ELEVENTH

BIENNIAL REPORT

OF THE

BOARD OF HEALTH

OF THE

STATE OF IOWA

FOR THE

PERIOD ENDING JUNE 30, 1901.

DES MOINES:
B. MURPHY, STATE PRINTER.
1901.

STATE OF IOWA,
OFFICE OF SECRETARY STATE BOARD OF HEALTH,
DES MOINES, *July 1, 1901.*

To Leslie M. Shaw, Governor of Iowa:

SIR—In accordance with the provisions of section 2565 of the Code, the Eleventh Biennial Report of the State Board of Health, for the period ending June 30, 1901, is herewith presented.

J. F. KENNEDY, *Secretary.*

MEMBERS OF THE BOARD.

CHARLES W. MULLAN, Attorney General, Des Moines, *ex-officio*.
JAMES I. GIBSON, State Veterinary Surgeon, Denison, *ex-officio*.
WARREN DICKINSON, Civil Engineer, Des Moines.

	TERM EXPIRES.
J. C. SHRADER, Iowa City (R)	January 31, 1902.
A. M. LINN, Des Moines (H)	January 31, 1903.
C. B. ADAMS, Sac City (H)	January 31, 1904.
J. A. MCKLVEEN, Chariton (E)	January 31, 1905.
HENRY MATTHEY, Davenport (R)	January 31, 1906.
R. E. CONNIFF, Sioux City (R)	January 31, 1907.
F. W. POWERS, Reinbeck (R)	January 31, 1908.

PREFACE.

Section 2565 of the Code makes it the duty of the Secretary of the State Board of Health, in his biennial report to the Governor, to "include so much of its proceedings, such information concerning vital statistics, such knowledge respecting diseases, and such instruction on the subject of hygiene as may be thought useful for dissemination among the people, with such suggestions as to further legislation as may be thought advisable."

In compiling the following report I have endeavored to conform fully to the requirements above stated.

A glance at the table of contents will show the wide range of sanitary subjects considered. The report on smallpox will be found interesting as it contains an account of the most widespread visitation of this disease in the history of the state.

There are a number of exceedingly interesting and valuable reprints that I am able to reproduce through the kindness of their writers and publishers.

There are republished herewith the circulars issued by the Board and the laws relating to the public health and safety which are codified and indexed so as to be readily referred to.

I regret exceedingly that I am unable to present a more complete and reliable report upon vital statistics—a regret that will have to be repeated biennially until the law is changed.

The cuts illustrating articles in this report have in most cases been generously donated or loaned by the parties whose papers are so much improved thereby.

J. F. KENNEDY.

CONTENTS.

I

BOARD MEETINGS.

SECOND QUARTERLY MEETING—AUGUST, 1899.

The second quarterly meeting of the State Board of Health was convened August 1, 1899, and called to order by President Scroggs at 9 A. M.

There were present: Scroggs, Guilbert, Conniff, McKlveen, Shrader, Gibson, Dickinson, Matthey, and Bancroft.

The minutes of the last meeting were read and approved.

The report of the Secretary for the quarter ending July 31st was read and considered *seriatim*.

INFECTIOUS DISEASES.

The Secretary reported outbreaks of infectious diseases, as reported to the office, as follows:

I am pleased to note the fact that at present there is an unusual degree of good health throughout the State and that in very few localities infectious diseases prevail.

Reports of outbreaks have been received as follows, May:

Cerebro-spinal Meningitis.—Linn Grove; Ottumwa; Davenport; June, Burlington; July, none.

Cholera Infantum.—May, none. June, Burlington; Cedar Rapids; Des Moines. July, none reported.

Diphtheria.—May, Dows; East Orange township, Sioux county; Liberty township, Hamilton county; Riceville; Alton; Harrison township, Harrison county; Dunlap; Linn township, Linn county; Des Moines; Dubuque; LeMars. June, Amsterdam township, Hancock county. July, Amsterdam township, Hancock county.

Measles.—May, Sibley; Rockford; Dubuque; Marengo. June, Sibley. July, none.

Scarlet Fever.—May, Alton; Correctionville; Lynnville; Kamrar; Harcourt; La Porte City; Lost Grove township, Webster county; Liberty township, Hamilton county; Wapello; Liscomb. June, Dawson township, Greene county; Bennett; Grundy Center. July, Corning; Lake township, Wright county; Coldwater township, Butler county; Washta; Dawson township, Greene county; Bennett; Holmes; West Liberty.

Smallpox.—May, Cresco; Rome; Orleans township, Winneshiek county; Le Claire; Iowa City. June, Iowa City: Pleasant Valley township, Scott county; Paris township, Howard county; Lourdes. July, none.

Typhoid Fever.—May, Davenport; Des Moines; Ottumwa. June, Buffalo Center. July, Franklin; Des Moines; Marshalltown.

Whooping Cough.—May, Slater; Keokuk. June, Boone; Burlington. July, none.

SMALLPOX.

I had hoped to lay before you an elaborate report of smallpox as it appeared in the various counties of the State. I have written to all who have in any way been identified with cases for data, to some several times. I still hope that I can have a complete report for the Biennial Report. From the data on hand I report as follows:

The first notification of the outbreak of the disease was from Hamburg, November 18, 1898, the source of infection being Nebraska City, Neb. I think it is safe to say that at least four-fifths of the cases that appeared in Iowa resulted from exposure to cases in Nebraska City or Omaha. It has appeared in the following counties:

Appanoose county. Franklin township, two cases, reported by H. E. Wilkinson, T. C.

Audubon county. Audubon, two cases; Douglas township, two; Exira, four; Kimbalton, one. Total nine.

Cedar county. Mechanicsville, two; Pioneer township, one. Total, three. Reported by S. T. Buell.

Fremont county. Percival, fifteen; Benton township, four; Hamburg, twenty-seven; Washington township, five. Total, fifty-one.

Henry county. Rome, two, reported by Dr. McKlveen.

Howard county. Cresco, fifty; Lourdes, three; Paris township, three. Total, fifty-six.

Johnson county. Iowa City, three, reported by Dr. Shrader.

Jones county. Springfield township, twenty-four, one death, reported by Dr. Williams.

Lee county. Pleasant Ridge township, one, reported by Dr. J. G. Geers.

Scott county. Davenport, one, reported by Dr. Preston; Le Claire, fifteen, reported by Dr. Matthey and two by Dr. Gamble; Pleasant Valley township, one. reported by Dr. Matthey. Total, nineteen.

Shelby county. Elkhorn, four; Jensen family, five, reported by Dr. McKlveen.

Warren county. Belmont township, one, reported by Dr. Price; Otter township, one, reported by Mr. Van Syoc; Milo, four, reported by Lou Dunn; Lacona, twenty-nine, reported by Dr. Hatfield. Total, thirty-five.

Washington county. Wellman, one, reported by Dr. Shrader.

Winneshiek county. Orleans township, one, reported by C. C. Brown, T. C.

Wayne county. Seymour, seven, reported by O. A. Cover; Genoa, one, reported by J. W. Gordon. Total, eight.

Number of counties reported, fifteen; number of cases reported, two hundred and twenty-three.

Dr. Matthey made the following special report respecting the outbreak at Le Claire.

GENTLEMEN.—During my recent visit to Le Claire, made for the purpose of investigating the cases of smallpox, I became acquainted with an osteopath practicing in that locality. When introduced to him I was ignorant of the fact that he was not a physician. Dr. Cantwell and I called first upon Dr. Bailey, the city physician, who then conducted us to the other members of the profession. At the residence of Dr. Gamble we met a young man of intelligent appearance, who, on hearing of our purpose, begged for permission to accompany us. This man was introduced as Dr. Meunier.

In our discussion relative to the nature of the cases—whether smallpox or chickenpox—Dr. Meunier took part. I was asionished when he suddenly addressed me with the words: "Of course I am not recognized by you, because I am an osteopath, but I have two cases of smallpox under my care."

Dr. Bailey remarked that these cases were diagnosticated by Dr. Gamble.

I now began to question Dr. Meunier, and inquired how he undertook to treat smallpox. He replied that it would be necessary for me to study osteopathy in Kirksville before I could understand his methods. I assured him that I knew more about osteopathy than he, and told him to answer my questions. Only after I had repeatedly explained to him that he owed it to the assembly there present to respond to the query put to him, did he deign to acquiesce to my demands. With an obvious effort at circumlocution, he stated that in pricisely the same manner in which the new science of osteopathy deals with other diseases, so, too, it deals with smallpox.

I did not, however, drop the question until he had specified that this method of treatment consists of manipulations with both hands in the form of rubbing, kneading beating, and passive movements. With a shake of the head, I observed that these measures were rather strange ones to adopt in the treatment of smallpox, and determined to question him further.

To my inquiry regarding the osteopathic treatment of syphilis he responded by informing me that such diseases are not within the province of osteopathy. Gonorrhœa and all venereal diseases are excluded from the category of osteopathic affections. I called his attention to the fate of the millions of patients suffering with these diseases if the scienfific world should acknowledge as supreme the doctrines of osteopathic faith. Regarding the treatment of puerperal fever, Dr. Meunier said that osteopathy had none but the best results to boast of. Gall-stones, Appendicitis, Cerebro-Spinal Meningitis, and numerous other affections looked upon as serious pathological conditions are cured by osteopathic treatment in every instance. I remarked that similar statements are being constantly made by Christian scientists, clairvoyants, spiritualists, somnambulists, cheiropaths, cancer doctors, and the like.

Thereupon he directed my attention to the brilliant results of the distinguished Dr. McFadon, of Davenport. I could not forbear to relate to him an incident which has come to my knowledge and in which the celebrated Dr. McFadon takes a prominent part.

During a bitterly cold night last winter, Dr. Crawford was summoned from his comfortable bed by an excited, impatient man, who begged the

doctor to accompany him immediately to his home to alleviate the suffering of his sick child. On inquiry Dr. Crawford was informed that the throat of the child was painful, and he offered to prescribe for it at once and call early in the morning.

The man, however, implored the doctor so pitifully to go with him without delay that Dr. Crawford finally yielded. On arriving at the house Dr. Crawford found the child suffering from an inflammatory condition of the throat, which was so mild in its nature that he was able, without compunction, to assure the father then and there that no significance need be attached to so slight an ailment.

The father of this child was no other than the renowned Dr. McFadon, who advertises in the most absurd and ridiculous manner his infallible ability to cure every disease, without regard to its character or severity. For the edification of the public, he circulates among them thousands of pamphlets describing some of the marvelous results which he has attained.

What do you think of this man who boldly approaches the sick bed without a trace of knowledge concerning the import and nature of the conditions he meets?

I requested Dr. Meunier to answer one last question—one concerning his methods of treatment in cases of fracture of the neck of the femur. He replied that his methods were similar to my own. On requesting him to describe these methods, he hesitated, but finally declared that a bandage about the hip joint, and rest in bed, comprised the Osteopathic *modus curandi*. I told him that I had expected this answer, but could not help feeling pity for the unfortunates who might be compelled to undergo such treatment, because of the inevitable shortening or possible uselessness of the limb. I added that it was not possible for me to comprehend why so large a number of young men and women should enter upon a life of systematic swindlery and deception at the sick bed, in view of the fact that it requires but a minimum amount of common sense to understand the quackery in such methods. Considering the enormous responsibility, I told him I was forced to regard the Osteopaths as the most vicious creatures on earth. In comparison with them Jesse James was an angel, for he made short work of his victims and did not prolong their misery, but the Osteopaths kill inch by inch.

I now requested Dr. Gamble to accompany us on our visits to every case in Le Claire. It happened that the first cases to be investigated were those under Osteopathic care, and Dr. Gamble asked Dr. Meunier's permission to see them. The latter declined, saying that no one in this country had ever been treated as shamefully as he had been that day. In case I would apologise he would grant Dr. Gamble's request. I told him that I believed I owed him no apology for telling the truth, and assured him that had our discussion dealt with any other subject I should, despite his delusion, have shown him all the respect that social laws demand; further, that in my report to the Iowa State Board of Health I should take into account the peculiarity of the circumstances. The result of this was that the permission was granted.

The two cases proved to be of some severity. The mother of the patients officiated as nurse. I questioned her concerning the number of treatments which the invalids had received, but was interrupted by Dr. Meunier with the

statement addressed to the woman—"You need not answer that question. These patients receive as many treatments as the science of Osteopathy regards necessary." In response to this I explained to Dr. Bailey that Dr. Meunier was dangerous to the community, especially to those inhabitants of Le Claire who are lacking in even that small amount of judgment required to discriminate between the false and the true in medicine. I ordered him, therefore, to be quarantined to avoid the possibility of his inoculating other individuals by rubbing the virus into their skins.

Report received and adopted.

CONFERENCE OF STATE AND PROVINCIAL BOARDS OF HEALTH

Dr. Conniff, on behalf of the delegates sent to the Richmond (Va.) meetting of the "Conference of State and Provincial Boards of Health of North America," presented a report of the meeting which was received, adopted and placed on file.

RABIES

Replying to a communication from a party relative to the alleged presence of rabies in some parts of the State, Dr. J. I. Gibson, chairman of the committee on "Diseases of Animals and Veterinary Sanitation," said:

Your committee, to whom was referred the communication of John Wagoner, Emeline, Iowa, enquiring what authority their township board could exercise in the control of dogs during a supposed outbreak of rabies, beg leave to report:

First.—That there is no positive knowledge of the existence of rabies in the vicintiy referred to.

Second.—That in cases where rabies does exist the local board has power to establish quarantine upon dogs or other animals exposed to rabid dogs and to require the confinement or muzzling of all dogs in the township for a period sufficient to cover the stage of inoculation of the disease, and as long as any cases of rabies exist in the township.

Third.—That in cases where such quarantine or muzzling rules are proclaimed by the local board and dogs are still allowed to run at large, it is the duty of the local board to order such dogs running at large in violation of such rules shot on sight.

This report was received and adopted.

LINSEED OIL

The Secretary reported the action that had been taken by the President and Secretary of the Board, by and with the concurrence of the Governor, and asked for instructions as to his further duties—especially as regards the institution of prosecutions where adulteration is found.

Dr. Guilbert offered the following resolution, which was unanimously adopted:

Resolved, That whenever specimens of linseed oil are sent to this Board for examination, and are found on analysis to be adulterated, that then the Secretary is instructed, at once to notify the local inspector of oils, that such specimens of oil from his district have been found to be adulterated, and that it is his duty to proceed against the violators of the law in the proper court of the State.

Professor Macy submitted the following report, supplementary to the report made by him and Mr. Pickell, at the last meeting of the board.

Iowa State Board of Health:

GENTLEMEN—The undersigned reported at last meeting, the results of certain tests of linseed oils. In the said report, the Mound City Paint and Color Works was reported as having a sample of adulterated oil, because of the presence of a neutral drier. Later it was determined that such a drier was not, and is not an adulterant, and we gave a certificate to the company to the effect that the sample in question was O. K.

We make this report to your honorable body as a modification of the report now on file and above referred to.

Respectfully submitted.

S. R. MACY,
Chemist State Board of Health.

Highland Park College, Des Moines, August 2, 1899.

The report was received and placed on file.

FINANCIAL.

The Secretary presented the following financial report, for the quarter ending July 31, 1899:

Board meeting, May 4, 1899

MEMBERS EXPENSE ACCOUNT.

E. A. Guilbert	$ 25.20	
J. C. Shrader	18.76	
Warren Dickinson	10.50	
J. A. Scroggs	25.51	
W. Bancroft	24.96	
J. I. Gibson	23.58	
J. A. McKlveen	14.82	
H. Matthey	26.90	
R. E. Conniff	28.50	
Total		$198.73

Paid by State warrant No. 8962.

SPECIAL EXPENSE ACCOUNT.

J. A. Scroggs, Richmond meeting	$ 75.65	
Paid by State warrant No. 9317.		
E. A. Gilbert, Richmond meeting	86.20	
Paid by State warrant No. 9501.		
R. E. Conniff, Richmond meeting	116.75	
Paid by State warrant No. 9376.		

CURRENT EXPENSES FOR MAY.

J. F. Kennedy, Secretary	$100.00	
Margaret S. Schoonover, Stenographer	50.00	
F. R. Conaway, printing *Bulletin*	27.45	
L. Young, binding *Bulletin*	9.00	

L. Schooler, postage	26.00	
J. C. Schrader, investigating smallpox	55.47	
J. A. Mcklveen, investigating smallpox	12.50	
Smith-Premier Co , 100 carbons	3.00	
Iowa Telephone Co	.45	
Western Union Telegraph Co	1.91	
United States Express Co	1.25	
Well-Fargo & Co's. Express	.68	
Total		$287.71

Paid by State warrant No. 9316.

CURRENT EXPENSES FOR JUNE.

J. F. Kennedy, Secretary	$100.00	
Margaret S. Schoonover, Stenographer	50.00	
J. A. Schroggs, consulting with Governor	13.33	
F. R. Conaway, printing *Bulletins*	27.45	
L. Young, binding *Bulletins*	9.00	
Iowa Lithographing Co , 6,500 letterheads	28.00	
Carter & Hussey, 10,000 wrappers, $9, 300 large wrappers, $1.50	10.50	
D. Appleton & Co	5.00	
Adams Express Co	2.79	
American Express Co	1.79	
United States Express Co	.89	
Wells-Fargo & Co's. Express	.85	
Haywood & Son, paper fasteners	.37	
Total		$249.97

Paid by State warrant No. 9733.

The auditing committee reported as follows:

To the State Board of Health.—The auditing committee desire to submit their report upon the Secretary's financial statement for the quarter ending July 31, 1899. We have found proper vouchers filed for each and every expenditure; and the warrants drawn correspond with the vouchers filed.

Respectfully submitted,

WARREN DICKINSON,
H. MATTHEY.

The report was received and adopted.

AMERICAN PUBLIC HEALTH ASSOCIATION

Warren Dickinson, J. A. Scroggs, J. A. McKlveen and J. F. Kennedy were duly elected delegates to the annual meeting of the American Public Health association, to be held at Minneapolis in October *prox.*

DISINTERMENT PERMITS

Eight applications for special disinterment permits were presented by the Secretary, all the deaths having resulted from

"Croup" or Diptheria. The applications were referred to the committee on "corpses," who reported in favor of granting the permits under the immediate supervision of the local boards of health of the respective localities, and in accordance with the provisions required by the State Board. The permits were granted.

The Secretary, on this subject, reported that, for the quarter ending July 31st, there had been issued one hundred and fifteen ordinary permits.

On motion Board adjourned to meet Wednesday, November 15, 1899.

THIRD QUARTERLY MEETING—NOVEMBER, 1899

The State Board of Health met in regular quarterly session in the office of the Secretary, Des Moines, November 8, 1899, and was called to order at 10 A. M. by the President, Dr. J. A. Scroggs.

There were present Scroggs, Guilbert, Bancroft, Conniff, Shrader, and Matthey. Later Dr. McKlveen came.

The minutes of the Secretary were read and approved.

The report of the Secretary was presented, read, referred to the regular standing committees, and considered topically.

AMERICAN PUBLIC HEALTH ASSOCIATION

The Secretary reported the following respecting the meeting of the above named association, held at Minneapolis, Minn., October 31st, and November 1st, 2d, and 3d:

As one of your delegates to the American Public Health Association, I have to report that returning from there so short a time before this meeting your Secretary was not able to make out a formal report for your edification and consideration.

I hereby report the following, and if the Board will so direct, will prepare for the next issue of the BULLETIN a report that will be, in a measure, a resume of the transactions of the Association.

This Board was represented by Drs. McKlveen, Shrader, Gibson, and your Secretary. Iowa was further represented by Professor Hohenschuh, of Iowa City, and Dr. C. H. Sheldon, of Davenport. Prof. J. Fred Clarke, of Fairfield, Lecturer in Hygiene in the State University, was elected a member, and Prof. Floyd Davis was assigned to read a paper, but neither was present.

There were one hundred and twenty-two members enrolled as in attendance, in addition to one hundred and twenty-five who were elected as new members, Drs. McKlveen, Clarke, Sheldon and Professor Hohenschuh representing Iowa in the list of new members.

The session was a very busy one, the program being greatly overloaded, and in consequence no time even for the reading of the papers, much less for discussions. There would have been even less discussion had it not been for the persistent efforts of Dr. Gibson.

Dr. Shrader was elected to represent Iowa in the Advisory Council, and your Secretary as a member of the executive committee, and I had the assurance that Iowa would be remembered as well in the regular standing committees. Dr. P. H, Bryce, of Toronto, was elected President for the ensuing year; Dr. M H, Bracken, Minneapolis, First Vice-President; Dr. Juan Breña, Zacatecas, Mexico, Second Vice-President; Dr. C. O. Probst, of Ohio, Secretary; Dr. Henry D. Holton, of Brattleboro, Vt., Treasurer. Next place of meeting, Indianapolis, Ind.

The report was received and the Secretary was directed to prepare a report in full for publication in the BULLETIN.

NATIONAL BOARD OF HEALTH

Dr. Conniff reported the result of the interview at Dubuque of the special committee, consisting of himself and Drs. Scroggs and Guilbert, with Hon. Senator Allison and Hon. D. B. Henderson, relative to the establishment of a National Department or Bureau of Health along the lines suggested by Senator Spooner's bill.

BOVINE TUBERCULOSIS

Dr. J. W. Kime, of Ft. Dodge, appeared before the Board and gave a history of the efforts of the people of Ft. Dodge to determine the freedom of the dairy herds, supplying the city with milk, from Tuberclosis, and speaking in general of the great prevalence of this disease among cattle and the danger therefrom to consumers of milk.

On motion a special committee, consisting of Drs. Gibson, Conniff, and Shrader, was appointed to formulate some definite expression upon this subject for consideration by the Board at the meeting to be held February next.

INFECTIOUS DISEASES

The Secretary reported the following respecting infectious diseases:

With the exception of severe outbreaks of diphtheria at Oskaloosa and Clinton, the health of the State has been remarkably good since your last meeting.

Smallpox: October 9th, Dr. J. F. Herrick, health officer of Ottumwa, reported a case of smallpox in the person of an adult male who had been traveling over the country on a wheel, and hence the source of infection could not be definitely determined. He was broken out in papules when first seen and was at once removed to a hospital, about two miles in the country. No other cases have occurred, demonstrating the value of prompt preventive measures.

October 21st, Dr. C. W. Stewart, health officer of Washington repored a case of smallpox in that city, in the person of a railway mail agent, the terminal of whose route was Albert Lea, Minnesota. As they have been having quite an epidemic of the disease in southern Minnesota, including Albert Lea, the source of infection is quite evident.

As in the case at Ottumwa the disease was promptly recognized and strict restrictive measures were at once adopted. No other cases have occurred.

In both cases the beneficent efforts of both Boards were jeopardised by the local press in the interest of business, declaring the disease was chicken pox and thus weakening the hands of the health officers and minifying the importance of vaccination, quarantine and other preventive measures. It would seem that such publications, though intended as such, are not in the interest of economy or commercial prosperity.

BIENNIAL REPORT

The Secretary reported as follows respecting the Tenth Biennial Report:

The Tenth Biennial Report is now in the hands of the State printer. It will be a publication of interest because of the large range of subjects covered and the amount of information upon these subjects. Your secretary, in its preparation, has strictly followed the requirements of the code, and he believes your honorable body will find that it places before the legislature and the people of the state, in a practical and convincing manner, the important work delegated to the Board, as well as the satisfactory manner in which that duty is being met. It will contain about 400 pages, and several of the articles are well illustrated. There are several practical and important, as well as up-to-date, reprints from the most reliable sources. Under the topic, "Suggestions for Further Legislation," your Secretary has endeavored to present, as forcefully as possible, the great partiality and injustice of the Osteopathic law as compared with the medical practice act.

Respecting this communication from the secretary, Drs. Shrader and Matthey, on behalf of the Committee on Contagious Diseases, reported as follows:

MR. PRESIDENT AND GENTLEMEN OF THE STATE BOARD OF HEALTH.—Your committee to whom was referred that part of the secretary's report in relation to the publication of the Tenth Biennial report of the Secretary of this Board, and in regard to the appoinment of a legislative committee, would say: That we are delighted to be informed that our secretary has taken the pride and given it the thought and care so necessary to show the legislature and the people of the state the valuable information here published, believing it will be a great factor in the education of the people in sanitary matters. We are of the opinion that a legislative committee should be appointed at this meeting who should at proper times, visit that body and see that no adverse action is taken and to inform the members of the work we are doing to prevent disease by removing the causes of sickness, by quarantine, disinfection, and abating nuisances of many different kinds.

LINSEED OIL INSPECTION

The Secretary reported as follows relative to the inspection of linseed oil:

Quite a number of the samples of linseed oil sent to this office for inspection have been found adulterated, and have been reported to the County Attorney and the local Oil Inspector for prosecution. Your Secretary has been assured that several prosecutions have been, or will be commenced. In other cases the County Attorney or the Inspector has reported that the oil adulterated was not being offered for sale, or had not been sold for "linseed oil," or that the party was a man of great integrity and had no knowledge that the oil was not up to grade, and that he had furnished the oil for inspection in order that he might for himself determine its character, and that he had, immediately upon learning that it was adulterated, reshipped the oil to the parties of whom it was bought. In all such cases the County Attorney and the Oil Inspector were reluctant to begin prosecution, and your Secretary felt that he had no right to involve the Board in any legal procedures under any such circumstances.

It may not be impertinent, and certainly is not irrelevant, for your Secretnry to remark that this matter of testing linseed oil, and prosecuting adulterators thereof, is not the appropriate work of a sanitary body. It is a cummercial transaction with but little, if any, sanitary significance whatever.

This act of the Twenty-seventh General Assembly, relating to the inspection of linseed oil, has, on practical test, proved contradictory and inefficient, and its enforcement well nigh impossible.

In reference to this item of the Secretary's report. Dr. Matthey, chairman of the committee on oil inspection, reported:

Your committee on oil inspection report that we have had under consideration the report of the Secretary in regard to this matter, and we are in accord with him in the conclusion that no prosecution should be insisted on when the local Inspector and the County Attorney believe that conviction could not be had. We also believe that the law should be so amended as to be less contradictory and more effective. The law should not place the enforcement of its provisions, further than the duty of determining the quality of the oil, upon the State Board of Health.

The report was adopted.

VACCINE VIRUS

The secretary said in his report relative to vaccination and supplying vaccine virus:

Your Secretary believes that if this office could order or supply on short notice vaccine virus from reliable laboratories to health officers and other physicians in the State, and advertise the fact in the BULLETIN, that vaccination would become much more general. This is done in some states, and is in the interest of better protection, because of the more general vaccination and the use of more reliable virus.

Your Secretary could make arrangements with several reliable establishments to furnish upon the shortest notice fresh virus, and in no way involve the Board in any financial responsibility. I append hereto some correspondence touching this matter for your consideration.

The committee on infectious diseases having this item under consideration reported the following, which was adopted:

Your committee, to whom was referred that part of the Secretary's report in relation to establishing an emporium for the sale

and distribution of vaccine virus, the same being under the supervision and care of the Secretary, this being done by some of the State Boards, have thought this matter over carefully and submit the following:

The Board, as a board does not wish to engage in any commercial enterprises. We think it would at once antagonize every dealer in vaccine in the State, and they would assuredly bring all the influence they and their friends could bring to bear against the successful carrying out of the project.

But we are met with this statement in the report of the Secretary, that the Board authorize the Secretary to keep the virus on hand, and sell from this office the virus to physicians and others, such as local boards, and to whomsoever might apply. Your committee think that this would not materially help the matter, as this was being done by and with the sanction of the members of the Board. Again, should this be done, and if the project was successful, it would require the services of another clerk, for we are informed that the labors of the Secretary are becoming more onerous every year; and, besides, good, reliable virus can be obtained from Chicago almost as soon as it could from this office. Therefore, your committee cannot recommend the adoption of this part of the Secretary's report.

All of which is respectfully submitted. J. C. SHRADER,
H. MATTHEY,
Committee.

The report was adopted.

DISINTERMENT PERMITS

The Secretary reported that during the qnarter there had been issued from the office one hundred and thirty-five (135) ordinary disinterment permits in addition to the special ones authorized by the Board at its last meeting—a careful record of all these permits, whether ordinary or special, being kept in the office. He also laid before the committee on corpses, Dr. Bancroft, several additional applications for special permits, upon which the committee reported favorably, with the exception of one, which was laid over until the next meeting. The report of the committee was adopted, and the Secretary was directed to issue special permits in the following cases:

ROSETTA KELLEY, *membranous croup*, to be removed from one lot to another in Coon Rapids cemetery.

ROBERT H. THOMAS, *membranous croup*, to be removed from Shellsburg cemetery, Benton county, to Evergreen cemetery in Vinton.

EARL RUSH HAVERLY, *croup*, to be removed from Woodland cemetery, Des Moines, to Odd Fellows cemetery, Marengo.

GRACE HURLBURT, *croup*, from a private lot near Boone to East Linwood cemetery, Boone.

UNKNOWN CHILD, to be removed from Salt Creek township, Tama county, by private conveyance to Oak Hill Cemetery, Belle Plaine.

MAGGIE AUGUSTA MAGNUS, *diphtheria*, to be removed from Oak Hill cemetery, Cedar Rapids, to another lot in the same cemetery.

MANEA BEUNABOSA, *diphtheria*, from one lot to another in Floyd cemetery, Sioux City.

JAMES BRAY, *diphtheria*, to be removed from the Catholic cemetery, Washington township, Dubuque county, to Key West cemetery, in the same county.

ADDIE I. HORNING, *diphtheria*, to be removed from one lot to another in Linwood cemetery, Boone.

A communication was presented from Mr. J. S. Harlan, secretary of the Atlantic Cemetery Association, asking in regard to granting certificates under certain specified conditions.

The Secretary was authorized to issue the permits upon application being made in each case in due form.

FINANCIAL

The Secretary presented the following financial statement for the quarter ending October 31st:

During the quarter the following amounts have been expended, the vouchers for which I submit herewith: Board meeting Aug. 2nd, 1899.

MEMBERS EXPENSE ACCOUNT

J. C. Shrader	$ 17.98
E. A. Guilbert	30.65
J. I. Gibson	21.08
J. A. McKlveen	14.82
W. Bancroft	21.90
H. Matthey	19.00
R. E. Conniff	28.00
Warren Dickinson	10.40
J. A. Scroggs	22.90
Total	$ 186.73

Paid by State warrant No. 10450.

CURRENT EXPENSES FOR AUGUST.

J. F. Kennedy, Secretary	$ 100.00
Margaret S. Schoonover, Stenographer	50.00
F. R. Conaway, State Printer	44.45
L. Young, State Binder	9.00
H. Matthey, investigating small pox	5.80
Carter & Hussy, printing circulars	3.75
Carter and Hussey, printing circulars	7.00
F. A, Dawson, express service	.75
Adams Express company	5.45
American Express company	.85
U. S. Express company	2.95

Wells Fargo & Company's express	2.15	
Western Union Telegraph company	.59	
Total		$ 232.74

Paid by State warrant No. 10844.

CURRENT EXPENSES FOR SEPTEMBER

J. F. Kennedy, Secretary	$ 100.00	
Margaret S. Schoonover, Stenographer	50.00	
L. Schooler, bulletin postage	40.00	
Conaway & Shaw, printing	27.45	
L. Young, binding *Bulletin*	9.00	
L. Schooler, stamps and envelops	203.79	
Pub. Photo Engraving Company, electros	17.06	
The Century company	13.50	
W. C. Newton & Company, electros	9.45	
W. P. Gerhard, books	6.00	
G. F. Lasher, postal guide	2.00	
Western Union Telegraph company	.68	
Adams Express company	.60	
American Express company	.65	
Total		$ 480.08

Paid by State warrant No. 11204

RECAPITULATION.

Members expense account	$ 186.73	
Expenses for August	232.74	
Expenses for September	480.08	
Total		$ 899.55

The fiscal year closed with September 30th, and the amount expended was made to equal the amount appropriated.

The new fiscal year began October 1st, and the expenditures for that month are as follows:

CURRENT EXPENSES FOR OCTOBER.

J. F. Kennedy, Secretary	$ 100.00	
Margaret S. Schoonover, Stenographer	50.00	
F. R. Conaway, State Printer	48.70	
L. Young, State Binder	9.00	
A. N. Marquis & Co., book	2.75	
United States Express company	2.90	
Adams Express company	.90	
Wells, Fargo & Co's. Express, August	.50	
Wells, Fargo & Co's. Express, September	.30	
Western Union Telegraph company	.50	
Total		$ 215.55

Paid by State warrant No. 11730

Total expenditures for August and September as above stated	$ 899.55	
Expenditures for October	215.55	
Total for quarter		$ 1,115.10

The report was referred to the auditing committee, who reported as follows:

Your committee, to whom has been referred the Secretary's financial report for the quarter ending October 31, 1899, report that they have found proper vouchers filed for each and every item, and warrants drawn check with bills paid.

H. MATTHEY.

The report was received and adopted.

SMALLPOX AT STORM LAKE

While the Board was in session the secretary received the following telegram:

STORM LAKE, Iowa, November 8, 1899.

Dr. J. F. Kennedy:

A camp of graders are quarantined here on account of a case of smallpox, reported by Chicago, as the man arrived there October 31. This camp is ordered to Mississippi to-day. Ten days has elapsed since quarantine; shall I permit quarantine to be raised and allow passage through the state? No one sick in camp. Answer quick. DR. L. M. JOHNSTON.

The Board directed the following reply:

L. M. Johnston, M. D., Storm Lake:

Vaccinate *all* persons known to be exposed, maintain quarantine seventeen days from last exposure, and if, at the end of that time, no cases develop, release quarantine on order of local board of health.

By order

STATE BOARD OF HEALTH.

On motion, the Board adjourned to meet the first Wednesday in February, 1900.

FOURTH QUARTERLY MEETING—FEBRUARY, 1900.

The State Board of Health met in quarterly session February 7, 1900, and was called to order at 10 A. M. by Pres. Dr. J. A. Scroggs.

There were present Scroggs, Matthey, Bancroft, Conniff, McKlveen, Remley, Gibson, and Dickinson, Dr. Guilbert being absent because of severe illness.

The minutes were read and approved and the Secretary presented his report for the quarter ending January 31, 1900.

SYMPATHY FOR DR. E. A. GUILBERT

The following telegram, dictated by Dr. Conniff, was sent to Dr. Guilbert:

"The Board, one and all, deeply regret your absence and join in sympathy with a prayer for your speedy return to health."

Later Dr. McKlveen presented the following resolution, which was unanimously adopted by a rising vote:

WHEREAS, This Board has learned with sadness of the serious illness of our colleague, E. A. Guilbert; M. D. Be it

Resolved, That the Board of Health, in session at Des Moines met, express our heartfelt sympathy to our esteemed colleague, Dr. E. A. Guilbert, and most sincerely hope his life may be spared, and that he may be fully restored to his former state of health.

CIRCULARS

Circular No. 2, on the restriction and prevention of contagious diseases in the public and private schools of Iowa, as revised and reissued, was declared official.

COMMUNICATIONS

An invitation was received from President Rearick, of Highland Park College, inviting the Board to visit the laboratories of the institution. The invitation was respectfully declined, owing to the pressure of business and the brevity of time.

Other communications were received and referred to Dr. Conniff, special committee, *vice* Dr. Guilbert, who reported as follows:

Your Committee on Communications beg to report as follows:

In the letter of Joe. E. Blackburn, President of Pure Food and Drug Congress, asking the Board to send representatives to the next meeting to be held in Washington, D. C., March 7, 1900. Your committee believes it to be a part of the work of the Board to lend its influence to the praiseworthy effort to secure proper legislation along this line, and would suggest that two delegates be named to attend the Washington meeting.

The communication from Mr. Junkin, chairman of the Committee on Retrenchment and Reform of the senate, asking information on the needs of the Board and the expense of clerical service for the biennial period:

Your committee would recommend that the president and secretary be instructed to put the information in the hands of the committee without delay.

In the matter of the communication from his excellency, the governor, stating that the writer had been appointed to succeed himself as member of the Board: Your committee finds the Board is entitled to a great deal of credit for their kind forbearance in the past, for overlooking his mistakes,

and for extending to him at all times uniform courtesy and kindness, and the writer wishes to thank you one and all for your many acts of friendship and consideration.

Your committee learns with sorrow of the severe illness of our friend and colleague, Dr. Guilbert, and would recommend that a copy of the resolutions passed by the Board at our morning session be sent to the good doctor, together with a draft for his quarterly fees in the Board of examiners.

The letter of D. A. King, chief statistician of the Twelfth United States census, endeavoring to secure as far as practicable, uniformity of form in reports of vital statistics: Your committee would recommend the adoption of the forms recommended by the national government and the Secretary be instructed to furnish to the auditor blanks in conformity with this recommendation.

In the communication of F. W. Peck, Commissioner-General of the Paris Exposition asking the Board if space is wanted in the official catalogue of the exposition:

Your committee make no recommendations.

INFECTIOUS DISEASES

The Secretary reported outbreaks of infectious diseases in various localities in the State as having been reported during the quarter.

The diseases reported were Diphtheria, Scarlet Fever, Typhoid Fever, Smallpox and Whooping Cough. Those reported in November and December were reported in the BULLETIN of December and January while those reported for January will be found elsewhere in this issue of the BULLETIN.

The Secretary said in conclusion upon this subject:

Notwithstanding the lage number of points of incidence and the many exposures, especially to Smallpox, in many of the localities there have been no epidemics and comparatively few of those exposed have contracted the disease, because of previous vaccination, re-vaccination, quarantine and isolation.

The committee to whom was referred this part of the Secretary's report, reported as follows:

Your Committee on Contagious Diseases, to whom was referred the report of the Secretary respecting outbreaks of these diseases, respectfully report that we have duly considered the same, and while we regret that these infectious diseases have appeared in so many localities we congratulate the various local boards on their prompt and successful efforts in preventing their extension and their assuming epidemic porportions. These boards are the duly appointed defenses of the people in such matters and we are glad to note the fact that they are so faithfully discharging their duties in so many localities. We hope in the near future there will be so hearty co-operation between the people, physicians and these local boards that such diseases will be immediately stamped out upon their appearance.

J. C. SHRADER.
H. MATTHEY.

TUBERCULOSIS

The special committee on the preparation of a circular for information upon Tuberculosis made the following report, which was adopted:

Your committee asks time until next meeting of the Board to present a circular for publication, which will be in harmony with laws which may then be in force in Iowa, and the scientific facts developed up to the date of said meeting.

(Signed) J. I. GIBSON,
R. E. CONNIFF,
J. A. MCKLVEEN,
Special Committee on Circular Relating to Tuberculosis.

IOWA STATE SANITARY ASSOCIATION

At the organization of this association a special committee was appointed, with Dr. Gibson as chairman, for the purpose, if possible, of having the State Board of Health publish as a supplement to the *Bulletin* the papers and discussions before the association.

The chairman, after consulting with the Board, presented the following report, which was adopted:

Your committee finds that the proceedings of the first meeting of the Iowa State Sanitary Association are so voluminous as to prohibit the publication of same in the *Iowa Health Bulletin*. Your committee recommends that the publication of said proceedings be referred back to the president of the Iowa State Sanitary Association, with the hope that said association will endeavor to raise the necessary funds to publish a yearly volume containing all its proceedings. (Signed) J. I. GIBSON.

DISINTERMENT PERMITS

The Secretary was directed to issue the following special disinterment permits:

CHARLES BENNETT, died in 1894, *Croup;* by private conveyance from Butler cemetery, Harrison township, Lee county, to Farmington cemetery, in Farmington township, Van Buren county.

ROY BENNETT, died in 1894, *Diphtheria;* disinterment, and removal same as above.

WILLARD G. BROWN, died 1884, *Croup;* by private conveyance from Davenport cemetery to West Davenport cemetery, Rockingham township, Scott county.

MAGGIE HEATON, died 1878, *Croup;* by private conveyance from Riverside cemetery, Fremont county, to Randolph cemetery, Riverside township, Fremont county.

BERTHA MAY ICKES, died 1887; by private conveyance from Oakdale cemetery, Davenport, to another lot in the same cemetery.

ALVIN VARIS, died 1874, *Scarlet Fever;* by railroad from Arcadia township, Carroll county, to Woodland cemetery, Des Moines.

FINANCIAL

The Secretary presented the following financial statement for the quarter ending January 31, 1900:

Board meeting, November 8, 1899.

MEMBERS EXPENSE ACCOUNT

E. A. Guilbert	$ 32.90	
J. A. McKlveen	12.82	
R. E. Conniff	31.50	
H. Matthey	22.50	
J. C. Shrader	16.66	
W. Bancroft	23.46	
J. A. Scroggs	23.56	
Total		$ 163.40

Paid by State warrant No. 11872.

SPECIAL EXPENSE ACCOUNT

J. F. Kennedy, Minnesota meeting	$ 26.95	
Paid by State warrant No. 11873,		
J. C. Shrader, Minnesota meeting	29.50	
Paid by State warrant No. 11874.		
J. A. McKlveen, Minnesota meeting	36.55	
Paid by State warrant No. 11875.		
J. I. Gibson, Minnesota Meeting	33.18	
Paid by State warrant No. 11960.		
Total		$ 126.18

CURRENT EXPENSES FOR NOVEMBER

J. F. Kennedy, secretary	$ 100.00
Margaret S. Schoonover, stenographer	50.00
F. R. Conaway, State printer	39.45
L. Young, State binder	9.00
J. F. Kennedy, trans. A. P. H. A.	15.00
Langan Bros., stationery	5.73
Interior Decorating company	5.00
R. E. Conniff, telegrams and express	3.20
J. F. Kennedy, street car fare	2.90
Babyhood Publishing company	1.00
Photo Engraving company, express	.40
Des Moines Book and Stationery company	.60
Adams Express company	1.50
American Express company	1.10

United States Express company	2.16	
Western Union Telegraph company	1.40	
Total		$ 238.94

Paid by State warrant No. 12331

CURRENT EXPENSES FOR DECEMBER

J. F. Kennedy, secretary	$ 100.00	
Margaret S. Schoonover, stenographer	50.00	
F. R. Conaway, State Printer	27.45	
L. Young, State Binder	9.00	
R. E. Conniff, smallpox, Storm Lake	43.05	
R. E. Conniff, smallpox, Doon	9.94	
J. A. McKlveen, smallpox, Coalfield	8.21	
J. A. McKlveen, smallpox, Corning	8.80	
J. C. Shrader, smallpox, Northwood	12.20	
Smith Premier Typewriter company, supplies	1.70	
Munn & Co., *Scientific Supplement*	5.00	
Popular Science News	1.60	
Adams Express company	.45	
United States Express company	1.40	
Western Union Telegraph company	4.41	
Total		$ 283.21

Paid by State warrant No. 28321

CURRENT EXPENSES FOR JANUARY, 1900

J. F. Kennedy, Secretary	$ 100.00	
Margaret S. Schoonover, Stenographer	50.00	
J. A. McKlveen, small pox	12.50	
J. A. McKlveen, small pox	2.80	
Lewis Schooler, postage stamps	10.00	
Carter & Hussey, printing wrappers	11.50	
Iowa Lithographing company, letterheads	5.00	
Bausch & Lomb Optical company	1.00	
W. Horace Hoskins, *Veterinary Journal*	3.00	
Adams Express company	1.26	
American Express company	1.23	
United States Express company	.84	
Western Union Telegraph company	1.18	
Total	$ 200.37	

Paid by State warrant No. 13694

RECAPITULATION

Expended during the quarter	$1,011.80	
Expended during October, 1899	215.55	
Expended for fiscal year	$1,227.35	
Amount of appropriation unexpended		$ 3,772.65

The report was received and referred to the Auditing Committee.

