excluded and none of the schools closed on account of the disease.

Hope.

Members of the board: D. H. Mansfield, Secretary; Dr. Isaac Bartlett, Chairman; Levere Howard.

We have had no cases of the infectious diseases, excepting two or three slight cases of measles.

Houlton.

Members of the board: Dr. Chas. E. Williams, Secretary; L. B. Johnson, Chairman; Dr. Geo. Cary.

The sewerage system has been extended. About fifty nuisances have been investigated and removed. There have been twenty-six cases of diphtheria, with only one death, four of scarlet fever, one of which was fatal, and twelve of typhoid fever with two deaths.

Howland.

Members of the board: O. C. Sweat, Secretary; James O. Davis, Chairman; R. Q. Lancaster.

One nuisance was abated. There have been no cases of the infectious diseases known.

Hurricane Isle.

Members of the board: J. J. McCabe, M. H. McIntire.

We have had nine cases of diphtheria with three deaths. Three men and a team were employed in cleaning up places that required it. (As the board has no secretary at present, the report is made by Mr. McCabe.—A. G. Y.)

Industry.

Members of the board: Dr. Wm. C. Hatch, Secretary; Caleb W. Gilmore, Chairman; H. B. Luce.

We have had no cases of the infectious diseases excepting rötheln. The method of heating is outrageously bad in every school-house in town. More care should be taken in the disposal of offal of slaughtered animals in this town, and a revolution should be made in the arrangement of privy vaults, and greater care taken to secure the purity of water supplies.

Island Falls.

Members of the board: Geo. H. Donham, Secretary; Alpheus Sprague, Chairman; W. D. Warren.

One nuisance was abated. We have had three cases of diphtheria with one death from this cause. The cases of diphtheria were isolated and after the death occurred the burial was supervised by the board of health. No others were ever allowed about the premises or at the burial.

Isle au Haut.

Members of the board: I. B. Turner, Secretary; James Robinson, Chairman; J. T. Barter.

We have had no cases of the infectious diseases, with the exception of two cases of whooping-cough. We have good water, pure air and good drainage.

Islesboro.'

Members of the board: J. A. Sprague, Secretary; Nelson Gilkey, Chairman.

Two nuisances have been abated, and we have had one case of diphtheria which recovered.

JACKSON.

Members of the board: I. D. Gould, Secretary; J. H. Cook; J. B. Jacobs.

We have had no cases of the specified infectious diseases, but measles has prevailed.

JAY.

Members of the board: Warren Leland, Secretary; E. W. Gould, Chairman: S. B. Farnham.

Two nuisances have been removed. We have had two cases of scarlet fever, both recovering, and five cases of typhoid fever resulting in one death. Prompt measures have been taken to prevent the spread of such diseases.

JEFFERSON.

Members of the board: J. J. Bond, Secretary; H. W. Clary, Chairman; Dr. A. A. Jackson, Health Officer.

In the case of two nuisances, improvements were made upon request of the board. We have had one case of typhoid fever.

JONESBORO'.

Members of the board: E. M. Watts, Secretary; G. F. Whitney, Chairman; G. E. Noyes; Dr. H. H. Smith, Health Officer.

We have had six cases of scarlet fever, but no deaths resulting, and two cases of typhoid fever in a mild form. Scarlet fever entered one of the schools which was immediately stopped for two weeks.

JONESPORT.

Members of the board: J. W. Peasley, Secretary; Geo. E. Watts, Chairman; E. L. Kelley.

We have had twenty-two cases of diphtheria, causing six deaths. Infected houses have been placarded and intercourse has, as far as possible, been forbidden with everybody, except the attending physician.

KENNEBUNK.

Members of the board: W. L. Dane, Esq., Secretary; Dr. F. M. Ross, Chairman; John Cousens.

Three nuisances have been removed by the board. We have had one case of diphtheria. Pleuro-pneumonia occurred in a herd of cows in February. This has been a healthy year at Kennebunk.

Kennebunkport.

Members of the board: Wm. H. Cluff, Secretary; Enoch T. Ccleman.

Two nuisances were abated. We have had ten cases of diphtheria, causing two deaths, and five cases of scarlet fever, all of which recovered.

Kenduskeag.

Members of the board: Geo. W. Worster, Secretary; M. L. Fisher, Chairman; A. A. Cook.

Kingfield.

Members of the board: C. W. Clark, Secretary; W. S. Gilbert, Chairman; W. E. Cummings; Dr. A. G. Howard, Health Officer.

We have had no contagious diseases during the year.

Kittery.

Members of the board: Dr. L. O. Buzzell, Secretary; Dr. M. F. Wentworth, Chairman; Dr. A. W. Johnson.

We have had no cases of the infectious diseases.

Lagrange.

Members of the board: H. W. Blake, Secretary; W. B. Danforth, Chairman; Fred H. Savage.

Lagrange has been remarkably free from disease the past year. We had one case of diphtheria, ending in recovery.

Lamoine.

Members of the board: W. S. Hodgkins, Secretary; Eben H. King, Chairman; I. N. Salisbury.

One nuisance was abated. We have had one case of typhoid fever, which recovered.

Lebanon.

Members of the board: Dr. J. S. Parker, Secretary; S. D. Lord, Chairman; J. C. Lord.

Lee.

Members of the board: J. M. Daniels, Secretary; A. K. Lewis, Chairman; I. O. Getchell.

It has been very healthy in this town, with deaths only of several aged people.

LEEDS.

Members of the board: Henry M. Brewster, Esq., Secretary; Albert Barker, Esq., Chairman; Dr. R. S. Loring.

One nuisance was abated. We have had two cases of scarlet fever and one of typhoid fever, but with no deaths from either disease.

Within the year for which this report is made five cases of diphtheria have occurred resulting in three deaths. (At this writing, January 23, 1890, seven cases with five deaths, all in one family). A woman living in Lawrence, Mass., in the family where one child died with diphtheria, moved to her son's in this town, who had a wife and five children. She brought with her, trunks, carpets, chairs, and a lounge, and in ten or twelve days the youngest child was taken with malignant diphtheria, and a few days later the mother was attacked. In less than a week the other children were down with the disease. The first child was taken December 24th, and died on the 30th; the mother died December 31st; a boy eight years old, January 3rd; a boy five years old, January 8th, and a girl ten years old January 15th. The eldest child, a girl of thirteen recovered. As soon as our board heard of the disease, and before we were notified by the physician, we placed the house in quarantine, and allowed no person to leave the premises and no person to go to the house without permission. After the only child that was left, recovered, we caused the bedding and lounges to be burned and had the house well fumigated with sulphur and the disease has not spread.

LEVANT.

Members of the board: C. W. Fernald, Secretary; C. M. Page, Chairman; Dr. A. M. Purington, Health Officer.

One nuisance has been abated. No infectious diseases observed.

LEWISTON.

Members of the board: C. V. Emerson, Esq., Secretary; Dr. O. A. Horr, Chairman; Dr. J. A. Donovan.

Thirty-one formal complaints of nuisances were made to the board, and a much larger number that were not reported, were abated or remedied. We had thirty-eight cases of diphtheria with eight deaths, seventy-five of scarlet fever with only three deaths known, and twelve of typhoid fever with three deaths.

We think all deaths should be reported to the local board of health, and that permits for burial or transportation of the dead should issue from the same board. In our city the clerk attends to this, and I presume the clerk in the towns generally through the State do the same. It is believed that the board of health is, or should be, better qualified to know of the risk attendant upon the transportation of those dead of infectious diseases than the clerks of the different towns through the State are. Many reasons exist why the board of health should know when a death in their town occurs. This is especially true in time of epidemic, and when neighboring towns may be affected with contagious diseases.

Liberty.

Members of the board: Dr. E. A. Porter, Secretary; J. O. Johnson, Chairman; W. H. Moody.

One nuisance was removed. We have had no cases of the infectious diseases. The condition of the school-house privies should be looked after more closely.

Limestone.

Members of the board: Dr. A. D. Hatfield, Secretary; E. G. Weymouth, Chairman; Mark Trafton.

We have had fifteen cases of typhoid fever with one death.

Limington.

Members of the board: W. S. Small, Secretary; Dr. J. F. Moulton, Chairman.

Lincoln.

Members of the board: Dr. C. Fuller, Secretary; C. A. Sargent, Chairman; L. E. White.

A reservoir costing $350.00 was built in Main street to supply water for fire purposes. Five nuisances have come to the notice of the board, of which four have been removed. Six cases of diphtheria and seven of typhoid fever have come to the notice of the secretary, with one death from croup in one of the diphtheria cases.

In one case, sickness was apparently caused by the water from a well situated between two barns, and in another instance where drinking water was taken from an old well near the school-house, many were taken sick. Good drainage should be put in on Main street.

Mr. Spencer lost thirty or forty sheep from a disease caused by a worm or grub in the nose and head.

Lincolnville.

Members of the board: Dr. E. F. Brown, Secretary and Health Officer, R. B. Sherman, Chairman; Henry A. Pierce.

Improvements have been made in the vaults and sinks in nearly all the houses in town. One nuisance was abated.

We have had two cases of diphtheria with one death, three cases of scarlet fever, and five of typhoid fever, two of which ended fatally.

Linneus.

Members of the board: Dr. Robert Boyd, Secretary; R. B. Young, Chairman; George W. Getchell.

One nuisance was removed. We had six cases of typhoid fever of which all recovered; whooping-cough was also quite prevalent.

Lisbon.

Members of the board: John W. Jordan, Secretary; A. J. Shaw, Chairman; Henry Hackett; Dr. A. W. Potter, Health Officer.

Twelve nuisances have been reported to the board, all of which have been removed. We need a good sewerage system very much, and also a water supply.

Twelve cases of scarlet fever and three of typhoid fever have occurred. All the patients recovered. Our physicians are all very good about reporting cases of infectious sickness, but I think it very probable that some cases of scarlet fever in the foreign population working in the mills have not come to the notice of the board, on account of the wrong habit which they have of concealing cases.

I think that the people generally agree with me that a board of health is a pretty good institution if it performs its duty.

Litchfield.

Members of the board: Gardiner Roberts, Jr., Secretary; Dr. Enoch Adams, Chairman and Health Officer; Thomas Holmes.

We have had no cases of the infectious diseases. Two cases of tuberculosis have occurred in one herd of cows. Action was taken by the Cattle Commission.

Littleton.

Members of the board: La-Roy F. Hall, Secretary; G. C. Hayward, Chairman; H. A. Hall.

Two nuisances were abated. We have had two cases of scarlet fever and one of typhoid fever.

In connection with contagious diseases we do just what is recommended by the State Board of Health.

Livermore.

Members of the board: W. F. Fuller, Secretary; Dr. G. F. Adams, Chairman and Health Officer; R. B. Bradbury.

We have had one fatal case of diphtheria. Prompt action was taken and the further spread of the disease was prevented.

Lovell.

Members of the board: Dr. C. P. Hubbard, Secretary; J. K. P. Vance, Chairman; W. W. Durgin.

We have had one case of diphtheria which ended in recovery.

Lowell.

Members of the board: J. F. Dam, Jr., Secretary; S. M. Cable, Chairman; J. Varney.

One nuisance was removed. No cases of infectious diseases given.

Lubec.

Members of the board: J. B. Neagle, Acting Secretary; Ira W. Hamilton, Chairman; S. Myers; Dr. E. H. Bennett, Health Officer.

One nuisance has been removed. We have had eleven cases of diphtheria with two deaths, three of scarlet fever with one death, and two cases of typhoid fever ending in recovery.

In the cases of diphtheria in our town we were able to trace them very well. The first case was in a young man who had been visiting at Little Machias and was taken sick the next day after his return, and two young men who spent the evening with him were also taken the following week. The next case was that of a young lady who came visiting in the same neighborhood with mild sore throat, and slept with another young lady who took diphtheria and died; and it was reported that another young lady, with whom she slept last before coming to our town, died of the same disease. The other cases of diphtheria were in families where they had had diphtheria years before, where the chambers in the houses were unfinished and are used as catch-alls.

The scarlet fever outbreak originated from a servant girl who had the disease two years before at home, and who went home and got an old dress to make over. While at work on the dress the children at the house where she worked were taken sick with scarlet fever, and their mother also took it. The dress had not been used for two years.

Lyman.

Members of the board: Geo. H. Day, Secretary; Dr. E. E. Hurd, Chairman; A. F. Roberts.

A new aqueduct has been laid in place of the old one to supply the village at Goodwin's Mills with water. We have had ten cases of diphtheria with one death, and one non-fatal case of typhoid fever. There is one locality in town where diphtheria usually makes its appearance, if this disease is prevailing in epidemic form. We have endeavored to scatter sanitary intelligence through the town and it has generally been well received.

Machiasport.

Members of the board: Dr. F. L. Shaw, Secretary; E. A. Moore, Chairman; Chas. M. Gates.

We have had about twenty-five cases of diphtheria, three of them ending fatally, strict isolation was carried out as far as possible.

Madawaska.

Members of the board: Eloie Albert, Secretary; Arthur Daigle, Chairman; Michel Albert.

No cases of typhoid fever have come to the knowledge of the board.

Madison.

Members of the board: Chas. W. Dyer, Secretary; Dr. C. D. Morrill, Chairman and Health Officer; John Chadbourn.

One death occurred from scarlet fever and one from typhoid fever. Three nuisances were removed.

I cannot fill this report out as I should like to for our book was burned the last of August, and most of the sickness occurred before that time.

Madrid.

Members of the board: Reuben Sargent, Secretary; Chester Whitney, Chairman; G. E. Moores.

We have not known of any cases of infectious diseases during the year.

Manchester.

Members of the board: G. M. Knowles, Secretary; W. R. Merrill, Chairman; F. J. Hewins.

Not a case of infectious disease has been known in the town.

Mapleton.

Members of the board: J. C. Chandler, Secretary; J. A. Stewart, Chairman; James McAlpin.

One nuisance was removed. We have had one case of diphtheria and two of scarlet fever.

Mariaville.

Members of the board: M. Kingman, Secretary; George W. Black, Chairman; B. G. Young.

We have had two cases of typhoid fever.

Marion.

Members of the board: B. L. Smith, Secretary; Joseph Thompson, Chairman; F. N. Gardner.

We have had no cases of the infectious diseases.

Marshfield.

Members of the board: I. W. Foss, Secretary; L. B. Thaxter, Chairman; Thomas Berry.

We have had one slight case of scarlet fever.

Masardis.

Members of the board: F. H. Knowlen, Secretary; S. W. Clark, Chairman; F. W. E. Goss.

Mason.

Members of the board: A. H. Witham, Secretary; E. Hutchinson, Chairman; H. G. Mason.

We have had no cases of the infectious diseases. (The above report was made by the chairman of the selectmen, who says that the secretary and chairman of the board have moved away and a new board will be appointed in the spring.—A. G. Y.)

MATTAWAMKEAG.

Members of the board: Alex. Thompson, Secretary; Alex. McLain, Chairman.

MAXFIELD.

Members of the board: Geo. Emery, W. S. Lancaster.

MEDDYBEMPS.

Members of the board: J. S. Bridges, Secretary; Charles L. Hatter, Chairman; S. J. Allen.

We have had no contagious diseases in town this year.

MEDFORD.

Members of the board: S. O. Dinsmore, Secretary; W. S. Lovejoy, Chairman; D. A. Hathorne.

We have had no contagious diseases.

MEDWAY.

Members of the board: C. A. DeGrass, Secretary; N. A. Powers, Chairman; G. L. W. DeGrass.

Three nuisances have been removed. There have been no contagious diseases.

MERCER.

Members of the board: Dr. V. R. Perkins, Secretary; John Bunker, Chairman; Eli Wells.

There have been six cases of typhoid fever with three deaths. Measles and whooping-cough have also been prevalent.

MEXICO.

Members of the board: H. W. Park.

There have been no cases of diphtheria, scarlet fever or typhoid fever. Three deaths (adults) occurred last spring all in one family. It was supposed to have been from typhoid-pneumonia. We have been having for some weeks past a disease affecting the eyes, the scholars in our schools being thus affected. The eyes become red, much inflamed, and in severe cases, of which there have been many, it would require much bathing to get the eyes open after a night's sleep.

MILLBRIDGE.

Members of the board: Dr. George Googins, Secretary; Dr. George H. Sawyer, Chairman; L. G Means.

We have had two cases of typhoid fever, with one death. We need an improvement in our drainage and a better water supply in certain localities.

MILFORD.

Members of the board: M. W. Sawyer, Secretary; M. A. Austin, Chairman; F. P. Olliver.

Three nuisances have been removed. Seven cases of typhoid fever with one death have occurred.

MONROE.

Members of the board: Dr. J. J. Sewall, Secretary and Health Officer; F. Atwood, Chairman; E. H. Nealley.

Two nuisances were abated. We have had one case of scarlet fever and four of typhoid fever. There was one death among the typhoid patients, whooping-cough has also been prevalent.

MONTICELLO.

Members of the board: G. W. Lowell, Secretary; M. J. Hogan, Chairman; Enoch Robertson.

There have been three cases of scarlet fever with one death, and one case of typhoid fever.

MONTVILLE.

Members of the board: Dr. A. D. Ramsey, Secretary; B. T. Foster, Chairman; J. W. Collins.

Four nuisances have been abated. Two cases of typhoid fever have occurred, one of which was fatal. Both cases of typhoid were caused by drinking stagnant water, or, at least, I could find no other cause.

MORRILL.

Members of the board: Dr. J. W. Pearson, Secretary; B. A. Hatch; D. O. Bowen.

Milo.

Members of the board: A. W. Murray, Secretary; M. L. Durgin, Jr., Chairman; Dr. H. Hamlin.

There have been one case of diphtheria and two of typhoid fever.

Minot.

Members of the board: Dr. C. M. Cobb, Secretary; Charles F. True, Chairman; C. H. Tobie.

Four nuisances have been removed. We have had two cases of diphtheria and nine of typhoid fever. We need a water supply and sewerage.

Monmouth.

Members of the board: J. H. Norris, Secretary; Dr. D. E. Marston, Chairman.

We have had ten cases of scarlet fever and two of typhoid fever, but no deaths have resulted from either disease. Prompt measures have been taken to prevent the spreading of infectious diseases.

Monson.

Members of the board: Dr. C. W. Ray, Secretary; F. J. Wilkins, Chairman; S. P. Bray.

Several nuisances were reported and all were removed. We have had two non-fatal cases of typhoid fever. We made a general examination of premises and suggested changes for improvements; the suggestions were followed.

Moscow.

Members of the board: A. Burke, Secretary; C. M. Hill, Chairman; Thomas Emerton.

One nuisance was promptly removed. No contagious diseases have been reported. The water supply in some instances is bad and changes should be made. In one case the water comes underground from a stagnant frog pond, runs under the barn and hog-house, and then supplies a well on the lower side of the house. The sink-spout from the kitchen is also very near the well. The woman living there is sick nearly all the time.

Mt. Chase.

Members of the board: E. A. Cooper, Secretary; John Sargent, Chairman; L. S. Tozier.

One case of diphtheria occurred.

Mt. Desert.

Members of the board: S. M. Nash, Secretary; B. T. Atherton, Chairman; W. S. Smallidge.

One nuisance was abated. We have had four cases of diphtheria, two of which were fatal. The board has surveyed the sanitary condition of all the public buildings and hotels and suggested some changes, but on the whole found them in very good condition.

Mt. Vernon.

Members of the board: Dr. Silas Burbank, Secretary; Rufus F. Fletcher, Chairman; James A. Robinson.

We had one case of diphtheria and three of typhoid fever, but no deaths from either disease. If I were to suggest anything in the way of improvements in the sanitary condition of the town it would be more care as regards ventilation and water supply.

Naples.

Members of the board: P. O. Cannell, Secretary; G. W. Hall, Chairman; Dr. C. Y. Lord.

One nuisance was removed and we have had two cases of typhoid fever ending in recovery.

Newburgh.

Members of the board: C. H. Whitcomb, Secretary; B. D. Newcomb, Chairman; Dr. F. O. J. S. Hill, Health Officer.

We have had five cases of typhoid fever, ending in recovery. Prompt action has been taken to prevent the spreading of infection.

Newcastle.

Members of the board: D. S. Glidden, Secretary; Dr. R. C. Chapman, Chairman; S. D. Wyman.

We had one case of diphtheria.

Newfield.

Members of the board: I. M. Trafton, Secretary; T. E. Mitchell, Chairman; C. L. Wentworth.

We are a favored people and have had no cases of the infectious diseases.

New Gloucester.

Members of the board: Dr. John I. Sturgis, Secretary; M. C. Clark, Chairman; Wm. H. True.

One case of diphtheria occurred, ending in recovery.

Newport.

Members of the board: Frank M. Shaw, Secretary; R. H. Libby, Chairman; Dr. A. I. Harvey, Health Officer.

We have had one slight case of diphtheria, and six cases of typhoid fever with one death from this cause at the date of making this report. Three of the cases were imported from Bangor, and in one of these cases, a young lady communicated the disease to her father.

New Portland.

Members of the board: Dr. W. H. Stevens, Secretary; Dr. S. A. Bennett, Chairman; Abel Thompson.

One nuisance was abated. We have had two non-fatal cases of typhoid fever. A more intelligent care of privies and sink-slops would improve the sanitary condition of our town. The board looks after the conditions of water supply and privies, and advises with parties that should be interested.

Newry.

Members of the board: W. B. Wight, Secretary; C. H. L. Powers, Chairman; H. M. Kendall.

No cases of infectious diseases have been present.

New Sharon.

Members of the board: D. R. Hargraves, Secretary; James Jewell, Chairman; D. J. Jordan.

Two nuisances have been reported, one of which has been removed, and the other did not prove to be a nuisance in fact. We have had three cases of typhoid fever with two deaths.

New Sweden.

Members of the board: John Jacobson, Secretary; O. P. Fogelin, Chairman; Olop Anderson.

One nuisance was removed. There were no cases of the infectious diseases.

New Vineyard.

Members of the board: George H. Pratt, Secretary; A. D. Turner, Chairman; M. V. B. Hardy.

Three nuisances were reported to the board and all were removed. There have been no cases of the infectious diseases.

Nobleboro'.

Members of the board: J. M. Winslow, Secretary; Wm. H. Moody, Chairman; Albert Cunningham.

We have had one case of diphtheria and one of typhoid fever, the latter of which proved fatal. Greater cleanliness as regards the management of the privy and more care of the sink drainage would improve the sanitary condition of many of the houses.

Norridgewock.

Members of the board: Dr. P. S. Lindsey, Secretary; A. O. Frederic, Chairman; Henry Murphy.

We have had two nuisances to deal with, one of which we have removed. The other was occasioned by too many sink-spouts and water-closets in close proximity to each other, and no drainage for them. It was not removed, because no mode of removal could be decided upon.

We have enjoyed unusually good health the past year, and no cases of the infectious diseases have been reported.

Northfield.

Members of the board: F. H. Smith, Secretary; Jas. McReavy, Chairman; C. Gardner.

North Haven.

Members of the board: B. C. Calderwood, Secretary; O. B. Kent, Chairman; J. C. Webster.

It has been a very healthy year and no cases of the infectious diseases have been reported. One nuisance was reported, but was not abated.

NORTHPORT.

Members of the board: M. C. Hill, Secretary; F. A. Rhoades, Chairman; John R. Hurd.

We have had three cases of diphtheria with one death. The diphtheria was caused by bad plumbing in a house in Belfast where a Northport girl worked.

NORTH YARMOUTH.

Members of the board: S. H. Sweetsir, Secretary; N. H. Jewett, Chairman; Dr. Wm. Osgood, third member and Health Officer.

One nuisance was abated. We have not had a case of any of the infectious diseases in town. I have not heard of the occurrence of any diseases among animals until lately, when rumor says that one hog died from hog cholera.

NORWAY.

Members of the board: E. F. Smith, Esq., Secretary; Dr. B. F. Bradbury, Chairman; E. H. Brown.

Two nuisances were reported, one of which was removed. The one not removed was that of a meadow or low lands above the falls, the character of which is well known to you.

We have had two cases of diphtheria and one of typhoid fever, but no deaths occurred from these causes. One case of glanders occurred in a horse. We need very much a complete system of sewerage.

OAKLAND.

Members of the board: H. W. Wells, Secretary; G. W. Hubbard, Chairman; Dr. M. S. Holmes, Health Officer.

One nuisance was abated. We have had one fatal case of diphtheria, and three cases of scarlet fever, all of which recovered. Two deaths occurred by drowning while in bathing. We have need of better drainage.

OLD ORCHARD.

Members of the board: W. G. Smith, Secretary; Gilbert Wyley, Chairman; F. G. Staples.

We have had very little sickness of any character and no cases of infectious diseases. Several nuisances were reported, all of which were removed. Our system of sewerage has been extended.

OLDTOWN.

Members of the board: Artemas Rigby, Secretary; C. P. Barker, Chairman; John Buffum.

The survey for the Holly Water Works has been made and many of the large pipes are now laid. Twelve nuisances were reported to the board, and twenty-four in all were removed. I cannot give the number of cases of infectious diseases that have occurred, because they are not reported by the physicians, with one exception. In my opinion Oldtown village and Great Works village cannot be put in a good sanitary condition without a system of sewerage.

ORIENT.

Members of the board: Wm. McAllister, Secretary; James Estabrook.

We have had one case of nuisance which has been removed, there has been one fatal case of typhoid fever.

ORLAND.

Members of the board: R. P. Harriman, Secretary; Dr. F. P. Perry, Chairman and Health Officer; Henry Partridge.

We have had one case of typhoid fever.

ORNEVILLE.

Members of the board: Llewellyn Sanborn, Secretary; M. R. Morgan, Chairman; Charles Hoxie.

We have had no cases of the infectious diseases.

ORONO.

Members of the board: C. P. Crowell, Secretary; Dr. J. H. Knox, Chairman and Health Officer; U. R. Penny.

We have had eight complaints of nuisances, and in all cases abatement was secured. There have been four cases of diphtheria with two deaths, and seven cases of typhoid fever with two deaths.

ORRINGTON.

Members of the board: Dr. G. B. Tibbetts, Secretary; A. M. Lufkin, Chairman; C. M. Rogers.

We have had two cases of scarlet fever with no deaths, and six cases of typhoid fever causing three deaths. One school was closed on account of whooping-cough.

Four of the typhoid fever patients had been drinking water from the Penobscot river, obtained near and below Bangor where this disease has been unusually prevalent. I think the.e is a close connection between the water and the disease in these cases.

Otis.

Members of the board: J. R. Grant, Secretary. We have had no cases of the infectious diseases.

Otisfield.

Members of the board: F. J. Sawyer, Secretary; D. L. Brett, Chairman; Sumner Spurr.

We have had six cases of typhoid fever, causing one death. Three of the cases of typhoid fever appeared to be caused by polluted well water.

Oxford.

Members of the board: S. P. Stuart, Secretary; Dr. Orin Stevens, Chairman; Geo. A. Poor.

Twelve nuisances were reported, eleven of which were removed. We have had one case of scarlet fever and two of typhoid fever, but with no deaths from either disease.

Palmyra.

Members of the board: C. M. Jewett, Secretary; Geo. W. Hanson, Chairman; N. B. Douglass.

One nuisance was abated. We have had one case of scarlet fever, and eight of typhoid fever, with two deaths from the latter disease. One case of glanders occurred in a horse.

The case of scarlet fever occurred in a girl of seven attending school. The school was closed, the house placarded and circulars were distributed, and although there were three other children in the same house no one else had it.

Parkman.

Members of the board: Dr. J. C. Butterfield, Secretary and Health Officer; H. O. Ayer, Chairman; Ireson Briggs.

We have had six cases of diphtheria none of which were fatal.

Patten.

Members of the board: Dr. F. F. Bigelow, Secretary; Leroy Miles, Chairman; Dr. B. C. Woodbury.

We have had three cases of diphtheria, and two of typhoid fever, with one death from the latter disease. Measles and whooping-cough have also prevailed.

Pembroke.

Members of the board: Wm. E. Leighton, Secretary; Dr. J. C. Rogers, Chairman; C. W. Hersey.

We have had eleven cases of diphtheria causing five deaths. All of the cases of diphtheria excepting one were clearly traceable to contagion, and came to us from outside of the town. One case we are unable to account for.

We are satisfied that we have had several cases of diphtheria in the past year which were never reported to the board, and that some cases which were reported, and from which death occurred, came from these sources, but as no physician was employed, there seemed no way to reach them until the mischief had been done. The good citizens who have given us their hearty co-operation are very, very largely in the majority. To them we tender our thanks.

Penobscot.

Members of the board: Dr. E. A. Sprague, Secretary and Health Officer; John Littlefield, Chairman; J. B. Snowman.

One nuisance has been reported and abated, we have had five non-fatal cases of typhoid fever. One death has occurred from drowning.

Perkins.

Members of the board: G. W. Call, Secretary; E. A. Hinckly, Chairman; T. G. White.

Three families have had water carried into their houses through iron pipes. We have had no cases of infectious diseases.

Perry.

Members of the board: G. P. Ricker, Secretary; J. B. Nutt, Chairman; Mark Leighton.

We have six cases of typhoid fever with one death.

Peru.

Members of the board: A. B. Walker, Secretary; Otis Wyman, Chairman; A. E. Eastman.

We have had no cases of the infectious diseases.

Phillips.

Members of the board: M. H. Davenport, Secretary; Dr. C. L. Toothaker, Chairman; E. M. Robinson.

Four nuisances have been removed. Typhoid fever, probably a mild type, occurred, and mumps and measles have been prevalent.

Phippsburg.

Members of the board: Geo. Duley, Secretary; F. S. Bowker, Chairman; Dr. M H. Ferguson.

We have had two non-fatal cases of typhoid fever.

Pittsfield.

Members of the board: Dr. T. M. Griffin, Secretary; H. C. Pooler, Chairman; D. M. Parks.

Some extension of the sewers has been made. Six nuisances were reported, five of which were removed. We have five cases of diphtheria with one death, and six of typhoid fever with two deaths.

Pittston.

Members of the board: J. E. Jewett, Secretary; E. A. Lapham, Chairman; Dr. C. C. Libby.

We have had two cases of diphtheria ending in recovery.

Plymouth.

Members of the board: Dr. J. L. Curtis, Secretary; J. F. Longley, Chairman; S. P. Gifford.

We have had no cases of contagious disease.

Poland.

Members of the board: Dr. Walter Corliss, Secretary; S. L. Littlefield, Chairman; B. M. Fernald.

Four nuisances were removed. We have had five cases of typhoid fever. Measles was prevalent.

PORTER.

Members of the board: Warren Libby, Secretary; D. Ridlon, Chairman; Amos Blazo.

Two nuisances have been removed. One fatal case of typhoid fever occurred. One case of accidental shooting occurred, and one of drowning.

PORTLAND.

Members of the board: Geo. C. Burgess, Secretary; Dr. Chas. D. Smith, Chairman; Dr. A. K. P. Meserve; John H. Sayward, Inspector.

The water supply is from Lake Sebago. The new reservoir of 20,000,000 gallons capacity is finished, and now in use to supply the low levels of the city. Sewers have been built in thirteen different localities, in length, 3,713.7 feet. These were very much needed, and have greatly improved the neighborhood where built. The method of removing excreta in air-tight casks has been continued. The material is composted outside of the city limits.

The number of formal complaints of nuisances made to the board has been 457. All have been removed or remedied as far as could be done.

We have had sixty-one cases of diphtheria with five deaths, twenty-five cases of scarlet fever with two deaths, and fifty-six cases of typhoid fever with ten deaths. When a notification is received of cases of the infectious diseases, the inspector visits the house with circulars and directions adapted to the case. If diphtheria or scarlet fever are reported, the premises are placarded, removable only on the order of the attending physician. The premises are examined and cleaned up if such action is necessary. Many of the cases of typhoid fever seem directly traceable to impure drinking water.

The report of the State Board of Health two years ago called the condition of the privy vaults at the North School "abominable." They have not been improved; in fact, are worse, and if any stronger word can be found I should use it in connection with the premises.

For the purpose of improving our sanitary condition, I would make the following suggestion: Continue to build sewers. Enact a plumbing law so that cheap work which leads to poisoning the air of houses may be prevented. Compel landlords to provide decent sanitary conditions in premises from which they derive an income. Sickness or death has resulted from the following accidents or causes: Falls, 2; drowning, 10; railroad, 2; unknown, 1.

By continuing our house-to-house inspection we are stirring up our people to a better appreciation of proper sanitation. It is much easier to have matters attended to now than it was two years ago, and our fall inspection of yards and alley-ways showed that they were in a very creditable condition, "Eternal vigilance is the price of—cleanliness."

Pownal.

Members of the board: Dr. S. A. Vosmus, Secretary; I. S. Brown, Chairman; Moses Plummer.

We have had no cases of infectious diseases.

Prentiss.

Members of the board: J. F. Belden, Secretary; E. E. Butters.

Presque Isle.

Members of the board: Dr. Frank Kilburn, Secretary; Dr. G. H. Freeman, Chairman; C. P. Allen, Esq.

One nuisance was removed. We have had one case of diphtheria; eleven cases of scarlet fever (reported) with one death; and thirty nine cases of typhoid fever with two deaths. Nearly all the cases of typhoid fever occurred in the northern section of the village within a radius of two hundred yards. The drainage was there defective, and none of the patients had used the water from the reservoir.

Five cases of typhoid fever occurred in one family, a mile from the village where the well is situated in the barn-yard. In fact, nearly all the cases could be traced to filthy well or spring water.

For the purpose of improving the sanitary condition of the town, I should advise the extension of the sewerage system, the use of dry earth closets, and supplying furnaces with cold air boxes, instead of taking the air from the cellars, as is the almost universal custom in this section.

Princeton.

Members of the board: Dr. S. G. Spooner, Secretary; Dr. C. Flower, Chairman; James Spencer.

One nuisance was removed. We have had three cases of diphtheria imported and ten cases of typhoid fever. No deaths, however, resulted from either disease. One drowning accident occurred.

PROSPECT.

Members of the board: J. H. Littlefield, Secretary; Robert Killman, Chairman; G. A. Avery.

We have had three cases of typhoid fever, ending in recovery. I think the Sanitary Inspector should be increased in size and an effort made to increase its circulation.

RANDOLPH.

Members of the board: B. A. Cox, Secretary; Albert White, Chairman; Benjamin Clark.

Six nuisances were removed. We have twelve cases of diphtheria with one death, and three of typhoid fever, all of which recovered.

In the only case of diphtheria which proved fatal, the parents of the child pretended to know more than the doctor and would not believe it was diphtheria or follow his advice. In one case of diphtheria, where the parents did family washing, the boy was removed to a front room, the case kept a secret, and for several days the washing and laundrying and returning of the clothes to their owners, continued. Happily, as the boy grew worse, the parents became alarmed and sent for the physician who at once notified our board.

We have freely circulated the circulars on diphtheria and other contagious diseases you have sent us, and hope that our people will soon be educated to the importance, not only of preventing contagious diseases, but of assisting the boards of health by keeping their premises in a better sanitary condition.

RANGELEY.

Members of the board: S. A. Ross, Secretary; J. F. Herrick, Chairman; Daniel Howe.

RAYMOND.

Members of the board: Dr. L. H. Jordan, Secretary; L. Welch, Chairman, Alfred Wilson.

One nuisance was abated. We have had three cases of typhoid fever. One case of tuberculosis occurred in a cow.

Readfield.

Members of the board: Dr. E. S. Hannaford, Secretary; Dr. W. A. Wright, Chairman; Prof. W. C. Strong.

One nuisance was removed. We have had one case of diphtheria, thirty-three cases of scarlet fever, and two of typhoid fever. Scarlet fever made its appearance at Kent's Hill last spring, and there has been an occasional case in different parts of the town to the present time. The case of diphtheria was inquired into thoroughly and no source or cause was found except that he was in the habit of drinking from a "spring," as he called it, located in a swamp, or low piece of ground which, at times, is about covered with water.

Ripley.

Members of the board: A. G. Farrar, Secretary; A. R. Dunlap, Chairman; W. H. Lambard.

Four nuisances were removed. We have had two cases of typhoid fever. Both recovered.

Robbinston.

Members of the board: F. R. Leach, Secretary; Alonzo Smith, Chairman; E. N. Campbell.

We have had no cases of infectious disease.

Rome.

Members of the board: L. G. Martin, Secretary; J. E. Farnham, Chairman; Geo. S. Tibbetts.

We have had eight cases of diphtheria with two deaths.

In regard to the outbreak of diphtheria it is the old story repeated. A young man having been at work from home in another town came home with a mild form of sore throat, was not confined to the house, and nothing was thought of the matter. A few days later, a little girl in the family was taken sick, a physician was called and pronounced it a case of diphtheria, but failed to report it to the board of health. Soon other members of the family were taken sick, two of which died. The board of health became alarmed and a physician was called, who pronounced it diphtheria in a malignant form. The board then took the outbreak in hand, and it spread only to an adjoining neighbor's house who had been calling there before the nature of the disease was known.

Roxbury.

Members of the board: A. W. Robbins, Secretary; S. M. Locke, Chairman; John Reed.

We have had one case of diphtheria.

Rumford.

Members of the board: Dr. H. F. Abbott, Secretary; H. M. Colby, Chairman; Wilson Thomas.

Saco.

Members of the board: Dr. L. D. Dennett, Secretary and Health Officer; Dr. F. E. Maxcy, Chairman; Dr. W. T. Goodall.

Two new sewers have been built, one on Spring street and one known as the Woodbury brook sewer. Twenty-six nuisances have been reported, all of which have been removed.

We have had one case of diphtheria, eighteen of scarlet fever, and eight of typhoid fever, but no deaths have been reported from these causes. The cases of scarlet fever were very mild indeed.

Salem.

Members of the board: Geo. W. Harris, Secretary; A. H. Perry; N. P. Harris.

We have had no cases of infectious diseases.

There should be a board of inspectors of any and all kinds of spices, molasses, lard, sugar, tea, etc., and they should have power to prosecute for sales of adulterated articles, or for keeping them for sale within the State of Maine. Highway robbery means your money or your life; adulterated food means your money *and* your life. There is a law for one; there should be for both.

Sanford.

Members of the board: Geo. E. Allen, Secretary; A. B. Sanborn, Chairman; ————————; Dr. E. C. Frost, Health Officer.

Two nuisances have been removed. The local board of health ordered all cesspools and vaults cleaned out twice each year; in November, and between April 15th and May 15th.

We have had sixteen cases of diphtheria with four deaths, and eight of typhoid fever with one death. Diphtheria prevailed in the spring at Springvale; the rest of the season was very healthful.

SANGERVILLE.

Members of the board: H. L. Leland, Secretary; A. T. Wade, Chairman; E. P. Files.

No cases of the infectious diseases are reported.

SCARBORO'.

Members of the board: Dr. J. B. Thornton, Secretary; B. F. Carter, Chairman; M. I. Milliken.

Four nuisances have been removed. We have had three cases of diphtheria, twelve of scarlet fever, and two of typhoid fever, with one death from each disease.

SEARSMONT.

Members of the board: J. W. Farrar, Secretary; P. S. Wing, Chairman; Dr. A. Millett.

We have had no cases of the infectious diseases, excepting whooping-cough.

SEARSPORT.

Members of the board: Dr. E. Hopkins, Secretary; W. O. Barney, Chairman; W. B. Sawyer.

The town has put in a good artesian well which furnishes an inexhaustible supply of good water. Three nuisances have been removed. We have had one mild case of typhoid fever. A good, thorough system of drainage is much needed.

SEBAGO.

Members of the board: B. F. Cole, Secretary; P. P. Larrabee, Chairman.

We have had one non-fatal case of typhoid fever.

SEDGWICK.

Members of the board: M. L. Ellwell, Secretary; Dr. R. E. Hagerthy, Chairman and Health Officer; J. W. Penney.

We have had six cases of typhoid fever, all in the same locality.

SHAPLEIGH.

Members of the board: Dr. F. A. Bragdon, Secretary and Health Officer; John Pugsley, Chairman; Dr. L. W. Leighton.

We have had two cases of diphtheria, one of scarlet fever, and four of typhoid fever. One of the typhoid fever patients died.

SHERMAN.

Members of the board: L. C. Caldwell, Secretary; Dr. D. H. Owen, Chairman; G. W. Durgan.

We have had but one case of diphtheria and this was in a mild form. Immediate action was taken, the patient was isolated, food was cooked away from the premises and carried in free of cost to the family, and at the close of the sickness the clothing and premises were thoroughly cleaned and disinfected, and no other cases have followed.

The board visited nearly every family in town in the early summer and examined the premises. A marked improvement has followed our suggestions regarding drainage, greater care as to the water supply, and the removal of excreta and care of privies. Both in regard to private and public establishments, the people are more thoroughly interested in the matter, and heartily endorse any movement of the board in relation to better sanitary conditions.

SHIRLEY.

Members of the board: H. Blackstone, Secretary; A. T. Mitchell, Chairman; J. Dennen.

We have had no cases of the infectious diseases. Our board has had but very little to do but intends to do its duty whenever occasion requires.

SKOWHEGAN.

Members of the board: Geo. Cushing, Secretary; Dr. S. A. Patten, Chairman and Health Officer; S. A. Bickford.

We have been completing and perfecting the city water supply, and the sewerage system has been extended. Several nuisances have been reported and all of them have been removed that could be. There is much need of the completion of the sewerage system.

We have had four cases of diphtheria with one death, and twenty-two cases of typhoid fever, with four deaths. The excess in the typhoid fever prevalence appears to have been caused largely by the defective drainage.

SMITHFIELD.

Members of the board: W. J. Haines, Secretary; I. W. Varney, Chairman; C. N. Simmons.

We have had no cases of the infectious diseases.

SMYRNA.

Members of the board: A. J. Berry, Secretary; A. P. Daggett, Chairman; H. C. Douley.

SOLON.

Members of the board: Dr. S. F. Greene, Secretary and Health Officer; Stephen Merrill, Chairman; J. Whipple.

We have had no cases of the infectious diseases.

SOMERVILLE.

Members of the board: Morrill Glidden, Secretary; A. L. Soule, Chairman; J. E. Bartlett.

We had one fatal case of diphtheria. Placards were posted on the house, premises disinfected, and after the burial we had the house thoroughly cleansed.

SOUTHPORT.

Members of the board: W. T. Maddocks, Secretary; Albert McKeown, Chairman; Stephen Pierce.

We had sixteen cases of diphtheria with one death, but most of the cases were in very mild form. We have had a few cases of very mild scarlet rash. The cases of mild diphtheria were at first considered nothing but sore throat.

SOUTH THOMASTON.

Members of the board: F. J. Dow, Secretary; Isaac Tolman, Chairman; John Alexander.

We have had six cases of diphtheria with one death, and one case of typhoid fever.

ST. ALBANS.

Members of the board: Dr. C. A. Moulton, Secretary; N. H. Vining, Chairman; N. B. Turner.

We had two non-fatal cases of typhoid fever.

STANDISH.

Members of the board: D. L. Warren, Secretary; M. S. Spear, Chairman; C. D. W. Shaw.

One nuisance was abated. We have had one case of scarlet fever, and four cases of typhoid fever. Two of the typhoid cases ended fatally. The four cases of typhoid fever were all in one family and one house, and we think the disease might have been caused by a cesspool under the sink-spout which was in an unsanitary condition. It was removed.

Starks.

Members of the board: Thomas Buswell, Secretary; J. F. Frederic, Chairman: L. F. Butler.

We have had one fatal case of diphtheria. As soon as the case of diphtheria was reported, the board went to the house and had the patient placed in a room away from the family, and gave strict orders to have no one go into the room except the necessary attendants. We posted a card on the door and forbade all intercourse with neighbors, except in cases of necessity. Although the family consists of seven persons no other one took the disease.

Stetson.

Members of the board: Dr. E. W. Perry, Secretary; Geo. M. Bond, Chairman; C. W. Wentworth.

We have had two non-fatal cases of typhoid fever.

Steuben.

Members of the board: J. C. Googins, Esq., Secretary; G. W. Moore, Chairman; M. S. Smith.

We have had three cases of typhoid fever, but no deaths from this cause. The attending physician thought one of the cases of typhoid fever had been caused by polluted water, and we caused the throwing of waste stuff where it would drain into the water supply, to be discontinued.

St. George.

Members of the board: Dr. A. Woodside, Secretary; H. F. Kalloch, Chairman; W. H. Matthews.

Two nuisances were removed. We had nine cases of typhoid fever, all recovering. Seven other cases were landed at this port from vessels. In my opinion, the cause was from the use of impure water.

Nearly every year cases of typhoid are brought home from sea. These are usually among the worst cases that physicians are called to treat, for the patients are usually much exhausted by the travelling, and the food and other conditions on board the vessels are not suitable for sick persons. It seems to me that the cause of this disease, in these cases is, usually, from polluted water. The captains of vessels are not particular enough about obtaining pure water, and if the water casks are once filled with impure water the pollution (or infection) is apt to remain, for the casks are usually, or frequently, refilled without any cleansing. If you could call the attention of these parties to this important subject, through the press or otherwise, you would do an important service, and perhaps save many lives.