The Auditing Committee, to whom was referred this report, submitted the following:

The Auditing Committee submit the following report upon the Secretary's financial statement for the quarter ending this date. We find proper vouchers filed for all monies expended, and warrants drawn check with receipted bills attached.

Respectfully submitted,

WARREN DICKINSON,
H. MATTHEY.

The report was received and adopted and the statement placed on file.

Professor Macy, Chemist for the Board, presented a bill for forty-four dollars for chemical analysis of linseed oil as directed by the Board. The bill was allowed and ordered paid.

On motion the Board adjourned to meet the first Wednesday in May unless ordered otherwise by the President.

ANNUAL MEETING—MAY, 1900

The Iowa State Board of Health met in annual session at the office of the Secretary, Capitol, May 15, 1900, and was called to order by the President, Dr. J. A. Scroggs, Keokuk.

There were present, Scroggs, Bancroft, Shrader, McKlveen, Matthey, Conniff, Gibson, and Dickinson.

The Secretary presented to the Board an official notification from the Governor of the appointment of Dr. Charles B. Adams, of Sac City, as the successor of Dr. E. A. Guilbert, deceased. Dr. Adams being present was duly recognized, his name enrolled as a member, and he a once entered upon his duties as such.

The minutes of the meeting of the Board, held February 7th–8th, were read and approved as correct.

THE SECRETARY'S REPORT

The Secretary read his report for the quarter ending April 30th, which was received and considered topically.

MEMORIAL

The first item was a reference to the death of Dr. E. A. Guilbert, which took place since last meeting. A special committee

was appointed to draft a suitable memorial, consisting of Drs. Shrader, McKlveen and Bancroft, and May 16th at 11:30 A.M. was set apart for a memorial service.

At the time appointed tender tributes to the memory of Dr. Guilbert were made by the different members of the Board and by the Secretary. In lieu of a report from this committee the following memorial, prepared by the the Seeretary, and published in the HEALTH BULLETIN was adopted as the sentiment of the Board, and was ordered spread upon the minutes of the Board, and a copy thereof furnished to his family:

Memorial

Edward Agustus Guilbert

Born June 12th, 1826

Died March 4th, 1900

DR. GUILBERT was born in Watertown, Jefferson county, New York. Attended the public schools and the Black River Institute at Watertown. Removed in 1837, with his father's family, to Chicago. Graduated from Rush Medical College, Chicago, in 1847. Practiced his profession first at Ottawa and later at Waukegan, Illinois. About 1825, he adopted Homeopathy as his system of practice and removed to Elgin, Illlinois, where he remained until his removal to Dubuque in 1857. From 1862 to 1865 he was surgeon of the board of enrollment for the third congressional district. He was chosen Captain, Co. A, 46th Iowa Volunteer Infantry, and in that capacity served five months in western Tennessee.

The Doctor was married in 1847 to Miss Kathleen Somers, who servives him, and by whom he had nine children, all of whom are dead except his son Guy and a married daughter, Mrs. Daykin, of Nashville, Tennessee.

Dr. Guilbert was very prominent in Masonic circles, having been connected with the order for half a century and having been advanced to the Thirty-third Degree, a distinction, it is said, enjoyed by only two other Iowa men. He was also a prominent writer upon Masonic matters, and editor of the "Evergreen." He was prominent as a member of the Grand Army of the Republic and was several times commander of Lookout Post, Dubuque, of which he was one of the organizers.

Dr. Guilbert was appointed a member of the State Board of Health by Governor Horace Boies January 31st, 1890, and was after seven years of faithful service appointed by Governor Francis M. Drake to succeed himself. His connection with this Board and the State Board of Medical Examiners covered a period of ten years, and he was promoted to the presidency of both Boards. During all the time of his service on these Boards he missed but one or two of the meetings, which are held quarterly. He was enthusiastic in his devotion to the sanitary and hygienic interests of the State. His learning, observation and experience were always devoted to his official duties. He was a frequent and very acceptable contributor to the Iowa Health Bulletin as "Soliped," and his presence was always an inspiration and aid to the Board at its meetings. There is not a member of the Board but regards his departure as a personal loss.

He was a man of fine literary ability, of extensive culture, a fluent writer and an eloquent speaker.

His remains were interred in Linwood cemetery, Wednesday, March 7th, with impressive ceremonies, conducted under the auspices of the Masonic fraternity and the Grand Army of the Republic.

Sleep, brother, sleep! sweet be thy rest,
Thy conflicts and thy toils are o'er.

INFECTIOUS DISEASES

The Secretary reported as follows respecting smallpox as having occurred in the State since last meeting.

There have never been in the history of Iowa so many outbreaks of smallpox in the State. The points of incidence for February and March were published in the BULLETIN of March and April. During April it appeared in the following localities: Grant township, Hardin county; Taylor township, Marietta township, and Liberty township, Marshall county; Marshalltown; Saylor township, Polk county; Des Moines; near Hansell; St. Anthony; Grinnell; Davenport; Oskaloosa; Toledo; Fort Dodge; Avery; Highland township, Palo Alto county; Adams township, Dallas county; Burlington; Cedar Rapids; Leon; Mt. Zion; Ottumwa; Cresco; Gowrey township, Osceola county; Jack Creek township, Emmet county; Corwith and Waterloo. During the quarter the disease appeared in thirty-eight different counties as follows: Monona; Boone; Clinton; Warren; Worth; Polk; Mills; Muscatine; Greene; Harrison; Madison; Osceola; Webster; Story; Sioux; Carroll; Hardin; Marshall; Hamilton; Franklin; Washington; Monroe; Woodbury; Scott; Palo Alto; Poweshiek; Mahaska; Tama; Dallas; Decatur; Des Moines; Van Buren; Linn; Wapello; Howard; Emmet; Hancock, and Black Hawk. In a number of these counties there were outbreaks at several points. I am unable to report the number of deaths or the results as to recovery, etc., as these data will not be reported until later. Your Secretary visited several points in person—in all cases to settle disputes as to diagnosis. It is a source of regret that the disease has appeared at many points, and has spread at other points through the obstinacy or incompetency of physicians. This is notably the case as regards Fraser, in Boone county, Lamoni, in Decatur county, and Muscatine. There will be laid before you some correspondence relating to this feature of the outbreak.

The Committee on Contagious Diseases reported as follows upon the above and accompanying communications:

Mr. President and Gentlemen of the Iowa State Board of Health:

We, your Committee on Contagious Diseases, to whom was referred sundry communications, beg leave to submit the following report:

I. In regard to the communication of Mr. A. D. Brown, of Manchester, Iowa, would say that we are pleased with the manner in which the case of scarlet fever was treated and the disinfection of the premises, private burial, etc., but according to Rule 10 of Regulations for Quarantine and Disinfection, the quarantine should not have been raised, nor the man and his wife allowed to go at large until the full seventeen days had expired.

II. In regard to the outbreak of smallpox at Fraser, Boone county, Iowa, would recommend that they strictly obey the rules and regulations of the State Board of Health in regard to contagious diseases; that strict and efficient quarantine and isolation of all persons who have been exposed, be maintained; that all persons who have not been recently vaccinated, or cannot show the results of successful vaccination, should be vaccinated at once; that if any person disobeys the rules of the Board, he should be arrested and punished, and further, if the people of Fraser disobey these rules and persist in coming to Boone, that the mayor of Boone maintain a strict quarantine against Fraser, or any other point where he may have reason to believe that they are endangering the health and lives of the people of Boone.

III. We would urge that the committee appointed to prepare a circular of information on tuberculosis, for general distribution, report not later than at the August meeting.

IV. Owing to the widespread dissemination of smallpox in Iowa, the appointment of a committee to prepare a circular of information containing instruction for the diagnosing of the disease by the laity, as well as by physicians, to give information as to the most approved care of such patients, and full information in regard to vaccination, quarantine, isolation and disinfection, not only of the patients but of the premises where they were confined, after death or recovery.

V. In regard to the communication from the mayor of Eldora. We would recommend that a strict quarantine be maintained, of all persons and places where smallpox exists, and also of those who have been exposed, whether in Eldora or elsewhere; and quarantine against any or all points considered dangerous to the health and lives of the people.

(Signed) J. C. SHRADER,
H. MATTHEY.

The report was received and adopted.

The Secretary reported the following in regard to

GASOLINE LAMPS

"The late General Assembly has made it the duty of the Board to regulate the use of gasoline as an illuminant, laying upon your honorable body the duty of determining the lamps or appliances by which this fluid may be used with safety. There has been a large amount of correspondence on this subject and it is greatly desired that not only some definite action shall be taken by your body at this meeting, but that several parties may be allowed to present their respective lamps. It might be well to have a standing committee to test these lamps in the interim of the meetings and report to the next meeting its findings. Your Bacteriologist, Chemist and Secretary, all living in Des Moines, might constitute such committee.

The following form of a certificate of approval of lamps is respectfully submitted for your adoption :

IOWA STATE BOARD OF HEALTH,
OFFICE OF SECRETARY.

DES MOINES,.....19..

This is to certify that at a meeting of the Iowa State Board of Health, held on the.....day of.....19...,an examination and test of the particular design, mechanism, workmanship, and safety of a lamp for the use of gasoline as an illuminant, submitted by.....
and known as the....., was made.

Pursuant to an amendment of section two thousand, five hundred and eight of the code, made by the Twenty-eighth General Assembly, relating to the use of the products of petroleum for illuminating purposes, it was ordered by the said Board that the use of said lamp in the State of Iowa be permitted.

.....
Secretary"

REPORT OF COMMITTEE ON OIL INSPECTION AND INSPECTION OF GASOLINE

Your committee, to whom was referred the inspection of gasoline lamps as required by law, begs leave to report that after careful consideration it is deemed necessary that this Board appoint a special committee, whose duty it shall be to inspect and test all gasoline lamps offered for sale in Iowa; and to the manufacturers or agents of such lamps as are found to be safe for use as illuminators a certificate of approval shall be issued by this Board. The form of said certificate is attached hereto. The special committee will report the results of the examination of gasoline lamps to this Board at this and the future meetings. Your committee further recommends that Warren Dickinson, S. R. Macy and Eli Grimes be appointed as the special committee on inspection of gasoline lamps.

H. MATTHEY,
J. I. GIBSON,
Committee.

Adopted, and a special committee appointed who reported as follows:

Your committee to whom was referred the question of the safety of the gasoline lamps presented for inspection to the State Board of Health, report that they have examined the same but are not fully prepared to say they are entirely safe for use, and we ask for further time to more fully investigate this important matter.

(Signed) WARREN DICKINSON,
S. R. MACY,
ELI GRIMES,
Committee.

Upon the receipt of the report Dr. Shrader offered the following motion, which was duly carried:

WHEREAS, Chapter sixty:two of the acts of the Twenty-eighth General Assembly anthorized the use of gasoline lamps, and provides that this Board shall decide as to the safety of such lamps, and

WHEREAS, We find by the report of the committee appointed by this Board to determine the safety of certain lamps presented, that said committee is not able to recommend any lamps presented thus far, and ask time for further tests, therefore, I move that this matter lay on the table for further investigation, that the committee be continued so as to pursue their investigations during the interim of the meeting of the Board, with power to act, and that they be authorized to ask the opinion of the Attorney-General on any point of the law relatlng to this matter not clearly understood by them.

FINANCES

The Secretary submitted a financial statement showing the expenditures for the quarter ending April 30th to be one thousand eighty-three dollars and seven cents. The amount of the appropriation previously expended, beginning with October, 1899, was one thousand two hundred twenty-seven dollars and sixty-five cents, making the total expenditures to date two thousand three hundred ten dollars and seventy-two cents, leaving an unexpended balance of two thousand six hundred eighty-nine dollars and twenty-eight cents.

The report in detail is as follows:

MEMBERS' EXPENSE ACCOUNT—FEBRUARY MEETING (1900).

H. Matthey	$ 24.70	
W. Bancroft	23.36	
J. C. Shrader	13.67	
J. A. McKlveen	14.82	
J. I. Gibson	21.08	
R. E. Conniff	31.75	
W. Dickinson	11.00	
J A. Scroggs	25.06	
Total		$ 165.64

Paid by State warrant No. 13795.

CURRENT EXPENSES FOR FEBRUARY, 1900

J. F. Kennedy, Secretary	$100.00	
Margaret S. Schoonover, Stenographer	50.00	
F. R. Conaway—		
Printing 6,000 *Bulletins* (January)	$ 28.00	
Printing 2,000 circulars	13.50	
Printing 6,000 *Bulletins* (February)	27.45	
Printing 2,000 Regulations (No. 1)	27.00	
		95.90
L. Young—		
Binding 2,000 Regulations (No. 1)	$ 3.00	

Binding 6,000 *Bulletins* (January)	9.00	
Binding 6,000 *Bulletins* (February)	9.00	
		21.00
J. C. Shrader, investigating smallpox		25.74
J. C. Shrader, investigating smallpox		20.88
R. E. Conniff, investigating smallpox		4.13
The Sanitarian (1900)		4.00
Langan Bros., ink		.50
Baker, Trisler company, ink		.63
Western Union Telegraph company		2.04
Total		$ 324.82

Paid by State Warrant No. 14588.

CCURRENT EXPENSES FOR MARCH, 1900

J. F. Kennedy, Secretary	$100.00
Margaret S. Schoonover, Stenographer	50.00
F. R. Conaway, printing 6,000 *Bulletins*	27.45
L. Young, binding 6,000 *Bullitens*	9.00
J. F. Kennedy, funeral services of Dr. Guilbert	18.40
L. Schooler, postage stamps	10.00
S. R. Macy, chemical analyses	44.00
R. E. Conniff, investigating smallpox	4.95
R. E. Conniff, investigating smallpox	5.61
Domestic Engineering (1900)	2.00
Langon Bros., stationery	.80
Adams Express company	.25
Western Union Telegraph company	1.87
Total	$ 274.33

Paid by State Warrant No. 15566.

SPECIAL EXPENSES FOR MARCH, 1900

J. C. Shrader, attending meeting at Washington ..... $ 90.23

Paid by State Warrant No. 15091.

CURRENT EXPENSES FOR APRIL, 1900

J. F. Kennedy, Secretary	$100.00
Margaret S. Schoonover, stenographer	65.00
F. R. Conaway, printing 6,000 *Bulletins*	27.45
L. Young, binding 6,000 *Bulletins*	9.00
R. E. Conniff, investigating smallpox	12.82
R. E. Conniff, investiging smallpox	4.91
Adams Express company	.22
American Express company	1.00
United States Express company	.25
Western Union Telegraph company	7.40
Total	$ 228.05

Paid by State Warrant No. 209.

RECAPITULATION

Members expense account	$165.64	
Current expenses, February	324.82	
Current expenses, March	274.33	
Special expense account	90.23	
Current expenses for April	228.05	
Total for quarter		$1,083.07
Amount previously expended		1,227.65
Total expenditures		$2,310.72
Amount unexpended		2,689.28

The Auditing Committee, to whom this report was referred, reported as follows:

The undersigned Auditing Committee for the State Board of Health hereby certify that we have carefully audited the report of the Secretary as above given and find the same to be correct, and that proper vouchers are on file verifying each item of expenditure.

(Signed) WARREN DICKINSON,
H. MATTHEY.

The report of the Committee was received and adopted and ordered placed on file.

PURE FOOD AND DRUG CONGRESS

Dr. Shrader made an interesting report of the transactions of this congress held in Washington city. The report was received and ordered published in the *Bulletin*, and will be found elsewhere in this issue.

TRANSPORTATION OF CORPSES

An interesting communication from Prof. Hohenschuh, of Iowa City, was presented by Dr. Shrader, relating to embalmers and to the transportation of corpses, and making suggestions as to a better practical enforcement of the rules and regulations relating to this subject. The communication was referred to the committee on corpses—Dr. Bancroft, who subsequently reported the following which was adopted:

To the Iowa State Board of Health:

GENTLEMEN:—Your committee to whom was referred the communication of Mr. Hohenschuh, relative to the transportation of dead bodies, respectfully report as follows:

That every undertaker in the state of Iowa who has no license from the State Board of Health be required in every case to make affidavit that he has followed the rules under which he can ship. In order to distinguish the cases as to their preparation those who have permits to should ship all cases

under the yellow paster and if there is any violation of the rules in these cases the permit can be revoked.

In all cases the time of death as well as the time of shipment must be given so that the time limit may be decided on.

The general baggage agent of each road in Iowa should instruct their agents that the rules must be strictly followed, and that particular attention should be directed to those cases that are shipped under the white paster.

The express companies must also be remined that the double fare that they charge for these cases does not absolve them from the rules of this Board.

In all cases where it is desired to check bodies through to points of destination on any line of the railroad, such bodies shall be prepared under the yellow paster, which will be guarantee of safety.

Every baggage man in the State, and every officer who issues transportation permits should be furnished with a list of licensed embalmers of the State and each licensed embalmer should also have such list for reference.

Respectfully submitted,

(Signed) W. BANCROFT.

The Secretary reported the following respecting

DISINTERMENT PERMITS

There were issued since the last meeting of the Board eighty-three disinterment permits, six of which were special permits approved by the Board at the last meeting. There is now on file for your consideration the following applications for *special* permits:

BLANCHE DONAHUE—Died 1892; *diphtheria;* by private conveyance to another lot in same cemetery.

MAUD DONAHUE—Died 1892: *diphtheria;* by private conveyance to another lot in same cemetery.

JOHN DRAKE—Died 1880; *diphtheria;* from Tipton township, Hardin county, to Radcliffe, same county.

JAMES COOLIDGE—Died 1880; *diphtheria;* by private conveyance from Concord township, Hardin county, to Radcliffe, same county.

THOMAS DRAKE—Died 1880; *diphtheria;* by private conveyance from Tipton township, Hardin county, to Radcliffe, same county.

MAUD HARRISON—Died 1890; *diphtheria;* from Cromwell, Union county to Afton cemetery, same county, by private conveyance.

MARTHA C. HINRICHSEN—Died 1887; *diphtheria:* by private conveyance from Davenport, Scott county, to Oakdale cemetery, same county.

JARIE KACER—Died 1895; *diphtheria;* Oak Hill cemetery, Cedar Rapids, Linn county, to Bohemian cemetery, same county, by private conveyance.

ELSIE SCHLAPKOHL—Died 1889; *membranous croup;* by private conveyance from City cemetery, Davenport, Scott county, to W. Davenport, cemetery, same county.

The committee on corpses reported in favor of granting the permits and the report was adopted and the special permits issued.

CADAVERS

The Secretary called attention to the law passed by the Twenty-eighth General Assembly, relating to furnishing bodies for dissecting to medical colleges and others under conditions named in the act, and that the duty of distributing this material was imposed upon the Secretary, under such rules and regulations as may be adopted by the State Board of Health.

Dr. J. A. Scroggs, with the Secretary, was directed to formulate these rules and to report them to the Board at its next meeting, with power to act.

SMALLPOX AT BAXTER

There being quite a good deal of discussion as to the conditions at Baxter and a request being made to have an investigation as to the character of the disease and the measures of protection adopted, Dr. Shrader was directed to visit the place and render such assistance as seemed required.

ELECTION OF OFFICERS

The following were elected for the ensuing year:

President, John C. Shrader, M. D., Iowa City.
Secretary, J. F. Kennedy, M. D., Des Moines.
Stenographer, Margaret S. Schoonover, Des Moines.
Chemist, Prof. S. R. Macy, Des Moines.
Bacteriologist, Eli Grimes, M. D., Des Moines.

Delegates to the conference of State and Provincial Boards of Health of North America, at Atlantic City, Drs. Shrader, Scroggs and Conniff.

SECRETARY'S OFFICE

The following resolution was passed:

Resolved, That the Executive Council be respectfully requested to make such arrangements respecting the rooms of the State Board of Health as will enable the Secretary to have the books, supplies, reports, documents, etc., of the Board properly taken care of.

STANDING COMMITTEES.

Auditing—Dickinson, Matthey.
Communications—Scroggs, Bancroft.
Contagious Diseases—Matthey, Adams.
Corpses—Bancroft, Conniff.
Diseases of Animals and Veterinary Sanitation—Gibson, McKlveen.
Disinfection—Grimes.
Food and Water—Conniff, McKlveen, Adams.
Gasoline Lamps—Dickinson, Grimes, Macy.
Legislation and Legal Enforcement—Remley, Scroggs.

Library and Printing—Adams, McKlveen.
Oil Inspection—Scroggs, Adams, Gibson.
Plumbing and Ventilation—Dickinson.
Publications and Rules—Remley, Conniff.
Schools—McKlveen, Scroggs, Adams.
Sanitary Analyses—Macy.

On motion the Board adjourned to meet on the First Wednesday in August, unless otherwise ordered by the President.

SECOND QUARTERLY MEETING—AUGUST, 1900.

The Iowa State Board of Health met in regular quarterly session in the Capitol building, August 1st, 1900, and was called to order by the President, Dr. J. C. Shrader, at 11 A. M.

There were present Shrader, Gibson, McKlveen, Matthey, Adams, Scroggs, Bancroft, Conniff, Dickinson, and Remley.

The minutes of the last regular and the special meeting were read and approved.

Dr. Gibson moved that 2 P. M. to-morrow (August 2d) be set apart for the examination and for action upon gasoline lamps. Carried.

On motion Board adjourned until 9 A. M. Wednesday, August 2d.

WEDNESDAY, AUGUST 2D

Board reconvened as per adjournment, President Shrader in the chair.

There were present Shrader, Bancroft, McKelveen, Adams, Scroggs, Gibson, Matthey, Conniff, Dickinson, Remley.

The rules adopted at the last meeting relative to the consideration of lamps presented for approval were readopted and enforced at this meeting.

GASOLINE LAMPS

The board proceeded to the examination, by test and otherwise, of certain lamps as to their safety, as contemplated by law.

The following lamps were recommended by the committee, duly examined by the Board and their use permitted in the state:

"New Century Lamp No. 50," "The Rockford X Ray." "The Omaha Automatic Gas Lamp," "The Standard Gas Lamp," "The Columbian," and "The Imperial Lamp."

At the previous meeting of the Board the use of three other lamps was permitted by the Board, viz: "The Welsbach Hydrocarbon Incandescent," all styles; "The M. & M. Arc," two styles, one for store and one for street, and the "No. 5 Special.'

It is to be understood that the Board does not issue guarantees of safety for any of these lamps and does not specially commend any one as more than reasonably safe under proper care.

No lamp not having this approval by the Board, after due test and consideration, can be used in Iowa without violating the law and subjecting those using them to severe penalties.

LIGHT SYSTEMS

Some systems of lighting where two or more lamps were supplied with gasoline from one reservoir, and where the reservoir thus serving is placed in the apartment to be lighted, were presented at this as at the previous meeting. The Attorney-General gave it as his opinion that the State Board of Health had jurisdiction in such cases—that such systems of lighting can only be used when the vapor is generated in a tank or reservoir placed *outside* of the room or building to be illuminated.

The following motion, offered by the Attorney-General at the last meeting and duly approved, was reiterated at this meeting: "Moved that the Secretary be instructed to inform the manufacturers of such plants that this Board has no jurisdiction to determine the safety of gas plants—that under the statute the use of gasoline is prohibited in all such plants, unless the vapor is generated in closed reservoirs outside of the building to be illuminated." Carried.

TUBERCULOSIS

The committe on tuberculosis reported a form of circular of information which was adopted, and the Secretary was authorized to have an edition of 10,000 copies printed for free distribution.

SECRETARY'S REPORT

The report of the Secretary was read and referred to appropriate standing committees. As showing the decline in smallpox, he stated that during the quarter ending July 31st there were reports of outbreaks of smallpox in thirty-seven localities in Iowa, of which eighteen occured in May, twelve in June and only seven in July. There were comparatively few reports of

diphtheria and scarlet fever. Typhoid fever has been prevalent at several points.

DISINTERMENT PERMITS

The Secretary reported, "there have been issued from this office, in addition to the *special* disinterment permits authorized by the Board at its last meeting, one hundred and seventy-three permits, as follows: In May, ninety-three; June, fifty-nine: July, twenty-one."

He laid before the Board applications for special permits, as follows:

1. To disinter and ship to another State a party dying in 1884 of *smallpox*.
2. JAMES COLVILLE, 5 years, *diphtheria*, 1888, to be removed by railway from Johnson City cemetery to Lakeside cemetery, Erie, New York.
3. SUSAN MOORE, 7 years, *diphtheria*, 1860, by private conveyance from a farm in Inland township, Cedar county, to the Inland cemetery, Inland township, Cedar county.
4. ANDREW GEORGE MOORE, 1 year, *scarlet fever*, 1860, to be removed and reinterred as above.
5. IRA M. DUTTON, 6 years, *diphtheria*, 1883, by private conveyance from Trenton cemetery, town of Trenton, county of Henry, to Forest Home cemetery, in the city of Mt. Pleasant, county of Henry.
6. DON ARMSTRONG, 3 years, *croup*, 1863, by private conveyance from Leeds Grove cemetery, township of Elk River, county of Clinton, to Oakland cemetery, township of Spring Valley, county of Clinton.
7. FLORENCE DIANA RUTH JEFFRIES, 2 years, *membranous croup*, 1895, by private conveyance from Oakland cemetery, township of Spring Valley, county of Clinton, to another lot in the same cemetery.
8. DAVIS LOSH, 2 years, *membranous croup*, 1899, from Woodland cemetery, city of Des Moines, by private conveyance to another lot in the same cemetery.
9. KATIE HIGH, 8 years, *diphtheria*, 1879, St. Mary's cemetery, township of Julien, county of Dubuque, by private conveyance from one lot to another in the same cemetery.
10. MARGARET H. MCMANUS, 10 years, *scarlet fever*, from Riverside cemetery, in the city of Marshalltown, county of Marshall, by private conveyance to another lot in the same cemetery.

The foregoing applications were all approved, except the first one where death occurred from smallpox, and the Secretary was directed to issue special permits to the applicants.

[It is an inflexible rule of the Board that the disinterment and "transportation of bodies dead of smallpox, Asiatic cholera, typhus fever, yellow fever, or bubonic plague is absolutely forbidden.—EDITOR.]

FINANCIAL

The Secretary presented his financial report for the quarter ending July 31st, showing the total expenditures for the quarter

to be $1,811.49; previously expended, $2,310.72, making total expenditures since September 30, 1899, $4,123.21. Balance of appropriation unexpended, $877.78.

The following is the itemized report referred to:

SPECIAL EXPENSE ACCOUNT, MAY, 1900

J. A. McKlveen, attending Washington meeting	$ 85.85	
Board meeting, August 5, 1900		

MEMBERS' EXPENSE ACCOUNT

J. A. Scroggs	$ 25.26	
C. B. Adams	18.66	
W. Bancroft	25.66	
J. A. McKlveen	18.57	
H. Matthey	27.75	
J. C. Shrader	24.76	
R. E. Conniff	34.65	
Warren Dickinson	15.60	
J. I. Gibson	27.08	
Total		$ 217.99
Paid by State warrant No.406		

CURRENT EXPENSE ACCOUNT, MAY, 1900

J. F. Kennedy, Secretary	$ 100.00	
Margaret S. Schoonover, stenographer	65.00	
F. R. Conaway, printing *Bulletins*	27.45	
L. Young, binding *Bulletins*	9.00	
Conference S. and P. boards of health	10.00	
J. C. Shrader, investigating smallpox	14.58	
R. E. Conniff, investigating smallpox	9.87	
J. A. McKlveen, investigating smallpox	23.74	
Omega Publishing company, (Sub. 1900)	1.00	
Mutual Telephone company	.30	
American Express company, (June)	.30	
American Express company, (April)	.57	
U. S. Express company	2.16	
Total		$ 263.97
Paid by State warrant No. 807		

SPECIAL EXPENSE ACCOUNT, JUNE, 1900

R. E. Conniff, attending Atlantic City meeting	$ 119.00
Paid by State warrant No. 1075.	
J. C. Shrader, attending Atlantic City meeting	110.88
Paid by State warrant No. 1074.	
J. A. Scroggs, attending Atlantic City meeting	104.30
Paid by State warrant No. 1093.	
J. C. Shrader, conference with Governor Shaw	9.76
Paid by State warrant No. 1110	
Board meeting, June 20th, 1900 (Special)	

MEMBERS' EXPENSE ACCOUNT

W. Bancroft	$ 23.56	
H. Matthey	22.50	
J. A. McKlveen	14.49	
C. B. Adams	16.46	
J. C. Shrader	21.76	
J. A. Scroggs	22.56	
J. I. Gibson	24.08	
Warren Dickinson	12.50	
Total		$ 157.91

Paid by State warrant No. 1109

CURRENT EXPENSE ACCOUNT, JUNE, 1900

J. F. Kennedy, Secretary	$ 100.00	
Margaret S. Schoonover, Stenographer	65.00	
F. R. Conaway, printing *Bulletins*, etc	169.45	
L. Young, binding *Bulletin*	9.00	
Iowa Lithographing company, letter heads	34.75	
Des Moines Box Works, tubes	8.38	
I. W. Lozier, flowers for Dr. Guilbert	3.50	
J. A. McKlveen, investigating smallpox, Lorimer	7.07	
J. A. McKlveen, investigating smallpox, Afton	6.04	
J. A. McKlveen, investigating smallpox, Murray	5.60	
J. A. McKlveen, investigating smallpox, Lovilia	5.09	
R. E. Conniff, investigating smallpox, Lemars	3.75	
Thomas E. Cox, newspapers	.30	
Adams Express company	.25	
American Express company,	.25	
Westesn Union Telegraph company	.87	
Total		$ 419.30

Paid by State warrant 1391

CURRENT EXPENSE ACCOUNT, JULY 1900

J. F. Kennedy, Secretary	$ 100.00	
Margaret S. Schoonover, stenographer	65.00	
F. R. Conaway, printing	57.45	
L. Young, binding	12.00	
L. Schooler, postage stamps	20.00	
J. F. Kennedy, notarial commission	11.00	
Iowa State Register, printing	45.40	
Interior Decorative company, brush	.20	
Baker-Trissler Co., blotters and mucilage	2.50	
Adams Express company	2.25	
American Express company	2.95	
U. S. Express company	2.65	
Wells Fargo & Co., Express	.38	
Western Union Telegraph company	.75	
Total		$ 322.53

Paid by State warrant 2045

RECAPITULATION

Special expenses, May	$ 85.85	
Members expenses, May	217.99	
Current expenses, May	263.97	
Total, May	$ 567.81	
Special expenses, June	$ 343.95	
Members expenses (special meeting)	157.91	
Current expenses, June	419.30	
Total	$ 921.16	
Currrent expenses, July	$ 322.50	
Total for Quarter		$ 1,811.50
Previously expended		2,310.72
Total expenditures		$ 4,122.22

REPORT OF AUDITING COMMITTEE.

The report was referred to the auditing committee, who reported as follows:

"Your anditing committee hereby certify that we have carefully audited the report of the Secretary as above given and find the same to be correct, and that proper vouchers are on file verifying each item of expenditure.

WARREN DICKINSON,
H. MATTHEY,
Committee.

The report of the committee was received, adopted and placed on file.

SMALLPOX

Dr. Shrader, on behalf of the committee on smallpox, reported progress and was given until the November meeting to complete his circular and report.

ANATOMICAL MATERIAL

There being quite a good deal of correspondence and evident misunderstanding in relation to the duties of coroners and undertakers, and their fees, and by whom such fees were to be paid, the Secretary was directed to prepare and, upon the approval of the President, publish another circular, covering the points in question, and to furnish them to the parties interested.

AMERICAN PUBLIC HEALTH ASSOCIATION

Dr. J. A. Scroggs, the Secretary and Dr. Charles B. Adams were elected delegates to the next meeting of the American Pub-

lic Health Association, which will be held at Indianapolis, Ind., October 22d, 23d, 24th, 25th and 26th.

On motion the Board adjourned to meet the first Wednesday of November unless sooner convened by the President.

THIRD QUARTERLY MEETING—NOVEMBER, 1900.

The State Board of Health met in regular session as per adjournment, at the office of the State Board of Health, Des Moines, November 7, 1900, and was called to order by President Dr. J. C. Shrader, at 10 A. M. There were present Shrader, Matthey, Bancroft, Scroggs, Conniff, McKlveen, Gibson, and Adams. The minutes of the last meeting were read and approved. The report of the Secretary for the quarter ending October 31st, was read, received and referred to the various standing committees.

INFECTIOUS DISEASES.

The report of the Secretary relating to infectious diseases was as follows:

Smallpox has been reported during the quarter as having occurred at the following localities:

August.—Montpelier township, Muscatine county; Grand Mound; and Dodge township, Boone county.

September.—Odebolt, Grand Mound, Webster City, Lost Creek, and Nemaha.

October.—Center and Jordan townships, Monona county; Des Moines; Moorhead; Webster City; Webster township, Hamilton county.

I was called to Titonka, in Kossuth county, about the middle of October, to investigate a supposed case of smallpox, but was gratified to be able to report that no such disease existed.

Typhoid Fever.—There have been a larger number of case of typhoid fever throughout the state than usual, judging from items appearing in the newspapers. Outbreaks of this disease are not reported to this office as it is not a quarantinable disease unless they assume something like epidemic proportions. The two most notable outbreaks in the state have occurred in connection with state institutions, the one in the hospital for the insane at Independence and the other at the Iowa State College at Ames. Exact data in regard to the former outbreak have not been received, but there have been in the neighborhood of two hundred cases, with nearly, if not quite, a score of deaths. Dr. Hill, the superintendent, informs me that the cause was traced to contamination of the water in one of the tanks supplying the institution.

At the request of Mr. Hungerford, President of the Board of Trustees of the Iowa State college, I visited the institution in person on the 26th of October, and from all the data I was able to obtain and from careful personal investigation I was lead to concur in the opinion arrived at by the college authorities that the cause of the disease was contaminated milk. So far as the results of these cases of typhoid have been observed the disease has been mild in type, the mortality being below the average.

Diphtheria and Scarlet Fever have been reported from a number of localities and it is gratifying to note in almost every instance the promptness and efficiency with which quarantine regulations are carried out by local boards. So far in no instance has either disease assumed epidemic proportions in any locality.

The report of the Committee on Infectious Diseases was as follows:

Your committee on contagious diseases reports as follows:

We have noted with interest the report of infectious diseases, by the Secretary, especially in regard to outbreaks of typhoid fever at Hospital for Insane at Independence, and the Iowa State College, Ames. We recommend that a committee be appointed to prepare and report, at next meeting, a circular on typhoid fever for the better information of the people on this subject.

H. MATTHEY,
C. B. ADAMS.

The report was adopted, and the President and Secretary were appointed a committee to prepare a circular on the Prevention and Restriction of Typhoid Fever, for consideration and adoption by the board at its regular meeting in February, 1901.

CIRCULARS

The Secretary reported that, as instructed by the board at its meeting in August, he had had printed 10,000 copies of a circular on tuberculosis and 4,000 copies of one on smallpox, for free distribution.

On motion the board declared both circulars as official and entitled to respect and observance, as declared by statute.

GASOLINE LAMPS

The board, upon the receipt of the report of the committee on the use of gasoline as an illuminant, passed favorably upon the following lamps:

"The Simplicity, style B," "The Efficient, No. 6," "Pressure Arc Lamp, No. 5 E."

The following lamps had been previously approved:

"New Century Lamp, No. 50," "The Rockford X Ray," "The Omaha Automatic Gas Lamp," "The Standard Gas Lamp," "The Columbian," and the "Imperial Lamp." "The Welsbach Hydrocarbon Incandescent," all styles; "The M. & M. Arc," two styles, one for store and one for street, and the "No. 5 Special."

It is to be understood that the Board does not issue guarantees of safety for any of these lamps, and does not especially commend any one as more than reasonably safe under proper care.

No lamp not having this approval by the Board, after due test and consideration, can be used in Iowa without violating the law and subjecting those using them to severe penalties.

FINANCIAL

The Secretary submitted a report showing the expenditures of the Board for the quarter ending October 31, 1900, which is as follows:

The following financial exhibit shows the expenditures of the Board for the quarter ending October 31st. Under the statute the fiscal year ended September 30th, and hence the expense account for the month of October, though a part of this quarter, is really a part of the new fiscal year. The expenses for the entire fiscal year, ending September 30th were exactly $5,000.00—the full amount of the appropriation.

The items of expenditures were as follows:

Board meeting August 3, 1900.

MEMBERS' EXPENSE ACCOUNT

R. E. Conniff	$ 34.50	
W. Bancroft	27.06	
J. A. Scroggs	27.56	
Warren Dickinson	16.00	
H. Matthey	30.00	
J. I. Gibson	26.58	
C. B. Adams	19.96	
J. C. Shrader	19.76	
J. A. McKlveen	19.82	
Total		$ 221.24

Paid by State warrant No. 2069

CURRENT EXPENSES FOR AUGUST, 1900

J. F. Kennedy, Secretary	$ 100.00	
Margaret S. Schoonover, stenographer	65.00	
F. R. Conway—		
6,300 *Bulletins*	$ 28.00	
10,000 circulars, form 5	35.00	
2,000 Rules and Regulations	20.00	
	83.00	
L. Young, binding *Bulletins*	9.00	
Carter & Hussey, *Bulletin* wrappers	11.50	
Journal, American Medical Association	5.00	

Adams Express company	1.20	
United States Express company	.80	
Wells Fargo & Co., express	.25	
Western Union Telegraph company	2,59	
Total		$ 278.34

Paid by State warrant No. 2671

CURRENT EXPENSES FOR SEPTEMBER, 1900

J. F. Kennedy, Secretary	$ 100.00	
Margaret S. Schoonover, Stenographer	65.00	
Lewis Schooler—		
Stamps and envelopes	$135.06	
Bulletin, postage account	25.00	
	160.06	
F. R. Conaway, printing 6,300 *Bulletins*	28.00	
L. Young, binding *Bulletins*	9.00	
Langan Bros.—		
100 paper fastners	.10	
100 " "	.12	
¼ lb. rubber bands	.69	
2 gross ¼ rubber bands	2.10	
1 " ½ " "	.90	
1 " " " "	.54	
1 " ½ " "	1.65	
	6.10	
Karl Kennedy, mailing *Bulletin*	6.00	
American Veterinary Review	3.00	
Adams Express company	1.05	
Total		$ 378.21

Paid by State warrant No 3214

SPECIAL EXPENSE ACCOUNT, OCTOBER 8, 1900

J. F. Kennedy, attending Denver meeting	$ 44.60

Paid by State warrant No. 3449

CURRENT EXPENSES FOR OCTOBER

J. F. Kennedy, Secretary	$ 100.00	
Margaret S. Schoonover, Stenographer	65.00	
F. R. Conaway—		
Printing 2,000 envelopes	$ 2.00	
Printing 6,300 *Bulletins*	28.00	
Printihg 4,000 circulars, form 8	17.50	
		$ 47.50
Carter & Hussey—		
Binding 31 copies *Bulletin*	$ 12.40	
Printing title pages	3.00	
		15.40
L. Young—		
Binding *Bulletins*	$ 9.00	

Folding and stitching Form No. 5.....	15.00	
		$ 24.00
American Express Company, August.....		.40
American Express Company, September.....		.60
Adams Express Company		.18
U. S. Express Company, August and September.....		1.00
Total.		$ 254.08

Paid by state warrant No. 3920.

The report of the Secretary, showing the expenditures of the Board for the quarter ending October 31st, having been referred to the auditing committee, was reported upon as follows:

The undersigned auditing committee respectfully report that we find the financial statement of the Secretary correct in every particular, and that proper vouchers have been filed corresponding with the items of expenditures.

(Signed.) WARREN DICKINSON,
H. MATTHEY.

The report was adopted.

DISINTERMENTS

The report of the Secretary showed that the nine special disinterment permits approved by the Board at the August meeting had been promptly issued, and that since that meeting there had been issued from the Secretary's office 180 ordinary disinterment permits.

Applications were filed for a number of special permits which were referred to the committee on corpses—Dr. Bancroft, chairman—who reported in favor of the following:

GRACE BELLE SLYE, *scarlet fever*, 1884, by private conveyance, from one lot to another in Woodland cemetery, Des Moines.

GEORGE HENRY SLYE, *diphtheria*, 1875, by private conveyance, as above.

LILLIE BENCH, *diphtheria*, 1887, by private conveyance, from the city cemetery, Davenport, to Fairmount, Rockingham township, Scott county.

MARY BLACK, *membranous croup*, 1891, by private conveyance, from Floyd cemetery, Sioux City, to Floyd cemetery annex, same city.

DELIA C. PIPER, disease unknown, 1896, by private conveyance, from Lincoln cemetery, Lincoln township, Sioux county, to Hope cemetery, in the same township.

EDDIE KNOSTMAN, *scarlet fever*, 1878, by private conveyance, from one lot in Oakdale cemetery, Davenport, to another lot in same cemetery.

ALICE MYRTLE HORNE, *diphtheria*, 1889, by private conveyance, from one lot to another in Oakdale cemetery, Davenport.

MATTIE ELNORA JOHNSON, *scarlet fever*, 1869, by private conveyance, from Pleasant Ridge cemetery, in Wyoming township, Jones county, to Wyoming cemetery, in the city of Wyoming.

WILLIE CALVIN HEATON, *Diphtheria*, 1898, by private conveyance, from one lot to another in the cemetery of the city of Clarinda.

In addition to the above, special permits were issued to disinter and remove several parties, in two or three localities, from abandoned cemeteries, where the names, date and cause of death were unknown. The conditions imposed by the Board upon those permitted to make these special disinterments are as follows:

1. That the disinterment is for the purpose of re-interment in another part of the same cemetery, or in a cemetery nearly contiguous.
2. That the removal shall not be by any public conveyance.
3. That the removal shall be done at an hour when there is the least possible exposure of other persons.
4. That no children shall be present, and only such persons as are actually necessary.
5. That the coffin shall not be opened.
6. That the sexton and all other persons engaged in such removal shall immediately thereafter change their clothing and properly disinfect or burn the same, and shall thoroughly disinfect their hands, head and face.
7. That this permit shall be approved by the local Board of Health of the town, city or township in which the body is interred.

EMBALMERS' EXAMINATIONS

The Secretary was directed to hold an examination in the office of the State Board of Health, in Des Moines, for applicants for embalmers' permits January 25, 1901. Parties desiring to avail themselves of this opportunity should apply to the Secretary for particulars.

SMALLPOX

The Secretary presented a communication regarding smallpox at Calamus, and charging great laxity of quarantine, and Dr. Conniff made a statement in regard to conditions at George and Morehead, alleging a dangerous disregard of the proper measures for the prevention and restriction of the spread of the disease.

On motion, President Shrader was requested to write the health authorities of these localities and insist upon a strict compliance with the law.

PERSONAL

Dr. Conniff presented the following resolution, which was unanimously adopted by a rising vote:

WHEREAS, The terms of service of two members of this board, Dr. J. A. Scroggs and Gen. Milton Remley, practically expire with this meeting, and,

WHEREAS, We recognise in them able, conscientious and efficient members whose work on this board has done much for the cause of preventive medicine; therefore be it

Resolved, That this board express its appreciation of this valuable service, its personal regard for them as men and citizens, and its deep regret that our association, which has been at all times most cordial and pleasant, is so soon to terminate, and to assure them that their counsel and help in the work of the board will be greatly missed.

On motion, the board adjourned to meet the first Wednesday in February, 1901, unless sooner convened by the President.

SPECIAL MEETING—DECEMBER, 1900

The Iowa State Board of Health convened in special session upon the call of President Shrader, and was called to order at 2 P. M., December 18, 1900, *ultimo*.

There were present Shrader, Bancroft, Adams, Conniff, McKlveen, Scroggs, Matthey, Gibson.

SMALLPOX

The Secretary read several communications from Stratford, Homer and Stanhope respecting a prevalence of smallpox and a failure to carry out the rules and regulations of the state and local boards relative to quarantine, vaccination, etc.

On motion Dr. C. B. Adams was instructed to visit the localities and adopt such measures as in his judgment will best protect the people against the further spread of the disease.

GASOLINE LAMPS

The following gasoline lamps were approved by the Board and their use permitted in Iowa: "The American Arc No. 2," "The Magic Arc," "The Magic Gravity," and the "Solar Arc."

The following lamps had been previously approved: "The Simplicity, style B," "The Efficient, No. 6," "Pressure Arc Lamp, No. 5 E," "New Century Lamp, No. 50," "The Rockford X Ray,"

"The Omaha Automatic Gas Lamp," "The Standard Gas Lamp," "The Columbian," "The Imperial Lamp," "The Welsbach Hydrocarbon Incandescent," all styles; "The M. and M. Arc," two styles, one for store and one for street, and the "No. 5 Special."

It is to be understood that the Board does not issue guarantees of safety for any of these lamps and does not especially commend any one as more than reasonably safe under proper care.

No gasoline lamp not having the approval by the Board, after due test and consideration, can be used in Iowa without violating the law and subjecting those using them to severe penalties.

SPECIAL DISINTERMENT PERMITS

The following special disinterment permits were granted:

GLEN BURNETT, 1889, *diphtheria*, by private conveyance from one lot to another in Woodland cemetery, Des Moines.

LEVI ELLIS, 1880, *diphtheria*, by team from Huff Settlement cemetery, Walnut township, Dallas county, to Grimes cemetery, Webster township, Polk county.

ARTHUR ERNEST KUHN, 1880, *diphtheria*, by private conveyance from Mt. Carroll cemetery, Chickasaw township, Chickasaw county, to Greenwood cemetery, Bradford township, same county.

NELLIE MAHONEY, 1900, *diphtheria*, by railroad from Catholic cemetery, Iowa City, to Victor, Iowa.

BESSIE INEZ NELSON, 1878, *membranous croup*, by team from Calhoun cemetery, Calhoun township, Harrison county, to Woodbine cemetery, Boyer township, same county.

FOURTH QUARTERLY MEETING—FEBRUARY, 1901

The regular quarterly meeting of the State Board of Health was convened February 6, 1901, and called to order by President J. C. Schrader at 10:30 A. M.

There were present Shrader, McKlveen, Adams, Bancroft, Gibson, Powers.

A communication was read from the Executive Office announcing the appointment of Dr. Fred W. Powers of Reinbeck as a member of the State Board of Health in place of Dr. Scroggs whose term of service had expired.

The Secretary also read a communication from Dr. H. Matthey announcing the death of his mother and his inability to be present.

The minutes of the November meeting and of the Special meeting held in December, were read and approved.

SECRETARY'S REPORT

The report of the Secretary for the quarter ending January 31st was read and referred to the appropriate Standing Committee.

The Secretary called especial attention to the large number of reports of outbreaks of infectious diseases; to correspondence on hand; to applications for special disinterment permits; to the expenditures of the Board, etc.

INFECTIOUS DISEASES

In regard to infectious diseases the Secretary reported as follows:

There have been reports to this office of infectious diseases from a greater number of points in the State than for any other like period in the history of the Board so far as I have any recollection. The reports of outbreaks of smallpox are especially numerous. The points of incidence for November and December have been published in the December and January BULLETIN and those for January are given herewith. Quite a number of calls have been made at this office for personal investigations, with a view of settling questions of diagnosis, some of which were responded to by your Secretary and others referred to the members of the Board who were contiguous to the localities desiring such visits. It was the observation of your Secretary that where such visits are made it has always been in the interests of the public health, the authorities cheerfully and promptly complying with the decision and directions given.

It has been somewhat surprising to note the number of places throughout the State where quarantine has not been enforced because of a failure to recognize the true character of the disease. I have sent out a great amount of literature from the office, especially Circulars No. 1, 2, 3 and 7, and those upon tuberculosis and smallpox. Circular No. 3 became entirely exhausted and demands for it were so frequent that upon consultation with your President I had re-published an edition of 4,000 copies. The circular upon smallpox has been also in such demand that I have ordered a second edition of it. There seems to be no occasion for revision of these circulars and the President suggested that under no circumstances should we allow the edition to become completely exhausted.

I would be glad if the Board would officially authorize me under such circumstances to reprint exhausted editions of our official circulars where a revision is not required.

In addition to the reports of smallpox as published in the BULLETIN I herewith report the following outbreaks for the month of January:

Boone; Webster City; Rands; Eden and Arcadia township, Carroll

county; Guttenburg; Weston; Elkader; Des Moines; Audubon; Dubuque; Ladora; Harrison and Garfield townships, Mahaska county; Eddyville; Murray; Vinton; Victor; Davenport; Viola; Cook and Levey Townships, Sac county; Portland and Lincoln township, Plymouth county; Washington and Garner townships, Pottawattamie county; Franklin township, Manona county; Percy; Clay township, Shelby county; Belmond; Guthrie Center; Atlantic; Rock Rapids; Waterloo; Kamrar; Marne; Independence; Hamilton; Blairsburg and Fremont townships, Hamilton county; Jewell; Perry township, Marion county; County Farm, Webster county; Douglas; Leroy and Hamlin towhships, Audubon county; Sheridan township, Scott county; Ottumwa; Mason City; Fremont and Cedar townships, Johnson county; Shenandoah; Bymosa; Brighton; Bear Grove and Grant townships, Cass county; Elberon; Dodge township, Boone county; Maxwell; Livermore; Creston; Blair township, Ida county; Washington township, Sioux county; Washington township, Winneshiek county; Cromwell; Lewis; Armstrong; River Junction; Anita; Blencoe; Paton; Libson; Gowrie; Humboldt; Delano; Avery and Weaver townships, Humboldt county; Villisca; LaPorte; Avoca; Union township, Adams county; Dana; Humboldt, Rock township, Lyon county; Stockholm township, Crawford county; Eldridge; Indianola; Jefferson township, Dubuque county; Garfield township, Montgomery county; Harrison and Summerset townships, Adair county; Oelwein; Wall Lake; Springfield township, Kossuth county.

In order to give you an idea as to the area of territory covered by this disease I have to say that it has appeared in the following counties:

Adair; Adams; Audubon; Benton; Black Hawk; Boone; Buena Vista; Butler; Calhoun; Carroll; Cass; Cerro Gordo; Cherokee; Clarke; Clayton, Clinton; Crawford; Des Moines; Dubuque; Emmet; Fayette; Greene; Guthrie; Hamilton; Harrison; Humboldt; Ida; Iowa; Johnson; Jones; Kossuth; Linn; Lyon; Mahaska; Monona; Marion; Monroe; Montgomery; O'Brien; Osceola; Page; Plymouth; Palo Alto; Polk; Pottawattamie; Poweshiek; Sac; Scott; Shelby; Sioux; Story; Tama; Union; Wapello; Warren; Webster; Winneshiek; Woodbury; Wright.

Supplementary to what I have said above relative to smallpox I have to report that in addition to other infectious diseases reported in the BULLETIN for November and December I have received the following reports for January:

Diphtheria. Jamaica; Dixon; Eden township. Benton county; Sioux Rapids; Union township, Benton county; Springbrook; Boone; Rockford; Kirkville; Nora Springs; Lynnville; Rock Grove township, Floyd county; Hays township, Crawford county; Jackson Junction; Vail; Aduza; Algona; Stanton; Waverly; Richland township, Guthrie county; Rock Falls; Fostoria; Waucoma.

Measles. Fontanelle; Ocheydan.

Scarlet Fever. Cylinder; Parnell; Exira; Adair; Ida Grove; Roselle; Bonaparte township, Van Buren county; Bonaparte; Rodman; Reels; Silver Creek township, Ida county; Persia; Bridgewater; Corwin township, Ida

county; Ackley; Doon; Rapids township, Linn county; Franklin township, Allamakee county; Sumner township, Bremer county; Killduff; Bennezette township, Butler county; Fairfield; Fayette; Central City; Fontanelle; Fremont township, Fayette county; Cass township, Harrison county; Woodbine; Altoona; Sutherland; Lincoln township, Warren county; Waucoma; Center township, Fayette county; Jamaica; Blanchard; Beaman; Morning Sun; Westgate; What Cheer.

Typhoid Fever. Linn Grove; Floyd; Waucoma; Burlington.

It is the custom of this office whenever we receive reports of infectious diseases to send out to the party so reporting a set of our circulars, distributing especially liberally our circular on smallpox and tuberculosis. The people of the State have never been so well supplied with the literature of our Board. The State Superintendent of Public Instruction was furnished from this office several hundred copies of our circulars No. 2 and 3 which he distributed from his office to superintendents and principals throughout the State.

Dr. Conniff reported a visit to Weston to investigate small pox and Dr. Powers reported a visit to LaPorte City for the same purpose, and the small pox condition throughout the State was discussed quite freely.

On motion Board adjourned to call of President.

THURSDAY, FEBRUARY 7th, 10:30 A. M.

Board reconvened by call of the President at 10:30 a. m. There were present Shrader, McKlveen, Powers, Adams and Gibson.

COMMUNICATIONS

The report of the Committee on Communications, Dr. McKlveen, chairman, was read and adopted.

DISINTERMENTS

Dr. Bancroft, Chairman of the Committee on Corpses, reported in favor of four applications for special disinterment permits—the parties having died of infectious diseases. He also reported in favor of the transportation through Iowa to Mt. Pleasant of the remains of Dr. W. R. McAdam, interred at Key West, Florida—the cause of death being Yellow Fever; assurances being given by Dr. R. D. Murray, Surgeon H. M. S., that the remains "were enclosed in a hermetically sealed iron casket; the casket inclosed in a zinc-lined box and both were inclosed in a board box."

The recommendations relative to the disinterments were adopted, and on motion, Rule 1 of the rules for the transportation of corpses was suspended, and the Secretary was instructed to issue the permit for the transportation of the remains of Dr. W. R. McAdam into and through Iowa to Mt. Pleasant.

GASOLINE

A communication was read asking that the branding of gasoline be so modified as to conform to the requirements of Chapter 83, Laws Twenty-eighth General Assembly. The brand as now used reads "rejected for illuminating purposes." Chapter 83, above referred to, permits its use in gasoline lamps approved by the State Board of Health. The Board directed that hereafter gasoline should be branded and cans containing it should be labelled "Gasoline—Rejected for illuminating purposes except in gasoline lamps approved by law."

GASOLINE LAMPS

Two of the members of the committee on gasoline lamps being absent and the remaining member not being able to report definitely, there were no additional lamps approved. It was stated that no such lamps can receive consideration at the hands of the Board or its committee, unless the manufacturer or some agent appears before the Board when in session with a sample of the lamp, to be tested, complete in all its parts. The simple burner of the lamp, or pictorial illustrations of it, will not receive consideration. It must be trimmed and burning, so that its faults as well as its virtues from the standpoint of *safety* may be determined.

PHYSICIANS TO BE NOTIFIED

The following action was taken by the Board relative to physicians who were reported as obstructing efforts to quarantine cases reported as smallpox by calling the disease chickenpox. People who have smallpox or who have been quarantined because of exposure to it, are glad to find anyone to dispute the diagnosis, and the declaration of such a physician even though he may never have seen a case of smallpox or one of the cases reported as having it will have more weight than that of a dozen physicians, who have seen and treated many cases of smallpox and chickenpox and who had personally seen and carefully examined the cases in question.

"WHEREAS, It has come to the knowledge of the Board that Drs. ——— ———, ——; and ———; respectively of ———; ——— and ———; have visited cases of smallpox, as diagnosed by a member of this Board and by other reputable physicians, naming it chickenpox, thus indirectly interfering with the legally established quarantine and thereby causing dissatisfaction in their localities; therefore be it

RESOLVED, That it is the sense of this Board that such practice is detrimental to the best interests of the people, and is condemned by this Board

RESOLVED, That if this practice continues, such physicians will be cited to appear before the State Board of Medical Examiners, to show cause why their certificates should not be revoked for incompetency, or willful violations of the rules of this Board, to the great detriment of good order, and greatly endangering the health and lives of the people.

FINANCIAL

The Secretary presented the following report which was recieved and referred to the Auditing Committee:

The following statement represents the expenditures of the board for the quarter ending January 31, 1901:

Board meeting November 9, 1900

MEMBERS EXPENSE ACCOUNT

J. A. McKlveen	$ 19.80	
W. Bancroft	27.56	
H. Matthey	28.75	
J. A. Scroggs	28.06	
J. I. Gibson	26.58	
R. E. Conniff	33.60	
Warren Dickinson	16.00	
C. B. Adams	24.86	
J. C. Shrader	26.26	
Total		$ 231.47

Paid by state warrant No. 4080

SPECIAL EXPENSE ACCOUNT

C. B. Adams, Indianapolis meeting		$ 65.66

Paid by state warrant No. 4108

CURRENT EXPENSES FOR NOVEMBER, 1900

J. F. Kennedy, secretary	$ 100.00	
Margaret S. Schoonover, stenographer	65.00	
F. R. Conaway, printing *Bulletins*	28.00	
L. Young, binding circulars and *Bulletins*	15.90	
R. E. Conniff, investigating smallpox	18.56	
Borden & Selleck, letter scale	1.00	
Babyhood Publishing company	1.00	
Gottfried Ball, grinding knife	.50	
Adams Express company	.60	
American Express company	.30	
U. S. Express company	.85	
Total		$ 231.71

Paid by State warrant No. 4603

Special meeting December 19th, 1900

MEMBERS' EXPENSE ACCOUNT

J. A. Scroggs	$ 25.56	
J. C. Shrader	17.78	
R. E. Conniff	33.50	
C. B. Adams	21.46	
H. Matthey	25.75	
W. Bancroft	25.06	
J. I. Gibson	23.58	
J. A. McKlveen	17.80	
Total		$ 190.49

Paid by State warrant No. 4895

CURRENT EXPENSES, DECEMBER, 1900

J. F. Kennedy, secretary	$ 100.00	
Margaret S. Schoonover, stenogragher	65.00	
F. R. Conaway, printing *Bulletin*	28.00	
L. Young, binding *Bulletin*	9.45	
C. B. Adams, investigating smallpox	14.04	
C. B. Adams, investigating smallpox	5.20	
American Public Health Association	5.00	
Munn & Co., supplement	5.00	
Geo. S. Lasher, U. S. postal guide	2.00	
Municipal Engineering company	2.00	
Popular Scientific News	1.60	
U. S. Express company	1.00	
Total		$ 238.29

Paid by State warrant No. 5248

CURRENT EXPENSES JANUARY, 1901

J. F. Kennedy, secretary	$ 100.00	
Margaret S. Schoonover, Stenographer	65.00	
Myers & Tucker, Printing and mailing *Bulletin*	56.30	
State Printing House, printing and engraving	25.00	
J. C. Shrader, investigating smallpox	24.93	
Conference State and Provincial Boards of Health	5.00	
Journal Composition Medical and Veterans Arch	3.00	
American Express company	.45	
Total		$ 279.68

Paid by State warrant No. 6006.

RECAPITULATION.

November board meeting	$ 231.47
November special meeting	65.66
November current expenses	231.71
December board meeting	190.49

December current expenses	238.29
January, 1901 current expenses	279.68
Total	$ 1,237.30

REPORT OF AUDITING COMMITTEE.

The undersigned auditing committee respectfully report that we have examined the foregoing financial statement of the Secretary and find the same correct and that vouchers filed therewith correspond with the items of expenditures.

Respectfully submitted.

(Signed) J. I. GIBSON.

The report of the Committee was received and adapted.

On motion the Boad adjourned to meet the first Wednesday of May unless ordered otherwise by the President.

ANNUAL MEETING—MAY, 1901.

The Iowa State Board of Health convened at its office, Capitol building, and was called to order by President Shrader at 10 A. M., Monday, May 20, 1901.

There were present, Shrader, Adams, Gibson, Powers, Conniff, Matthey, McKlveen, and Dr. A. M. Linn, of Des Moines, appointed to fill the vacancy occasioned by the resignation of Dr. Bancroft.

The minutes of the last meeting were read and approved.

The report of the Secretary for the quarter ending April 30th, was read, approved, and referred to appropriate standing committees.

On motion Board adjourned to meet upon the call of the President.

Reconvened at 2 P. M., and was called to order by President Shrader.

There were present, Shrader, Conniff, Powers, Adams, Gibson, McKlveen, Matthey, and Linn.

Dr. Matthey took occasion to express very feelingly his appreciation of the resolutions passed by the Board at its last meeting relative to the death of his mother.

Adjourned upon call of the President.

Board re-convened at 11:30 A. M., Tuesday, 21st, with Dr Shrader in the chair.

There were present, Shrader, McKlveen, Linn, Adams, Conniff, Matthey, and Powers.

SPECIAL DISINTERMENTS

The following special disinterment permits were issued:

HULDA ARZBERGER, *diphtheria*, 1889, by private conveyance from city cemetery Davenport to Fairmount cemetery, Rockingham township, Scott county.

OTTO ARZBERGER, *membranous croup*, 1888, to be disinterred and reinterred as above.

GERTRUDE ASHBAUGH, *scarlet fever*, 1895, by private conveyance from Pleasant Grove cemetery, Sigourney township, Keokuk county, from one lot to another in the same cemetery.

BLANCHE PHILIPS BEWGER, *diphtheria*, 1893, by private conveyance from one lot to another in Newton cemetery, town of Newton, Iowa.

MILLARD GRACEY, *scarlet fever*, 1899, by private conveyance from one lot to another in Woodland cemetery, Des Moines.

CLARA LUCRETIA GATROST, *scarlet fever*, 1901, by private conveyance from one lot to another, in Valley View cemetery, Union township, Harrison county.

MARY IDA GEWEVS, *scarlet fever*, 1882, by private conveyance from Blue Grass cemetery, Blue Grass, to Chippinock cemetery in Rock Island, Illinois.

CLARA ANNA BERTHA HEMANN, *diphtheria*, 1848, from Oakland cemetery, Cooper township, Webster county, to Haviland cemetery, Cooper township, same county.

FRANK MULSOFF, *diphtheria*, 1890, by private conveyance from private yard near Nashua, in Bradford township, Chickasaw county, to Pearl Rock cemetery in same township.

ROY POINTER, *membranous croup*, 1889, by private conveyance from one lot to another in Woodland cemetery, Des Moines.

GERTIE SCHERMERHORN, *diphtheria*, by private conveyance from Fleming cemetery, Fremont township, Buchanan county, to Fairview cemetery, Winthrop.

ADOLPH STECKEL, *scarlet fever*, 1890, by private conveyance from Fairmount cemetery, Rockingham township, Scott county, to another lot in the same cemetery.

NELLIE MATILDA STONEMAN, *diphtheria*, 1896, from Young cemetery, Ohio township, Madison county, to another lot in the same cemetery.

MABEL L. TABOR, *diphtheria*, 1890, by private conveyance from one lot to another in Floyd cemetery, Sioux City.

LEROY WHORTON, *diphtheria*, 1900, by private conveyance from Montrose cemetery in the city of Montrose, to Nauvoo cemetery in the city of Nauvoo, Illinois.

Adjourned to call of the President.

Reconvened at 3 P. M., President Shrader in the chair.

Present, Shrader, Powers, Matthey, Conniff, Linn, Adams and McKlveen.

OFFICERS

Dr. J. C. Shrader was re-lected president; Dr. J. F. Kennedy,

secretary; Margaret S. Schoonover, stenographer; Dr. Eli Grimes, bacteriologist, and Prof. S. R. Macy, chemist.

Dr. Shrader was elected delegate to the British Congress on Tuberculosis in London, England.

GASOLINE

On motion of Dr. Gibson, it was declared that any system of lighting for domestic use, where the gasoline is forced by gravity or otherwise from reservoirs or tanks outside the building, to be lighted and distributed by pipes therefrom to lamps inside the building, comes within the purview of the State Board of Health, and must before being used receive the approval of said Board. This ruling is in accord with the recent opinions of Attorneys-General Remley and Mullan.

The following additional lamps were approved by the Board: "Nulite," "Bystrom Gas Lamp," "Corona," "Columbia," "Morey's No Mantle," "Grinnell Lamp," "Sterling Arc," "Sterling Gravity," "White Star," and "One Gallon Doran."

The following lamps had been previously approved by the Board:

"The American Arc No. 2," "The Magic Arc," "The Magic Gravity," the "Solar Arc."

"The Simplicity style B," "The Efficient No. 6," Pressure Arc Lamp No. 5 E," "New Century Lamp No. 50," "The Rockford X-Ray," "Omaha Automatic Gas Lamp," "Standard Gas Lamp," "The Columbian," "The Imperial Lamp," "the M. & M. Arc," two styles, one for store and one for street, and the "No. 5 Special."

It is to be understood that the Board does not issue guarantees of safety for any of these lamps and does not specially commend any one as more than reasonably safe under proper care.

No gasoline lamp not having the approvai of the Board, after due test and consideration, can be used in Iowa without violating the law and subjecting those using them to severe penalties.

PERSONAL

The following tribute to Dr. W. Bancroft was presented by a committee appointed by the president:

MR. PRESIDENT AND MEMBERS OF THE STATE BOARD OF HEALTH—

Gentlemen,—Since our last meeting a respected and honored member has tendered his resignation to the Governor of the State.

Dr. Walton Bancroft has been compelled to take this step by long continued ill health.

We, his colleagues, deplore the necessity for this action on his part.

While a member of this Board he endeared himself to his colleagues by the most sacred ties. He is beloved and respected by us all. A noble Christian. His soul was in his work—that of alleviating human suffering and the prevention of disease. No nobler sentiment can engage the human mind.

Our love and best wishes will always follow him while here on earth.

(Signed) J. A. MCKLVEEN,
J. C. SHRADER,
C. B. ADAMS.

FINANCIAL

The Secretary presented the following financial statement for the quarter ending April 30th, which was received and referred to the Auditing Committee:

Board Meeting, February 6 and 7, 1901

MEMBERS' EXPENSE ACCOUNT

R. E. Conniff		$ 15.46
J. I. Gibson		26.83
W. Bancroft		23.31
J. C. Shrader		20.78
J. A. McKlveen		16.80
C. B. Adams		19.96
F. W. Powers		21.70
Total		$ 144.84

Paid by State warrant No. 6103.

CURRENT EXPENSES FOR FEBRUARY, 1901.

J. F. Kennedy, Secretary		$ 100.00
Margaret S. Schoonover, Stenograper		65.00
F. R. Conaway, 6000 circulars, No. 8	$ 27.50	
4000 circulars, No. 3	23.00	
4000 circulars, No. 2	40.00—	90.50
Meyers & Tucker, printing 6300 *Bulletins*	56.30	
Postage, January and February	6.15—	62.45
J. C. Shrader, investigating smallpox, Yale		14.71
R. E. Conniff, investigating smallpox, Weston		17.54
J. A. McKlveen, investigation smallpox, Lost Creek		4.60
J. A. McKlveen, investigating smallpox, Cromwell		11.92
J. A. McKlveen, investigating smallpox, Villisca		5.76
J. A. McKlveen, investigating smallpox, Indianola		4.50
F. W. Powers, investigating smallpox, La Porte City		7.00
C. B. Adams, investigating smallpox, Peterson and Kiron		19.80
C. B. Adams, investigating smallpox, Wall Lake and Rands		8.28
Iowa Printing company, record		11.00
Adams Express company		6.90
American Express company		3.36

United States Express company	3.28	
Wells, Fargo & Company, express	5.67	
Baker-Trissler company, one gross pens	.95	
Total		$ 443.22

Paid by state warrant No. 6697.

CURRENT EXPENSES FOR MARCH, 1901.

J. F. Kennedy, secretary		$ 100.00
Margaret S. Schoonover, stenographer		65.00
Meyers & Tucker:		
Printing 6,300 *Bulletins*	$50.00	
Mailing 6,300 *Bulletins*	6.30	
Express	.65	
Extra stamps, foreign	.31—	60.00
State printing house:		
4,000 rules and regulations No. 7	$40.00	
1,500 envelopes, printing	1.50—	41.50
Iowa Lithographing company, 400 letter heads		5.00
Popular Science Monthly		3.00
Domestic Engineering		2.00
Puck Manufacturing company, 400 bill heads		1.50
Adams Express company		1.35
American Express company		1.00
United States Express company		1.25
Wells Fargo & Co. Express company		.61
The Sanitarian		4.00
Total		$ 286.21

Paid by state warrant No. 7208

CURRENT EXPENSES FOR APRIL, 1901.

J. F. Kennedy, Secretary		$ 100.00
Margaret S. Schoonover, stenographer		65.00
Meyers & Tucker, printing 6,300 *Bulletins*	$ 50.00	
" mailihg " "	6.30	56.30
J. C. Shrader, investigating smallpox		43.79
F. W. Powers, " "		16.43
C. B. Adams, " "		19.70
Puck Manufacturing company, 2,500 portfolios		2.50
United States Express company		.50
Well, Fargo & Co. Express company		.30
Total		$ 304.52

Paid by state warrant No. 7813.

RECAPITULATION.

The following represents the expenditures for the fiscal year thus far, beginning with October 1st:

October	$ 298.68
November	528.94
December,	428.78
January	279.68
February	588.06
March	286.21
April	304.52
Total	$ 2,714.77
Annual appropriation	$5,000.00
Expended	2,714.77
Amount unexpended	$ 2,285.23

The Auditing Committee reported that they had carefully audited the financial statement of the Secretary and that the same was found to be correct in every particular—that proper vouchers were shown corresponding with each reported item of expenditure.

The report of the committee was received and adopted.

(Inasmuch as footings in the foregoing financial exhibits for the various meetings have not been carried forward the Secretary desires to state that the entire amount of appropriation for each year ending September 30th was expended.)

STANDING COMMITTEES

Auditing—Matthey.
Commvnications—Powers, Linn.
Contagious Diseases—Matthey, Adams.
Corpses—Conniff, Linn.
Diseases of Animals and Veterinary Sanitation—Gibson, McKlveen.
Disinfection—Grimes.
Food and Water—Conniff, McKlveen, Adams.
Gasoline Lamps—Gibson, Grimes, Macy.
Legislation and Legal Enforcement—Mullan.
Library and Printing—Adams, McKlveen.
Oil Inspection—Adams, Gibson.
Plumbing and Ventilation—
Publication and Rules—Conniff, Linn
Schools—McKlveen, Powers, Adams.
Sanitary Analysis—Macy.

ADJOURNED

On motion the Board adjourned to meet the first Wednesday in August unless otherwise ordered by the President.

II

STATE BOARD MEDICAL EXAMINERS

Though chapter 17, title 12 of the Code, relating to the State Board of Medical Examiners, contains no provision for a report of any kind it seems that the State Board of Health having under the statute a general supervision of the lives and health of the people should at least in its biennial report give some data relative to the medical department of the state. In none of the reports heretofore issued, however, has there been any illusion to the work of this Board.

The law creating the State Board of Medical Examiners was enacted in 1886, and went into force July 1st of that year. It provided that the physicians of the State Board of Health, together with the Secretary, should be a Board of Medical Examiners, and that the Board should elect a President and Secretary. It authorized the Board to grant three forms of certificates; "A" to those who were graduates of medical colleges recognized by the Board as of good standing; "B," to those who had, at the time of the passage of the act, been not less than five years in continuous practice in the state, three years of such practice having been in one locality; and "C," to those who, not having these qualifications, passed a satisfactory examination before the Board. The fee for the first two certificates was placed at $2, and for the "C" certificate $10 was required, which enabled the applicant to have a re-examination in case of failure without additional fee.

Later the law was changed so that the Secretary ceased to be a member of this Board, but, by virtue of his connection with the Board of Health, as Secretary, he became Secretary of the Board of Medical Examiners, as well.

Under the law of 1886, the members of the Board were entitled to a per diem of $10, and traveling and other necessary expenses, while performing their duties as such, and the Secretary was entitled to the sum of not more than $5 a day for each day that he was engaged in the work of the Board.

The present Code cut down the pay of the members to $8 per diem, and left the Secretary without any compensation. It raised the fee to $5 for each certificate and $20 for examinations, and provided, further, that itinerants should pay directly into the State Treasury the sum of $250 per annum for an itinerants' permit, which they were required to have in addition to the regular physicians certificate; and provided that all persons beginning the practice of medicine in Iowa, after January 1st, 1899, should pass a satisfactory examination before the Board, and that in order to be admitted to this examination, they should be graduates of colleges of medicine recognized by the Board as of good standing, and requiring not less than four courses of medical study of not less than twenty-six weeks each, in separate years, as a condition of recognition by the Board.

The Twenty-seventh General Assembly passed an act, chapter 69, providing for the issuance of certificates to practice osteopathy. The Twenty-eighth General Assembly cut down the fee for examinations to $10 and provided that graduates of Iowa Medical Colleges should be examined at the time and place of graduation. It also provided a salary for the Secretary not to exceed $25 per month.

Since the organization of the Board certificates have been issued to 6,930 applicants, classified as follows: To regulars, 5,434; to Homeopaths, 804; to Eclectics, 576; to Physio-Medics, 55; to midwives, 39; miscellaneous, 22; total, 6,930.

The midwives above referred to were those engaged in practice in the state at the time of the enactment of the law who were graduates of colleges of midwifery, and these certificates were issued early in the history of the Board. It was discovered later that the statute made no provision for the issuance of certificates to this class, the law giving all women who were at the time of its enactment the right to practice midwifery without a certificate whether graduates or not. Those termed "miscellaneous" were hydropaths, electropaths, magnetic healers, etc., and they received their certificates on length of practice.

During the biennial period ending June 30, 1901, there were issued 314 certificates as follows: Regulars, 272; Homeopaths, 39; Eclectic, 2; Physio-Medics, 1. Total, 314. To men, 300; to women, 14.

All these certificates were upon examination, the applicants being graduates of the following colleges: American Medical College, St. Louis; Baltimore University; Barnes' Medical Col-

lege, St. Louis; Bennett College of Eclectic Medicine and Surgery, Chicago; Central Medical College, Indianapolis; Chicago Homeopathic Medical College; Chicago Physio-Medical College; College Physicians and Surgeons, Chicago; College Physicians and Surgeons, Baltimore; College Physicians and Surgeons, St. Joseph, Missouri; College Physicians and Surgeons, Keokuk; Cornell University, Ithica, New York; Eclectic Medical Institute, Cincinnati; Ft. Wayne College of Medicine, Indiana; Georgetown University, District Columbia; Hahnemann Medical College and Hospital, Chicago; Hahnemann Medical College, Philadelphia; Harvard University, Boston, Massachusetts; Iowa College Physicians and Surgeons, Des Moines; Jefferson Medical College, Philadelphia; Jenner Medical College, Chicago; John A. Creighton Medical College, Omaha; Kansas Medical College, Topeka; Kansas City Medical College, Missouri; Kentucky University, Louisville; Keokuk Medical College, College of Physicians and Surgeons, Iowa; Louisville Medical College, Kentucky; Marion Sims Medical College, St. Louis; McGill University, Montreal, Canada; Miami Medical College, Cincinnati; Missouri Medical College, St. Louis; New York Homeopathic Medical College; Northwestern University Medical School, Chicago; Northwestern University Woman's Medical School, Chicago; Queen's University, Kingston, Ontario, Canada; Royal University of Norway, Christiana; Rush Medical College, Chicago; St. Louis Medical College; Sioux City College of Medicine; Syracuse University, New York; Trinity University, Toronto, Canada; University of Iowa, Iowa City; University of Iowa (Homeopathic), Iowa City; University of Michigan, Ann Arbor; University of Munich, Germany; University of Oregon, Portland; University of Pennsylvania, Philadelphia; University of Vermont, Burlington.

Under chapter 69, laws of the Twenty-seventh General Assembly, relative to the practice of osteopathy, there have as yet been no certificates issued. There have been in all forty-four applications from the following colleges of osteopathy: American School of Osteopathy, Kirksville, Missouri; Quincy Osteopathic Institute, Illinois; Dr. S. S. Still College and Infirmary of Osteopathy, Des Moines.

Certificates were refused on the grounds that the colleges from which the applicants graduated were declared not to be as of good standing as contemplated by the law, and by the minimum requirements of the Board.

The Dr. S. S. Still College of Osteopathy has applied to the district court for a writ of mandamus to compel the board to issue certificates to its graduates. This case is now pending.

The fees allowed by law for the legitimate expenses of the Board have not been adequate to meet the expenses. This deficit might be met in part, if not wholly, by requiring the itinerants' license fee, two hundred and fifty dollars annually, now paid directly into the State Treasury, to be paid to the Board for its use; or by having the examination fee remain as it is and requiring a fee of five dollars additional for those who successfully pass the Board. This is the law in Illinois, and the fee thus increased is less than is paid in almost every other state.

The expert committee, appointed by the Executive Council, as provided by the Legislature, in calling attention to this deficit in their report recommended the payment of a renewal fee of one dollar per annum by all persons holding a certificate of the Board. Such a fee would be but a light burden upon those in practice and would not only meet, with the examination fee as it now is, all the expenses of the Board but would enable the Board to keep in touch with every legalized practitioner in the state and to detect and root out more readily those who were violaters of the law.

The Legislature could further promote the interests of the people and enable the State Board of Health to furnish some very valuable information if section 2565 of the Code were so amended as to include the proceedings of the State Board of Medical Examiners together with a list of legalized physicians in the State in the biennial report of the Secretary.

III

EMBALMERS' DEPARTMENT.

For several years sanitarians and health organizations have recognized the danger to the public health of exposure to bodies dead from infectious diseases, and the necessity of the adoption of measures of prevention. Railroad and other common carriers show a disposition to promptly and heartily co-operate with health organizations in the adoption of rules and regulations respecting the transportation of corpses. Sixteen or seventeen years ago the president of this Board, Dr. W. S. Robertson and the SECRETARY, the writer hereof, together with members of the Illinois and Minnesota State Boards of Health met at the Pacific Hotel, Chicago, with the several general baggage agents of railroads of the Northwest and discussed at length ways and means of safely transporting dead bodies—especially those dead of infectious diseases—with the least possible danger to the puplic.

As a result rules were proposed which were adopted by the General Baggage Agents Association, and subsequently by various State Boards of Health; by the American Public Health Association, and by the National Conference of State and Provincial Boards of Health.

These rules were subsequently revised and amended until the following became the rules for transportation as adopted by the above named organizations.

RULE 1. The transportation of bodies dead of Smallpox, Asiatic Cholera, Yellow Fever, Typhus Fever or Bubonic Plague is absolutely forbidden.

RULE 2. The bodies of those who have died of Diphtheria (Membranous Croup), Scarlet Fever (Scarlatina, Scarlet Rash), Glanders, Anthrax or Leprosy. shall not be accepted for transportation unless prepared for shipment by being thoroughly disinfected by arterial and cavity injection with a proved disinfectant fluid (b) disinfecting and stopping of all orifices with absorbent cotton, and(c)washing the body with disinfectant, all of which must be done by an embalmer holding a certificate as such approved by the State Board of Health. After being disinfected as above, such body shall be enveloped in a layer of cotton not less than one inch think,

completely wrapped in a sheet and bandaged, and encased in an air-tight zinc, tin, copper, or lead lined coffin, or iron casket, all joints and seams hermetically soldered, and all enclosed in a strong, tight wooden box. Or, the body being prepared for shipment by disinfecting and wrapping as above, may be placed in a strong coffin or casket, and said coffin or casket encased in an air-tight zinc, copper or tin case, all joints and seams hermetically soldered, and all enclosed in a strong outside wooden box.

RULE 3. The bodies of those dead from Typhoid Fever, Puerperal Fever, Erysipelas, Tuberculosis, Measles, or other dangerous communicable diseases, other than those specified in rules 1 and 2, may be received for transportation when prepared for shipment by filling cavities with an approved disinfectant, washing the exterior of the body with the same, stopping all orifices with absorbent cotton and enveloping the entire body with a layer of cotton not less than one inch thick, and all wrapped in a sheet and bandaged and encased in an air-tight coffin or casket, provided that this shall apply only to bodies that can reach their destination within forty-eight hours from time of death. In all other cases such bodies shall be prepared for transportation in conformity with rule 2. But when the body has been prepared for shipment by being thoroughly disinfected by an embalmer holding a certificate as in rule 2, issued by the state health authorities, the air tight sealing may be dispensed with.

RULE 4. The bodies of those dead from diseases that are not contagious, infectious or communicable may be received for transportation when incased in a sound coffin or casket and enclosed in a strong outside wooden box, provided they reach their destination within thirty hours from time of death. If the body cannot reach its destination within thirty hours from time of death it must be prepared for shipment by filling the cavities with an approved disinfectant, washing the exterior of the body with the same, stopping all orifices with absorbent cotton and enveloping the entire body with a layer of cotton not less than one inch thick, and all wrapped in a bandage and encased in an air-tight coffin or casket. But when the body has been prepared for shipment by being thorougly disinfected by an embalmer holding a certificate as in rule 2, issued by the state health authorities, the air-tight sealing may be dispensed with.

RULE 5. In case of contagious, infectious or communicable diseases the body must not be accompanied by persons or articles which have been exposed to the infection of the deceased, unless certified by the health officer as having been properly disinfected; and before selling passage tickets agents shall carefully examine the transit permit and note the name of the passenger in charge, and of any others proposing to accompany the body, and see that all necessary precautions have been taken to prevent the spread of the disease. The transit permit in such cases shall specifically state who is authorized by the health authorities to accompany the remains. In all cases where bodies are forwarded under rule 2 notice must be sent by telegraph to the health officer at destination, advising the date and train on which the body may be expected. This notice must be sent by or in the name of the officer at the initial point, and to enable the health officer at destination to take all necessary precautions at that point.

RULE 6. Every dead body must be accompanied by a person in charge, who must be provided with a passage ticket and also present a full first-class

ticket marked "corpse" for the transportation of the body, and a transit permit showing the physician's or corner's certificate, name of deceased, date and hour of death, age, place of death, cause of death, and, if of a contagious, infectious or communicable nature, the point to which the body is to be shipped, and when death is caused by any of the diseases specified in rule No. 2, the name of those authorized by the health authorities to accompany the body. The transit permit must be made in duplicate, and the signatures of the physician or coroner, health officer and undertaker must be on the original and duplicate copies. The undertaker's certificate and paster of the original shall be detached from the transit permit and pasted on the coffin box. The physician's certificate and transit permit shall be handed to the passenger. The whole duplictate copy shall be sent to the official in charge of the baggage department of the initial line, and by him to the Secretary of the State, or Provincial Board of Health of the State or Province from which said shipment was made.

RULE 7. When the dead bodies are shipped by express the whole original transit permit shall be placed upon the outside of the box and the duplicate forwarded by the express agent to the express agent and Secretary of the State or Provincial Board of Health of the State or Province from which said shipment was made.

RULE 8. Every disinterred body dead from any disease or cause shall be treated as infectious or dangerous to the public health, and must not be accepted for transportation unless said removal has been approved by the State or Provincial Health authorities having jurisdiction where such body is to be disinterred, and the consent of the heaith authorities of the locality to which the body is consigned has first been obtained; and all such disinterred remains must be enclosed in a hermetically sealed (soldered), zinc, tin or copper lined coffin or box.

The foregoing rules were adopted by the Iowa State Board of Health November, 1897, and on May 11, 1898, the following regulations were adopted to carry them into effect:

TRANSPORTATION OF CORPSES

First.—It shall be the duty of every Funeral Director, Undertaker, or Embalmer within the State who may desire recognition by transportation companies and common carriers, for the transportation of the bodies of human beings dead from Diptheria, Scarlet Fever, Glanders, Anthrax or Leprosy, to conform to regulations made therefor by the State Board of Health to-wit:

Second.—He may make application to the State Board of Health for a permit to prepare such bodies for transportation. Said application shall contain his full name, age and place of residence, and the certification of two legal physicians of good repute in the place where he resides.

He shall pass an examination before the State Board of Health at such time and in such manner as the Board may determine. Said examination shall comprise the following subjects:

(*a*) The visceral anatomy and vascular system of the human body.

(*b*) The comparative value and action of disinfectants and germicides.

(*c*) The proper method, after embalming, for further safely preparing bodies for transportation.

(*d*) The meaning of "contagion," and "infection;" the dangers they beget, and the best methods of their restriction and arrest.

(*e*) The signs of death, and the best methods of their determination.

And such other topics, general and special, as the Board may from time to time determine.

Seventy-five per cent of satisfactory answers in a scale of one hundred shall be required to entitle the applicant to a permit.

Third.—Upon satisfactory evidence of the competency of the applicant as an embalmer, he may be granted a permit to prepare corpses herein designated for transportation upon the payment of the sum of five dollars, to pay the expenses of such examination. Said permit shall be limited to the term of one year, and shall be signed by the President of the State Board of Health, and attested by the Secretary and seal of the Board.

Permits may be renewed upon the payment of one dollar within thirty days after the expiration of the term of a permit.

Fourth.—The failure of the holder of a permit to comply with the regulations of the State Board of Health shall be deemed sufficient cause for the revocation of his permit.

Fifth.—The Secretary of the Board shall keep a record in which shall be registered the name and residence of all persons to whom a permit is granted and the number and date of the permit, which record shall be for the information of the profession, the public and for transportation companies.

He shall also keep a record of all money received, expenses incurred and paid under these regulations, and make report thereof at each quarterly meeting of the Board.

Sixth.—Bodies of those who have died from diphtheria (membranous croup), scarlet fever (scarlatina, scarlet rash), glanders, Anthrax, or leprosy, may be transported by common carriers upon the affidavit of a funeral director, undertaker or embalmer, made under oath, that he is the holder of a permit from the State Board of Health, giving the number of the permit, his name and residence, and certifying that the body has been prepared for shipment in accordance with the regulations of the State Board of Health, to-wit:

In the case of Diphtheria.—The body shall be thoroughly injected with a proven disinfectant embalming fluid, and all orifices of the body, such as the nares, mouth, rectum, and vagina in the female subject, then plugged with absorbent cotton. The body shall then be washed in the disinfecting fluid and wrapped in absorbent cotton layers one inch thick, then bandaged and placed in an air-tight zinc or metallic case.

In case of Scarlet Fever.—All clothing must be removed from the body, and the whole arterial system and cavities, including the cerebro-spinal, injected with a disinfectant of the highest germicidal powers. The body must then be thoroughly washed with the disinfecting fluid; all orifices plugged with absorbent cotton then covered with absorbent cotton one inch thick, then bandaged and placed in an air-tight zinc or metallic case.

In case of Glanders, Anthrax or Leprosy.—After protecting the hands by either vasline or gloves, all clothing which has been around the body shall be removed and burned. The body shall then be thoroughly washed

with a disinfectant of the highest proven germicidal powers, and sufficient of the disinfectant and embalming fluid injected into the circulatory system to thoroughly saturate all the tissues of the body. All the main cavities of the body shall be filled with the disinfectant, and all orifices plugged with absorbent cotton. The body shall then be washed with the disinfectant, wrapped in absorbent cotton not less than one inch thick, then bandaged and placed in an air-tight zinc or metallic case. When the condition of the body demands the removal of the blood, it may be removed by using a bottle which contains not less than four ounces of the disinfecting fluid. The vein selected for the operation must be opened carefully and the tube introduced to the right auricle of the heart, and the blood aspirated into the bottle without exposing it to the air of the room, or without coming in contact with the hands of the operator.