STOCKTON.

Members of the board: Dr. G. A. Stevens, Secretary and Health Officer; J W. Thompson, Chairman; J. F. Hichborn.

One nuisance was removed. We have had three non-fatal cases of typhoid fever.

STONEHAM.

Members of the board: W. L. Goodwin, Secretary; Hilton McAllister, Chairman; N. H. Palmer.

We had no cases of the infectious diseases.

STOW.

Members of the board: C. W. Day, Secretary; O. P. Charles, Chairman; O. R. Barrows.

One nuisance was removed. We had two cases of typhoid fever both recovering.

STRONG.

Members of the board: J. W. Porter, Secretary; G. Z. Higgins, Chairmen; M. A. Will.

We have had one case of diphtheria, ending in recovery.

SULLIVAN.

Members of the board: Dr. F. W. Bridgham, Secretary and Health Officer; M. H. Hawkins, Chairman; M. E. Rideout.

Four nuisances have been removed. The drainage, as a general thing, is good, and the people generally are particular as to the disposal of excreta. Some wells in which the water was polluted have been filled, and some have been ordered to be cleaned out and cemented.

We have had nine cases of typhoid fever, all ending in recovery. The unusual prevalence of typhoid fever was attributed to the lowness of the water in the well.

In the quarry districts slops and excreta generally are thrown out of the windows directly upon the ground. In some instances the board has compelled the erection of privies and their proper management. Six, out of nine patients with typhoid fever, used water from this spring, into which had probably drained some of the soluble excreta from the quarries just above.

Two cases of arsenical poisoning occurred, one from the dust raised by ravelling green rags for rugs; one from holding bits of similar rags in the mouth.

SUMNER.

Members of the board: Sharon Robinson, Secretary; L. H. Bisbee, Chairman; Dr. C. H. Bisbee, Health Officer.

One nuisance was removed. We have had two cases of typhoid fever, both recovering. The removal of some hog-pens and privies too near residences and wells would improve the sanitary condition of some places.

SURRY.

Members of the board: Dr. W. E. Emery, Secretary and Health Officer; D. G. Means, Chairman; Augustus Milliken.

Two nuisances have been removed. We have had one case of diphtheria and twelve of typhoid fever, with one death from the latter disease.

SWANVILLE.

Members of the board: H. E. Greeley, Secretary; C. M. Marden, Chairman; Z. L. Downs.

No cases of the infectious diseases have been reported.

SWEDEN.

Members of the board: E. F. Bangs, Secretary; O. R. Maxwell, Chairman; Elden Brown.

We have had two mild cases of typhoid fever.

TALMADGE.

Members of the board: F. R. Neale, Secretary; H. F. Dinsmore, Chairman; George Williams.

There have been no cases of the infectious diseases.

Temple.

Members of the board: S. R. Norton, Secretary; L. H. Farmer, Chairman; G. W. Staples.

One nuisance was removed. We have had no cases of infectious disease, excepting one of typhoid fever.

Thomaston.

Members of the board: Dr. H. C. Levensaler, Secretary and Health Officer; J. H. H. Hewitt, Chairman; Dr. J. E. Walker.

A few cases of nuisance reported to the board were promptly abated. We had one case of diphtheria and fifteen of typhoid fever. One of the typhoid cases ended fatally. The cases of typhoid fever were apparently caused by the defective drainage, and we need a system of sewerage.

Topsfield.

Members of the board: C. T. Day, Secretary; W. H. Malkson, Chairman; L. Tupper.

Topsham.

Members of the board: J. C. Purington, Secretary; Dr. I. S. Curtis, Chairman and Health Officer; David Work.

Three nuisances have been reported of which two have been removed. We had one case of diphtheria and two fatal cases of typhoid fever.

Tremont.

Members of the board: Dr. W. A. Spear, Secretary; J. T. Clark, Chairman; J. H. Gilley.

Four nuisances have been reported to the board, of which three have been removed. We have had eight cases of typhoid fever with two deaths. There was an unusual prevalence of typhoid fever from contagion, that was not recognized at first, until it was well developed and pretty generally spread.

Trenton.

Members of the board: K. K. Thompson, Secretary; W. G. Bunker, Chairman; D. B. Alley.

We had two cases of typhoid fever, one of which was fatal.

Trescott.

Members of the board: John Saunders, Secretary; W. H. Leighton, Chairman; S. A. Wilcox.

We have had three cases of diphtheria, one of which was fatal. In the case of diphtheria, the family having the disease, and others living in the vicinity, were at once supplied with the necessary directions issued by your board, the house was placarded and was afterwards thoroughly fumigated. Whooping-cough has been prevalent.

Troy.

Members of the board: Dr. M. T. Dodge, Secretary; O. B. Rhoades, Chairman; John Woods.

Turner.

Members of the board: Seth D. Andrews, Secretary; H. C. Haskell, Chairman; J. H. Conant.

Five nuisances were reported and all were removed. We have had one case of diphtheria, and nine cases of typhoid fever, of which one was fatal. In the diphtheria case the secretary immediately visited the family, placarded the house, stopped the other children from going to school, visited the teacher and distributed circulars to the neighbors. Two of the cases of typhoid fever were caused by impure water, so the physician reported.

There are seventeen school-houses in town. The members of the board have visited them all. Many of them were in a bad condition, and arrangements were made for improvements.

Two cattle were slaughtered by the State Veterinarian on account of tuberculosis.

Union.

Members of the board: Dr. A. P. Heald, Secretary; E. Daniels, Chairman; A. J. Young.

Two nuisances were reported. We had five cases of typhoid fever, of which two were fatal. During the months of April and May, we had an epidemic of measles. No disease of animals prevailed except pinkeye which appears to effect horses and persons somewhat alike, though I fail to see that it necessarily affects horses and people at the same time.

In the adjoining town of Appleton, I treated a man sick with typhoid fever in the month of August. The house was quite small in comparison with the number of inmates. He recovered, but his wife succumbed to the malady four or five weeks later, and this is the only instance where I have seen two persons in one family suffer from this same disease, and I account for this, as also for the result in this particular case, by her having almost exclusively cared for her husband night and day, as nurses were not to be had, and the neighbors were busy.

Unity.

Members of the board: Dr. James Craig, Secretary; John Perley, Chairman; Benjamin F. Kelley.

We have had no cases of the infectious diseases.

For the past fourteen years this town has not had an epidemic, except scarlet fever in a mild form thirteen years ago. Have had one case of diphtheria in the village during that time. One case of typhoid fever developed in Massachusetts and came here, but no new cases from that.

The school-houses in this town are in a horrible condition.

Upton.

Members of the board: Enoch Abbott, Secretary; W. F. Hemingway, Chairman; F. B. Brooks.

We have had two cases of scarlet fever.

Vanceboro'.

Members of the board: C. A. Sterling, Secretary; W. R. Finson, Chairman; George H. Peva; Dr. M. L. Young, Health Officer.

Fourteen nuisances were removed. We have had no cases of the infectious diseases, except one non-fatal case of scarlet fever.

Improved drainage is needed in the village, one death occurred from drowning. One herd of hogs was nearly destroyed by hog cholera.

Vassalboro'.

Members of the board: Dr. G. L. Randall, Secretary; Dr. F. A. Libby, Chairman; C. A. Stilson.

We have had four cases of diphtheria with one death. Two cases of scarlet fever ending in recovery.

VEAZIE.

Members of the board: L. H. Parke, Secretary; O. D. Winchester, Chairman; J. B. Skinner.

Four nuisances were cheerfully removed by their owners. The town is always ready to help the health officers in the discharge of of their duties. We had four cases of typhoid fever.

VERONA.

Members of the board: A. H. Whitmore; Secretary; Joseph Allen, Cha rman; Peter Abbott.

We have had six cases of diphtheria, none of which were fatal.

Our first case of diphtheria occurred in a child who became sick on board a coasting vessel, and who was landed at the house of her grandmother. The board of health took charge of the case, the patient recovered, and no more cases occurred. In a few days another grandchild, sick with the same disease, died in Hampden, and the old lady went to the funeral and kissed the corpse. She came home and was taken down with diphtheria and had a hard time, but recovered. She is sixty-five years of age. We consider our town fortunate that, in the three different times within the year that we have been exposed, the spread of the disease has been prevented. I believe it due in a great measure, to the prompt action of the board of health.

VIENNA.

Members of the board: L. C. Davis, Secretary; LaForest Dowst, Chairman; Horatio Porter.

We have had one case of typhoid fever that recovered. Cases of the infectious diseases were attended to immediately.

VINALHAVEN.

Members of the board: Dr. F. A. Smith, Secretary; William H. Littlefield, Chairman; J. A. Babbage.

Thirteen nuisances were reported of which twelve were removed. We had four cases of diphtheria with one death, one case of scarlet fever, and six of typhoid fever in a very mild form. Better sewerage is needed, the soil is shallow and it is impossible to sink a sewer below the frost.

WAITE.

Members of the board: C. B. Tupper, Secretary; J. B. Phelps, Chairman; J. C. Neals.

WALDO.

Members of the board: George C. Harding, Secretary; A. J. Simmons, Chairman; J. D. Webster.

We had one non-fatal case of scarlet fever.

WALDOBORO.'

Members of the board: Dr. F. M. Eveleth, Secretary; C. E. Hovey, Chairman; Everett Farrington.

We had one non-fatal case of scarlet fever, and one fatal case of typhoid fever.

WALES.

Members of the board: Benj. Hodsdon, Secretary; A. M. Donnell, Chairman; T. T. Jenkins.

We have had no cases of the infectious diseases. Pneumonia prevailed more than usual, and in the east part of the town, during the summer there was throat disease of mild form that prevailed to some extent.

WALTHAM.

Members of the board: Alden K. Haslam, Secretary; J. H. Haslam, Chairman; Wm. Fox.

No cases of infectious diseases are reported by the board.

WARREN.

Members of the board: Dr. J. M. Wakefield, Secretary and Health Officer; W. O. Counce, Chairman; B. B. Libby.

We had three cases of diphtheria with one death, and four cases of typhoid fever, one of which proved fatal. As to the wants of the town from a sanitary point of view, it is the old story, pure water and better drainage.

WASHBURN.

Members of the board: Dr. P. J. Conroy, Secretary and Health Officer; C. L. Stoddard, Chairman; E. M. Hinds.

Five nuisances have been removed. We have had fifteen cases of typhoid fever none of which were fatal. Better drinking-water is needed in some parts of the town.

WASHINGTON.

Members of the board: T. S. Bowden, Secretary; J. F. Davis, Chairman; E. A. Sivlinger.

Two nuisances were removed. We had six cases of typhoid fever with two deaths. Better ventilation of public halls, school-houses, and private residences is needed. The local board of health has caused the several school-house privies, many of which were nuisances, to be thoroughly cleansed.

WATERBORO'.

Members of the board: L. E. Langley, Secretary; J. T. G. Emery; Geo. P. Chase.

WATERFORD.

Members of the board: Dr. C. L. Wilson, Secretary; Melville Monroe, Chairman; C. M. Cooledge.

We have had no cases of the infectious diseases.

WATERVILLE.

Members of the board: H. D. Bates, Secretary; Dr. M. H. Holmes, Chairman; Geo. A. Alden.

WAYNE.

Members of the board: Dr. F. L. Chenery, Secretary; Dr. C. H. Barker, Jr., Chairman; W. Jennings.

WEBSTER.

Members of the board: J. G. Jordan, Secretary; A. J. Larrabee, Chairman; T. C. Billings.

Two nuisances were removed. We do not know that there have been any cases of the infectious diseases in town.

WELD.

Members of the board: Dr. C. E. Proctor, Secretary and Health Officer; A. E. Houghton, Chairman; L. L. Jones.

One nuisance was removed. We have had two cases of typhoid fever, one fatal. Pneumonia and cerebro-spinal meningitis have been unusually prevalent. Pneumonia prevailed especially along the cold, flat localities.

WELLINGTON.

Members of the board: Reuben Whitehouse, Secretary; A. C. Curtis, Chairman; Joseph Libbey.

We have had no cases of the infectious diseases.

WESLEY.

Members of the board: H. F. Day, Secretary; J. Driscoll, Chairman; J. W. Day.

We had one case of diphtheria and perhaps more, not fully developed. Rheumatic troubles were so prevalent that they almost seemed to be contagious and epidemic. Whooping-cough was also prevalent.

WESTBROOK.

Members of the board: H. K. Griggs, Secretary; Dr. A. H. Burroughs, Chairman; H. T. Clark.

Our water supply is from Sebago lake. Eighteen nuisances have been reported, twelve of which have been removed. Our town villages have been built up so rapidly that the building of public sewers has not kept pace with the wants of the people. We have had five cases of diphtheria, nine of scarlet fever, and twenty-nine of typhoid fever.

All through this section there was a disease among cows resembling cow-pox which terminated in the closing of the teats, and the consequent loss of the animal. I lost one myself.

WEST GARDINER.

Members of the board: S. M. Pinkham, Secretary; D. E. Merrill, Chairman; W. P. Haskell.

We have not known of any cases of infectious diseases.

WESTON.

Members of the board: G. W. Brannen, Secretary; George Moody; Frank Gilpatrick.

We had two cases of typhoid fever, one of which proved fatal.

Westport.

Members of the board: S. P. Webber, Secretary; Jas. Thomas, Chairman; W. M. Pierce.

We had one fatal case of typhoid fever.

Whitefield.

Members of the board: Dr. W. Johnson, Secretary and Health Officer; C. J. Skehan, Chairman; E. C. Jewett.

We had thirteen cases of diphtheria with three deaths. The cause of the cases of diphtheria was contagion.

Whiting.

Members of the board: W. J. Crane, Secretary; A. N. Crane, Chairman; Judson Hall.

We have had one case of diphtheria, but no deaths from this disease.

Whitneyville.

Members of the board: Jas. Pope, Secretary; D. W. Rollins, Jr., Chairman; W. M. Flynn.

We have had four cases of scarlet fever and one of typhoid fever, but no deaths from these diseases.

Williamsburg.

Members of the board: R. J. Williams, Secretary; J. R. Faulkes, Chairman; J. R. Hughes.

We had two cases of diphtheria, but no deaths resulted.

Willimantic.

Members of the board: Frank Hart, Secretary; W. A. Mills, Chairman; Irving Floyd.

One nuisance has been removed. We have had no cases of the infectious diseases.

Wilton.

Members of the board: Dr. A. B. Adams, Secretary; Joel T. Wilkins, Chairman; Frank F. Noyes.

Four nuisances have been reported, three of which have been removed. We have had three cases of typhoid fever. For the improvement of the town, from a sanitary point of view, the water-closets and privies should be moved from over the stream and canal.

WINDHAM.

Members of the board: Dr. I. D. Harper, Secretary; Dr. C. W. Bailey, Chairman; Dr. A. N. Witham.

Four nuisances have been removed. We have had four cases of diphtheria and four of typhoid fever, with one death from the latter disease. Two cases of measles occurred and one school was closed for one week.

WINSLOW.

Members of the board: G. S. Paine, Secretary; J. W. Bassett, Chairman; B. F. Towne.

We have had two cases of diphtheria with one death, and one case of scarlet fever. We have sought to confine the cases of infectious diseases to the house where they originate.

WINTHROP.

Members of the board: Dr. C. A. Cochrane, Secretary and Health Officer; C. A. Wing, Chairman; G. A. Smith.

Several minor nuisances have been reported all of which have been removed. We had two cases of diphtheria and six of scarlet fever, but with no deaths from either cause. Our policy has been action at once, isolation, guards stationed to maintain the quarantine if necessary. Better drainage is needed in some parts of the village.

WISCASSET.

Members of the board: Dr. C. A. Peaslee, Secretary and Health Officer; Llewellyn Nute, Chairman; W. F. Merrill.

We had one case of scarlet fever and two of typhoid fever, with one death from the latter disease. The sanitary condition of the town could be improved by the removal of accumulative privies and filthy sink drainage.

WOODLAND.

Members of the board: D. A. Snowman, Secretary; A. W. Stover, Chairman; Andrew Johnson.

We have had no cases of the infectious diseases, excepting an epidemic of measles resulting in one death from consecutive pneumonia.

WOODSTOCK.

Members of the board: Dr. C. B. Rankin, Secretary; A. P. Bowker, Chairman; I. W. Andrews.

One nuisance was removed. We have had three cases of diphtheria, four of scarlet fever and three of typhoid fever, but with no deaths resulting. The cases of scarlet fever in a mild form, occurred in a family of eight children. Four of them had it, and the other four have escaped thus far. The disease also appeared in a family in Milton Plantation about a mile from the above-mentioned family. It was said there had been no communication between the two families, but there is some doubt about that. We think that the poison was communicated from the first family before the nature of the disease was known.

WOOLWICH.

Members of the board: H. O. Thayer, Secretary; Howard Corliss, Chairman; Dr. S. P. Buck.

YARMOUTH.

Members of the board: R. Harding, Secretary; Dr. W. W. Thomas, Chairman; C. T. Grant.

Four nuisances have been removed. We had one case of typhoid fever, ending in recovery. A water supply is needed in the village.

YORK.

Members of the board: Dr. W. L. Hawkes, Secretary; G. W. S. Putnam, Chairman; F. H. Ellis.

Healthy Homes for the Working Classes.*

BY VICTOR C. VAUGHAN, M. D., PH. D.

LOCATION.

The location of the home of the working-man is often determined by considerations over which he has no control. Cost of land and distance from place of labor must influence the selection. If possible, however, the house should not be located in a low, damp place, nor on made earth. In cities, many low tracts, and even the beds of small streams, marshes and lakes, are filled in with general refuse, such as street sweepings, back-yard rubbish, ashes and garbage. Such soil, unless thoroughly under-drained, must be unfit for the location of habitations. It is damp, and will for years be filled with the products of decomposition arising from the putrefaction of the garbage deposited there. Houses built in such locations must be damp, musty and unhealthful. The inmates of a house built in such a place are likely to suffer from malaria, bilious fever, and rheumatism, even if they do not fall victims to the more dreaded diseases, typhoid fever and consumption. The house should also be far from marshes and other low lands, whose surface is covered with water in the spring and early summer, and then exposed later. Such situations are likely to be malarious. Neither should the home be located near manufacturing establishments which usually have much garbage about them, such as breweries, tanneries, glucose factories, rendering houses, and oil refineries.

The site should be one which is naturally well drained; and whether this be the case or not often cannot be decided in cities without consulting maps which show the original lay of the land before any grading had been resorted to, though the position and

* This is the first part of "Healthy Homes and Foods for the Working Classes", one of the Lomb Prize Essays, published by the American Public Health Association.

course of neighboring streams and the location of springs may suggest valuable information. The slope of the land should be from the house. Extra precaution must be taken when it becomes necessary to build at the foot of a hill which is covered with houses from which the surface water and under-ground drainage flow toward the home. The location of neighbors' out-houses, with reference to the proposed home, should also be taken into consideration. While an intelligent man will not neglect the sanitary condition of his own premises, his neighbor's cesspool or privy vault may drain into his well and poison his drinking-water. Have the house upon a place high enough, and as dry as possible. Avoid, whenever practicable, narrow streets, which are devoid of sufficient sunlight and pure air. The width of the street should be twice the height of the houses along it, and no street, even in the business centres of cities, should be narrower than the height of the houses. In many of the older cities, however, the streets are narrower than this.

The best soils upon which to build are gravel, marl and limestone; for in these the drainage is likely to be better than in others.

A due amount of shade around the home renders it more healthy, but the shade should not be dense enough or close enough to the house to obstruct the air and light.

THE CELLAR.

Every dwelling-house, even that which has but one room in it, should either have a cellar, or should be raised sufficiently high from the ground to allow a free supply of air under it. The walls of the cellar should be perfectly water and air tight. It is better, in making the excavation, to remove the earth a foot, on all sides, further than the line on which the outside of the wall will stand; then, after the walls have been built, pack the space with clay or gravel. In this way the walls of the cellar are more likely to be kept dry. If built of brick the walls should be hollow, consisting of a thin outer wall two or three inches from the main wall. The two are firmly held together by occasionally placing a brick across from one to the other as the walls are being built. Unless this is done, moisture will pass through a brick wall, it matters not how thick it may be.

The cellar floor should be of concrete, about six inches thick, and covered with Portland cement or asphalt. If the soil be very damp, tiling should be placed under the cellar floor, and carried out beneath the wall to a larger tile which passes around the house and leads off into some suitable receptacle.

It is absolutely essential to a healthy house, that its cellar should be free from dampness and ground air. In order to secure these requisites, the walls and floor of the cellar must be well built, even if it becomes necessary, on account of increased cost, to deprive the superstructure of some of its ornamentation

The cellar should be well supplied with light by having windows above ground, or by sunken areas in front of the windows. The window-sashes should be hung on hinges, so that they may be easily opened when the cellar needs an airing.

If the cellar is to be used for several purposes, as the location of the heating apparatus and the storage of fuel and vegetables, it should be divided into compartments, the temperature of which may be kept at different degrees.

Basement bed-rooms are almost universally unhealthy, and should be used only in cases of absolute necessity. It is also best not to have the kitchen in the basement, especially if the room directly above be occupied. If stationary wash-tubs be placed in the basement, they should have a metallic or porcelain lining, and the pipes which conduct the refuse water from them should be thoroughly trapped.

THE WALLS.

If built of brick the walls of the house should be hollow, as described in referring to the walls of the cellar. Furthermore, the plastering should never be placed directly on the brick. The inside of the wall should be "furred," scantling nailed to the furring, and the lathing done as in a frame house. It has been found that a single brick will absorb as much as one pound of water; and if a brick wall be built solid and the plastering placed directly on the brick, the house will be constantly damp. Many of the older brick houses are constructed in this manner, and consequently their interiors always have a damp, musty oder, it matters not how untiring the housekeeper may be in her efforts to have everything sweet and clean.

Even in case of a stone wall, the plastering should not be placed directly on the wall; though stone does not absorb water to any such extent as brick does.

New brick and stone walls are necessarily damp, and for this reason houses built of either should not be occupied until some weeks after the building of the walls. In order for them to dry thoroughly they must be pervious to air; and walls built as recommended above will allow the air to pass through them freely. Plastering does not prevent the air from passing through the walls, but papering does. However, as papering is the most economical way in which walls can be decorated, it will long continue in use. Wall papers containing arsenical colors have been, and are still to some extent, used. Rooms decorated with such papers are not suitable for living apartments. It is generally supposed that only the green colors contain arsenic, but, in truth, it may be present in paper of any color. The only way, then, by which they may be avoided is by having the selected samples tested. Any intelligent drüggist or chemist will make the analysis for a small fee, which should be at the expense of the paper-dealer.

A nice way of finishing inside walls is to paint and then varnish them. The varnish prevents the rubbing off of the paint, and places the walls in such a condition that they may be washed whenever desirable.

THE FLOORS.

Floors should be made tight, so that they may be thoroughly scrubbed with soap and water occasionally. The best floor, from a sanitary view, is one of hard wood, planed smooth and oiled. It is far better to have a clean, bare floor, than one covered with a filthy carpet. However, where carpets are kept clean, and are occasionally taken up and the floor scrubbed, there is no objection to their use; and it must be admitted that a clean carpet adds much to the comfort of a room. A cheap straw matting is now made, which can be washed when necessary, and it will not retain dust and filth to the extent that woolen carpets do. Such a covering is especially suitable for dining-rooms.

ARRANGEMENT OF ROOMS.

The living-rooms should be on the sunny, airy side of the house. Human beings as well as plants demand sunlight. Too frequently the good housewife shuts out the sunlight for fear that it will fade the carpet. As some one has said, "It is far better to have faded carpets than to have faded cheeks." A little saving in the color of the carpet is poor economy when it is secured at the cost of health. Especially should the room occupied by the women and children, who are indoors much of the time, be well supplied with light. If there is to be a long, dark hall or passage-way in the house, let it be on the side upon which the least sunlight falls, and place the living rooms on the other side.

It is, unfortunately, the fashion to make bed-rooms small in order to have a large sitting-room. Too often the bed-room is a mere recess scantily supplied with fresh air. It is better to have a smaller sitting-room and a larger bed-room. Even farmers often suffer from diseases which are due to an insufficient supply of pure air. This arises from the fact that for six or seven hours out of every twenty-four they are shut up in small, tight, musty bed-rooms, and are compelled to rebreathe the air which they have already once breathed.

As has been said in discussing the cellar, basement bed-rooms are always poorly supplied with fresh air, and are generally damp and musty. They should be used only in cases of absolute necessity. Attic bed-rooms are cold in winter and hot in summer, and their use also can be excused only on the question of dire necessity.

If the owner of the house can afford it, at least one bed-room should contain a grate or fire-place,—for, with every attention to the laws of health, there will come times when some member of the family will be sick; and the sick room should be full of cheer. The open fire is cheerful, and serves as an excellent ventilator. Pleasant surroundings often aid the doctor's pills and potions in restoring the patient to health.

Of course the number and exact arrangement of the rooms will depend upon the purse of the owner; but a cottage may be built so as to be as healthy as a palace,—and indeed the advantage is often in favor of the former, as the more complicated finishings and elaborate furnishing of the latter may serve as harbors for dust and filth.

Space may often be saved by doing away with the conventional long, dark hall, and by having the stairs go up from a sitting-room, or from a smaller vestibule. The long halls are often cold, dark and dreary. In winter they are filled with cold draughts, and in summer they are receptacles of refuse of various kinds, and at all times they are cheerless. They may be necessary in certain houses, but in small homes they are neither ornamental nor pleasant.

It is the ambition of most American housewives to have a parlor, in which the most valuable household ornaments are placed, and which opens only when some honored guest comes. The small boys of the family look upon it as forbidden territory, and too frequently both fresh air and sunlight are regarded as intruders, and are shut out. The exclusion of the small boy may be all right, but the air and sunlight should not be treated with so much discourtesy. Indeed, they should be consided the most honored guest, and should be welcomed even to a place in the parlor.

Probably the most important room in the house is the kitchen. Before you praise the housekeeping of any woman, visit her kitchen. The parlor may be a beauty, the bed linen may be spotless, the table may be covered with decorated china, but if the kitchen be filthy, all is in vain. But in order that the kitchen may be kept in good condition, its construction must be proper. The floor is best of hard wood or yellow pine; or, if these are too expensive, of selected white pine. They should be kept bare.

At least two windows, one on each side, are desirable. A pantry or shelves for setting aside clean cooking utensils and dishes should be at hand. If the cellar be used for the storage of vegetables, an inside stairway from the kitchen or pantry should lead down into it. The flour-box in the pantry should be so hung that it will close itself. It adds much to the comfort of the cook, and to the cleanliness of the walls and ceiling of the room, if the stove or range be covered by a hood which conducts the vapors arising from the cooking food into a flue in the chimney.

If the owner can possibly afford it, the house should contain a bath-room. In the absence of public water supply, a force-pump below, a cold-water tank in the attic, and a hot-water tank attached to the kitchen range will furnish the bath-tub. The room should be heated either directly or from another room, otherwise it would not be used much in cold weather. The cost of the bath-room and its supply need not be great, while the pleasure and benefit derived from its use will be appreciated.

THE WINDOWS.

The importance of an abundant supply of sunlight has already been insisted upon. If possible, every room should have direct light, and not be dependent upon that which is diffused through an adjoining room. The location of the windows should be such as to give the greatest amount of direct sunlight. The windows should extend well towards the ceiling, and should be hung so as to lower from the top as well as raise from the bottom.

The window shutters or blinds must be hung in such a manner that they are easily opened. In no part of the house should they be kept closed during the day.

HEATING AND VENTILATION.

It would be wholly out of place to attempt here any elaborate discussion of the many methods of heating and ventilating buildings now in use. Only a few practical statements will be made with reference to securing adequate warmth and sufficient fresh air in dwellings.

The most common methods of heating small residences are by the stove, open fire, and hot-air furnaces. The stove is the most economical. The open fire is the most enjoyable, and where it is sufficient, the most healthy; but in the northern states the open fire alone seldom furnishes enough heat during the coldest months. The hot-air furnace may be so constructed as to be a good method, but care must be used in selecting the furnace and arranging for ventilation.

In small houses the heat is generally supplied by stoves. In rooms which are occupied only during a few hours of the day the wood stove is sufficient, and, indeed, has certain advantages. The room can be quickly heated, and when left, the fire soon dies out, thus saving fuel. But where the room is constantly occupied, coal is a more suitable fuel than wood. The temperature is more even, and the fire burns more slowly. The relative cost of these fuels varies in different sections.

The coal stove should have no loose joints through which gases can escape. The mica doors should be kept in repair, and the flue must not be allowed to clog. The principal gases given off from burning coal are carbonic acid gas, carbonic oxide, and sulphurous oxides. The carbonic oxide is poisonous when inhaled in any quantity. It produces a sensation in the head similar to that which would be caused by a tight band; and in larger amounts it renders persons insensible, and may produce death. It should be remembered that the carbonic oxide is without odor. Whole families have been fatally poisoned with it. Especial care must be taken with coal stoves which are used in bed-rooms or in rooms which communicate with bed-rooms, as the carbonic oxide may prove fatal to persons while sleeping, without waking them. But there is no danger if the stove and flue be in proper condition. Makers of wrought iron stoves and furnaces will insist that these gases pass readily through cast iron, and for this reason their stoves are superior, and free from danger; but a properly constructed and properly managed cast iron stove or furnace is free from danger, and in many respects is superior to those made of wrought iron. Especial attention should be paid to the position of dampers in coal stoves at night.

One of the greatest objections to the use of stoves is, that in houses in which they are used there is generally no attempt at ventilation. However, a house heated with stoves may be as well ventilated as any other. In houses as ordinarily built, much fresh air will come in through the crevices around the doors, windows, and baseboards. but if many occupy the room, the amount of fresh air which finds admittance through these channels may be insufficient: especially is this likely to be the case if the room is partly surrounded by other parts of the building, and consequently has but a small surface directly exposed to the out-door air. Besides, the direct draughts from doors and windows may be so great as seriously to affect the health of the inmates, giving them colds. When any any of these troubles exist, one of several simple devices may be resorted to in order to secure the admission of plenty of fresh air without dangerous draughts. The most common of these devises consists in fitting a piece of board from four to eight inches wide in the window frame under the lower sash. By this means a space is left between the bottom of the upper and the top of the lower sash, through which the air enters, and the current is thrown upward, striking the ceiling, from which it is diffused all over the room. Dr. Keen recommends tacking a piece of cloth across the lower eight or ten inches of the window frame, then raising the lower sash to a greater or less extent, according to the weather. In this way two air vents in the window are established, one under the lower sash, the current of which is turned upward by the cloth, and the other between the upper and lower sash, as when the board is used. Through the upper vent it is supposed that some of the foul air will escape, though the current through this opening is not invariably outward.

What is known as Maine's elbow-tube ventilator consists of a board placed under a raised sash, as already described. This board carries two tubes, about six inches in diameter, which turn upward, and the ends of which are supplied with valves by which the amount of in-flowing air can be regulated.

Another method provides for smaller tubes brought through the wall and turned upwards into the room. Some favor still another plan, which consists in bringing a tube about six inches in diameter through the wall, and, possibly, under the floor to the stove, where the tube terminates in a sheet-iron jacket placed around the stove, leaving a space of one or two inches, and having escapes only at the top of the jacket. The heat of the stove will produce a strong current through the pipe, and the incoming air will be warmed in passing through the jacket.

By any of the above-mentioned devices, abundant facility may be furnished for the admission of fresh air; but as two bodies cannot occupy the same space at the same time, there must be provided some escape for the foul air. This should always be attended to in the construction of the house. For every room which is to be heated by a stove, there should be two flues, one for the smoke and other gaseous productions of combustion, the other for the removal of foul air from the room. The ventilating flue must come to the floor, just above which should be a register. When there is a fire in the stove, the upper part of the ventilating flue will be warmed by the smoke flue, and consequently there will be an upward current in it. In this way the withdrawal of the foul air is rendered certain. It should also be seen, in the constrction of the chimney, that the inside of this ventilating flue is not left so rough as to impede the flow of air through it, and that it is not clogged with mortar or pieces of brick. A good draught through the ventilating flue is almost of as much importance as the draught of the smoke flue.

The partition between the smoke and ventilating flues should be of brick placed on edge, thus making it as thin as possible, so that the upper part of the ventilating flue will be thoroughly heated from the smoke flue. By another method the smoke flue may be made of iron pipe placed in a large flue, and the space all around the pipe will serve as the ventilating flue. I have stated that the register in the ventilating flue should be near the floor. If near the ceiling, as some would have it, there would be too great a loss of heat, as the fresh air as soon as heated would find its exit. For summer ventilation, the foul air outlet may be at or near the ceiling; but such ventilation in winter costs too much, and, besides, when it is used, great difficulty will often be experienced in heating the room.

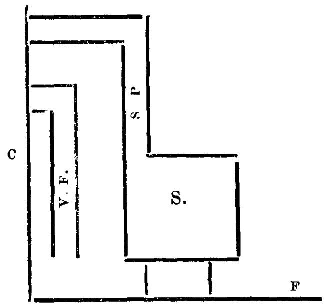


Fig. 1.—F., floor; S., stove; S. P., stove pipe; V. F., ventilating flue; C., chimney.

With the plan recommended above, there is no reason why any room heated with a stove may not be so well ventilated that no disagreeable odor will be perceptible to the most sensitive person upon coming in from the outdoor air; provided, always, that the room is clean. Unfortunately, however, the great majority of houses which are heated by stoves are built without the slightest provision for ventilation. In such houses, fresh air may be introduced according to the methods already given; but the escape of the foul air is more difficult to be provided for. It may be done, however, as follows: Place a tin or sheet iron pipe, of from six to ten inches in diameter, according to the size of the room, along the wall behind the stove. The lower end of this pipe extends to within a few inches of the floor, and remains open, while the upper end passes, by means of an elbow, into the smoke flue below the point at which the stove pipe enters, as shown in the accompanying Fig. 1. The upper end of the ventilating flue may, when the chimney begins near the ceiling, terminate in a jacket around the stove pipe, the jacket passing into the chimney, as here shown in Fig. 2. In all cases the ventilating flue is to have air-tight joints.

With the open fire or grate, the withdrawal of the foul air is all provided for, as it will escape up the chimney. The open fire is not so economical as the stove; but, when sufficient to warm the room, the former is, at least as both are ordinarily arranged, more healthful. With the open fire or grate, much of the heat escapes up the chimney; however, with the grate this loss of heat can be, to a considerable extent, lessened by setting the fire-basket well forward.

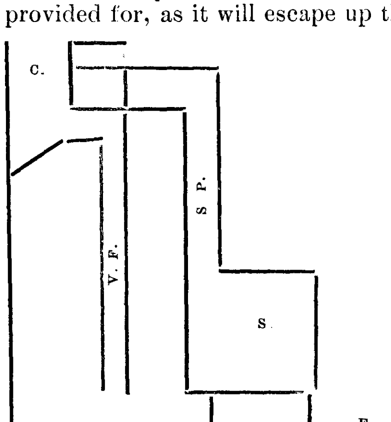


Fig. 2.

When the hot-air furnace is used, certain precautions are desirable, both for economy and health. In the first place, the furnace selected is nearly always too small for the extent of heating required of it. When this is the case, the fire must be pushed as much as possible in order to keep the rooms warm in winter; consequently the air entering the room is over-heated, and produces headache and dulness. At the same time the furnace is soon burnt out and any money saved in the first place by purchasing the smaller size will have to be expended with an additional amount in securing a new furnace.

The furnace should be thoroughly encased with thick brick walls, to prevent great loss of heat by direct radiation in the cellar. The owner of the house will be rewarded for his time and trouble if he sees to it that this work is well done.

The furnace must receive the air which is to be heated directly from the out-door air, and not from the cellar. The cold-air duct should be perfectly air-tight, so as wholly to prevent the cellar air from entering the heating chamber. Wooden air-boxes are not to be recommended unless they be carefully lined with some metal. The external opening of the cold air-box should not be near any cesspool, drain, or other possible source of deleterious gases. It should also be protected by a piece of wire net. In the cold-air duct, preferably near its external opening, should be a sliding valve, by which the amount of air passing to the furnace can be regulated; but care must be taken that this valve is never entirely closed. Probably it would be better to have it made so that when pushed in as far as possible it will obstruct only half the area of the duct.

The air chamber in the furnace should be kept supplied with water. The hot-air flue should be so arranged that the horizontal ones are not more than fourteen or sixteen feet in length, for if the horizontal flues be much longer than this, the draught through them will be so slight that the rooms will not be warmed, while the rooms supplied with verticle pipes will be over-heated.

The warm-air register in the room should not be placed directly in the floor, but in the base-board. If placed in the floor, it soon receives a large amount of dust and other refuse.

With a hot-air furnace properly selected and arranged, the amount of warm, fresh air entering the room is sufficient. But before the fresh, warm air can enter, the air already present must find an exit. The following principles may guide us in economically ventilating a room heated with a hot air furnace:

(1) Bring the fresh air in near the floor.

(2) Take the foul air out near the floor.

(3) Create a draught in the foul air shaft by means of heat.

Unless the air already in the room has some means of exit, it will be found utterly impossible to heat the room with the warm air furnace. Then it will be seen that both the heating and ventilation depend largely upon the withdrawal of the foul air. If the foul air register be near the ceiling, much of the warm air from the furnace will escape directly into the foul air shaft. If there be an open fire in the room, the foul air will find a ready exit through the chimney. If there be only a ventilating flue, it should be in the same chimney with some other flue which is heated, at least in its upper half. Thus a number of ventilating flues from as many rooms may be placed in the same chimney with, and arranged about, the smoke flue of the furnace. Often we find that one ventilating flue is expected to do service for a room on the first floor, and also for another directly over it on the second. The result frequently is, that the foul air of the lower room passes into the room above. There should be a separate ventilating flue for each room.

WATER-SUPPLY.

It is of the greatest importance to the family that its supply of drinking-water be of unquestionable purity. That such dreaded diseases as cholera, typhoid fever, scarlet fever, diphtheria, and dysentery may be spread by impure drinking-water, there can now be no question.

The sources of drinking-water may be divided into the following classes:

(1) Cistern water.

(2) Surface water.

(3) Subterranean water.

Cistern water is that which is collected upon the roof of a house, and stored in a reservoir known as a cistern, or in a tank, which is usually placed in the attic of the house. Cisterns, or underground reservoirs, are more generally used than tanks.

The condition of this kind of water will be influenced by the air through which it falls, by the nature of the roof, and by the kind of cistern, and the care exercised in keeping the roof and cistern clean.

In large cities, especially where there is much manufacturing done, there is always a considerable amount of dust and other impurities in the air, much of which is brought down with the rains. The conductors leading from the roof to the cistern should be supplied with means for turning off the first part of the rain-fall. In this way the impurities taken from the air and those collected on the roof are disposed of. Especially is this desirable if the roof be of wood and old, if there be a collection of leaves and other *debris* from projecting branches of trees, and if there be any chance of birds depositing their excrement upon the roof. Probably the cleanest roofing material is slate; but its cost has prevented its general use in the construction of residences.

The cistern should be built of brick, and plastered water tight upon the *outside* as well as upon the inside. Strict attention should be paid to this, and the walls should be so built as to prevent the possibility of water from the adjacent soil passing into the cistern.

The top of the cistern should be well covered, so as to prevent small animals as well as vegetable refuse from falling in. The best covering would be a box built up several feet above the ground, and covered with fine wire netting. In this way the fresh air will pass down, and the space above the surface of the water will be ventilated. When this cannot be used, a tight covering of stone, or of wood, if all boards are removed and replaced by new ones at the first sign of decay, may be used.

A wooden pump should not be placed in the cistern, as it soon decays, becomes covered with moss, and collects upon it much filth. An iron pipe with the pump in the kitchen is probably the best arrangement. However, the cistern should never be built under the house. When so built the air above the water is invariably bad, and the periodical cleaning out of the cistern, which should be done once a year at least, is not so likely to be attended to.

It is customary in some places to place near the top of the cistern an over-flow pipe which leads into a cesspool or privy-vault. This practice has, without doubt, cost many lives. There should not under any circumstances be any connection between the cistern and any receptacle of filth. This over-flow pipe is often untrapped, or the trap becomes defective, and the gases arising from the decomposing matter of the cesspool and privy-vault pass into the cistern. Indeed, cases are known where not only the gas, but fluid refuse, has thus been poured into the cistern.

However much care may be taken with the cistern,—and the above suggestions should be deemed of imperative importance,—the cistern water should be filtered before used. Many cheap and effective household filters are made and it is not necessary to go into detail concerning their construction; but a few practical hints may be given as to their care. A filter which is kept constantly under water soon becomes utterly worthless. The charcoal box should be frequently exposed to air, and, if possible, to direct sunlight. A filter removes suspended matter, and, on account of the air condensed in the pores of the charcoal, destroys to a certain extent the organic matter held in solution in the water. If any epidemic disease prevail at the time, it is always safest to boil any and all water used for drinking purposes. Cistern water may be boiled and then filtered. If one has no regular filter, it will be better at all times to boil the water, after which it may be allowed to run through a piece of filter paper, which can be obtained for a trifle at any drug store, placed in a tin or glass funnel. When filter paper is used, a new piece should be placed in the funnel each day.

The purity of surface water will depend on the condition of the soil upon which it falls and over which it flows, as well as upon the air through which it falls. Water which falls upon and flows over a filthy soil should not be used for drinking. Since the amount of refuse on the surface of the earth is usually greater in thickly settled countries, the water collected on such sheds is unfit for use. That there is a certain degree of purification in running streams there can be no doubt; but notwithstanding this, specific poisons have been carried long distances in rivers, and have still manifested their poisonous effects.

When any serious epidemic prevails, and surface water constitutes the drinking supply, it should always be boiled. In India, the spread of cholera is often along the water-courses into which excrement from the sick and the bodies of the dead are often cast. Typhoid fever and dysentery are also often spread by the use of surface water.

The water collected in shallow wells is really surface water, and that often of the worse kind. The use of drinking-water from shallow wells is, as a rule, to be condemned. Many people think if water percolates through a few feet of soil, every harmful substance is removed. No greater mistake could possibly be made. Indeed, by percolation through the soil, the impurity of the water is often increased. Various kinds of filth which have accumulated upon and within the soil are dissolved in the water and carried into the well. Often we find in a small back yard a cesspool, privy-vault, and well, all in close proximity. If the well be a shallow one, such an arrangement is probably the worst, in a sanitary sense, that could possibly be devised.

Subterranean waters used for drinking purposes are those obtained from springs and deep wells Whether such waters are pure or not depends largely upon the geological formations in which they exist. The source of the water must be below rock or thick clay beds in order for the water to escape surface contaminations. Springs from gravel hills may be as impure as shallow wells. A very small amount of iron in water does not render it unfit for drinking; but water which contains more than one-tenth of one per cent of iron is unfit for constant use.

Deep wells should have their walls so protected as not to permit of surface water finding its way through them. If this is not the case, their waters may become quite as foul as those of shallow wells.

Subterranean waters are often hard. By this is meant that they fail to make a lather with soap, or a large amount of soap must be used with them in order to produce a lather. The hardness of water is due to the presence of certain inorganic salts, as those of lime and magnesia, which form insoluble compounds with soap. Hard waters are divided into two classes:

(1) Those whose hardness is removed by boiling. This is known as temporary hardness.

(2) Those whose hardness is not removed by boiling. This is known as permanent hardness.

Many waters possess both a temporary and permanent hardness. Such waters are improved by boiling, but are not rendered wholly soft.

Hard waters are not suitable for laundry purposes, especially when the hardness is largely permanent. They also often form incrustations in boilers. But unless the hardness be very great, it does not unfit the water for drinking purposes. There has been much discussion as to the possibility of hard waters producing goitre. It is well known that this disease is very prevalent in certain limestone districts; but that the use of hard water for drinking is the cause of the disease has not been positively demonstrated. It would be best, however, for families in which a tendency to goitre prevails to use soft water.

Hard water has also been supposed to favor the formation of gravel. The writer has met with a few persons who are troubled with gravel only when using hard water.

Some hard waters have an irritating effect upon the bowels of those not accustomed to their use, producing in such persons diarrhœas.

In case of the use of a public water-supply, it is the duty of the health authorities of the city to see that the water is wholesome, and it is the duty of the consumer to see that the water is not contaminated on his premises. Lead pipes and lead lined storage tanks should not be used for conveying or storing cistern water. The pipes should be of iron, or better still, of block tin, or should be lined with tin.

THE DISPOSAL OF WASTE.

One of the most important questions connected with modern sanitation is as to the best methods of disposing of waste matter. When allowed to accumulate in the vicinity of homes, it may poison both the water and the air. Many of the older cities of southern Europe have become thoroughly saturated with filth, and for this reason cholera has found a fertile field for its growth in Spain, Italy, and southern France. Filth and disease always go hand in hand, the former leading the latter. Cleanliness invariably lessens the death-rate. Typhoid fever, cholera, and other diseases, whose growth and spread are plainly due to the accumulation and putrefaction of waste matter, should be stamped out of existence. With perfect cleanliness they would not be known.