Seventh.—Disinfectants referred to herein must be approved by the State Board of Health.

Eighth.—The foregoing rules shall go into effect, and be in force on and after September 1, 1898.

R. E, CONNIFF, M. D., *President.*
J. F. KENNEDY, M. D., *Secretary.*

Since the adoption of these regulations providing for the education, examination and licensing of embalmers there has been a wonderful improvement in the personnel of the undertakers of the state. Those who desire to stand at the head of their profession, and to be recognized as holding embalmers permits took up the study of the scientific features, as well as the technique, of their profession; they attended schools of embalming; became more interested in their professional Associations and promptly and cheerfully availed themselves of the opportunities to take the required examination.

The question of taking the examination or not was left entirely at the option of the party interested. While the statute, chapter 16 of the Code, gives the State Board of health a general supervision of the lives and health of the people, yet the board was advised that it had not the right under the law to require a fee as a condition for taking the examination, nor had it the right to interfere with the work of the undertaker so far as he complied with the rules for the transportation of corpses as above given.

The advantage to the educated licensed embalmer was that by virtue of his proficiency as shown by a successful examination, he was premitted, and the railroads were anthorized and agreed to transport bodies dead of diphtheria, scarlet fever, glanders, anthrax or leprosy that under the rules could not be otherwise received for transportation.

Since the adoption of the regulations providing for the issuance of these permits there have been held eight examinations—two of which were in connection with the meetings of the State Funeral Directors Association outside of Des Moines—viz. at Waterloo and Boone.

As a result of these examinations there have been issued four hundred and sixty-six embalmers licenses. The Board subsequently passed a resolution agreeing to issue licenses to undertakers of other states who were possessors of embalmers licenses granted upon examination by their respective State Boards of Health upon the payment of the fee, without examination—provided like courtesy was shown to licensed embalmers of this state. Several states have promptly signified their willingness to thus reciprocate; and one party holding an Illinois license has been awarded, on these conditions, a license by this board making the total number of licensed embalmers in Iowa four hundred and sixty-seven.

In addition to the examining and licensing of embalmers this department has printed the transportation permits used all over the State, and printed and issued all the application blanks and disinterment blanks and permits used by the Board and has paid for the same out of the fees received for examinations. In this way the State has had the benefit of a most valuable sanitary service without any expense. Before the organization of this embalmers' department the cost of the printing and distribution of blanks and permits relating to the disinterment and transportation of corpses was paid out of the appropriation for the State Board of Health.

From the time of the adoption of the regulation relative to the issuing of embalmers' licenses, May 11th, 1898, to the end of this biennial period, June 30th, 1901, there have been issued from the office of the State Board of Health 1,623 ordinary disinterments—1,217 of which were within the last biennial period; and 120 special permits of which 96 were within the period ending as above stated. The special permits referred to were granted in cases of death from infectious diseases—principally diphtheria and scarlet fever, and imposed the following conditions upon those interested :

1. That the disinterment is for the purpose of re-interment in another part of the same cemetery, or in a cemetery nearly contiguous.
2. That the removal shall not be by any public conveyance.

3. That the removal shall be done at an hour when there is the least possible exposure of other persons.

4. That no children shall be present, and only such persons as are actually necessary.

5. That the coffin shall not be opened.

6. That the sexton and all other persons engaged in such removal shall immediately thereafter change their clothing and properly disinfect or burn the same, and shall thoroughly disinfect their hands, head and face.

The time is not far distant when the methods of disinfection shall be so reliable and the skill of the embalmer such that bodies dead from smallpox, asiatic cholera, plague and yellow fever will be transported as safely as though dead of scarlet fever and diphtheria. Indeed, Michigan, through its Board of Health, has already expressed such confidence in her licensed embalmers that the restrictions against the transportation of bodies dead of infectious diseases heretofore prohibited by all other Boards have been so modified as to permit their transportation under certain prescribed conditions.

The State of Iowa was one of the first to adopt these rules relating to the transportation of dead bodies and the first to provide for the examination and licensing of embalmers, and it is a source of great gratification and commendable pride to find that the means of safety thus adopted have become well nigh universal so far as Canada, the United States and Mexico are concerned. In taking up this line of work the Board builded better than they knew, not only in conserving the public health but at the same time making it possible, without danger, to grant those bereaved the comfort and satisfaction of having their loved ones, though dead of contagious disease, repose in places of their own selection.

IV

LEGISLATIVE SUGGESTIONS

One of the duties of the Secretary in respect to the preparation of the biennial report, as required by section 2565 of the Code, is to make "such suggestions as to further legislation as may be thought advisable."

In compliance with this requirement the following suggestions are respectfully submitted:

APPROPRIATIONS

When the State Board of Health law was enacted in 1880, the appropriation per annum was fixed at five thousand dollars. Notwithstanding the work of the Board has been greatly increased, covering subjects of sanitation not thought of, and greatly increasing the expenses of the Board, the appropriation has remained the same as it was twenty-one years ago. The State Board of Health, through its oil inspection service, organized since 1880, not only is no expense to the State, but pays into the State Treasury much more annually than double the amount received by it by appropriation. To meet the legitimate demands of the Board, and to provide for original bacteriological, chemical and other sanitary investigations, the appropriation should not be less than seven thousand five hundred dollars annually.

The per diem of the members of the Board should be increased to ten dollars instead of eight as provided by the present code; the Secretary should receive a salary of not less than fifteen hundred dollars per annum instead of the twelve hundred now paid, and section 2575 should be further amended so as to insert after the word "office" the words "except postage and stationery," which shall be drawn from the supply department of the State.

VITAL STATISTICS

A glance at the data respecting "vital statistics" as shown elsewhere in this report will show that something should be done

to either repeal section 2566 and all of 2567 after the words "immediately preceding," or enact such penalties as will secure on the part of the assessors a better observance of the law; or else return to the old law requiring the physicians to report births and deaths. Vital statistics are of no benefit unless approximately correct. The physicians are the legitimate—the natural—agents for reporting births and deaths, and should under proper penalties be required by law to make these returns. They shonld also be reasonably compensated therefor. The reports of marriages are as nearly correct as could be expected, and are consequently quite reliable.

REPORTING INFECTIOUS DISEASES

It is painfully and dangerously apparent that a considerable number of physicians holding certificates from the State Board of Medical Examiners either through ignorance or a disposition to shield their patients from quarantine fail or neglect to report to the proper authorities cases of diphtheria, scarlet fever, smallpox and other infectious diseases as required by the regulations of this Board. The Board has disciplined some of these physicians, but its authority in such cases, so far as suspension from practice or revocation of the certificate is concerned, has not as yet been determined by the courts, nor is there as yet any direct legislative enactment in regard to this matter—the only provision for such discipline being the rather indirect question of "incompetency" as found in section 2578 of the Code.

In order that there may be no question as to the powers of the Board in regard to this matter, a prominent attorney has suggested the following amendment to section 2570 of the Code:

"Any person who shall purposely conceal or withhold information of any case of smallpox, varioloid, scarlet fever. or other quarantinable disease from the legally constituted public health authorities of the locality in which the same may occur, shall be punished on conviction thereof by a fine of not less than one hundred, or more than five hundred dollars, or by imprisonment for not less than six nor more than twelve months, or by both fine and imprisonment at the discretion of the court. And in case the person offending is a physician or holds a license from the State Board of Medical Examiners, in addition to the above penalties, his license shall be suspended, and on conviction of a second offense, it shall be permanently revoked."

STATE BOARD OF MEDICAL EXAMINERS

The fees received from applicants for certificate are not adequate to meet the expenses of this Board. Three methods are suggested by which these expenses might be more nearly, if not entirely, provided for.

First—The fees for itinerant physicians' permits issued by the Board, under section 2581 of the Code, might be paid into the Board for its use instead of into the State treasury for the use of the State. As the State is at no expense whatever on behalf of the Board of Medical Examiners such a diposition of these fees would only be just.

Second—The fee for examination might remain as at present with an additional fee of five dollars for the certificate where the examination is successful. This is the requirement in Illinois and would increase the fees of the Board thirty-three and one third per cent.

Third—A renewal fee of one dollar annually, might be required of each physician holding a certificate from the Board, as is the case with those holding pharmacy certificates. In addition to this plan furnishing an ample income, it would have the advantage of enabling the Board to keep in intimate touch with every legitimate physician in the State, or out of the State, who desired to keep his certificate in force. It would also enable the Board to furnish for publication with this report a reliable roster of all the legal medical practitioners of the State.

V

RAILROAD ACCIDENTS AND CAR SANITATION

The legislature of Iowa in 1892 enacted a statute requiring all railroads operating in Iowa to equip their cars with air brakes and automatic couplers. This was done to prevent accidents resulting from the ordinary methods of braking and coupling. As the change was expensive and required time, the period for full compliance with the law was fixed for January, 1, 1900.

It will be interesting to know what the results have been in the way of preventing accidents. The time since the last limit expired has been so short that valuable comparisons can hardly be instituted. The Iowa Board of Railroad Commissioners in its report for 1900 says relative to the compliance of the railroads with the statute above referred to: "It is the opinion of the Board that all railway companies operating lines within the State have substantially, or as nearly as may be, complied with the law with reference to equipping their cars with automatic couplers."

This report furnishes some interesting data relative to accidents occuring since 1882. From the tables given it is shown that beginning with 1882, the first tabulated report of accidents in Iowa, the following number of casulties have occurred to employes "from coupling cars" and "falling from trains:" The number killed, including the year 1900, from coupling cars, 199; from falling from trains, 385; total, 584.

Number injured, including 1900:

From coupling cars	3,408
From falling from trains	971
Total	4,378

As stated previously, the law requiring the change in method of coupling and braking was enacted in 1892. Inasmuch as but few of the roads could comply with the law for a year or two at least, and an extension of time was granted, but little reduction in the number of accidents could be expected at once. The records show the following, beginning with 1892:

ACCIDENTS TO EMPLOYES FROM COUPLING CARS.

YEARS.	Killed.	Injured.	Totals.
1892	14	196	210
1893	10	196	206
1894	7	91	98
1895	5	80	85
1896	6	97	103
1897	7	80	87
1898	4	75	79
1899	12	72	84
1900	8	59	67
Total	73	946	1,019

ACCIDENTS TO EMPLOYES BY FALLING FROM TRAINS.

YEARS.	Killed.	Injured.	Totals.
1892	28	63	91
1893	22	68	90
1894	17	32	49
1895	20	37	57
1896	19	35	54
1897	14	65	79
1898	18	50	68
1899	12	64	76
1900	20	59	79
Total	170	473	643

For the ten years prior to the enactment requiring air brakes and automatic couplers the causualities were as follows:

From both causes, 341; injured, 2,155, making a grand total of 2,496.

ACCIDENTS TO EMPLOYES FROM COUPLING CARS

YEARS.	Killed.	Injured.	Totals.
1882	16	182	198
1883	16	98	114
1884	8	109	117
1885	13	174	187
1886	10	126	136
1887	9	134	143
1888	19	240	259
1889	8	149	157
1890	14	203	217
1891	13	242	255
Total	126	1,657	1,783

ACCIDENTS TO EMPLOYES BY FALLING FROM TRAINS

YEARS.	Killed.	Injured.	Totals.
1882	31	57	88
1883	33	42	75
1884	10	57	67
1885	16	34	50
1886	25	38	63
1887	23	39	62
1888	32	52	84
1889	5	44	49
1890	17	53	70
1891	23	82	105
Total	215	498	713

Comparing the ten years prior to the passage of the law in 1892 with the nine years subsequent we have the following, respectively:

FIRST PERIOD.

Accidents to employes from coupling cars, 1882-1891: Killed, 126; injured, 1,657. Total, 1,783.

Accidents to employes by falling from trains, 1882-1891: Killed, 215; injured, 498. Total, 713. Total killed, 341; injured, 2,155. Total accidents, 2,496.

SECOND PERIOD.

Accidents to employes from coupling cars, 1892-1900: Killed, 73; injured, 946. Total, 1,019.

Accidents to employes by falling from trains, 1892-1900: Killed, 170; injured, 473. Total, 643. Total killed, 243; injured, 1,519. Total accidents, 1,662.

The grouping of the results for the period before the law with those subsequent may, at first glance, seem somewhat disappointing, and yet when all the facts are considered the State and the railroad authorities are to be congratulated and certainly have occasion to recognize the wisdom of the law.

In getting at the facts in regard to proportionate casualties for the two periods the number of persons employed constitutes an impotent factor. The records show the following:

NUMBER OF RAILROAD EMPLOYES.

YEARS.	Number.	YEARS.	Number.
1882	17,273	1892	30,192
1883	27,112	1893	31,127
1884	26,731	1894	29,308
1885	25,666	1895	24,107
1886	25,761	1896	28,165
1887	29,088	1897	26,690
1888	30,794	1898	30,009
1889	24,612	1899	32,385
1890	24,311	1900	37,696
1891	27,588		
Total	259,007	Total	269,739

It will be seen from the above that for the ten years preceding 1892 there were 259,007 men employed in the railroad service, of whom 126 were killed and 1,657 injured while coupling cars; and 215 were killed and 498 injured by falling from cars while braking, making the total killed 341, and injured 1,657; total 2,157 accidents.

For the nine years beginning with 1892 and including 1900, with 269,739 men employed, there were 73 killed and 946 injured by coupling cars and 170 killed and 473 injured by falling from

trains, making a total of 243 killed and 1,419 injured, or a total of accidents 1,662, showing 98 less deaths and 736 injuries to employes than for the ten years preceding. In justice it must be stated, however, that not all this favorable showing is to be credited to the use of the improved coupler and brake.

The morale of the men must be considered. It will readily be conceded that many of the accidents occurring in both the above named periods were occasioned directly or indirectly by the use of intoxicants, and the prohibition placed upon this habit by several of the companies employing the largest number of men has had much to do with not only preventing accidents to the employes but to passengers patronizing their lines and to others. By "others" are meant accidents at crossings, trespassing, stealing rides, or walking on the track. The report of the railroad commissioners shows the following additional relating to passengers and others:

YEARS.	KILLED.		Total.	INJURED.		Total	Total.
	Pass.	Others.		Pass.	Others.		
1882	7	69	76	61	72	133	209
1883	4	65	69	25	50	75	144
1884	6	51	57	47	59	106	163
1885	9	75	84	89	66	155	239
1886	8	62	70	35	74	109	179
1887	8	65	73	28	58	86	156
1888	10	69	79	77	86	163	242
1889	4	33	37	25	46	71	108
1890	9	69	78	67	101	168	246
1891	5	91	96	80	92	172	268
1892	23	76	99	64	77	141	240
1893	17	79	96	78	64	142	238
1894	7	90	97	62	62	124	221
1895	4	82	86	39	74	113	199
1896	6	94	100	62	84	146	246
1897	27	90	117	81	86	167	284
1898	5	114	119	30	70	100	219
1899	14	95	109	101	128	229	338
1900	9	143	152	82	136	218	372
Total	182	1,512	1,694	679	873	1,553	3,247

The Board of Railroad Commissioners in speaking of these accidents to persons in Iowa says:

"Iowa has been singularly free, with very few exceptions, from railroad disasters resulting in great loss of life.

"Two notable exceptions have occurred within the past two or three years. Considering the greater number of trains now being operated, and the greatly increased speed of all trains, this condition in Iowa reflects great credit on railway management, and the integrity and reliability of the men whose duty it is to keep the track and roadbed in proper condition, and those employed in handling these trains. The public does not always ap-

preciate how much it owes to these employes, who daily guard the lives of thousands of people, and property to the value of millions of dollars."

While this is true, the fact must remain that much of the loss of life and injury to passengers as above tabulated, together with the loss of property, is the result in too large a measure of carelessness on the part of employes—mistakes in issuing or understanding orders and neglect in faithfully obeying proper orders when given.

The SECRETARY heartily congratulates the railroads of Iowa upon the above showing, and with the railroad commissioners believes that the people at large seldom appreciate the risk to life and deprivation of home and natural rest required, as well as the fidelity and integrity, of the great bulk of those who manage and operate these great commercial enterprises that are revolutionizing the world and making all peoples neighbors.

CAR SANITATION

The American Public Health Association, representing the Dominion of Canada, United States of America and the Republic of Mexico, for some years has had a Committee on Car Sanitation. The Committee has been made up of men of great ability, who have been faithfully and conscientiously striving to secure for the traveling public the best possible sanitary conditions with as little embarrassment to railroad managers as possible.

Prof. S. H. Woodbridge, of the Massachusetts Institute of Technology, Boston, is Chairman of the Committee. In behalf of the Committee he made a very interesting report at the meeting held in Indianapolis, Indiana, October, 1900. He had sent to seventy or more railroad companies of the Continent asking certain questions relative to the sanitary condition of their respective systems and asking their co-operation in securing greater uniformity and improvements along sanitary lines. Of the seventy thus addressed, thirty-nine failed to respond. One company, through its representative, replied as follows—the sentiments expressed reflecting possibly the position of many of those not in evidence:

"You ask a number of questions in regard to the care of cars which are not easy to answer, and which I hesitate to answer until I know the use you intend making of them. If this information is desired in the cause of science, that is one thing; if it is desired in order to compel the railroads through legislation to adopt expensive methods of sanitation, I hesitate very much to give you the information. I am quite certain that the railroad

with which I am connected, and other trunk lines in this vicinity, are doing quite as much in regard to protecting the traveling public against contagious diseases as they can afford to do, and it is quite a question in my mind whether any public or semi-public institution can be expected to do more for the public than the public will do for itself. Public opinion is such that people who ought to be in quarantine are traveling around at large, and it does not seem to me that you ought to expect transportation companies, hotel keepers, or other institutions to protect the public against them. Railroads are, as you know, considered in law 'common carriers.' They must carry whoever comes along, and regulations in regard to not spitting in cars, etc., are usually of no avail."

"In the matter of sterilized water at various places, it is a great question in my mind whether railroads can go into this matter. While waters of guaranteed purity are usually used in dining cars and eating houses, in the ordinary water tanks of sleeping and passenger cars, railroads simply furnish the best water which they are able to get from the cities and towns through which they run. Take for example, the city of Chicago, a very large proportion of the population drinks the lake water as it comes from the faucet, and this is what is supplied in the cars of all railroads running out of Chicago. A very small proportion of the population do not use this water at home and purchase water in bottles and cans. Would you contend that it was the duty of the railroad companies to furnish water to its patrons which was better and more expensive than those patrons would think of using in their own homes?"

"The steam railroads are at the present time in active competition with electric lines, especially in suburban traffic and traffic between large towns when not too far apart. The railroads furnish waiting rooms with appliances for the comfort of passengers on their trains which their competitors do not furnish, and many prominent railroad managers feel that they have already gone further than they can afford to in this direction."

The committee in its investigations acted upon the following well grounded assumptions:

"1. The public through its chosen form of government has unquestionable right to protect itself from such preventable danger as it is in its power to control.

2. A danger is constituted whenever existing conditions are a menace to the best state of life, health, property, or happiness.

3. From various causes, many of the dangers to health increase in number and potency with the aggregation of persons in various conditions of health, and especially when such persons are assembled in illy-aired and illy-cleaned enclosures.

4. The public right is unchallenged to demand good hygienic conditions in all buildings and conveyances designed for public use and dependent, in their origin and operation, on public franchise.

5. The public standards, so far from being gauged by private, or family, or local habits, often conflict with and overrule them when the latter are at variance with the public good.

6. In the matter of public hygiene the State is supreme over any part of its contained communities and industries."

They submitted to the Association the following general statement of principles for its consideration:

"1. Among the traveling public are some, and in the aggregate many, who are afflicted with contagious disorders which may be communicated to the well through emanations transmitted as microbic dust and conveyed through the air, either directly from person to person, or after lodgment and short or long retention on surfaces or in textile fabrics.

The well, whenever in close proximity to, or confined with, those who are ill with communicable diseases, or who occupy uncleansed apartments previously occupied by such sick, or who use unsterilized or otherwise inefficiently treated bed-clothing or drapery previously used by them, are exposed to a preventable danger. So also are those who are furnished with unwholesome drinking water or foods.

Air, through its capacity for floating and carrying vaporous and minute solid material, is one of the principal vehicles by which disease is transmitted from the sick to the well. The greater the air supply furnished breathers the more the disease emanations are diluted, and the less dangerous the air and its contents become to the breather, and the more vigorous the latter's vitality is made by the abundance of air furnished and the consequent purity of the air breathed. The less the air supply, on the other hand, the greater the concentration of the microbic dilution, the lower the breather's vitality, and the greater his danger becomes.

2. The more absorbent, porous, rough, recessed, fluted, carved, or shelf-like the material or the surface exposed to air to any degree laden with microbic dust, the greater the amount of such floating material absorbed or lodged and held by them, to be dislodged and again floated whenever or however suffiiciently disturbed. Hence the advisability and sanitary necessity of furnishing no avoidable harbor for the retention of dust.

3. Car sanitation, simply stated, is car cleanliness; cleanliness of the car itself and of its contents—including the furnishings, its air, and its supply of water and food. As the most dangerous poisons are those which are tasteless, so the most dangerous dusts or dirts are those which are not visible. It is because of the invisibility of danger that it is too often disregarded as imaginary, and the counsels of the benefactor, to whom the things unseen are the real, are scouted as the alarms of a dreamer. The emphatic trend of modern pathology is toward what may be termed the microbic or zymotic origin of all contagious disease, the dust or dirt origin, as it might be called; the invisible but dangerous dust in air, on clothing and furnishings, in water and foods.

Car sanitation, therefore, affects the building and the furnishing of cars, their ventilating and cleaning,—the water and food supply."

RECOMMENDATIONS

1. Passengers Known to be Ill with Contagious Diseases—When a passenger is known to be contagiously ill, he should be isolated in a compartment, appropriately equipped, and thoronghly ventilated in a manner to atmospherically separate it from, and to protect, the rest of the car. Through cars or trains should be provided with sick rooms, as well as state rooms, interchangeable in use, if necessary, and for the use of which charge

may properly be made proportionate to the service rendered to the individual and the public.

2. Construction of Cars—The interior of passenger cars should be furnished with hard, smooth and polished surfaces. All surfaces should be smooth and plain. Carvings, mouldings, groovings, flutings and all so called ornamental work which furnishes lodgement and harborage for dust and dirt should be avoided.

3. Furnishings. The furnishings of floor, seats, windows, draperies, should be as nonabsorbent as practicable. Wherever admissible, carpets and matting should give place to impervious material for plush in seat and seat-backs some impervious material should be substituted; curtains of suitable nonabsorbent material should be used, rather than slatted blinds in windows. Floor coverings, seats, draperies, and window curtains should all be made easily removable for cleaning.

4. Ventilation.—Coaches should be furnished with effective means for continuously supplying not less than 1000 cubic feet of warm air an hour for each chair or other single seat with which the car is provided and for distributing and removing the air in an effective manner for doing ventilating work without troublesome draught.

5. Temperature Regulation—The artificial temperature of the car should be so controled either manually or automatically as to prevent the debilitating effects of over heating, and the still more harmful effects of chill, or of wide range temperature fluctuations.

The excessive summer heat of cars brought from yards to be made up into trains should be mitigated as much as practicable by shedded yards, protected car roofs, open deck windows and also side windows while the cars are in the yard; or, if need be, by sprinkling the car roofs.

6. Car Cleaning—The cleaning of cars should be frequent and thorough and] without much, and certainly not exclusive, reference to evident dirtness, since danger from this cause cannot be safely guarded by dirt quantity, nor indicated by its conspicuity.

The cleaning of all removable furnishings should be done outside the car, and, when weather conditions premit, all other cleaning should be with wide open windows and doors.

The feather duster should be used only with wide open windows, and for the purpose of lifting dust so that it may be removed by a strong through current of air.

Under ordinary conditions interior dusting should be done by means of dampened cloths.

When the cars are in transit and occupied by passengers any method of cleaning which stirs up and floats the dust from the floor or furnishings should be prohibited. The brushing of floor or carpets with whisk brooms, the brushing of clothing in the open car, the porter's manœuvering for a tip, should be discouraged.

7. Disinfectants—Floors should be washed frequently with suds and an added disinfectant of simple, orderless and effective nature, The sanitary and lavatory fixtures should be similarly and frequently treated with a disinfecting wash.

8. Sterilizing Treatment—Thorough cleaning of all fabrics by beating, air blast, dusting, airing and washing should be supplemented by occas-

ionally subjecting the entire interior car and contents to disinfectant treatment by sterilizing gases, vapors or fumes, and by methods of recognized efficacy. Such treatment should be followed whenever any known or suspected case of communicable disease is found among the passengers, and periodically, even though such cases do not appear.

All bedding, including mattresses, pillows, blankets and curtains; should be similarly treated, being always thoroughly aired and otherwise cleaned after each use, and sterilized promptly after exposure by a suspected or known case of contagious disease.

All bed and lavatory linen should be thoroughly sterilized in the process of laundering.

9. Excreta—The practice of disposing of excreta by scattering it over roadbeds is both dirty and dangerous—alike to the passenger and to the public. Such material on drying contributes to the dust of the road and in the cars, and becomes part of the floating contents of the air of the cities and the country through which the roads run. Convenience in disposal affords no adequate excuse for the maintenance of this slovenly, filthy and dangerous practice. Sewage tanks and earth closets should be provided under the cars.

10. Water and Ice Supply—Water and ice should be obtained from the purest available source, and none should be used from any source, which has not been proved by reliable tests to be safely free from harmful contents. If natural water and ice of such quality cannot be obtained, then the water should be treated by the most appropriate and effective method for its purification, and ice should be artificially made from purified water.

Ice should no more be handled by bare and soiled hands or by dirty gloves than drinking water should be poured over such hands or gloves into the water holder. The use of ice tongs should be insisted upon.

11. Water tank—The water tank should be shaped and placed with reference to easy access to its interior for cleaning. It should be frequently cleansed and periodically sterilized with boiling water or otherwise.

12. Drinking Cups—The public should be discouraged from using common drinkihg cups, and educated to use individual cups. To this end, a conspicuous notice might well be posted at the drinking fountain cautioning passengers against the danger of the public cup, and parafined paper cups, might be supplied by a "cent-in-the-slot" device.

The vertical jet method of furnishing drinking water—in successful use in some buildings in this country—is the safest conceivable and the best, aside from the difficulty of adapting a jet to all ages, and from the waste incident to its use by many unaccustomed to drinking water jetted into the mouth.

13. Food—The use of canned goods in buffet car service makes careful inspection of such goods imperative. Reports of sickness directly traceable to canned edibles served on trains have occasionally reached your committees. Fruits and all edibles should, before and after purchase, be stored with care to avoid all unnecessary exposure to street and car dust.

14. Fouling of Cars—Cars should be protected against all unnecessary fouling. The filthy habit of spitting on car floors should be dealt with in a manner to cause its prompt discontinuance. The nastiness should everywhere be made punishable, and should be punished as one of the most

flagrant of the thoughtless offenses against the public righ to health. Prohibitory notices should be posted in all cars and suitable and sufficient cuspidors should be provided for the use of passengers. The experience of street car conductors show that a great reform can be wrought in this matter without serious difficulty.

15. Station Premises—Station premises should receive attention direct to general cleanliness of floors, furnishings, air, sanitaries, lavatories, platforms and approaches, and should be plentifully supplied with approved disinfecting material, and with pure water and safe means for drinking it."

VI

TYPHOID FEVER

The amount of typhoid fever that exists in any given locality is largely, if not wholly, the measure of the efficiency of methods of disinfection in some previous case. The patient may have been miles away—in the country or upon the mountain side—and the city or village whose water or milk supply has been contaminated with the infected stools or other secretions from the patient suffers the consequences.

Typhoid fever is a very serious, lingering and largely fatal disease, and only exists by the too often criminal carelessness of those whose duty it is to prevent its spread by proper disinfection.

The cause of typhoid fever is indisputably and definitely settled, and so generally recognized that there is a growing conviction among sanitarians that it has no right to exist among intelligent people.

It is not usually considered a contagious disease in the sense that smallpox and measles are, yet it has been fully and frequently demonstrated that foul odors, arising from soiled bedding and clothing, and from typhoid excreta, can and have produced the disease in others.

The theory held and promulgated by the most eminent sanitarians, and most careful and conscientious observers is that the disease is the result of a special contagium.

It is further demonstrated that this specific poison is always present in the discharges from the bowels of typhoid fever patients, and possibly in that from the kidneys. It is generally believed that these excreta are comparatively innocuous when first discharged, but that soon after, by a peculiar fermentative process they acquire their dangerous character.

This disease germ, or contagium, of typhoid fever is not only developed or vitalized after being thrown from the bowels, but seems to be indefinitely multiplied under the favoring conditions of heat, moisture and filth.

It is a well admitted fact that in a large majority of instances the disease germ is introduced into the intestinal track by means of food and drink—especially by contaminated water. The discharges are thrown into the privy-vault, or as was the case in the terrible epidemic at Plymouth, Pennsylvania, upon the ground—in either case, by percolation or by drainage, finding their way into the family well, or into the public reservoir. The drinking of this water; its use for cleansing (?) milk-cans, or for diluting milk; or the use of milk that has been exposed to air contaminated with the typhoid poison; the dissemination of sewer gas charged with noxious fever germs throughout dwelling houses badly plumbed; and the leachings from decomposing typhoid bodies into wells contiguous to cemeteries, are the more common and direct means by which the disease is propagated. There are cases on record where typhoid discharges were thrown upon the manure pile during the winter. The disease germ survived the rigors of winter, and when the heat and moisture of spring came, those who removed the manure were stricken down with the disease in a most malignant form.

In the case at Plymouth, referred to, the discharges from a typhoid fever case were thrown upon the frozen ground and snow, and in March the melted snow laden with the disease products of these excreta, found its way into the reservoir, and thence to families supplied with this water. The result was, in a few days one thousand one hundred cases of typhoid fever occurred, one hundred and seven of whom died. The causes leading to this outbreak were most thoroughly investigated, with every possible source of error eliminated, by the local physicians, as well as by physicians of Philadelphia and elsewhere, and the unanimous and indubitable conclusion was reached that it had its origin as above stated.

It has been demonstrated that the disease is most prevalent when the water used for drinking purposes is taken from wells in which the water is very low—the poison produced by the fever germ thereby being rendered more concentrated, and hence more noxious.

It is especially important that the fact that the presence of the special contagium of typhoid fever is necessary to produce the disease be kept in mind, since there are so many well authenticated cases where water highly polluted has been used, and though other filth diseases resulted, typhoid fever did not occur until the water became contaminated with the specific contagium.

The germ theory of the cause of typhoid fever is now *universally* admitted, and there is, at the present day, no better working theory from a sanitary point of view.

Typhoid Fever from Milk—There have been several notable epidemics of typhoid fever in this and other countries, caused by the contamination of milk. The disease germs are imparted either by the absorption of noxious exhalations from sewers or from the soiled body linen of typhoid patients.

From the foregoing statements relative to the cause of typhoid fever, it is apparent that there is no sentence, nor number of sentences that so happily and aptly expresses the most complete sanitary environment as the old one of Hyppocrates—"pure air, pure water and pure soil."

Prevention—Whatever will most promptly and efficiently prevent the contamination and promote the purification of the air, water and soil, naturally suggests itself as the best means of preventing and restricting the spread of typhoid fever.

The Hygienic Council of the French Academy of Medicine, fearing direct contagion, demand in all cases (1) isolation, (2) aeration of the chambers, (3) disinfection of the evacuations, (4) disinfection of the clothing, (5) disinfection of the room.

If the following rules were faithfully practiced, the number of cases of typhoid fever would be greatly lessened, and in time, the disease would be stamped out:

I. Strict cleanliness of homes and surroundings, including the burning of decaying chips and saw-dust, and the removal of decaying vegetables from the cellar.

II. Have all sewers and drain pipes connecting with the premises well trapped, and cess-pools and privy-vaults abolished, or at least one hundred feet from any well used for drinking or dairy purposes. The use of the dry-earth closet is greatly to be preferred to the ordinary privy-vault.

III. Isolation of the patient should be as rigidly enforced as possible, as much for the good of the patient as for that of the public. The drinking water, sewer connections and milk should also be critically examined with a view to ascertain the origin of the disease. Every case should at once be reported to the local board of health, as dangerous to the public health.

IV. All discharges of the patient should at once be disinfected, by being well mixed, a solution of corrosive sublimate (two drachms to one gallon of soft water), or with a solution of copperas (three pounds to a gallon of warm water), and if possible, buried

rather than thrown into the sewer or privy-vault. The corrosive sublimate solution, in the strength given above, should be kept in a large bottle or demijohn, properly labelled, and given to the nurse. Each evacuation immediately after its passage, should be covered with this solution and allowed to remain for fifteen minutes. A small quantity should be kept in the bed-pan in the interval of its use. Patients in no stage of the disease, even if able, should be allowed the use of the water-closet.

V. The water and milk used for drinking purposes during the run of the disease in a family should be boiled, and *the sale of milk from such infected premises should be prohibited.*

VI. Disinfection of clothing and bedding which can be washed, can be done in no better way than to put it through the ordinary operations of the laundry. Boiling for an hour will destroy the vitality of all known disease germs. Soiled clothing on removal from the person or bed of the sick should be *immediately* immersed in boiling water, or in a solution of corrosive sublimate (two drachms to one gallon of soft water).

VII. After death or recovery, the thorough disinfection and fumigation of the patient's room, and all its contents, should be enforced. To fumigate a room effectively, three pounds of sulphur should be burned in a room ten feet square. Every opening in the room, including flue, except one door, should be closed tight, and the furniture and contents of the room so arranged as to admit, as far as possible, the contact of the fumes on all sides. The sulphur should be placed in a shallow iron pan, and these on a couple of bricks in a tub containing water. Coal oil or alcohol should be poured on the sulphur, and a match applied. The person igniting the sulphur should at once leave the room, as the fumes are highly poisonous; and the door should be tightly closed. The room should remain closed twenty-four hours. A great many, with large experience and careful observation, place but little confidence in the sulphur fumigation. It is, if effectual at all, only so when done *thoroughly.* A more certain method, though destructive to wall paper, is to thoroughly wash the walls and woodwork of the room with the corrosive sublimate solution (two drachms to one gallon of warm water). After washing the wood-work, a coat of paint and varnish would "make assurance doubly sure."

VIII. The privy-vault and cess-pool, if any, whether the disease is present or not, should be disinfected at least *once every week* with a solution of copperas (one and a half pounds to a gal-

lon of water). One of the best and cheapest disinfectants is chloride of lime, which can be used in the proportion of one-fourth pound to a gallon of soft water.

IX. Good food, proper clothing, the avoidance of over work, mental or physical; in fact, whatever conduces to the best physical condition, contributes most largely to the powers of the system to successfully resist the encroachments of this disease.

There have been outbreaks of typhoid fever in a great many places in Iowa during the biennial period—in several places assuming epidemic proportions. Unfortunately the disease appeared in two of our public institutions, the Hospital for the Insane, at Independence, and at the Iowa State College, Ames. Drs. Hill and Harriman have kindly furnished reports of these outbreaks for their respective institutions.

IOWA STATE COLLEGE—REPORT OF THE SECRETARY OF THE STATE BOARD OF HEALTH

At the personal request of Mr. Hungerford, of Carroll, president of the board of trustees of the Iowa State college, Ames, I visited the institution October 26th, and by the personal assistance of President Beardshear, Professors Weems, Marston and others, made a thorough examination of the east and west cottages, the main building and Margaret hall, with the view of determining their sanitary condition, and also carefully inspected the water supply and system for disposal of sewage. President Beardshear accompanied me through the cottages and part of the main building used for recitations and as a dormitory. The east cottage did not impress me as being in good sanitary condition. The rooms were rather small and occupied by from two to three students each, sleeping in bunks one above the other with curtains hanging against them in front. The rooms are not well ventilated, the only means being by windows and a transom over the door opening into a hall running from one end of the building to the other. This cottage has three floors occupied, the upper floor having transoms over the door about 12x12 inches.

The west cottage I found in better condition, both as regards cleanliness, comfort and sanitary conditions, and the same may be said of the main building.

Margaret hall I regard as a model structure for the purposes intended. The rooms used as dormitories, by the ninety-six women occupying them, are large, well lighted and ventilated, and not over-crowded, and everything was neat, clean, and so far as could be found, in perfect sanitary condition.

The water supply is from a well twenty-two hundred and fifteen feet deep, and the water is stored each day in a high, closed iron tank, with a capacity of one hundred and sixty thousand gallons. The daily consumption for all purposes is ninety thousand gallons, so that if the tank were filled it would be entirely exhausted in less than two days. With the tank half full there is a pressure of fifty to sixty pounds to the square inch in the water main, thus making it impossible, should there be any leak, for germs to enter the mains.

The sewage, kitchen and laundry wastes are carried in cemented, glazed sewer pipes to a safe distance from the building on the college grounds, and are finally disposed of, after passing through a septic tank, by a modern and highly commended system of intermittent filtration—the effluent from which is a water clear and sparkling and free from odor. There are some interesting details in connection with this system of sewage disposal that I would be pleased to note for the benefit of others, but cannot here.

In addition to a careful examination of the buildings, water and food supply and the disposal of sewage, while on the grounds and since returning to the office, I have endeavored faithfully and impartially to get all the facts possible relating to the unfortunate outbreak of typhoid fever so as, if possible, to determine without doubt the source of the disease.

I have corresponded with Mr. Briley, a farmer near Ontario, from whom a part of the milk supply was obtained, and who during August and September had a daughter sick in his home with typhoid fever; with Dr. C. S. Hutchinson, of Ames, who attended the girl; with Hon. L. B. Robinson, of Harlan, a member of the board of trustees of the college who in behalf of the board spent three days on the college grounds in an endeavor to arrive at the cause; with Dr. W. E. Harriman, the medical officer of the college, having charge of the patients; with Professor Weems, who reports the results of analyses of water taken from nine different sources as follows: Skelton's well; Peterson's watering trough and well; Pritchard's tank and well; Briley's deep (180 feet) and shallow (forty-five feet) wells, and from the college laboratory and kitchen outlets. The first seven sources named were from farmers furnishing the college milk supply. I also have the report of Professor Macy, of Highland Park, the chemist of the State Board of Health, showing the results of his analyses of the same water. I have also the bacteriological reports of Professor Pammel, of the Iowa State college, and Dr. Eli Grimes, of Des Moines, the Bacteriologist of the State Board of Health. I have a communication from Mr. Henry Wallace, editor of *Wallace's Farmer*, in which he suggests the college water-supply as the possible cause of the disease, and a report of the college engineer regarding the insertion of a valve in the water main of the college.

After weighing carefully all the evidence in connection with my own personal observations I am fully convinced that the Briley milk was the cause of the outbreak.

My reasons for arriving at this conclusion are as follows:

1. The unsanitary condition of the east cottage must be eliminated as a factor in causing the disease, from the fact that no larger proportion of the students in this cottage were attacted than of the women in Margaret hall with all its sanitary advantages.

2. The cause cannot justly be attributed to the water supply. The college administration—the president, professors, their families, etc.—consisting of about two hundred persons, did not have a case of the disease.

Of the forty-two cases treated on the college grounds, forty were students—one, Mr. Prall, a sub-professor, and one a kitchen girl at the college dining hall. *All* these patients boarded at the dining room in Margaret hall, and all drank milk. At the time the water was reported "roily," and when the repair was made in the water main, the school was in vacation—only the Campus residents using it, none of whom, as above stated, contracted the

disease. If the water were the cause it would be reasonable to conclude that at least some of the administration and faculty, who used it continuously, not only when the school was in session, but during vacation, should have contracted the disease.

This negative argument in favor of the college water supply is strongly supplemented by chemical analysis and bacteriological investigation. Professor Pammel has furnished me a detailed report of his findings. Omitting details and speaking of organisms found in the college water supply, taken at different points, he says:

"It was a significant fact that morphologically none of the species found indicated either *coli-communis* or *bacillus typhosus* in the college water supply.

"Of the oft-repeated statement that sewerage contamination might have occurred, I wish to state that the writer, together with Proressor Marston, climbed to the top of the tower and investigated conditions, and everything was found it in its usual good condition. There was certainly no indications of growth of algæ on the water, nor were there any indications of other filthy condition. In fact, the water and everything connected with it seemed to be in an ideal state.

"The statement has also been made that, owing to the fact that the college at different intervals used the supply from the spring, in this way it became contaminated. An investigation of the college spring water, as well as of the different hydrants and cisterns, those of Professor Stanton, Professor Marston, and the old Sexton well, indicate, usually, good water, with the exception that in the Curtiss well and the Sexton well gas was produced, but this undoubtedly came from the surface soil. The spring water showed no gas whatever, nor was any obtained from the hydrants, which was next to the spring."

The bacteriological examination, by Dr. Eli Grimes, of samples of water taken from the college laboratory and the kitchen the 26th of October, failed to detect any sewage contamination, or the presence of typhoid-producing germs. This much for the college water supply, from a bacteriological standpoint. The same might be said substantially of the water supplies from all the other sources as examined, except that from the Briley shallow well. Of these samples, Professor Pammel says:

"In conjunction with Dr. Weems and Mr. McKinley, on another occasion, the writer collected samples of water at the Briley well, and at one time Mr. Faurot collected samples. It is a suggestive fact that the first time that we collected this water, and the second time when Mr. Faurot collected it, we got an unusually large number of germs per cubic centimeter. Various specimens were found. Some of these have been excluded as having no connection with *bacillus typhosus* or *coli-communis*. On the other hand, there are a number of species that belong to the typhosus group, culturally, so far as has been carried out, but as it is extremely difficult to run these species out on short notice, you will appreciate that more time will be needed to report on this fact: * * *

"In regard to the condition of the well it looks as though the water could easily have drained off from the surface, but nevertheless upon removing some of the boards from the top of the well I found that water might easily have entered between the cracks of some of the boards. In fact I found moisture upon the upper tile so that one could readily see how that *coli-communis* or other foreign organisms could get into the water. Gas was produced in one tube poured by Mr. Faurot and a slight amount in another. In this case we made the usual test. We also obtained gas from the first plates that we poured."

Dr. Grimes' bacteriological examination of the samples furnished by Professor Weems were numbered respectively 1-9 both inclusive. No. 4 was the Briley water and No. 6 Peterson's watering trough. Dr. Grimes in his report says, "The number of bacteria per cubic centimeter was not determined owing to the age of the sample. Examination for color bacilli. Nos. 1, 2, 3, 5, 7, 8, 9, none. Nos. 4 and 6 present. This shows sewage contamination in 4 and 6, but no evidence of contamination in the remaining seven samples. (The college samples were 8 and 9 - Secy.) * * * The conclusion can be reasonably drawn that 4 and 6 are bad."

In speaking of the fact that he was not able to find the typhoid bacillus in the milk, Professor Pammel says: "In milk we are dealing with such a large number of species that it would be a mere accident to discover the organism. As said heretofore, it seems to me to be reasonable that the milk has formed a favorable medium for the growth of the organism, and be it specially remembered that Mr. Briley, from his own testimony, failed to wash the cans with boiling water, as should have been done. The milk cans could easily have been contaminated, and the failure on his part to wash the cans with boiling water, it seems to me, made it not only possible but probable that these germs were propagated in the milk." Professor Pammel says in conclusion: "A comparison of the water of the Briley well and the college effluent shows that the Briley well had a greater amount or contamination than the college effluent from the sewage filter beds:"

The chemical analyses by Professor Weems and Professor Macy, independently of each other, of the Briley shallow well, showed a high state of pollution, while the college water was shown to be excellent.