It is the writer's object to give here some practical suggestions for the disposal of waste matter. Probably the disposal of human excrement deserves more care than any other waste. In cities where there is an abundant public supply of water, and where sewers are in use, the water-closet is the most convenient method, and it may be made perfectly safe. Where water-closets are used, the so-called "separate system" of sewerage is desirable. This system provides two sets of sewer conductors. One of these is the ordinary brick sewer, and this system is used only for carrying off the storm water. The other is made of small sewer pipes which convey the sewage proper, and which are connected with flushing tanks, by means of which they are periodically flooded with water and washed clean. The advantage of this method is easily understood. When the single system is used, the sewers are necessarily large, in order to carry off the great amount of rain-water. The bottom and sides of these sewers must be more or less rough, and they are flushed only at the time of heavy rain-falls; consequently much of the time the flow of sewage through them is slow, and the solid matter is deposited on the rough surfaces, where it decomposes with the formation of noxious gases, which escape through ventilators into the street, or pass through defective traps into the houses.

With the separate system the small sewer pipes with smooth inner surfaces are flushed three or four times a day, and their contents are swept out. It requires twenty-four hours at least for human excreta to decompose to such an extent as to evolve poisonous gases; therefore, if the pipes be flushed clean one or more times during the day, there can be but little danger from "sewer gas."

However, whichever system of sewerage is in use, the individual should take certain precautions in arranging his water-closets. In the first place, water-closets should not be placed in living-rooms or in bed-rooms. They should be located if possible in some detached part of the house. The kind of closet selected should be determined upon by some competent person. Changes and improvements in the patterns are being constantly made, so that should any preference be given at this time it might not hold good three months hence. The flushing tank for the water-closet should not in any way be connected with the drinking water-supply. The closet should be well trapped, and the trap should be so placed that it can be examined at any time without tearing up the floor or breaking into the wall. The habit which plumbers have of hiding all their work should be condemned. The soil pipe should not be connected at any point inside of the house, at least with the other waste pipes such as those from the bath-tub and stationary wash-bowls. The soil pipe should be ventilated by a pipe which should be as nearly perpendicular as possible, and which should extend above the roof of the house, and should not be placed near a window. This ventilation of the soil pipe is of the utmost importance, and should never be neglected.

When there is no system of sewerage, the dry-earth closet is the best method of disposing of human excrement. Indeed, upon sanitary grounds the dry-earth system is in many respects more desirable than the use of water-closets; but the former requires possibly more care than the latter. Economically, also, the dry-earth system will prove the better when it comes into more general use, and the excrement is used as a fertilizer. A dry-earth closet properly kept is free from all noxious gases, and there is no possibility of the drinking water-supply becoming contaminated from it.

There are many patterns of dry-earth closets in use, but the simplest may be made as efficient as the most complicated and costly. A cheap form is made by placing under the seat boxes or drawers lined with galvanized iron. There is placed conveniently a quantity of dry earth, and for each evacuation a small shovel of the earth, from one to two pounds, is thrown in. When the drawers are full they are removed, emptied, and replaced. The best earth to use is pulverized clay mixed with about one-third its weight of loam. Ordinary garden soil may be used, if dried perfectly. Sifted coal ashes are almost or quite as good as any earth. Moreover, they are generally on hand, and to be disposed of in some way. The writer has used for his family a dry-earth closet for three years, and prefers the sifted coal ashes to any kind of earth. Gravel is not at all suitable.

With an ordinary family with not more than half a dozen members it is not necessary to empty the boxes more than once in three or four weeks. Their contents, which if enough soil or ashes has been added, is wholly inodorous, and may be emptied upon the garden. Here it is spaded in during the spring, and as a fertilizer amply repays for the time and trouble that has been taken with it. Several large cities in Europe have adopted the dry-earth system, and the waste is removed by those who desire to use it as a fertilizer.

The patent earth-closets are so arranged that the requisite amount of earth falls into the box in a manner similar to that by which the water-closet is flushed with water.

In case epidemics of any kind are prevailing in the neighborhood, it would be well to throw a handful of chloride of lime into the closet each day. And even when no epidemic prevails, but the weather is very hot, the same quantity of sulphate of iron (copperas) may be used daily. The cost of this substance is so small that it may be used freely when needed. Where many are using the closet, a vault may be dug beneath the seat, and made water-tight with brick and cement. Into this should be thrown each day a sufficient quantity of this dry earth, and the vault should be thoroughly cleaned at least once a month.

The ordinary privy-vault with porous walls is an abomination. It has caused more deaths in this country than war and famine have produced. The liquid poisons from it filter into wells, while its gaseous exhalations float through the air. People breathe and drink their own excretions, and typhoid fever and kindred diseases slay tens of thousands annually. It is safe to say that the privy-vault is the origin of the majority of the cases of typhoid fever. As the country becomes more thickly settled, the dangers from the privy-vault increase, and they should be wholly abandoned.

In many places it is the custom to move the privy, and cover the contents of the vault with a few shovels of dirt as soon as the vault is filled. In this way from one to half a dozen repositories of filth are formed in the average village back yard in a few years. Such a condition is certainly a highly unsanitary one.

The waste-pipes from the bath-tub and stationary wash-bowls should be well trapped, with the traps where they can be readily examined; and, as has been stated, these waste-pipes should have no connection, inside of the house at least, with the pipe from the water-closet. In the absence of sewage, the waste-pipes from the bath and bowls may be conducted into a cesspool. If the soil be gravelly, this cesspool should be lower than the bottom of the cistern, if the cistern be near. Its walls may be of stone or brick loosely laid, and a ventilating pipe should pass from the top of the cesspool and extend at least ten feet above the surface. No kitchen or laundry waste should be allowed to pass into this cesspool. Since the water passing into this cesspool comes only from the bath and wash-bowls, it does not contain a great deal of organic matter, and will pass into the soil. The cesspool for the kitchen slops should be walled up and made water-tight. This cesspool should also be ventilated by means of a large vertical pipe. The top of this cesspool should have a man-hole in its centre, covered with a stone or iron slab, which can be removed in order to clean out the cesspool.

It is better for all pipes leading to sewers or cesspools to be disconnected, or furnished with gully traps or with an air pipe just outside of the house, in order to prevent the possibility of gas passing from the sewer or cesspool into the house. All cesspools should be as far from the house as possible, and they should be cleaned at regular intervals. The contents of the kitchen cesspool may be used for fertilizing.

All solid kitchen waste should be removed daily by a scavenger, who does this without expense to the householder, or it may be dried under the kitchen stove in shallow pans and then burned in the kitchen fire, or, if in the country, it may be fed to hogs or other animals.

The dust swept from the floor should be burned, not thrown out into the yard. Ashes should be kept in a dry place, and if so kept they may often be disposed of without cost. The soap-maker will pay for dry wood ashes, and coal ashes are often sought for and used for filling in low places. Each fire-place and grate should be furnished with an ash-pit in which the winter's product may fall, and by which accident from fire is greatly lessened.

When a house is built, a plan of all its drainage pipes should be made and preserved, as with it a faulty pipe or joint may often be found with ease, when without it much work may be necessary in order to find where the trouble is.

THE SURROUNDINGS.

It would be better if residences were not built up in solid blocks. Even narrow passage-ways between the houses, through which the air can move freely, are to be preferred to unbroken blocks. However, the price of land and of building material may compel some in the larger cities to deny themselves any further separation from their neighbor than that afforded by a single brick wall. But under no consideration should residences be built back to back, without any open space between the kitchens of the two houses. Even a few feet of open yard are of great benefit in affording ventilation, and in preventing excessive dampness. The yard should be kept scrupulously clean, and it should be rendered as beautiful as circumstances will permit. In summer there is no place for children in their play preferable to a nice spot out of doors.

The arrangement of cesspools, wells, cisterns, and out-houses has already been discussed. None of these should be allowed to contaminate the soil or air of the yard. Trees not too dense or too near the house are beneficial in shutting off dust, and tempering the heat of the summer's sun. Besides, no other ornament about the premises can be more attractive than beautiful trees.

The location of all the out-houses of the immediate neighbors, as well as those directly on the premises, should be taken into consideration. The yard should be so graded that the surface water will not collect about the foundations of the house.

A little care and a trifling expense in the surroundings will amply repay any family, and will increase one's love for what should be the dearest spot on earth—home.

THE CARE OF THE HOME.

Suppose that a location has been selected, a house built, and the surroundings prepared according to the foregoing directions, the next thing is to see that all is kept in a sanitary condition. Some families would convert the most scientifically constructed house into a den of filth. Cleanliness should be the watchword of every family. So far as sanitary needs are concerned, all the directions under this head might be condensed into the few words, "Keep everything clean."

Decaying vegetables must not be left in the cellar. Fresh air is to be admitted daily into every part of the house, from cellar to garret. Bed-rooms especially are to be thoroughly aired. Refuse bits of food are not to be left to mold on the pantry shelf, nor should they be thrown out into the back yard. Better burn them. Offal from the preparation of food is not to be allowed to remain in the house, nor is it to be thrown out. It must be placed in the swill barrel, or burned. Dirty dishes are not to go unwashed, nor filthy floors unscrubbed, nor soiled linen unlaundered.

Fresh meat, milk, and other foods are not to be allowed to remain uncovered in living-rooms or bed-rooms. The flour-box is to be kept free not only from the ravages of rats and mice, but from the dust of the room.

The drain from the ice-box should not be allowed to pass into a cesspool, sewer, or soil-pipe. Indeed, there should be no kind of connection between the ice-box, or other place in which food is kept, and any receptacle of waste matter.

The floors and seats of water-closets and earth-closets are to be kept clean. Drains and cesspools must be attended to. The supply of drinking-water must be kept free from every contamination.

Continued health is the reward for the care bestowed upon these details. The labor brings a rich return.

BUYING OR RENTING A HOUSE.

Great care should be exercised in renting or buying a house for family occupation. Many houses are now built purposely to rent or sell, and too many of these are constructed in a very flimsy manner. The object of the builder is to attract attention to his house, and money is spent in ornamentation, which should have been used in the more important parts of the structure. No one should place his family in a house until he has made a thorough investigation of its sanitary condition. The mere advertisement that "the house is furnished with the most approved sanitary appliances" should not be considered as a sufficient guaranty. Indeed, the statement of the owner or agent, that "everything is all right," is usually not to be relied on. The time will come when no one will be permitted to rent a death-trap in the shape of a house; but, unfortunately at present, the duty of seeing that everything is really all right devolves upon the person seeking a house. For this reason a few practical directions for house inspection may not be out of place here. The writer has known a man, even after having been warned by a former tenant, who placed his family in a house whose sole recommendation was its attractive appearance, and to regret his rashness a few weeks later when typhoid fever had stricken his family. The dangers to health and life are too great to allow anyone to be careless or indifferent in this matter.

The house offered for rent or sale should be visited by the one seeking a home, and thoroughly inspected in regard to its sanitary condition, as well as to its general appearance. The surroundings should be studied. The condition of the back yard,—especially the location of out-houses on the premises and those of the neighbors, the location and condition of cesspools, privy-vaults, cisterns, or wells, if such be present, should undergo careful inspection. What the sanitary arrangements should be has been already sufficiently indicated.

The cellar should be visited, and if its walls be cracked, damp, and covered with mold, if water stands upon its floor, and if light and ventilation are not provided for, seek some other habitation. It is better far, to sleep in the open air, with no roof but the sky and no bed but a few blankets placed on the dry earth, than to live in a house built over a reeking cesspool; and such a cellar is nothing more nor less than a cesspool.

The general construction of the house should be closely scrutinized. Observe the height of the first floor above the level of the street, the proportion of the lot covered by the house, the arrangement and size of the rooms, and the condition of the floors, ceilings, and walls. Of course newly constructed walls are always damp. A great amount of water is used in the mortar and plastering, and much of this must evaporate before the building is fit for occupation. Neither should a house freshly painted with lead paints be occupied until the paint is well dried. The living-rooms should be placed upon the sunny, airy side of the house. The bed-rooms especially should be examined with reference to their size and means of ventilation. The floors should be of seasoned wood, well jointed. This is very desirable, as it prevents the accumulation of dirt under the floors, and permits of the free use of water in scrubbing the upper floors without danger of injury to the ceilings of the lower rooms.

"Skin" houses, put up by "jerry" builders simply to rent or sell at the highest price, can usually be recognized by careful inspection. Extra ornamentation will generally be observed, but, if a few months have elapsed since its construction, doors will be noticed not to close tightly, the wood-work is shrunken, the window-sashes do not move easily, and too frequently the foundations have settled and the walls cracked.

If the house be furnished with any plumbing, this should undergo thorough inspection. A map showing the distribution of the pipes, unless all are in plain view, should be furnished by the owner. In many old houses large brick drains are found in the cellar. These are always bad. In them a great quantity of filth accumulates. They are seldom sufficiently flushed. Such a condition should lead one to reject a house for a residence. If the drain in the cellar be of earthen pipe, its joints should be examined, for they are often imperfect, and allow of the escape of both gaseous and liquid contents. In this way the cellar floor becomes impregnated with filth, and from it noxious exhalations rise into the rooms above. The writer has known of more than one instance in which one of these drains has been broken by settling, and the consequence was that a regular cesspool was formed instead of the drain. In one instance the break occurred near a cistern, and much of the chamber and and kitchen slops soaked through the imperfect cistern, polluting the water; and this was the probable cause of the typhoid fever which attacked four of the inmates of the house. Still worse is the box drain made of plank. Often at the junction of the vertical pipe with such a drain, the wood decays, and a filthy cesspool is formed.

Unfortunately in most cities the sewers pass along the street in front of the house, and the sewage is collected in the back part of the cellar, and carried by a drain under the floor for the entire length of the cellar, passing out under the front wall on its way to the sewer. The best place for the sewer is in the rear of the house, but when in front, the drain should be carried around the house; or, if through the cellar, it should consist of an iron pipe freely exposed along its entire length, and with sufficient fall to give a rapid current. Its grade should be uniform, and free from depressions in which accumulations might occur.

The proper arrangement of the soil pipe has already been referred to. It should be of iron, not of lead. Leaden soil-pipes are often corroded and leaky. The ventilation of the soil-pipe should be by means of a pipe extending above the roof. The water conductor from the roof should not be made to do service as a ventilating pipe. Moreover, when the rain-water conductor empties into the soil-pipe the force of the current through it will siphon the traps above unless they are all ventilated.

The location of all traps should be ascertained, and it should be seen that none of the pipes are either clogged or leaky. The desirability of the separation of the water-closet from the bath and wash-bowls has already been referred to. It is not desirable to have even stationary wash-bowls in bed-rooms.

If there be a water-supply, it is well to see, before renting or buying the house, that all the pipes are in good order and so protected that they will not freeze. If the drinking-water be stored in a tank, see that the tank is not lined with lead. All water pipes should be well supported, or they may sag and break.

The inspection of the method of heating and ventilating the building may be made from the rules in regard to these points already given. The same is true in regard to the disposal of garbage and the construction of earth-closets.

TENEMENT-HOUSES.

Every working-man should strive to secure a home, and the tenement-house can never be a home in any proper sense. The privacy and comfort of a home can never be secured in a tenement-house.

Here people of all kinds are congregated, and the noise of the boisterous will disturb the rest of the quiet; the filth of the slovenly is likely to injure the health of those who endeavor to keep everything about them clean; and the habits of the immoral are distasteful to the moral. However, on account of poverty, many good people are compelled, for a time at least, to occupy rooms in a tenement-house. Unfortunately, the majority of such houses are built for the purpose of making as large pecuniary return to the owner as possible, and he cares but little about the character of his tenants or the manner in which they live, so long as their rent is paid. In the large tenement-houses of New York, all kinds of occupations are carried on, and many of them in the most slovenly manner.

The tenement should have a cellar under every part of it. The cellar should be divided into compartments by brick walls. No part of it should be used for sleeping-rooms, and it should be perfectly dry and well ventilated. The walls and floors throughout the building should be deadened. The halls should be lighted at both ends. They should be wide, and the space should not be encroached upon by using them as storage rooms.

Each water-closet should be thoroughly trapped and ventilated by a pipe extending above the roof. The ends of these pipes should not have return bends, nor be furnished with caps which are likely to obstruct the upward current.

The water-pipes from baths, stationary wash-bowls, laundry tubs, and sinks should have no connection with the water-closets, and should discharge into the open air outside the building over gullies, or should pass through air-traps outside of the house, the air-trap having a large ventilating pipe carried above the roof. In this way there will be no connection between the drain or sewer and the inside of the house, except through the ventilated soil-pipe cf a trapped water-closet.

The floor and seat of every water-closet should be scalded with hot water and soap at least twice a week. There should be a separate closet for every fifteen persons.

The laundry work should be done in some special place, and not in the living or sleeping rooms. The water-supply should be abundant; and where the water-closets are used, not less than thirty gallons per day for each inmate of the house. Kitchens and bedrooms should be separate. The minimum amount of cubic space allowed should be five hundred cubic feet per head, and this amount will answer only when ample provision for ventilation exists.

Each room should be lighted by outside windows or by light-shafts. The window sash should lower from the top as well as raise from the bottom. Each room must be furnished with a separate flue for ventilation, or a foul-air shaft, which should be heated. These shafts may be heated by being placed in the same chimney with smoke flues, or in case the entire building is heated by steam, a number of foul-air shafts may be brought together in the attic, and heated by a steam coil. If this is done there should be no means of cutting off the steam from this coil. The method of removing foul air, by means of a large central shaft, may do when there are conductors leading from each room to such a shaft, but when it depends upon the foul air from distant rooms reaching the shaft by means of open doors or through transoms, it will often fail. Moreover, all attempts to ventilate a number of rooms on different floors through the same flue or shaft, it matters not how large it may be, will always prove more or less of a failure; because on account of difference in temperature, the foul air from one room will often pass into another.

Various Sanitary Topics.

BY A. G. YOUNG, M. D., Secretary of the Board.

TUBERCULOSIS AND CONSUMPTION.

In the Fourth Annual Report of this Board and in the preceding reports, the results were given of the more important late investigations into the nature and causes of tuberculosis, and especially that form of human tuberculosis which we call consumption. The evidence presented since 1882, when Koch first announced his discovery of the *bacillus tuberculosis*, has been so plentiful and so convincing, that he who now declares his incredulity as to the infectious nature of this disease puts himself in an unenviable position.

But along with the establishment of the fact of infectiousness, we have made some substantial advances in our knowledge of the conditions and influences under which infection or immunity is the most likely to occur. We have learned

That tuberculosis or consumption does not occur except through the agency of the tubercle bacillus.

That the bacillus, though widely distributed over the earth, is not generally present in the atmosphere, as some other micro-organisms are.

That the multiplication and development of the bacillus can take place only in a human or animal body.

That the infection of a human being or an animal may occur as the result of breathing in the bacillus, swallowing it in food, or by inoculation through the skin, mucous membranes or otherwise.

That in man, at least, infection occurs, in the great majority of cases, by means of inhaling the virus.

That practically the only source of the inhaled virus is the sputa of consumptives.

That the sputa is harmless so long as it is prevented from drying.

That when dried it is readily pulverized and floated in the air as an invisible, but infectious dust.

That, though the infectiousness of the bacillus is positive and unquestionable, on account of its slow growth it implants itself in the animal organism with some difficulty and only after a considerable lapse of time.

That the power of the bacillus to invade the animal organism, and the power of the animal body to resist the attacks of the parasite are very nearly equally balanced.

That this balance of power may be destroyed, in a way unfavorable to the person or animal attacked, by the repeated re-infection of the system, or by inborn or acquired conditions of debility.

That this balance of power may, on the other hand, be destroyed, in a way unfavorable to the parasite, by conditions or influences which strengthen the general powers of the individual, and probably by conditions or treatment inimical to the bacillus.

That heredity as a factor in the causation of tuberculosis is much less operative than was formerly supposed.

It will be seen therefore that though tuberculosis is an infectious disease, the sources of the bacillus are so few and so well defined, the channels of infection are now so well known, and the growth of the bacillus is surrounded by such limitations, that we can very gladly exchange our former belief in hereditary influence and inevitable fate for the recent one of infectiousness and the preventability of infection.

The importance of this new direction for public health endeavor is of the greatest—is worthy to engage the earnest attention of statesmen as well as sanitarians. The field is broad and the modern tendency to press toward urban and manufacturing centres makes the need of work imperative. Consumption has aptly been called by somebody the "great white plague." One of the leading English physicians lately in speaking of the ravages of this disease in his own country has said:

Tubercle at the present day carries off annually nearly 70,000 persons in the form of phthisis, at the ages between fifteen and forty-five, the most useful stages of human existence; it kills more than one-third of the people who die, and nearly half between fifteen and thirty-five. Moreover, in its prolonged and painful course it either prevents its victims from earning their livelihood, or at least interferes greatly with their daily work. Its habit of seizing upon the flower of the population, its slow but almost certain progress towards death, the utter misery of the last few months or weeks of existence—all these are features in the fell disorder that render its study all-important not only to medical men but also to the statesman and to all who are concerned with the welfare of the nation.*

In the German Empire from 170,000 to 180,000 die yearly from tuberculosis.† In our own country Dr. D. E. Salmon,‡ Chief of the Bureau of Animal Industry, estimates the annual number of human deaths from consumption at over 130,000; and the deaths from all forms of tuberculosis at 150,000.

CONSUMPTION AS AN INFECTIOUS DISEASE.

Since the publication of the last report, a large number of histories have come to my notice, mostly within the literature of the year in which the communicability of pulmonary tuberculosis is pretty well shown. The presentation of a few of them may serve a good purpose in helping to impress the fact, that the danger of infection is a real one.

Numerous experiments upon animals have shown that tuberculosis may readily be communicated to them by causing them to breathe air into which the tubercle bacillus has been diffused by the atomization of tuberculous matter, or of the pure artificial cultures of the bacillus. That tuberculosis may be communicated to human beings in the same way, the fool-hardiness of one person, at least, has shown. While Tappeiner was engaged in his inhalation experiments upon animals, he was assisted by a servant in his fortieth year, who had always been very strong and healthy, and was absolutely free from suspicion of hereditary taint. In spite of energetic and repeated warnings to keep out of the inhalation room this man, to show the freedom from danger in doing so, persisted in entering the room. In this way he acquired the same form of inhalation tuberculosis which he had so often seen given to dogs, and he died fourteen weeks afterwards. The post-mortem showed the same changes which had been previously found in the dogs that had been subjected to the experiments.§

Recently Vallin, in the French Academy of Medicine, told about a family, whose home the arrival of a consumptive brother transformed into a "house of the doomed," where five persons died of

*Lancet I, 1890, 531.

†Centralblatt für al. Gesundheitspflege, VIII, 255. 1889.

‡Trans. Amer. Pub. Health Assoc., XIV., 92.

§Zeit. für Hygiene, V, 299.

consumption within three years. The family, living in the country in easy circumstances, consisted of father and mother, both of more than sixty years of age, but very healthy, and five children at ages from twenty-five to thirty-two years. The eldest son living in Paris, became consumptive, and, returning to the home of his parents, died in about six months. Within the two years that followed, there died in rapid succession, a sister of thirty, another of thirty-two, a third of twenty-seven, and finally a son-in-law, husband of one of these young women, who had continued to live with the rest of the family after his wife died. It may be added that the sisters who became infected occupied successively the same chamber in which their dead brother had passed the last month of his sickness. Ten years later the father died of apoplexy, and the mother was then living without a trace of tubercle.*

Dr. A. Ollivier,† physician to l'Hôpital des Enfants Malades, Paris, states that a family previously in robust health occupied two small rooms opening into a narrow court. The parents, a young son, and the baby, slept in one of the rooms. An older son, who had been living elsewhere contracted phthisis, returned home, and slept in the same apartment. He died January 16, 1883. His mother, who was constantly at his bedside, began to cough, emaciated and died of the same disease in the following May. Seven days after the death of the mother, her infant had tubercular meningitis, of which it perished, and a little later the older child who occupied the same apartment, sickened and died like the mother. The father only remained of those who occupied the small room, and his immunity was probably due to the fact that he was most of the time in the open air.

Dr. E. I. Kempf relates the following striking instance of infection (Louisville Medical News, March 22, 1884). In the fall of 1880, a girl of eighteen years, whose brother had died of consumption, was found to have tubercles at the apices of both lungs. She belonged to a sisterhood, and slept in the general dormitory with the other sisters. In four months nine of her companions began to cough, and were found to have tubercles. No one of the sisterhood had previously had disease of this kind.‡

Dr. Marfan§ gives an account of a local epidemic of pulmonary consumption which appears to have been due to infection. In the centre of Paris an office gave employment to twenty-two clerks. The wooden floor was old and uneven, and the building otherwise was far from being in a sanitary condition; but there appears to have been no cases of consumption among the employes before the one of which we are to speak. In 1878, a man who had been in the office twenty-four years, died of consumption after a sickness

*Revue D' Hygiene, XII, 56, 1890.

†Medical News, LV, 651, 1889.

‡Ibid.

§Semaine Med. quoted in Revue D'Hygiene, XII, 66, 1890.

of three years, during all of which time, excepting the last six months, he had been at his desk in the office, coughing and spitting upon the floor. Since this time, of the twenty-two employees, fifteen have died, one of cancer, and all of the others of consumption. Before the death of the first case, two other men who had been in the office six years, began to cough and spit upon the floor. They died in 1885. For a while the deaths succeeded each other at frequent intervals, the decedents having been in the office for periods of from two to twenty years. It appears to have been the custom to have the office swept every morning, and the sweeping was not usually completed before the arrival of some of the employees. When Dr. Marfan, head of the medical clinique of Paris, advised the office that the probable cause of the heavy mortality had been the inhalation of the infectious dust from the floor, the floor was promptly removed and burned and a new one laid. In future, the sweeping is to be done evenings after the departure of the clerks, and other precautions against the continuance of the trouble were taken.

INFECTION FROM THE ALIMENTARY CANAL.

In the preceding cases it is presumable that the infection was due to the inhalation of the virus,—the breathing in of the dried and pulverized sputa. In the following cases the infection was from the alimentary tract.

Dr. W. J. Wilson* observed the following case: B W., aged four months; family history good, and no trace of phthisis or syphilis discoverable in either family. Had had no previous illness, was plump, fat, and well-nourished. The mother was forced to wean the child when about a month old, and it was fed on cow's milk from a bottle, and thrived well for a time, having no digestive troubles. It was attended by a nurse, who was well advanced in consumption, and had free expectoration. The child slept with the nurse, and, consequently, was much exposed to her breath. Nothing unusual was noticed in the child's condition for the first three or four weeks after the nurse's arrival, when it began to loose flesh and cough slightly. This cough and wasting gradually increased, and finally Dr. Wilson was called in. On examination he found well marked and far advance phthisis, with frequent cough and great emaciation. The child died in its eighth month, three months after the first symptons were noticed. The same nurse who, later on died of consumption, attended five other children, and four out of the five died of some wasting disease, but as Dr. Wilson did not see any of them he was unable to state its nature.

*Canadian Practitioner, quoted by Health Journal, XI., 116.

A case of infection of an infant through the milk of a tubercular nurse is reported by Dr. Steinberger* of Buda-Pesth. An infant aged five months, of healthy parentage, developed caseating cervical glandular abscesses, of a distinctly tubercular kind. Microscopical examination verified the diagnosis. Inquiry elicited the fact that the infant had been nursed for a period of four weeks by a woman who had been discharged on account of phthisis, with abundant expectoration. The etiological relationship was thus clearly established.

Prof. Demme† of Berne has published the following interesting case:

A four months old boy died of tuberculosis of the mesenteric glands. The microscopic examination of the swollen glands which were partly caseated showed the presence of the tubercle bacilli. In the intestinal mucous membrane, as well as in other organs, small localizations of tubercle were discovered. Neither on the side of the parents nor of the grandparents had any cases of tuberculosis ever occurred. On the other hand the child had been fed from birth with the uncooked milk of a cow which was fed upon dry fodder. After the death of the child the physician ordered the cow to be killed. The finding was interesting and instructive. In the left lung of the cow, medium-sized tuberculous nodules were found containing tubercle bacilli. The microscopical examination of the milk, pressed out from the deeper portions of the udder, also revealed the bacilli.

Heller‡ believes that very probably milk plays a principle part in the so-called hereditary tuberculosis of children. In favor of this view is the fact of the frequency of tuberculosis of the mesenteric glands, just that part of the lymphatic system which must be first affected by the tuberculous virus when introduced into the intestinal tract.

Observations like the foregoing and the results of feeding experiments on animals have shown the danger from the use of milk, from suspicious sources, and have led to attempts to determine the magnitude of the danger. An answer was needed to the question whether the milk becomes infectious before the tubercular disease of the cow becomes generalized, and as Bang of Copenhagen and others had called attention to the fact that tuberculosis of the udder in the cow is not a rare occurrence, an answer was needed to the question, may the milk become infectious in the absence of tubercular formations in the udder? Hirschberger's recent experiments throw considerable light upon this matter.

*Pesth. med. chir. Presse, quoted by Health Journal, XI., 116.

†Schweiz. Blätter fur Gesundheitspflege, III., 95. 1888.

‡Deutsche Viert. für öffent. Gesundh. XXII., 94. 1890.

He sought to answer two questions: 1. Are the cases frequent or not in which tuberculous cows furnish an infectious milk? 2. In what forms of tuberculosis is the milk infectious? He experimented with the milk of twenty cows affected with tuberculosis of various grades. The milk taken with the necessary precautions was inoculated into the peritoneal cavity of guinea-pigs. His answer to the first question is that the danger of infection from the milk of tuberculous cows is not only present but it is a very great one; in 55 per cent. of all the samples experimented with, the milk was shown to be infectious. In answer to the second question, his results show that the danger of the infection is greater in advanced cases, in which the disease is generalized, but that it also exists in those cases in which the disease is entirely local. From tuberculous cows in which the wasting is marked, the milk is generally infectious; from those that were in good order, he found 30 per cent. to be infectious. The milk from 80 per cent. of advanced, 66 per cent. of medium grades, and 33 per cent. of localized tuberculosis, was found to be infectious.*

The Massachusetts Society for the Promotion of Agriculture employed Dr. Ernst to investigate the question, as to the danger from the use of the milk from tuberculous cows and at what stage in the disease the milk becomes infectious. Thirty-six cows suffering from tuberculosis other than of the udder were used in the investigations, and 114 samples of milk from them were examined; seventeen samples from ten different cows were found to contain the bacilli of tuberculosis.

Well animals were then inoculated with the result of inducing the disease in 50 per cent. of the cases subjected to the experiments. Feeding experiments were also made, with the result of inducing the disease in a number of calves and young pigs. The following conclusions were presented: 1, and emphatically, that milk from cows affected with tuberculosis in any part of the body may contain the virus of the disease; 2, that the virus is present, whether there is disease of the udder or not; 3, that there is no ground for the assertion that there must be a lesion of the udder before the milk can contain the infection of tuberculosis; 4, that on the contrary, the bacilli of tuberculosis are present and active in a very large proportion of cases in the milk of cows affected with tuberculosis, but with no discoverable lesion of the the udder.

*Deutsche Med. Woch., XVI., 118. 1890.

It will thus be seen that Dr. Ernst's results and conclusions are essentially the same as those to which Dr. Hirschberger arrived.

The Tuberculosis Congress in Paris spent much time in the discussion of the question as to the permissibility of using as food the flesh of tuberculous animals in the earlier stages of the disease. There was a difference of opinion as to the expediency of absolutely interdicting the use of such meat. Recognizing the difficulty of drawing a line to divide the cases in which the flesh may be used from those in which it may not be used, the Congress eventually passed a resolution to the effect that all animals affected in any degree with tuberculosis should be seized and condemned as unfit for food. This was carried with only three dissenting votes.*

At Munich some experiments have been made by Steinheil† as to the possibility of infecting guinea-pigs with the products from the muscles of persons affected with phthisis. The material used was portions of the psoas muscles of nine patients, who died of phthisis. The muscle was cut up into very fine pieces, and submitted to the pressure of a screw press. The juice obtained was injected into guinea-pigs. Of eighteen guinea-pigs thus treated, fifteen died of tuberculosis, although no tubercle could be detected in the muscles so used. Steinheil draws the conclusion, that the muscular flesh in advanced human phthisis is infectious as a rule; hence, the possibility that the flesh of animals affected with bovine tuberculosis is dangerous, cannot be denied.

‡Kastner undertook a similar research as to the infectiousness of the muscles of tuberculous cattle.

Infusions of the meat were injected into the peritoneal cavity of guinea-pigs. Out of sixteen animals thus treated, twelve remained healthy. He concludes that special dangers from infection are not to be feared, save in the rare cases, in which tubercles are to be found in the muscles.

From the juice pressed from the meat of a cow seized on account of local tuberculosis, but fat and in good condition, Veyssiere inoculated two rabbits and caused tuberculosis in both.§

Drs. Straus and Würtz presented a communication to the Tuberculosis Congress on the action of the gastric juice upon the tubercle bacillus. Experiments made by them had shown that prolonged action of pure gastric juice upon the bacilli was necessary in order to destroy their virulence. The time required was at least six hours. It was, therefore, useless to expect that the bacilli could be destroyed by this secretion after their introduction into the human stomach.§§

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*Medical Record, XXXIV., 218. 1888.

†Public Health, II., 285. 1890.

‡Public Health, II., 231. 1889.

§Medical Record, XXXIV., 218. 1888.

§§Medical Record, XXXIV., 251. 1888.

TUBERCULOSIS FROM INOCULATION.

A third way in which the tubercle infection may be received is by inoculation, and the following cases show how accidents of this kind may occur.

Nocard,* in the discussion on tuberculosis, mentioned that Moser, a veterinary surgeon of Steiner, died from a tuberculous infection received while making a post-mortem examination of a tuberculous cow.

Dr. Lesser† of Leipzig gives the history of a case of inoculated tuberculosis in a woman who washed the clothing of her consumptive husband.

The infection resulted in a tuberculous growth the size of a cherry on the lower part of the right forearm. Its removal was followed by tuberculous granulations which healed after their removal by scraping. Lesser also refers to a case of Merklen's, in which the inoculation occurred on the fingers and advanced to general and fatal tuberculosis. The patient was a woman who for six months had washed the clothing and the spittoons of her consumptive husband.

The same author referred to the cutaneous tubercles which are seen on the faces of children not so very rarely, and which are to be regarded as tuberculosis. Several cases of the kind are given. Most of the cases of inoculation of tuberculosis of course occur on the sites of abrasions or wounds of the skin, but Lesser thinks infection is possible by the way of the sweat glands in the uninjured skin.

As to the future results of such subcutaneous inoculations it is said that from no other point does the tubercle bacillus find so much difficulty in invading the general system as from the skin. Many of the cutaneous tubercles disappear spontaneously, and, if the virus reaches the nearest lymphatic glands it may there remain stored up for months or years, or even for the whole lifetime without leading to general tuberculosis.

Dr. Gerber‡ of Königsberg relates his own unfortunate inoculation with tubercle virus while making the section of the lungs of a patient, in November, who had died of consumption. In so doing he received a slight cut on one of his fingers. Pain and febrile symptoms of short duration followed, and a tumor the size of a

*Revue D'Hygiene, XII., 49. 1890.
†Deutsche Med. Woch. XIV., 592. 1888.
‡Deutsche Med. Woch. XV., 322. 1889.

cherry formed on the site of the cut. The local tubercular growth was exercised in March following. Soon afterward the glands in the arm-pit began to swell and eventually formed a mass larger than a goose egg. In the meantime the doctor had fallen into a hectic condition with a remarkable depression of the nervous system. In May the radical extirpation of the infected glands was undertaken and a cure was effected which seemed to be permanent.

During the past year Dr. Cornet of Berlin, has made some investigations to determine the points of entry of the virus in tuberculous infiltration of the glands.

He showed some guinea-pigs into whose conjunctival sacs some sputum containing tubercle bacilli had been placed. No injury of the sac took place. Notwithstanding this, the bacilli grew, penetrated the tissues, and set up swelling and hyperplasia of the conjunctiva. In all the animals caseation and softening subsequently took place in the neighboring glands. The side on which the inoculation took place showed the most extensive changes. In two other animals the nasal mucous membrane was painted by means of a pigeon's feather, with bacillary sputum in one case, and a pure cultivation of tubercle bacilli in the other. The corresponding glands became tuberculous in both cases. In other cases the cavity of the mouth was inoculated with sputum or pure cultivation material, and all the corresponding glands became tuberculous. In another guinea-pig infective material was introduced into the ear and the auricular glands became subsequently caseous. In still another animal the skin over the nose was shaved clean and sputum rubbed in, when later on a serpiginous ulcer covered with a thick scab, reminding one of lupus, was observed, the cervical glands became much enlarged. Another animal was scratched on both cheeks with a finger-nail dipped into tuberculous sputum, and the ulceration, covered with scab, that followed, spread and became confluent. Another animal was rubbed, but without abrading the surface, with a wash leather that had been dipped into bacillary sputum; after some weeks it was killed, when the corresponding lymph-glands were found enlarged. He concluded that tubercle bacilli could penetrate into the system without causing distinguishable injury at the point of entry. The nearest lying glands became tuberculous and illness developed resembling scrofula as it was often seen and without doubt scrofula depended on a tuberculous infection from without. This was less remarkable when we remembered how incautiously we treated phthisical sputum, and how frequently children made a way for the entrance of disease by putting every possible object within their reach, covered with tuberculous dust it might be, into their mouths, up their noses, or into their ears.*

Other ways than those suggested in the foregoing histories are conceivable in which tuberculous infection may take place by the

*Medical News, LV., 69. 1889.

way of the alimentary canal or by infection. Carelessness and want of cleanliness on the part of consumptive patients or their attendants, may transfer the infective agent to human food or drink, or to abraded skin or mucous membrane. To illustrate how much æsthetics has to do with hygiene, Cornet relates that he once observed a neat appearing young lady from aristocratic circles, who was a consumptive, go to the table without washing her hands, soon after she had smeared her fingers with her expectoration. Heller* has told something that will help us to understand the sanitary significance of such acts of carelessness. Counting under the microscope the b cilli in one cubic millimeter of the sputum of a consumptive patient he found one million germs. On this basis he estimates that three hundred million bacilli on an average are thrown out at each expectoration of a consumptive patient. In none of her realms does nature show a greater prodigality than in her department of bacteriology. Though millions are wasted, one seed may fall upon congenial soil, and a human life may be the price of a thoughtless act.

AUTO-INFECTION.

By referring to Circular No. 54, Prevention of Consumption, republished on page 32 of this report, it will be seen that an emphatic warning is given the consumptive patient against the danger of reinfecting himself with his own sputum, thus defeating the effort that nature always makes to bring about a spontaneous cure. Many consumptive patients show at some stages of the disease marked signs of improvement, and the physician and friends are greatly encouraged with the hope of a recovery, only later to feel a bitter disappointment.

A careful observation of these phenomena has convinced Dr. Flick† that they are not the result of taking cold, but of auto-infection. He relates several cases which had something to do with bringing him to that conclusion, and proceeds as follows: In these and other similar cases there was no exposure that could have accounted for the sudden change in the course of the disease. In none of the cases did the change come in extremely cold weather, and in one it came during the summer. Taking cold, moreover, would not satisfactorily account for the phenomena, as in each case there were new centres of disease, and taking cold should only have affected the old centre. Auto-infection not only gives a proper

*Deutsche Vierteljahrsschrift für öffent. Gesundheitspflege, XXII., 88. 1889.

†Times and Register quoted by N. Y. Medical Times, XVII., 231. 1889.

explanation of these and all similar cases, but renders intelligible many clinical facts about phthisis which are otherwise hard to understand.

Were it not for auto-infection I believe that most cases of tuberculosis, at least most cases in which the disease is outside the cranium, would get well. In every case which has ever come under my notice there was a decided effort on the part of nature to establish a cure, and in proportion as the victim had retained his powers of digestion and assimilation she made a good, bad or indifferent struggle against the disease. In her very effort, however, seems to lie the danger, for by trying to resolve the tubercular deposits she is liable to start up new centres of disease.

Dr. Mosler refers to another kind of danger of self-infection to which consumptive patients subject themselves, that is by swallowing their expectoration.

In one case, which he treated in hospital, the patient, who was rather stupid, could not be persuaded into ejecting the sputum, but invariably swallowed it, in quantities which other symptoms showed to have been very great. Ten days after his first attack of cough with expectoration, diarrhoea and severe colic came on, which was relieved by opiates and other appropriate remedies, but which, nevertheless, kept on until death, which occurred in eight days. Distinct signs of tubercle were found in the lung, but in no other part of the body except abundantly in the intestines. Mosler attributes the presence of tubercle in the intestines in all cases, more to the swallowing of the sputa than to a general infection.*

"PHTHISIS NESTS."

Observation teaches that consumption often shows a tendency to endemicity, or in other words, that the infection has the power of clinging somewhat tenaciously to localities.

Referring to the tenacity with which the infection will cling to places where consumptive persons have dwelt, Liebermeister† says that he has known many instances in which families, hitherto exempt from this disease, developed it after moving into houses formerly occupied by consumptive patients.

Dr. Flick‡ of Philadelphia, as the result of an elaborate topographic study of phthisis in that city, comes to the following conclusions: (1) that a house which has had one case of consumption will probably have another within a few years, and may have a large number in close succession; (2) that when a case of consumption occurs in a house, approximate houses are considerably

*Med. Record, XXXV., 15. 1889.

†Deutsche Med. Wochenschrift, XIV, 545, 1888.

‡Lancet, 1, 1890, 588.

exposed to contagion; (3) that houses in localities where endemic after endemic has existed have, nevertheless, escaped the disease; (4) that tuberculosis of different kinds occurs in the same localities and often in the same lots as consumption; (5) that during twenty-five years scarcely twenty per cent. of the houses of the ward were so affected. He ascribes these results to contagion in the houses themselves, and these facts must be placed in apposition with the researches upon the bacillus-holding properties of the walls of houses in which consumptive patients have resided.

Dr. Ransome* has an interesting paper on "Tubercular Infective Areas" in which the same idea is brought out.

IS TUBERCULOSIS A HEREDITARY DISEASE.

Hiller† concisely sums up the evidence against heredity as a cause of consumption.

It is evident that the possibility of the hereditary transmission of tuberculosis cannot be doubted; experience has presented a seeming evidence of probability and recently a very few cases of fœtal tuberculosis in calves have been related, only one of which, a case by Johne, is to be regarded as unquestionable. The rarity however, of congenital tuberculous in calves is shown by the records of the slaughter-houses. For instance, during the last year over thirteen per cent of all the cows killed in the slaughter-houses at Kiel were found to be tuberculous, while among 6,300 fatted calves only five in all, or .079 per cent, and among 8,300 calves not fattened, not a single one was found tuberculous.

With man thus far, according to the universal experience of pathological anatomists, not a case of fœtal tuberculosis has been shown; the few reputed cases are referable to other diseases. Among 300 still-born children which in part were from tuberculous mothers, I have found not a case of tuberculosis. Among the mothers there were two particularly with the disease far advanced though the children were well developed and entirely free from tuberculosis.

The further proof that heredity plays no role in human tuberculosis, is offered by Table II,‡ which shows that tuberculosis in infancy first appears when sufficient time has passed after birth for the bacilli which have been introduced into the system to be developed, thenceforward, however, the frequency of tuberculosis increases rapidly. Among 541 nursing children before the age of nine weeks, I have never found but one case of tuberculosis, that in a nine weeks old child, and in this one of meningeal tuberculosis.

The innumerable experiments upon animals since Villemin's work was done, have, however, shown that the introduction of tuberculous

*Trans. of the Epidemiological Society of London, VI., 124.

†Deutsche Viert. für öffent. Gesundheitspflege, Band XXII., 88. 1890.

‡Omitted here.

material into healthy animals leads to the development of tuberculosis within a few weeks. Among tuberculous animals, in many examinations, I have succeeded no better than Koch and other observers in finding tuberculosis in the first few weeks of life.

Observations of other kinds also negative the significance of heredity in tuberculosis, particularly the investigations of Epstein, in which the children of consumptive mothers given to healthy wet nurses escaped the disease, while those nursed by their own mothers died tuberculous.

Similar testimony is given by well arranged orphan asylums, the occupants of which are in great part the children of parents who have died of consumption. According to Stich, only one case of tuberculosis occurred in the Nuremberg Orphan Asylum in eight years, and in the Munich Orphan Asylum, among 613 children, in twelve years, only one case, although more than half of the children had lost father or mother, or both, from consumption.

So, in man, we may entirely disregard hereditary as a cause of tuberculosis, for, if it occurs at all, it has an extremely slight practical significance. The teaching of the hereditary transmission of tuberculosis is only a perversion of the fact, that in numerous families tuberculosis carries away many members, a fact which is more easily explained by assuming that a consumptive member of a family is in a position to infect other members by his plentiful distribution of bacilli. It cannot be denied, however, that through congenital or other influences, some persons have a lesser power of resistance than others against the bacillus of tuberculosis, and this is true as regards other infections.