Believing the foregoing will be sufficient as to the sanitary condition of the college buildings, the water supply and the sewage disposal, I will take up:

3. The Milk Supply for the Margaret Hall Dining-room—At the time of the outbreak and for some time previous the milk was obtained from four dairies—farmers living near Ontario, Skelton, Peterson, Pritchard and Briley. Milk had been received from Briley during the fall, 1899, but complaint was made as to its keeping quality, but no contract made for 1900. In February, 1900, however, milk was again taken, but soon stopped for the reason given above. September 3, 1900, the Skelton supply being short, Briley again supplied the college. The average amount supplied was seventy-five pounds—six days prior to September 20th the daily receipts were as high as one hundred pounds. October 17th the Briley milk was discontinued, and all milk received after that date was sterilized.

The dining-room contains sixty tables, with eight students at each table. About three pounds of milk were served at each table, except to the tables occupied by the football team, who were given six pounds to the table, as they were encouraged to use a milk diet largely. In this connection it must be noted and borne in mind that no one who did not use of this milk contracted the disease, and that of the football team who used double the quantity fully fifty per

cent. took typhoid fever. Inasmuch, therefore, as any unsanitary condition of the buildings, the college water and the water at other points from which the milk was obtained, except Briley's, and the sewage disposal, must be eliminated as probable factors in producing the disease, since all were subjected to the same conditions, and, further, inasmuch as only those using the milk in Margaret hall dining-room contracted the disease a reasonable inference is that contaminated milk was the cause—especially as many similar outbreaks have been traced to the same cause. The question naturally arises, "Whose milk was it?" The following circumstances lead me to conclude that it was the Briley milk:

(a) The Briley milk was discontinued twice because of its poor keeping qualities, indicating the introduction of some agent that was injurious to it.

(b) The condition of the water showing sewage contamination in the Briley shallow well, and the use of this water for washing the cans—some of which most probably remained in the can, thus polluting the milk.

(c) Mr. Briley informed me that his daughter was taken sick with what Dr. Hutchinson, of Ames, called typhoid fever, August 3d. Dr. Hutchinson, who attended her, confirms this statement. Both say that a nurse was employed; that the discharges were disinfected and emptied into a pit two hundred feet from the well, with fresh earth raked over it each time; that at the same time the milk was furnished to the college Mr. Briley furnished one hundred and seven other persons with milk, and that none of these had typhoid fever. Mr. Briley stated that railroad men grading along the Chicago & North-Western railroad used freely of this shallow-well water, none of whom contracted the disease.

As offsetting these statements, however, it must be remembered that the existence of typhoid fever in any home, even with the best of care, is such a menace that the State Board of Health forbids the sale of milk or butter from dairies or homes where there are cases of any infectious disease. There is never an absolute assurance that disinfection has been so efficient as to destroy all disease germs. The vessel, after being emptied of its contents, might have been taken to this abandoned well and rinsed, and thus typhoid germs be introduced into a water that would afford, as shown by bacteriologic and chemic examination, a favorable medium for their multiplication. During the run of this disease there were a number of heavy rains that by some sub-soil communication may have carried the unsterilized germs into this well.

(d) In regard to the railroad men who drank of the Briley water Dr. Harriman says: "It develops that five of these men are now sick or have been sick this summer of typhoid fever. I am unable to furnish names and other data, owing to having only recently learned of their sickness and because of a lack of time."

Dr. Harriman further says: "Mr. Briley states that he furnished milk to one hundred and seven people residing off the campus, none of whom contracted the disease, but as a matter of fact three men went home sick from these places, and two are known to have had typhoid fever. In regard to the other, we have, at present, no definite knowledge. The two mentioned are Fred Hoeye, of Perry, Iowa, who boarded at Overhulser's, and W. S. Nichols, who boarded at Manheart's. The small number involved here is explained by the fact that most of these people used milk only in hot tea or

coffee—drank none as a beverage. Indeed, only at two places (Overhulser's and Manheart's) was milk used as a beverage; furthermore, the milk was kept in the patrons' cans, and not those of Mr. Briley. It is stated by those who have examined the milk that there was a great difference between this milk and that supplied to the college. Another significant fact bearing upon this matter is that of age. Many of the people in this list of one hundred and seven are above 45 years old—an age not especially predisposed to typhoid."

There were forty-two cases in all treated by Dr. Harriman—two of whom have died. The period of incubation is usually from two to three weeks.

Dr. Hutchinson says he began the treatment of the Briley girl August 4th and made his last visit, she recovering, September 10th. September 3d the college resumed the use of the Briley milk, having stopped it in February preceding. The disease made its appearance in the college October 8th, with three cases and subsequent cases occurred as follows: October 9th, one case; October 10th, two; October 11th, four; October 12th, seven; October 13th, two; October 14th, three; October 15th, seven; October 16th, three; October 17th, one; October 19th, two; October 20th, one; October 24th, two; October 27th, two and November 4th, two. The Briley milk was discontinued October 17th. It was expected that cases might occur in reduced numbers for three weeks from that time. The above record shows the last case occurred three days short of the three weeks.

Some parties have expressed doubt as to the disease being typhoid and in some instances where students have gone home it is reported that their attending physicians have pronounced the cases malaria. There is no question as to the character of the disease as treated at the college. They have been seen and examined by Drs. Priestley, of Des Moines; Wright, of Carroll; Harriman and Littig, Iowa City; Owen, of Williamsburg; Burton, of Colchester, Ill., and Dyer, of Gilbert, all of whom have not hesitated to pronounce it typhoid and unusually severe in type.

There is much more that might be said in support of the milk theory of infection, and in favor of the contention that the Briley milk was unfortunately the culpable agent.

The lesson to be emphasized is that food stuffs should not be sold from places where infectious diseases exist.

I ought to say perhaps before concluding, that the college authorities are not to blame for the sanitary condition of the east cottage referred to. They are, in the growing attendance upon the college, confronted by a condition that the legislature must meet.

J. F. KENNEDY,
Secretary.

DR. HAMINAN'S REPORT

This epidemic occured at the State College of Agricultural and Mechanic Arts at Ames, Iowa in the fall of 1900.

The total number of cases was sixty-five. Of this number twenty-three went to their homes at the onset or early in the disease. Forty-two remained to be cared for at the college.

GENERAL ENVIRONMENTS

The college is located one and one-half miles from the town proper. It is situated on a one thousand acre plot of high rolling land, provided with

most excellent natural drainage, abundant exposure to sun and wind —and altogether one of the most naturally healthy spots in the state. The buildings are large and well constructed. Fitted with first class plumbing, water supply and sewage disposal—in short, are in good sanitary condition.

The enrollment of students at the time of the outbreak was about nine hundred. Many of them roomed at the various college dormitories. Margaret Hall, a building devoted to the lady students, contains also a large dining hall. Most of those students who roomed in college buildings, and a few additional students and faculty assistants, took their meals at this dining hall. Of those remaining, some lived in the dormitories, and dined outside the college, others both roomed and boarded entirely off the campus in private residences near the college or in the town proper. But all used the one water supply, closets, etc., while on the grounds.

This definite knowledge of the whereabouts, and customs of the entire student body rendered possible a systematic study of atiologic factors and warrants a somewhat detailed narration of the events which led to the discovery of the source of infection.

When it became apparent that the college was in the face of an epidemic, there was instituted a renewed study of the existing sanitation, and a determined search for the origin of the disease.

The problem was approached from the following vantage grounds:

First—sewers and sewage disposal; *Second*—water supply; *Third*—food supply; *Fourth*—all other possible sources.

SEWERS AND SEWAGE DISPOSAL

The closets of the various buildings, the laboratories, the creamery, the laundry and kitchen in Margaret Hall, as well as many of the faculty residences, are connected by individual outlets, with the main sewer. The sewers are of the most approved sewer tile, comparatively new and were constructed under the direct supervision of most thoroughly competent sanitary engineers. The plumbing is of the best, modern ventilated traps are used throughout, and are supplied with arrangement for abundant flushing. It has been the custom during the college term to give the sewers an extra flushing at least once each week. The system was inspected without the discovery of any defect whatever. No leak could have existed without detection to quantitative measurements of sewage, and other sewage experiments which were there in progress.

The sewage disposal system is that known as the septic tank and intermittent filtration process. This is the most modern and satisfactory system in use to-day. It is so successful that after the sewage has passed through the septic tank and through the bacterial filter beds, the effluent can scarcely be told by its appearance from the clearest sparkling well water. The principle upon which the plan depends entails the process of septic precipitation and bacterial consumption, combined with simple filtration. Time forbids a detailed account of the plant, within the confines of this paper, but for those who care to familiarize themselves with the system, reference is here made to complete explanation and description of the same by Professors Marston, Weems and Pammel of the college. A copy may be obtained of Prof. A. C. Marston, Ames, Iowa. Suffice to say this plant was in most perfect condition and was heartily approved by Dr. J. F. Kennedy during his inspection of the entire college premises.

THE COLLEGE WATER SUPPLY

The water is pumped from a well 2,215 feet deep, into a large, tightly closed tank 160 feet above the surface, and is piped to the various college buildings and residences on the campus. The tank when filled contains one hundred and sixty thousand gallons. The daily consumption of water is 90,000 gallons. So that if the tank were completely filled, the regular demand would exhaust the supply in less than two days. However, as a rule, the tank is kept about half full, hence practically each days supply is freshly drawn from over 2,000 feet below the surface. When the tank is half filled, there is a pressure of sixty pounds to the square inch in the mains. Had there been even such a misfortune as a leaking main passing through a veritable culture bed of typhoid bacilli, the water would have found constant exit through the tank with such force as to have positively precluded the possibility of bacillary entrance.

The water had been examined each year, and always found in good condition. But not content with this, and the above negative evidence, it was again subjected to thorough chemic and bacteriologic tests and found to be in an exceptionally high state of purification. These analysis were made by Professor J. B. Weems, of the department of Chemistry, and Professor L. H. Pammel, college bacteriologist, and were confirmed by Professor Macey and Doctor Grimes, respectively, chemist and bacteriologist of the Iowa State Board of Health.

Failing to locate the difficulty in the college water supply, attention was called to the

BOARDING DEPARTMENT

Here, nothing leading to a clew was discovered until, in the investigation of food and its sources, there was reached the important item of milk.

THE MILK SUPPLY

At the beginning of the term, the college had contracted with one Skelton and one Pritchard (farmers near the college) for the necessary supply. But on September 2d, Mr. Sketon's supply having partially failed, he arranged with one Mr. Briley (another farmer), to make good the deficit. Mr. Briley did so, and in large amounts, from September 3d, to October 17th. The greatest amount having been delivered during the week from September 15th to 24th.

At the mention of the Briley milk the recollection at once occurred to the author, of the existance, nearly all summer, of a severe and prolonged case of Typhoid fever in the family of Mr. Briley. The case occurred in the practice of Dr. C. S. Hutchinson of Ames, who assured me of the correctness of diagnosis. Acting upon the suggestions of this coincidence the Briley milk was rejected in-toto, and all other milk subjected to Pastureization prior to its use. Investigation was further continued, but it was very interesting to note in this connection that the last case was bedridden November 3d, three days less than three weeks (usual limit of period of incubation) from the date on which the Briley milk was condemned.

ADDITIONAL WATER EXAMINATIONS

Specimens of water were obtained from Skelton's, Prichard's and Briley's wells, the latter having two wells. Both chemists and bacteriologists pronounced all the specimens free from suspicion except that from the shallower one of the two Briley wells. This water is said to have contained over 180,000 germs to the cubic centimeter—among them a bacillus somewhat resembling Eberths bacillus—if not that identical organism, it was at any rate a member of the typhosis group. Prof. Pammel condemned the water emphatically. Regarding the chemic condition of this water, Prof. Weems reported as follows:

"The Briley wells two in number are situated about four feet apart. One having a depth of 180 feet, and the other 45 feet. The 180 foot well showed chemically to have water of excellent quality. The shallow well is, on the other hand, evidently contaminated from some source. The excessive amounts of nitrogen as nitrates and nitrates, and also chlorides, would indicate that some vault or outhouse was the cause of contamination. The results also indicate that a large amount of the organic matter in the original source of contamination had been oxidized by the process of nitrification. The water was in worse condition than the effluent of the college sewage beds." He continues further: "From a chemical consideration of the matter the conclusion of the investigation shows that the Briley shallow well is evidently the cause of the trouble, as it probably is in connection by some underground means with a vault. It would naturally result that should typhoid bacilli be introduced into the vault or outhouse the underground connection would transmit them to the well readily through the tile casing of the well. And the use of this water for washing milk cans and watering the milk would transfer the germs to the individual using the milk."

Mr. Briley admitted that he did not scald the milk cans, hence if bacilli were present in the water nothing hindered their development in the cans.

FURTHER FACTS REGARDING THE MILK

The milk collected in these unscalded cans was delivered at the college once each day, about 8 or 9 o'clock A. M. It was kept all day and used for supper, thus allowing an abundance of time for the development of bacilli. Owing to its tendency to sour easily it was kept separate from the other milk. The cook drew from this supply for cooking purposes but the greater portion remained to be used for supper.

The dining room contained 61 tables, with eight persons per table, making the total of 488 people in the dining room served at the same time. Three pounds of milk was served to each table except numbers 58 and 59, the patrons of which received a double portion, six pounds each. These were known as the training tables being patronized by sixteen football men in training— as fine specimens of muscular development and general physical resistance as one could wish to see. These students were encouraged to use their double portion of milk and it is a painfully significant fact that thirteen of those sixteen great, powerful fellows contracted typhoid.

Some of the Briley milk reached various parts of the room but a greater portion was distributed in the west half, and a greater number of cases occured among those at that end. The younger students, many of whom were recently from rural homes, occupied this section, and being accustomed

to the use of milk at home as an acceptable food doubtless drank more than the older students. There were no cases among those who did not drink raw milk, and in every instance of sickness, upon interrogation regarding the milk, the patient replied that he had drank milk freely.

Whether the Briley well water contained the organisms and the milk became in this manner infected, or whether by flies passing from the dejecta to the milk cans in a tank near by, will never be positively known because of the destruction of the bacteriological laborator and its contents by fire. Isolation experiments with the milk and with the Briley water were in progress when the disastrous fire occured in the main building and destroyed all cultures and further means of determining the exact method of infection of the milk. But in the light of the above facts there can be no reasonable doubt as to the infectiousness of the milk, from whichever of the two sources it may have originated.

The following is the report of the outbreak at the hospital at Independence, as furnished by the superintendent:

INDEPENDENCE, IOWA, September, 14, 1901.

J. F. Kennedy, M. D,. Secretary Iowa State Board of Health, Des Moines, Iowa.

MY DEAR DOCTOR—In accordance with your request I make report to you concerning the epidemic of typhoid fever at the hospital at Independence in 1900.

The records of this hospital show there were deaths from typhoid fever in the biennial period as follows: One in the second, two in the third, two in the seventh, nine in the thirteenth, one in the fourteenth and thirty in the fifteenth.

Two male patients were admitted in April, 1900, each of whom had a mild attack of typhoid fever immediately after entering the hospital. Seven cases were put to bed on account of this disease in July, seventy-one cases in August, 101 in September, thirty-three in October, eight in November and three in February, 1901.

In this total of 233 cases, 111 were male patients, seventy-seven were female patients, nineteen were male employes, fifteen were female employes and one was the wife of the Superintendent. Besides the deaths among the patients one female attendant was lost.

Somehow the water in the pipes, which has always been used with impunity to quench thirst, became impregnated with the germs of this disease. During the hot weather of June and July, 1900, this water was freely drunk, especially by patients and employes who were at work, so that in August the epidemic manifested itself in an extensive and serious manner.

In spite of the best care that could possibly be given these numerous cases there was a death rate of thirteen per cent. It is believed that by carefully watching the condition of the pipes, and by not drinking it when chemical and microscopic tests prove that it is dangerous, we will avoid typhoid fever hereafter.

Beginning on the top of page 140 of the second volume of the *Bulletin* of Iowa State Instutions you will find an article on this subject written by Dr. Boody.

Again, in July, 1900, as during the first two epidemics in 1896 and in 1898, the source of infection became a mooted question. The milk which

was produced on the farm was thought of as a possible carrier of contagion. Careful bacterologic examination carried out in every detail, as in the water tests to be described further on, proved the milk to be uncontaminated.

Specimens of water were collected into sterilized flasks, from the taps in all parts of the institution, also water with a silt-like sediment from the bottom of each standpipe, and 50 c. c. from each transferred to carbol-bouillon in flasks. After remaining twenty-four hours in the incubator, the bouillon in each flask presented a milky appearance, thus showing a marked growth of some kind. Under the microscope each of these live bouillon cultures was found to contain some sphero-micro-organisms,some very long thick non-motile rods, many bacilli, which in size and in every way, with the exception of the absence of the power of motility, appeared much like typhoid bacilli, and also many very motile rods, which, with the same magnification, were identical with parallel bouillon cultures from the stock of cultures of pure typhoid bacilli kept in the laboratory for the purpose of making Widal's blood serum tests. After careful study of all the cultures of the same generation and of many subsequent generations in this way, with the result that at the end of the step the motile rods had been constant, that they did not lose their identity and that they did not lose their points of similarity to the known cultured typhoid bacilli there seemed scarcely room for doubting that they were typhoid bacilli. The non-motile rods remained constant throughout all the generations cultured in carbol-bouillon, while the sphero-micro-organisms disappeared. This fact led to the belief that they might be colon bacilli. Stroke and spread cultures were now made on agar, and numerous single colonies were picked off, and as many separate tubes of Parette's hydrochloric acid carbol-bouillon inoculated, with the result that there were growths in each. Agar tubes were again inoculated and also plain bouillon tubes. The growths in some of these tubes, both agar and bouillon, were identical with the parallel growths of the known typhoid bacilli. Litmus milk was then inoculated from the agar and bouillon cultures of the suspected typhoid bacilli and it remained unchanged, thus proving them to be non-acid producing like the known typhoid bacilli, while innoculation of the known colon bacilli into litmus milk gave acid reaction, which is characteristic of this bacillus. The growth of the organism on potatoes was typical, stab cultures into glucose agar generated no gas in the path of inoculation and plain bouillon cultures reacted perfectly to Widal's blood serum tests, thus positively proving them to be typhoid bacilli. Other heavier colony cultures into bouillon and onto agar were proven, by subjecting them to tests, to be colon bacilli. *The source of infection was thus positively determined.*

Within the past few weeks the water was again subjected to the same rigid examination with the same results. It was found, however, that spreading cultures onto agar plates from very dilute plain bouillon cultures is a much more practical way of getting single colonoies of the different organisms than by culturing onto agar in tubes and into gelatine plates. A few drops of a very dilute plain bouillon culture are spread onto an agar plate and carefully spread over its surface by a sterile rod bent at right angles, so that an inch or more of the rod will touch the surface at the same time, while it is gently and rapidly drawn over the agar surface.

During the epidemic last year, as soon as we were convinced that the

drinking water was the source of the disease, sterilized water only was used for drinking purposes. This spring and summer well water has been used. There have been no cases of tophoid fever here this season until the beginning of September, when four cases developed at once, one male and three females, located in different parts of the hospital. None of these cases have died up to date (September 14) and there have been no deaths from other causes so far this month, and the health of the patients has been remarkably good during the past spring and summer.

My theory is that there have been typhoid fever germs in the water pipes of this hospital for years; having got there by means of faulty plumbing and making it possible for water in some of the bath tubs to flow back into the cold water pipes, in case the latter happened to be empty, which condition has occured occasionally when the water supply from the city was insufficient. The plumbing in this institution, for the most part, is the same in kind and condition that it was when placed twenty-five or thirty years ago. I expect a good sized appropriation from the next legislature, which is badly needed, and if secured will be used to overhaul all of the bath rooms and water closets in the institution, to wainscot the walls with marble, place the most approved water closets everywhere and substitute almost wholly for bathing purposes showers instead of tubs.

When these changes are made and we secure an ample supply of pure water from an artesian well, it is believed that we shall thereafter be entirely free from typhoid fever.

I am, very respectfully yours,

G. H. Hill.

VII

VITAL STATISTICS

Births, marriages and deaths constitute the most important events in life, and their record and tabulation constitute vital statistics. A correct record of these causualties form the basis for many important calculations, while their faulty record is misleading and worthless. Twenty-one years ago the Iowa State Board of Health was organized, and one of its specified duties under the law was to supervise a registeration of births, deaths and marriages; and the proper machinery was provided for collecting the necessary data. There were defects in the law, however, and the results were unsatisfactory. Births and deaths were to be reported by physicians in attendance to the county clerk within a specified time, and these data together with the returns of marriages, were to be reported to the Secretary of the State Board of Health.

The law was never popular with the physicians, as it entailed considerable labor and often great inconvenience with no compensation therefor. The result was that the reports of births and deaths were not even approximately correct. The blanks were suitable and the returns apparently correct so far as they went, but for the reason above stated many such returns were not sent in at all. To secure better records, by removing the most objectionable feature, bills were from time to time introduced into the legislature to provide even a modest fee to physicians and midwives making such returns, but these bills never found favor.

To remedy the matter an expedient was resorted to by the legislature that has only made matters worse. The physicians were releived from their obligation under the law to report these causualties, and it was made the duty of the county auditor, through his assessors, to collect these records for the year ending December 31st immediately preceding and to furnish them to the county clerk, who on or before June 1st of each year is required to send them to the Secretary of the State Board of

Heath. This duty though specified by the statute has been sadly neglected by the assessors though the proper blanks have been regularly put into their hands.

So patent is this neglect and failure that the State Convention of County Clerks, held in this city some time since, unanimously declared itself in favor of the repeal of the present law and a return to the old law or such modification of it as will insure correct statistics.

The State, because of the great importance of such statistics, should provide a compensation to those reporting them and then punish those refusing or neglecting to comply with the law. A persistent refusal on the part of such physicians should be regarded under the statute as a proper cause for the revocation of the certificate to practice medicine.

There is presented herewith a tabulated statement of marriages, births, and deaths for the years 1897, 1898, 1899, and 1900. A careful investigation of these figures will prove interesting and suggestive rather than valuable for the purposes of investigation and sanitary conclusions.

It is proper, however, to state that these criticisms do not apply to marriages, as the presumption is, if indeed it is not a fact, that these reports are correct so far as numbers are concerned; and yet many of the data prescribed by this Board are not supplied in these reports. In many instances the returns of marriages to this office are so carelessly transcribed and put together that it is very difficult, as the data in each case run across two pages, to get the item on the second page to correspond with those on the first page. The result is that the name of the groom being on one page and that of the bride on the other it has often been impossible for the Secretary of the State Board of Health to determine what woman was the bride of a given groom on the opposite side. When these returns are sent back for correction there is delay, and the county clerk does not always feel happy over it.

Nearly all the New England states and several others have efficient laws relating to vital statistics and their reports not only do them great honor but they are conclusive as to the facts desired. It is to be earnestly hoped that Iowa may not be behind in this important particular.

The following tables furnish data for the years above stated as well as respecting the number of deaths in the State institutions under the care of the State Board of Control:

VITAL STATISTICS—Part I.

COUNTIES.	BOARD OF HEALTH RECORD. 1897. Marriages.	1897. Births.	1897. Deaths.	1898. Marriages.	1898. Births.	1898. Deaths.
Adair	144	168	58	102	304	79
Adams	125	117	37	80	144	76
Allamakee	150	191	80	123	337	129
Appanoose	306	438	165	240	458	139
Audubon	100	170	42	97	327	71
Benton	255	407	177	184	440	131
Black Hawk	325	303	109	253	499	107
Boone	276	428	199	253	604	170
Bremer	250	246	104	241	310	113
Buchanan	223	224	77	182	333	134
Buena Vista	168	342	116	100	292	83
Butler	174	221	101	149	363	114
Calhoun	138	390	79	118	367	74
Carroll	192	232	45	150	485	97
Cass	180	599	151	177	395	105
Cedar	175	262	114	139	377	123
Cerro Gordo	250	165	109	159	374	154
Cherokee	185	155	36	146	337	75
Chickasaw	138	81	151	103	362	95
Clarke	165	173	33	107	270	89
Clay	132	222	48	94	233	57
Clayton	253	174	88	201	560	151
Clinton	453	897	398	439	712	258
Crawford	294	190	58	31	492	101
Dallas	184	264	114	186	409	134
Davis	264	236	51	81	310	118
Decatur	300	288	75	97	347	117
Delaware	142	286	152	149	403	102
Des Moines	480	540	425	370	501	467
Dickinson	69	130	27	57	178	37
Dubuque	468	1,051	626	372	1,509	261
Emmet	88	159	30	70	206	39
Fayette	274	256	113	305	566	179
Floyd	210	224	79	125	265	84
Franklin	150	184	67	113	280	75
Fremont	180	230	80	176	294	80
Greene	148	193	45	159	337	92
Grundy	130	190	22	112	209	79
Guthrie	165	246	88	128	397	82
Hamilton	176	208	51	182	341	103
Hancock	110	203	38	70	271	60
Hardin	217	556	158	179	573	110
Harrison	198	370	105	144	542	125
Henry	207	286	194	166	524	215
Howard	156	180	62	127	345	88
Humboldt	126	107	42	84	324	72
Ida	146	354	66	130	305	65
Iowa	168	304	109	148	392	138
Jackson	205	251	107	203	430	163
Jasper	285	246	73	197	314	113
Jefferson	168	247	156	138	298	103
Johnson	261	174	144	226	345	170
Jones	192	161	67	169	341	143
Keokuk	171	149	51	264	519	151
Kossuth	117	278	47	156	439	84
Lee	557	412	432	340	471	287
Linn	593	708	362	478	481	300

VITAL STATISTICS—Part I—Continued.

COUNTIES.	BOARD OF HEALTH RECORD. 1897. Marriages.	1897. Births.	1897. Deaths.	1898. Marriages.	1898. Births.	1898. Deaths.
Louisa	133	396	120	104	270	113
Lucas	177	302	78	127	236	86
Lyon	108	193	93	57	335	52
Madison	202	264	72	148	345	144
Mahaska	456	421	294	325	623	170
Marion	239	448	16	196	432	159
Marshall	396	392	334	298	577	207
Mills	204	196	143	134	253	100
Mitchell	150	177	45	127	207	84
Monona	189	450	94	143	277	73
Monroe	150	170	54	178	318	92
Montgomerty	195	144	49	186	332	89
Muscatine	342	488	311	237	322	159
O'Brien	180	392	91	124	399	84
Osceola	56	121	21	72	246	52
Page	261	336	144	215	406	170
Palo Alto	120	205	32	94	272	58
Plymouth	170	340	82	154	441	78
Pocahontas	121	248	50	103	327	83
Polk	1,330	740	655	543	898	185
Pottawattamie	540	344	412	628	323	51
Poweshiek	160	223	70	149	338	126
Ringgold	207	241	51	110	296	71
Sac	104	37	20	162	224	70
Scott	552	1,783	965	427	851	601
Shelby	136	271	54	139	396	105
Sioux	212	420	70	164	698	137
Story	258	299	144	236	458	156
Tama	221	315	84	228	390	125
Taylor	198	370	144	175	362	114
Union	235	135	125	198	318	75
Van Buren	222	246	100	152	178	81
Wapello	414	317	403	331	549	181
Warren	200	306	130	174	422	129
Washington	198	242	100	141	371	145
Wayne	202	64	36	186	393	88
Webster	252	318	192	220	532	118
Winnebago	96	174	40	106	316	88
Winneshiek	246	417	165	196	542	186
Woodbury	468	404	364	501	775	167
Worth	90	136	54	74	274	60
Wright	147	192	42	148	292	84
Total	23,048	30,102	13,584	18,066	38,455	12,455

VITAL STATISTICS—PART II.

COUNTIES.	1899.			1900.		
	Marriages.	Births.	Deaths.	Marriages.	Births.	Deaths.
Adair	117	297	77	141	302	86
Adams	116	229	103	125	261	89
Allamakee	130	310	124	130	362	164
Appanoose	271	517	193	265	435	138
Audubon	66	266	77	72	282	71
Benton	200	401	123	222	473	138
Black Hawk	282	394	173	329	388	121
Boone	259	540	149	292	639	138
Bremer	144	308	114	196	321	105
Buchanan	163	268	131	176	353	152
Buena Vista	119	275	57	126	279	90
Butler	149	428	134	114	430	128
Calhoun	127	324	70	149	400	102
Carroll	132	440	108	182	473	108
Cass	207	358	115	186	329	107
Cedar	118	337	128	156	350	131
Cerro Gordo	196	390	88	198	354	107
Cherokee	149	323	57	166	347	56
Chickasaw	191	267	73	122	254	78
Clarke	124	272	104	136	258	107
Clay	104	252	44	114	236	71
Clayton	201	546	196	233	542	189
Clinton	366	679	240	372	644	250
Crawford	188	469	146	155	508	158
Dallas	201	412	123	222	433	122
Davis	142	280	107	157	202	93
Decatur	166	361	118	187	363	106
Delaware	156	333	126	151	426	167
Des Moines	324	541	431	418	537	366
Dickinson	70	162	25	59	164	50
Dubuque	401	740	433	491	677	282
Emmet	75	178	21	88	208	39
Fayette	245	493	169	214	445	144
Floyd	160	279	113	175	274	74
Franklin	130	307	92	129	231	64
Fremont	135	320	105	134	307	128
Greene	131	282	76	176	283	90
Grundy	135	238	59	117	322	169
Guthrie	175	302	108	171	364	70
Hamilton	199	373	98	135	386	121
Hancock	105	250	55	107	260	67
Hardin	207	398	121	204	397	128
Harrison	221	489	184	208	468	172
Henry	174	346	276	200	324	257
Howard	115	311	98	112	255	55
Humboldt	93	198	53	91	235	70
Ida	88	232	55	88	259	63
Iowa	166	413	143	174	427	133
Jackson	197	466	142	188	394	180
Jasper	223	462	151	272	489	143
Jefferson	175	359	157	163	304	122
Johnson	213	443	271	193	494	277
Jones	178	294	120	168	324	121
Keokuk	221	491	153	225	493	147
Kossuth	139	443	87	215	594	117
Lee	374	417	295	369	430	253
Linn	498	753	274	539	632	234

VITAL STATISTICS—PART II—CONTINUED.

COUNTIES.	1899.			1900.		
	Marriages.	Births.	Deaths.	Marriages.	Births.	Deaths.
Louisa	106	286	137	95	252	107
Lucas	166	224	64	171	249	58
Lyon	71	315	62	92	319	54
Madison	160	342	144	155	309	95
Mahaska	338	569	199	374	590	173
Marion	217	415	210	230	495	202
Marshall	266	522	217	341	587	183
Mills	134	284	166	147	297	131
Mitchell	126	288	94	99	281	117
Monona	140	391	96	166	431	96
Monroe	178	278	134	156	380	94
Montgomery	166	289	81	186	257	109
Muscatine	282	261	134	273	404	189
O'Brien	86	374	72	111	379	95
Osceola	77	234	39	86	224	42
Page	198	394	192	240	415	169
Palo Alto	127	271	52	115	229	59
Plymouth	143	474	43	162	503	113
Pocahontas	115	326	64	141	344	79
Polk	936	1,182	384	1,017	741	195
Pottawattamie	93	309	77	102	281	91
Poweshiek	132	346	154	156	308	142
Ringgold	130	342	89	125	280	78
Sac	141	338	78	149	286	92
Scott	525	852	628	567	882	607
Shelby	145	413	89	131	400	106
Sioux	180	644	131	154	624	140
Story	188	578	149	217	395	139
Tama	184	356	71	205	348	88
Taylor	154	290	106	168	307	88
Union	177	298	85	182	296	83
Van Buren	149	328	149	140	304	142
Wapello	353	503	188	357	542	240
Warren	152	300	109	163	296	107
Washington	172	329	160	163	362	156
Wayne	174	347	95	173	369	125
Webster	218	495	133	228	552	133
Winnebago	95	287	80	86	282	74
Winneshiek	186	492	212	178	504	214
Woodbury	536	833	217	586	1,007	244
Worth	70	230	67	100	264	74
Wright	153	302	59	217	257	60
Total	14,224	30,397	13,387	19,175	48,465	12,890

DEATHS OCCURRING IN STATE INSTITUTIONS UNDER THE BOARD OF CONTROL FOR THE BIENNIAL PERIOD ENDING JUNE 30, 1901.*

INSTITUTION.	Average daily population.	Male.	Female	Total.
Soldiers' Orphans' Home, Davenport	447.5	.....	1	1
Sold ers' Home, Marshalltown	591	49	7	56
College for the Blind, Vinton	137.2	.....	.....	.....
School for the Deaf, Council Bluffs	264.7	.....	.....	.....
Hospital for the Insane, Mt. Pleasant	943	124	78	202
Hospital for the Insane, Independence	1,030	137	86	223
Hospital for the Insane, Clarinda	907	98	54	152
Home for Feeble-Minded Children, Glenwood	866	32	30	62
Industrial School for Boys, Eldora	465.8	3	..	3
Industrial School for Girls, Mitchellville	153.7	.....	2	2
Penitentiary, Fort Madison	477	5	.....	5
Penitentiary, Anamosa	481	8	.....	8
Total	.....	456	258	714

* Data kindly furnished by the honorable Board of Control.—SECRETARY.

VIII

MUNICIPAL SANITARY ENGINEERING

BY CHARLES FRANCIS, DANENPORT, CIVIL ENGINEER, IOWA STATE BOARD OF HEALTH

The need of sanitary engineering in this great section of our country, which we know as the middle west, is evidenced in many ways: So many in fact, that it would be futile to attempt enumeration, so that but a few of the most pronounced will be discussed here.

The immediate purpose of this paper is to call attention to the fact that the people—the public—the masses—whatever their name may be—are very indifferent to, if not profoundly ignorant of, the fundamental principles of sanitary science, and many of the primary rules of hygiene.

Moreover, this indifference or ignoronce is by no means confined to that large class of people who work with their hands, who have neither time nor inclination to think upon these things, and for whom the consideration of these matters is naturally (and rightly also) left to others.

This same carelessness in sanitary matters obtains very largely in what is called "the better class"—those who have rather more money, and are supposed to work with their brains—who appear to be so fully occupied with business (which has come to mean merely the chase for the dollar) that they have no time to get acquainted with themselves or their environment.

Great statesmen have told us that this is a government of the people, by the people and for the people. In all the great crises through which our nation has passed, it has been the voice of the people that has shaped our course. The people, then, having such a heavy responsibility, should use every means to enlighten themselves in every direction, as far as possible, so as to be able to govern well.

Then political education is looked after very sharply. During political campaigns, those political leaders supposed to be best acquainted with great national questions, go about explaining why this or that policy should be adopted, and vast quantities of "campaign literature" are circulated so that this great factor in our national safety and welfare "the voice of the people", may be intelligently declared.

Large sums of money are expended—campaign funds; and nothing is left undone to educate the people as to the policy which they should adopt to insure their prosperity and happiness.

Now the question arises, and it appears to be a reasonable one:—Why should this careful education of the people, and training of public thought be confined to politics; Why should not such vital questions as Public

Health, Municipal Sanitation, and other like matters affecting the people qnite as closely as politics receive similar attention?

These are plain questions and demand a plain answer, and we do not have to go very far to find it. It is this: There is no money in it. On the contrary, the study of these matters only discloses the fact that proper Sanitary methods are expensive, which means increased taxation, and "we are taxed enough now, goodness knows."

If the people would only treat these great questions relating to public health, as they do the public schools—and they are undoubtedly of equal importance—it would only be a short time before our sanitary systems would be in true scientific line, and we should all understand them and take the interest in them that they deserve.

The first rule of health is KEEP CLEAN; ourselves, our clothing, our dwellings, premises, barns, stables, alleys, and all that we have to do with. Everybody knows this, and most of the people live up to it.

When a community can afford it, a system of water supply is introduced. This necessitates a system of sewerage, by which the sewage is removed from the residences, etc., in the community. This sewerage system is carefully worked out by the engineer, who calculates with great pains, the proper dimensions of the sewers and their grades, so that they will all fit together and form a "sewerage system," and so far everything is done in true scientific fashion.

But how many people have given a thought as to what shall be finally done with the sewage collected by this carefully prepared system, except that it shall be discharged into the neighboring stream *below town?*

If there be a stream near town there is no question as to the feasibility of constructing a system of sewerage; if there be no stream near by, it is very doubtful if a sewerage system is built, in fact it may be set down as a moral certainty that it will not be built, because there is no place to discharge the sewage. The stream is necessary to carry away the sewage. Never mind about the people living on the streams lower down, "let them take care of themselves, our sewage is carried away from us."

It seems necessary to state, in view of the almost universal custom (perhaps better to omit the almost) that attains in Iowa of discharging sewers into streams, that this method of disposing of sewage is wholly wrong and as it is entirely unnecessary in this section; it is very nearly criminal.

To show this, we have only to take one Iowa city and its sanitary methods as an example.

The city of Davenport, on the Mississippi river, has about 40,000 inhabitants, with a most excellent water supply taken from the river, and a very fair system of sewerage.

The sewage collected by this system is discharged into the river at various points on the water front, and the garbage is collected in the most approved form of iron carts, and dumped into the river by a very efficient dump boat.

These are the sanitary methods of all the cities or communities in Iowa where there is a systemmatic water supply and sewerage, systematic or sporadic, if the word may be permitted.

In general it may be said, that for the river cities, there is and can be no other source of water supply than the rivers upon which they are situated. It would seem to be reasonable to say the least that these cities should endeavor

to keep their sources of water supply as clean and free from pollution as possible.

There are quite enough of what we may call natural pollutions of rivers (which call for considerable attention in the way of settling basins and filters) without pouring our sewage into them.

Sewage may be disposed of in a natural and proper manner without injury or cause of complaint to our neighbors, and our water sources preserved against pollution out here in the west with but comparatively small cost, if it be done *now*.

Every year of delay increases the cost by a large percentage, and we are very imprudent, unbusiness like, not to say criminally foolish, to wait for the time (which is as sure to come as the sunrise) when we shall, by federal and state laws, be compelled to keep our sewage out of any stream or water course which may be used as a source of water supply.

Continuing our illustration, suppose that the city of Davenport should acquire 120 acres of land as near the river as might be,. Let. we will say, sixty acres of this area be, by grading and tiling, converted into great filters, say eight of them of seven and one-half acres each, this would give each filter one day's work and seven days rest.

Now, this filtering area of sixty acres would dispose of and purify completely the sewage of 60,000 people for an indefinite time.

The effluent from these filter beds would be very nearly perfectly pure water, better and safer to drink than that now furnished and used in most cities, and no harm is done to anybody.

The other sixty acres should be held until the growth of the city demands their services, or in the mean time, might be used as a sewage farm, that is a farm or kitchen garden irrigated by sewage—a most profitable form of horticulture. The sale of the products of the great sewage farms near Berlin in Prussia, brings revenue enough to pay all the expenses of the maintainance of their great system (which includes eleven pumping stations in the city), the interest on the cost of construction, and the annual contribution to the sinking fund.

A scheme of sewage disposal, of this sort is perfectly feasable for Davenport, and in fact for all our Iowa cities. Land, suitable for such purposes, is to be had near every one of them and it is not too expensive now, and in view of the fact that this system, which is known as "Intermittent downward filtration," is one of the best known methods of sewage disposal it is very strange indeed that it has not been adopted here.

Moreover if Davenport disposed of her sewage in this way, she would be in a position to *demand* that the cities above her on the Mississippi river should cease from polluting her water supply with their sewage.

If the city of St. Louis employed this system of disposing of her sewage, her case against Chicago would be immensely strengthened. As it is, she has no case because she is doing to the cities below her on the river, just what Chicago is doing to her.

Some of the details of construction of the large filters mentioned above and also the discussion of the question of the reduction of garbage will be the subject of a future paper.

IX

MODES OF INFECTION AND NOTES ON DISINFECTION

BY ELI GRIMES, M. D., DES MOINES, BACTERIOLOGIST STATE BOARD OF HEALTH

How the cause of disease gets into the human body is a most important question. If we knew the means by which the various disease producing agencies enter the body we could to a great extent prevent disease. We will not enter into a technical discussion of this question, but note briefly some of the simple facts that experiment and observation have demonstrated.

Let us notice first that all diseases are of external origin, that is, due to some cause taken or acting from without. This is very apparent in such diseases as smallpox, scarlet-fever, measles, etc.; as after an exposure to the disease a definite time elapses and the disease appears. In many diseases such as typhoid fever or malaria the canditions are more obscure owing to the remotness of the cause, but that they are of external origin there is no doubt. While it is evident that all infectious diseases are of external origin, the non-contageous likewise depend on conditions outside the body for their conception. Even the so-called hereditary diseases owe their origin to injurious circumstances under which the body or its parent, usually both, is placed. It is a physiological impossibility for the healthy body to become diseased, except from extrinsic causes.

In order to understand clearly the way by which diseases are contracted we must understand something of disease producing agents. Among the known causes of disease bacteria are the most important. The great diseases, *tubercuolsis*, *typhoid fever*, *cholera*, *bubonic pest*, *diphtheria*, and many others are due to bacteria, while malaria in all its forms is due to an organism which belongs to the animal kingdom, Bacteria are vegetable and are classed with the lowest and simplest forms of plant growth. The laity and and popular press regard bacteria as animal life, this is false, for in all their manifestations they are distinctly vegetable.

The distribution of bacteria, their dissemination, and constant presence are peculiarties due to their size. They take rank as the smallest thing that lives. To say that a certain bacterium is one twenty-five thousandth of an inch in diameter conveys no definite idea of actual size. Many are but one-half this size, *i. e.* one-fifty thousandth of an inch in diameter. If we reduce this to terms of comparison we find very astonishing results. A box one cubic inch in capacity would hold 125,000,000,000,000 of the smaller bacteria, which if placed side by side like beads on a string would make a

line nearly 2,000,000 miles long. It is evident that in both size and number figures fail to convey an adequate idea.

The rapidity with which these bodies multiply is as wonderful as their size. Some bacteria reproduce by spores, but they all multiply by segmentation, *i. e.* direct division. When a bacterium is living under favorable conditions it divides unto two or more segments, each piece or segment rapidly reaching an adult size and dividing as the parent did. This goes on very rapidly, often less than twenty minutes being required for segments to obtain full size and divide. Here again we find numbers difficult to express and beyond comprehension. Beginning with but a single germ the possible number in twenty-four hours is very great. Even in ten hours the number is more than 200,000,000,000. This explains the rapid course that many infectious diseases run. Bacteria are to be found almost everywhere, in the soil and water, floating in the air, and clinging to our clothes. Foods of various kinds unless recently heated contain great numbers. Processes of decay and decomposition are all due to bacterial growth.

Just why disease is produced by some bacteria while others are harmless can be explained by comparing them with higher plants. Of the hundreds of varieties of bacteria there are but few that are disease producers. In other words there are but few that are poisonous.

Of the great variety of green flowering plants there are but few that are poisonous. The poppy, night-shade, stramonium, and some other plants are harmful because of certain chemical compounds contained in their substance, as morphine, atropine, etc. The bacteria that produce disease do so in virtue of certain chemical compounds they form while growing. The action of bacteria is in all cases that of a poison and not that of a mechanical agent.

By keeping in mind their minute size, their rapidity of multiplication, and the way in which they injure the body we can better understand the conditions that favor the outset of the various diseases.

Besides the active bacterial cause of disease there must be at the same time a predisposing condition present in the individual or else the bacteria will have no effect. We cannot here enter into a discussion of personal hygiene. Here is where the battle with disease is fought, and here the right care of the human body yields its reward.

Disease germs enter the body through different channels; the air passages being the commonest route. The bacteria floating as particles of dust in the air are inhaled and lodge in nose, throat, bronchi, or lung tissue, and if at the place of lodgment the tissue is not sufficiently resistant infection takes place, which infection may be either local or systemic. The diseases most frequently contracted this way are *infiuenza*, *diphtheria*, *smallpox*, *bronchitis*, *pneumonia*, *whooping-cough*, *tuberculosis*, *scaret fever*, and *measles*.

The next most important avenue of infection is by the mouth and stomach. Food and drink often contain pathogenic bacteria which when taken into the gastro-intestinal canal invade the body. Water is much more dangerous than food as a carrier of disease. The diseases that find their way into the body by way of food or drink are typhoid fever, cholera-morbus, diarrhoea, tuberculosis, cholera, and other diseases of the intestine and stomach.

The eye often serves as a part by which germs are introduced into the body. When this is the case the disease is one that might be contracted by inhalation. The tonsils when large often catch bactoria and pass them into the body. These diseases are those that might be contracted by ingestion or inhalation.

The skin rarely allows the passage of bacteria, perhaps never does unless injured. A very slight injury of the skin permits the gravest infection. The diseases so contracted are septicemia or blood poisoning, erysipelas, boils and carbuncles, tetarnus or lock jaw, tuberculosis, leprosy, skin diseases of many kinds, syphilis, and in some cases cancer.

There are certain conditions of the body or its environment that predispose to certain classes of disease. The different seasons of the year bring in different classes of disease, because each season effects the body differently, hence the susceptability changes from time to time. There are diseases that are peculiar to hot weather, and those peculiar to cold weather. Sunshine, rainfall, drouth, excessive heat or cold, all have their peculiar influence both upon the human body and the germs that are capable of infecting it.

CARRIERS OF DISEASE

Many agents are capable of carrying disease germs from place to place. We must remember that disease germs are not generated out of certain conditions, but must in all cases come from pre-existing germs. The appearance of a disease means that some way the germs have been brought to the susceptible person from some pre-existing case or infected place. The more common ways by which germs are carried are as follows: dirt, water, food and animals of various kinds. The domestic animals often carry the germs in their coat. Pet cats and dogs carry diptheria. Rats carry bubonic plague. The mosquito and malaria are related almost as cause and effect. In the Orient a flea bite often produces bubonic plague, while with us we often see a carbuncle following the sting of this little animal. Flies carry typhoid fever germs on their feet. Insects as carriers of disease are being carefully studied, with many facts yet to be demonstrated.

NOTES ON DISINFECTION

To disinfect means to destroy harmful bacteria, hence there can be no disinfection where there is no infection.

To destroy or obscure a bad odor is not disinfection.

The most dangerous infection may exist with no odor, while a very foul odor may be harmless.

To burn a few spoonfuls of sulphur on the stove or a shovel of coals has no effect on disease germs. It requires pounds.

To wet a towel with "PLATT'S CHLORIDES" and waft about the room is a delusion and a deoderant, not a disinfectant.

Asafœtida and onion may keep the individual who has an infectious disease out of your house, but they have no effect on the microbes.

The instructions to dust the carpets and air the bedding while the room is being disinfected are bad instructions. Disinfect, then dust and air.

A saucer full of copperas is often used under the sick bed. It does no good.

Everything that goes out of a sick room should be disinfected before it goes. This applies to the doctor and nurse as well as to the soiled linen.

Kill the flies.

Before disinfecting, make the room as nearly air tight as possible.

Don't attempt to disinfect books. Burn them.

Don't trust sulphur gas or formaldehyde gas to penetrate heavy fabric.

Every carpet, rug and bed quilt should be sprinkled with a four per cent. formaldehyde solution and tightly packed away for twenty-four hours. They will then be disinfected. Treat wearing apparel the same way.

Sprinkle the walls, floors and suspended sheets with 40 per cent. formaldehyde, using one-half pound for every 1,000 cubic feet of room space, close the room for a day and it is disinfected.

Farmoldehyde is better than sulphur.

Disinfection should be done thoroughly or it is useless.

Disinfection is not to save time and money, but life.

X

THE RELATION OF CHEMISTRY TO PRESENT-DAY SANITATION

BY PROF. S. R. MACY, DES MOINES, CHEMIST TO STATE BOARD OF HEALTH

In no branch of science has there been greater progress in recent years than in the line of chemistry. It would seem that our present knowledge of chemistry would bring us far more satisfactory results than we are able to realize. One would naturally suppose that a knowledge of the chemical composition of the materials making up a paint and their relation to one-another, thus producing various reactions, would give us in the paints now used an article very much superior to the mixture once used for the same purpose. We hear our painters of to-day talking about the good old "white lead and oil paint." They deplore the fact that the mixtures put upon the market do not stand the weather as well as the oil and lead manufactured by the old process. Whether or not "Distance lends enchantment to the view" and they really forget how long the old mixture did last, or whether their claims are true, I cannot say; but one thing is certain—that a knowledge of chemistry enables unscrupulous individuals to make mixtures that in appearance, taste, and in fact, in many of their characteristics and reactions, so closely resemble the genuine article that they are sold to the public, labeled as though they were pure. On the other hand the analytical chemist is able to detect the difference between these imitations and the article for which they stand.

This brings us to the phase of present-day sanitation that demands a great share of our time and attention, i. e. the investigation of our food products. There is nothing so detrimental to health as certain impure foods and impure air; the latter and sometimes the former resulting from filthy surroundings. One scarcely knows where to begin to discuss the sebject, "Relation of Chemistry to Sanitation." Where chemistry leaves off, bacteriology may put in its apparance, or reversing the order, we may have the action of certain bacteria resulting in the formation of chemical products, that are detrimental to public health. Hence it may readily be seen that it is almost impossible to discuss the subject and leave out bacteriology. But this I will not enter into further than to say that many of the chemical changes closely related to sanitary conditions are brought about by the action and development of bacteria.

The subject of pure air being the one uppermost in our minds, will be taken up first. Here, of course, next to the constant supply of pure air for

the healthy as well as the sick, is the ventilation of the sick room. In our houses heated by hot air or steam, this is not so important as in some of our country homes, especially those in which the sick room is not provided with a chimney, enabling the individual to use a stove for heating purposes. Often I have visited the sick room where an attempt was being made to heat the room by the use of an oil or gas stove, and on one occasion, a gasoline stove. Let us for a moment study the conditions. The room was closed, stove sitting on the floor, burning with a pale yellow flame, the ceiling covered with drops of water caused by the condensation of the vapor formed from the combustion of the oil. One may approximate the amount of carbon dioxide in this room by noting the amount of water condensed upon the wall and ceiling, and upon the window panes.

This carbon dioxide will collect in the lower part of the room as fast as it is formed, later passing to the other parts of the room by diffusion, but, inasmuch as there is a constant increase in the quantity, the lower strata will contain a larger per cent. of carbon dioxide. The patient lying on the bed, the nurse, sitting or standing; which gets the purer atmosphere? The nurse. Which should have the purer? The answer is plain.

If you care to verify the statements made, go to some kitchen where the gasoline stove is used. Close the windows and doors tightly. If there are any openings of considerable size around the windows or doors, cork with strips of cloth. It is well for two to be in the room together. Take with you a chair and a lamp, light the lamp and place on kitchen table. Light the burners of the gasoline stove. Do not stir around the room more than you can help. After the gasoline stove has been burning for twenty-five or thirty minutes, take the lamp from the table, lower it slowly toward the floor. You will notice that it will reach a point where the flame will apparently flash above the wick. If you are careful, you can separate them as far as two inches. Raise the lamp and the flame will meet the wick, lower the lamp and the flame will apparently float on the surface of some fluid heavier than the gas that is given off from the hot wick. This heavy gas is carbon dioxide. It has been formed by the union of oxygen of the air in that room with the carbon in the gasoline. At the same time oxygen has been removed fram the air to unite with the hydrogen of the gasoline to form water. This water has probably condensed on the walls and furniture or, if the weather is sufficiently warm, and the room warm, it will remain in the air in the form of vapor.

There is an additional danger in the heating of the room where the sick are confined with gasoline oil or gas stoves. As the quantity of oxygen in the air decreases, the combustion is more or less incomplete with the possibility of forming the poisonous carbon monoxide, that will unite with the haemoglobin of the blood and prevent its doing its duty as oxygen carrier for the system.

The question will naturally present itself, if this method of heating a room is so objectionable, and there is no flue, what is your remedy? It is very simple. No doubt the room has windows, at least one. Lower the top sash almost to the bottom, take a sheet of sheet-iron that will fill the space above; place in it, about the center, a hole the size of a stove pipe. Procure a stove and place in the room, fit it with a pipe passing from the stove through this opening to the outside of the building. You may support an

upright section to carry away the smoke by means of wire attached to the house and from the pipe to a stake driven in the ground some distance from the house, thus forming a triangle support which is very effective. I cannot conceive of a room that cannot be heated and well ventilated in this manner. Here, it is true, we have combustion in the stove which produces the carbon dioxide, but that passes out of the stove pipe, while the hot surface of the stove heats the air in the room by what is known as convection and radiation without decreasing the quantity of oxygen or increasing the quantity of carbon dioxide. Then, surely, we may say it is simply a knowledge of the chemistry of combustion that enables us to point out and remedy these defects.

Next in importance to the subject of pure air is that of pure water. Owing to the pollution of our rivers by the sewage of towns and cities, the water question is becoming one of great importance, not only to our towns and cities, but to our country homes. It is a well-known fact that running water purifies itself by the oxidation of organic matter therein; but, if this organic matter is unduly increased in quantity, the purification is less rapid and the water supply is to a greater or less extent polluted. The disposal of our sewage is a matter of great importance in order that we may have clean, pure rivers and lakes. The disposal of this sewage depends upon the chemical changes and the action of bacteria. The latter we will leave out of consideration. Therefore, we must determine the amount of organic matter emptied during any period into the sewers of our city. This is to be measured definitely, calculations made as to the amount of oxygen or other chemical agents that will be necessary to convert it into harmless compounds. Some classes of organic substances are more readily converted into harmless compounds than others. The nature of these organic compounds must be determined by our chemist. He also must point out the form of treatment. This treatment must be easy of application and economical, and yet do the work thoroughly. No doubt some of these organic matters may be so modified and separated from the water that accompanies them, that they may be put to use as a fertilizer. This, while it disposes of objectionable matter thrown into our streams, also enriches the land, and, if it can be carried out without endangering the health of individuals living near the point of distribution, it is to be recommended.

We have many sewage plants in operation, some more or less successful, which are well worth the time and expense of investigation. Many of our so called inland towns and cities are without any sewer facilities. They will do well to investigate these systems, employ competent experts, and make use of them in their own case. I have in mind a little city near an Iowa lake. It is not provided with sewers. The ground is level; it would be hard to get fall to carry the drainage into the lake, and should they do this, they would not only pollute their water supply, but they would render the lake water unfit for its finny inhabitants. Our fish commissioner would do well to take in hand the pollution of our Iowa streams by towns and cities situated along their banks. I am well aware of the fact that every case is met with the statement that it costs too much money, but what is of greater importance to a state like Iowa than the health of its people? And this can be maintained only by improving our sanitary conditions, and especially in our towns and cities.

Next to the public water supply of a town or city is its private wells. At the present time, the State Board of Health is investigating through its chemist a number of wells that furnish water to private families. The analysis of the water from all of these wells shows a questionable condition. The water contains a large amount of chlorine and nitrates, showing that at some time in the past water from a cess pool or something of that nature had percolated through the soil, and saturated it with these materials. This, of course, is objectionable. It is not only objectionable, but in fact dangerous. We are unable to tell how soon more complete openings may be made from that source of pollution to the well and admit large quantities of organic matter, possibly carrying disease germs. Here we bring into use our knowledge of chemistry, first in the analysis of the sample of water from the well, river or lake, an examination of its probable sources, and the interpretation of the analysis, that is the pointing out of the conditions indicated by the analysis. Much may be said concerning the chemistry of our water supply, but let us stop with the statement that a more thorough investigation of the water supply of the state is needed. This should be done under the supervision of our State Board of Health through the local boards. This plan would insure uniformity of action and result in great good to the people of our state.

Chemistry also has to do with our food supply. Many articles are put upon the market that are of inferior character, which are not only inferior but are mixed with foreign substances, that are added for the purpose of adulteration as well as preservation. Preservatives, in general, are objectionable in food materials. There may be individual cases where a limited quantity of certain preservatives at certain times of the year used with special precautions are allowable and even desirable, but this is not often. It is quite probable that in case of preservatives used in milk, that the preservatives not only prevent fermentation or objectionable changes taking place, but they also interfere with the processes of digestion. In fact it is known that many of our preservatives do this. We have some of them that will combine with proteid matter in the milk and form compounds that are very hard to digest.

Passing from the subject of preservatives, we may touch upon the adulteration of spices and ground goods of every character. This field offers a greater opportunity for adulteration than many others, because the goods are ground and may be mixed with foreign substances in such a way that the adulteration cannot easily be detected. This condition of affairs is brought about to a certain extent by the demand of the public for cheap goods. The manufacturer prepares them; they pay their money expecting to get something for nothing. This is the wrong principle. The people of our state should call to their aid the chemist, provide means whereby an extensive investigation of food products sold in our state may be carried on, and enact a law requiring everything to be labeled, showing its true nature. In other words, if an article is made up of fifty per cent. true article and fifty per cent. some foreign material, let the label of the package so state. The law should provide for the punishment of violating it as well as for the detection of fraud. It is true that many things put upon the market may be properly mixed with substances other than the article shown on the label, and the nature of the article improved; for example, I doubt very much if

we would care to use absolutely pure ground mustard on our tables. I will further say, let the label of this package state that it contains a mixture composed of fifty per cent. ground mustard and fifty per cent. flour. In other words, let us tell the truth and pay for it.

The subject of vinegar from a chemical standpoint is one that is worthy of notice. We often hear the claim that the artificial vinegar should not be used because it contains acid. Of course, these statements are made by those only who are without a knowledge of chemistry, for if they understood the fundamental principles of chemistry they would know that all vinegars contain acetic acid. They, however, object to a vinegar made by the fermentation of dilute alcohol being colored and flavored and put upon the market as vinegar. They object seriously, I suppose, because upon evaporation of a sample of the vinegar it fails to give such a residue as would be left upon the evaporation of a sample of our good old cider vinegar. This good old cider vinegar it would be well for us to investigate a little. The best apples, especially those without inhabitants, are neatly picked, placed in barrels and sent to market; those that are partially rotted and wormy are shovelled together into the cider press. The juice of the apples as well as other juices therein go into the cider. Of course, in the cider press, the insoluble portion is strained out and only the soluble portion passes into the cider, and again the process of fermentation, that is the changes of the sugar in the cider to alcohol, and then to acetic acid, causes many changes that will precipitate some of the foreign materials, while others only change in form and become more soluble. Some one may say that the writer is drawing on his imagination. That is true, but so are the parties who would not use artificial vinegar because it contains acid. I know of one state having a law that prohibits the sale of a vinegar that will not show upon evaporation a certain per cent of residue, that, of course, must come from the apple. Let this residue be of whatever nature it may, it is an unnecessary product, and I believe that the condition of affairs which leads to this peculiar predjudice referred to is brought about by the limited knowledge of chemistry, and in many cases a total absence of knowledge of even the fundemental principles of chemistry.

When we come to explore the great field of thought whether theoretical or practical and undertake to find some subject or phase of a subject that is not primarily based on or connected directly with chemistry in some form, we have a very hard task. Then if chemistry is so widely connected with every affair of life, why not make use of it and apply it to the greatest possible extent in the preservation of the public health.

XI

THE GROWTH OF PREVENTIVE MEDICINE*

Mr. President, Ladies and Gentlemen:

This, the semi-centennial meeting of our State Medical Society, marks the beginning of a new and an important era in medicine. The nineteenth century has passed; its record for epoch-making discoveries has not been equalled in all the history of medicine. Its achievements stand out distinct and alone, and will have an important influence on the future of medicine for all time.

Medical science has not only kept step with the scientific progress of the age, but in many important particulars, ranks easily first. From fragment and conjecture a hundred years ago, certain departments of medicine have passed to the stage of completeness and accuracy, and this through the steady advance in scientific knowledge that stands the test of time and experience. Achievements in this department are but "the samples and promise of coming accuracy in all departments."

*Delivered at the Fiftieth Annual Meeting of the Iowa State Medical Society held at Davenport, May 15 to 19, 1901, by the President, Dr. R. E. Conniff, Sioux City, member and late President of the State Board of of Health.

Let us glance at some of the more important developments which have taken place in the field of medicine in the past hundred years, and which will serve as illustrations of "that spirit of advancement which is working in and through it all." In an able and interesting paper on this subject, Dr. Jones has very aptly said in substance: The physician a hundred years ago had reason to believe his art to be near perfection; every department seemed to him to have been thoroughly investigated. He called in the experience of the ages; there had been no startling departures from the teachings of the old masters in medicine, and there really seemed to him but little to be done. Prevention, the key note of modern medicine, had not yet been sounded, and we know that he was groping in the dark; that he was beyond the threshold; that he was only clearing the way and preparing a place for the foundation, which is only as yet begun, and upon which the future will raise the superstructure of rational, scientific medicine.

Could the physician of a hundred years ago have comprehended the marvelous advancement in every branch of medicine which you and I have lived to see; could he have dreamed of the possibilities in the labors of a Sshwann or a Schleiden in tracing animal or vegetable structures back to their ultimate cellular elements; could he have believed that the microorganisms, so minute that no microscope then in existence could discover

them, would be known before the dawn of another century to be the cause of much of the pathology of disease; could he have had reason to predict that surgical procedures, then impossible; would become common; that every cavity of the human body would be entered by the surgeon, with safety and without pain, through the benign influence of anesthesia; if it had been suggested that suppuration was not necessary or even desirable in the repair of wounds; that ideal re-generation took place, not through the influence of suppuration, but in spite of it and that laudable pus never had existence, in fact, do you think for a moment that that statement would have been favorably received?

If it had been suggested that cholera, smallpox, diphtheria, yellow fever, tuberculosis, scarlet fever, puerperal fever, and a host of other diseases were clearly preventable, and only had an existence through ignorance and neglect, do you not think that the person making the statement would have been shunned by his colleagues as a heretic and a dreamer?

We are living in a practical age; assertion means little or nothing; what is demanded is demonstration. The aim is not at the ideal, but at the practical; not at the highest development of the few, but at the highest happiness of the greatest number. What is the record of the century in this direction? What has been done to promote happiness, to procure health, or prolong life? What has been done to make man better physically or mentally, or to prevent, arrest, or remove disease and death? These are the questions that have engaged the medical profession and are still the problems with which we must contend.

Preventive medicine is indeed a child of the nineteenth century. "Every discoverer in medicine seems to carry the motto: 'Prophylaxis is the best cure.' The nobler aim and manifest destiny of a farsighted prevention become necessarily dominant ideals."

It would be a labor of love, and a very pleasant task indeed to go into some detail over the lives and labors of the leaders in medicine of the last century. They did much for their time, and for all time. They held an important place in the history of that great century, to whose influence and glory they so materially contributed. Someone has said, "other vocations have given us many fine examples of bravery and sacrifice, but pestilence and disease have bred many quiet heroes" who go about their work simply, fearlessly, devotedly. No words of eulogy may have been spoken over their remains, "no granite shaft may mark their resting place," but the poor, the suffering, and the unfortunate in all coming ages, will call their names blessed.

The limits of this address will permit me to mention but a few of the many facts which indicate the splendid achievements along these lines.

At the beginning of the last century, the average duration of human life in England was twenty-seven years; it is now something over forty-five. The death rate in the city of London has been reduced from fifty to eighteen per thousand. The individual longevity of man has been increased more than three years; that of woman more than three and one-half years. The general mortality has been reduced in fifty years more than one-half. Dr. Parker estimates that deaths from smallpox have diminished ninety-five per cent; deaths from fevers generally, eighty-two per cent; deaths from typhoid fever, sixty per cent; from scarlet fever, eighty-one per cent; from diphtheria, fifty-nine per cent; and deaths from tubucular disease, forty-six per cent. The mortality from surgical operations has been reduced twenty per cent. One surgical procedure alone, ovariotomy, has added forty thousand years of useful life to the women of England, with a like proportion for other countries. Has humanity then no debt of gratitude to the medicl profession?

Mr. Chadwick tells us that the death rate in the English army forty years ago was twenty per thousand; it is now less than six; in Germany it is six; in France, ten; in Italy, eleven, and in Russia, eighteen. In the Indian army, in 1858, the death rate was sixty-nine per thousand; in 1888, it was reduced to fourteen.

In the cholera epidemic in 1831-3, in Europe and America, deaths were numbered by the millions. In 1893, the nature of the disease was understood; medical science had robbed it of its terrors. In Europe, the deaths resulting were comparatively few, and in our country it was completely shut out, not even getting a foothold in our seaboard cities. Smallpox, which a hundred years ago claimed hundreds of thousands annually, is now almost entirely under control, and would be completely eradicated were it not for the opposition and indifference to preventive measures by members of our own profession.

An eminent sanitary authority has said, we can perhaps find no better evidence of the efficacy of preventive measures than in the history of yellow fever in our southern states. Fifty years there was throughout the South a most appalling condition prevailing. The city of New Orleans was in great danger of being depopulated. In thirty days there were over five thousand deaths from yellow fever alone. The enforcement of sanitary regulations, inaugurated in 1863, was a most fortunate circumstance in that fair city. It not only checked the ravages of yellow fever, but it did much to prevent other epidemics, and to awaken the people to the establishment of a magnificient system of sewerage and the adoption of other sanitary regulations.

Contrast the condition of the present magnificent city of Memphis with that of 1878, when, out of a population of 19,500 persons, unable to get away, there were 17,600 cases of yellow fever, with a death rate of over thirty-three per cent. No such awful example of filth inviting disease has ever before occurred on our continent, nor will it ever occur again. Through the influence of preventive medicine these scourges have all but disappeared, and no longer terrorize our people, and in the growing light we feel the dawning of a better day, when not only they, but tuberculosis, and our common forms of fever, all of which are preventable, will have disappeared. "Every day sees the sentiment growing stronger among all classes of our people. Every day is marked by a distinct advance in public interest. The stagnant cess-pool has given way to ventilated drain; the reeking well and foul cistern to a well regulated public water supply."

Preventive medicine is steadily gaining ground; medical men everywhere are awakening to the realization of their own responsibility. Governor Shaw has very forcibly illustrated the thought by a comparison between the great engines which move our modern trains and the locomotive engines of fifty years ago. In a word, as our opportunities increase, so do our responsibilities.

It is plain, the medicine in the future will be in the main, preventive,

and there is a great responsibility resting upon us as a profession, for as we become acquainted with the conditions which produce disease, our responsibility increases in directing our efforts toward their eradication, and fortifying against the encroachments of disease by building up resistance.

A distinguished authority has said this is a problem involving a campaign of popular education; certain unfortunates must have the help of the State in providing treatment in sanitoria.

Private philanthropy is by no means adequate to so great a problem, but efforts in this direction must be supplemented by municipal, state. and national support.

One of our great dailies recently said: "Our country is becoming enormously wealthy; public resources are unstinted, and there is no apology for distress or want anywhere. Out of the various methods which are proposed for a more even distribution of material blessings, may it not be expected that a system may be evolved by which decent and kindly care will be bestowed upon those requiring it without the thought that they are receiving anything to which they are not justly entitled."

But sentiment and humanitarian considerations should not alone influence the state in dealing with this question. A broader view of the subject must be taken. We must regard it as a matter of the wisest and best policy on the part of the state or community, acting in and for its own best interests. Perhaps no field at the present time is so inviting and "ripe for the harvest" as the question of tuberculosis. Its insiduous beginning, its slow and weary course, under ordinary conditions, its sad termination, present a picture only too familiar to us all. Specific after specific, "cure" after "cure" have been proposed, and have vanished in an elixir dream. Climate, which at one time gave such bright promise, has been disappointing, and we find it has but a mild influence on the disease. Patients compelled to live out-of-doors show as large per cent of recoveries in low as is claimed in high altitudes. Two factors, and only two factors, seem to govern its control. Its inception depends on the passage of a living micro-organism from one body to another, and then finding favorable conditions for growth and multiplication.

Hygienic-dietetic treatment in sanitoria, both in Europe and America, emphasizes the fact that tubercular disease is both preventable and curable. In treating it let us keep these facts in mind—that it is both preventable and curable no longer admits of doubt.—The concensus of opinion from every quarter accentuates the fact.

Dr. Stewart, in an admirable paper on this subject, says: "In place of despair and the calm resignation of helplessness with which the consumptive has heretofore been treated, we observe growing confidence on the part of the physician in his ability to do something. We hear him speaking words of encouragement and hope inspiring courage and gladness."

Let us glance at practical results in cases so treated. Knopt's statistics show absolute cures, fourteen per cent; relative cures fourteen per cent; amelioration, forty-two per cent. The chances of the disease to heal without being discovered are between twenty and twenty-five per cent. Nine per cent of those dying of non-tubercular disease are shown to have had phthisis at some time in their lives. Four thousand consecutive autopsies, conducted by Birch-Hershfeld, show tubercular lessons in forty per cent. Turban's

statistics show that patients treated in the early stages of consumption are relieved, if not cured, in as high as eighty-four per cent.

In view of these encouragihg facts, is it not our duty to lessen as far as possible the spread of this disease which annually causes more deaths in Iowa, than all other contagious diseases combined? It is not an extravagant estimate to say that two thousand lives in our state have been sacrificed to the fell destroyer since last we met. What are we doing to limit its spread, to protect or cure those who, through somebody's neglect, have fallen victims to this terrible malady? That it is a legitimate function of government to protect its citizens no one will question.

In Iowa we care for our criminals and for our insane, for our feeble-minded and for our incorrigibles, for our destitute and for our afflicted at an enormous cost to the state, and we thank God we can do these things, for surely no one who loves his fellow man could wish it otherwise. And these yet, unfortunate persons whose kindly care is prompted by such noble sentiments of humanity, are not a source of danger to the lives and health of the community in which they live, while the poor victim of tubercular disease is a sower of contagion in every community, and a menace to the lives and health of all with whom he comes in contact.

With a more thorough knowledge by the people of the nature and infectiousness of this disease, and a more active interest by the members of our own profession, who are or ought to be, conservators of health and priests in the temples of Hygiea, the present condition of things cannot long endure. Other commonwealths have taken the step, and the time is ripe in Iowa to inagurate a movement for the establishment of a state hospital for the care of our tuberculosus poor. It is our prerogative as well as our duty, and I want to suggest, if it meets the approval in the society, that a committee composed of one member from each county of the state be appointed on reorganization, to present this matter to the next general assembly and if possible, secure an appropriation for the establishment and maintenance of such an institution.

If this society will but set to work in earnest, I cannot but believe that so noble and philanthropic an enterprise will appeal to the sound judgment, philanthropy and justice of our legislators, and that Iowa will be classed with the states which are endeavoring to throw about their citizens protection from tubercular disease, and to promote health and prosperity within their borders.

Our modern civilization has brought us many new problems to be solved. We are living in closer touch with sections and people in remote parts of the world. New conditions and questions are constantly arising, and we must give them attention, but not to the extent of neglecting the more important and helpful work at our very doors.

The new century "shall proclaim the nobler aim of thought and action," and it perhaps goes without saying, that the medicine of the future will be in the main, preventive. Our attitude along well established lines will remain unchanged. Research in pathological and bacteriological laboratories will continue. Physiology and hygiene will engage the thought of the profession; soundness of body, the importance of local tissue health as a means of resisting the invasion of pathogenic micro-organisms, will receive greater

attention, until every infectious disease, the great death producers of the world, will be eradicated.

The nature and conditions giving rise to malignant disease will probably be understood, and its preventive treatment established as the result of greater pathologic knowledge. Greater perfection in diagnosis, technique and treatment of all pathologic conditions will follow along the lines already mapped out. The serum treatment of all disease will play an important role in the medicine of the future. Means will be devised and stringent laws enacted for the protection of the race against the curse of inherited disease and those physically and mentally unfitted for the marriage relation will not be permitted to propagate their kind.

What the achievements of the new century will be, no man can prophesy. Marvelous things will be accomplished along lines we little dream of now. It is perhaps safe to predict that the great forces of nature will be utilized to serve man's purpose. A broader and deeper culture will be required of the physician. Some things now taught in our schools of medicine will have to be unlearned, and instruction given along lines which have never yet found place in a college curriculum. "More attention will be paid to the quality, not the quantity of the output."

A closer relation between sanitary authorities national, state and local, will be found necessary and desirable, and will greatly facilitate the work of stamping out infectious disease, and improving sanitary conditions.

"The future of science is not in doubt." Medical men will "hew close to the line." ever ready to seek after and to accept truth, no matter how it may disarrange our preconceived ideas of things, nor how many idols we may tumble down in the pursuit.

Many things were accomplished in medicine during the last century which were undreamed of a hundred years ago.

"The new
Shall do
The unknown things, the wondrous deeds
Earth's future needs
Demand;
Its hand
Shall shape the course
Its brain devise
The plan
To win the richest prize that man can win—
The betterment of man."

XII

SANITATION FOR THE FARM *

In presenting this paper I have to say that the title "Sanitation for the Farm" was selected by your secretary.

To go into any detailed consideration of this important subject, at all, would require at least two or three octavo volumes of many pages each.

There are so many things that affect the health of the home, whether in the country or town, and so many things that are peculiar to the country, and that influence for weal or woe the physical condition of the farmer and his family that I shall have to content myself with but the merest suggestions as to desirable sanitary measures, leaving to your discriminating judgment such after consideration and reflection as their seeming importance may warrant.

The ideal of the sanitarian, for a healthy home, is one where there is the nearest approach to pure air, pure water, and pure food. In city life these requisites are difficult, if not impossible to be obtained. Just in proportion as they are denied, in that proportion are those subject to such denial called upon to battle for health.

Health is a normal, physiological condition, and the life forces that the All Wise Creator has planted in every animal and vegetable are ever vigilant to detect and militant to remove whatever tends to impair health or destroy life.

In country life, and in farming as an occupation, we should have, and could have the essentials for healthful living above referred to, viz., pure air, pure water, and pure food. To have the first two there must be pure soil. Soil pollution is the greatest factor, perhaps, in air and water pollution.

One would naturally expect to find in the abodes of our farmers the noblest specimens of robust health—little sickness and long and vigorous life on the part of their inmates. And yet is this so to the extent that might reasonably be expected?

Is it not rather a fact that sickness and insanity are as prevalent in the country as in the city? There are many who deal in statistics and who seem to be careful and conscientious observers who tell us that proportionate to the population there is a much larger per cent. of both sickness and insanity in the country than in the city.

From my own observation as a physician in Iowa extending over forty years I am compelled to state that sickness and accident in the country were far beyond what it should have been had proper sanitary precautions been

* Read before the Iowa State Agricultural Society December 10, 1900, by J. F. Kennedy, A. M. M. D., Secretary State Board of Health.

observed. Indeed! I may say proportionately larger than in the towns in which I lived.

Nor this could not have been accidental. The natural conditions were all in favor of the country and farm life. Faulty methods of living and defeat of naturer's health giving and health preserving provisions must have produced these results.

It will be the object of this paper to briefly suggest some of the reasons for the seeming incompatibility of health with country life as exemplified in farm life.

1. The location of the house is too often faulty. Instead of being built on high well drained ground it is too often placed on the hillside or low ground, so as to be near a well that is convenient to a slough, and where the wâter can be obtained with as little expense as possible.

As a result the soil beneath and immediately around the the house is more or less saturated with water, drainage is imperfect, and the slough or low ground, extending as it generally does to some river or creek bottom, furnishes the means by which miasmatic breezes are carried into the house. In prairie countries the air in the low lands is not only more heavily laden with moisture, but the temperature is several degrees lower, and colds, pneumonia, nueralgia and rheumatism are much more prevalent.

The site of the house should be such as to afford good surface drainage in all directions. Where there can be plenty of sunshine, and a good cellar, and the building should be two stories high so as to afford ample sleeping appartments in the second floor. The rooms should have plenty of light, and facilities for free ventilation, and there should be enough of them to prevent overcrowding. The kitchen and dinning room should be conveniently arranged, bright and cherry so that the housewife and the daughters who spend so much of their time indoors should labor under as little disadvantage and discouragement as possible.

It too often happens, or used to, that more care, regardless of expense is given to housing and feeding the stock on the farm than to the inmates of the home—esteeming the profits derived from the sale of the stock more desirable than pleasures derived from providing for the comfort, convenience and health of himself his wife and family.

It is pitiable, as well as surprising, to what extent many farmers will deny themselves and their families comforts, to say nothing of the luxuries of life—subject themselves to the dangers of sickness and loss of life in order to lift the mortgage from the home, buy more acres of land, build additional barns or stock up their farms, with the too often delusive hope that there is a good time coming when they can say "Soul, thou hast much goods laid up, eat, drink and be merry."

2. The "well" should be at a point where the surface drainage, so far as possible is from it instead of toward it. It should, if not piped be lined with large tiles, cemented at the joints and should extend far enough above the ground to prevent in the time of heavy thaws or rainfall the entrance of surface water. It should not be nearer than 150 or 500 feet to the privy or feed yards, and should be covered with a good tight platform on cement or water tight curbing. If windlass and buckets are used the frame supporting them should be boarded up and roofed over. As a general thing an open well with buckets and windlass is to be preferred to the closed well

with a pump. The ventilation is helpful, and the agitation and aeration of the water by the ascending and descending buckets improve its quality both as to taste, smell and healthfulness. Water, in a closely covered well in soil contiguous to coal deposits, will generally be dark colored and foul smelling from the sulphur present, and as a steady beverage cannot be healthful; nor is it so good for culinary purposes. The open well greatly improves this water.

3. There should be provisions for getting rid of the kitchen and laundry slops. There is always quite a good deal of kitchen garbage and refuse that can be fed to the hogs and chickens to advantage. The laundry water and dish water laden with alkali as it must be, could be profitably disposed of in in the garden or about the trees and shrubbery or could be carried to a distance from the house in the ordinary open-jointed drain tiling. It should be laid below the frost line and might be carried if convenient to some ravine where it would be rapidly evaporated. Indeed, in such a drain but little of it would be carried very far from the house, as the leakage through the open joints soon absorbs all the liquid. This drain should not be near the well and the opening to it, which should be at least twenty feet from the house, should be boxed, with a strong heavy wire bottom with meshes so small as to pass but little of the solid substances that might be in the slops. This boxing should be covered with a good tight fitting lid.

The privy should not be too far from the house and should be made as comfortable as possible. Disease is often contracted by exposure where the outhouse is barn like, and too far away from the residence. The building should be up from the ground two and one-half or three feet and the wall of the rear or one end should be left open so that a box fitting pretty snugly could be shoved in to fill up the space beneath the seat for receiving the discharges. This box could be placed on plank runners, or small heavy wheels so that when full a horse could be hitched to it and it could be removed to the fields for fertilizing purposes. A drop door fixed on hinges should cover the opening in the rear or end when the box is in place.

The earth or ash closet, however, is a much more sanitary device. In its application sufficient dried earth, garden loam or coal ashes, are mixed with the excretea to absorb all foulness, to keep down odor and to prevent putrefaction. Wm. Paul Gerhard, the well known civil engineer, of New York City, speaking of these closets, says: "Such earth closets work quite satisfactorily with but little attention and forms a simple and cleanly substitute for the privy nuisance."

I may say in this connection that the State Board of Health, with the permission of Mr. Gerhard, has republished for free distribution his practical phamphlet upon the "Disposal of Sewage of Isolated Country Houses." There is a fund of information in it that would be appreciated by and helpful to the farmer, looking to the sanitary interest of his home.

Proper attention to the foregoing suggestions as to the house, its location, convenience, facilities for ventilation, etc.; to the well; and to the disposal of slops and sewage should do much to secure pure air and pure water, two of the essentials demanded.

5. The food question is a most important consideration in the sanitation and healthfulness of any home. The farmer can have his choice for his table of all he raises whether animal or vegetable.

Does he always select the best? Is it not often, too often, the case that the best of all he produces goes to the market and the inferior if not the poorest, is regarded as good enough for himself and his family? And then how often even the best food is rendered unpalatable and indigestible by faulty cooking? How few there are on our farms who know anything about the chemistry or philosophy of cooking? As a result there is dyspepsia, lack of assimilation and nutrition, and such lowering of the vital powers that the subjects thereof are especially susceptable to disease, and poorly prepared to withstand protracted illness.

During sickness there is not such isolation and disinfection practiced as will successfully protect the other inmates of the family. In my professional life I have known almost entire families in the country carried of by scarlet fever, diphtheria, or typhoid fever because the well or the milk had become contaminated from lack of proper care of the disposal of the discharges of those first attacked.

There is scarcely anything that is so easily contaminated by the germs of scarlet fever and typhoid fever as milk, and there is no medium in which the germs of these diseases multiply more rapidly and have greater vitality than milk. It would be surprising if you knew what the busy wide awake physisian has observed in regard to the production of tuberculosis, especially in children, from the use of milk from tuberculous cows. Raw milk constitutes so large a part of the dietary of the farmer that his family is especially exposed in case this disease exists in any of his milk cattle.

It would pay the farmer to have a clean bill of health for his cattle, not only from an economical and commercial standpoint, but as a safeguard for his family against infectious disease.

6. The labor on the farm is too often unnecessarily and slavish—often out doors from sunrise to sunset, and longer indoors. In this, however, the men have the advantage over the women. With the labor saving machinery now so generally in use the hours of toil should be greatly shortened and thus lessen the labor and worry of the women in the house.

In the matter of clothing it is sufficient to say that it should be such as will afford the greatest comfort and protection in winter and summer. Neuralgia, rheumatism, colds, pneumonia, affections of the kidneys and bowel disorders are often caused by insufficient or too heavy clothing—by the body being suddenly chilled when bathed in prespiration.

Sunstroke is one of the accidents liable to occur but that fortunately may be almost always prevented by avoiding severe labor in the hot sun when the stomach is empty unless there is kept in the hat wet leaves, a wet handkerchief, or something else to protect the head.

Farmers are peculiarly liable to infectious diseases by intervisiting, or by the visits of traveling salesmen and solicitors. It is a very common occurance to be able to trace smallpox, scarlet feaver, diphtheria and other infectious diseases from one place to another by the means above suggested.

Rats, flies and mosquitoes are all convicted carriers of infection, and flies especially are often the cause of wide spread epidemics of typhoid fever.

A lack of social opportunities affects the health of the farmer's family more injuriously than is generally appreciated. The superintendents of our insane hospitals allege that too great proportion of their inmates have come from the farms, especially of the females, and they attribute the cause to the long hours of labor in the house; to the humdrum life of the farmers' wives; and to the lack of opportunity or of inclination or time to improve opportunities for social recreation. I think, however, this condition is being greatly improved. The grange; the lyceum; the spelling school; the church and Sunday school; the bicycle; the better facilities for getting to town; and the rural postal delivery together with the low price of excellent reading matter all help to a healthier, happier home life on the farm.

My pleasantest home recollections are connected with country life, and many of the most enduring and delightful friendships I have ever made have been among the farmers. I believe that farm life with a residence in the country, where the laws of hygiene are faithfully carried out is not only most noble and natural but most conducive to health and long life, and hence to happiness. I think there are but few men who leave the farm and go to the city but that often and often, however successful they may be in acquiring wealth, sigh for the quite and rest of the old country home; and I may say here that fewer farmers wives would want to sell out and move to the city if they had more social advantages and less daily and nightly drudgery.

I may say in conclusion as I said earlier in this paper that the requisite of all successful sanitation is pure air, pure food and pure water, together with proper protection against infectious diseases, and a due regards for the moral and social opportunities that drive away dull care. All these can be had more easily in the country than in the town.

XIII

THE HYGIENIC TREATMENT OF TUBERCULOSIS

BY J. F. KENNEDY, A. M., M. D., DES MOINES
SECRETARY OF THE IOWA BOARD OF HEALTH

As far back as the days of Moses a sanitary code was promulgated that to the Israelites had all the authority of a divine utterance. Many provisions in that code were fully abreast of the most advanced thought of the ablest sanitarians of today—as practical protective measures.

We find that in leprosy, for instance, not only lepers themselves were regarded as the means of extending the disease, but that their clothing, and their residences, if incapable of being successfully disinfected, were to be destroyed.

The fact was fully recognized that the walls, and even the foundations of the houses of lepers became so infected as to be sources of spreading the disease, and under specified conditions were regarded as incapable of disinfection, and ordered destroyed, and the debris removed beyond the city or camp.

About one year ago an intelligent gentleman, a merchant living in an Iowa town to which he had recently removed, purchased a residence property for a home for himself and family. After doing so he was informed of some facts that produced a great deal of anxiety, and he wrote to me as Secretary of the State Board of Health for advice. The facts as stated were that of three families who had previously lived in the house in succession, each family had lost one or more members with pulmonary consumption. Of the last family four members had died of this dread disease.

He wrote that the house was in every way desirable, and yet with such a history he hesitated, and justly, too, to move his family into it.

The mere fact of such an inquiry demonstrates that the laity as well as the profession is coming to look upon the "great white plague" as an infectious disease; and that its appearance in any individual is a result not so much of heredity as of infection and environment.

Consumption is essentially a house, or indoor, disease. Perhaps I ought not to say "essentially," and yet the expression is not far from the truth. I would not have you think that a residence in a comfortable, well ventilated house is in itself a source of danger because of its liability to produce tuberculosis. The danger lies in the fact that the bacillus of tuberculosis which has become omnipresent finds more congenial and favorable conditions for its multiplication, duration of vitality, and for its destructive life processes in dwellings than out of doors.

There is much in the selection of a building site, so as at all times to secure good ventilation, plenty of sunshine, and freedom from dampness. A house destitute of these hygenic conditions that has once become the abode of the tubercle bacillus is indeed a constant menace to its occupants —a meance that grows and strengthens with the increasing years.

The following interesting history of a house in Ohio was furnished Dr. C. O. Probst of Columbus, the secretary of the Ohio state board of health, by Dr. J. E. Gaston of Mineral Ridge: "This house was constructed about 1830, and was occupied by a family of the name of F. It is related that a young man who lived with the family was 'always ailing and in delicate health,' but the only death was that of a baby with bowel trouble. They resided on the premises until about 1846, when the house was occupied by another family. They were an unusually strong and healthy family when they first came to this place, with no previous tubercular history. The first one connected with the family to pass away was a lady boarder, but information does not reveal the cause of her death. It was quickly followed, however, by the death of two sons, two daughters, father and mother, from tuberculosis, leaving only one son, who had previously gone to Illinois on account of his health, and who still survives. From 1879 until now the house has been held by the present occupants. There is no history whatever of consumption in the family prior to their coming to this house. The daughter who died recently was born there. Her death was the seventh in the family in as many years from pulmonary tuberculosis. A sister, two brothers and a mother survive, but the characteristic traces of the disease are plainly visible in the faces of one brother and the surviving sister. The building is a story and a half high and is surrounded by dense foliage." The doctor further says that the residents of this place look upon the house with horror, and if the family were to move out the building would go up in flames inside of twenty-four hours, and not a hand would be turned to save it.

The lesson I would teach from the foregoing is that when tuberculosis appears in successive families in the same house it is pertinent to inquire whether health authorities and citizens generally should not insist that it be if possible successfully disinfected, or else completely destroyed, for the public good.