INFLUENCE OF CLIMATE ON CONSUMPTION.

In this State there is an opinion somewhat current, which I believe is erroneous, that our rather severe and changeable climate has a tendency to increase the prevalence of consumption. In the complete absence of any provisions for the collection and record of deaths and their causes, we have no way of positively deciding this question, but reasoning with the help of the vital statistics of our neighboring states, we are able to guess that our tubercular death-rate is rather below the average. New Hampshire with its improved system of collecting and recording deaths, has shown that its mortality from consumption is very low in comparison with that of the more thickly populated New England States.

Dr. J. Edward Squire* of London expressed the opinion before the Epidemiological Society, "that the influence of climate upon consumption is infinitesimal as compared with the effect of density of population."

*Lancet, Vol. I., 1889, 174.

In a lecture at the Royal College of Physicians, Dr. Ransome* said:

In all the chief cities of Europe, Asia, Africa and America there is but little difference in the phthisis rate, and what differences exist are not to be accounted for by differences in climate. Army and navy returns impel us to similar conclusions. And again he says, we have already seen reason to conclude that the ancient doctrine of its origin in a damp, changeable climate is erroneous; and if we take the extreme variations of the disease in places geographically close together, we shall find that they are so great and so frequent in different countries that they could not have been due merely to differences in climate.

The same author referring to certain parts of the globe in which tuberculosis is but little prevalent says:

The last group of districts to a great extent exempt from consumption consists of the arctic and subarctic countries. We do not know why extreme cold should be antagonistic to consumption, and the fact is entirely opposed to the notions of our forefathers on the subject.†

A Russian writer, Dr. Worms‡ of Riga, while emphasizing the fact that in the treatment of consumption, our attack upon the disease must be indirect, that is, by the invigoration of the body by an abundance of nutritious food and the constant breathing of pure air, has, also, the idea that a direct action may be brought to bear upon the bacillus tuberculosis by the means of cold air; since it has been shown that the bacillus flourishes only between very limited ranges of temperature, the most favorable temperature being 37.5° (99.5° F.). He would have patients, protected by an abundance of wraps, breathe continuously during the day the out-door winter air, and at night sleep with the bedroom window open.

On the other hand, some regions formerly free, or nearly so, from consumption have suffered an increase in the prevalence of the disease due to an increased density of population, in some instances, and to importation of the tubercular virus in others.

According to M. V. Widal,§ formerly medical inspector of the army, consumption was almost or quite unknown in Algeria before and during the early years of the French occupancy of that country. In 1832 a case of phthisis was a rarity. From 1853 to 1867 M. Widal did not see more than twenty cases in the aggregate. Since the latter date, matters have changed. From 1882 to 1886 the military hospitals of Algeria, taking patients from both the civil and the military population, have received 2,934 tuberculous patients, not including European and native residents treated at

*Lancet, I, 1890, 586.
†Lancet I., 1890, 587.
‡Deutsche Med. Wochensch. XV., 263, 1889.
§Revue D'Hygiene, XII, 60, 1890.

their own homes. Dr. Widal thinks that tuberculosis was imported into the country as typhoid fever was, which he says was unknown earlier.

In a notable discussion on tuberculosis before the Academy of Medicine, in Paris, Cornil cited what he claimed as a fact, that consumption did not exist among the Fuegians before the installation of the English mission in their country. The wife of the pastor, who was phthisical, had collected in a school a certain number of children. These young Fuegians were lodged, clothed, and placed under apparently better hygienic conditions than those who still lived in a savage state. Notwithstanding this, a terrible mortality occurred among the former. There was a veritable epidemic of acute phthisis.*

Liebermeister† is authority for the assertion that almost invariably savage peoples are free from tuberculosis, until they have come into association with civilized races. He says that tuberculosis is unknown to the negroes of Central Africa, while, among those who have come in contact with civilization, the disease is more prevalent than among other people. He reminds us also that the Indians of North America and the natives of the Australasian Islands were free from consumption before European immigrants came.

THE CURABILITY OF CONSUMPTION.

Though consumption is the most destructive disease of modern times, the study of statistics teaches the encouraging fact that the gradual improvement which has taken place in the sanitary condition of civilized peoples has resulted in a diminution in the death-rate from consumption. This is shown by the mortality reports of ssachusetts, and the same truth is taught by a study of the English statistics. But otherwise there are grounds for encouragement. The dictum of that brilliant medical authority of an age just passing, Sir Thomas Watson, that "tubercular disease when established is beyond our power," has not even to this day been widely disputed. There are, however, encouraging signs that the scientific investigation of the present day is rearing upon the foundations of the past, a knowledge which will lead to a more rational and more successful management of this disease.

*Lancet, II, 1889, 1316.

†Deutsche Med. Wochenschrift, XIV, 544, 1888.

Before the French Academy of Medicine, Vallin* declared last year that "it is less dangerous to be tuberculous in 1889 than it was in 1840; many patients are cured now a-days, and we can assure them a long existence by a life in the open air."

THE OPEN-AIR TREATMENT OF CONSUMPTION.

The last lines in the foregoing quotation from Vallin express the direction in which the cure of consumption is now sought with the most reasonable hope of success. The discovery of the bacillus tuberculosis led to the fond hope that some agent would soon be found which could be used for the sure destruction of the parasite, without injury to the organic cells which constitute, in the aggregation, the higher organism preyed upon. This hope thus far has not been realized, and we have been driven again to an appreciation of those natural agencies, out-door air, sunshine and nutrition, the value of which have not received due recognition.

In 1887, at the meeting of the American Climatological Association, Dr. E. L. Trudeau,† of Saranac Lake, N. Y., read a paper on "Environment in its Relation to the Progress of Bacterial Invasion of Tuberculosis," in which he narrated some experiments made the year before. Fifteen healthy rabbits were inoculated with a pure culture of the tubercle bacillus. Five of these were subjected to overcrowding in a dark cellar with insufficient food. All of these became tuberculous. Five were placed in a box and lowered into a damp pit dug in the ground, and given a limited food supply. All were alive and active at the end of four months. They were killed and were found not to be tuberculous. The last five were turned loose on a small island where they had abundant sunlight, fresh air, and exercise. They were daily supplied with wholesome food. Of this last series, one died at the end of one month tuberculous; the remaining four were killed at the end of four months. They were fat and all the organs were normal.

The following year the experiment was repeated with some variations and Dr. Trudeau‡ reported to the association as follows:

On June 10, 1887, six full-grown, healthy rabbits, were inoculated in the right lung with a quantity of a pure culture of the tubercle bacillus, as nearly as could be estimated, at least twice as large as

*Revue D'Hygiene, XII, 53, 1890.
†Sanitarian XIX., 99. 1887.
‡Medical News, LIII., 466. 1888.

that made use of in the experiment of 1886. They were at once turned loose on the same island and supplied with an abundance of food throughout the entire summer. After being permitted thus to run at large for four months, three of them were killed, while the remaining three were placed in a box and spent the following four months in confinement in a sandy pit, on a moderately restricted diet. At the expiration of four months more they too were killed and their organs examined.

Lot No. 1. Killed as soon as removed from a favorable environment. In one no sign of disease, in a second, a thoroughly localized tubercular lesion, and in the third, advancing and extensive tuberculosis of both lungs.

Lot No. 2. Killed four months after removal from favorable to less favorable surroundings. In one animal a localized cavity resembling a cystic tumor in the lung at the point of the injection. The fluid of the cavity contained a few bacilli. Otherwise every organ perfectly healthy and the general nutrition was excellent. In the second rabbit all the organs were normal. In the third, old and stationary tubercular lesions were found on the pleura, but the lungs and all other organs were normal. The beneficial influence produced by a good environment on the course of the tubercular affection as evinced by the arrested lesions of the last rabbit, seems to have maintained for four months in spite of their removal to less favorable surroundings.

Before the Congress for the study of Tuberculosis M. Calmette read a paper on "The Evolution of Tuberculosis in Healthy Surroundings".* His observations were confined to Belle-Isle-en-Mer, an island lying eight miles from the mainland. The course of the disease is modified by the healthful surroundings, being very slow. Often the infection lies quiet for five or six years, then seeming to have acquired more strength, proceeds slowly, without hectic symptoms.

The British Medical Journal (of November 16) in an editorial advocating this "open-air treatment" says:

"Among the many changes which have taken place in the treatment of phthisis in the last forty years, none is more marked than the substitution of a system of bracing and hardening the patient for one of 'coddling', and foremost in this plan is the principle of open air, or exposure of the patient as much as possible by day and by night to the influence of the atmosphere. The great object of change of climate is to afford greater facilities for this process, and it appears from the testimony of most authorities that the meteorological phenomena which interfere with the success of the system in England are not the coldness of the climate, but its humidity and the prevalence of fog and mist, and the fear of exposure to these elements prevents it being completely carried out here. There is

*Medical Record, XXXIV., 250. 1888.

no question now that cases not only of non-pyrexial (without fever) but also of pyrexial phthisis are favorably influenced by open air treatment, which produces a diminution of the troublesome symptoms, such as high temperature and night sweats. It is doubtful whether in England we are sufficiently alive to the advantages of the open-air treatment in phthisis, for though in our palatial hospitals the systems of ventilation and warming have been carried to a high state of perfection and without draught, the exposure of the consumptive patient on a terrace or balcony to the sun's rays and free breezes of heaven would probably be far more beneficial, provided the effects of chill and damp were guarded against."

An English physician† relates the case of a young man who had advanced phthisis pulmonalis with cavities. His case was considered hopeless, and, despair making him reckless, he gave up all treatment, went to the west of Ireland, spent his days shooting over the mountains, taking no precautions against cold, wet, or over-fatigue. The result was he improved and practically recovered, living for many years afterward.

Dr. Neale‡ gives the case of a patient aged 24, with great emaciation, rapid pulse and high temperature, scanty expectoration often highly tinged with blood, and a distinct cavity on right side, the left lung being fairly healthy. Weight 116¼ pounds. The family had had considerable experience with such cases and agreed to the open air treatment. A large room facing south, and in a house in an elevated situation was selected and cleared of all furniture except the bare requisites. The bed was sheltered from draughts, the windows left wide open at the top, the door left open, and other doors and windows communicating were also left open. Woolen for the whole body was worn day and night. Food was given plentifully and medical treatment was given at the same time. In less than two months there was but seldom a slight tinge in the expectoration and the lungs showed evident signs of repair. The weight was then 125 pounds. The patient then went to Australia.

Dr. H. I. Bowditch§ of Boston read an interesting paper at the meeting of the American Climatological Association to show the great value of "open air travel as a curer and preventer of consumption, in the history of a New England family."

The family under consideration is that of which the author is a member. At the age of thirty-five his father was undoubtedly threatened with consumption, having cough, hemoptysis, anorexia, diarrhœa, and general malaise, with fever and great debility. In

*The Health Journal, XI., 220, 1889.

†Medical Press and Circular, XLVII., 408, 1889.

‡British Medical Journal quoted by N. Y. Medical Times.

§Medical News, LV., 343. 1889.

this condition he set out with a friend as his companion and driver, in an open one-horse chaise for a tour through New England. After the first day's travel of twenty-five miles he was so much exhausted and had so much bleeding from the lungs, that the friend was advised to carry him home to die. The travelers, however, were both plucky and kept on, and soon every day's travel brought improved health. In this journey he traveled 748 miles, going "down into Rhode Island, thence by the way of Connecticut up through the hills of western Massachusetts to Albany and Troy, and back through Massachusetts to New Hampshire, Vermont and Maine, and then to the home from which he started."

The benefit which he derived from this journey had proved to him the absolute need he had of regular daily exercise in the open air. Afterward, under daily walks of one and a half to two miles, taken three times daily during thirty years of life, all pulmonary troubles disappeared. He died in 1838, from cancer of the stomach, one lung presenting evidences of an ancient cicatrix at its apex, both being otherwise normal. He was sixty-five years old—i. e., thirty years after the journey. Dr. Bowditch tells us that his father married his cousin, who, after long invalidism died of chronic consumption in 1834. Notwithstanding the strong predisposing influence to lung disease which would result from such a union, six of their eight children either reached old age or adult life and were married and have had children and grandchildren, but not a trace of consumption has appeared in any of these ninety-three persons.

This remarkable immunity from consumption Dr. Bowditch attributes to the fact that his father, having experienced in his own case a vast benefit resulting from constant, regular exercise out of doors, apparently determined that his children should be early instructed in the same course. Daily walks were required as soon as the children were old enough and "if any of us, while attending school were observed to be drooping, or *made the least pretence* even to being not '*exactly well*' he took us from school, and very often sent us to the country to have farm life and out of door play to our heart's content. In consequence of this early instruction all of his descendants have become thoroughly impressed with the advantages of daily walking, of summer vacations in the country, and of camping out, etc., among the mountains. These habits have been transmitted, I think, to his grandchildren in a stronger form, if possible, than he himself had them."

Dr. Bowditch adds: "I submit these facts and thoughts for candid, mature, and *practical consideration* and *use* in the treatment all are called to make of this terrible scourge of all parts of this Union. For my own part I fully believe that many patients now die from want of this open-air treatment. For years I have directed every phthisical patient to walk daily from three to six miles; *never* to stay all day at home unless a *violent storm* be raging. When they are in doubt about going out, owing to 'bad weather,' I direct them to '*solve the doubt*, not by staying in the house, *but by going out.*'"

More than thirty years ago a pioneer movement was made for the more rational treatment of consumption by Dr. Brehmer lately deceased. He established a sanatorium in Goerbersdorf where patients were treated by living as much as possible in the open air, by nutritious diet, and by exercise, all regulated carefully, and under the constant supervision of the physicians. Establishments in which the treatment has followed more or less closely in the line of that laid out by Dr. Brehmer have multiplied, but they are far from being as numerous as they deserve to be. The most celebrated of the other German sanatoria, is the one at Falkenstein on the Taunus Hills, under the management of Dr. Dettweiler, a former patient in the establishment of Dr. Brehmer, and afterward one of his assistants.

As to the value of the kind of treatment of consumptives which we should like to bring more prominently to the notice of our readers Dr. Dettweiler* gives his estimation of its value as follows, based upon his experience as patient and as physician:

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 cannot 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 to 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.

Dr. Meissen† in an able article entitled "Contributions to our Knowledge of Human Phthisis," speaking of the results obtained

*Dr. Kretzschmar in N. Y. Med. Jour., Feb. 18. 1888.

†New York Medical Journal, February 18, 1888.

in 731 cases treated in Dettweiler's sanitarium at Falkenstein, gives the following statistical report:

The 731 cases were taken without selection from the records of the institution. They comprise 105 cases of initial pulmonary phthisis, 442 cases of active pulmonary phthisis, 125 cases of progressive pulmonary phthisis, six cases of florid pulmonary phthisis, fifty-two cases of stationary pulmonary phthisis, and of these, 483 patients were benefited by treatment, and 248 either died or did not improve. As we can hope for successful treatment in initial, active and stationary cases only, the others—florid and progressive phthisis—ought to be excluded from the list, and it would then appear that, of 600 patients with pulmonary phthisis, 483 were improved and 117 were not benefited by treatment, and while of all the patients, 66 per cent. improved and 33 per cent. did not, of those available for treatment 81.5 per cent. improved and 18.5 per cent. did not. Dr. Meissen says further: I have classified the result of treatment simply as "improved," for I do believe that in very few cases we can, after three months' treatment, speak of a positive cure. By 'improved' I mean not only a temporary disappearance of one or more of the unpleasant symptoms of the disease, or a slight improvement in the physical signs, but a decided and lasting gain in every particular, more especially an increase in the weight and in the strength of the patient, a stronger heart's action, and an increased capacity of the lungs, such as a careful and painstaking physician can observe during the duration of the treatment. In the cases reported the average duration of treatment was ninety days; but I should expect still better results if the patient could remain longer, although even then each case must be judged for itself. As an evidence that early treatment is of vital importance, it may be here stated that of 105 patients with initial phthisis 104 improved, and of 442 with active phthisis 334 improved and 108 did not.

The following description of a sanitarium for consumptives in the Adirondack Region, we quote at considerable length from a paper by Dr. Paul H. Kretzschmar*, Brooklyn, N. Y.

The interesting paper read by Dr. Alfred L. Loomis before the Medical Society of the State of New York, in 1879, on "The Adirondack Region as a Therapeutical Agent in the Treatment of Pulmonary Phthisis," and the very favorable results obtained personally by Dr. E. L. Trudeau, during a residence for over ten years in that portion of the Empire State, induced a number of benevolent ladies and gentlemen, under the lead and guide of Dr. Trudeau, to make an effort for the establishment there of an institution for the treatment of phthisical patients of limited means, and, in 1884, a moderately sized main building, two cottages (each of which accommodates two patients) and a stable were erected, and given the name "The Adirondack Cottage Sanitarium." Thanks to the philanthropy and the unselfish work of Dr. E. L. Trudeau, and to

*Medical News, LV., 259. 1889.

the kind support given to him by Dr. Alfred L. Loomis and others, this establishment has grown from year to year, and consists to-day of an enlarged main building—two wings having been added to the original—and eight fully equipped cottages, with three more almost completed, thereby offering facilities for over fifty patients. The feature which distinguishes this from other institutions of the same kind is the fact that the patients are not crowded together in one or two palatial houses, but that they live almost in the open air, in small cottages scattered over quite an area. These cottages are but one story high, elevated from the ground enough to prevent them from becoming damp, with a veranda in front and partly around each; they are supplied with running water and open fire-places. The smaller cottages are planned for two patients, the larger ones for four; the latest of these buildings all have a general sitting-room and a separate one for each patient. The partitions between the bed-rooms are of mason work, and reach to the ceiling, while those dividing the sitting-room from the sleeping department are only seven feet high, thus allowing free circulation of air throughout the whole building.

The location of the Sanitarium is a very pleasant one, about 1750 feet above tide-water, covering an area of over eight acres, about one mile from Saranac lake and seven miles from Paul Smith's; it is situated on a bluff commanding a grand mountain view toward the north and east, well protected from the prevailing eastern winds.

The drainage is simple and efficient. The earth closet system is wholly in use and the material is removed to a distance at frequent and regular intervals. All the water is derived from a spring half a mile distant and is brought through iron pipes to the Sanitarium, reaching the second floor of the main building by gravitation only. All the meals are taken together in the airy drawing-room in the main building; a large supply of pure milk is derived from the cows belonging to the institution, and patients are allowed to drink it *ad libitum* whenever they desire to do so, whether at meals or between them.

Three meals are served daily and the usual bill of fare is about as follows: Breakfast, at 7.30 A. M., consisting of oatmeal or hominy and milk, beefsteak, chops or bacon, potatoes, bread and butter, coffee or milk. Dinner at 1 P. M., soup, fish or fowl, or roast meat, two vegetables, pudding or fruit in season, milk *ad libitum*. Supper, 6.30 P. M., broiled meat or fish, or hashed meat, eggs, bread and butter, porridge, milk, fruit when obtainable. Alcoholic stimulants are very little used, and, contrary to the very pronounced view of all German observers, not at all in febrile cases. When the circulation is not readily excited and where no marked flushing follows their exhibition, they are moderately prescribed, usually in the form of whiskey or beer at meals. Patients are never allowed to use stimulants at their own discretion.

The climate of Saranac lake does not differ materially from that of other parts of the Adirondack wilderness, except that the temperature during the cold season is remarkably low and steady, almost all changes from December to April being below the freezing-point.

Much snow falls, and windless, cold, snowy days are a marked feature of the climate. January of this year was considered especially warm, the highest temperature recorded was 39° above and the lowest was 12° below zero. The rainfall is a little above the average for New York State, amounting to about 55 inches.

The prevailing winds are westerly and southerly, and very windy days are the exception. The lower the mercury falls the less wind there is usually and the dryer the air becomes, so that exceedingly low temperature, such as 20° below zero, is well borne by the patients. There is a dry period during the summer when little rain falls and the days become hot, while almost without an exception the nights are decidedly cool, and even during the hottest season there are but few nights when a blanket is not needed.

With the closest attention to hygienic matters, the main reliance in combating the disease is placed on the climatic influences and the life in the open air, this part of the treatment being carried out most thoroughly. Patients are encouraged to live out of doors and are gradually accustomed to inclemency of weather until they go out without regard to bad weather. Winter and summer they often sit—in winter thoroughly wrapped up—from six to eight hours in the open air. As the fever diminishes they are allowed to exercise, but not until then, and always moderately. The drug treatment is considered as secondary, but is used to meet indications.

The actual results obtained at the Adirondack Cottage Sanitarium are of very gratifying character, and compare favorably with those reported by others. A decided and important effect of treatment and climate is observed in the weight of most of the patients; the average gain for six months' stay at the institution is from nine to thirteen pounds. Perhaps the most remarkable effect has been observed in regard to one of the most frequent and dangerous complications of pulmonary consumption—hæmoptysis. Among eighty-three patients treated at the Sanitarium during the last year not a single hemorrhage occurred, and only four cases have been recorded since the institution began to receive patients four years ago.

Up to the end of 1888, 146 consumptive patients have been treated, and the results have been about as follows: Deaths 4 or not quite 3 per cent.; failed steadily 25, about 17 per cent.; stationary or slightly benfited 38, about 26 per cent.; disease arrested 63 or 43 per cent.; and cured 16 or 11 per cent.

The results of the last year are especially gratifying; of eighty-three patients, two, or 2½ per cent., have died; ten, or 12 per cent., continued to lose ground and returned to their homes; eight, or 10 per cent., have improved; sixteen, or 20 per cent., have been so restored as to be able to resume again their various occupations, and twelve, or 14½ per cent., have been cured. The success in curing over 14 per cent. of consumptives is remarkable, and speaks highly for the sanitarium treatment in general, and especially for that adopted at the Adirondack Cottage Sanitarium. Not to depend upon the patient's memory regarding important instructions, the following short, plain, and decided rules are placed in the hands of every inmate:

Out-of-door Life.—Patients gradually accustom themselves to leading an out-door life, that is, to remaining eight to ten hours in the open air each day. This should be done gradually, and at first the clothing should be heavy and the exposures to cold or inclement weather moderate in duration. Little by little the open-air sittings and walkings are to be increased until the entire day is spent out of doors in all kinds of weather. In stormy weather the sheltered side of the veranda should be used for walking or sitting. When feverish, patients are urged to go out and remain sitting on the verandas well wrapped in suitable clothing.

Exercise.—Violent exercise is injurious. When feverish, patients will do well to make as little exertion as possible. Fatigue, when induced in persons still having active disease, is sure to be followed by loss of appetite, fever, exhaustion, and even sweating. Severe exercise in hot weather is injurious and may be dangerous. Patients will be informed by the physician how much exercise their case requires.

Food.—If unable to eat at the regular meal hours, patients will do well to drink milk every four hours.

Expectoration.—Patients are required always to use the large spittoons in the public rooms and on the verandas, and the pasteboard ones in cottages; the latter should be burned every day in the stoves or fire-places. Expectorating in handkerchiefs or on the floors, or even on the grounds in the immediate vicinity of the buildings, is strictly prohibited.

It has been found that while moist sputum is harmless, when it becomes dried it will rise as dust, and may be inhaled. The above directions are given to guard against this result. Patients for their own welfare and in order to assist their rapid recovery, will strictly observe these rules, and will be liable to dismissal for wilful disobedience in this matter, which involves not only their own welfare but that of others.

Stimulants.—Stimulants are not allowed except under medical advice. No smoking is allowed at any time in the public rooms or on the piazzas. Patients are requested not to smoke at all unless permission is given by the physician.

The actual results obtained at the Saranac Lake Sanitarium place it in the front rank of institutions of similar character, but it stands before the world as unique, worthy of the highest praise, regarding its monetary affairs. Without endowment of any kind, depending simply upon the voluntary contributions of those interested in its work; strengthened and supported by the untiring labor of love of Dr. E. L. Trudeau and his associate, Dr. C. T. Wicker, of Saranac lake, the Sanitarium is a charitable institution of the highest and noblest type. The patients are by no means paupers, but the price for board and medical attendance is fixed at such a low figure, five dollars per week, that people of moderate means are thereby given a chance to enjoy the great benefits of this remarkable institution. The promoters and supporters of the Adirondack Cottage Sanitarium deserve the thanks not only of those who have directly been benefited by a stay there, but of everybody who can appreciate the excellent service done by it to suffering fellow-beings.

In an interesting paper read before one of the societies, and subsequently published, Dr. A. L. Loomis states his belief that the terebinthinate vapors in the evergreen forests possess healing properties for consumptives. He quotes the statement of Ringer that turpentine employed as a medicine enters the blood, and may be detected in the breath, the perspiration and in an altered form in the urine of the patient. The presence of the vapor of turpentine in the pine forests, Dr. Loomis remarks, cannot be doubted, and its "local and constitutional effects" he adds, "are those of a powerful germicide as well as stimulant." Dr. Loomis quotes the opinion of Mr. Kingsett that turpentine, during its oxidation, evolves the peroxide of hydrogen, and therefore by the "oxidation of the terebinthinates, there is produced in extensive pine forests an almost illimitable amount of peroxide of hydrogen, which renders the atmospheres of such forests antiseptic." He believes that the peroxide of hydrogen, so abundantly produced in pine forests "successfully arrests putrefactive processes and septic poisoning," and therefore he recommends residence in the pine forests as one of the most efficient means of relieving the symptoms of tuberculosis and retarding the progress of this fatal malady. At high altitudes, the coniferous or evergreen trees usually predominate, and if the views of Professor Loomis be substantiated by future investigations, it may be that the benefit believed to be obtained by consumptives at high elevations is partly due to the exhalations from these trees.*

THE INFECTIOUSNESS OF DIPHTHERIA.

Diphtheria is undoubtedly more frequently spread by direct contact than by indirect methods, yet that it is transportable upon the clothing of persons who have not had the disease there should be no doubt. The following few cases will serve to illustrate the ways in which the contagion is spread. Similar instances in our own experience will be found in the reports of the local boards of health and in former numbers of the Annual Report of this Board.

In a paper of the past year Dr. Jacobi† refers to a case in which a simple inflammation of the tonsils appeared to have had the diphtheritic inflammation engrafted upon it by the infection preserved two years in an old swab.

The case was at first tonsillitis, the result of exposure to cold. An abcess formed in one tonsil, and, after its rupture and discharge, the child had temporary relief. Up to this time there had been no particular systematic disturbance other than the tonsillar trouble would account for, nor were the voice and breathing affected any different from what would be expected in this disease. A day or so before the abcess broke, his mother thought swabbing the throat with alum water might give him relief, and she proceeded to do this, using a sponge swab that she had used in swabbing the throat in a case of

*Medical News, LVI., 164, 1890.

†Archives of Pediatrics VI., 131, 1889.

diphtheria in her family in Chicago two years ago. Two days after using this swab laryngeal stenosis began to show itself, together with a profound systematic disturbance characteristic of diphtheria, and death resulted in three or four days from septic absorption and obstruction to breathing.

Dr. Downes* narrates the following history of indirect contagion:

Diphtheria had been brought from Halstead to a family at Goldhanger, in the neighborhood of which village no throat illness was then known. Two children were attacked at Goldhanger, of whom one died. On October 19th, their mother took some needle-work to an isolated farmhouse some two miles distant. On October 22d, two boys at the farmhouse sickened with diphtheria. One of them had been in the kitchen at the time of the needle-woman's visit, but had not spoken to her; the other was away at a day-school, a mile distant, in another direction. The needle-work was sent straight to the wash-tub, and the boys never touched it; but the brown paper in which it was wrapped was given, it was believed, to the two boys on the evening of the 19th, and was cut up by them into patterns for their amusement.

De Cresantignes states that in 1884 he was externe to l'Hopital des Enfants Malades in the service of Jules Simon. It was his duty to take notes, examine diphtheritic patients, and watch the cannulæ of tracheotomized cases. When he left the service each day he thoroughly washed his hands, and did not remember having ever soiled his clothes with the blood, mucus, or particles of pseudo-membrane, and at no time did he have symptoms of diphtheria. After the day's work he returned to the rooms occupied by his mother. The mother, without any other exposure, so far as could be ascertained, contracted diphtheria, of which she died. That the disease was conveyed by the garments worn and infected during the hours of service in the pavilion could not be doubted. An interne of l'Hopital de la Pitiè visited the child of one of the employès of the establishment, whom he found with diphtheria, for which he prescribed. He then returned to his father's house, a long distance, on foot, and embraced his parents and sister. On the following day the sister, who had not been exposed to any patient, complained of her throat, and the next day her tonsils were covered with the characteristic pseudo-membrane, and the cervical glands were slightly tumefied. The brother, who had not changed his clothes after visiting the patient, was apparently the the medium of communication, although he himself was not affected with the disease.†

A study was made at Ouillins by Prof. Bard of Lyons, in the latter part of 1888, for the purpose of learning in what ways the infectious germ of diphtheria is transported from person to person.

There were under observation twenty-nine cases, between the eighteenth of September and the end of November. The first case

*Trans. Epidemiological Society of London, VII., 209.

†An. Univ. Med. Sciences, Vol. I., J—18. 1889.

could not be traced to anything in the local surroundings of the village, and the conclusion was forced upon the investigator that it was to direct or mediate contagion which was imported into the place. Such conclusions coincide with the known resisting power of the diphtheritic germ, and the possibility of its prolonged preservation and transportation. Roux and Yersin have shown that the bacillus of Loeffler preserved its virulence after five or six months of culture, and clinical facts have shown that its virulence continued as long as four years. In twenty-six of the twenty-nine cases which were studied, the author was enabled to ascertain the subject who had been the bearer of the contagion, and in most cases could trace the day upon which the contagion was borne. In twenty-five cases there was direct contact between the bearer and the sufferer of contagion ; in one the contagion was mediate. Of the twenty-five direct communications, ten were from brother to brother, three were among neighbors, and twelve at school. The remission of the epidemic followed the closing of the school. In only two of the secondary cases was the dangerous contact suspected, but not demonstrated. The first case developed six secondary ones ; five of the latter were sterile, but the sixth developed another case, and the latter still another. The productive power of other cases has been carefully traced out, and the general conclusion may be drawn that in the development of epidemics of diphtheria, the disease is usually propagated from the persons of the sick to those of the well, usually by direct contagion.*

Lancry† tells us of an outbreak of diphtheria in a school which was undoubtedly started by a single diphtheritic pupil. Of seven pupils who came into pretty close contact with this child all took the disease, while of twelve who associated with her but little if any, all escaped. And yet the space in the school-room which separated the infectious child from the twelve that escaped, was only seven or eight feet, but her position was in a chair of her own near the fireplace and not on the benches common to the other scholars. On the strength of this Lancry argues that the infection of diphtheria does not have much power to diffuse itself through the air, a fact which, if determined to be true, will have a practical significance in the isolation of diphtheria patients. Many authorities believe that the diphtheritic virus has a high degree of power of adhering to articles and thus of becoming transported, but many would agree with Lancry that, if we can be assured against the carrying of the infection by the medium of persons and things, a separation with only a limited intervening space of air, not too confined and stagnant, would be sufficient to give a considerable degree of certainty against the spread

*Arch. of Pediatrics, VII., 318. 1890.

†De la Contagion de la Diphtherie, p. 81.

of the infection. Dumez* has also given a history, somewhat like that of Lancry's, of an outbreak of diphtheria in a school in which the boys and girls upon the same floor were separated by an open space only a few yards wide. Diphtheria prevailed among the girls, but did not affect the boys.

AS TO THE IDENTITY OF CROUP AND DIPHTHERIA.

The relation of croup and diphtheria was investigated by Lennander† by carefully finding out, whenever a case of croup came to his notice, whether cases of diphtheria had also occurred, either previously or subsequently, in the same house or in the neighborhood. In this way he was repeatedly able to connect a case of croup with a case of diphtheria. In all cases in which he tracheotomized for croup, and in which there was no deposit upon the pharynx, he was either able to demonstrate with positiveness a relation to diphtheria, or to show that it was highly probable. In the greater number of cases it was believed that secondary croup also depended upon diphtheria.

QUESTIONABLE CASES.

Dr. Downes in "Notes on Diphtheria,"‡ makes the following remarks on the confusion which exists in England in regard to the nosology (classification) of diphtheria, and what he says is as applicable to this side of the water as it is to the other:

The Registrar-General repeatedly notes and exemplifies the confusion which renders the diphtheria returns "very untrustworthy," save on the broadest scale and with the greatest care. Unfortunately, this chaos involves a very considerable amount of danger to the public health, as some examples taken quite at random from my journals may suffice to show.

Kate B——, a servant, sickened with diphtheria, then locally prevalent in a part of my district, was sent to her home, and died in a village fifteen miles away, also in my district. No diphtheria was then known for many miles around. Within a week, her child, at the same house—an inn—sickened and died also. The mother's death certificate was "diphtheritic croup," the child's "cynanche trachealis." I was aware of the whole matter at the onset, and warned the school authorities of the village. In reply the rector wrote: * * * "As to the disease, we are not very clear. Kate's was said first of all to be diphtheria, then croup, now diphtheritic croup. You evidently consider it infectious. The medical attend-

*An. Univ. Med. Sciences, Vol. I., J. 14, 1889.

†Arch. of Pediatrics, V., 694. 1888.

‡Trans. Epidemiological Society of London, VII., 195.

ant told the mother that the ch ld's complaint is not infectious, that she was not to be afraid. * * * I hope language is not used in any technical sense calculated to mislead the public mind."

Now, we had no more "diphtheria" in this village, but I will tell you what we did have—some "sore-throats"; and in the autumn came a fatal outbreak in the next village, followed early in next year, in the parish beyond, by the following succession of cases, the record of which I take from the Medical Relief and Death-Returns:—

February,	Eliz. B.,	aged 5	"Laryngitis,"	Fatal.
May,	Edith B.,	" 5	"	Fatal.
April,	Francis S.,	" 2	"Glandular swelling."	
May,	Ernest S.,	" 4	"Laryngitis,"	Fatal.
June,	Arthur R.,	" 5	"Sore-throat."	
July,	Emily W.,	" 8	"Diphtheria."	
August,	John W.,	"	"Tonsillitis."	
"	Mary W.,	"	"	
October,	Wm. M.,	" 1	"Laryngitis,"	Fatal.

Yet I was assured on medical authority that, with the exception of Emily W., there had been no diphtheria in this parish.

Again, one of the most fatal outbreaks I have ever witnessed was initiated by the school attendance of two diphtheric children. They had recently lost a little brother, but "only of croup," and their own swelled necks were merely "mumps," though mumps of a kind that left behind it nasal voice and impaired vision. And let me say by the way that very often indeed do I find diphtheria masquerading in this guise.

My able predecessor in office drew a distinction between diphtheria and what he described as "spreading-quinsy," but the medical attendant of cases regarded by Dr. Fox as spreading-quinsy tells me that paralysis subsequently followed in some of them. Again, the term "diphtheritic sore-throat" is becoming to the public as comfortable a euphemism as was, and to a great extent still is, scarlatina—a convenient excuse for shutting one's eyes to unpleasant responsibilities. Finally, a new candidate for popular favor has sprung up with an attractive title, which should become both popular and fashionable. I refer to the so-called "Sandringham sore-throat."

Now, I wish to emphasize my belief that, if we are to understand diphtheria aright, and to cope successfully with its spread, we must, in the first instance, bring ourselves to recognize, or at least to admit, its insidious and often trivial forms, and seek not to split up, but to unify our classification of its varieties.

So trustworthy an authority as Dr. J. Lewis Smith tells us:

Diphtheria will continue to spread and largely increase the aggregate of deaths until stringent measures be employed to prevent its propagation by mild walking cases. Children mildly affected with diphtheria, with little or no complaint of sore throat, are allowed to go abroad. They enter public conveyances, sit among other children in the schools or churches, are allowed to promenade the streets, and call upon their friends. I have in a number of instances seen children with diphtheria sitting among other children in the clinics at Bellevue, and have in many instances traced the disease directly to the schools where one or more of the children had complained of sore throat. Recently, in a case of fatal diphtheria, an only child of about eight years contracted the disease apparently from embracing a playmate in the street who had been allowed to leave the house for the first time after an attack of diphtheria. I see no way to prevent the propagation of diphtheria by these mild cases, except by enforced stringent inspection and surveillance of children by parents, nurses, and teachers During an epidemic of diphtheria, and wherever, as in most of the cities, diphtheria is established as an endemic, children who have the least sore throat should be excluded from the schools and be compelled to remain at home. In order, also, to adopt adequate protective measures, the fact should be recognized that third persons who have had no diphtheritic symptoms and infected apparel or furniture may be the medium of communication.*

FURTHER STUDIES OF THE INFECTIVE AGENT.

In last year's report we summarized briefly the studies of Loeffler, as well as those of Roux and Yersin and others, on the bacteriology of diphtheria. Since that report was written the results of much other work in the same direction have been published. When Loeffler made his first report† on the etiology of diphtheria, he did not claim that he had adduced strict proof that the bacillus which bears his name is the specific cause of diphtheria.

Several circumstances influenced him to take this conservative view of the matter. First, he had not succeeded in finding the bacillus in all of the cases of diphtheria examined; again, he had found a bacillus which he supposed to be the diphtheria bacillus in mouths or throats not affected with diphtheria; finally he had not succeeded in producing true diphtheritic paralysis in any of the animals inoculated with the bacillus.

Since this first report was made, Loeffler has resumed the same line of investigation and gives his latest results and conclusions in a paper just published.‡ In his later researches he has examined twenty-one typical diphtheria cases and the bacillus has not been missing in one. He found the bacillus in microscopic sections made through the diphtheritic exudate into the mucous membrane of the stomach of a child that had died of diphtheria, and also in the false membrane covering the site of a blister applied over the larynx in a

*An. Univ. Med. Sciences, Vol. I., J—18. 1889.

†Mittheilungen aus dem Kaiserl. Gesundheitsamte, II.

‡Deutsche Med. Woch XVI., 81. 1890.

case of diphtheria, and in two cases of diphtheria of the conjunctiva. From cultures made from a case of diphtheria seen early, before medical treatment was begun, almost a pure culture of the bacilli was obtained. At the time this paper was read, the bacilli derived from this source had been carried, for a period of twenty-seven months, through seventy-seven cultivations, and, though their virulence had been frequently tested, it was always found to be undiminished.

Referring to his first paper in the report of the Imperial Board of Health, and to the fact that in three instances he had found, in the mouths and throats of persons not affected with diphtheria, bacteria which at the time he supposed to be identical with the diphtheria bacillus, Loeffler is now convinced that he fell into the error which some other investigators have fallen into since then, of mistaking a pseudo-diphtheria bacillus for the true bacillus of diphtheria. He thinks that there may be several bacilli morphologically very similar, but distinguishable by important differences in the conditions favorable to their growth, and by the fact that the pseudo-bacilli are not virulent to the guinea-pig. In numerous examinations of the secretions from the mouth and throat of well persons, and persons with other diseases of the throat than diphtheria, he has never again succeeded in finding the bacillus.

In his later work Loeffler has succeeded, as some other investigators have, in producing an apparently real diphtheritic paralysis of animals as a sequel of the infection by inoculation.

After the inoculation of guinea-pigs with the bacilli of diphtheria, notwithstanding the grave changes found in the kidneys and in the pleural cavity, the bacilli are never discoverable in the internal organs. Loeffler therefore reasons that the bacillus in its localized growth must produce a poison very deleterious in its action, especially upon the blood vessels. He therefore sought to isolate this poison and succeeded in doing so. He found that the poison was of the nature of an enzyme, and that the older the culture the more of the poison it contained. Injected into animals, it produced symptoms identical or similar to those produced by the inoculation of the bacilli, and in dogs it often caused paralysis in those animals that survived. Rats and mice, which show an immunity against the bacilli, were also immune against the isolated poisonous principle. Sunlight and the free exposure to the air diminished the virulence of the poison.

As to the duration of the life of the diphtheria bacillus, Loeffler found that when dried on silken threads in the dessicator, the bacilli grew very luxuriantly after thirty days; after forty-eight days, the number of the colonies was somewhat diminished, and after sixty, seventy-one, and 101 days a few colonies still developed. He was not able to test the duration of their vitality longer on account of using up his stock of threads.

During the past year Roux and Yersin have continued their studies and have concluded that the poison secreted by the diphtheria bacillus resembles diastase in several of its properties. The diphtheritic poison, so potent when it is introduced under the skin, may be taken by the mouth, in large quantities by guinea-pigs and pigeons without much apparent inconvenience to them. Having shown the numerous points of similarity between the diphtheritic poison and the diastases and venoms, Roux and Yersin remarked that the extreme toxicity of the poison secreted by the bacillus might lead one to regard the bacillus itself as very virulent, but that, as a matter of fact, the contrary is true. The toxicity of a culture fluid does not express the virulence of its microbe. The energetic toxic power of the diphtheritic poison, which even in very small doses and after it has been kept a long time produces the most terrible results, makes it imperative that the physician should interfere at the beginning of the formation of the false membrane, and before sufficient time has elapsed for the bacillus to secrete a sufficient quantity of poison to do its fatal work, for in diphtheria, contrary to that which occurs in many infectious diseases, infection is not produced by the invasion of the microbe into the tissues, but by diffusion into the entire organism of a poison secreted upon a mucous membrane which may be only slightly eroded.*

Dr. Escherich† has communicated a preliminary report of studies as to the cause of diphtheria. He investigated twenty-two cases of epidemic diphtheria of various grades of severity to determine the character of the bacteria present in the secretions of the mucous membranes and in the false membrane. His method of precedure was merely to touch the end of a sterilized platinum wire to the affected membrane, or to lightly bore it into the false membrane, and then to transfer to the culture media the almost invisibly small quantity of matter adhering to the end of the platinum needle. The colo-

*Arch. of Pediatrics, VII., 315. 1890.

†Centr. fur Bakteriologie und Parasitenkunde, VII., 8, 1890.

nies which developed within twenty-four hours were sometimes found to consist of pure cultures of the Loeffler bacillus (bacillus of diphtheria). In many other cases, however, other bacteria developed within the second twenty-four hours. The diphtheria bacillus was inoculated upon animals, and with guinea-pigs, one and a half cubic centimeters of a twenty-four-hour bouillon culture sufficed to cause death within from twenty-four to forty-eight hours. Young dogs were found to be very susceptible to even small quantities of the culture. Injected under the skin, they died from it in from two to three days, with enormous hæmorrhagic œdema. Inoculated in the windpipe, false membrane was formed, accompanied with croup-like difficulty of breathing, and death in most of the cases.

In the twenty-two cases of diphtheria, the bacillus of Loeffler was found after the first inoculation in nineteen, and after the second trial in the twentieth case. In the two cases where negative results were obtained only a single test was made in each. In one of these, it was a case of so-called chronic diphtheria. In the twenty cases in which the bacillus was found, it was tested upon animals in fourteen cases, and its virulence was shown in all. In two cases of throat diphtheria which ended in recovery, fresh cultures were made every second day until complete recovery, and the virulence of the bacillus was found not to diminish in the least as convalescence set in, neither was there any difference in the virulence of the bacillus derived from severe or mild cases of diphtheria.

As "control" experiments, he examined a series of cases of sore throat accompanied with fever, a part of which had small fibrinous exudations in the crypts of the tonsils. In none of these was the bacillus of Loeffler found. The author considers, however, as the most convincing "control," the results of the every-two-day examinations of cases until complete recovery and afterward. He brought out the fact that the bacillus may persist in the throat from one to three days after all false membrane has disappeared, and he asks the question whether it may not be possible to have a diphtheria without false membrane, as it is to have a scarlet fever without rash.

Zarniko* making use of the material from the medical clinic of Kiel, found the Klebs-Löffler bacillus in eighteen out of twenty cases of diphtheria. In artificial cultures the bacillus grew at temperatures between 66° F. and 107.6° F.; most readily at from 91° F. to 98.6° F. It was found that a temperature of 140° F. maintained

*Centr. fur Bak. u. Par. VI., 227. 1889.

for ten minutes, destroyed the bacillus. He could in no case make out the presence of spores. Zarniko also examined eleven throats affected with non-diphtheritic inflammations A large number of colonies were examined, but in no case was the diphtheria bacillus found. He examined also the mucous membranes of eighteen throats in persons with various diseases, with the same negative results. On the other hand, in a case of rheumatism, he found a bacillus probably identical with Loeffler's pseudo-diphtheria bacillus but differing from the diphtheria bacillus in that it was not virulent to guinea-pigs, as well as in other respects.

PREVENTIVE MEASURES.