The same inquiry perhaps would be pertinent in the case of some other infectious diseases. Only a few weeks ago I received a letter from Cumberland, Cass connty, informing me of a severe outbreak of scralet fever in a certain house. Some months before a party who resided in the house had in his family several cases of scarlet fever. Soon after he removed to Colorado—perhaps without the house being properly disinfected, if at all. Within ten days or two weeks after another family had moved in and several members also came down with the disease in a malignant form.

The design of this paper is not only to emphasize the dangers of insanitary dwellings, but to magnify if possible, the advantages of fresh air, outdoor life, chest expansion, and such athletic and other muscular exercises as will best secure and maintain the most perfect respiration; and this for the purpose of the treatment as well as of the prevention of tuberculosis.

I do not underrate nor minimize the great importance of disinfection, or destruction of the sputa and other excreta of consumptive patients, nor the

beneficial effects of proper therapeutic measures. These measures are highly essential and hence are heartily commended, as are also all efforts to secure milk and other articles of food that have no taint of tuberculosis.

Whatever undermines the general health increases the susceptibility to the infection, and diminishes the power of recovery from incipient or advanced tuberculosis. The highest condition of health and resistful vitality is best promoted by the habitual breathing of pure air. I believe the greatest enemy to the bacillus tuberculosis is an abundance of oxygen, as found in pure, fresh air.

The open air treatment of consumptives and of those threatened with tuberculosis disease, has, when systematically carried out, given better results than any other. In Germany, and to some extent in this country, the systematic treatment of those believed to be predisposed, and of those afflicted with tuberculosis in various stages, is resorted to in "sanitoria," with the most encouraging results. In these resorts the inmates have the advantage of a regular life, nutritious food, such exercise and chest distention as they can bear, and above all, an abundance of fresh air. Even in the coldest winter weather patients, after gradual habituation, pass the whole day walking in the open air, or sitting or lying on resting places comfortably wrapped in blankets. No claim is made for the advantage of climate—the all-important thing being an abundance of pure air.

Dr. Hambleton, of London, England, in his recent work on "The Suppression of Consumption," makes this bold proposition, and produces an array of evidence in support of it:

"Consumption is the direct result of the reduction of the breathing surface of the lungs below a certain point, in proportion to the remainder of the body, and is solely produced by conditions that tend to reduce the breathing capacity of the lungs." He says further: "I have experimentally produced consumption by these conditions. On one occasion I took a well developed chest and gradually submitted it to conditions that tend to reduce the breathing capacity, and at the same time as far as possible, placed impediments to the performance of compensatory action by other organs. At first there was a reduction of the chest girth, a wasting of the muscles, a loss of the range of extension, the well-known change in shape, and increased frequency of breathing. This was soon associated with catarrh, pain in the chest, steady loss of weight, and hectic; and the process was continued until I was satisfied that consumption was well established. Then I induced compensatory action by other organs, and submitted the lungs to conditions that tended to develop them. This was followed by great relief in the chest symptoms, which evidently greatly disappeared, by a restoration of the general health, a return to the normal weight, and a change in the shape of the chest in the opposite direction, and I continued the process till the chest had regained its full development, and there was sound health. Each step in the experiment was carefully verified, the same sequence invariably observed, and I have both traced the presence of conditions, and watched their process in many cases of consumption."

Dr. Hamilton cites various occupations and conditions of life as illustrating his proposition—showing that the worst districts in England were not so productive of consumption as the conditions in the English army. Notwithstanding these men were selected because of their physique, were examined before being listed, and re-examined in three months, yet an unusually large proportion became consumptive owing to the changed conditions of life, to the impure air of the barracks, and to the compression of the chest by clothing, and by a variety of conditions that tend to reduce the breathing capacity. He cites the fact that many animals that never in their wild and unrestrained conditions develope consumption, die from the disease within a few months or years after being confined—that strong, healthy women, accustomed to work in the fields, go to Paris, put on corsets, restrict their breathing capacity, and furnish the majority of consumptive subjects; that the children of consumptive parents, though born with as well-developed chests as those born of healthy parents, because of the care taken of them to prevent colds by exposure, and because of heavier clothing that interfers with breathing, early develop the disease; that from greater indoor life and greater chest compression the women of our country homes are more liable to consumption than the men.

He speaks of the easy facilities for travel existing today as conducive to consumption, and the reluctance of the people to walking if they can ride, and that by the invention of machinery so much is done now that formerly required muscular exertion. The construction of modern houses—the effort to make them impervious to outside air—creating a hyper-sensitiveness to cold, and preventing us from venturing out more than necessary during the colder winter months—also favors the production of the disease.

The preventive measures recommended by our author are erect carriage of the body; chest expansion by a systematic course of full inspirations; life out-doors as far as possible; the freshest and fullest ventilation of our homes; the discarding of all clothing or occupations that restrict chess expansion; the maintenance, so far as possible, of the highest and most perfect physical vigor by proper food, exercise, cleanliness, etc., having constantly in view, however, in all preventive measures the proposition so emphatically enunciated, "that consumption is the direct result of the reduction of the breathing surface of the lungs below a certain point, in proportion to the remainder of the body, and is solely produced by conditions that tend to reduce the breathing capacity."

He concludes his monogram with fifteen propositions, the last of which is: "That both the experimental and the practical application of measures that tend to compensate for and counteract those conditions have been invariably followed by the arrest and subsequent complete recovery from consumption, where the disease was not too extensive; and the same process has obtained in the thousands of cases of cure by nature, and by Sydenham. * * * Consequently we now have it in our power to secure, with absolute certainty, the prevention of and recovery from consumption."

Dr. Hambleton writes as an enthusiast—perhaps as a faddist—but he refers to more than a score of our most noted medical authors in support of one or more of his propositions. I firmly believe that the preventive and curative measures recommended by him conjointly with the methods of disinfection recommended by the advocates of the germ theory, afford methods of prevention that, if faithfully carried out, will materially reduce the number of cases, and greatly lessen the fatalities of this dreaded "white plague."

Vital statistics furnished by the register general of Great Britain show that the deaths from this disease have, because of more intelligent pre-

ventive and curative methods, been declining in number the last ten years; and Dr. S. W. Abbott of Boston, Secretary of the Massachusetts State Board of Health, makes the same observation as to Massachusetts. He attributed this falling off largely to the extensive use of the bicycle, especially by women.

In order that the best results from this treatment may be witnessed, it is important that the treatment should begin early. Indeed, the treatment should begin before the disease has really stamped its impress upon the subject, and be continued until the chest development and the general health are so improved as to render the subject immune, or until recovery is complete. Chest measurements should be taken and carefully noted, and where the lung capacity is below the normal, persistent and intelligent measures should be adopted and persevered in until the breathing capacity has been brought up to or beyond the normal.

Where practicable, treatment should be in hospitals or sanitoria, located and constructed with the most favorable sanitary conditions, and where the system of chest-development would be intelligently and persistently prosecuted. With a will and determination, however, to get well, no such appliances are essential. The patient at home can by his or her own individual efforts, under the direction of an intelligent physician, successfully combat the disease and regain and maintain excellent health.

I verily believe if the preventive measures above recommended are rigidly and faithfully observed for the next twenty years there will be a most surprising as well as gratifying falling off of cases of tuberculosis, and the methods of treatment recommend will commend themselves to the laity as well as to all schools of medical practice because of the large number of recoveries.

XIV

REPORT OF BRITISH CONGRESS ON TUBERCULOSIS *

So much interest has been manifested in the great Congress on Tuberculosis recently held in England, and so many have expressed a desire to see what was done that the SECRETARY takes great pleasure in republishing the following very excellent report sent by Dr. A. R. Thomas, Passed Assistant Surgeon U. S. M. H. S. to Surgeon General Walter Wyman, and published in *Public Health Reports*, September 6th. The report is a most compact as well as complete summary of the proceedings. This fact is the only apology for republishing it entire:

OFFICE OF MEDICAL OFFICER IN COMMAND,
MARINE-HOSPITAL SERVICE,
London, England

SIR,—I have the honor to make the following report of the British Congress on Tuberculosis, held in this city from July 22, to July 26, 1901, inclusive, and to which I was appointed a delegate:

OPENING OF THE CONGRESS

The congress was opened by a general session on the afternoon of July 22d, the Duke of Cambridge occupying the chair on behalf of his Majesty the King. The delegates and members of the congress were welcomed by the various bodies of the city, and one delegate from each country responded. The further meetings of the congress were divided into four sections, to meet each morning as follows: Section 1, state and municipal; section 2, medical, including climatology and sanatoria; section 3, pathology, including bacteriology; section 4, veterinary. In addition, on each afternoon of the congress, a general meeting was held and an address delivered on some topic of common interest to the whole congress. Various forms of social diversion were provided during the week, including garden parties, receptions, and a dinner to the foreign delegates.

PROFESSOR KOCH'S ADDRESS ON TUBERCULOSIS

The first general meeting on July 23d was addressed by Professor Koch, of Berlin, his subject being, "The fight against tuberculosis in the light

*Though this Congress was held subsequent to the close of the period embraced in this report its importance justifies its insertion herein.—SECRETARY.

of the experience that has been gained in the successful combat of other infectious diseases." He said that since the discovery of the bacillus of tuberculosis it was evident that tuberculosis was a preventable disease, and in combating it as such it would draw valuable lessons from our experience in other pestilences, for we had learned that every disease must be treated individually and measures adopted according to its special nature and etiology. An illustration of this principle is plague, where formerly the patient was considered in the highest degree a center of infection, but now only patients with plague-pneumonia are so regarded, and we know that the chief source of contagion are the rats affected with plague, and effective work could be done in exterminating rats, otherwise the chief etiological factor is not touched. Cholera offers another example, for here the chief propagator of contagion is the water, and so the water is the first thing to be considered. Hydrophobia is also instructive, for while inoculations are curative, they are not preventive of infection, and the only real way of combating this pestilence is by compulsory muzzling. Lastly, leprosy is closely akin to tuberculosis, and like it only spreads from man to man by close contact, so to combat it it is necessary to prevent close communication of the well and sick, and so isolation is adopted.

In by far the majority of cases of tuberculosis the disease has its seat in the lungs, and has also begun there. From this it is justly concluded that the germs of the disease—that is, the tubercle bacilli must have got into the lungs by inhalation. As to the question where the inhaled tubercle bacilli have come from there is also no doubt; on the contrary, we know with certainty that they get into the air with the sputum of comsumptive patients. This sputum, especially in advanced cases of the disease, almost always contains tubercle bacilli, sometimes in incredible quantities; by coughing and even speaking, it is flung into the air in little drops—that is, in a moist condition, and can at once infect persons who happen to be near the coughers, but it may also be pulverized when dried in the linen or on the floor, for instance, and get into the air in the form of dust.

The bacilli may get into other organs in the same way, but rarely. Transmission by heredity is extremely rare.

It is generally assumed that another source of infection exists in the transmission of germs from animal to man, but investigations by him have led to a contrary conclusion. Experiments were conducted by feeding tubercular-free young cattle and swine with tuberculous material from bovine and human sources, with the result that from bovine sources the animals became infected, while from human sources they remained free, and the conclusion would seem to be that human tuberculosis differs from bovine and can not be transmitted to cattle. But more important is the question as to whether bovine tuberculosis can be communicated to man, but this is impossible of absolute demonstration. As large quantities of butter and milk are consumed containing bacilli, it would seem that many cases of tuberculosis affections should be caused, but from the examination of a large number of post mortem reports, it was found that primary intestional tuberculosis was extremely rare even in children in whom it ought to be most common.

"Though the important question whether man is susceptible to bovine tuberculosis at all is not yet absolutely decided, and will not admit of obsolute decision today or tomorrow, one is nevertheless already at liberty to say

that if such a susceptibility really exists the infection of human beings is but a very rare occurance. I should estimate the extent of the infection by the milk and flesh of tuberculous cattle and the butter made of their milk as hardly greater than that of hereditary transmission, and I, therefore, do not deem it advisable to take any measures against it."

The main source of infection in tuberculosis is, therefore, the sputum of patients, and to prevent this infection is our first object. Isolation is impractible and also unnecessary. If proper precautions are taken no infection need occur, but this is difficult among the poor where there is overcrowding, bad ventilation, and often whole families are thus infected. Therefore, the first indication is to improve the social condition of the poor, and, secondly, to provide consumptive hospitals where patients in the latter stages may obtain treatment gratis, and where the patient would be willing to go. England is the only country having any great number of such institutions, and the diminution of consumption in this country is probably due in a large measure to this reason. Another measure especially valuable is compulsory notification, which not only shows the number of tuberculous persons, but also where they reside, and, therefore, where disinfection and instruction are necessary. Disinfection is of the greatest importance, not only of rooms and houses, but also of infected bedding and clothing. Education of the public is of great benefit, for it has already done much to limit infection.

On the other hand, for treatment, are the sanatoria, which have lately come into vogue, and can cure a certain number in the early stages of the disease. This number is small however, in comparison with the whole number of infected persons, and its value should not be over estimated.

"And now, in conclusion, to glance back once more to what has been done hitherto for the combating of tuberculosis, and forward to what has still to be done, we are at liberty to declare, with a certain satisfaction, that very promising beginnings have already been made. Among these I reckon the consumption hospitals of England, the legal regulations regarding notification in Norway and Saxony, the organization created by Biggs in New York, the sanatoria, and the instruction of the people. All that is necessary is to go on developing these beginnings, to test and, if possible, to increase their influence on the diminution of tuberculosis, and wherever nothing has yet been done to pursue similar measures."

DISCUSSION OF PROFESSOR KOCH'S ADDRESS

It is needless to say that this address has given much ground for discussion thoroughout the congress. Lord Lister remarked that it would be a serious and grievous thing if it should lead to any relaxation of the efforts being made at presenf to provide a pure milk supply, and it should turn out that these views of Professor Koch were erroneous. He cited the instance of smallpox and cowpox and stated that while smallpox could not often be inoculated from man to cows, it was possible to inoculate monkeys from man and afterwards cows from the monkeys, and we now know that the two diseases are identical. He further said that he agreed with the speaker that further investigation was desirable. Professors Nocard, Bangs and Sims Woodhead all agreed with Lord Lister.

PROFESSOR BROUARDEL'S ADDRESS

The third general meeting was addressed by Professor Brouardel, of

Paris, on "The measures adopted by different nations for the prevention of consumption." He pointed out the havoc that was caused by this disease and the slowness in recognizing its dangers until its infectiveness was proven by Willemin and Koch. Before this Engiand had recognized the dangers arising from damp and dark dwellings and seventy years ago began the crusade for healthy dwellings. The grounds of prevention in all countries are identical—that is, that tuberculosis is preventable and curable. First comes legislation and the education of public opinion. Pamphlets are issued for the information of the public in England by the National Association for the Prevention of Consumption, and in Germany societies were founded for building sanatoria and popularizing sanitary ideas. Belgium has a national league against tuberculosis. Norway has voted money for the printing of a popular work on tuberculosis. In France they have collected together those who can teach and popular lectures are given, and on every hand societies for the prevention of tuberculosis are springing up. This year 88 lectures on tuberculosis had been given to 12,000 pupils. Thus gradually in all countries the public are beginning to realize that personal care and cleanliness are necessary to obviate contagion, and are also realizing that other idea to my mind equally important, that a consumptive patient is only dangerous if the necessary precautions are not taken around him, and if he himself does not take them to protect his relatives, friends, and fellow-workmen from contagion. The great danger is spitting, and once this disgusting habit has been suppressed, consumption will decrease rapidly. In the United States the habit is against the law, and in Sidney, New South Wales, a fine of £1 is imposed for spitting in the streets. The sputum is not dangerous if put in antiseptic receptacles, or if thrown in dry and well-lighted places it soon loses its dangerous properties; thus, more victims occur in dark and ill-ventilated houses, for here it retains its virulence a long time. Thus the importance of healthy dwellings becomes plain, and is recognized by various countries, notably England, which has several acts dealing with workmen's dwellings, and model dwellings are largely built. In Germany also an effort is being made in this direction. Belgium is also one of the most enthusiastic countries in taking up this subject, but in Denmark building societies have flourished best of all. In France also something has been done in this direction, and all authors agree that mortality is lower in these healthy houses and in the town in which they are built. Bad quarters exist in all towns, which are a hotbed of tuberculosis, and these must be found and demolisned. Alcohol is another potent cause of tuberculosis, and it has been shown that the death rate is higher from this disease in the different classes of society in proportion to the amount of alcohol consumed. In scrofulous children and those reared in unhealthy dwellings the duty is to build up the body. for this purpose there are established in France and Italy and other countries, sanatoria at the seaside for such children, with good results. France has 14 such institutions that accommodate more than 2,000 children a year.

Prevention also follows the line of food, and the inspection of meat is in this direction. However, the great danger here is in the private slaughter-houses where no inspection occurs. In milk the danger is in tuberculous mastitis and here the danger can only be recognised by examination of the udders. In England it is a noticeable fact that while the deaths from tuberculosis have decreased 45 per cent. in the last fifty years the deaths in children have increased 47 per cent., which is attributed to the increase of abdominal tuberculosis due to milk. Strict inspection measures are adopted in Norway, Sweden, and Denmark.

Coming to the curability of tuberculosis, we know it is curable in all stages, but especially in early stages, as is abundantly shown by post-mortem examination and the finding of cicatrices of all sizes in the lungs. For this object come dispensaries where the patient can obtain treatment in the earlier stages and receive instruction regarding measures of hygiene and feeding, and if necessary be sent later to a sanatorium. In Germany there are polyclinics for tuberculosis, in the large towns, where the patient can be treated throughout the illness or till sent to a sanatorium, and a committee connected with it looks after the patient at home, tells his wife what to do, and sees that the house is kept clean, and, as far as possible, relieves the poverty caused by the breadwinner's illness by means of a bank kept for such purposes.

The same idea was first carried out in France by Chalmette, but he went further in going and seeking out the consumptive and inviting him to come to the dispensary, and he has established a dispensary on these lines at Lille, and several others have been founded on similar lines in various parts of France.

Some patients must be sent to sanatoria, and here the principles are rest, moral and physical, stuffing, and the open-air treatment. In Germany this system is carried out most enthusiastically, and there are eighty-three sanatoria opened already or ready to open which can accommodate 12,000 patients each year. They have been built by local insurance, by sickness banks, by the manufacturers who have combined to found sanatoria for their work-people, by parishes which have united for the purpose. There are more of the latter. In some parts a tax of from 1d. a head has been exacted. The state has also founded several sanatoria for its servants. Patients remain three months, and it is thought advisable that they return for a month's treatment the next year. The results seem satisfactory, for from forty-six to sixty per cent of those who leave were able to work. Germany's example has been followed by England, Scotland, Australia, Canada, Austria, and America, also in Russia, Sweden, Denmark, Norway, Italy and the Netherlands sanatoria are building, and in France several sanatoria have been opened. In the United States also, wards are assigned in hospitals for the exclusive use of consumptives. From an international standpoint, it would seem that consumption can not be treated as plague and the other pestilences, but much can be done by disinfection of railroad carriages, steamboats, and hotels. In the United States hotel keepers are obliged to notify the authorities if they receive a consumptive patient, and disinfection of the room so occupied is compulsory. The minister of the interior in Germany has brought in even more stringent measures. Every doctor who attends a case of pulmonary or laryngeal tuberculosis is bound to report it in writing to the police as soon as he has made his diagnosis. After death from tuberculosis the room in which the patient has died has to be disinfected and also his belongings. Hotel proprietors, furnished housekeepers,

asylums, and other public institutions are compelled to notify at once every case of tuberculous disease which arrives in their establishments.

PROFESSOR MC FADYEAN'S ADDRESS

The fourth general meeting was addressed by Prof. John McFadyean, of the Royal Veterinary College, his subject being "Tubercle bacilli in cow's milk as a possible source of tuberculous disease in man." He said that until a few days before he had not thought he would have to argue the question as to the identity of human and bovine tuberculosis, but Professor Koch's address made this necessary. He thought Professor Koch's train of reasoning appeared to be the following:

First. That the bacilli found in cases of bovine tuberculosis were much more virtulent for cattle and other domestic quadrupeds than the bacilli found in cases of human tuberculosis.

Second. That this difference was so marked and so constant that it might be relied on as a means of distinguishing bacilli of bovine tuberculosis from those of the human disease, even assuming that the former might occasionally be found as a cause of the disease in man.

Third. That if bovine bacilli were capable of causing the disease in man, there were abundant opportunities for the transference of bacilli from the one species to the other, and cases of primary intestional tuberculous from the consumption of tuberculosis milk ought to be of common occurence, but post-mortem examination of human beings proved that cases of primary intestional tuberculosis were extremely rare in man, and, therefore, it must be concluded that the human subject was immuned against infection with the bovine bacilli, or was so slightly susceptible that it was not necessary to take any steps to counteract the risk of infection in this way.

He thought one of these premises was ill founded and the others had little or no bearing on the subject, and that reasonable ground remained for regarding tuberculous milk as distinctly dangerous to man. He argued that even if bovine bacilli were more virulent to cattle, and that human bacillus has little virulence, the opposite did not follow, and the probability was all the other way, for it was known that those bacteria that were common to all the domesticated animals were also pathogenic to man. As for infection from cattle to man, he quoted the post-mortem records from the hospital for sick children in London and the Royal Hospital for sick children in Edinburgh. Out of 547 cases of tuberculosis, the proportion of primary infection through the intestine was found at the former institution to be 29½ and the latter 28½ per cent. He hence submitted that there was strong prima facie evidence that animals were a possible source of human tuberculosis. He thought the diseased cows were only dangerous when the udders were affected, for it was estimated that 30 per cent of the milk cows in England were tuberculous, and only about 2.2 per cent had the udder affected. In the latter class, the milk often contained large quantities of the bacilli and the danger was greater because in the early stage such udders were quite painless and no change showed in the character of the milk. Another source of contamination of milk that could not be lost sight of was dust and dirt. As a remedy, he thought the tuberculin test impracticable, because too expensive and too disturbing to the cattle industries. He, therefore, recommended periodical inspections at brief intervals by competent inspectors. He supported also the compulsory notification of udder disease and of symptoms of tuberculosis in milked cows and the interdiction of the sale of milk from any animal suffering from tuberculous disease of the udder, or exhibiting clinical signs of tuberculosis.

DR. BIGGS ON "THE NOTIFICATION OF TUBERCULOSIS"

In the section of State and Municipal Dr. Biggs, of New York, presented a paper on "The Notification of Tuberculosis," dealing mainly with New York City, but he also mentioned that notification was also compulsory in Michigan, Buffalo, and Philadelphia. New York was the first to pass such a law in 1893, but the compulsory notification was not complete, physicians in private practice only being invited to notify. Sputum was examined free of charge and at the end of the third year 8,000 specimens per year were examined. Efforts were made to disinfect premises in which death from tuberculosis had occured. In 1897 it was resolved by the board of health of New York that tuberculosis being a dangerous and contagious disease, every physician should report in writing as to patients suffering from that disease within one week of being called in, and a sum was appropriated for the care of poor tuberculous patients. This resolution was not strictly enforced as regards private patients, but public opinion was gradually decreasing the number of cases not notified. In consequence of these measures and the better treatment of consumptives, there has been a decrease of 30 per cent in mortality arising from tuberculosis.

ALDERMAN MACDOUGALL'S PAPER ON VOLUNTARY NOTIFICATION

Alderman Macdougall, of Manchester, read a paper on the working of the voluntary system of notification in that city. At first it was restricted to institutions, but later, in 1900, private physicians were invited to notify, in order that—first, the assistant medical officers might visit the homes of patients and instruct the household in the precautionary measures to be adopted, leaving with them printed instructions Second, that the nature of measures of disinfection required might be determined. Third, that they should make inquiries into the exposure to infection of individual cases from relatives, work mates, friends, etc., and into their occupations and places of work, the various houses which they had inhabited, their physique, personal habits, etc. Fourth, that supervision might be maintained over infected households, change of address ascertained, personal precautions and household cleanliness maintained, and necessary measures of disinfection carried out from time to time. Fifth, that it might be ascertained if the required measures of disinfection were being executed. Sixth, that assistance might be given in getting bacteriological examination of sputum in suitable cases. Seventh, that information regarding households might be obtained to serve as a basis for hospital provision.

The number of cases notified from September, 1899, to March 31, 1901, had been 2,338, and of these 1,701 had been in institutions and 638 in private practice. In addition to disinfection and cleansing, notes were made of centers of infection.

Dr. M. Holmboe said that in Norway notification was limited to pulmonary tuberculosis and tuberculosis of the skin and urinary organ that could be positively diagnosed. Deaths from tuberculosis must be reported

and the premises be disinfected. He thought compulsory notification was necessary to give authorities power to enforce sanitary orders. Various other members expressed their opinion, all being in favor of some form of notification, and the following resolution was passed: "That the voluntary notification of cases of phthisis attended with tuberculous expectoration and the increased preventive action which it has rendered practicable has been attended by a promising measure of success, and that the extension of notification should be encouraged in all districts in which sufficient sanitary miaistration renders it practicable to adopt the consequential measures."

PREVENTION OF TUBERCULOSIS IN CHILDHOOD

Two papers on the prevention of tuberculosis during childhood were presented. One by Dr. Leon Petit of Paris, reporting the establishment of dispensaries for children in that city and the good that had resulted. Dr. Knopf, of New York, read a paper on the State and individual prophylaxis of tuberculosis during childhood, advocating the separation of consumptives and children and the doing away of many habits tending to infect children, such as kissing and the tasting of food.

THE INFLUENCE OF HOUSES AND AGGREGATION

Under the "Influence of houses and aggregetion," Dr. Coates, of Manchester, reported experiments made with dust from various localities. In twenty-three specimens taken from dirty and infected houses, sixty-six per cent proved infective. In ten clean but infected houses fifty per cent proved infective, and from the waiting room of a large consumptive hospital and a large general hospital the results were negative, but specimens from a railroad waiting room gave positive results in two cases. For disinfection he recommended the use of a solution of chlorinated lime, one and one-half ounces to a gallon. Walls, ceilings and floors, and all suitable articles of furniture were to be thoroughly washed with this several times. Clothing and bedding should be steamed, and wall paper in clean houses and with no sputum attached might be cleaned with bread dough.

Various members spoke of spittoons, and the general opinion seemed in favor of some form of combustible receptacle contained in a metal or porceclain carrier.

CONTROL OF MEAT AND MILK SUPPLIES

Mr. Shirley Murphy opened a discussion on the control of meat supplies. He said there was very little new to be said on the subject. He gave a review of the measures adopted in England for the prevention of the sale of tuberculous meat, but added that there was always the possibility of a tuberculous animal being slaughtered under conditions avoiding inspection. Other speakers spoke in the same vein.

In the discussion of milk supplies, nearly every speaker took occassion to disagree with Professor Koch, and to express the opinion that tuberculous milk was dangerous to man as a food. Professor Delapine thought no animal could be declared free of tuberculosis unless the tuberculin test had been applied.

SANATORIA

In opening a discussion on the provision of sanatoria, Sir James Creighton-Browne said that sanatoria were needed for two reasons, first to cure those affected in curable cases, and second that incurable cases might be removed so as not to be a source of infection as well as having a life prolonged and the comforts necessary to their condition. It was held that the tendency to spontaneous cures were what made sanatoria so necessasy, and it ought to be brought within the limit of all classes. He thought there ought to be three classes of sanatoria, first, for the affluent; second, for the competent, and third, for the poor.

CLIMATOLOGY

In opening a discussion on climatology, Dr. Theodore Williams said that in whatever climate the patient was treated the great object was to get him into the open air and to live under the most favorable hygenic conditions. The climate that best fulfills the open-air treatment need not be a very warm or a very cold one, but should be dry and stimulating, and with abundant sunshine, admitting of much exercise and producing nervous and muscular vigor. Climates might be classified as, first, marine climates, including sea voyages; second, mountainous climates, partly inland, partly marine, and third, mountainous climates. Under marine climates are the south coast stations of England and Ireland having an equable temperature and a good deal of wind with considerable rain and many rainy days. They were suitable for chronic cases and especially the strumous forms. Sea voyages were going out of vogue, partly at least, because steamers made the trip too short, and also because of the disadvantages of the close cabin and the lack of exercise and also because other methods of treatment had come into use.

Under dry warm climates are, first, the desert, giving dryness and warmth, sunshine and great radiation with the consequent great variation of day and night temperature, and the asepticity of the atmosphere. In experience these climates produce a diminution of secretion and improvement and quiescence, but seldom absolute arrest. Second, comes the warm dry climate of the Mediterranean basin. It is cooler and more stimulating than the desert and clearer and with less fog and rain than the English-coast stations, and the cool nights are especially advantageous.

Mountainous climates are characterized by: First, diathermancy; second, asepticity, and third, by the physiological effects on the body, tanning the skin, at first quickening, then slowing the circulation, and fuller respiration accompanied by dilatation of the thorax. He gave statistics of 385 cases treated in high altitudes in various places, the treatment averaging eleven and a half months. The results were that 173 or forty-five per cent completely recovered, seventy-seven or twenty per cent greatly improved, and fifty-four or fourteen per cent improved, so that in all 334 improved. His conclusions as regards the effects of the high altitude on consumption are, first, that the respiration of the rarified atmosphere produces hypertrophy of the healthy lung and local pulmonary emphysema around the tuberculous lesion, giving rise in due time to thoracic enlargement; second, that it is possible the arrest of tuberculous disease is at least partly due to the pressure exercised on the tuberculous masses by the increasing bulk of the surrounding lung tissue, which, by emptying the blood vessels, promotes caseation and cretefaction of the tubercle; third, that these changes are accompanied by general improve-

ment in digestion and assimilation, the cessation of all symptoms of disease, the return of normal functions by gain of weight, of color, of nervous and muscular activity, and of respiratory and circulatory power; fourth, that arrest of disease takes place in fifty-eight per cent of tuberculization cases and great improvement in eighty-seven per cent; that in excavation cases arrest occurs in twenty-one per cent, and great improvement in sixty-one per cent; fifth, that the climate is especially beneficial in hemorrhagic phthisis and phthisis in which hereditary predisposition is strongly marked, and is well suited to chronic tuberculosis of the lungs in general; sixth, that males and females seem to do equally well and to profit most between the ages of twenty and thirty, and seventh, that the climate is contraindicated in acute phthisis, catarrhal phthisis, in laryngeal phthisis, in cases of phthisis accompanied by great nervous irritability, in cases of double cavities with fibroid phthisis and in all patients whose pulmonary surface has been so much reduced from any cause that it does not suffice for complete respiratory purposes.

Dr. Burney Yeo followed on much the same lines, the objects of treatment by climate being, he stated, to arrest catarrhal conditions of the air passages, to improve nervous and circulatory tone, to increase the activity of the digestive functions and thus stimulating nutrition by promoting the desire and increasing the power to exercise, to raise the moral tone by affording a clear, bright, and cheerful environment, and to diminish by its asepticity bacteriological activity.

In conclusion, he stated that a suitable climate relieves or removes catarrhal conditions accompanying the disease in a number of cases; it raises nervous and vascular tone, it increases muscular energy and the ability as well as the desire for exercise; by rendering an open-air life possible, it increases the aëration of the lungs and diminishes the activity of bacterial agencies. It improves the tone and promotes the activity of the digestive functions.

In regard to suitable climate, he said that cases treated at the commencement of the disease, and who were otherwise in good health, may be permitted a certain amount of latitude in the choice of climate. Second, for progressive febrile cases, repose in bed or on the couch at home is the best condition practicable for the free access of air and sunshine. Third, for catarrhal cases, soothing climates like Madeira or Teneriffe are best. Fourth, for rheumatic or gouty cases of the fibroid type, dry marine climates or the desert are most suitable.

USE OF TUBERCULIN

The discussion regarding the therapeutic and diagnostic value of tuberculin was opened by Dr. Heron, who gave a short history of it, and thought it had fallen into disuse owing to its frequent use in unsuitable cases, its administration in too large doses, neglect of the rule that a dose should never be given until the patient's temperature has been normal for the previous twenty four hours at least, neglect of the rule that the dose of tuberculin should never be increased, but rather diminished, when its administration has been followed by a rise of temperature, and the prejudice raised against the remedy among both medical men and patients, because of the severity of the symptoms which not seldom follow upon its use. Of fifty-one cases treated by him, seventeen were lost sight of, and of the remaining thirty-four, sixteen were known to be well. Lupus did well up to a certain point and then relapsed. One case of lupus treated by the new tuberculin recovered permanently. Tuberculin was now known to be worse than useless in cases of mixed infection. For diagnosis, tuberculin was most valuable, making very early diagnosis possible, when the chances of recovery were best.

Professor Koch said that if the diagnostic injections were properly made in the human subject, it was a valuable method and without danger. The injections should be small enough in weak subjects; not more than ½ mm. was enough to begin with, and no second injection should be given until the temperature was again normal. If the first injection gave a faint reaction a second injection of the same quantity frequently gave a very marked reaction. Over 3,000 cases had come under his observation, and he concluded that the diagnostic test of tuberculin was almost absolute. As a therapeutic agent he had no doubt it was of great value in early uncomplicated cases, and when used in these cases a complete cure frequently resulted. In advanced cases it was necessary that the temperature should be normal before the injections began. The treatment should be continued over a long period, if necessary, with intervals of three or four months, until they gave no reaction. In answer to a question, Professor Koch said the tuberculin was prepared from tubercle bacilli of human origin; but that the reaction was produced in both man and cattle, and though the bacilli were different they possessed a common "group" reaction.

Many members spoke for and against the use of tuberculin, but most were agreed that its diagnostic value was great and harmless, but opinion was much divided on the curative qualities.

DISCUSSION ON SANATORIA

In opening the discussion on sanatoria, Dr. Clifford Allbutt said that open-air treatment was possible at home, but was best carried out in sanatoria and had been perfected there. The coldest air possible was the best stimulant for the appetite and made forced feeding unnecessary, but it varied for different individuals. What a young man could stand was too cold for an old or a weak one. Two degrees of cure were possible in sanatoria, arrest or oblescence; but the latter was hardly possible with the poor, requiring on the average two winters and one summer; so an economic cure was to be aimed at rather than absolute cure. Six months would be required in the majority of cases. He protested against the emptiness of mind advocated by some reformers and would give amusement and tranquil occupation.

Dr. Philip, as a result of ten years' experience, said that each case must be treated per se; rest and exercise must be considered together and regulated by the temperature and the pulse; a full dietary was necessary, but not forced feeding. The location of the sanatorium was not dependent upon the surroundings or ground; it could not be too far from the large centers of population, and it was better if patients were treated in their native air.

Dr. Burton-Fanning presented a report of the sanatorium treatment in England, covering 716 patients from sanatoria where patients paid their way. As a result, 92 per cent gained weight; quiesence or definite recovery occurred in 25.1 per cent; of patients without fever or quickened pulse, 63.6 had quiesence or recovery.

THE RÖNTGEN RAY IN TUBERCULOSIS

In discusssing the use of the Röntgen ray in the diagnosis of pulmonary tuberculosis, Dr. Walsham said that in normal lungs they were quite transparent from apex to base, with the exception of a few ill-defined, shadowy lines to the right of the heart. The movement of the diaphragm like a piston up and down was ordinarily equal on the two sides of the chest, but in disease was much less on the affected side, even when the disease was limited to one apex. In well-developed cases of tuberculosis the diseased areas showed as flocculent shadows punctate in parts. He would say that the rays could not decide the earliest stage of tuberculosis in the lungs, but they would definitely show tuberculosis, and that at a very early stage,

THE TUBERCLE BACILLUS

Dr. Alfred Moeller, of Belzig, in opening the discussion of the morphological and physiological variations of the bacillus of tuberculosis and its relation to other bacteria resistant to acids and to the streptothrices, said that he had shown that bacteria which were acid fast were not necessarily tubercle bacilli, as, for instance, the smegma bacillus and the bacillus of avian tuberculosis. A series of bacilli resembling the tubercle bacillus had recently been found, including the butter bacillus and the Timothy bacillus. The tubercle bacilli, like all the acid fast bacilli, seemed to belong to the streptothriciæ.

RESOLUTIONS ADOPTED BY THE CONGRESS

The last general meeting was held on the afternoon of July 26 and the following resolutions were adopted:

1. That tuberculous sputum is the main agent for the conveyance of the virus of tuberculosis from man to man. Indiscriminate spitting should, therefore, be suppressed.

2. That it is the opinion of this congress that all public hospitals and dispensaries should present every out-patient suffering from phthisis with a leaflet containing instructions with regard to the prevention of consumption, and should supply and insist on the proper use of a pocket spittoon.

3. That the voluntary notification of cases of phthisis attended with tuberculous expectoration and the increased preventive action which it has rendered practicable has been attended by a promlsing measure of success, and that the extension of notification should be encouraged in all districts in which efficient sanitary administration renders it possible to adopt the consequential measures.

4. That the provision of sanitoria is an indispensable part of the means necessary for the diminution of consumption.

5. In the opinion of this congress, in the light of the work that has been presented at its sittings, medical officers of health should continue to use all the powers at their disposal and relax no efforts to prevent the spread of tuberculosis by milk and meat.

6. That in view of the doubts thrown on the identity of human and bovine tuberculosis, it is expedient that the government be approached and requested to institute an immediate inquiry into this question which is of vital importance to the public health and of great consequence to the agricultural industry.

7. That the educational work of the great national societies for the prevention of tuberculosis, is deserving of every encouragement and support; it is through their agency that a rational public opinion may be formed, the duties of public health officers made easier to perform, and such local and state legislation as may be required called into existence.

8. That this congress is of the opinion that a permanent international committee should be appointed to collect evidence and report on the measures that have been adopted for the prevention of tuberculosis in different countries, to publish a popular statement of these measures, to keep and publish periodically a record of scientific research in relation to tuberculosis, and to consider and recommend measures of prevention. This congress is further of opinion that such a committee should consist of representatives to be elected by the great national societies formed for the suppression of tuberculosis and also representatives nominated by various governments. It is further of the opinion that all international committees and great national societies whose object is the prevention of tuberculosis should be invited to cooperate.

9. In the opinion of this congress, overcrowding, defective ventilation, damp general unsanitary condition in the houses of the working classes, diminish the chance of curing consumption and aid in pre-disposing and spreading the disease.

10. That while recognizing the great importance of sanatoria in combating with tuberculosis in countries, the attention of governments should be directed towards informing charitable and philanthropic individuals and societies of the necessity for anti-tuberculous dispensaries as the best means of checking tuberculous disease among the industrial and indigent classes.

Respectfully,

A. R. THOMAS,
Passed Assistant Surgeon, U. S. M. H. S.

The SURGEON-GENERAL,
U. S. Marine-Hospital Service.

XV

THE BUBONIC PLAGUE

There is no disease of modern times so fatal as the plague, and none so persistent in its occupancy when it once gets a good foothold.

It has been approaching the west from India and China so menacingly, and appearing at so many unexpected points, that the people, especially the health authorities, should be thoroughly informed in regard to it, in order, if possible, that an outbreak may be averted; or if occurring, should be stamped out as promptly as possible. To that end we present herewith a valuable contribution to the literature of this disease by DR. WALTER WYMAN, Surgeon-General Marine Hospital service, which we are kindly permitted to reprint:

LETTER OF TRANSMITTAL

TREASURY DEPARTMENT
OFFICE OF THE SUPERVISING SURGEON-GENERAL
MARINE-HOSPITAL SERVICE

WASHINGTON, D. C., Jan. 6, 1900.

The Secretary of the Treasury:

SIR: I have the honor to submit herewith an article on the bubonic plague, being a revision of the article prepared by myself and published in the annual report for 1897.

Within the past two years many facts of importance have become known with regard to this insidious epidemic disease, and it is the object of this revision to embody in available form the latest information which may be of practical value to quarantine officers, health officers and others.

In this undertaking I have had the assistance of Passed Assistant-Surgeon H. D. Geddings, who was the technical delegate from the United States to the International Plague Conference in Venice in 1897, and subsequently was ordered to the Pasteur Institute in Paris, to familiarize himself with the latest scientific advances in the bacteriology of this disease. Valuable information also has recently been forwarded by Surgeon Eugene Wasdin, now engaged in like manner in the Pasteur Institute.

From the facts set forth in the article it is obvious that the greatest care must be exercised in the *inspection at quarantine* of vessels, even thou g

they hail from non-infected ports, for they may carry passengers, crew, stowaways or merchandise from plague-infected districts.

Attention is called to the ambulant, or walking form of the disease, which might readily escape detection by ordinary inspection, but becomes as active an agent in dissemination as the more violent form.

With great care in inspection and enforcement of other regulations at domestic ports, supplemented by the information conveyed by medical officers of the service in foreign ports and their surveillance over vessels, it is hoped that no case of plague will be admitted. But should this misfortune occur, the observations detailed in the article show that energetic sanitary measures may be made to avail, while we have in the curative serum and the Haffkine prophylactic additional and effective weapons in preventing the spread of the disease. While these facts are encouraging in character, it should not be forgotten that the epidemic is surely, though slowly, extending, and that for the first time in history it has invaded the Western Hemisphere.

The necessity, therefore, of especial vigilance has been, and is still being, impressed upon quarantine officers by the Bureau; and of equal importance is the provision which should be made by municipalities, especially those on the seaboard, to correct immediately unsanitary conditions which are now so well known to favor the propagation of infectious disease.

New facts as they develop and new measures which may become necessary will be duly promulgated in the Public Health Reports issued weekly by the Bureau.

As this brochure is intended to be one of practical utility, I have to recommend that authority be granted for its publication.

Respectfully, WALTER WYMAN,
Supervising Surgeon-General Marine-Hospital Service.

Approved:
L. J. GAGE, *Secretary.*

THE BUBONIC PLAGUE.

The plague, known also as the bubonic plague, Pestis bubonica, Levantine, Oriental, and black plague, and black death, is a disease which has ravaged from time to time the several countries of Africa, Asia and Europe almost from time immemorial. The literature on the subject is appalling in extent, a mere enumeration of titles with authors covering forty pages, royal quarto size, of the Index Catalogue of the Library of the Surgeon-General's Office, United States Army, and a score or more of the columns of the Index Medicus, published since the issue of the Index Catalogue in 1889.

Manetho, an Egyptian historian, who lived at the beginning of the third century B. C., described pestilences, supposed to have been the plague, as having occurred in the reign of the most ancient Egyptian kings. It prevailed in Athens 432-429 B. C., and reappeared in eighteen months after the last-named date. Thucydides has described it, and had the disease, and Hippocrates noted it. It is said that Athens lost more than one-third of its population by the epidemic.

According to Rufus of Ephesus, plague prevailed in Lybia in the third century B. C., and its home was considered to be in northern Africa. The

great plague reported by Livy, who died 221 B. C., is said to have destroyed a million of persons in Africa, but it is not mentioned that it passed into Europe. Plague is also alluded to in the Bible, Zachariah xiv, 18, as peculiarly Egyptian, of which country this disease has been a great scourge.

In the Christian era it is not until the sixth century that we find bubonic plague in Europe. In 542 it spread over Egypt; and passed to Constantinople, where it carried off 10,000 persons in one day, and in the same century appeared in Italy, and extended also along the northern coast of Africa. It prevailed in England in the seventh century.

In the fourteenth century it was introduced from the East and prevailed throughout Armenia, Asia Minor, Egypt, northern Africa, and nearly the whole of Europe. Hecker calculates that one-fourth the population of Europe, or 25,000,000 persons, died in all of the epidemics in the fourteenth century. It was in this century that the first measures were taken to check the spread of the plague, Venice appointing in 1348 three guardians of the public health for this purpose.

In the fifteenth century it recurred frequently in nearly all parts of Europe, in one year, 1466, the mortality reaching 40,000. The first quarantine establishment was founded in this century, namely, at Venice, in 1403, on a small island adjoining the city.