In Boston where diphtheria has been quite prevalent of late years, the opinion has been expressed by the municipal board more than once that the prevalence of the disease in that city is due in large part to mild and often unrecognized cases of diphtheria. In his report for the year 1889, Dr. Durgin, chairman of the board says:

In order to effectually deal with an epidemic of diphtheria, the following things are absolutely necessary: First, a good hospital, this the city has; second, what might be termed a house of refuge, where all who had been exposed to the disease might be placed for a reasonable time; third, a building in which convalescents could be placed during the process of disinfection of their houses; fourth, a careful medical supervision of the schools, for it is an undisputed fact that many children attend school while they are suffering from the disease in a mild form, and communicate diphtheria to other children; fifth, power to remove these cases in tenement houses, not only the legal power, but also that which is of fully as great importance, the moral support of the community; sixth, the prompt report of cases, not only of diphtheria, but also of membraneous croup, which is conceded by the best medical authorities of the present day to be the same as diphtheria; seventh, the prohibition of public funerals in cases of diphtheria. The report of cases is evaded in many ways by using the term "laryngitis," and various other terms, which, if not absolutely incorrect, serve to mislead, not only the friends of the patient, but also the general public.

* * * In regard to the removal of patients, it is neither desirable or important to send all indiscriminately to a hospital, for in many instances the patient can be isolated at home, or the other members of the family can be sent to some institution under the control of the board of health. A patient can be perfectly isolated in a house occupied by only one family. Isolation is also comparatively easy in one of the modern apartment houses, but in the ordinary dwelling-house, occupied by two or more families, isolation is practically impossible. The history of the course of diphtheria the past two years demonstrates this.

NEED OF REST AFTER DIPHTHERIA.

It is generally understood by intelligent people that diphtheria is a treacherous disease, but if the importance of rest and the wisdom of prolonging the period of convalescence were generally acknowledged, many lives might be saved that are now lost, sometimes several weeks after the patient is thought to have recovered. Dr. Earl* of Chicago has spoken as follows in regard to this subject:

It is probable that a larger number of sudden and unexpected deaths take place after diphtheria than follows any other disease. And yet we are acquainted with medical men who do not believe it worth while to isolate those sick with this malady, and think their responsibility ceases when the white spots commence to disappear in the throat. The following is a hypothetical case, but is there a gentleman present who has not seen one or more which corresponds with it?

A. B. C., aged six years, was taken with a mild attack of diphtheria, which yielded easily to treatment in five days. The spots on the tonsils had nearly disappeared, and I discontinued my visits. Ten days after, I was hastily summoned, and, upon my arrival, found the child dead. The parents informed me that the little one had made an excellent recovery from the diphtheria, and, although somewhat weak and easily tired, had been playing around the house. "A short time before we summoned you, we noticed that the little one was quite pale, and complained of a little pain around her heart. She perspired freely, however, and we thought nothing of the pallor; but her limbs began to get blue and her breath short, and so we sent for you."

Not all cases are as pronounced and sudden as the one narrated but death comes. Sometimes we have premonitory symptoms, if we will note them, and if we will take any sort of notice, death may be averted in some cases. I have recently ordered a young woman to maintain the horizontal position for ten weeks and during some of this time her heart was so irregular and weak that its pulsations could not be counted. I saw a case recently in consultation with my colleague, Professor Quine, simply to add my testimony to his, that the only safety to a young girl who had passed through a mild diphtheria was in bed. Her heart was slow and weak, and the extremities were a little subnormal as regards temperature. The people were amazed when I told them that the child should be kept in bed for at least four weeks, and possibly a longer period.

Two months ago I saw a case, in consultation, in one of our suburban towns (we have no suburbs now, we have taken them all in). An adult had only a moderate pharyngeal diphtheria, but his lungs were involved, probably a catarrhal pneumonia (secondary). He was very weak, but his recovery could be looked for, although a long time must elapse before he could resume work as a bank clerk. His

*Archives of Pediatrics. VI., 879. 1889.

attending physician had given him excellent advice, but everybody was clamoring for a speedy cure. It is sometimes very difficult to make the people understand the necessity of carrying out details, particularly those which the profession have not grasped and fully realized. Notwithstanding that this young man was kept in the lying position, fed with food whose assimilation was made as easy as possible, nourished by rectum and under his skin, life maintained by general, cerebral and cardiac tonics and diffusable stimulants, notwithstanding all this he died. In some families, where they are willing to go to the trouble, I am in the habit of keeping all diphtheritic patients in bed two or three weeks after all symptoms subside. This may not be necessary, but it is safe. It is absolutely demanded, however, where symptoms of paralysis are present, and should be insisted upon till every sign denoting it has disappeared.

TYPHOID FEVER.

In this department of the Fourth Annual Report an explanation was given of the two principal theories that prevail in regard to the causation of typhoid fever. In accordance with one, the "water theory," infection occurs, at least in the great majority of cases, through the medium of drinking water. The views held for sometime by most of the American and English physicians have been in accordance with this theory. The other, the "ground theory," elaborated and ably upheld by Pettenkofer of Munich, has, until recently, met the approval of the majority of Continental medical and sanitary authorities. This class has held that the typhoid fever germ, dejected from the fever patient, is not at first infectious, but must needs reach the earth for its development, subsequently rising into the atmosphere and infecting when inhaled. As the believers in the Pettenkofer theory have denied the transmissibility of the typhoid infection through the medium of drinking water, so now, perhaps, some of the adherents of the water theory go too far in dogmatically asserting that typhoid fever is never communicated through the medium of the atmosphere, though we are not so certain that the ends of public hygiene might not be all the better served by this exclusive doctrine, since we believe that the general public needs especially to have strengthened its hold on the idea that polluted water is by far the most frequent source of typhoid infection, even water that to the senses appears all right. Late scientific studies into the causation of typhoid fever have, on the one hand, served to support and confirm the results of practical observations as to the water origin of the disease, and, on the other hand, have given a modicum of consolation to the ground theory in a modified form. For a summary of some of the most important work in this field, the reader is referred to the following pages:

POLLUTED WATER AND TYPHOID FEVER.

The experience in Paris during the last few years in the use of polluted water, is interesting and instructive. The ordinary supply of the city for drinking purposes is of good quality, but during the dry seasons it is insufficient, therefore it is sometimes found necessary to resort temporarily to the use of river wa er. When this is unavoidable, with a fine sense of justice, the water department turns the river water, drawn from the Seine, first on one arrondissement for a while and then on another, but giving no notice when the bad water is coming. Vallin,* in a recent communication, has given further information as to the results of this practice.

In 1887, Chantemesse and Widal demonstrated that the distribution of the water of the Seine in Paris gave rise, three or four weeks after the beginning of the distribution, to an increased number of cases of typhoid fever in those districts of the city in which the river water was turned on. To show that the excess in the typhoid prevalence was not due to seasonal influences, these writers call attention to the fact that the same excessive prevalence followed the turning on of the polluted water in January 1887, on account of the breaking of the main of the drinking water supply.

In 1888 M. Chantemesse continued his researches in the same direction and also in 1889. In 1888 the abundance of rain prevented the necessity of a resort to the river water and typhoid fever that year was more rare than it had been for thirty years before.

In 1889 it was otherwise; from May 25th to June 19th the water of the Seine was distributed in place of the spring water to the 13th, 14th, 16th, and 9th wards, comprising a population in the neighborhood of 500,000 inhabitants. The admission of typhoid fever cases into the Parisian hospitals vacillated before the change between fifteen and thirty cases a week. These figures augmented very lightly but regularly during all of the month of June and reached the number of forty admissions per week by June 16th. But after this period of infection and incubation it is seen that the numbers rapidly increased. From July 7th to the 13th there were 73 admissions, then 53, 127, 100, 120, 129, 73, for the weeks ending with August 24th.

Thus it is seen the curious coincidence of 1887 was reproduced, and it would have been still more marked if, to the complete and typical cases of typhoid fever, were added the cases of febrile

*Revue D'Hygiene, XI., 1049, Dec. 1889.

derangement of the stomach (*d'embarras gastrique febrile*), which Chantemesse considers, with Kelsch and Kiener, as cases of abortive typhoid fever, and of which the prevalence was much greater in the ward where the river water was distributed.

Dr. Schneider* gives some interesting facts in regard to the use of river water in 1889 upon the troops in the Parisian garrison. When it has been found necessary to substitute the river water in the place of the usual good supply, the consequences have invariably been the same as those suffered by the civil population from the same cause. For example:

In the Penthièvre Barrack, there were no cases of typhoid fever in June, there were two in July, and one in August. From August 13th to September 2d the water of the Seine was turned on in the place of that from the Vanne. Then twenty-one cases in September.

In the Barrack of Chateau d' Eau, there had been no cases in May and June. The river water was put on from June 15th to July 3d. Then fifteen cases in July and August.

In the Reuilly Barrack, only five cases in the first six months of 1889. River water turned on from July 4th to the 23d. Result, ten cases in July and August.

In all the barracks of Paris, there were only ten cases of typhoid fever in October. From the 31st of this month to November 5th the river water is put on. From the 1st to the 21st of November there were only fourteen cases, but in three weeks from the time the water was changed, there was a serious outbreak. From November 22d to the 30th, there were thirty-four cases, and forty-one from December 1st to the 12th.

Another remarkable fact incriminating the river water is that six barracks, which did not receive the river water from October 31st to November 5th, had only a single case from November 22d to December 12th.

The city of Vienna was furnished with a good and pure supply of drinking water in 1874, taken from elevated springs at a distance from the city. After this new supply had been put into the houses pretty generally, there was a marked diminution in the rate of prevalence of typhoid fever, so much so, that of late years the professors in the General Hospital have remarked that a case of typhoid fever in the institution had become something of a rarity. A final and convincing proof that the change in the water supply was the cause of the change in the typhoid prevalence was furnished by an epidemic in 1877, which followed the partial substitution of the river water for the spring water in certain quarters. The epidemic was located in the districts provided with the Danube water.

*Revue D'Hygiene XII., 25. 1890.

The number of patients in this quarter was at the rate of 21.5 while in those provided with water from the spring it was 3.8.*

In the latter part of the summer of 1885, an outbreak of typhoid fever of considerable magnitude occurred among the troops of the German city of Altona, a suburb of Hamburg, and lying just below the larger city on the river Elbe. Pfuhl, who investigated the outbreak, came to the conclusion that the men received the infection while bathing. The bathing establishment is situated on the river and the water is grossly polluted. He thinks that in diving or in some other way some of the river water was accidentally swallowed, giving rise to the infection. When the bathing was stopped the outbreak ceased forthwith.†

The danger from water contaminated with the stools of typhoid fever patients was well shown on the Ohio river in 1887. From Bellaire, to near the mouth of the Ohio river, a distance of nearly 800 miles, almost every town obtaining its water supply from the river was more or less affected with typhoid fever. Drs. Rushford and Cameron of the Bacteriological Laboratory of the Medical College of Ohio, demonstrated before the Cincinnati Academy of Medicine the bacilli of typhoid fever in the water of the river.‡

Dr. Cyrus Edson§ thinks that typhoid fever is never communicated through the medium of the atmosphere, that it never originates *de novo*, and that the causes of the spreading of the disease are, in the order of their frequency, infected water, infected milk, infected ice, digital transportation, and infected meat, and believes that, "if in every case of typhoid fever the stools and the bedding were effectually disinfected, and the person of the patient after convalescence was also disinfected, typhoid fever would soon cease to exist."

Brouardel, as quoted by Dr. Theobald Smith, says:

Experience has taught us that it is the large cities which perpetuate the epidemics of typhoid fever and from which the transmissions of this disease radiate. It may be burdensome to obtain pure water and distribute it to a community, but it is possible. Has it not been said repeatedly that nothing costs so dearly as an epidemic? Is it not true that a malady which kills one or two thousand persons every year strikes, from an economic point of view, a population more cruelly than the taxes, which might have spared the lives of several thousand from fifteen to twenty-five years old, cut down at an age at which they have cost so much and returned so little to their State? If we share these views, we should

*An. Univ. Med. Sciences, Vol. I., H-14. 1889.

†Uffelmann's Supplement, VI., 187. (1888.)

‡Dr. Johnson in Brooklyn Medical Journal, IV., 210. 1890.

§New York Medical Record, XXXV., 9. 1889.

make an energetic effort in every country, proclaim the good fight, the preservation of human life. Our proofs are sufficient. The authorities need only to be convinced.

Uffelmann cites an instance in which Pettenkofer's theory of the ground origin of typhoid fever would apparently not hold. An outbreak of typhoid fever occurred among the soldiers in the barracks of Oschatv. The building rested upon an impervious rock covered with an impervious stratum of clay. Further safety was secured by a layer of cement beneath the building. The water supply was derived from a brook which passed through three villages before it reached the barracks. Typhoid fever first appeared in these villages and the dejec ions of the patients were thrown out upon manure heaps or upon the overhanging bank of the brook, where the rain must have washed the infection into the water course. Later the disease broke out in the barracks. An importation from the villages could be excluded as well as from the city, for in the latter place there had been only one case of typhoid fever securely isolated in the poor-house.*

DIGITAL TRANSMISSION OF TYPHOID FEVER.

Dr. Roberts Bartholow† of the Jefferson Medical College, Philadelphia, referring to the subject of the digital transmission of typhoid infection, says:

"The unfortunate results of ignorance are well exhibited in some of the modes in which disease germs get into human food. Nurses, attendants and families of the sick, having no knowledge of the subject and of uncleanly habits, will carry under the finger nails, or in the crevices of the skin, disease germs and spores which may be attached to bread or other foods used by a household. Such large bodies relatively as the ova of the tapeworm have been thus conveyed, self-infection may thus occur, and general infection of a community may have its original source in the same way with entire facility."

THE TYPHOID BACILLUS IN THE SOIL, FILTH, ETC.

Uffelmann‡ refers to the practical importance of the question whether the infection of typhoid fever can retain its vitality for any great length of time in masses of decomposing filth such as are found in privy vaults, manure heaps, and other places where it is often

*Wiener Med. Presse, XXIX., 1354.

†Twelfth An. Rpt. State Bd. of Health of Wis., 141.

‡Centralblatt für Bak. u. Par. V-, 497. 1889.

thrown, and he cites several personal observations which make it evident that it can for weeks, and even months, and perhaps for years retain its virulent qualities. He relates that in the earlier years, of his practice he observed a localized outbreak of typhoid fever in a small village in which three laborers all, nearly at the same time, came down with typhoid fever. A little later a few single cases occurred in the same houses. These three laborers had, about six days before their sickness, removed and hauled away a manure heap upon which, one year before, the discharges from the bowels of two typhoid fever patients were emptied without disinfection, and upon which, since then, the excrement of men and animals had been thrown. In the meantime there had been no other cases of typhoid fever in the village.

He also relates that he saw in 1875 two cases of typhoid fever in which sickness began about a week after the persons had been engaged in cleaning out a privy vault into which, twelve weeks before, the dejections from a typhoid fever patient had been thrown without disinfection. In this place also there had been no intervening cases of typhoid fever.

Uffelmann refers also to a case of Finkler's in which typhoid fever followed the removing of a manure heap into which, nine months before, a portion of a mattress badly soiled with typhoid dejections had been thrown.

Dr. Chour,* a Russian military surgeon, tells about two regiments of infantry stationed at Jitomir and receiving the same water supply suffering unequally from typhoid fever. One regiment, the 127th, furnished a sickness-rate of 9.6 per 1,000 in 1885, and of 3.2 per 1,000 in 1886. The other, the regiment of Kourk, presented, during the same period, a sickness-rate from typhoid fever much more elevated, particularly among the men lodged in the Hemmermann Barrack. In this barrack the sickness-rate from typhoid was as high as 50 per 1.000, and even 155 per 1,000 in one of the companies. The head of the medical department of that corps ordered the evacuation of the rooms occupied by the fourth company and the energetic disinfection, not only of the walls and the floors, but also of the clothing and bedding. These were submitted to steam disinfection, the floors were taken up, the spaces beneath them were saturated with the five per cent. solution of carbolic acid, and, finally all the wood-work was repainted. After the execution of these radical measures, the fourth company re-occupied its rooms and its sickness-rate from typhoid was reduced to 1.7 per 1,000 in 1887, and to 0 in 1888.

*Revue D'Hygiene, XII., 72. 1890.

Meanwhile in the rooms of this barrack which had not been submitted to disinfection, the prevalence of typhoid fever persisted and gave a sickness-rate of 22 per 1,000 in 1887, and of 33 in 1888.

At this epoch the dust from the floor and from the space beneath the floor was submitted to a bacteriological examination and was found to be exceedingly rich, 14,000,000 in each gramme, and among others, the presence of the typhoid bacillus was demonstrated. The infectious rooms were then quickly evacuated and the men were camped in the neighboring woods. Three cases appeared within the period of incubation and after this there was a complete cessation of the prevalence of the disease.

The discovery of the bacillus of typhoid fever in the dust of floors and sub-floor spaces is not an isolated fact. Tryde and Salomonsen in 1884 discovered the typhoid bacillus, not only in the soil, but also beneath the floors of the barracks of Copenhagen where typhoid fever had been prevalent. Utpodel at Augsburg, Birch-Hirschfeld in Leipzig have also found the bacillus under similar circumstances.

Dr. E. W. Perry of Stetson communicates the following histories of cases of typhoid fever, two of which were supposed to have received the infection from an old privy vault, and the third from the rubbish of an ancient building.

A. B., thirty-eight years old, a carpenter, and C. D., a young man, his apprentice, were at work repairing buildings, and during the work it became necessary to tear down and move a portion of an old building in which was situated the privy vault. These two men did this work on a very hot, sultry day. The smell of the old vault was horrible, but they persevered, and raised and put the new part in proper shape. In less than three weeks the young man came down with typhoid fever and had a long, but not very severe, run of sickness, finally recovering. A. B. sickened later with typhoid fever in a severe form and died after two and a half weeks' sickness. A. B. was the older, stronger and more active of the two and did more of the shoveling, and sweat profusely while at his work.

E. F., a carpenter was engaged in tearing down and rebuilding some very old and filthy buildings, and, in a short time after, became sick, and for six weeks or more had a "slow fever," so-called, then gradually recovered. I believe it was a case of mild typhoid, and I now recall that he complained of the bad smell he was forced to work in while on these old buildings.

Uffelmann* studied the life of the typhoid bacillus by mixing a pure culture of this micro-organism with earth taken from the superficial layer of garden soil which had been dried in the sun. Polluting the mixture with fluid and solid excreta and triturating the mass in a mortar, the mixture was sprinkled at intervals with rain water and kept at varying temperatures from 32° to 73.4° F. Once every

*Centralblatt für Bak. und Par. V., 502. 1889.

month samples from it were examined bacteriologically for the typhoid bacillus, and every sample contained quite a high number of the bacilli, and at the time this communication was made, at the end of five and a half months, there had been some increase in the plentifulness of the typhoid bacilli.

The same author investigated the fate of the typhoid bacillus in fecal masses, as in privy vaults. Observation has shown that the common putrefaction bacteria rapidly destroy some disease producing bacteria, but Uffelmann's observations do not show that this is true as regards the typhoid bacillus. In some of his experiments the life of the bacillus, when kept at temperatures between 62.6° and 72.5° F., in mixtures of solid and liquid excreta, was preserved 121 days, and when kept at a temperature below 44° F., the bacillus retained its vitality from 66 to 116 days. There was apparently no difference in the action upon the bacteria whether the excreta was fresh or was a portion of the old contents of a privy vault.

Uffelmann also studied the life of the bacillus of cholera under similar conditions and found that it was much more brief, extending to not more than three or four days at most.

Grancher and Deschamps* investigated the power of the typhoid bacillus to penetrate the soil of irrigation fields. Their principal conclusions are, that it does not ordinarily descend farther than forty or fifty cm. (sixteen or twenty inches) ; that at this depth (sixteen to twenty inches) it retains its vitality a long while without being destroyed by the other bacteria in the soil; that it does not penetrate into the substance of vegetables grown in the soil.

Twenty-two samples of earth, sand, and dirt were examined by Holz† for the typhoid bacilli, including sand swept from the floors of rooms where there were cases of typhoid fever, dirt from between and beneath the flooring of rooms where there were cases of typhoid fever, and earth from walks, play-grounds, gardens, etc., but in none of these was the bacillus of typhoid fever found. He found, however, in quite a large number of these samples, as well as in samples of water, a bacillus resembling somewhat the specific germ of typhoid fever but differentiated from it with certainty.

*Giornale della Reale Soc. Ital. D'Igiene, XI., 651. 1889.
†Zeitschrift für Hygiene, VIII., 143. 1890.

FURTHER STUDIES OF THE BACILLUS OF TYPHOID FEVER.

Vilchur* of St. Petersburg, made a series of studies covering a period of two years, as to the etiology and clinical bacteriology of typhoid fever. In the examination of twenty-eight cases he found that the specific bacillus never appeared in the dejections before the tenth day, but that after that it is almost constantly to be recognized. As to their number, they are never numerous, usually not more than one to twenty-five or thirty of other bacteria found in the intestines. He could discover no relation between the severity of the disease and the number of bacilli present.

In thirty-five cases the blood was examined microscopically, as well as by cultures, but the bacillus of Eberth was found but once, and it is interesting to note that this was on the eighth day of the disease, and that examination of the stools on the same day gave only negative results. On the other hand, the bacillus was absent from the blood on the fourteenth day, but present in the stools. The blood for examination was not taken from a rose-spot, but from the skin of the arm. Vilchur inoculated sixteen rabbits in various ways, but in none were anatomical changes produced which he thought to be characteristic of typhoid fever.

In the cases of typhoid fever examined by Karlinski† the bacillus was found in the fæces in all, but in none before the ninth day, and in the largest number of cases, not before the fourteenth day of sickness. Agreeing with other observers, he found the number of typhoid bacilli small as compared with the other micro-organisms in the stools. With the sinking of the temperature and the disappearance of the diarrhœa, the bacilli rapidly disappear. In twenty-eight cases, the bacillus could be found in none later than the twenty-third day. In one single case that suffered a relapse, the bacillus, after its complete disappearance, reappeared on the fiftieth day.

The stools received and kept in sterilized jars at various temperatures from 46.4° to 89.6° F., did not preserve the typhoid bacillus longer than three months. While the number of typhoid bacilli never in but two cases, exceeded 100 per cubic centimeter in the fresh stool. In some, after standing some time, the number of typhoid bacilli had increased to 1,800 colonies for each cubic centi-

*Centr. fur Bak. u. Par. VII., 280. 1890.

†Centr. f. Bak. u. Par. VI., 65. 1889.

meter. The absence or presence of certain other bacteria had a great influence upon the life of the typhoid bacillus.

The typhoid bacilli in stools, added to the liquid drainage from a privy, were found to have entirely disappeared within forty-eight hours, although many plate cultures were examined. The sewage, before the addition of the specific bacilli, contained 1,500,000 bacteria and had a slight acid reaction. Some of the same sewage, sterilized, preserved the typhoid bacilli a month, though not in large numbers.

Mixed with a portion of the contents of a privy vault, alkaline in reaction, the bacilli diminished in numbers and disappeared in forty-five days.

Mixed with river water in a large flask and kept at a temperature of from 52.7° to 61.7° F., their numbers gradually diminished and none could be found after ninety-six hours. In cistern water at 57° F., they had disappeared in seventy-two hours.

In other experiments with a mixture of typhoid excreta and normal stool, the bacillus was preserved more than one hundred days.

Typhoid stools mixed with sterilized garden earth, preserved the bacilli at least three months at variable temperatures, although the earth had become entirely dry. Mixed in the same way with earth but sprinkled with rain water every five days, the baccilli endured only thirty-one days; in river mud, only three weeks; in dried typhoid stool, over one month.

Karlinski at the suggestion of Pettenkofer sought to determine the fate of the typhoid bacillus when added to well water. He made use of a well in the yard of the Hygienic Institute in Munich, by adding a sufficient quantity of the bacilli to the water and making daily plate cultures with quantities of the water.

The water of the well, before the addition of typhoid bacilli, contained from 730 to 1,120 bacteria of from five to eight different kinds. Five litres of bouillon, of which one cubic centimeter contained seventy-two million of typhoid bacilli, were added to the water. Two hours later one cubic centimeter of the water was found to contain 500,000 typhoid germs; on the next day 130,000; on the third day 18,000; fourth day 9,400; seventh day 200; eleventh day five; and on the fourteenth day the water had returned to the same condition as before the experiment. The water of the well was stirred up each time before the sample was taken.

As this report is going through the press, a communication comes to hand giving the results of some experimental studies on the typhoid bacillus made by Holtz* in the Hygienic Institute at Greifswald, at the suggestion of Professor Loeffler. By the use of a potato gelatin with the addition of a slight quantity of carbolic acid, he has apparently an advantageous method of excluding colonies of unsought for bacteria and of recognizing the bacillus of typhoid fever. Holz shows that the life of this bacillus in water is longer than is admitted by most observers. In well water inoculated with typhoid bacilli, these germs could be demonstrated with certainty as late as the eighteenth day, and in the highly polluted water of a drain similarly inoculated the bacilli were found as late as the fourteenth day.

Dr. W. Hesse† has tested a great variety of food stuffs, cooked and uncooked, as they are found in the kitchen, to determine their suitability as culture media for the bacteria of typhoid fever and cholera. After sterilization they were inoculated with the germs of these diseases, each species of bacterium in reagent glasses by itself. Testing the contents of the glasses four or five weeks after inoculation, he found that the specific bacteria were alive in by far the greater number. Thirty food substances were used, and among them the typhoid fever bacilli had died out in only hydrant water, string beans, cow's milk cheese, and mushrooms. The cholera bacilli did not do so well, having died out in nine substances. These results show that nearly all of the substances tested are good media for the growth of the bacilli of typhoid fever and cholera.

DO ANIMALS HAVE TYPHOID FEVER?

Dr. Roberts‡ has published an interesting account of what he believes to have been an epizoötic of typhoid fever among the dogs of a town in India. In a large number of post-mortem examinations of dogs, victims of the disease, he found a combination of the following lesions: spleen increased in size, mesenteric glands inflamed and enlarged, large oval ulcers in the ileum, enlargement of Peyer's patches, points of submucous hæmorrhage, etc. These dogs had suffered a continued fever, diarrhœa, and other characteristic symptoms of typhoid fever. Dr. Roberts believes that if future observations

*Zeitschrift für Hygiene, VIII., 143. 1890.
†Zeitschrift für Hygiene, V., 527. 1889.
‡La Salute Pubblica II, 280. 1889. From Indian Medical Gazette.

confirm the truth of his conclusions, that dogs may have typhoid fever, this fact may help to explain the continued prevalence of the disease in some places.

Dr. Serres had already noted the existence of typhoid fever among monkeys, dogs and cats, and subsequently had an opportunity to observe an outbreak of typhoid fever among the monkeys of the Museum of Natural Sciences in Paris.*

Dr. Rackford† of the Medical College of Ohio experimented upon rabbits by pouring cultures of the typhoid bacillus into the stomach after an intra-peritoneal injection of morphia had been given, and a dose of bicarbonate of soda by the stomach. Though the production of this disease was not the object of the investigation, the experimenter believes that one animal died of typhoid fever. This animal remained well for a few days, and then had increased temperature and diarrhœa. Death followed on the thirteenth day after the inoculation. "Peyer's glands throughout the ileum projected normally above the surface of the mucous membrane, and were much injected; one patch, about six inches from the caecum, was slightly broken down in its center, apparently a beginning ulceration. Some twelve or fifteen ulcers were found in the small intestine. They were chiefly located in the ileum. These ulcers were clearly defined, circular, deeply injected, about one-sixth or one-eighth of an inch in diameter, and situated opposite the mesenteric attachment." The typhoid bacillus was recovered from the spleen by means of plate and potato cultures and sections of the kidney and spleen contained bacilli corresponding in size and shape to the typhoid bacilli. Two of the other animals also had ulcers in the ileum.

The primary object of the experiment was to determine the physiological effects of typhoid ptomaines formed in various food stuffs. Cultures were made with peptonized milk, peptonized beef, peptonized brain and bouillon, and beef peptonoids. The conclusions of the doctor are:

1st. The bacillus typhosus of Koch and Eberth is the cause of typhoid fever.

2nd. The physiological and poisonous properties of the ptomaines formed by this bacillus will depend in great part upon the character of the food material on which it is growing.

3. Milk is the best diet in typhoid fever, since the ptomaines produced in it do not cause either fever or nervous symptoms.

*La Salute Pubblica II, 280. 1889.

†Medical News, LV., 453. 1889.

THE INFECTION OF SCARLET FEVER.

The following extracts give information in regard to the characteristics of the infection of scarlet fever, of a kind which is of practical value in connection with the adoption of measures for the prevention and restriction of this disease.

Dr. Jacobi,* Professor of Diseases of Children in the College of Physicians and Surgeons, New York, writes as follows:

There is no reason to believe in a primary origin of scarlatina. The efficacy of the virus is so persistent, and it clings so long to clothing, bedding and furniture, that it can be carried and transmitted to long distances by persons, towels, toys, letters, and even domestic animals and articles of food. It is transferable through the whole duration of the disease, from the incubation to the disappearance of the very last symptoms. The incubation of scarlatina may last but a few hours, like that of diphtheria or erysipelas, or as long as nine days; in this it differs greatly from measles, variola, and varicella. The last symptoms may not disappear until long after the fortieth day, which, it is true, is the average termination. The fine desquamation of the second week may have terminated entirely, but the gross peeling, particularly of the hands and feet, extends frequently to the end of the seventh or eighth week. It carries contagion as well as the desquamation of the former weeks, or as the breath of the patient, or his expectoration in the earlier periods. So slow is sometimes the process of elimination that Spottiswoode Cameron claims that the end of the disease is seldom reached before the eighth week, and not always in the thirteenth. Whether the urine or the alvine dejections of the patient can spread the disease is not quite certain; but as long as there is an uncertainty they ought to be treated as dangerous elements, and disinfected and removed.

The London *Lancet* Committee regards the period of contagiousness as running from the first appearance of the rash to the date when all *roughness of the heels and ankles* has disappeared. This time was found to be as follows for the four years from 1878 to 1882: In one year the average number of days was fifty-four; in two years seventy; and in one year seventy-four.†

Dr. Rotch‡ has recently related to the medical class the following histories to impress the truth that the most infectious period of scarlet fever is that of desquamation, while in measles it is readily communicated at the very earliest stage of the disease even before any trace of the eruption is seen. He, however, is careful to remind

*Archives of Pediatrics, VI., 9. 1889.

†An. Univ. Med. Sciences, Vol. I., I—2. 1889.

‡Arch. of Pediatrics, VII., 131. 1890.

his hearers that infection with both diseases may occur at any time during their course.

A boy, six years old, and his sister, four years old, slept in the same room with their beds close to each other. The boy was taken sick May 1, but remained in the same room with his sister during the day and night of May 2. He was seen by me early on May 3, and was then found to have a well-marked scarlet fever. The sister was taken to the country, and the boy left in charge of a trained nurse. There was then absolutely no communication between town and country house by either people, clothes or letter until June 1, when I was called out to see the sister and found her with well-marked scarlet fever. There were no other cases of scarlet fever in the vicinity of the country-house. The boy at this time was desquamating freely, and the sister was found to have received from the boy, on May 26, what she called a letter, directed from the boy's scarlet fever room by the nurse. The sister had kept this letter by her in bed and under her pillow.

The boy, so far as the closest study of the case could disclose, had, during the period of his desquamation, infected his sister at a distance of twenty miles, by enclosing the scarlet fever contagium in an envelope, and this sister had, in the beginning of the boy's sickness, been in the same room with him for thirty-six hours without contracting the disease. In the following year, March 20, I was again called to see the same boy. He was well in the morning, but in the afternoon was found to have a high pulse and temperature, with cough, coryza, and lachrymation, so that it was deemed best to send the sister, who had only been in the nursery with her brother a few hours after he had been taken sick, to her aunt's house, where she was absolutely isolated from the boy. The boy showed a measles efflorescence on March 24, and the sister was taken sick with measles March 30. The sister was then infected at the very beginning of the boy's attack of measles, and after only a few hours' exposure.

THE MOST SUSCEPTIBLE PERIOD OF LIFE.

Dr. Arthur Whitelegge,* Medical Officer of Health, Nottingham, England, read, a year ago, a paper of unusual excellence on scarlet fever from which we make a few extracts of practical value.

He quotes the Registrar-General's Annual Report for 1886 to show that "the liability of the unprotected to infection is small in the first year of life, increases to a maximum in the fifth year, or soon after, and then becomes rapidly smaller and smaller with the advance of years."

In shielding a child against the infection during the first few years of his life there is a double gain; every year of escape from scarlet

*Trans. Epidemiological Society of London, VII., 153. 1889.

fever renders him less and less susceptible, until finally he becomes almost insusceptible; and secondly, even if he should ultimately take the disease, every year that the attack is deferred reduces the danger to life which it brings. In other words, attacks of scarlet fever become both less severe and less frequent with every year of age after the fifth. Up to the fifth year the liability is less, but the risk to life in case of attack is very great.

PREVENTIVE MEASURES.

Dr. Love* strongly advocates personal as well as general disinfection in scarlatina. His method is to apply freely to the desquamating surfaces, carbolized olive oil and glycerine, afterwards sponging off with dilute listerine (1-12) or antiseptic cologne, containing one part of corrosive sublimate to two thousand of cologne; this is done each day.

In confirmation of his opinion, the author quotes Dr. F. C. Shattuck, who states:

"From the moment that the disease is declared, the patient should be thoroughly anointed daily with carbolized vaseline, lard, or the like, and this should be kept up until desquamation has ceased. Not only is the comfort of the patient promoted, but the danger of the spread of the infection is thereby greatly lessened."

Baeumler† gives some statistics showing the high rate of mortality from scarlet fever. Regarding the prophylaxis against scarlatina, the two questions arise, whether this is possible, and whether it is necessary. Though this disease is much more dangerous than measles, the disposition to get it is very much less. Only in a few of the early years of childhood is there a really considerable tendency to catch it from others, and this rapidly grows less with advancing age. An important point, therefore, is that the longer a child can be protected from the disease, the greater is the likelihood that it will escape it entirely.

As is well known, the contagium of scarlatina is always derived from some other case; it possesses a very great vitality; it is active from the earliest beginning of the disease until far into convalescence; and it usually requires a very short period for its incubation. The author reports cases to show that the breath may carry the contagion before the appearance of any eruption, though the chief danger is during the stage of desquamation. It is therefore absolutely necessary to isolate patients as soon as possible. The clothes can be disinfected, but it is virtually impossible to disinfect the epithelial covering. A fixed time during which the patient must be isolated cannot, therefore, be named, but the child must remain

*The Satellite, I, 10. 1887.

†Munch. med. Woch., 1888, No. 42, 703. (Am. Jr., Med. Sciences).

away from others until the shedding of the epithelium, especially that of the palms and soles, is entirely completed. The author has known this to require sixty-three days from the onset of the disease, and a still larger number has been reported by others. Desquamation can perhaps be hastened by bathing with soap and warm water, and the dissemination of scales hindered by inuctions. It is very important that the scalp be treated in this way, as the scales of this part are fine and are shed early. A convalescent room is of especial value for those patients who feel well, but who cannot with safety mingle with others.

Children who have come in contact with cases of scarlatina should remain under observation ten or twelve days before again joining other children. Those in attendance upon the patients should wear some outside garment in the sick-room and change their clothes and wash their hands in carbolic water on leaving it. The sick-room should be thoroughly aired every day, with proper precautions that the patient take no cold. All the linen used about the patient is, while in the sick-room, to be put in a three per cent. carbolic acid solution, and then boiled with a strong soap. Shoes are to be disinfected with a carbolic water, and the clothes treated with steam. The walls of the sick-room, if papered or painted, are to be rubbed down with bread after the patient has been removed, the iron and the wooden furniture and the floors washed with a carbolic solution, and the curtains, mattresses, etc., subjected to steam. Special vehicles should be employed to bring children with scarlet fever to hospitals. Finally, precautions should be observed against the carrying of the disease by third persons, domestic animals, books, letters, milk, etc.

Referring to the great danger of nephritis (inflammation of the kidneys) in scarlet fever Dr. Rotch* gives the following advice which is valuable not only as regards the safety of the patient, but that of the public as well; for there is an urgent need of longer periods of isolation in this disease than the general public understands to be necessary.

It may be merely a coincidence, but it seems of some significance that in the first year of life, where the food so universally is milk, should also be the period which is least likely to present scarlatinal nephritis. I am in the habit of putting my scarlet fever patients on an absolutely milk diet from the beginning to the end of the disease, or at any rate in the first four weeks. It is possible that in this way, in a certain number of cases, the precipitation of a marked nephritis is avoided, while, if it develops, the patient is already on a diet which is best suited to the disease. *The patient should be kept in bed until the desquamation is almost over, and confined to the room until the desquamation is entirely over.* In the fourth week, towards its end, the diet can gradually be increased b the addition of soup and bread. It is well to keep the child in the house for five or six

*Arch. of Pediatrics, VII., 138. 1890.

weeks, and still longer if the weather is not pleasant. The urine should be frequently tested for albumen (preferably in the sick-room) during the first three weeks, and afterwards, when the child is first allowed to get up, after each change in the diet, and after first going out. If albuminuria appear, the child should immediately be put back to bed and on to milk diet until the albuminuria disappears. Remember that these mild cases are the very ones in which a nephritis is liable to occur, and therefore watch them vigilantly until they are out of danger, which is usually in the fifth or sixth week.

TETANUS (LOCKJAW).

Tetanus, until a few years ago regarded as purely a disease of the nervous system, is now shown to be infectious, usually communicated by inoculation. In the early part of 1884 two Italian investigators Carle and Rattone published their successful results in transmitting tetanus from man to animals. In the latter part of the same year Nicolaier in the Hygienic Institute at Göttingen discovered that certain micro-organisms of the ground when inoculated into mice, rabbits and guinea-pigs produced symptoms similar to those of tetanus, and that, with the application of particles of earth taken from some soils, tetanus could be produced in certain species of animals. In the early part of 1886, Rosenbach, in the same city, made it more evident by his inoculation experiments from man to animals that the tetanus of inoculation is identical with human tetanus, and his bacteriological examinations of the different organs of the body, with negative results, led him to the conclusion that the bacillus described by Nicolaier, multiplied only in the immediate vicinity of the wound and there gave origin to a poisonous principle, the absorption of which produced symptoms somewhat similar to those which would be caused by strychnia. As we mentioned in the Second Annual Report, Brieger was able to extract from cultivations of the tetanus bacillus, which, however, were not pure, but were intermixed with another bacterium, a basic substance that he named *tetanin* and which produced tetanic symptoms in mice, frogs and guinea-pigs.

An important addition to our knowledge of tetanus was made by Beumer.* He was able to show that the tetanus of new-born infants (trismus nascentium) is identical with ordinary tetanus and is usually caused by inoculation of the umbilicus by want of cleanliness. He showed further, by examining a large number of samples, that the

*Zeitschrift für Hygiene, III, 242. 1883.

bacillus was present, not only in many soils, but frequently in the dust and other dirt of dwellings.

Success in cultivating pure cultures of the bacillus of tetanus was reserved to Dr. Kitasato*, a Japanese physician working under Koch in the Hygienic Institute of Berlin. The tetanus bacillus does not thrive in the presence of the air, and he succeeded in getting pure cultures only by substituting an atmosphere of hydrogen gas. With the inoculation of pure cultures so produced he was enabled to cause tetanus promptly in rats, guinea-pigs, rabbits and mice, and to show, in this way, that there was no need of the help of foreign bodies, as earth, splinters of wood, etc., to produce positive results.

As to the life of the bacillus and its resistance to destructive agencies Kitasato learned that silken threads soaked in pure cultures of the bacillus and then dried for several days over sulphuric acid in the dessicator, and afterward preserved in the ordinary atmosphere, retained their virulence for several months, and the same was true o the bacilli when mixed in sterilized earth and kept for the same length of time.

Tetanus bacilli containing spores are not injured by an exposure for one hour to moist heat of 176° F., but are destroyed in five minutes by steam at 212° F. Spores on silk were virulent after ten hours subjection to the action of a five per cent. solution of carbolic acid, but after fifteen hours they were destroyed. In five per cent. carbolic acid solution with one-half per cent. muriatic acid, they were destroyed in two hours, as also when they were exposed for over three hours to a 1 :1,000 solution of corrosive sublimate, or in thirty minutes when exposed to a 1 :1,000 sublimate solution with one-half per cent. of muriatic acid added.

In connection with the present views as to the causation of tetanus by inoculation with the earth bacillus, the following cases are not without interest:

A six years old boy went to school as well as usual on the 7th of June, but when he returned at 4 P. M., he complained to his mother of pain in his teeth and stomach. When he ate his supper it was noticed that he chewed his bread and butter slowly and with apparent difficulty. Through the early part of the night he was restless and in the morning he awoke with difficulty in breathing. The jaws were immovable, the face cyanotic, and the head drawn backward. Death ensued the following night.

In the hospital where he had been received, a careful examination of the child was made as soon as he arrived to discover whether, upon any part of the body, there had been a wound or injury. There was discovered on the ball of the great toe a small sharp

*Zeitschrift für Hygiene, VII., 225. 1889.

stone driven into the skin. Upon pressure the minute wound, from which the stone was removed, gave a drop of pus. The boy had gone barefooted for about two weeks before his sickness.

Out of the depths of the small wound a small portion of the bloody serum was transferred on a platinum wire, and culture media inoculated with it, and in these cultures was found the bacillus which had already been described by Nicolaier and Rosenbach as the germ of tetanus. From the immediate vicinity of the wound minute bits of tissue were removed and inocculated into animals, reproducing tetanus in all of the six which were used.*

Dr. Widenmann† of Stuttgart observed the following case of tetanus:

Hermann K., fell August 24th, 1888, from a wall back of his father's house strikiug his right cheek upon a small stake driven into the earth and inflicting a slight wound which neither he nor his parents thought anything of, but two days later, on account of some swelling of the face, he was seen by a physician. From beneath the crust covering the small wound the physician pressed a few drops of pus and applied an antiseptic bandage. November 1st, the first symptoms were apparent and the child died of tetanus on the 3rd.

Two small splinters of wood which were extracted from the wound were sent to the Hygienic Institute at Breslau, together with some of the earth in the vicinity of the stake, and the following tests were made with them.

Particles from the splinter which appeared to be clean, that is, free from earthy particles, produced in mice very rapid and fatal tetanus. Subcutaneous inoculations with pus from the dead mice reproduced the same disease in other mice. Inoculation with the earth in small quantities produced tetanus in mice; when inoculated in larger doses the deaths of the experimental animals rapidly ensued from malignant œdma. In this instance the bacillus described by Nicolaier and Rosenbach was not discovered.

CEREBRO-SPINAL MENINGITIS.

Dr. Kohlmann,‡ district physician of Remagen, narrates the history of some cases of cerebro-spinal meningitis in his town which he thinks show that the infection of this disease may be carried in clothing. Translated and condensed, the facts are as follows:

In the night of December 19th and 20th, Franz M., a hotel keeper, seventy-one years old, and hitherto always well, was attacked with a light form of the disease. He recovered.

In the same house January 9th, Theodor M., eighteen years old, and always well, son of Franz M., also a mild form of the disease from which recovery began in four days.

*Zeitschrift für Hygiene, III., 250. 1888.

†Zeitschrift für Hygiene, V., 522. 1889.

‡Berliner Klinische Woch. XXVI., 375. 1889.

January 16th, Johanna, twenty-three years old, the daughter of Franz M., hitherto well, was taken with the initial symptoms of cerebro-spinal meningitis and died forty-eight hours afterwards.

On the 29th of January, Bernhard B., a fourteen years old lad, well, but never very strong, was taken with cerebro-spinal meningitis in a severe form, and died in seventy-two hours after the beginning of the attack. This case occurred in the same city but in a street remote from the one on which the M's lived.

February 2nd, after some days of premonitory symptoms, in which the patient complained of severe pain in the upper part of the spinal column, tenderness of the spine, stiffness of the neck, and a few times tonic spasms of the upper extremities, intermitting with clonic spasms, the mother of the deceased Bernhard B., fifty-seven years old and hitherto well, was attacked with croupous pneumonia and died on the seventh day. In connection with this case the writer calls attention to late views as to the identity of the contagion of cerebro-spinal meningitis and pneumonia.

In his investigations as to possible infection, the author believed himself justified in referring the origin of all these cases to one which occurred in August of the preceding summer. On the 25th of August, the seventeen year old daughter of a poor family in the city returned home on account of sickness from another town where she had been working as a servant girl. Dr. Kohlmann attended her, and she died of cerebro-spinal meningitis on the ninth day of her sickness. The remains of this girl were kept four days before burial in a room occupied by the family, and on account of poverty the father and the brother of the dead girl were obliged each to borrow a coat for the funeral. Now it so happened that the father borrowed a coat from Franz M., whose sickness formed the first case narrated in the preceding, and the brother borrowed a coat from Bernard B.

Only from these two houses upon different streets was clothing borrowed. The borrowed coats were retained in the house several days after the funeral.

Only one other case occurred in the city in a woman of eighteen who had visited Johanna several times during her few days sickness. She recovered. Everything possible was done in the way of isolation and disinfection and no other cases occurred.

Dr. Corney,* Colonial Surgeon to the Fiji Islands, gives an interesting narrative of an outbreak of epidemic cerebro spinal fever in those islands. He states that the epidemic was truly appalling. There is reason to suppose that the disease was brought from other

*Trans. of the Epidemiological Soc. of London, VII., 110.

islands where its ravages were confined to the persons of certain emigrant laborers introduced from other islands in the Western Pacific. But on the other hand, these people had been too long in the colony to allow one to believe that they had brought the disease with them, in the way in which ordinary zymotic diseases can be transplanted. The epidemic showed a marked preference for the natives of four particular localities. There were 128 cases, of which 90 terminated in death.

The peculiarity of the distribution of the cases of cerebro-spinal fever in this epidemic early suggested to me the probability that the disease was infectious from man to man, but that very close association was necessary for its propagation. Subsequent observation failed, in my opinion, to disprove this theory, although I am still unable to assert that any very salient facts support it.

In the German regulations for preventing the spread of epidemic cerebro-spinal meningitis the public are instructed that it has been shown that this is a communicable disease, that the disease is accompanied with a high rate of mortality, and that a frequent after effect of the malady is deafness, and in children, deaf mutism. Physicians are required to give notification of cases coming to their knowledge, persons sick with this disease are to be isolated from other persons as much as possible, children from houses infected with it are to be excluded from the schools, and a thorough disinfection is enjoined, of the sick-room, of all excreta, and of clothing and other things used by the patient.*

CONTAGIOUS PNEUMONIA.

A report was read by Weill† before the medical society of Lyons on a localized epidemic of contagious pneumonia.

The outbreak occurred at a baker's establishment and affected three young men who successively contracted pneumonia and were sent to the hospital. The starting point of the outbreak was probably from a child of the baker, ten years of age, who had a cough and expectoration, the exact nature of which is not determined. During the convalescence of this child, a young man, Jean, 24 years old, was taken the 10th of December with pneumonia.

December 15, a second man, Martin, 37 years old, was called from a distant part of the city to take the place of Jean. He slept in the same bed and under the same clothes that had been used by Jean, and 48 hours after his arrival, December 17, he presented marked symptoms of pneumonia.

*Centralblatt für all. Gesundheitspflege, VIII., 285. 1889.

†Lyon Medical, LX., 640. 1889.

December 18, a third man, Manon, aged 18 years, was brought from still another quarter of the city. This young man had coughed for two months, but had not felt sick and was not prevented from working. He slept with Martin on the night of his arrival. Thirty-six hours after coming he was attacked with pneumonia.

Dr. Marx* describes a series of cases of pneumonia observed by him which were pretty clearly due to infection from case to case.

On the 21st of October, 1888, M. came down with pneumonia, and died on the seventh day. The patient lived in a small house containing only kitchen, living-room and sleeping-room.

On the third day of the sickness of M. his wife was attacked with pneumonia and recovered after eleven days sickness.

A daughter of the M's, a maid of seventeen, who worked away from home, visited her parents during their sickness, and, having walked a long way, was somewhat exhausted when she reached home. She remained with her parents through the afternoon, and, not feeling very well, went to her uncle's and there came down with pneumonia. She recovered.

During the sickness of this young woman she was visited by a friend, a girl of eighteen, and she was taken with pneumonia two days after her last visit. She recovered.

During the illness of the M's they were helped by S., fifty-seven years of age. Some days after the death of M., S. had an attack of pneumonia and recovered. He had already passed through three attacks of the same disease.

During the sickness of S., he was visited repeatedly by a neighbor, C. Five days from the beginning of S's sickness, C. was attacked with pneumonia and recovered. He had already had two attacks of pneumonia.

Just before his sickness, and during the period of incubation, C. was visiting the house of D., where he entertained himself for long periods of time with a boy fourteen years of age, recovering from measles. The boy was out of bed and fully convalescent. Two days after the sickness of C., the boy came down with pneumonia in a severe form, but finally recovered.

Marx concludes that pneumonia may be infectious.

INFLUENZA.

Before the late wide prevalence of influenza the general opinion as to the etiology of the disease seemed to be preponderatingly in favor of a miasmatic, or at least an aerial source of the causative agent. At the present time, as far as can be judged from a careful watching of the current literature, this epidemic has divided the medical profession into two parties, probably not very unequally distributed as to numbers, the one believing in the communicability of the

*Allg. Med. Central-Zeitung, LVIII., 350. 1889.

disease from person to person and the other believing in its atmospheric origin. Still a third class may be mentioned, believing that the disease is communicable and also spread by the atmosphere. As bearing on the questions involved, the following observations and opinions, mostly from late journals, are perhaps worthy of record in this place.

Dr. Da Costa* says: "We know nothing of the cause of this disease. It is epidemic and I think myself that it is feebly contagious." Dr. A. Jacobi† speaks as follows of the infectiousness of influenza: "The disease seems to be not only miasmatic, but also intensely contagious with a very short period of incubation."

In a discussion before a Berlin medical society‡ Dr. Ewald expressed his disbelief in the direct communicability of influenza; Dr. Fränzel also doubted its infectious nature; Dr. Meyer, from an observation of about two hundred cases, believed that the spread of the disease occurs through contagion; Dr. P. Guttmann thinks that proof has not yet been brought of the infectiousness of influenza, while Dr. S. Guttmann referred to the case of the French school ship "La Bretagne" in proof of the communicability of the disease. Dr. Henoch had observed in the children's department of the Charité Hospital no undoubted case of influenza, which he thought was due to the fact that no child with influenza had been received from without, and believed that this fact might be accepted as evidence in favor of the contagiousness of the epidemic for in all the other divisions of the hospital the disease had been very prevalent.

A similar want of unanimity is shown in the discussions before American medical societies.

A correspondent of a London journal§ communicates a portion of a letter received from Dr. Bäumler, director of the medical clinic in Fryeburg in regard to the contagiousness of influenza.

Dr. Bäumler considers the disease to be highly infectious, as "many patients that were in the ward for other ailments were almost at once seized when a single case was admitted into the ward. This quite coincides with what your countrymen, Haygarth and Falconer, have made out in the last, and the beginning of this, century. It was probably the suddenness of the spreading which made it appear improbable that the disease spreads from the

*Medical News, LVI., 62, 1890.
†Medical News, LVI., 262. 1890.
‡Deutsche Med. Woch. XVI., 71. 1890.
§The Lancet, I., 1890. 103.

sick to the healthy by direct infection. The incubation period is evidently very short. Why should there not be diseases with an incubation of only a few hours, when we know that in scarlatina it may be less than a day? I think that the notion, or rather hypothesis, that the disease is due to a miasm is much more improbable than that it is a truly contagious disease."

In a convent-like institution in Charlottenburg near Berlin where the inmates, all women, are rigorously cut off from intercourse with the outer world, not one of them had influenza *

Dr. Trudeau† who has charge of the sanitarium for consumptives in the Adirondack region as soon as the epidemic of influenza appeared in the neighborhood quarantined the institution strictly against the disease, and while the great majority of people in the surrounding country, as well as the visitors at the hotels and boarding houses in the neighboring village, were attacked, no case appeared in the sanitarium.

As an example of the contagiousness of la grippe, Dr. Proust read at the Academy of Medicine an extract of a report from Dr. d'Hoste, surgeon of a mail boat called Saint-Germain. The boat left Saint Nazaire on December 2nd, for Vera Cruz, in excellent sanitary condition. It put in at Pauillac on the 6th, having touched at Santander on the 5th. At this port there embarked a first class passenger, coming from Madrid, where la grippe was raging. Till then the health of the passengers and crew was perfect, but on the 6th the passenger from Santander was seized with the disease, and gradually, from December 12th to January 7th, 154 passengers out of 436, and 47 of the crew were, in their turn, affected. The epidemic, however, was slight and no death occurred. The conclusion was, that it is a contagious malady, transmissible not only in its graver complications, as established by Prof. Bouchard, but also in its simple and benign form.‡

A French Journal§ gives the following:

The training ship "La Bretagne" lay in the harbor of Brest with 850 men aboard, and had 244 cases of influenza. In the harbor by the side of this vessel lay two other training ships, each with the same number of men on board, but on these two ships there has not been a single case of influenza. Dr. Danguy who reported the facts, believes that the history of the outbreak excludes climatic influences. An officer of "La Bretagne," whose residence was in Brest, received a box from Paris, the unpacking of which he personally attended to. Three days afterward, December 12th, the officer sickened with influenza and the next day all his family were attacked. On the 14th, still sick, he went on board the ship "La

*Lancet, I., 1890. 110.

†Medical News, LVI., 185. 1889.

‡The Lancet, I., 1890. 379.

§Revue D'Hygiene, XII., 3. 1890.

Bretagne :" on the 17th, there were twenty cases of influenza aboard the ship, the next day forty-five, and by the end of the month there were 244 cases.

Dr. Bolton, writing from Kustendjie in Bulgaria on the Black Sea to an English medical journal*, says that he had a very complicated case of influenza, and the patient supposed to be in a dying state, her brother was telegraphed for and arrived in the sick-room at one P. M., and remained through the night, attending his sister. The next morning this brother was found suffering from influenza, the first symptoms of the disease, the shivering, having come on thirteen hours after his arrival in the sick-room. This man asserted that in his country village in Bulgaria, whence he came, there existed no cases of influenza and that he could not have caught the disease at any village on his route, as he stopped at none.

Dr. Bolton also communicates the following case to show that the infection is carried through the air and says he can vouch for the facts.

An Armenian arrived here from a village fourteen hours distant to consult me regarding a brother who was suffering from phthisis. In course of conversation I asked him if there were any cases of the epidemic in his village. He replied, "Oh yes, nearly all have been in bed with the same complaint you have here, and many have died." I then inquired if his village had much communication with other places where the disease had already existed. He replied, "Certainly not. At this season there is no need of communication, and I am sure I am the only individual who has left the village for some weeks." He also states that since the disease first appeared in his village, now two weeks since, no one has come to or gone from there.

In former epidemics of influenza, outbreaks have been recorded as occurring on board ships many days out to sea. It is said† that in the present epidemic influenza appeared on board a French steamer, the Alphée on a voyage from Constantinople to Marseilles. All of the passengers and the greater part of the crew were affected, only six men and the captain being available to work the vessel. No information is given as to the time out when this outbreak occurred, nor as to whether any of the passengers or their baggage had come from infected places.

*Lancet, I., 1890. 215.

†Lancet, I., 1890. 107.

INFLUENZA OF ANIMALS.

The question has been asked quite frequently, but has received no definite solution, whether the influenza of man and that of the lower animals, especially of the horse, are identical. Dr. Schneidemühl* of Kiel divides the influenza of the horse into two distinct diseases: 1st, the genuine epizoötic horse influenza (Pferdestaupe); and 2nd, contagious pleuro-pneumonia of the horse (Brustseuche). The first disease (Pferdestaupe) is known in France as *fievre typhoide des chevaux*, in England as "horse plague" and "equine distemper," and in America as "pinkeye." Its infectiousness is great, and it can, in a short time, extend over wide regions, yet the infection is fleeting and is supposed to be distributed by the air of expiration. Dieckerhoff succeeded in communicating the disease by subcutaneous and intra-venous injections of the blood of sick horses. The infection is communicable directly from animal to animal and also through the medium of persons, straw, thermometers, etc. One attack of the disease usually confers immunity against future attacks. According to the investigations of Dieckerhoff the period of incubation is five to seven days.

In the second form, infectious pleuro-pneumonia of horses, the disease is communicable, but not in so great a degree as the true influenza. Of horses exposed to the infection, from thirty to forty per cent. escaped the disease, yet the prognosis in animals attacked is not so favorable as in the first mentioned disease. The communication of this disease to men and to other animals has not yet been observed. Infection in this disorder is communicated directly from animal to animal, and not less frequently through the medium of attendants, horses that have not had the disease, clothes, provender, and sometimes by dogs. The convalescing animal is particularly dangerous to other horses, and the infection may be transmitted for weeks after apparent recovery.

Schneidemühl refers also to the influenza of dogs and characterizes it as an infectious disease, especially affecting those in the first year of life. The period of incubation is from four to seven days, and the symptoms are principally catarrhal, affecting the mucus membranes of the eyes, and of the respiratory and digestive tracts, together, in many cases, with severe affections of the nervous system. It is usually accompanied with a pustular eruption. The

*Deutsche Med. Woch. XVI., 153. 1890.

prognosis for the animals affected is unfavorable—from sixty to ninety per cent. die.

The same author seems to be inclined to the opinion that there is some close relationship between these animal influenza, and the human form of the disease, and mentions various observations and pieces of information which he thinks support this view.

When human influenza was prevalent in Russia, from a Russian journal he learns that the influenza of dogs was never so prevalent in St. Petersburg as in the past winter. In Austria according to the *Allgem, Wiener med. Ztg.* influenza of horses had not been so prevalent for years as it was in the fall and winter before the epidemic of human influenza. The disease was especially prevalent among military horses. During the winter horse influenza was remarkably prevalent in Germany. Communications in German veterinary journals spoke of the extended prevalence of horse influenza in a comparatively mild form, and some of the writers speak of the remarkable similarity of the disease to human influenza. The animals are attacked suddenly with severe shivering while harnessed to their wagon, and hardly able to stand and are brought with difficulty to their stalls. In most of the cases the symptoms, which were at first severe, had disappeared in a very few days. An Italian journal mentions the extended prevalence of horse influenza in certain parts of their country.

Dr. Scheller* observed an outbreak of influenza in the spring of 1889 among the horses of one of the German cavalry regiments which appeared to be communicated to the men of that regiment. The height of the prevalence of the human influenza followed from two to three weeks after the horse influenza was at its height. He mentions also some individual cases of apparent direct communication from horse to man which seemed to support his views as to the relation of horse influenza to the disease as it appears in man.

The Sanitary Inspector for January, 1890, referred in the following words to a paper by Dr. Judson of New York, on the "History and Course of the Epizoötic among Horses on the North American Continent in 1872–3."†

The outbreak resembled very much outbreaks of influenza in man. It started in the Province of Ontario, near Toronto, the latter part of September, 1872, and extended in all directions with consider-

*Deutsch Med. Woch., XVI., 163. 1890.

†Trans. of the American Public Health Association, I., 88.

able rapidity, and eventually reached every part of the main land of this continent that had communication by means of horses or mules, with places where the disease existed. Prince Edward Island escaped because the rigors of a northern climate closed navigation between it and the neighboring provinces before the influenza reached them Vancouver's Island escaped by means of a quarantine against horses and mules. Key West, Hayti, San Domingo and Jamaica escaped, but they had but limited commercial intercourse with infected parts, and the importation of horses or mules was a rare occurrence. Several places in the main land escaped, due to isolation by mountain barriers or otherwise from infected places.

The conclusion of the author is that the epizoötic influenza spread by virtue of its communicability, and not by virtue of any recognized or unrecognized atmospheric conditions. We may add that the horse influenza of 1872 did not reach across the ocean, but that in other outbreaks in Europe this disease has been investigated and is quite generally believed to be contagious, and we believe the credit of first describing the germ lies between Prof. Shütz of the Berlin Veterinary School and Prof. Lustig.

GLANDERS.

It should be understood by all that glanders is a dangerously infectious disease, communicable to man as well as to horses and other animals, that it never arises from colds or from causes other than the infection derived from previous cases, that it is useless to try to cure a glandered horse, and that his continued life is a wrong against other owners of horses and a serious danger to whomever has anything to do with him. Every glandered horse should be destroyed.

A few months ago many of the medical journals were telling of a distressing case which occurred in the General Hospital in Vienna, in which a physician died from accidental self-inoculation with the virus of glanders.

In August, a man was brought to the hospital suffering from glanders, which he contracted from a horse. After death Dr. Rowlaski, an expert in bacteriology made the autopsy, and produced pure cultures of the glanders bacillus from the virus. But a "Medical Thomas," Dr. Hoffmann, expressed his doubts as to whether the bacillus had still in it, the power of infection. Dr. Rowlaski gave him one of his cultures to perform a series of experiments which proved affirmative. Early in October, having contracted a serious cold, which he treated by hypodermic injections, using the same syringe with which he had performed the experiment on the animals, Dr. Hoffmann found himself seriously ill, and in a few days was covered with tubercles and ulcers, and died of acute glanders.*

Kiemann† observed a case of glanders in a man, thirty-seven years of age, which at first simulated articular rheumatism. At a later stage there were developed in the skin on different parts of the body and extremities small swellings which had the appearance somewhat of abcesses. Matter from a pustule was examined and the presence of the glanders bacillus was shown, as well as in the blood and urine. Meanwhile it was learned that the man had had the care of glandered horses. Death followed three weeks after the beginning of the disease.

Weichselbaum‡ had an opportunity of observing a case of glanders in a woman who was engaged as a rag-picker, and who probably became infected through the medium of the rags. In the matter from the pustules on her body the bacillus of glanders was found, and pure cultures of the bacillus inoculated into guinea-pigs, produced the disease.

The following letter was written by Dr. Sternberg and has been published for the information and guidance of the United States Army:§

BALTIMORE, July 24, 1888.

To the Quartermaster-General U. S. Army, Washington, D. C.

GENERAL:—In reply to your communication of July 19th, I have the honor to submit the following statements and opinions:

Glanders is an infectious disease in which the infectious agent has been demonstrated to be a living micro-organism, a bacillus.

The bacillus of glanders was discovered by the German bacteriologists, Loeffler and Shutz, in 1882, and the discovery has since been confirmed by several other competent bacteriologists. It is found in the nasal secretions and ulcers of the mucus membrane, in the "farcy-buds" pustules and enlarged lymphatic glands of infected animals, and it is probable that it is also sometimes present in the urine.

It is a slender rod, somewhat similar in appearance to the well-known tubercle bacillus, but more uniform in size and somewhat broader. In preparations stained with fuchsin or with Loeffler's solution of methyline blue, clear spaces are often seen in the rods, which have been thought by some authors to be spores, but this is doubtful, as Loeffler has found that no development occurs after the bacilli have been exposed to a temperature of 55° C. (131° F.) for ten miuutes.

*Jr. of Comp. Med. and Vet. Arch. XI., 70. 1890.

†Centralblatt fur Bak. und Par., V., 351. 1889.

‡Uffelmann's Supplement, III., 209. 1886.

§Brooklyn Medical Journal.

Pure cultures of this bacillus have been shown to produce typical glanders in horses and asses, and it is recognized by bacteriologists as the cause of the disease. The disease may also be transmitted by inoculation to guinea-pigs and field-mice, which animals (preferably guinea-pigs) may be used as a test of the infectious character of the nasal secretions of a suspected animal.

Exact experiments have shown that the bacillus of glanders is killed by exposure for five minutes to a 5 per cent. solution of carbolic acid, or by a 1 to 5000 solution of corrosive sublimate.

In practice it will be best to rely upon boiling water for the disinfection of all articles which can be immersed in it without injury—rope halters, blankets, currycombs, bits, etc. To keep on the safe side, half an hour may be fixed as the standard time which articles to be disinfected shall be immersed in boiling water, or exposed to steam at a temperature of 212° F.

Articles of leather should be repeatedly washed with a 5 per cent solution of carbolic acid or a 1 to 1000 solution of corrosive sublimate; or immersed in such a solution for at least one hour. If the solution can be used hot, say 180° F. without injury to the material, this will be desirable.

All exposed parts of an infected stable should be thoroughly and repeatedly (three or four times) washed with a hot solution of one of the above named disinfectants. The carbolic acid solution (5 per cent) will be preferable on account of the poisonous nature of the solution of the bichloride of mercury; but the latter is less expensive, and under proper supervision there should be no special danger in using it. After its use, feeding-troughs, etc, should be thoroughly scrubbed with hot water to remove all traces of the poisonous salt. The application of a lime-wash to all surfaces, after complete disinfection, will be desirable.

Stables occupied by infected or suspected horses should be disinfected daily by washing exposed surfaces with a 5 per cent. solution of carbolic acid, and nose-bags, halters, buckets used for drinking water, etc., should be carefully washed with the same solution or with boiling water. In view of the reliability of known measures of disinfection, when properly executed, I do not consider it necessary or justifiable to destroy Government property of value which has become infected by contact with animals suffering from glanders.

I do not doubt the propriety of killing animals suffering from glanders or farcy as soon as the nature of the disease is recognized.

Very respectfully, your obedient servant,

GEO. M. STERNBERG,

Major and Surgeon, U. S. Army.

MEASLES.

In some of the eruptive diseases, scarlet fever and small-pox for instance, the early stage of the disease, before the eruption has appeared, is not characterized by so great a degree of infectiousness as later in their course, and with a knowledge of this fact the health officer has good reason to hope that the separation of the well from the sick when made not too late after the first symptoms have appeared, will be successful in saving further infection. In measles it is otherwise; this disease is characterized by a very high degree of infectiousness, even with the appearance of the very first symptoms, resembling those of an ordinary cold in the head, long before the eruption appears. The requirements of public hygiene, therefore, demand a very early separation of the sick from the well, even before it is possible to make a positive diagnosis by awaiting the eruption. As a result of this characteristic of the disease, isolation has never been so successful a preventive measure in measles as in some other diseases; nevertheless this fact is no justification for parents or others to withhold all precautionary measures, or to let children probably in the early stages of infection attend the public schools. On account of the extremely infectious nature of the disease, its early stage of infectiousness, and the fleeting character of the contagium, there is no disease in which the temporary closure of schools as a preventive measure is so often justifiable as in measles.

In an instructive paper, "Notes on the Influence of the Closure of Schools upon an Epidemic of Measles in Cardiff," Dr. Walford* resorted to this measure. The schools of Cardiff were closed four weeks by his advice. During the three weeks previous to the closure of the school, seventy-six cases of measles were reported, and for the three weeks immediately following their opening, only three cases occurred. Three or four weeks after the opening of the schools a list of absentees was obtained from every public elementary school in the sanitary district, and an enquiry was made, which resulted in the discovery of only four cases of measles among the 20,000 scholars of the various schools. Dr. Walford says:

"I am aware that it is frequently stated that on the closure of the schools children will play together in the streets, and meet in houses, and that the epidemic will thus spread still more. Doubtless under these circumstances there is a probability of some infected

*Sanitary Record, X, 513. 1888.

children coming into contact with healthy ones, but the danger of spreading the infection must be infinitely greater when a large number of children are congregated together for hours in over-crowded and badly ventilated school-rooms. It must be borne in mind that measles is probably infectious in the early or catarrhal stage before it is recognized by any one, so that with the most efficient supervision it is impossible to prevent children attending school who are really suffering from the premonitory symptoms, and in a condition in which they are likely to disseminate the disease."

Dr. Dornblüth* emphasizes the fact that human susceptibility to the poison contagium is very general and is restricted to no age, yet individual differences of susceptibility occur, for some children are infected by the first contact with a case of measles, while others take the disease only after three or four weeks living with other children in the family who have the disease. Very young infants appear to be less susceptible than are children of other ages. As showing the very infectious nature of the measles contagium he mentions that in where for sixteen years there had been no outbreak of measles there were 147 households with 418 children. An outbreak of measles occurred in this vicinity, and 401 children in 134 homes were affected. Nearly all the remaining families had only one child, and therefore could more easily keep it isolated. Nevertheless, the infection of measles is very fleeting,—it does not have the persistent vitality possessed by the infection of some other diseases. The assembling of many children in the same room with overheating and want of ventilation favors very much the spread of the disease, and seems to make the infection more virulent. Children should be isolated, especially when there is any tendency to troubles of the chest and when the epidemic assumes an unusually severe form.

DISINFECTANTS.

Hardly in any other department of hygiene has more rapid improvement been made within the last few years than in our knowledge of disinfectants and their intelligent use for the end sought—the destruction of pathogenic germs. Since I gave, in the Second Annual Report, under the title of "Notes on Disinfectants," an abstract of the most important work which had then been done in determining in a scientific way the power of various agents for the destruction of infection, much additional work has been done which furnishes information of a practical character.

*Deutsche Viert. für öff. Gesundheitspflege, XVIII., 214. 1886.

CHLORIDE OF LIME.

In a lecture at the Hoagland Laboratory last year, Dr. Sternberg* re-affirmed his estimate of the value of this agent as a disinfectant in the following words:

A most valuable chemical disinfectant, and the one which the Committee on Disinfectants has placed at the head of the list, after boiling water, is a four per cent. solution of chloride of lime. Numerous experiments were made by the Committee in 1885, and since that time again, under my direction, by Dr. Bolton, the results of which show the great value of this agent. The bacillus of typhoid in bouillon is destroyed by one to two thousand; the cholera spirillum in bouillon by one to one thousand; anthrax spores in bouillon by one to one thousand.

It is cheap and may be purchased by the quantity for three and one-half cents a pound; you can get a pound package from the drug store for fifteen cents. The proportion recommended by the Committee on Disinfectants is six ounces to the gallon of water.

But you must be sure that you have a good chloride of lime. Our tests showed that the common article, as put up in cans and jars, as a rule is of good quality, but it must be in hermetically sealed packages. The disinfecting power of this agent depends upon the hypochlorite of lime present in it; this is an oxidizing agent and must be used in excess. If not, your hypochlorite of lime is destroyed by the organic material present, and after that, if there is an excess of organic matter containing pathogenic germs, you will not have disinfected the whole material, and not to disinfect the entire amount is equal to not disinfecting any of it. There can be no partial disinfection; unless complete it cannot be considered disinfection.

In the final report of the Chairman of the Committee on Disinfectants appointed by the American Public Health Association, Dr. Sternberg† suggests that Standard Solution No. 1 (Solution A, State Board of Health of Maine) be made by adding six ounces of chloride of lime to the gallon of water (about four per cent.) instead of four ounces as hitherto recommended.

In the final experimental work of this committee solutions of chloride of lime of 1:50, 1:100, and 1:200 were uniformly successful in destroying the bacillus of typhoid fever in recent cultures in bouillon, in recent cultures in flesh-peptone-gelatin containing ten per cent. of gelatin, and in cultures in bouillon with ten per cent. of egg albumen added. In tests made with liquid typhoid

*Brooklyn Medical Journal, III., 346.

†Disinfection and Disinfectants, p. 157.

fæces from a patient in the third week of the disease, complete sterilization was not effected by 1 :100 chloride of lime solution.

In the above experiments on typhoid fæces, as in all other experiments reported, the amount of material to be disinfected had been made equal to the amount of solution of the disinfecting agent (5 cc. of each) and the time of exposure had been uniformly two hours.

Dr. Jaeger* made an examination of the disinfecting power of various chemical agents with the view of determining their efficiency for the destruction of contagia when applied for only limited periods of time, particularly their comparative value when used in the disinfection of stalls, cattle cars, etc. His estimate of the worth of the chloride of lime as a disinfectant for these purposes is a high one, and he says that, "Among the agents tested in the foregoing experiments chloride of lime is one of the most efficient."

Dr. Nissen† in the Hygienic Institute of Berlin undertook at the request of Koch an investigation into the value of chloride of lime as a disinfectant. The samples used in his experiments were derived from different apothecaries and the quantity of hypochlorous acid contained in them was determined volumetrically. The strength of the solutions of chloride of lime used were from five per cent. downward. They were tested on pure cultures of the bacillus of typhoid fever, bacillus of cholera Asiatica, anthrax bacillus, staphylococcus pyogenes aureus, and streptococcus erysipelatis.

Typhoid bacilli were destroyed with certainty in five minutes with solutions containing not less than 0.12 per cent., irrespective of whether they were filtered or unfiltered. With the higher percentages their total destruction was effected in one minute.

Cholera bacilli with solutions of the same strength (0.12 per cent.) were usually destroyed in one minute and constantly after five minutes exposure.

Only in one point is the action of chloride of lime different from that of caustic lime, viz: in the time required for disinfection. With the chloride of lime only a few minutes are required, while with the caustic lime one or several hours are required.

Anthrax bacilli from the spleen of a mouse just dead, or in a bouillon culture ascertained microscopically to be free of spores, were completely destroyed in one minute with a 0.1 per cent. solution.

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*Arbeiten aus dem kaiserl. Gesundheitsamte, Band V., 247.

†Zeitschrift für Hygiene VIII., 62. 1890.

Staphylococcus pyogenes aureus, and streptococcus erysipelatis were destroyed in one minute by a two per cent. solution of chloride of lime.

The anthrax spores used by Nissen were not of the most resisting kind,—their vitality was destroyed by three minutes subjection to the action of flowing steam, and in one minute by the action of a 1 :1,000 solution of corrosive sublimate with five parts of muriatic acid per 1,000 added.

These spores were seldom destroyed by a five per cent. solution of chloride of lime in five minutes; they often were in fifteen minutes; almost constantly in thirty minutes. In one experiment with a one per cent. solution they were completely sterilized in seventy minutes. Nissen found that the addition of muriatic acid to the chloride of lime solution effected a marked increase in the disinfecting power of the chloride of lime.

Later Nissen received some very resistant anthrax spores. Dried on silken thread, they were destroyed in a 1 :1,000 sublimate solution only after four hours. In flowing steam they were not destroyed in ten minutes, but were in twelve. *In a 5 per cent. filtered solution of chloride of lime they were killed in four and one-half hours.*

CAUSTIC LIME (QUICKLIME, CALCIUM OXIDE).

In 1887 Liborius* published a paper giving the results of his experiments with quick, or caustic lime to determine its disinfecting power. He sums up his results in the following words:

A watery solution of lime of the strength of .0074 per cent. is sufficient to destroy typhoid bacilli in a few hours, and in the proportion of .0246 per cent. it will disinfect cholera bacilli in the same length of time.

Cultures of the cholera bacillus in unfiltered bouillon containing abundant albuminous precipitate, which offer at least as unfavorable conditions for the action of the disinfectant as are present in natural cholera dejections, are completely and permanently disinfected in the course of a few hours by the addition of .4 per cent of pure quicklime, or by two per cent. of crude burnt lime in fragments.

Under more difficult circumstances the most energetic action of the lime was obtained when it was used in the form of pure pulverized caustic lime, or as a milk of lime containing 20 per cent. of the same.

To test the conclusions of Liborius, Sternberg† made a somewhat extended series of experiments. He says:

*Zeitschrift für Hygiene, II., 15.

*Disinfection and Disinfectants, p. 172.

The above experiments suffice to demonstrate the fact that pure calcium oxide has no great value for disinfecting purposes, and now that the proposition of Liborius to give it the preference over chloride of lime on account of its comparative cheapness is based upon a misconception of the *practical* value of the two agents for disinfecting purposes. Inasmuch, however, as calcium oxide has considerable germicide power when used in the form of lime-wash, especially after prolonged contact, the general use of lime-wash for sanitary purposes is to be recommended wherever it can be applied to surfaces which are supposed to be infected by disease germs.

Kitasato* concluded from his own experiments that the typhoid bacillus is destroyed in nutrient gelatin and in bouillon by the addition of .0966 per cent. of lime, about thirteen times the proportion found by Liborius to be necessary. This difference he deems to be due to the fact that Liborius diluted his bouillon with fifteen times its quantity of sterilized distilled water, while he used his culture media undiluted.

Cholera bacilli were disinfected with caustic lime in the proportion of .1 per cent. against .0246 per cent. as given by Liborius.

Liborius and Kitasato having determined the minimum quantity of caustic lime to be used for the destruction of typhoid and cholera bacilli, Pfuhl† set himself the task of learning in what quantity and in what form it is best to use caustic lime for the disinfection of typhoid and cholera stools. His experiments taught him that the action of the lime, when added in fragments to liquids to be disinfected, is slow and uncertain. When to the quicklime, as obtained in the market, one-half its weight of water is added, it is slaked to a dry powder. If the hydrate of lime thus resulting is added in the form of powder to typhoid dejections, the powder has a tendency to collect in masses and not mix uniformly with the matter to be disinfected.

Pfuhl found that the best way to use the lime was in the form of milk of lime made by the addition of one part of caustic lime to four parts of water, and thoroughly mixing. This gives a twenty per cent. mixture. Two per cent. of this milk of lime added to neutral typhoid discharges disinfected them completely in one hour.

He therefore concludes that in practice it is best to add to the matter to be disinfected two per cent. by volume of the twenty per cent. milk of lime.

It is self-evident, he says, that the addition of two per cent. of the lime-wash will be sufficient only when it is prepared from lime of

*Zeitschrift für Hygiene III., 416. 1887.

†Zeitschrift für Hygiene, VI., 98. 1889.

good quality, and when used soon after its preparation, or at least within a few days, having in the meantime been excluded from the atmosphere, and when the typhoid or cholera dejections, as is the rule, are of a liquid consistency.

According to his experience it is sufficient in the disinfection of excreta to add the milk of lime until every portion of the matter to be disinfected gives a distinct alkaline reaction, that is, until red litmus paper is colored a deep blue when a drop of the mixture on a glass rod is touched to it.

The results obtained by Liborius, Kitasato, and Pfuhl were so unexpected, and their practical application if correct would be of so much value in practice, that Richard and Chantemesse* thought it worth while to repeat the work of their predecessors. They tested the comparative disinfecting power of lime, using Pfuhl's twenty per cent. milk of lime, and, for purposes of comparison, a solution of corrosive sublimate 1 : 1,000, solution of corrosive sublimate 1 : 1,000 with five per cent. of hydrochloric acid added, and a 5 : 100 solution of chloride of lime.

As matter to be disinfected, they used typhoid and dysenteric stools in flasks, sterilized with heat, inoculated with typhoid bacilli or with the micro-organism thought by the authors to be the pathogenic agent of dysentery. Eight hours afterward the disinfectant was added and mixed with the pure cultures thus secured.

The typhoid bacilli were not destroyed in forty-eight hours by the corrosive sublimate solution, neither were they by the acid sublimate solution. They were not destroyed by the chloride of lime solution in one hour. On the other hand, the milk of lime effected complete disinfection in half an hour.

The dysenteric stools were also thoroughly sterilized in half an hour by the milk of lime, while the acid corrosive sublimate solution failed to do it in twice that length of time.

There is unfortunately a discrepancy, apparently a mistake of the printer, in the statement of Richard and Chantemesse of the quantity of the disinfectant solutions used in comparison with that of the matter to be disinfected.

Schanz† also tested the disinfecting power of caustic lime and was able to confirm the results of Liborius, Kitasato and Pfuhl as to its efficiency in the disinfection of liquids, but he doubts whether it

*Revue D'Hygiene XI., 641. 1889.

*Deutsche Med. Woch. XVI., 77. 1890.

would be suitable for the disinfection of excreta on account of its lack of power to penetrate the more solid masses and particles of fecal matter.

Karlinski* gives his testimony also to the efficacy of lime as a disinfectant. Added to typhoid stools in the proportion of about four per cent., the bacilli were entirely destroyed within forty-eight hours. (See also "Disinfection of Excreta.")

CORROSIVE SUBLIMATE (MERCURIC CHLORIDE).

Though corrosive sublimate destroys infection of all kinds rapidly and with certainty, when it is brought directly in contact with it, it possesses certain characteristics which limit very much the range of its applicability in practical disinfection.

1st. Through its property of coagulating albuminous matters when mixed with liquid or semi-solid matter containing albumen, there is a tendency to the formation of a protective coating, or layer of coagulated albumen around the more solid particles or masses, thus protecting their interior against the action of the disinfectant. This property of the sublimate renders it less suitable than some others for the disinfection of excreta, and still more unsuitable for the disinfection of tuberculous or other sputum. For the disinfection of material of these kinds, chloride of lime has a great advantage over corrosive sublimate.

2d. Mixed with organic matter, especially with albuminous matters, the corrosive sublimate itself suffers decomposition into inert compounds, or at least into those with questionable disinfecting powers. Here corrosive sublimate, compared with carbolic acid, is at a disadvantage. Carbolic acid, though coagulating albuminous matters, is not itself decomposed or destroyed, but remains unimpaired, constantly exerting its power of destroying infection.

3d. Corrosive sublimate is a dangerously poisonous agent. A safeguard to some extent against accidental poisoning is offered by the coloring matter, in Solution B, potassic permanganate; in Solution C, copper sulphate. Carbolic acid is also a rapidly fatal poison when swallowed. Neither agent should be trusted in the hands of unintelligent or careless persons.

4th. Another disadvantage of corrosive sublimate is its corrosion of metals or amalgamation with them. Nor can it be poured through

*Centralblatt für Bak. und Par. VI., 75. 1889.

the leaden pipes of our plumbing fixtures in large quantities without destroying them.

After enumerating the limitations in the uses of corrosive sublimate, there remains still a field in which it is useful,—the disinfection of rooms (walls, floors, furniture) and clothing. Sternberg* says:

A solution of bichloride of mercury of one to one thousand is probably the most valuable and useful solution for washing surfaces and scrubbing floors and woodwork, and for disinfecting the hands and surfaces generally, and also as a solution in which to immerse clothing which cannot be boiled. For instance, in the sick room you are not prepared to send soiled clothing at once to the laundry, and, indeed, it might not be safe to do so. You should, therefore, have a proper receptacle containing a solution of one to one thousand bichloride of mercury in which to immerse soiled clothing; allow it to remain one or two hours, or longer, before sending to the laundry.

In the late experiments of the "Committee on Disinfectants," corrosive sublimate, 1:10,000 almost invariably killed typhoid bacilli in two hours in bouillon without albumen, but when 10 per cent. of albumen was added, their destruction required the corrosive sublimate in the proportion of 1:100.

Dr. Laplace of New Orleans, while working in the laboratory of Koch in Berlin, discovered that the addition of acids to solutions of corrosive sublimate prevents the precipitation of albumen by them, and increases the disinfecting power of the sublimate. He recommends adding to the 1:1,000 solution of sublimate five parts of hydrochloric acid or tartaric acid.†

The investigations of Lübbert and Schneider have confirmed them in the opinion that tartaric acid, as well as some other acids renders albuminates of mercury soluble, but that when other salts are present, as in serum, they do not accomplish this end. They show also that the addition of ammonium chloride to solutions of corrosive sublimate made with ordinary water does not accomplish the end of preventing the precipitation of the mercury on account of the disturbing influence of the calcium carbonate. A reaction ensues between the ammonium chloride and the calcium carbonate, resulting in the formation of calcium chloride and ammonium carbonate, and the last decomposes the sublimate and the separation of a "white precipitate" occurs.

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*Brooklyn Medical Journal, III., 347. 1889.

†Uffelmann's Supplement for 1887, p. 170. (From D. Med. Woch.)

Instead of ammonium chloride, they recommend the addition of sodium chloride (common salt) which prevents almost entirely the precipitation of the mercury and renders solutions thus made active in the presence of albuminous matters. For the purpose of preventing the coagulation of albuminous matters, they recommend the use of 1.3 times the quantity of sodium chloride as is used of corrosive sublimate. Solutions of corrosive sublimate should not be kept too long before they are wanted for use.

The corrosive sublimate in solutions made with ordinary drinking water, particularly well water, is decomposed on account of the presence of carbonate of lime and falls out of solution. Light also exerts a destructive influence upon the sublimate and causes it gradually to fall out of solution even when made with distilled water. Michaelis* has shown that antiseptic sublimate solutions may be preserved without change in glass bottles colored brownish-yellow.

CARBOLIC ACID.

After it was learned what remarkable properties corrosive sublimate possesses for the destruction of bacteria, it seemed that this agent would pretty nearly supplant carbolic acid as a destroyer of infection. Soon, however, it was learned that there are many limitations to the use of corrosive sublimate in the practical work of disinfection, and carbolic acid seems to be regaining in many directions much of its lost ground.

In the last report of the Committee on Disinfectants of the American Public Health Association the results of a new series of tests made with carbolic acid by Dr. Meade Bolton are given, and their results accord very closely with those made by Sternberg in 1883. A large number of bacteria without spores were uniformly destroyed with a 1 : 200 solution of carbolic acid and almost uniformly by the 1 : 100 solution. The 1 : 100 solution was destructive of typhoid bacilli in flesh peptone gelatin, and was also destructive in the one per cent. solution to typhoid bacilli in bouillon, containing ten per cent. of dried egg albumen, thus presenting evidence that the disinfecting action of carbolic acid is uninfluenced by the presence of a large amount of albumen. The report says:

Finally we may say that the experiments herein recorded justify the recommendations of the Committee on Disinfectants, for the use of this agent, in their report of 1885, viz., a 2 to 5 per cent. solu-

*Zeitschrift für Hygiene IV., 395. 1888.

tion "for the destruction of infectious material which owes its infecting power to the presence of micro-organisms *not containing spores*."

Dr. Sternberg* said last year:

Carbolic acid, in the absence of spores, is a most effective disinfecting agent, and we have put it seventh in the list below mercuric chloride, although for many purposes it is preferable to this salt. It is now generally used in Germany for the disinfection of the excreta of typhoid and cholera patients. It is not itself destroyed, and may be left indefinitely in contact with the material to be disinfected. Experiments show that a one per cent. solution destroys the cholera spirillum and the typhoid bacillus, as well as the various pus micrococci. So when we direct the use of a five per cent. solution we think we are on the safe side, and it has the advantage of being quite as effective in the presence of albumen as in its absence. It destroys spores after a very long exposure.

Uffelmann† learned from his own experiments that carbolic acid, when used in the strength of a five per cent. solution, did not disinfect typhoid bacilli at the end of one hour, but effected a complete sterilization in twenty-four hours.

For the disinfection of tuberculous sputum Schill and Fischer‡ recommend carbolic acid in a five or ten per cent. solution, the bacilli being subjected to the action of the disinfectant as long as twenty-four hours.

Recent experiments by Laplace show that the addition of hydrochloric acid to a disinfecting solution containing carbolic acid greatly increases its disinfecting power for spores. Thus it is stated that "2 per cent. of crude carbolic acid with 1 per cent. of pure hydrochloric acid destroyed anthrax spores in seven days, while 2 per cent. of carbolic acid, or 1 per cent. of hydrochloric acid alone, did not destroy these spores in thirty days. A four per cent. solution of crude carbolic acid, with 2 per cent. of hydrochloric acid, destroyed spores in less than one hour; 4 per cent of carbolic acid solution alone did not destroy them in twelve days."§

Fränkel§§ has tested the disinfecting action of the mixture of crude carbolic acid and sulphuric acid following the directions of Laplace, viz: the mixing of the two liquids in equal quantities. The mixture should be carefully made as a high degree of heat is evolved, by adding the sulphuric acid gradually to the crude carbolic acid. The mixture resulting is a grayish yellow emulsion

*Brooklyn Medical Journal, III., 348. 1889.

†Deutsche Med. Woch. XVI., 37. 1890.

‡Mittheilungen a. d. kaiser. Gesundheitsamte, Bd, II., 139.

§Disinfection and Disinfectants, 164.

§§Zeit. für Hygiene, VI., 521. 1889.

with a strong smell. Fränkel learned that the disinfecting strength of this mixture varies according to whether it is kept carefully cooled or not during its preparation. Anthrax spores were killed within one day by the action of a 5 per cent. solution of the crude carbolic acid and sulphuric acid prepared cold, while the 5 per cent. solution of the mixture prepared hot required nine days to destroy them.

CREOLIN.

Dr. Sternberg refers to this article as follows in the last report of the "Committee on Disinfectants:" *

Dr. E. V. Esmarch, assistant in the Hygienic Institute in Berlin, has made an extended research upon a product of coal tar distillation called creolin. This is described as a syrupy, dark brown fluid, which smells like tar, and forms a milky emulsion with water. This is perhaps the same material which was introduced in this country some years since under the name of "Little's Soluble Phenyle," and which was tested by the Committee on Disinfectants with favorable results.

"Creolin is decidedly more active for pure cultures of micro-organisms in the absence of spores; but, on the other hand, carbol (carbolic acid) is more potent for masses of putrefying material and retains its disinfecting power longer; it seems as if creolin in contact with putrid matter after some time undergoes changes which neutralize its disinfecting power."

The prompt deodorizing action of creolin and its decided germicide power make it a suitable agent for the disinfection of excreta in the sick-room, but we would still give the preference to our standard solution of chloride of lime (containing six ounces to the gallon), as this quickly destroys all pathogenic organisms, including the most resistent spores.

According to the testimony of various quarters, there seems to be great differences between the various preparations of creolin as regards their efficiency as disinfectants. This variability was observed by Esmarch, and has been noticed by subsequent experimenters.

The two principal brands of creolin are a German preparation, Artmann's and an English, Pearson's (Jeyes').

According to the analysis of Weyl† Artmann's creolin contains only 3.4 per cent. of carbolic acid while Pearson's has 22.6 per cent. His experiments on animals show that the claim of the manufacturers as to the non-poisonous character of their preparation is untrue,

*Disinfection and Disinfectants, p. 165.

†Zeitschrift für Hygiene VI., 151. 1889.

though Pearson's is much more poisonous than the other. He calls attention anew to the inconstant compositions of these preparations.

Henle*, with others, found the composition of creolin to vary much, the English preparation containing much more carbolic acid. A 5 per cent. mixture of Artmann's creolin had but little if any injurious effect on the typhoid bacillus in one hour, while even one-half of one per cent. of Pearson's destroyed typhoid bacilli in five minutes. There was the same marked difference as regards the bacteria of suppuration. Henle separated the English creolin into its four principal constituents: soap, used for the purpose of making the emulsion, creolin-oil, pyridin, and phenol (carbolic acid). The phenol appeared decidedly to surpass in disinfecting power, solutions of pure carbolic acid in the same percentage strength. Henle concludes that phenol, aromatic carbo-hydrates, and hard soap are the constituents that endow creolin with its antiseptic properties. The removal of one of these substances, is sufficient materially to weaken its disinfecting power.

Jaeger† also, in his studies of substances suitable for the disinfection of stalls, etc., has examined creolin. He obtained his samples from seven different sources, including a sample of the English preparation.

The result of the test with anthrax spores was entirely negative. A 10 per cent. solution failed to sterilize them. With tubercle bacilli the results were favorable. The 10 per cent. solution was uniformly destructive of them.

SULPHUR FUMIGATION.

Dr. T. Mitchell Prudden‡ estimates the value of disinfection by sulphur fumigation as follows:

It is a great pity that in the matter of disinfection of rooms we should in this region still be going through with the inefficient mummery of burning sulphur with closed doors under the impression that it will destroy contagion. This operation has, indeed, a certain archaic picturesqueness about it, and save for the damage which is liable to accrue from the fading of furniture and hangings, is a tolerably harmless practice; but it savors rather of the propitiatory sacrifices to malevolent deities of centuries gone by than of the intelligence of the present time. Sulphurous acid, as it is usually applied in house disinfection, has been shown over and over again

*Arch für Hygiene IX., 188. (D. Med. Woch.)

†Arbeiten aus dem kaiserl. Gesundheitsamte, V., 279. 1889.

‡The Amer. Jour. of the Med. Sciences, XCVII., 476. 1889.

by the most careful experiments to be a very inefficient and unreliable disinfecting agent. It may be better than nothing, but in disinfectants—which are often our sole weapons in fighting epidemics—the best is none too good. The efficiency of sulphurous acid may be increased by securing the thorough wetting of everything to be disinfected, but even then it is not great.

Dr. Wm. H. Welch,* of Johns Hopkins University, Baltimore, holds the following opinion of the value of sulphurous acid gas as a disinfectant:

Whether it be pertinent to this occasion or not, I cannot forbear to add my protest to that of others against placing reliance upon any method hitherto employed of disinfecting houses or apartments by fumigation. And I would, furthermore, call attention to the lack in most cities of this country of public disinfecting establishments such as are in use with excellent results in many cities of Europe, and which are indispensable for the thorough and convenient disinfection of clothing, bedding, carpets, curtains, etc.

All who have carefully investigated the value of sulphur fumigation have generally arrived at the conclusion that, in the concentration which is practicable in the disinfection of rooms, sulphurous acid gas occupies a low rank. In nearly all late European regulations for disinfection it finds no place. Nevertheless, in this country, many practical public health officers believe that sulphur fumigation is not without value. This opinion was brought out quite prominently at the Brooklyn meeting of the American Public Health Association, and in the discussion the importance of supplying moisture to the atmosphere, together with the sulphurous acid gas, was strongly insisted upon as increasing very much the effectiveness of this method of disinfection.

DISINFECTION OF ROOMS.

In the disinfection of rooms sulphur fumigation should occupy a very subordinate place. If used at all it should be intended as only auxiliary to the action of other more potent disinfectants. Woodwork should be washed down in a sublimate solution, Solution C reduced to the strength of 1 : 1,000, or Solution E; picture frames, especially the projecting parts of mouldings, the tops of doors and window casings, and other places that can harbor dust, should be carefully wiped with a cloth wrung from one of these disinfecting solutions, floors should be thoroughly washed in the same, especial

*Sanitarian, XXIII., 113. 1889.

attention being given to disinfecting the spaces between the floor boards, the wall paper should be washed or wiped in the same solutions, unless they are considered too valuable to spoil; clothing should be disinfected by steam or by boiling,—when this is done there is not much left for the sulphur fumigation, and it may be trusted to do it.

A paper by Esmarch* appeared in 1887, which might be paraphrased as "The Disinfection of Walls with Bread," and the author's suggestion for freeing walls of bacteria were so contrary to the reader's sense of the fitness of things that he had to recall himself to the fact that he had not opened a journal given to the travesty of one of the most sacred articles in the creed of the sanitarian. The walls of rooms, whether they are papered, painted or simply finished in plaster, no matter how smooth they appear to the eye, in reality they are not so, and in their niches and on their projecting ledges disease producing bacteria find ample lodgement.

That this is not mere assumption is shown by the experiments of Esmarch. Rubbing 25 square centimeters of the walls of different rooms with bits of sterilized sponge and afterwards making cultures from them, he obtained from the walls of a stable from 231 to over 6,000 bacteria, on the walls of the laboratory, from 2 to 112 according to location and character of surface; in a dwelling room from 2 to 153 bacteria. Some of the results obtained from these preliminary investigations of the germ contents of walls are interesting, particularly in one house in which a part of the paper hanging and painting was old and a part new. In this house, in the living room, on the old paper there were 14 bacteria, another place 12, and another 10; on the new paper, three months old, 5; in the corridor, old paper, 43; in the closet, old paper, 38, in another place, 31; in kitchen, kalsomined wall, 14, oil painted wall, 14; sleeping-room, oil painted, one month old, 1. In another house in which there had been no thorough cleaning of the walls for sixteen years he obtained distinctly higher numbers.

Investigating the condition of the walls after they had been disinfected by various processes, he came to the conclusion that the most efficient method of removing bacteria from them was by rubbing the walls with bread.

For a long while in Germany the cleansing of walls by rubbing with bread had been a process in favor with the public, as in this

*Zeitschrift für Hygiene II., 491.

way, whether papered or painted, they could be, without injury, freed from dirt and renovated in appearance.

Esmarch found that by rubbing down the walls with bread they were freed more completely from bacteria than after washing or spraying with 1 : 1.000 sublimate solution, or 5 per cent. carbolic solution. The superiority of this method of cleansing walls was so conclusively shown that the process has since been adopted in the official regulations of many cities.

The kind of bread and method of procedure recommended is as follows: Common rye bread, new and well baked through, is cut into pieces of a size convenient for the hand so that they may be grasped by the hard outer crust. With these pieces of bread, held so that the hand does not touch the wall, I could very conveniently with moderate pressure rub the walls. * * * * In most of the cases the walls were rubbed only once, and in doing so the surface of the bread was blackened very distinctly. The crumbs falling to the floor are to be carefully swept up and burned, not fed to animals.

An interesting paper was contributed two years ago by Krupin*, a Russian surgeon in the Alexander Barracks-Hospital, St. Petersburg. From the experience in that hospital and from their studies of the current literature, the surgeons were inclined to divide infectious diseases, into two classes, a division of some importance in connection with the adoption of measures for the disinfection of rooms. In one class they placed those diseases whose infection is characterized by a tendency to adhere to surfaces upon which they have found a lodgement, as diphtheria, scarlet fever, croupous pneumonia, small-pox, erysipelas, and dysentery; in the other class, those diseases whose infection is possessed of but feeble powers of vitality, as relapsing fever, typhus fever, and measles.

Upon the opening of the Hospital the process of disinfecting with chlorine gas was adopted for rooms and wards which had contained infectious cases, and in connection with certain diseases this appeared to be sufficient; for example, after typhus fever, typhoid fever, and relapsing fever, scarlet fever, measles and small-pox.

The first doubt as to the efficacy of chlorine disinfection was raised after the disinfection of a barrack on account of diphtheria. In barrack No. 17, containing scarlet fever patients, one case was found to be complicated with diphtheria toward the end of the epidemic. In a short time afterward, several convalescents from scarlet fever in the same barrack were attacked with diphtheria. The barrack was therefore closed, and thoroughly disinfected with chlo-

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*Zeitschrift für Hygiene III., 219. 1888.

rine gas. After disinfection, this barrack was washed, ventilated, and for seven months it remained vacant. When it was again opened it was occupied for four months with measles patients, and during this time a few cases of measles were complicated with diphtheria, although none of these patients had had this complication when received. Again the barrack was vacated, still more thoroughly disinfected with chlorine gas and again remained vacant, this time seven months. When it was again opened it was devoted to small-pox patients, and some of these patients had diphtheria as a complication. In addition to these, the barrack physician, two nurses and a waiter, in short, the whole personnel of attendants. Again the barrack was closed, and a third time disinfected with chlorine gas. When this barrack was again opened, it was used for typhoid fever patients, adults only being received, and no further cases of diphtheria occurred.

This experience led them to make an investigation as to the disinfecting power of chlorine gas for certain well-known pathogenic bacteria, particularly anthrax spores. The results of these experiments were not satisfactory, and finally led to the abandoning of chlorine in the disinfection of rooms.

From further laboratory experiments and from a long series of subsequent experiences in the disinfection of rooms, Krupin comes to the following conclusions:

1st. The disinfection of sick rooms is best done by washing or sprinkling with sublimate or carbolic acid solutions.

2d. The most efficient agent for disinfecting rooms is a solution of corrosive sublimate 1 :1,000 alone, or half and half with a solution of carbolic acid 5 :100.

3d. As far as our experience yet shows, these methods of disinfection are entirely harmless for the subsequent inhabitants of the rooms.

DISINFECTION OF EXCRETA.

A series of experiments was carried out by Dr. Foote* in the laboratories of the Yale Medical School for the purpose of determining whether corrosive sublimate is a good disinfectant for feces, and if it is not, whether this is due to the formation of inert, insoluble compounds of mercury with the feces; 2d, to determine the relative value of certain other disinfectants used for this purpose. As a test mixture, normal feces were used, mixed with about two-thirds their bulk of decomposing urine.

The following standard solutions of the disinfectants to be tested were made up according to the following formulæ:

Corros. subl., two drachms; water, one gallon.

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*Amer. Jour. of the Med. Sciences XCVIII., 329. 1889.

Chloride of lime, four ounces; water, one gallon.

Sulphate of iron, eighteen ounces; water, one gallon.

Corros. subl., two drachms; tartaric acid, ten drachms; water, one gallon.

Hydrochloric acid, one per cent. (ten drachms to one gallon).

Corros. subl., two drachms; hydrochloric acid, ten drachms; water, one gallon.

Carbolic acid, five per cent. solution.

Corros. subl., two drachms; potass. permang., two drachms; water, one gallon.

These experiments furnished an excellent opportunity to observe the deodorant effects of the disinfectants tested. Sulphate of iron, which is often regarded as a good deodorant, developed an odor considerably more disagreeable than that of the mixture of feces with sterilized water. The odor did not seem to be lessened in any appreciable degree after seventy-two hours when the flask was emptied. The bichloride and the mixtures of the bichloride with hydrochloric acid, tartaric acid, and potassium permanganate are primarily good deodorants. Thus at the end of four hours there was no appreciable odor from mixtures containing these. After forty-eight hours, however, a very sickening odor was developed in all these mixtures. This was not of putrefactive origin, since the mixtures were frequently perfectly sterile. Chloride of lime rapidly destroyed all fecal odor, but replaced it by its own. Carbolic acid also destroyed all fecal odor after four hours.

The experiments showed that:

The bichloride with hydrochloric acid is by far the most efficient disinfectant. Next in order stands chloride of lime, it acts less efficiently, but more rapidly than the bichloride with hydrochloric acid.

The addition of tartaric acid to the bichloride solution somewhat increases its power, though not nearly so much as hydrochloric acid.

The sulphate of iron shows itself totally inefficient, both as a disinfectant and deodorizer, and there is no rational basis for its use for these purposes. One per cent. solution of hydrochloric acid, and five per cent. solutions of carbolic acid, have little power as disinfectants.

The addition of potassium permanganate to the bichloride solution considerably increases its efficacy. * * * * The simple bichloride solution has also shown itself unreliable.

The chemical analyses of the filtrates has shown that considerable mercury exists in solution in them, and the bacteriological tests * * * * have shown that this soluble form of mercury is a powerful germicide—even when diluted one-half, capable of destroying the bacillus typhosus after an exposure of six hours; consequently the inefficacy of the bichloride as a disinfectant does not seem to be due to the fact that it forms insoluble, inert compounds with organic matter, for the compounds are neither insoluble nor inert, but rather due to the lack of power of penetrating organic matter. This being the case, it is doubtful if an increase, within certain limits, in the proportion of the bichloride to the feces, would increase its efficacy much.

Experiment VI. further shows that one pint of the best disinfectants (bichloride with hydrochloric acid, bichloride with potassium permanganate, and chloride of lime) is sufficient to sterilize a semi-solid dejection consisting of 100 c. c., after four hours' exposure, but that it is insufficient to sterilize, after four hours' exposure, one of 250 c. c. in a small proportion of cases. Therefore, one pint of these disinfectants should be used to every 100 c. c. of a semi-solid dejection.

These experiments were all performed with normal feces. The probability is very slight that these same disinfectants which are efficient in sterilizing normal feces would prove inefficient in cases where pathogenic germs exist, since the spores of the hay bacillus which exist in normal feces are certainly as resistant to the action of germicides as the most resistant pathogenic germs, and far more resistant than the pathogenic germs most common in feces, such as the bacillus typhosus and the comma bacillus.

Conclusions.—The best disinfectants to use are the bichloride with hydrochloric acid, the bichloride with potassium permanganate, and the chloride of lime.

Five per cent. solutions of carbolic acid and two-tenths per cent. solutions of the bichloride are unreliable even when used in the proportion of one pint to every 100 c. c. of dejection.

Emphasis needs to be laid on the necessity of thorough disintegration of the fecal matter by stirring with the disinfectant, and on the necessity of allowing the mixture to stand four hours, at least, before emptying.

For continued use the bichloride solutions would injure lead pipe, while if used for a few days only, probably no injury would result. For long continued use, where the dejections are thrown into a water-closet, chloride of lime is undoubtedly the most available disinfectant.

Solutions of chloride of lime should be kept tightly corked and should not be used after they are one week old.

At the request of the city government of Buda-Pesth, Dr. Gerlóczy in the Hygienic Institute in that city made an extensive series of investigations for the purpose of determining the most suitable agents to be used for the disinfection of privy vaults, sewage, the mud and slime of streets, dry garbage, and fresh excreta, particularly from diarrhœal and typhoid fever patients.

The disinfectants tested were corrosive sublimate, sulphate of copper, sulphate of zinc, sulphate of iron, pure carbolic acid, crude carbolic acid, said to be of some 25 to 30 per cent., carbolate of lime, creolin, crude sulphuric acid, milk of lime 20 per cent., boiling water, hot and cold lye of wood ashes, and strong solutions of common salt.

The conclusions which he deduces from his various experiments are as follows:

As a disinfecting agent for excrement and garbage, corrosive sublimate does not deserve the confidence which it received as the result of the earlier disinfection experiments which were made with this substance. For the disinfection of the contents of privy vaults, corrosive sublimate is not to be considered, because, even in concentrated solutions, the excrement is not disinfected when the solution is used in quantities equal to that of the matter to be disinfected.

From my experiments I can recommend sulphate of copper as an efficient disinfectant. This agent, in the proportion of 1:1,000 of the sewage, rendered it pure and odorless, and it remained permanently sterile. When used in sufficient quantity (and its cheapness permits this) fresh excrement and even the contents of the privy vaults were disinfected. The advantages of sulphate of copper are that it is comparatively cheap, that it is not very poisonous, and that its color prevents mistakes.

With similar positiveness I can recommend the lye of wood ashes. In concentrated solution even when cold it disinfects fresh excrement. Hot lye is still more active and is to be considered as one of the most rapidly acting disinfecting agents.

Pure carbolic acid deserves, in my opinion, a lower place than sulphate of copper or lye, and, in comparison with these disinfectants, is to be still less recommended on account of its price.

Raw carbolic acid is valuable as a deodorizer. Creolin is not to be recommended. (The author does not state what brand of creolin was tested.—A. G. Y.)

(a) *Disinfection and Deodorization of Privy Vaults.*

The complete disinfection of privy vaults can be required only under extraordinary circumstances; for example, in cholera times when the dejections from the first cases have been thrown into the vault. For disinfection under these circumstances sulphate of copper is to be recommended in strong solution, at the rate, at least, of 40 kg. of sulphate of copper to each cubic meter of material to be disinfected. (2½ lbs. to each cubic foot.)

For the deodorization of vaults, crude carbolic acid is suitable, using at the rate of 20 kg. to the cubic meter.

(b) *Disinfection and Deodorization of Sewage.*

For this purpose sulphate of copper is to be recommended. Foul and bad smelling cesspools and outlets may be rendered odorless with crude carbolic acid, and to accomplish this, two parts to one thousand parts of the sewage are sufficient.

(d) *Disinfection of Fresh Excrement.*

For the disinfection of discharges from the bowels, a strong solution of sulphate of copper is effective. One part of sulphate of copper to one hundred parts of excreta being sufficient. A still more efficient method for the rapid disinfection of stools is pouring over them three times their bulk of hot lye (one part of ashes to two parts of water.) A cheap and good disinfectant, also for the same purpose, is milk of lime.

Pfuhl having confirmed the correctness of the results obtained by Liborius* as to the value of caustic lime as a disinfectant for typhoid fever and cholera dejections, communicated, in a second paper,† the results of his use of milk of lime as a disinfectant for privy vaults, latrines, etc.

One of the vaults used by Pfuhl for purposes of experiment belonged to one of the barracks not connected with the sewerage system of the city, and was used by 280 men. By the addition every other day of a quantity of the milk of lime, equal to one litre of the dry hydrate of lime to each one hundred litres of daily increment to the contents of the vault, it was found that a sufficient degree of alkalinity of the whole mass could be maintained to ensure its disinfection.

Pfuhl states that, contrary to expectation, the odor of the vault was diminished in a marked degree. The following method of preparing the milk of lime is recommended:

The lime is so placed in the vessel in which it is to be slaked that every piece touches the bottom. Sixty parts of water are to be added to one hundred parts of burnt lime, pouring it in so that it spreads over the bottom of the vessel and is absorbed upwards into the lumps of lime. Proceeding in this way, with this quantity of water, all excess of water is dissipated by the heat evolved and a comparatively uniform preparation of dry hydrate of lime is obtained which may be preserved for some time by excluding the free access of air from it. To prepare from this hydrate of lime, milk of lime, 5 : 100, it is only necessary to mix one volume of the hydrate of lime with two volumes of water. For general use a milk of lime of half this strength is recommended, one volume of hydrate of lime to four volumes of water.

For the disinfection of excreta Nissen‡ prefers the chloride of lime on account of its more rapid action and great effectiveness.

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*See page 244. †Zeitschrift für Hygiene, VII., 363. 1889. ‡See page 242.

DISINFECTION OF STALLS, CATTLE CARS, ETC.

From the extended investigations of Jaeger* as to the most appropriate disinfectants for stalls, cattle cars, etc., where the disinfection must be done rapidly and usually by a single application, put on with a brush or otherwise, he comes to the following conclusions, given here in abstract:

The principal result of the preceding work is that among the whole series of pathogenic bacteria which have been made use of in the experiments, not a single one has been found which was not killed by one or other of the disinfecting agents used. It is shown that a strict arrangement of the disinfectants in a series according to their efficiency cannot be made, for one acts upon this and another upon that species of bacterium with a greater degree of disinfecting power. It may be mentioned that tubercle bacilli, in all the experiments, have stood at the head of all the bacteria in their power of resistance.

Among those substances which sometimes fail to destroy anthrax spores and tubercle bacilli, but are destructive of other kinds of infection, caustic lime occupies the first place. Among those agents which do not with certainty destroy even bacilli without spores, and, therefore, which should be excluded from use as disinfectants, potassium permanganate and sulphate of iron are to be mentioned. In all of the experiments the former was uncertain in its action, and the latter in solution, 1:30, failed to destroy anthrax bacilli without spores, although these frequently enough perished as the result of simply drying.

The power to destroy anthrax spores with certainty has been shown by only solutions of carbolic acid, with hydrochloric acid added, and a milk of chloride of lime 1:3. In spite of this positive disinfecting power, the chloride of lime is untrustworthy as a disinfectant for tubercle bacilli, and even for the bacillus of glanders. On the other hand, agents which are effective for the destruction of tubercle bacilli have shown no action upon anthrax spores.

For the disinfection of tubercle bacilli, carbolic acid and especially preparations from the tars are shown to be suitable; even wood tar in one experiment destroyed tubercle bacilli, and still more remarkable was the action of the mixture of sulphuric acid and carbolic acid, of creolin, and of cresolin which have destroyed tubercle bacilli with spores in all the experiments; creolin and cresolin accomplishing this even in two per cent. solutions. For the destruction of the infection of tuberculosis, therefore, a preparation derived from the tars should have the preference. For this purpose, crude carbolic acid, with the addition of hydrochloric or sulphuric acid, deserves a place near a 3 to 5 per cent. solution of pure carbolic acid.

The choice of disinfectants is to be made, not only with reference to the power of resistance of the infection to be destroyed, but also

*Arbeiten aus dem kaiserl. Gesundheitsamte V., 247. 1889.

with reference to the character of the objects to be disinfected, as for instance chloride of lime and the mineral acids are unsuitable for disinfecting articles made of iron on account of rusting them. Articles of this nature are preferably disinfected with heat, and when this cannot be done, painting with tar is to be recommended.

DISINFECTION WITH STEAM.

Much fertility of invention has been shown in the devising of apparatuses for disinfection through the agency of heat, some using for this purpose hot air, and some using steam. In England particularly, hot air as a disinfecting agent has been used considerably, but it has gradually been learned that, as compared with steam, it is much less certain and much less rapid in its action, especially when in practical disinfection bulky articles like mattresses must be penetrated and permeated by the heat.

Dr. Parsons* made an extensive examination of disinfecting apparatuses for the Local Government Board of England and, together with the expression of his preference for steam, gives the following as the most important requisites of a good apparatus for disinfecting by heat:

(a) That the temperature in the interior shall be uniformly distributed; (b) that it shall be capable of being maintained constant for the time during which the operation extends; and (c) that there shall be some trustworthy indication as to the actual temperature of the interior at any given moment. Unless these conditions be fulfilled, there is risk, on the one hand, that articles exposed to heat may be scorched, or on the other hand that, through anxiety to avoid such an accident, the opposite error may be incurred, and that the articles may not be sufficiently heated to ensure their disinfection.

In steam apparatus the three requirements above mentioned are all satisfactorily met, and for this reason, as well as on account of the greater rapidity and certainty of action of steam, steam chambers are in my opinion, greatly preferable to those in which dry heat is employed.

As early as 1862 our eminent sanitarian, Dr. A. N. Bell, at that time surgeon in the U. S. Navy, suggested the use of steam for the disinfection of ships infected with yellow fever, and his recommendations were carried out with successful results. In reporting his experiences that year to the Medical Society of the State of New York he formulated the following conclusions:

That inasmuch as a temperature of 145° Fahrenheit, which coagulates albumen, * * * * effectually disinfects the

*Rpt. of the Med. Officer of the Local Govt. Board for 1884, p. 302.

worst fomites, we have in this fact alone strong evidence of the identity of virus with organic matter.

That the necessary degree of heat for disinfection may be applied in some form to almost every article of commerce or apparel liable to the virus of infection or contagion, without injury.

That the examples furnished are an amply sufficient guide for the application of heat under the most variable circumstances.*

In the application of steam to disinfection, steam under various conditions has been used: steam at rest but under pressure, steam not under pressure and flowing in a free current through the goods to be disinfected, steam superheated but not under pressure, and mixtures of steam with hot air. The following extracts from the recent literature of steam disinfection will serve to show the drift of opinion in regard to the kind of steam to be employed, as well as some points to be observed in the construction of disinfectors.

As regards the efficacy of steam under pressure there seems to be no question, but there are certain points of disadvantage which render the general use of steam under pressure impossible in many places where the advantages of disinfection with steam are often needed.

Steam under pressure, to guard against the dangers of explosion, requires greatly increased strength of construction of both the steam generator and the disinfecting chamber, and this necessitates comparatively high cost of manufacture, thus effectually placing disinfectors of this sort outside the means at the disposal of most sanitary authorities and many public institutions not well endowed.

In addition to the first cost, apparatus for the use of steam under pressure requires the constant attendance of skilled help in running it, otherwise the increase in cost of construction would be no protection against accidental explosions; this of course entails extra cost in the operation of it.

These disadvantages appear to be overcome by the employment of steam not under pressure.

DISINFECTION WITH FLOWING STEAM.

In the report for 1887 of the Committee on Disinfectants† appointed by the American Public Health Association we find the following:

*Trans. of the Ninth Internat. Med. Congress, IV. 568.

†Disinfection and Disinfectants, p. 208.

By referring to the report of the committee for 1886, it will be seen that the most efficient devices for disinfection by heat consist of those in which steam under pressure, or passing through the articles to be disinfected in a free current (strömender Wasserdampf) are employed. The opinion was expressed, based upon practical experience, that steam under pressure, in order to raise its temperature (or possibly to increase its penetrating power,) was the best form in which to employ the agent. This opinion was justified by European experience, and especially by the personal observations of Drs. S. H. Durgin and Joseph Holt, members of the committee, to whose reports attention is directed.

Recent experience abroad seems to indicate, however, that an apparatus in which the steam is not confined under pressure may be equally efficient, more easily managed, and much more economical.

One of the first apparatuses for using steam in a free current for disinfecting purposes was Henneberg's disinfector. One of these was placed in the Hygienic Institute in Berlin for a few weeks, and under the direction of Koch was tested by Dr. Esmarch.* The apparatus consists of an open top boiler, or kettle, upon which rests the disinfecting chamber, mouth downward. The steam, not under pressure, passes freely upward through the goods to be disinfected and escapes from the top of the chamber. In these experiments Esmarch was struck with the rapidity with which the steam penetrated the interior of clothing and even into the center of rolls and packages of goods so as to bring the temperature up to 100° C. His conclusions were that steam not under pressure at a temperature of 100° C., when it streams rapidly through the goods is well suited to be used as a certain and comparatively rapid acting disinfecting agent.

The Henneberg disinfector corresponds to the requirements of a good disinfecting apparatus and may be further recommended on account of its cheapness and the simplicity of its working.

In testing this apparatus all the micro-organisms found in the soil were not destroyed with certainty, and Esmarch questioned whether it is necessary to set the requirements of steam disinfection so high, since anthrax spores and tubercle bacilli, the most resistant of pathogenic germs known, were destroyed within a few minutes by flowing steam. All other bacteria which are known as the cause of human or animal diseases, the bacillus of cholera, of typhoid, and of glanders, the micrococcus of suppuration and of erysipelas, as well as the bacteria found by Friedländer and Fränkel in pneumonia, and by Loeffler in diphtheria, are all destroyed before the temperature reaches 100° C.

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*Zeitschrift für Hygiene, IV., 342. 1887.

Dr. Loeffler,* as a member of the committee on disinfection before the International Hygienic Congress at Vienna, said:

Practically the requirement does not now exist to kill all spores, but only the infectious germs. The spores of the bacillus of tuberculosis are killed in half an hour, and those of anthrax in a few minutes, by steam at a temperature of 100° C. More resistant pathogenic germs than these we do not know. When objects in all their parts are subjected for half an hour to steam at a temperature of 100° C. (212° F.) the disinfection is completed.

In another paper Esmarch† gives the results of his investigations as to the comparative activity for disinfecting purposes of simple flowing steam not under pressure, and the same superheated. He found that, as the temperature of the steam was raised, within certain limits, its disinfecting power was diminished. Thus anthrax spores were killed with certainty with simple flowing steam at 100° C. (212° F.), but they were not destroyed by superheated steam at 110°, 120°, and 150° C. In another series of experiments, anthrax spores were killed with flowing steam at 100° C. in five and ten minutes, but with steam at 110° and 120° C. they were not destroyed in twenty minutes. Only as the temperature approached 150° C. (302° F.) did the disinfecting power of the steam increase again, and at 150° C. anthrax spores were killed in ten minutes. Esmarch could account for the failure of superheated steam to destroy anthrax spores only by supposing that bacteria are surrounded with an organic covering which protects them to some extent against the action of heat until it is softened or penetrated by moisture, and, as the superheated steam is dry steam, this fact accounts for its failure to destroy the spores of anthrax.

Prof. Gruber‡ of Vienna tested a Thursfield disinfector of the old pattern, and a later one of the new pattern. In the old apparatus, steam flowing in a free current through the goods, together with an admixture of hot air, was made use of. The results of Gruber's tests of it were unsatisfactory. The mixture of steam and heated air did not penetrate the objects to be disinfected readily, and the action was much inferior to the simple steam flowing in a free current.

In the new disinfector, steam alone is admitted into the disinfecting chamber, and Gruber found the working of the apparatus, very satisfactory. He says that it is not necessary, in disinfection with steam, to use a higher temperature than 100° C. (212° F.) and

*Viert. für öffent. Gesundheitspflege, XX., 236. 1888.

†Zeitschrift für Hygiene IV., 197. 1888.

‡Gesundheits-Ingenieur XI., 282. 1888.

that the knowledge is not unimportant, that, for the rapid penetration of the heat into the interior of objects, the steam should be as pure as possible, that is free from admixture with air.

Gruber also advises strongly the admission of the steam into the top of the disinfecting chamber and its escape from the lower part, thus passing the steam downward through the goods instead of upward as in most of the steam disinfectors. His reason for this recommendation is that air at the temperature of 100° C. has nearly twice the specific gravity of steam at the same temperature, and therefore, by the admission of the steam into the upper part of the disinfecting chamber, the air is more readily and quickly pressed downward out of the interstices of the goods and out of the disinfecting chamber.

On account of the prevalence of diphtheria in Copenhagen and the need of more efficient methods of disinfection, the city government charged Drs. Salomonsen and Levison* with the testing of various disinfecting apparatuses to determine their comparative efficiency. Five different disinfectors were tried. The results were as follows:

"We had successful results only with Reck's two disinfectors and with Geneste, Herscher & Co's apparatus." (The Reck disinfector employs steam moving in free currents and not under pressure, the steam entering the upper part of the chamber. It is recommended by the royal Danish health authorities. The Geneste, Herscher & Co's disinfector is a French apparatus using steam under pressure. A. G. Y.)

The French apparatus has one weak spot which we did not find in the Reck apparatus: the atmospheric air must necessarily be wholly expelled from the cylinder in order that rapid and complete destruction of the bacteria can be accomplished with the Geneste-Herscher apparatus. The carrying out of the disinfection with the apparatus is moreover more complicated, and the operation must be more closely watched than is necessary with Reck's disinfector, in which the expelling of the air goes on automatically as in all the disinfectors which use streaming steam, (*strömender Wasserdampfe*).

Dr. Budde† of Copenhagen takes a rapid view of the different kinds of steam disinfectors that have been put upon the market and speaks of the unsuitability of most of them for smaller towns, rural communities, small hospitals, alms-houses, prisons, etc.

If the use of steam disinfectors is to become generally extended in such places the first requirement will be that they shall be much

*Zeitschrift für Hygiene, IV., 94. 1888.

‡Zeitschrift für Hygiene VII., 270. 1889.

less costly than hitherto without any diminution of their effectiveness. He hereupon goes on to describe a new disinfector made under his direction. The steam is generated in an iron wash boiler fitted with a cover, is conducted through a hose into the upper part of the disinfecting chamber and passes in a free current through the goods to be disinfected from above downward. The steam is under very slight, almost insignificant pressure.

The results obtained in the use of this disinfector are interesting and somewhat surprising. In all the experiments a maximal thermometer and an electrical contact-thermometer were rolled and wrapped in a woolen blanket, and outside of this another blanket of the same kind was wrapped, and the whole packet tied with twine. In five experiments the signal from the contact-thermometer indicated in from 12 to 30 minutes that the temperature of 100° C. had been reached, and the temperatures shown by the maximal thermometer ranged from 104.1° to 105° C. The author writes of these results as follows:

The hypothesis that this phenomenon can be explained by an increase in the steam pressure is shown by the records of my experiments to be entirely untenable. In tests 1, 2, and 3, for example, where the degrees of temperature were 104 3°, 104.7° and 105° C., one must have, if the temperature were due to the tension of the steam, a pressure of about one-fifth atmosphere, while in reality the pressure, as the records of this experiment show, was only one-thirty-fifth atmosphere. The high degree of temperature cannot be explained by the pressure to which the steam is subjected, indeed there remains only one moment explanatory of it, namely, condensation of the steam.

In a later series of experiments with steam under moderate pressure, Budde found that flowing steam delivered with a pressure of fifteen pounds penetrated the interior of a roll of wrappings and raised the contract-thermometer to 100° C. in two and one-half minutes, while with steam at rest, but under the same pressure, eleven minutes were required, and with intermitting pressure, after the Geneste-Herscher method, five minutes were required to attain the same temperature.

Dr. Hahn* has recently described a new form of disinfector which he tested in the Hygienic Institute in Berlin, the Budenberg disinfector, which makes use of flowing steam, the steam passing downward instead of upward through the disinfecting chamber. This disinfector is intended for small towns. In some of the experiments

*Deutsche Med. Woch. XVI., 240. 1890.

the temperature indicated by the maximal thermometer was 105.5° C., and in one experiment with the steam in the disinfecting chamber under the pressure of .3 atmosphere, the maximal thermometer showed a temperature of 107° C. With this slight pressure, and in other experiments with none, anthrax spores and garden earth were completely sterilized.

Dr. Hahn presents the following points as the principal requirements in a disinfector of this kind:

1st. The apparatus must be capable of destroying all known pathogenic micro-organisms and their spores, even the most resistant anthrax spores.

2d. It must be capable of accomplishing these results in every part of the disinfecting chamber within a reasonable length of time, which varies of course with the size and character of the objects to be disinfected.

3d. The objects must not be injured in any marked degree.

4th. The apparatus must not be too complicated in its construction and must be easily operated.

Dr. Rohrbeck*, referring to the discrepancies in the results obtained by different investigators in the use of steam of different qualities for disinfecting purposes, says that "from all the investigations it is evident that the damp (gesättigte) steam is the principal agent in disinfection, while the non-saturated, dry (superheated) steam is not particularly better as a disinfectant than hot air."

As to the changes or injuries suffered by goods in the process of steam disinfection, Esmarch speaks as follows in reference to his trial of the Henneberg disinfector:

Among several hundred samples of woolen, silk, plush, and other goods of the most different colors, only a very few were changed after one to two hours disinfection, as light blue, pink, and white. The rest of the samples remained entirely unchanged not only in color, but also in luster and strength of texture. Linens were unchanged excepting in spots where they came in contact with the galvanized iron wire of the baskets in which they were placed, and this could be easily prevented by the interposition of a covering of cloth. Most samples of paper acquired a slightly yellowish tint and lost their gloss; the bindings of books were injured especially when in leather. Articles in leather and fur are spoiled in a short time so as to become worthless.

*Centralblatt für Bak. u. Par., VI., 493. 1889.

DISINFECTORS FOR SMALL TOWNS.

Dr. C. N. Hewitt* in his presidential address before the Milwaukee meeting of the American Public Health Association, in enumerating the essentials for successful local sanitary work referred as follows to the need of a practicable steam disinfector for small towns and rural communities:

Another essential is an apparatus, not too expensive or elaborate, or too heavy for easy movement on wheels, for disinfecting clothing, bedding, and the like, by steam. One to which steam could be supplied by the boiler of a thresher engine would serve our country districts, and the same could be used where steam boilers are available elsewhere. It could be taken to the infected house, charged, closed, and moved to the nearest available boiler, connected, disinfected, and discharged of its contents, with no danger, and at trifling expense.

At the meeting of the German Public Health Association of 1887 the following resolutions with reference to steam disinfection and disinfecting establishments were passed:

Each large city should have one or more public disinfecting establishments. For the general use of the public in small towns, transportable disinfecting apparatuses are preferable.

The use of public disinfecting establishments should be available to the poor without pay when their need is certified by the attending physician.

For purposes of disinfecting "streaming steam" is preferable.

The choice of the apparatus, and the technical arrangement of it, will depend upon the local conditions †

At a recent meeting of the Paris Academy of Medicine, M. Paul Gibier described a disinfecting stove he has recently invented. It can be taken to pieces, and moved into the infected room. The inventor aimed at preventing the diffusion of germs by removing infected articles to be disinfected. The stove is made of galvanized sheet-iron; outside it is covered with felt. It resembles Koch's sterilizing apparatus; like it, this stove sterilizes bedding, even a mattress by means of steam at 100° C. (212° F. Some exceptional microbes resist this temperature during a certain period of time, but it is rare to see them survive the influence of this degree of moist heat during three quarters of an hour, or at the most an hour. M. Gibier destroyed all the pathogenic microbes he had experimented on—the cholera bacillus, bacillus of typhoid fever, several kinds of micrococci, ferments, fungus of the aspergillus order, aspergillus fumigatus, the A. flavescens of dried blood, containing the microbe of symptomatic charbon. The smoke passes up the chimney of the room which is disinfected. The process of disin-

*Trans. American Public Health Association, Vol. XIV., 11. 1888.

†Uffelmann's Supplement, 1886, p. 141.

fection lasts one hour or more, according to the size of the stove, and this can be regulated. The stove is a system of segments, and, according to the number of segments utilized, the stove is smaller or larger. This stove is simple in construction and moderate in price, therefore would be of great use in hospitals and charitable institutions, as well as private houses.* (This disinfecting stove is figured in the last report of the Committee on Disinfectants appointed by the American Public Health Association.—A. G. Y.)

HYGIENIC VALUE OF SUNSHINE.

In the Brooklyn meeting of the American Public Health Association last fall Dr. Parker of Newport, R. I., read a paper on "The Overshading of Our Homes" in which he said:

Houses overshaded are not healthful, no matter how commodious or well built they may be. Too many trees near sleeping and living rooms exercise a very injurious influence and induce various diseases, notably rheumatism, heart disease, consumption, general debility, and anæmia. * * * * * The air entering the bedrooms and living rooms from such surroundings is chilly and dead, and is not at all suitable for respiration. Such an atmosphere cannot bring health to invalids, and is dangerous to the well. It is invariably productive of sickness and even death, especially among children and those of feeble constitution.

In a lecture on disinfection Sternberg† places light among those agencies which are capable of destroying disease-producing influences.

Among the germicide agents which have been tested I will first mention light. We have experiments by a number of different observers upon the germicide power of light, and it is a very interesting fact that exposure to the bright sunlight destroys pathogenic organisms, independent of the heat of the sun; experiments have been made to show this. Taking two tubes, one of which is enveloped in tinfoil to exclude the light, but which receives the heat in the same way as the other; in the one which is exposed to the bright sunlight the germs in certain cases are destroyed—in some instances in quite a short time. Duclaux found that certain micro-organisms are destroyed in twelve hours' time when exposed to the sun during June and July. He found that dry spores were destroyed in two months when exposed in a dry condition. These spores can be kept indefinitely when put in a dark place in a dry condition. Another observer, Arloing, found that the spores of anthrax in bouillon were killed in two hours; whereas the anthrax bacillus required from 27 to 30 hours. It was a strange fact that the anthrax bacilli which had grown out withstood the light longer than the spores. The explanation is supposed to be that the spore just at the moment of sprouting is more tender and more easily killed than

*Sanitary Record, VII, 558. 1886.

†Brooklyn Med. Journal, III., 341. 1889.

the bacilli after they are in full development and multiplying by binary division. He found by putting these same spores in water that they were not killed; it was only in a suitable culture medium that the light had this effect on them. By the electric light spores in bouillon were killed in one hour. This shows us that in sunlight we have a sanitary agent of great importance; a fact which has long been recognized by sanitarians, and now we have experimental data to support this well recognized fact.

Dr. Uffelmann,* in a thoughtful paper on "The Hygienic Significance of Sunlight," refers to the work of a large number of investigators who have clearly shown the healthful influence of direct sunlight upon the human and animal bodies. A marked increase in the excretion of carbonic acid and absorption of oxygen occurs as a result of the action of sunlight, and this is due partly to the direct chemical action of the light upon the surface of the body, and partly to a salutary reflex action from the retina. Upon the air, the light does an important work in purifying it from the organic matter present in it. On some disease germs, sunlight has a rapidly destructive action, upon others, among which is the typhoid bacillus, it does not. As yet is it too early to generalize.

Observation teaches that children especially suffer from a lack of natural light. Even the children of families in easy circumstances whose houses are otherwise healthful except that the direct sunlight has little or no access to the rooms, very frequently have but little freshness of color and a flabby muscular development, but when they are moved to well lighted rooms with a southerly exposure, they gradually improve. This I have so frequently observed in my former practice that I think it safe to say a causal relationship exists between the removal to better lighted rooms and the improvement in the appearance of the children. One disease of childhood is particularly related to the lack of sunshine, that is, scrofula. * * We shall not err, therefore, if we regard sunshine as one of the important factors for the maintenance of sound health and the absence of light as a debilitating influence.

Dr. Deichler† of Frankfort-on-the-Main is another recent writer on this important subject.

The rays of the sun falling on the skin have a direct and important influence upon the blood in the vascular system immediately beneath. * * * The epidermis permits the passage of warmth through it, that we feel; it also permits the passage of light

*Wiener Klinik, 3 Heft. 1889.

†Deutsche Medizinal-Zeitung, VIII., 285. 1887.

as is shown by the experiment of holding the hand in the night time before a clear light. We see then, by the beautiful blood red color of the finger, that the light penetrates through the comparatively thick skin of that part, and that this function of the light is an important one in the economy of the body. We see, in the skins of the naked inhabitants of the equatorial regions, the care which nature takes in interposing a protection against the penetration of too strong light. Upon the skin of the negro the light and warmth act simultaneously. The heat, on account of the dark color of the skin, is absorbed in a high degree, but notwithstanding this the colored man is not injured, for he sweats and is cooled thereby. The almost vertically falling rays of the sun, however, are moderated by the pigment layer and reach the blood with the intensity of their chemical action considerably moderated. Thanks to this dark hide the inhabitant of the torrid zone bears the excessive action of the sun without injury, while the white European endures with difficulty the tropical climate, and even his children are not acclimated.

Good food, a plentiful supply of air rich in oxygen, a certain amount of iron, all these are not sufficient for the building up of a healthy blood capable of withstanding the innumerable harmful influences of life; there is needed also the action of the light upon the surface of the body in order that it may exert its influence upon the blood.

M. Trelat* has written upon a subject which touches the faulty styles of draping windows which are in vogue, so as to diminish very much their value as sources of light for our houses. He reminds us, as the writers on school hygiene do, that for lighting and sunning rooms the upper part of the window is of greater value than the lower part, on account of the greater depth to which it permits the penetration of the rays of light into the room. He does not approve, therefore, of the prevailing style of covering the upper part of the window and leaving only the lower part open for the admission of light.

PURITY OF THE SEA AIR.

While those primal forces, light, chemical action, etc., are not to be ignored, it may be said that nature's principal means for purifying the atmosphere of those substances which render it less suitable for breathing, are the action of vegetation, the washing of the air

*Revue D'Hygiene VIII., 647. 1886.

by rain and other precipitation, and that constant process of sedimentation which goes on when matter of a higher specific gravity is suspended in gases or fluids of a lesser. As regards the first of these forces it is common knowledge that a reciprocal action goes on between plants on the one hand as consumers of carbonic acid, and those natural and artificial processes of combustion which deliver carbonic acid in large quantities to the atmosphere. It is also a matter of common observation that a shower often has a remarkable effect in clearing the air of smoke or other matter which diminishes its transparency, and the exclamation, "How pure the air is!" is not amiss, for science confirms the assumption. For instance, Tissandier found that in a given quantity of air from one of the parks in the city of Paris, there were fifteen milligrams of foreign matter in the form of dust before a rain and only six milligrams after a rain had fallen. In the country, in a dry time, there were from 3 to 4 5 milligrams of dust, and after a rain only .25 milligrams.

Few persons, however, have an idea of the part played by sedimentation in the purification of the air. It is true that fine particles of solid matter, caught up by the wind may be transported long distances by the stronger currents of the atmosphere, and thus the microscope often shows in the atmospheric dust, particles of matter foreign to the places in which they are found, but it is nevertheless true that, on account of their greatly superior specific gravity, these solid particles, organic and inorganic, have a tendency to settle with comparative rapidity. Among the smallest of the solid contents of the atmosphere are the bacteria, and the rapidity with which their numbers in the air are diminished as we proceed from land to the open sea, has been shown, or rather re-shown, by some comparatively recent experimental work.

Professor Uffelmann,* in the Hygienic Institute in the city of Rostock, made for more than a year, careful observations chemical and bacteriological upon the character of the air in and around that city. The average of 420 determinations of the quantity of carbonic acid in the air of the city was 3.51 parts per 10,000, and the average of 26 observations on the free air outside the city was 3.18 per 10,000. Further, the quantity of carbonic acid was greater when the wind blew from the land than when it came from the sea.

*Archiv für Hygiene, VIII., 262. 1888.

As regards the amount of organic matter in the air, the figures representing the averages were, 3.70 for the city, 2.71 for the free fields, and .80 for the seacoast. (Rostock is on a river about nine miles from the sea.)

The number of bacteria present in the air varied much, but their average was, in the yard of the university, 450 per cubic meter; in the free fields, 250; on the seacoast, 100. The number of bacteria was diminished by sea breezes, and increased when the wind was from the land. Protracted rains diminished their numbers in a marked degree, but did not cause all to disappear.

Dr. Fischer*, a German naval surgeon, while crossing the Atlantic to the West Indies, carried on a long series of investigations in regard to the germ contents of the atmosphere. In fourteen of his tests, aspirating each time on the average 113 liters of air, not a single germ was found, and in 2,978 liters of aspirated air only the small aggregate of 68 germs was found. In twelve experiments which were made at a distance of at least, 120 nautical miles from land, the air was shown to be entirely free from germs. The number of bacteria found in the different observations varied much with the distance from land and with the direction of the wind. Thus, as regards the proximity to land, in the outward voyage, on the German ocean, one germ; in the English channel, eleven; near Plymouth, one mile from land, nine; and then as they sailed out to sea, the next two observations showed no germs, and the next but one.

Miquel has also studied the ocean air bacteriologically, and at a distance from the coast has found it almost completely free from germs, and in air taken at the distance of 100 kilometers (62 miles) from shore it was absolutely pure. Therefore, he says that "the sea is the grave of all the bacteria of the atmosphere, indeed, the sea air, as it blows over the land, purifies the atmosphere lying above it. The air of the ship's cabin is decidedly richer in bacteria than that of the sea, but on the voyage, from day to day it becomes purer the farther the ship sails from the coast. Under all circumstances the cabin air contains a decidedly smaller number of organic germs than the air of our dwellings."

*Zeitschrift für Hygiene I., 421. 1886.

COUNTRY AIR AND SEA AIR FOR SICK CHILDREN.

One of the best of the humanitarian movements of the time is that which seeks to take poor sick children from the unhealthful surroundings of their crowded city life out into the pure air of the country for a few weeks in the summer. In this work we are not alone. Two years ago an International Congress met in Zurich for the purpose of discussing the various aspects of this beneficent movement, and it was attended by delegates from almost every European country, even from comparatively remote Russia and Spain. Some of the speakers gave facts and figures which show the beneficial influence of such outings. Thus the average gain in weight in the different colonies, or stations was from two to six or eight pounds, with a corresponding increase in appetite, muscular strength, and richness of the blood in red corpuscles.

That the good results derived from these three to six weeks holidays in the country, were due in great measure to the salutary influences of country air and sunshine, and not wholly to better food, is shown on the one hand by the fact that the gain exceeded very much the gain of the children from the same cities and the same classes, who were sent for their health to the milk cure establishments in the city, instead of going to the country, and on the other hand by the fact that children who carried their own provisions to the "colonies" made also a marked improvement. The children of some of these colonies were kept under observation after their return home, and in Breslau and Stüttgart, the periodical weighings were kept up for nine months and indicated that the start given in the improvement of the physical condition is often a permanent gain.*

This movement for curing puny children by sending them to the country, to the mountains, or to the seaside, is not by any means new. Nearly a hundred years ago a seaside hospital for sick children was opened at the English watering-place, Margate, and has been successively enlarged and improved. France has a large marine hospital at Berck-sur-Mer with beds for more than 700 children. Many other countries have seaside hospitals for children, some for permanent occupancy, some for summer colonies only. Italy, however, leads in this good work, with nine of these seaside asylums on the Mediterranean, and six on the Adriatic coast, devoted principally

*Verhand. des Internat. Kong. für Ferienkolonien, p. 10. 1888.

to the cure of scrofulous children. An interesting account of the work done in these Italian seaside hospitals, as well as those in Europe generally, is given by Dr. Badaloni,* in a paper entitled "Scrofula and the Sea." The records of these hospitals or health stations show that they are remarkably successful in their work. In these Italian seaside hospitals, the treatment of scrofula is successful in 92.8 per cent. of the cases, and unsuccessful in 7.2 per cent. A French surgeon is quoted as saying, "The ocean, without the scalpel cures a great number of scrofulous leisons: the scapel without the sea, cures only a limited number; together they mutually aid each other and cure cases the most severe and the most inveterate."

SUMMER DISEASES OF CHILDREN.

Considerable difference of opinion has prevailed as to the more potent causes of the summer diarrhœal diseases of children. It is matter of common observation that the greatest prevalence of these disorders occurs during the warm season, therefore it is easy to jump to the conclusion that they are caused by the direct action of the heat on the bodies of the children. As the temperature characteristics of our climate, excepting on a small scale within our dwellings, are entirely beyond our control, this conclusion leads to very pessimistic views as to preventability. It is a common remark among physicians that the great majority of cases of the diarrhœal diseases of children occur in bottle-fed babies. Observations of this kind suggest a difference unfavorable to the babies between the artificial food and healthy mother's milk. Another fact is known to be true: that the diarrhœal diseases of children are much more prevalent in cities than in the country. In explanation of this, various untoward conditions of city child life suggest themselves, among which are the inferior quality of the milk supply, the want of ventilation and the heated air of tenement blocks which absorb the heat of the day and radiate it into the tenements at night.

Dr. Seibert† of New York, made a painstaking comparison of the statistics for ten years of summer-complaint in that city with the meteorological records, examining every summer month for the ten years, and every batch of days in them. He could find no relation whatever between the barometric figures, humidity, rainfall, and velo-

*Giornale della Reale Soc. Ital. D'Igiene XI., 163. 1889.
†Medical Record, XXIII., 317. 1888.

city of air currents on the one hand, and the prevalence of summer-complaint on the other. As regards temperature, he shows that the greatest prevalence of this disease does not fall with the hotest days, but corresponds closely with the warmest nights, or in other words the maintenance of the temperature above a given minimum has more influence than the summer maxima of heat. He concludes his paper with the following statements:

1. Hot weather (either dry or moist) is not necessary for the epidemic appearance of summer-complaint.
2. Warm weather (either dry or moist) showing minimum daily temperatures of not less than 60° F., brings on the epidemic appearance of cholera infantum invariably in every year, irrespective of the height of the maximal daily temperature, as in the latter part of June of nearly every year.
3. Summer-complaint loses its epidemic character as soon as the minimal daily temperature remains below 60° F., as in the latter half of October of nearly every year.
4. Therefore, this disease cannot be brought about by the direct working of high temperatures on the infantile body, but must have other causes.

What may these causes be? Let me suggest one of them. The lowest temperature of each day in summer is at night; the milk feeding our children is brought to the city during the night, shaken and jolted in cars and wagons, absorbing impurities from the time it leaves the cow until it enters the mouth of the child; thus, the conditions for decomposition are given in every instance, without exception. The only question remaining is: How far is your New York City milk advanced in decomposition when you get it? Now we know that low temperature retards putrefaction and decomposition of any animal or vegetable substance, and that higher temperature aids it, and especially milk. My only explanation for the so much higher morbidity and mortality of July over August is, that it takes a few weeks of high morbidity and mortality every year to fully arouse the public, and especially the poorer classes, to the dangers threatening their children, and to impress upon the parent's minds the very simplest fundamental principles of how to avoid them—a beginning of which was made by the distribution of the rules of how to handle milk and babies, written by the President of this Academy about fifteen years ago.

In a discussion which has lately been held by the New York Academy of Medicine, the remarks by some of the speakers give an idea of the present prevailing medical opinion as to the causation of the diarrhœal diseases of infancy.

Dr. Caillé* said that most all cases of infantile diarrhœa were due either to improper feeding or improper food.

*Archives of Pediatrics VII., 219. 1890.

As an illustration of the former he cited overfeeding at the breast; as an illustration of the latter, spoiled food in bottles and unhealthy breast-milk.

In severe diarrhœa, in city practice, milk should be at once interdicted and mucilaginous and farinaceous drinks given. As soon as the patient is better we should teach the guardians of a bottle-fed child how to prepare a good bottle food.

As cows' milk is the basis of infants' food we need not rely upon any kind of patent food. We select good milk, dilute the same with one or two parts of water or barley-water, and add sugar, salt, and lime-water. The addition of cream is unnecessary if the cows' milk is sufficiently rich in fat.

Such a food if sterilized or steamed in small bottles, is a good imitation of nature's food, and forms a good tissue-builder for the developing child. Where the digestive apparatus is defective, through long-standing disease, we give our patient a predigested milk, easily prepared with the peptogenic milk-powder of the shops. At the present state of our knowledge the formula for infant dietetics is very simple, and there should be no diversity of professional opinion on so important a subject.

In the same discussion Dr. Baruch spoke as follows:

I believe that in the rigid exclusion of micro-organisms from the milk which nourishes them lies the safety of our infants. We know that breast-milk is sterile in the breast; we know also that cows' milk is sterile in the udder. We know that breast-fed children die of summer diarrhœa only in proportion of three to one hundred artificially fed (Meinert of Dresden, and Hope of Liverpool, have given these ample statistics). We know, therefore, that artificial feeding is the predominating element in the etiology of these diseases; we know, also, that they are so rare in winter that the title summer diarrhœa has been unanimously recognized as a correct designation. It follows as a logical deduction that there is some causative connection between the high temperature and artificial feeding. Soxhlet, I hold, is the Semmelweiss of this question. He has shown us that milk curdles three hundred and thirty times faster in a temperature of 98° F. than at 58° F. This, taken in connection with Pasteur's discovery, made forty years before, that the curdling of milk is due to a bacterium lactis, clears up the subject wonderfully.

STERILIZED MILK.

Dr. Soxhlet, a German physician, proceeding on the assumption that the summer diarrhœas of children are caused principally by changes in the milk due to the presence of bacteria and the poisons which these micro-organisms generate, conceived and put in practice the idea of "sterilizing" milk for the use of children. To sterilize milk is simply to destroy the life of the micro-organisms in it by the aid of heat. After full sterilization is accomplished, the milk will remain without souring or other change, providing the access of bacteria from the air or other sources be guarded against, and this may be accomplished by tightly fitting (sterilized) stoppers or by plugging the bottles with cotton. When cotton is used it does not, of course, exclude the air, but it arrests and strains out the solid particles which may be suspended in the air, including bacteria.

This is only another use of the well known principles applied in our multiform industries of canning. Since the use of sterilized milk was suggested by Soxhlet a few years ago, the worth of the suggestion has been abundantly confirmed in private and public practice, though it has not yet been adopted so generally as it seems to deserve.

Warner* recommends a domestic apparatus for the sterilization of milk. It consists of an ordinary cooking-steamer, which is filled to the height of two inches with water, which is brought to the boiling point; the milk, which is the infants' allowance for the next twenty-four hours, is placed in as many nursing-bottles as are employed during that period of time. These bottles, having been previously placed in an oven for fifteen minutes, are now stoppered with pledgets of cotton and put on the perforated plate of the steamer, not touching each other, the cover shut tightly down, and the whole allowed to steam for thirty minutes. Dr. Warner found milk to remain pure for five weeks after being sterilized as above. This, indeed, seems to be very practicable for mothers or nurses.

For the sterilization of milk on a larger scale, or for transportation, various patterns of bottles with self-sealing stoppers are now made, and an apparatus might be used for sterilizing with "flowing steam" something like some of the steam disinfectors that have been mentioned on preceding pages; or just as efficient would be a sterilizing chamber made like a large steam cooker (or cooking steamer) to set upon the kitchen stove or other heater.

FURTHER NOTES ON INFANT FEEDING.

All writers on the subject unite in condemning in strong terms the nursing bottle with the long flexible tube. This apparatus cannot be thoroughly cleaned, and the interior of the long rubber tube is a focus for the infection with the germs of fermentation of all the milk passing through it. A simple rubber nipple, slipped over the mouth of the bottle should be used.

*An. Univ. Med. Sciences, for 1889, II., K-21.

Dr. Rotch,* Assistant Professor of Diseases of Children, Harvard University, gives the following useful tabulation of rules for the artificial feeding of infants:

Age.	Intervals of feeding.	Number of feedings in 24 hours.	Average amount at each feeding.	Average amount in 24 hours.
1st week........	2 hours.	10	1 ounce.	10 ounces.
1-6 weeks.......	2½ hours.	8	1½ to 2 ounces.	12 to 16 ounces.
6-12 weeks, and possibly to 5th or 6th month	3 hours.	6	3 to 4 ounces.	18 to 24 ounces.
At 6 months.....	3 hours.	6	6 ounces.	36 ounces.
At 10 months....	3 hours.	5	8 ounces.	40 ounces.

Dr. Starr,† in his excellent little work, gives the following general directions concerning the preparation of infant foods:

The object to be accomplished in the preparation of cows' milk is to make it resemble human milk as much as possible in chemical composition and physical properties. To do this, it is necessary to reduce the proportion of caseine, to increase the proportion of fat and sugar, and to overcome the tendency of the caseine to coagulate into large, firm masses upon entering the stomach.

Dilution with water is all that need be done to reduce the amount of caseine to the proper level; but as this diminishes the already insufficient fat and sugar, it is essential to add these materials to the mixture of milk and water. Fat is best added in the form of cream, and of the sugars, either pure white loaf sugar or sugar of milk may be used. The latter is greatly preferable, as it is little apt to ferment, and contains some of the salts of milk, which are of nutritive value.

Firm clotting may be prevented by the addition of an alkali or a small quantity of some thickening substance, as barley water, gelatine, or one of the digestible prepared foods.

Lime water is the alkali usually selected. It acts by partially neutralizing the acid of the gastric juice, so that the caseine is coagulated gradually and in small masses, or passes, in great part unchanged, into the intestines to be there digested, by the alkaline secretions. As it contains only a half a grain of lime to the fluid ounce, the desired result cannot be attained, unless at least a third part of the milk mixture be lime water. The quantity often used—one or two teaspoonfuls to the bottle of food—has no effect beyond neutralizing the natural acidity of the milk itself. When lime water is constantly employed, it becomes quite an item of expense if procured from the drug shop; this outlay is unnecessary, for it

*Arch. of Pediatrics, IV., 465. 1887.

†Hygiene of the Nursery, p. 137.

can be made quite as well in the nursery. Take a piece of unslaked lime as large as a walnut, drop it into two quarts of filtered water contained in an earthern vessel, stir thoroughly, allow to settle, and use only from the top, replacing the water and stirring as consumed.

Dr. Rotch* in seeking a suitable artificial infant food has shown by chemical analyses that the following mixture recommended by Dr. Meigs, corresponds very closely in its chemical composition to that of human milk:

Cream	2 parts.
Cows' milk	1 part.
Lime water	2 parts.
Sugar water	3 parts.
Total	8 parts.

The cream should contain from 14 to 16 per cent. of fat. "To avoid the necessity of having the cream analyzed, cream made by the centrifugal process can be used, for this has a per cent. which varies very little from thirty-two, so that by diluting this cream with water one-half we have a cream with a per cent. of about 16, which is what is usually needed for the average infant digestion." The sugar water consists of $17\frac{3}{4}$ drachms of milk sugar dissolved in one pint of water.

From an extended schedule to guide parents in the dietary of infants from birth upward given by Dr. Starr in the work to which reference has already been made, I extract only the following:

Diet during the first week:—

Cream	2 teaspoonfuls.
Whey	3 "
Water (hot)	3 "
Milk sugar	$\frac{1}{4}$ teaspoonful.

For each portion; to be given every two hours from 5 A. M. to 11 P. M., and in some cases once or twice at night, amounting to twelve fluid ounces of food per diem.

Diet from the second to the sixth week:—

Milk	1 tablespoonful.
Cream	2 teaspoonfuls.
Milk sugar	$\frac{1}{4}$ teaspoonful.
Water	2 tablespoonfuls.

*Op. cit.

For one portion; to be given every two hours from 5 A. M. to 11 P. M.; amounting to seventeen fluid ounces of food per diem:—

Diet from the sixth week to the end of the second month—:

Milk	$2\frac{1}{2}$ tablespoonfuls.
Cream	1 tablespoonful.
Milk sugar	$\frac{1}{2}$ teaspoonful.
Water	$2\frac{1}{2}$ tablespoonfuls.

For each portion; to be given every two hours, amounting to thirty fluid ounces per diem.

Diet from the beginning of the third month to the sixth month:—

Milk	5 tablespoonfuls.
Cream	1 tablespoonful.
Milk sugar	1 teaspoonful.
Water	2 tablespoonfuls.

For each portion; to be given every two and a half hours, or thirty-two fluid ounces per diem.

THE IMPORTANCE OF A PURE MILK SUPPLY.

Dr. Cyrus Edson* of New York, read a paper before the Ninth International Medical Congress beginning with these words:

From a sanitary standpoint the milk supply of cities is second only in importance to the water supply. The most vulnerable portion of the community to the attacks of disease are the children.

To protect these is the health officer's first duty. Children are, of necessity, subjected to influences in large cities that tend to depress and lower their vitality. It is, therefore, of the highest importance that they should receive plenty of nourishing food.

Milk is the chief food of children. No article of food is so liable to be adulterated or charged with noxious matter. The peculiar physical properties of milk make it easy for the unscrupulous to tamper with it for his own selfish ends and it readily conceals within its opaque body disease-producing material with which it may be accidentally charged.

On the same occasion Dr. Vaughan† gave the following rules concerning the care necessary to prevent milk undergoing putrefactive changes:

1. The cows should be healthy, and the milk of any animal which seems indisposed should not be mixed with that from perfectly healthy animals.
2. Cows must not be fed upon swill, or the refuse of breweries, or glucose factories, or upon any other fermented food.

*Tr. Ninth Int. Med. Congress, Vol. III., p. 477.

†Ibid, p. 486.

3. Cows must not be allowed to drink stagnant water, but must have access to pure, fresh water.
4. Cows must not be heated or worried before being milked.
5. The pasture must be free from noxious weeds, and the barn and yard must be kept clean.
6. The udders should be washed, then wiped dry before each milking.
7. The milk must at once be thoroughly cooled. This is best done in the summer by placing the milk can in a tank of cold spring water, or ice water, the water being of the same depth as the milk in the can. It would be well if the water in the tank could be kept flowing, indeed, this will be necessary, unless ice water is used. The tank should be thoroughly cleaned every day to prevent bad odor. The can should remain uncovered during the cooling, and the milk should be gently stirred. The temperature should be reduced to 60° F. within an hour. The can should remain in the cold water until ready for delivery.
8. In summer, when ready for delivery, the top should be placed on the can and a cloth wet with cold water should be spread over the can, or refrigerator cans may be used. At no season should the milk be frozen, but no buyer should receive milk which has a temperature higher than 65° F.
9. After the milk has been received by the consumer, it should be kept in a perfectly clean place, free from dust, and at a temperature not exceeding 60° F. Milk should not be allowed to stand uncovered even for a short time in the living or sleeping rooms. In many of the better houses in the country and villages, and occasionally in the cities, the drain from the refrigerator leads into a cesspool or kitchen drain. This is highly dangerous; there should be no connection whatever between the refrigerator and any receptacle of filth.
10. The only vessels in which milk should be kept are in glass or porcelain. After using the vessel, it should be scalded, and then, if possible, exposed to the air.

When these rules are put into operation, milk can be preserved free from putrefactive changes for a reasonable length of time, and it will remain fresh and palatable. When such care is not exercised, the milk may become, as we have seen, highly poisonous within a few hours after it is drawn from the cow. When we take into consideration the fact that many children must feed exclusively or largely upon this milk, we certainly cannot regard the time and expense which the above rules demand as of great moment.

At the meeting of the American Medical Association, two years ago, Dr. Wood*, Chairman of the section on Dietetics and Diseases of Children, made the following remarks:

There are two classes of people that need looking after: the first is the vendor of unwholesome milk. This class must be taken in charge by the strong arm of the law. Milk kept in foul vessels, watered milk, adulterated milk, and milk from wretched cows

*Sanitarian XXI., 97. 1888.

chained up all their miserable lives in dark stables and fed on brewery slops, slay annually thousands and thousands of helpless babes in our cities. Such milk is unfit for any purpose, and it should be kept out of the market. Those who vend such milk are deliberate murderers, and they should meet with the punishment commensurate with their cowardly crime. The other class consists of the mothers and nurses who will persist in over-feeding babes, dreading starvation, ignoring the fact that babes, need water, not milk, when fretful and feverish from indigestion. The crime of this class is ignorance, and they must be educated out of their pernicious practice. Thousands of children may be saved by lessening the amount of food during the heated term.

Arsenic in Wall Paper.

By F. C. Robinson, Member of the Board. Professor of Chemistry, Bowdoin College.

It is now many years since the attention of physicians and chemists, and through them of the public generally, was called to the fact that arsenic was largely used in the manufacture of wall paper, and that numerous cases of dangerous, if not fatal poisoning had resulted therefrom. These statements were at first denied by dealers and manufacturers of room papers. They could not deny that arsenic was present in such papers, especially in the green colored samples, but they denied most strenuously that poisoning could result therefrom unless the paper was actually taken into the mouth. Doubtless they were sincere in their denials, but it was another case of believing easily what one wants to. At this late day all doubt is removed, especially as concerning those old Paris-green papers, and they are rarely seen in the wall papers now sold. Case after case of their evil influence has been most positively identified, not only by the well known symptoms of arsenical poisoning developed in persons occupying such papered rooms, but the arsenic has been actually obtained from their urine, and to make the chain of evidence complete, both the symptoms and the arsenic have disappeared upon removing the patient or the paper from the room.

It is thus of no use for anyone to contend that the use of arsenic in making wall papers is not a source of danger; and the practical question for us here in Maine to-day is, what is our condition with reference to the matter? One thing is certain, however, and that is that even if poisonous papers are sold within our borders we have at present no redress. It is not at all against the law. We may be "ground down" by the "sumptuary law" which forbids a man from selling us rum to poison us or our children, as some think we are, but one may with impunity sell us paper loaded with Paris green, which will more surely destroy the health or lives of ourselves or children. No officer can say him nay. But are such papers being actually sold in Maine to-day, and, if so, how can we recognize and avoid them? It was to answer and if possible settle this question that I began investigating the matter the present winter, at the instance of the State Board of Health. The investigation is not yet completed to my satisfaction, and so this report is only a preliminary one. It seemed best however to state at this time the results already found, and the general condition of the subject, and to continue the matter in some future publication. It is hoped too that the spreading of the fact that such work is being done will serve to call the attention of physicians and others to the matter, and bring in cases and samples of papers which could not otherwise be obtained. And I take this opportunity to invite the cooperation of all in this most important matter, to the health of the State.

My first work was to collect samples from different quarters of the State, and by the aid of the local health boards in Bangor, Calais, Portland and Brunswick, I soon received several hundred samples, obtained from the dealers in those cities. And I wish to say here that I found a ready wish expressed by all dealers I came in contact with, to give all aid in their power to my investigation. Of course examination of such samples would not represent the actual condition of rooms in Maine, for they were taken from the new stock of the dealers, but by this time, many of them are probably on rooms, and their examination will tend to answer one part of the question, at least, and a very important one, as to the character of the papers being now offered for sale in the State. Upwards of one hundred of these samples have now been examined for arsenic and it is gratifying to be able to state that the vast majority of these are free from the poison or contain but the merest trace. In fact but three only have been found which are unmistakably dangerous But while this number is so gratifyingly small, one of them is so typical of what has been sold so largely in the past, and so dangerous in its nature, that if my investigation had succeeded only in finding it I should have regarded it as a most profitable work. It happens, too, that the paper in question was not simply obtained in sample from a dealer but was used upon two rooms within my knowledge, and in one case caused the serious illness of children occupying the room. I am glad to say, however, that it was not a paper made in this country but imported from England, being too poisonous for sale there it was sent like a "forced emigrant" to do its deadly work upon our shores. It was a landscape paper made for pleasing children, representing a scene in the grape region, and the bright green grape vines and purple clusters of grapes and gay-colored clothes of the workers made truly a pleasing sight.

Temperance people will perhaps regard it as very appropriate that such scenes should be represented in poisonous pigments. The arsenic is not confined to the green parts but exists largely also in the purple, blue and drab tints. The paper contains on the average, as nearly as it can be got, 125 grains of pure arsenic, equivalent to 168 grains of arsenious acid in every square yard. When we remember that two grains of arsenic may be regarded as a fatal dose, the astounding fact comes out that every square yard of this paper contains arsenic enough to kill seventy-five men. The bright green color is Paris-green, the blue probably London-purple, and the other shades only a little less in their amount of arsenic. But is it not harmless when securely fastened to the wall? Paint does not escape when once dried to the woodwork of a room, and how can the colors from a paper? The apparent analogy is not a real one. Paint contains oil which hardens and holds firmly any color however poisonous. It would probably be perfectly safe to sleep in a room painted with an oil paint containing as much Paris-green as this paper. Wall paper contains no such protector. Its colors are loosely held as every one knows. Rub your hand over most any wall paper and behold how the colors rub off! Every disturbance or jarring of the room by walking, sweeping, or in other ways, sends into the air of it particles of these colors from the paper. From one of the rooms papered with this sample I secured a small portion of dust from under the carpet and the presence of arsenic was very manifest in it by the chemical test. It has been proved to, that arsenic escapes from a wall paper in other ways than as dust. Some one or more of its many gaseous compounds, all very poisonous, is undoubtedly formed, especially if the room be damp so that the paste tends to mold. Now it is well known that arsenic is not a poison which accumulates in the system as lead does. It is constantly being eliminated, especially through the kidneys. But yet if one be exposed to small doses of arsenic taken very frequently, the system becomes gradually undermined and death may result. It is well known, too, that a weakened body is more liable to contract disease than a strong one. So one weakened by arsenic may contract and die of other disease, and the agency of the arsenic never be suspected.

There is an impression among dealers and paperers that an arsenical paper can be told at a glance. While getting samples of paper for analysis, dealers informed me that they now sold no arsenical green papers, and seemed to think it strange that I should think of finding arsenic in those of any other color. But it is a well known fact to physicians and chemists, who have had to do with such things, that the color of a paper is no guide to its character. It happened that the papers colored by Paris-green were those which first caught the attention of physicians as sources of poisoning to their patients, and so the notion arose that such only were dangerous. But in every report upon the subject, in recent years at least, it has been made very clear that almost any colored paper may contain arsenic in dangerous amount. Dr. E. S. Wood in his elaborate report on the subject contained in the Report of the State Board of Health of Massachusetts for 1883, says: "There is absolutely nothing in the appearance of a paper by which we can form any opinion as to its arsenical or non-arsenical nature." Again, in the more recent report of D. H. Galloway to the American Pharmaceutical Association in 1889, after having examined more than 100 samples, we find the statement. "I am now convinced that it is impossible to say before examination whether a given sample contains arsenic or not." My own experience would confirm these statements in general, and yet I think I observe that the darker colored papers are the greatest sinners in this respect. It may have been simply accidental, but I found no arsenic in any of the light colored papers yet examined. One cannot help noticing, too, that the samples of arsenical paper pasted into the report of Dr. Wood, referred to above, are all dark with perhaps two exceptions. For many years past dark papers were "all the fashion" as we know, but now the light colors prevail, at least the large majority of the samples I got were light. I at first thought that my results indicated that the agitation of the matter by physicians and health boards had at last exerted that wholesome restraining action upon the manufacturers and dealers which is so desirable. I am more inclined now to think that such is not the case; and to believe, that, unless there be more positive restraint, when fashion next calls for the darker colored papers we shall see a return to the arsenical colors of preceding years.

Of course this is not the proper place to speak minutely of the symptoms of poisoning by arsenic. Physicians will turn to their medical books and journals for detailed accounts of such. But it seems to me desirable that a few words should be said here upon the subject for the benefit of the non-professional reader especially. In the first place it should be said that poisoning by inhaling arsenic from wall paper is rarely like, in its symptoms, that from a fatal dose taken at a given time. In this respect arsenic is like other powerful drugs; repeated small doses of any of them differ in their effect from single large doses. We think of arsenic poisoning as accompanied by great pain and suffering; the stomach seems burning up and nature tends to relieve herself of the destructive principle by violent vomiting and purging. Not only the physician, but every one else knows, that something out of the ordinary course is the matter with the patient, and antidotes and the stomach-pump are at once called into service. But let the same amount of arsenic be gradually given and no such marked and extraordinary symptoms appear. Indeed, it seems to depend upon the age and general constitution of the person as to what the symptoms will be. The difficulty in formulating any typical set of symptoms for such slow poisoning has, in the past, undoubtedly prevented its recognition even by physicians, and even to-day there seems to be no general agreement in the matter. The cases cited in Vol. 120, No's 10 and 11 of the *Boston Medical and Surgical Journal* show how varied may be the symptoms in undoubted cases of slow arsenical poisoning. Some points, however, seem to be very clearly established by those and other cases, and these may well be borne in mind even by those not physicians, and the appearance of such symptoms without other apparent cause lead to a careful inspection of the wall paper in rooms inhabited by those exhibiting them. Nervous depression with irritability and sleeplessness, derangement of the stomach, soreness of the muscles, are some of the more general symptoms observed. In addition, examination invariably shows that the kidneys are affected, albumen and even casts and blood being voided in the urine, not infrequently. In such cases, too, arsenic is always found in the urine, it being the channel by which it is most rapidly eliminated from the system.

In the case under my immediate knowledge where the two children were affected by the landscape paper, they seemed to lose flesh, grew very pale and had occasional attacks of what seemed to be bilious sick-headache. They were also troubled with what they called "bad dreams" and one of them not infrequently would come into his parents room in the middle of the night and say that he couldn't sleep. Their urine unfortunately, was not examined. The children were seven and five years old. A younger child who occasionally slept in the room and frequently played there, grew very pale and had a kind of "cold sore," as it was called, on his upper lip which refused to heal for a long time, but which grew better rapidly as soon as the room was re-papered. The mother of these children who used the room as a sewing-room, at times, complained of unaccountable feeling of depression and was troubled considerably by sleeplessness. There is no reasonable doubt in my mind but what one or both of these children would have been fatally poisoned if they had not been removed from that room and its objectionable paper taken off. One of the most surprising results too of the more recent investigations of this subject is the small amount of arsenic which seems to act deleteriously when contained in a paper. In the samples given by Dr. Wood in 1883, all but three contained more than one grain per square yard, and those three very nearly a grain. He intimates too in the description of his manner of testing, that amounts much smaller than that would be too small to be considered as dangerous, but in the articles referred to in the *Boston Medical and Surgical Journal*, we find a case of poisoning referred to papers containing in round numbers one-thirtieth, one-third and one-half grains per square yard respectively. And in the report of the American Pharmaceutical Society an amount equivalent to about one-seventy-fifth of a grain per square yard is thought worthy of publication as more than a trace. I must confess, too, that some of the results of such paper seem to me most surprising.

Patients exposed to it seem to be passing enough arsenic in their urine to indicate that all the arsenic contained in the paper of a whole room would be eliminated by a single person in not an excessively long time. But however apparently anomalous these results may seem, I am inclined to regard them as anomalies of analysis or figuring rather than anything else, and to believe that even small fractions of a grain of arsenic per square yard may exert a bad influence upon the health of occupants of a room, and I am perfectly convinced that the only safe way is to demand that no arsenic beyond a mere trace be allowed in the papers which are to cover our walls. Many foreign countries have laws to this effect and it is time that the States of our Union took action in the same direction. There was no difficulty in passing a law in Maine to prevent the use of comparatively harmless glucose in our molasses, or of oleo in our butter, but the danger to our health in the use of arsenical wall paper is far greater than from either of these.

As I said at the beginning of this paper, I regard this report as only preliminary. I intend to make many more examinations in the year to come, and hope to include not only wall papers but other colored papers and articles of clothing as well, and hope for the co-operation of all interested in sending me facts and samples.

It may be of interest to state briefly my method of analysis, for although not new in principle it is somewhat different in construction from that commonly used, and with it I am able to make more tests in a given time than in the common way, and I think with increased accuracy. I use the Marsh test, but instead of using zinc and acid, use a current of electricity from the electric light station in the town. The poles are platinum plates inserted is a U tube containing pure dilute sulphuric acid. The hydrogen is conducted through proper drying tubes and the arsenic deposited as usual. I insert the paper directly into the acid. All impurities in the zinc are thus avoided; antimony if present is kept back, and the gas stream is perfectly constant. The acid soon gets hot and the temperature can be kept at any desired point by surrounding the tube with water. By allowing it to be quite hot, the solution of the coloring matters is much facilitated. Of course if the electricity had to be generated by a battery it would be far more expensive and troublesome.

THE METRIC SYSTEM.

Length.

1 Myriameter	Mm	(10.000 m.)	=6.2137 miles.
1 Kilometer	Km	(1.000 m.)	=0.62137 miles.
1 Hectometer	Hm	(100 m.)	=328 0833 feet.
1 Decameter	Dm	(10 m.)	=393.7 inches.
1 Meter	M	(1 m.)	=39.37 inches.
1 Decimeter	dm	(0.1 m.)	=3.937 inches.
1 Centimeter	cm	(0.01 m.)	=0.3937 inch.
1 Millimeter	mm	(0.001 m.)	=0.03937 inch.

Surface.

1 Hectare	Ha	(10,000 sq.m)	=2.471 acres.
1 Are	a	(100 sq. m.),	=119.6 square yards.
1 Centare	ca	(1 sq. m.)	=1550 square inches.

Capacity.

1 Kiloliter or Stère	Kl. or st.	(1,000 l.)	=61027.0515 Cu. inches,	=264.17 gallons.
1 Hectoliter	Hl	(100 l)	=6102.7052 Cu. inches	=26.417 gallons.
1 Decaliter	Dl	(10 l.)	=610.2705 Cu. inches	=2.6417 gallons.
1 Liter	l	(1 l.)	=61.0271 Cu. inches	=1.0567 quarts.
1 Deciliter	dl	(0.1 l.)	=6.1027 Cu. inches	=0.845 gill.
1 Centiliter	cl	(0.01 l.)	=0.6103 Cu. inch	=0.338 fluid ounce.
1 Millileter	ml	(0.001 l.)	=0.0610 Cu. inch	=0.27 fluid drachm.

Weight.

1 Millier or Tonneau	M or T.	(1,000 Kg.)	=1 Kl. or 1 Cu. m.	=2204.6 lbs. (avoird)
1 Quintal	Q	(100 Kg.)	=1 Hl. or 0.1 Cu. m	=220.46 pounds.
1 Myriagram	Mg	(10 Kg.)	=1 Dl. or 10 Cu. dm	=22.046 pounds.
1 Kilogram	Kg	(1,000 g.)	=1 l. or 1 Cu. dm	=2.2046 pounds.
1 Hectogram	Hg	(100 g.)	=1 dl. or 0.1 Cu. dm	=3.5274 ounces.
1 Decagram	Dg	(10 g.)	=1 cl. or 10 Cu. cm	=0.3527 ounce.
1 Gram	g	(1 g.)	=1 ml. or 1 Cu. cm	=15.432 grains.
1 Decigram	dg	(0.1 g.)	=0.1 ml. or 0.1 Cu. cm.,	=1.5432 grains.
1 Centigram	cg	(0.01 g.)	=0.01 ml. or 10 Cu. mm.,	=0.1543 grain.
1 Milligram	mg	(0.001 g.)	=0.001 ml. or 1 Cu. mm.,	=0.0154 grain.

One kilogram is equal to a weight represented by one liter of distilled water at 4 degrees C.

One inch =2.5 centimeters nearly; one quart (wine measure) =0.946 liter; one pound Troy =0.373 kilogram; one acre =0.4046 hectare.

To reduce (approximately) grains to grams, divide by 10 and from the quotient subtract one-third of itself; to reduce drachms to grams, multiply by 4; to reduce ounces to grams, multiply by 32.

To convert degrees of one thermometer scale into those of another. Fahr. into Cent.—Divide by 9, multiply by 5 and deduct 32; Cent. into Fahr.—Multiply by 9, divide by 5 and add 32.

GLOSSARY.

This Report has been prepared for the benefit of all classes of persons in the State, and as far as possible it has been the wish to make its language as clear and intelligible as possible. A few technical terms, however, are so inseparably interwoven into the consideration of the subject of public hygiene that the avoidance of their use is impossible, and as it is desirable that the general public should become acquainted with their meaning, and especially to know in what sense they are used in the present work, this Glossary is introduced.

Aerobic. Applied to bacteria that can flourish only in the presence of air.

Ætiology. [See Etiology.]

Anaerobic. Applied to bacteria that can grow in the absence of air.

Anorexia. Want of appetite.

Anthrax. A specific disease caused by the *bacillus anthracis.*

Antiseptics. Agents which prevent or retard putrefaction; or as now understood, those which prevent the development of pathogenic or fermentative organisms. Some of these which, in weaker solutions, act as antiseptics, in stronger solutions, being destructive of the life of the organisms, are also disinfectants.

Auto-Infection. Infection of self, or from sources within the body of the person infected.

Autopsy. Ocular inspection; post-mortem examination.

Bacilli. The plural of bacillus.

Bacillus. One genus of bacteria in which the length of the cells distinctly exceeds their thickness. They are sometimes arranged in threads.

Bacillus anthracis. The bacillus of anthrax, the essential cause of the disease.

Bacteria. Unicellular organisms, microscopic in size, on the border land between the vegetable and the animal kingdom, but now regarded as pertaining to the former. Schizomycetes.

Bacteriology. That branch of science relating to the bacteria.

Bacterium. The singular of bacteria.

Caecum. The uppermost part of the large intestine, next to the ileum, and separated from it by the ileo-caecal valve.

Cannula. A small tube.

Caseation. A degenerative change into a substance resembling cheese.

Clinical. Pertaining to a bed. Clinical observations are observations which are made at the bedside of the patient.

Contagion. The specific cause of certain diseases by means of which they may be transmitted. Also applied to the act of transmission of communicable diseases.

Contagious. Capable of being transmitted by contagion; communicable; infectious. But little effort has been made in this Report to discriminate between the meaning of Contagious and Infectious; although their derivation and original application were different, most of the later medical writers of Europe and America use the two words interchangeably. This, at least in works for popular use, is the less confusing way.

Coryza. Cold in the head.

Cyanosis. A bluish color of the skin due to lack of oxygen in the blood.

De novo. Anew. As applied to the origin of infectious diseases, their appearance independent of the contagion of preceding cases.

Deodorants. Substances which destroy offensive smells. Some, but not all deodorants, are also disinfectants. (See Disinfectants.)

Desquamation. The shedding of the outer skin, usually in scales, after scarlatina and some other diseases.

Diagnosis. The determination of the character of a disease.

Diagnosticate. To determine the character of a disease.

Diastase. A nitrogenous principle developed in grain during fermentation, and having the property of converting starch into that form of sugar which is called glucose.

Diplococcus. Double bacteria, or those which are constricted in the centre in the process of division.

Disease germs. Disease-producing bacteria. Micro-organisms whose reception into the system, and multiplication in it, produce the contagious diseases.

Disinfectants. Agents or substances by means of which the contagion of diseases may be destroyed. Often improperly applied to substances which, though useful as deodorants or antiseptics, are nearly or quite valueless as germicides.

Duodenum. The first and upper portion of the small intestine.

Dyspnoea. Difficult or labored breathing.

Endemic. Applied to diseases which prevail in particular localities or districts, and which are due to local conditions or causes.

Enteric fever. Typhoid fever.

Enzyme. A chemical ferment.

Epidemic. Common to, or affecting many people at the same time; generally prevailing; the causes of epidemics were formerly very generally regarded as depending upon an "epidemic constitution of the atmosphere," but of this there has never been collected any satisfactory proof. The more we study epidemiology the more we are led to look to contagion and the laws which govern its diffusion for an explanation of the occurrence of epidemics.

Epithelium. The outer layer of the skin and mucous membranes.

Epizootic. Applied to the diseases of animals in the same sense as epidemic is used with reference to human diseases; affecting many animals at the same time.

Etiology. The causation of diseases.

Fission. Division; the common method of multiplication with many of the lowest organisms.

Fomities. Substances or articles which are liable to carry the contagion of diseases.

Germicides. Destroyers of germs; disinfectants.

Glandular. Relating to glands.

Haemoptysis. Bleeding from the lungs or air passages.

Haemorrhage. Loss of blood.

Hectic. Pertaining to consumption or to a wasting.

Hepatization. A change through which the structure of the lungs or other organs comes to resemble liver.

House-drain. That part of the house-drainage system which carries the wastes from the soil-pipe and waste-pipe to the sewer.

Hygiene. The science and art relating to the preservation of health.

Hyperplasia. Exagerated increase in the elements of a part.

Ileum. The third or lower portion of the small intestine.

Infection. Contagion; the specific cause of communicable diseases, now known in many diseases, and supposed in others, to be a microscopic organism.

Infectious. Communicable, as a disease; contagious. (See Contagious.)

Immunity. Freedom from liability to disease.

Inoculation. Insertion of a known or suspected virus into the tissues of an animal or into a test-culture.

Laryngitis. Inflammation of the larynx.

Lesion. A wound, injury, or morbid change of a part.

Meningeal. Pertaining to the meninges.

Meninges. The membranes that envelop the brain and spinal cord.

Meningitis. Inflammation of the meninges.

Mesenteric. Pertaining to the mesentery.

Mesentery. The double fold of peritoneum connecting the small intestines with the posterior wall of the abdominal cavity.

Meteorological. Pertaining to meteorology, or that science which treats of the air and its phenomena.

Miasm. A term vaguely applied to noxious exhalations.

Miasma. The same as miasm.

Microbe. Bacterium; micro-organism.

Micrococcus. A genus of the bacteria, consisting of very small, globular or oval organisms.

Micro-organism. A minute organism.

Non-pyrexial. Without fever.

Nosology. Classification of diseases.

Œdema. A swelling from effusion of serous fluid into the cellular tissues.

Pathogenic. Generative or productive of disease.

Pathological. Pertaining to pathology; diseased.

Pathology. The knowledge of diseases.

Peritoneum. A serous membrane investing the abdominal walls and viscera.

Phthisis. Consumption; pulmonary tuberculosis.

Physiology. The science which treats of the functions of living animals or plants.

Pleura. The serous membrane lining the cavity of the chest.

Pleurisy. Inflammation of the pleura.

Prognosis. The prediction, from the present symptoms of a disease, of its future course or termination.

Pseudo-membrane. False membrane.

Ptomaines. Basic compounds resulting from putrefactive changes in animal tissues. Many are highly poisonous.

Sanitaria. Plural of sanitarium.

Sanitarium. An establishment for the cure of diseases.

Scarlatina. Another name for scarlet fever.

Schizomycetes. A class of unicellular organisms multiplying by fission and also in some cases by the formation of spores. Bacteria.

Septic. Pertaining, or due to putrefaction.

Serous. Relating to serum, or to the membranes which secrete it.

Serum. Watery, clear or yellowish, animal fluids, exhaled by serous membranes, or separated from the coagulable parts of other fluids, like blood or milk.

Sewage. The liquid or other filth conveyed in sewers.

Sewer. A drain for conveying dirty water and filth.

Sewerage. A system of sewers.

Soil-pipe. The pipe which conveys excreta from water-closets and urinals. (See House-drain.)

Sporadic. Applied to diseases, it means occurring in single or scattered cases, as opposed to epidemic or endemic, in which numbers, or many are affected.

Spores. Minute particles or bodies which are formed within many of the lower flowerless plants, and which perform the functions of seeds. The microscopic one-celled plants called bacteria, multiply by fission, and in addition to this, some of them multiply by means of spores.

Sporification. The formation of spores.

Staphylococcus. A genus of round bacteria, or cocci, arranged in groups like clusters of grapes.

Stenosis. A narrowing.

Sterilize. As used in bacteriology, the freeing of culture fluids or other substances, of bacteria which are capable of development.

Streptococcus. Cocci or round bacteria, arranged in rows or chains.

Therapeutical. Pertaining to the art of healing.

Tonsilitis. Inflammation of the tonsils.

Trap. An arrangement on some part of the sewerage system, usually a bend in the pipe in which water stands, by means of which we seek to prevent the return of gases and disease germs into the building.

Tubercular. Pertaining to, or affected with, tubercle.

Tubercle. Nodules of greatly varying size constituting the disease tuberculosis.

Tuberculosis. A specific disease usually characterized by the formation of tubercles. Pulmonary consumption is a tuberculosis of the lungs.

Typhoid fever. Meaning literally a fever resembling typhus. The common fever of this country. Formerly typhus and typhoid were not distinguished, the one from the other. Typhoid fever is communicable only in a slight degree, if at all, by direct contagion; but there is great danger of its spread from the sick to the well from defective sanitary arrangements and regulations.

Typhus fever. A dangerously contagious disease rarely found in this country, and when appearing in our State, probably always by importation. (See Typhoid fever.)

Varioloid. Small-pox modified by vaccination. It is contagious, and cases of small-pox as severe may arise from exposure to its infection as from unmodified small-pox.

Virus. An infective agent.

Waste-pipe. That part of the house-drainage system which conveys the waste-water from sinks, baths, etc.

Zymotic. Characterized by fermentation. Applied to epidemic, endemic and contagious diseases, on account of the similarity between the process of fermentation and that which is started in the organism after its infection with the cause of any of these diseases.

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