The sixteenth century was not more free from plague than the fifteenth. In 1572 50,000 died at Lyons. In 1576 Venice lost 70,000.

In the seventeenth century it still prevailed in Europe, though less widely than in the middle ages. In 1656 one of the most destructive of all recorded epidemics raged in Naples. It is said to have carried off 300,000 in a period of five months. The great plague of London was in 1664 and 1665. The total number of deaths in 1665, according to the bills of mortality, was 68,596 in an estimated population of 460,000, out of whom two-thirds are supposed to have fled to escape contagion.

In the eighteenth century it prevailed extensively in Europe, the most notable epidemics being in Marseilles (1720), when from 40,000 to 60,000 persons were carried off. In 1721 it appeared in Toulon and spread over Provence, and out of a population of 250,000 persons 87,659 are said to have died. Sicily was visited in 1743, namely, at Messina, where the mortality was between 40,000 and 50,000. In 1771 it broke out in Moscow, and more than 50,000 persons, nearly one-quarter of the population, were carried off.

The nineteenth century has been marked by a recession of the plague toward the East, although in 1815 it appeared on the eastern coast of Italy, confined to a small district—its last appearance in that country. An isoloted epidemic appeared in Greece in 1828. It appeared in Egypt between 1833 and 1845, the last year witnessing the last plague epidemic observed in that country and marking its great eastward recession.

There was an epidemic of extreme severity in Cairo, 1835, during which there died a number of the inhabitants equal to the whole adult male population.

In 1840, Dalmatia; in 1841, Constantinople, and in 1843 and 1844, the eastern part of Egypt, were its western boundaries.

THE PLAGUE IN THE LATTER PART OF THE NINETEENTH CENTURY—THE "PLAGUE BELT"

Since 1850 the western limit of the plague is the Canary Islands, 1852,

while its eastern limit is the Island of Formosa, off the coast of China, where it now prevails.

Since 1850 the disease has oscillated, now east and now west, between the Red Sea and the Pacific, in China, India, Arabia, Persia, Mesopotamia, Russia, Caspian Sea, Afghanistan, Tripoli. There have been since 1850 but nineteen years when it has not been recorded in one or the other of these countries. The last outbreak of plague on European soil was in 1878 and 1879, on the banks of the Volga.

As to the "plague belt" it may be said that since 1850 the disease has never traveled farther north than Astrakhan, about 45o north, although within the present century it has visited Moscow, Norway, Sweden and latitudes as far as 60° north. During the nineteenth century the belt of the plague, according to Cantlie, may be roughly described as the basin of the Mediterranean and the strip of country in Asia from Turkey to China, running parallel to that sea; but the mediterranean part of the belt has disappeared almost wholly within the present generation.

Formerly it was asserted that the plague never appeared east of the Indus in India; nevertheless it has been observed during the present century in more than one distinct center in India. Of late years, since 1871, it has been heard from, particularly in China.

It should be remarked in this connection that according to Lowson the history of the disease in the far east is, with the exception of Rocher's Papers, a perfect blank. Chinese history makes no reference to any epidemic which has left a permanent record.

THE ORIGIN AND SPREAD OF THE PRESENT EPIDEMIC OF PLAGUE

While comparatively isolated outbreaks of plague have occurred in Asiatic countries from time to time, it seemed improbable that there would be any more extensives epidemics of the disease. This hope was rudely dashed down by the appearance of the disease in 1893 in epidemic form in Tonkin and Hongkong, and within a short time after in Bombay, Kurrachee and Poonah, in British India.

In 1892 it was deemed necessary by the Chinese Government to increase and maintain the garrisons on the Manchurian frontier. There was necessity for frequent and intimate intercourse between Longtcheu and Yun Nan, the latter an endemic focus of the disease, and transportation of stores and materials was affected by means of mule caravans. The distance was about 200 kilometers; the time occupied in the trips was five or six days. The disease made its appearance in Longtcheu in 1893, and muleteers were the first victims. The disease spread in Longtcheu and assumed epidemic proportions, and was conveyed by means of the crews and passengers of trading junks to Canton and Hongkong, in which cities it appeared in epidemic form in 1894.

There is no doubt that the plague was conveyed by sea from Hongkong to Bombay, and in that city it broke out in the Mandvi quarter, which is in close proximity to the docks, and which contains many and large warehouses for the storage of merchandise from Chinese ports. Kerachee and Poonah were either infected from the same source or, most probably, from Bombay as the infecting focus. Through the channels as detailed above has resulted an epidemic outbreak which in Bombay (presidency) alone has

resulted in 220,907 cases, with the enormous mortality of 164,083; in Hongkong 1,600 cases, with 1,541 deaths; Amoy, within a limited period, 540 deaths; Calcutta, approximately, 500 deaths, and in Formosa 2,468 cases, with 1,866 deaths.

Plague has also recently been introduced into Alexandria, Egypt, but thanks to severe restrictive measures has made little headway, and now seems to be under control.

There is a seemingly correct statement of its introduction into Kobe, a port of Japan, by means of infection conveyed in a bale of cotton, but the question is still involved in some doubt.

Plague was introduced into Nieuchwang, in July, 1899, through the persons of arrivals from more southern districts, probably with ambulant types of the disease, who infected their surroundings and the soil and set up an epidemic whose manifestations were preceded by very large mortality among domestic animals—as rats, dogs, chickens (?), and cattle. It is supposed, also, that the use of cattle dead of plague for food among the inhabitants was in a measure responsible for the spread of the disease.

More important to us still was the announced appearance of the disease in Oporto, Portugal, in August, 1899. How the infection was introduced is a matter still shrouded in some mystery. Reputedly it has been traced to a cargo of rice from some of the Indian plague-infected ports, but this theory is open to the objection that the cargo of rice in question was trans-shipped in English ports and there cleaned and prepared for use. However this may be, it is certain that the disease made its appearance in a hovel near the water front, where dwelt two laborers who were occupied in unloading this and other ships. It is well known that from time to time the ships of the Peninsular and Oriental Line have brought cases of plague from Bombay to Plymouth, but there is no record of any spread of the disease. Is it not possible that, owing to the lack of any quarantine restrictions in the British Isles, cases of the ambulant type may have escaped observation, and passengers and crew from some of these ships be responsible for the infection of others?

The appearance of the plague in Santos, Brazil, in October 1899, marks an important epoch in plague literature, as furnishing the very first recorded instances of the occurrence of the disease in the Western Hemisphere. There is also considerable difference of opinion as to the origin of the Santos outbreak. It is usually attributed to the ship *Rei de Portugal*, which arriving from the infected port of Oporto, lay alongside the dock in Santos, and within a short time there was an extensive mortality among rats, followed within a short time by the appearance of cases among human beings. But it is recorded, too, that on two occasions prior, in the months of July and September, 1899, there was an unexplained and great mortality among rats in the city of Santos, and that the first suspected case of plague was in the person of a patient who had been sent to the yellow-fever hospital, and in whom, after death, large buboes were discovered. It is regarded as equally possible that instead of the disease having been introduced from Oporto it may have been introduced by a rice-laden ship from Rangoon or by a ship from Tamatave, Mozambique, and that earlier mild cases may have passed unrecognized, and only when a death occurred under the conditions mentioned above was suspicion aroused.

Up to the present time the disease in Santos has spread rather slowly, but the sanitary conditions are notoriously bad, and while the best is hoped it is reasonable to fear further spread.

From Santos the disease extended to Sao Paulo, a hill resort in the neighborhood, the first case occuring in a child of a switchman of the railroad connecting the two places. The employe in question lived in a cabin or hovel immediately alongside of the railroad.

On the 18th of November, 1899, the British steamship, J. W. Taylor, from Santos, arrived at the quarantine station of the port of New York, from Santos, with two cases of bubonic plague on board, and having lost one man at sea from the same disease. Prompt measures as to the ship, her crew, and cargo were taken, and fortunately no spread of the disease has occurred.

In the light of experience in other parts of the world, and with even a cursory study of the sanitary conditions obtaining in the places infected with plague, it seems reasonable to believe that even were the disease introduced its spread would be very limited in cities where the sanitary conditions are good and where precautions as to the isolation of patients and the segregation of those exposed to infection could and would be practiced. Cases in Vienna, resulting from accidental inoculation while studying the disease in one of the laboratories, were controlled and were limited to the two original victims and a physician and nurse who ministered to them. The same may be recorded of a case introduced into Trieste, Austria. No spread of the disease followed. With the rigid application of the ordinary principles of sanitary science and with the means now at our disposal for the prophylaxis and cure of the malady, it seems extremely doubtful if the plague will ever secure a decided foothold in the United States.

In the latter part of December, 1899, the plague made its appearance in Honolulu, Hawaiian Islands, where it had been previously introduced, but had been suppressed without extensive spread. Being confined at this time to the Chinese quarter of the city and vigorous repressive measures having been instituted, it is to be hoped that a general spread will be averted and this new source of danger to the United States removed.

OUR MODERN KNOWLEDGE OF PLAGUE

This disease furnishes a striking illustration of the scientific advance of modern medicine. It was not until 1894 that positive knowledge of its true nature became known. Now its cause, method of propagation, and the means to prevent its spread are matters of scientific certainty. True, investigation is still necessary to make this knowledge complete, but enough is known to warrant the foregoing statement. All through the centuries, before and during the Christian era, down to 1894, the subject has been enveloped in darkness, and there has been the same groping after facts, the same unsuccessful search for the true cause, the same struggle in ignorance against its ravages on the part of physicians, sanitarians, and public officials as has marked the history of that other great epidemic disease, cholera, now likewise robbed of its terror by science.

One has but to reflect upon the vast amount of research, thought, and labor involved in the preparation of that mass of literature previously referred to, and to the misery, disaster, and death of which it is the exponent,

in order to appreciate the value of the great discovery of 1894. It is to the immortal Pasteur and his contemporary, Koch, in their establishment of bacteriology as a science, that credit is due for the possibility of this discovery, and to a Japanese physician, Dr. Kitasato, a student in the laboratory of Koch, and Yersin, a pupil of the Pasteur Institute, we are indebted for the discovery itself.

When, in 1894, the plague was epidemic in Hongkong, hundreds dying daily, great apprehension existed on the part of Japan, and accordingly Drs. Kitasato and Aoyama, with assistants, were commissioned by the Japanese Government to visit Hongkong and there study the disease, the former to make bacteriological investigation and the latter to report upon its clinical and pathological characteristics. The report of Kitasato announcing the discovery of the plague bacillus was published under the auspices of the University of Tokio, July 7, 1894, and may be found in full in the Annual report of the Marine-Hospital Service for 1894. Other investigators during the same year were, on the part of the English, Drs. Lowson and Cantlie; on the part of the French Government, Dr. Yersin; of the German Government, Dr. Wilm; and the United States was represented in these investigations by Dr. Arnold, of the Navy, to whom we are indebted for the cultures which form the basis of the experiments now being conducted in three laboratories in the United States.

Plague; or malignant polyadenitis, as it has been termed by Cantlie, has been defined as an acute febrile desease, of an intensely fatal nature, characterized by inflammation of the lymphatic glands, marked cerebral and vascular disturbances, and by the presence of a specific bacillus. Although one gland alone may be clinically apparent, most, if not all, of the lymphatic glands are found to be enlarged at the post-mortem examinations.

The micro-organism invades the blood and forms numerous and extensive colonies in the spleen, especially when death is delayed beyond the second day. It is practically a septicæmia.

In a varying period of twelve hours to twelve days, usually within four days after exposure, the disease makes its appearance in the individual. The patient complains of high fever, a swelling of one or more of the lymphatic glands, and has delirium early in the attack, though seldom violent. The fever persists at least a week, and convalescence thereafter is slow. In fatal cases, death usually occurs at the height of the disease, between the second and eighth day, frequently within forty-eight hours. If life is prolonged for five or six days the prognosis is better. The glands most commonly affected are those of the thigh and groin, next of the axilla, and sometimes those in the neck. The swollen gland quickly attains the size of a hen's egg, and, unless death intervences, after five or six days the gland may soften and be filled with pus, which may be evacuated. In many cases of the severer type the bubo has not time to form, and then there are hemorrhages from the mucous membranes and beneath the skin—hemorrhagic extravasations- the so-called petechial spots. It is probably this phenomenon, giving a dark appearance to portions of the skin, which has given the name of "black death" to the disease. Large buboes may form in a few hours after a time when a person has felt in the best of health; and, on the other hand, patients die of the disease without the appearance of a single affected gland, although the post-mortem examination shows the glands to be slightly swollen, and their substance contains the plague bacillus.

Death is generally the result of a toxæmia, the effects of the toxins produced by the bacillus being shown as a meningitis or cerebritis; indeed, the seat of election for the action of the toxins would seem to be the central and axial nervous system, which are the seat of punctate hemorrhages and hemorrhagic infarcts, the toxins apparently acting by causing a breaking down of the walls of the capillary blood vessels.

The death rate varies in different epidemics, and is estimated at from 50 to 90 per cent. It varies, however, apparently according to nationalities. From the official reports of the epidemic in Hong Kong in 1894, the following table shows the death rate of the several nationalities named: Chinese, 93.4 per cent; Indians, 77; Japanese, 60; Eurasians, 100; Europeans, 18.2. The small relative percentage of deaths among Europeans is attributed to the European blood and stamina and to the early treatment and confidence in the European medical attendant.

SUGGESTED CAUSE OF PREVALENCE IN INDIA AND CHINA

An interesting suggestion as to the cause of the prevalence of this disease in India and China is offered by Dr. Charles W. Dabney, jr., formerly Assistant Secretary of Agriculture, to the effect that it may be because the people of India are so badly fed, and fed only on rice and other grains, which contain very little protein. As compared with wheat, oats, Indian corn and rye, rice, by the protein standard, is the poorest food of them all. Additional credence may be given to this theory from the fact that plague so often accompanies famine. Other conditions are known to favor it, such as overcrowding and filth; but in cities and localities where these two elements are present, while the disease has raged violently, it has been made in time to disappear; while in India, where these conditions prevail, with faulty nutrition added, the disease is persistent. Following is the letter of Dr. Dabney containing the suggestions mentioned:

WASHINGTON, D. C. February 3, 1897.

DEAR SIR: In pursuance of our conversation of Monday evening, I take pleasure in handing you herewith some suggestions which have come to me with regard to the reasons for the persistence of the bubonic plague in certain oriental countries. The density of the population, which in certain portions of Bombay approximates 1,000 to the acre, the filthy habits of the people, the heat of the tropical climate, the absence of pure water, the crowded and badly managed cemeteries, and the utter ignorance of all sanitary laws doubtless combine to give rise to conditions which would favor diseases of this sort.

But why is it that this disease is continuously present in certain oriental countries and does not persist in occidental countries, even among people who are equally filthy and crowded together fully as densely as those in China and India. If it is density of population and filth that alone keep the disease going, why do we not have it all the time in Egypt or Africa, in Italy, in Spain, and even in the West Indies and South America? The population in certain tenement districts in New York City is almost as dense as in the section of Bombay referred to, though distributed more in altitude, perhaps, through the great tenement houses. I can testify that the negroes in our Southern cities are certainly filthy enough to make it possible there if that were all that is required for the disease.

I have asked myself, therefore, what other condition exists in the east that does not exist among these other peoples?

It is well known that the poorer classes in India live largely upon grains, chiefly rice and pulse, with very little meat or fish. Many classes among them are vegetarians. There is a want of accurate dietaries, but from the report of Cornish (Nature of the Food of the Inhabitants of the Madras presidency) and from the unpublished statements of professor Atwater,

said to have been compiled from the reports of intelligent and careful missionaries, it is evident that under normal conditions the Indian peasantry are among the poorest-fed people in the world. They are not at all delicate in their diet, but gladly consume any kind of vegetable food, and will even eat decaying fruits and tainted meat or fish.

Calculations based upon data supplied from these sources show that the food of the Indian peasant does not afford, on the average, more than 1,200 to 1,400 calories per man per day. We know that 2,000 calories is considered the lowest upon which a grown person can maintain comfortable existence, while 3,000 calories is the amount usually allotted for a man at ordinary work. We have nothing equaling the poverty of the Indian's dietary except that of the poorest Russian laborers, existing chiefly on buckwheat and animal fat, yielding only 1,600 calories.

Similarly the reported dietary of the poor Malays, among whom the plague plays great havoc, is said to have consisted for their whole lives of nothing but rice and fruit, yielding not exceeding 2,000 calories The Indian peasant, in fact, appears to be always in a condition verging on famine, so that he would be a ready victim of disease of any kind.

These facts seem to suggest that one reason, at least, why the plague persists in the east is that the people are so badly fed, and fed only on rice and other grains, which contain very little protein. We know that, compared with wheat, oats, Indian corn, and rye, rice, by the protein standard, is the poorest food of them all

Respectfully yours,

CHAS. W. DABNEY, JR.

THE PLAGUE BACILLUS

As first described by Kitasato, the cause of the disease is a bacillus somewhat resembling that of chicken cholera, a small, short rod, with rounded ends, of the nonspore-bearing variety, characterized by its property of extremely rapid multiplication and the facility with which it enters the human organism. It is found in large numbers in the pus from the buboes, occasionally in the interior organs, in grave cases in the blood, and in the feces. It is also found in the dust of infected houses and in the soil. While so virulent, its resisting power to chemical disinfectants is feeble, succumbing shortly in a 1 per cent solution of carbolic acid or of limewater. It dies in four days if kept at a dry heat of 60 degrees C., or 140 degrees F., or in half an hour if subjected to a temperature of 80 degrees C., 176 degrees F., and in a few minutes if subjected to a heat of 100 degrees, C., 212 degrees F. As demonstrated in the hygienic laboratory of the Marine Hospital Service, it is easily destroyed by all of the ordinary disinfectants. On the other hand, it developes easily in many culture-media at the ordinary temperature, 18 degrees to 22 degrees C., or 64.4 degrees to 71.6 degrees F.

A subsequent description by Yersin (whose discovery was coincident with Kitasato's) differs somewhat from the above, and as detailed by him and confirmed by Roux is as follows: A cocco-bacillus, almost as broad as long and about 2 micromillimeters in greatest diameter. Stains very readily with the ordinary aniline dyes, but is easily overstained, thus masking its true characteristics. Is best stained with a 1 per cent solution of thionin, carbolized, when it shows as a cocco-bacillus, staining more deeply at the poles than in the center and forming chains of three or four elements. Is completely decolorized by the method of Gram. Grows readily upon ordinary media, as peptone-agar, peptone-gelatine, and peptone-boullion. Does not liquefy gelatine. Upon agar the separate colonies are very small round in shape, almost transparent by transmitted and white by reflected light. In boullion, under ordinary conditions of temperature, it forms flakes or flocculi, which rapidly sink to the bottom of the flask or test tube, leaving the liquid above clear. This is characteristic. Examined in the hanging drop, the organism is absolutely devoid of automobility.

In old cultures upon agar and bouillon the organism rapidly assumes involution forms, some of which are very curious, and most prominent among them is that of a rather long, slender bacillus, segmented, and presenting a vacuolated appearance. In this state they stain badly and have notably lost some of their virulence

The differences in the two descriptions as detailed above may be accounted for by the pleomorphism of the bacillus in old cultures, but the latter is the form usually met in animals subjected to experimental inoculation and in patients recently dead with the disease.

Viability of the plague bacillus.—It would seem that the bacillus of plague, while not as sensitive to desiccation as the cholera spirillum, still loses its virulence by drying, and that to retain its virulence it requires the action of both heat and moisture. The presence of organic matter, animal or vegetable, and in a state of decomposition, would seem to furnish the most favorable nidus for its growth, which will account for its more or less prolonged existence in oriental countries and the comparative rarity of its appearancein Europe since the existence of modern and improved hygienic conditions. This does not mean, however, as was maintained by some of the Venice conference, that filth and crowding are alone responsible for the disease. The malady is preminently of bacterial origin, and wherever the microbe is found, there the plague is likely to develop.

The length of its life when exposed to favorable conditions outside of the human body has an important bearing upon the quarantine measures necessary to be enforced, particularly with regard to merchandise from an infected port.

The following report of experiments on the viability of the plague bacillus has been published by S. L. Rappoport, St. Petersburg. The material used was allowed to soak in bouillon cultures of bacillus pestis in a dark closet for twenty-four hours, then exposed for successive days to all the sunlight obtainable, or to dry heat.

TEMPERATURE AND TIME REQUIRED TO KILL

Material.	20° C. (68° F.).	36° C. (96.88 F.).	60° C. (140° F.)	80° C. (176° F.).
Silk thread	19-24 days	13 days	75 minutes	15 minutes
Note paper	10-17 days	5 days	30 minutes	15 minutes
Filter paper	10-24 days	7 days	45 minutes	15 minutes
Linen thread	9-13 days	4 days	30 minutes	15 minutes
Woolen thread	13-23 days	5 days	60 minutes	15 minutes

The organism is killed by a temperature of 55 degrees C. for ten minutes by 80 degrees C. for five minutes. Corrosive sublimate solution, 1-18,1000, destroys the bacilli immediately; one per cent carbolic acid and one per cent lysol in ten minutes. Mineral acids are very effective. Sulphuric acid, 1-1,000, kills the bacilli in five minutes; hydrochloric acid 1-1,000, in thirty minutes.

LIFE OF THE BACILLUS OUTSIDE OF THE ANIMAL BODY

"The longest time that infected material, as lint, wadding, earth, etc., remained active was eight days. Sputum from patients affected with the the pneumonic form, kept in a vessel plugged with cotton wool, was no longer virulent in sixteen days. In ordinary drinking water the bacilli die

in three days, in sterilized water in eight days, and in sterilized bilge water in five days. In direct sunlight the bacilli die in three to four hours."—(Report of the German Plague Commission, as quoted by Bowhill.) The bacilli are killed by drying at ordinary room temperatures in four days.—(Bowhill. Manual Bacteriological Technique and Special Bacteriology, 1899, pp. 197, 198.)

HOW IS THE DISEASE CONTRACTED?

The methods by which the bacilli enter the human body are three in number—by inoculation (through an external wound or abrasion), by respiration and by introduction into the stomach. The Japanese investigator, Aoyama, contracted the disease by inoculation incurred during a post-mortem, and one of his assistants died of the disease contracted in the same manner. According to Lowson, skin to-skin infection is impossible, unless the one to be infected has some wound, and the infector's skin has been soiled by feces, blood, or the contents of buboes. The individual may contract the disease by inhaling the dust from infected houses which contain the germ; furthermore, by imbibing infected fluids or eating infected food.

It may be contracted, therefore, through one or more of the above-mentioned channels, by prolonged and intimate contact with the plague stricken as in the case of a nurse carrying a child ill with the disease; also by the handling of fomites—clothing, bedding, and other infected materials—and by eating with soiled or unwashed hands. Infection from bodies found in the street, in houses, or awaiting burial may take place if the clothes have been soiled by discharges. Cantlie says:

Bulard says sleeping in the dead man's shirt proves nothing further than that the plague-infected garment did not generate the poison of an intensity sufficient to infect. The poison grew every moment more dilute; but a nurse carrying a child throwing off contagion continuously is an exposure of a different stamp.

According to Lowson, the poison is not given off in the ordinary respiration of a patient suffering with the disease, and sputum and saliva from an infected person have given negative results in the only case of which Lowson was able to make investigation upon this point.

HOW DOES IT SPREAD IN HOUSES AND IN LOCALITIES?

The conditions favoring plague are similar to those favoring typhus fever, namely, crowd poisoning, bad ventilation and drainage, impure water supply, famine or imperfect nourishment, and inattention to sanitary requirements. It is probable of this disease, as of yellow-fever, that human habitations and the ground may become so thoroughly infected as to establish endemicity. The bacillus may infect food and water, though how long it will retain its virility in water is as yet undetermined. Clothing and other personal effects, bedding, etc., may be infected through the discharges. The bacillus may be carried in the dust arising through the cleansing of dwelling houses which plague patients have occupied.

A very important element in the spread of plague in houses and localities are rats and other animals. It has been found that rats, mice, snakes, beetles, bugs, flies, dogs and jackels are infected during an epidemic. It is significant that the epidemics do not attack the purely herbivorous animals

—horses, oxen, sheep, goats and rabbits. Rats die in large numbers, and generally this phenomenon is observed in advance of the appearance of the plague among human beings. The cause of their infection is still a subject of discussion. The soil becomes infected, and a very common belief in oriental countries is that the rat contracts the disease from miasmatic emanations from the soil, but this has never been scientifically demonstrated and is probably incorrect. The fact that mortality among rats precedes an outbreak of plague among human beings is explained by Lowson by the fact that rats have their snouts about an inch above the floors of houses and are more liable to inspire plague-infected dust than are human beings.

PREVENTION OF SPREAD IN HOUSES AND LOCALITIES

Modern science, in its development of the serum therapy of disease, appears to have found an efficacious remedy in the prophylaxis and treatment of this disease, which hitherto has maintained an average mortality of 90 per cent. A French physician, Yersin, was the first to use the serum from an immunized horse upon cases of a severe type. At Amoy, in 1896, he treated twenty-three cases of plague in this manner, all of whom recovered excepting two whose cases were desperate from the outset, and upon whom treatment was not begun until the fifth day of the disease. Additional statistics, which follow, confirm the efficacy of this procedure. The method in this treatment is similar to that of the antoxin of diphtheria, the efficacy of which is now thoroughly established.

In the prevention of the spread of the disease in a given house all hygienic measures are necessary, such as proper sewerage, purity of water supply, isolation of the sick, disinfection of clothing and bedding, of the evacuations and sputum, and disinfection of the room; all unnecessary contact with the sick to be avoided, great care to be exercised with regard to food and drink, and, according to Kitasato, after recovery the patient to be kept in isolation for at least one month. It is believed that we have a valuable aid in disinfection of rooms and house in formaldehyd gas, which has now been established as a reliable agent, and which can be used without injury to metals or fabrics. It has the disadvantage, however, of not killing vermin, while sulphur fumigation does. The latter, therefore, is more generally desirable. The general and well-known administrative precautions in the prevention of the spread of smallpox—isolation, guarding of premises, etc.—are applicable to plague.

The advice of Kitasato that the patient should be kept isolated one month after apparent recovery is significant. Like precautions are necessary with regard to other contagious diseases, and too little attention has heretofore been paid to this very necessary precaution against the spread of contagious disease. For example, patients apparently recovered from cholera may carry within the intestinal tract the germs of the disease a variable time, in one recorded instance one hundred and sixty-three days. Patients who have apparently recovered from diphtheria may still be found to have the diphtheria bacillus present in the throat for many days after recovery.

As a means of preventing the spread of the disease mention should not be omitted of the Haffkine prophylactic, the efficacy of which has been demonstrated, as shown further on.

The means to be adopted when the disease becomes epidemic in a city consist, first, of a house-to-house inspection.

There should be prohibition of the use of dwellings unfit for habitation, and abatement of overcrowding should be required. Buildings and premises, if infected or suspected, should be vacated for cleansing and disinfecting. The sick should be removed to hospitals or treated in their own homes and the well who have been exposed should be removed to refuge camps. Infected bedding, clothing, etc., should be destroyed, unless there are proper facilities for disinfection by steam or boiling. An active campaign should be waged against rats and vermin. It is the opinion of some English writers that when plague has been thoroughly fixed and established in a given city its speedy eradication is impossible, that the subsidence requires a period of seven months and seems to depend upon the abatement of its virulence in the due course of its evolution.

Plague in Alexandria, Egypt, during the past summer and fall appears to have been well handled and has apparently disappeared. During the summer 80,000 rooms were disinfected in a scientific manner, and this suggests and illustrates the importance of this disinfection, not only of known infected houses, but of many others in the general neighborhood of the infection, or which by reason of the character of their inhabitants are liable to infection.

THE DISEASE FROM A CLINICAL STANDPOINT—ITS MORTALITY, TYPES, SYMPTOMS, COURSE, ETC.

Mortality.—From the most reliable information collected from all sources, it would seem that the average mortality in this epidemic in India has reached the appalling figure of ninety to ninety-five per cent of those attacked. This is open to some doubt, as the Hindoos have displayed an aversion to treatment in hospitals, and compulsory removal to these institutions having been adopted, many cases occuring among the native population have been concealed and do not appear in the total cases or deaths. The mortality as reported is, therefore, probably rather below than above the truth.

Types of the Disease—For convenience of classification, and in accordance with the clinical symptoms presented, the disease has been classified as (*a*) bubonic, or ganglionic; (*b*) septicæmic; (*c*) pneumonic. Of these forms the bubonic is the most common, the pneumonic the most fatal. The method of infection—that is to say, the point of entrance of the specific microbe—is a point still under active discussion, and is different not only for the various types and forms given, but also varies in different countries and in different sections of the same country. For example, in Hongkong, where the natives as a rule go barefooted, infection in a large number of cases has been traced to abrasions and wounds of the lower extremities. In India some covering or protection for the foot is usually worn, but the natives suffer from the bites of insects and vermin; consequently the point of entrance of the infection has been largely upon the hands and arms. Infection through the intestinal tract, while admitted, is as yet largely unexplained; for, in spite of the assertions of Wilm, some breach of continuity would seem to be necessary for the entrance of the micro-organism. As a rule, a small red spot marks the point of infection; this becomes successively a vesicle and a pustule, and in the ganglionic form and in a large proportion of cases a general redness or a series of vesicles marks the passage of the infection along a lymphatic tract or channel. These vesicles have been of very frequent occurance in the Bombay epidemic.

Symptoms and course.—In the bubonic form the victim is seized with a chill, followed by a fever of greater or less intensity, sometimes reaching 41 degrees to 42 degrees C.; there is an overwhelming prostration; nausea and vomiting and the rapid formation of a glandular enlargment, surrounded by an extensive œdema, forming the bubo which has given the most common name to the disease. The bubo may or may not break down and go on to supperation. If it does, the ganglionic form merges into the septicæmic, without any distinct line of demarcation between the two types. Early in the disease stupor, delirium, and a more or less profound unconsciousness mark the existence of an intoxication or general systemic infection.

In the septicæmic form it would seem that the infection has taken place through the intestinal, digestive, or respiratory passages, or has been secondary to the suppuration of a bubo. These cases are, as a rule, not as violent in their course as the other types, and furnish the larger portion of the small number of recoveries. The pneumonic form is at once the most insidious in its onset, the most difficult of diagnosis, and the most fatal in its results. It is usually ushered in by a pain in the side, which becomes more pronounced as the disease progresses; the respiration becomes difficult and embarrassed, and there is cough, with a tenacious, dark-colored, or bloody expectoration. It is through the examination of this expectoration that the diagnosis is most easily made, as, spread upon a slide, stained and examined under the microscope, the presence of the plague bacillus in large numbers may be thus tentatively established until cultural and other methods of studying the organism are concluded. The bacillus is not in pure culture, but is accompanied by diplococci, staphylococci, and streptococci, and in making the diagnosis by this method the property of the plague bacillus of completely decolorizing by the method of Gram must be borne in mind.

Post-mortem, the pneumonia is found to be generally lobular or disseminated in character, though it is sometimes lobar, sometimes involves a whole lung, or may, indeed, involve both lungs.

The general characteristic of the lesions of plague is a tendency to hemorrhages, either into the parenchyma of the spleen or kidneys, the subdural and arachnoid spaces, the spinal cord, or into the loose connective tissue of various regions of the body.

This tendency to hemorrhages would seem to be a manifestation of the peculiar properties of the toxines formed by the plague bacillus in the process of growth, as it has been observed alike in animals subjected to inoculations with the culture of the bacillus and its isolated toxines.

Among the sequelæ of the plague may be mentioned as most frequent, long-continued suppuration of glands, boils, and carbuncles, and eruptive diseases of the skin, and paralyses, sometimes of a particular set of muscles, sometimes of the lower and sometimes of the upper extremities. These manifestations may persist, or the affected muscles may gradually acquire strength and tone. These manifestations may be accounted for as

to the suppurations by the fact that the plague bacillue is usually accompanied by the organisms of suppuration; as to the paralyses, by the above-mentioned tendency to hemorrhages into the meninges and spinal cord.

SERUM THERAPY AND SERUM PROPHYLAXIS OF PLAGUE

It is necessary to draw a sharply defined line between the serum therapy and serum prophylaxis of any disease, and more particularly of plague. There is a wide difference between a preventive or prophylactic serum and an antitoxic or curative one: Nor in the case of plague does this seem to be one of degree, but one of kind. Any serum which is curative against plague is preventive' but unfortunately the reverse does not hold good. A serum perfectly prophylactic may be powerless to cure when once the disease has declared itself, and this should be borne in mind to avoid disappointment and to prevent possible discrediting of sero-therapeutic measures in general.

For the cure of plague there is at present but one accredited remedy, viz, the curative or antitoxic "antipest serum" of Yersin and Roux.

The preparation of the Yersin serum is, in brief, as follows: Horses are treated with progressively increasing doses of the tocsins of plague, prepared by subjecting virulent bouillon cultures of the *B. pestis* to a degree of heat which insures their destruction. These injections at first have a very profound effect upon the horse, and in time a certain immunity is conferred, and his blood serum is found to have a very decided effect in preventing the infection of animals when these are subjected to inoculations of cultures of the organism after the usual laboratory methods. Usually the process does not stop here, but is carried on to the production of true antipest serum, preventive and curative, whose further preparation is as follows: When reaction to the increasing doses of toxsin has practically ceased, toxins of the same nature are administered intraperitoneally and intravenously, and these are supplemented by the intravenous injection of toxins prepared with a special view to rendering soluble the toxsin which is enveloped in the dead bacterial body. If necessary, this is supplemented by the intravenous injection of live bouillon cultures, and bleedings are practiced and experiments made with the serum both against living, virulent cultures and against the precipitated toxins of the organism. When the serum has reached a point of strength when a dose of 1–10 c. c. will protect a mouse of 25 grams weight against living cultures and a three times mortal dose of toxin, the serum is considered to have acquired full antitoxic power, and is not only protective or prophylactic, but also antitoxic or curative.

THE VALUE OF YERSIN'S SERUM

The results from the treatment by the Yersin serum are gratifying. His first experiments were at Amoy in 1896, where he treated twenty-three cases with serum with a mortality of two, and these were desperate when first brought under observation, and should really not have been included for statistical purposes.

Subsequent experiments seem to justify the high hopes which had been built up as a result of this bold therapeutic departure, and the treatment of plague, both therapeutically and as a prophylactic measure by means of the serum has taken a firm hold in the minds of sanitarians and those whose duty it is to guard against invasions and extensions of the dreaded malady.

The results of treatment of the disease by the serum have been outlined above. Instances are not wanting which prove the prophylactic value of the agent. The following is cited as typical:

"The Bombay manager of the local branch of the Credit Lyonnaise resided with his wife, children, and a numerous retinue of native servants in a dwelling in an infected portion of the city. His little daughter was stricken with the pest in a virulent form; was treated with the serum, and made a rapid and uneventful recovery. As a precautionary measure the whole family were subjected to inoculation, and the same measure of treatment was offered to the native domestics. Some accepted and escaped infection, while six who declined on the ground of religious scruples were all stricken, and five died. It seems that a more crucial test could not have been devised or a more triumphant vindication obtained."—Lecture by Roux at Pasteur Institute, 1897.

A French commission which has recently been investigating the disease in Oporto, Portugal, has determined that from investigations made upon mice, monkeys, and human beings the value of the "serum antipesteux" (Yersin's serum) is incontestable. In cases treated with the serum the mortality was only 14 per cent, while in those not so treated it was at least 70 per cent. These cases were of the pneumonic form, but it is believed that it will be found equally efficacious in those cases where the infection has taken place through the ordinary channels of infection of the skin and mucous membranes.

THE HAFFKINE PROPHYLACTIC

Haffkine's prophylactic is prepared at the Pasteur Institute at Paris by simply planting the *B pestis* on ordinary agar-agar, spread on dishes or other suitable vessels which expose a large surface. These cultures are allowed to mature for four days, and the growth upon each dish is then taken up in 100 c. c. of bouillon, free from peptone; then heatet to 70° C. for one hour, and the product decanted or pipetted into sterile tubes, which are subsequently sealed in the flame. A dose of 5 c. c. of the Yersin serum will confer an immunity for about fifteen days, when it must be repeated. A dose of 1 c. c. of the Haffkine material will confer an immunity which is slower in being established, but which is of longer but undetermined duration. Statistics collected in British India show that the percentage of protection in those vaccinated once is about 85 per cent; in those twice or more vaccinated it is 95 to 100 per cent.

But the Haffkine material should not be used if the person has been definitely exposed to the plague or is thought to be in the incubative period; for if by chance he is already infected, the Haffkine injection may produce fatal results. Therefore the Haffkine material should be used as a preventive on persons before their exposure, while the Yersin treatment may be used either before or after exposure or while a person is suffereng with the disease.[1]

The rationale of this is not difficult of comprehension. An injection of

[1] The Haffkine material should not be used on suspects held in quarantine or on persons who have been definitely exposed to the plague, but is applicable to persons who are liable to be brought into contact with plague and before such possible contact, as quarantine officers and attendants, health officers and employes, and persons in a community where there is danger of the introduction and spread of the disease.

Haffkine prophylactic introduces into the economy a certain amount of toxin which in any event has to be counterbalanced or taken care of by the gradual production of an antitoxin. If before this elaboration the disease is given or acquired there is present the amount of toxin given plus the amount produced by the organism in the process of its growth in the economy, and the individual, man or animal, is overpowered.

The rationale of the Haffkine immunity is also a simple matter when the process is thought out. In the preparation of the Yersin serum the introduction of toxin into the cellular economy of the horse reacts, and in reacting produces antitoxic elements which are held in solution in the blood serum of the animal. These elements introduced into man or animals neutralize[1] the toxin introduced or elaborated by the pathogenic organism. In the Haffkine method the horse or other intermediary animal is dispensed with and the antitoxin is elaborated in the individual himself, which explains why the immunity is slower in being produced.

THE VALUE OF THE HAFFKINE PROPHYLACTIC

The following figures, taken from the British Medical Journal, show the results of the Haffkine inoculations, practiced in various villages in the Bombay presidency, during 1898:

	Number	Cases.	Deaths.
Inoculated	174	2	0
Noninoculated	172	12	6
Inoculated	147	3	0
Noninoculated	127	10	6
Inoculated	71	8	3
Noninoculated	64	27	20

These figures show that in addition to affording a very large percentage of protection against the disease, the mortality among those who had been inoculated was reduced 80 to 90 per cent, and the duration of the protection afforded was "several months."

An instance of the average mortality is given in the city of Hubli (British India) among those not inoculated, where it reached the figures of 657 per 1,000 of those attacked.

In the cities of Bombay and Mofussil the figures were as follows:

	Inoculated.	Cases.	Deaths.
Bombay	8,200	18	2
Mofussil	429	7	0
Noninoculated	.....	20	24

These figures are for the Haffkine method of inoculation alone.

[1] The use of the word "neutralize" is not intened to denote adherence to the theory of Behring that toxin and antitoxin neutralize each other in the chemical sense of the effect of alkali upon acid. The word is used for the sake of convenience and clearness, and the weight of evidence would seem to be in favor of the theory of Roux and his school that the production of antitoxin is the result of cell stimulation.

Being thus able to cite instances in which the Haffkine and Yersin inoculations have been instrumental in preventing the disease, it is thought that it will be perfectly rational to lay down as a general principle that it will in the future be just as rational and scientific to practice preventive inoculation against the plague as it is now customary to vaccinate those exposed to the infection of smallpox with a view to preventing the spread of the disease.

The limit of the protection afforded by these preventive inoculations as to time is a matter which is involved in some doubt. In the Haffkine experiments which are quoted in this article the percentage of protection is very favorable, but the time is simply loosely stated as "several months."

In 1897 Roux recommended that the Yersin inoculations should be repeated at least every thirty-five to forty days. The reports of Simond would seem to show that they should be practiced even more frequently—every fourteen to twenty-one days. It should be distinctly borne in mind that these inoculations do not in any way take the place of general hygienic measures; they are simply an invaluable method of bridging over a crisis while other preventive measures are in progress.

ADMINISTRATION OF THE ANTIPEST SERUM (YERSIN)

General Tecnique.—The injection should be administered in the subcutaneous connective tissue of the flank, the abdomen, or the back, and should be practiced under the usual antisceptic precautions. The region where the remedy is to be injected should be washed with a solution of carbolic acid (five per cent or solution of mercuric chloride (1-1,000). A large antitoxin syringe should, if possible, be employed, and before using it should be nearly filled with cold water and then submerged in water which should be brought to a full boil and maintained at that temperature for fifteen minutes. After emptying, it should be allowed to cool before being filled with the serum, as heat has an injurious action on the remedy, and the syringe may be clogged by the coagulation of albumen. In the absence of an antitoxin syringe, an ordinary hypodermic syringe may be employed in its stead, care being taken as to the sterilization as above, and the syringe having been filled and emptied, the remainder of the dose determined upon may be administered without removing the needle, by detaching the syringe and filling its barrel the requisite number of times, the syringe being screwed or otherwise joined to the needle in situ. This obviates the necessity for multiple punctures, always disagreeable, and is an important point in the treatment of children.

(*a*) *Administration for prophylactic purposes.*—When a case of plague manifests itself in a house or on board ship, ten c. c. of the serum may be administered to all persons exposed to the contagion. The injection is not accompanied by any inconvenient or disagreeable after-effects. It should be repeated in ten days, in order to prolong the immunity, and in a badly infected locality the injection should be repeated several times.

(*b*) *Administration for curative purposes.*—The curative action of the serum is the more efficient the earlier in the disease the injection is practiced. Large doses should be administered, thirty to fifty c. c., rather than smaller doses successively administered. Under the influence of the serum the fever decreases and the swelling of the glands (the buboes) rapidly diminish. If this amelioration is not produced promptly, a second and even a third dose should be administered, until the fever and the general and local symptoms

disappear. This is important, for so long as the bubo remains, especially if suppuration supervenes, the patient is liable to secondary infections.

THE USE OF THE HAFFKINE PROPHYLACTIC

This is for prophylatic purposes strictly, and should not be used in persons in whom the infection is probable or who have been definitely exposed to the infection. Under antiseptic precautions, as detailed above, a dose of one c. c. should be administered, and when the constitutional reaction has subsided the dose may, with advantage, be repeated. The duration of the immunity conferred is uncertain, but the inoculations should, it is believed, be repeated every thirty to forty days.

The preparation of antipest serum, according to the methods pursued by Yersin, and perfected by Roux, and the preparation of Haffkine prophylatic have been commenced in the hygienic laboratory of the United States Marine Hospital Service at Washington, D. C.

THE SPREAD OF PLAGUE FROM ONE COUNTRY TO ANOTHER

The spread of plague from one country to another presents many curious features, in marked dissimilarity to other epidemic contagious and infectious diseases. Continuity of territory, while the most general avenue, does not seem to be essential, but the disease proceeds from place to place by leaps and bounds, often skipping large inter-mediate tracts, but usually following the beaten tracks of commerce. There seems to be no doubt, in the present stage of our knowledge, that in spite of the limited viability of the plague bacillus, its easy loss of virulence, and its other biological characteristics, it is sometimes capable of being conveyed in merchandise.

Another source of great danger is the existence of a type of the disease, described almost exclusively by English writers, and denominated by them the "ambulant" form of the disease. In this, owing to the introduction of an attentuated infection in individuals, the disease may go on to glandular enlargements, suppurations, and constitutional manifestations either of a very mild type or altogether lacking them. Suppurations, expectorations, possibly alvine discharges from such individuals disseminate the plague bacillus in number, but in probably a still attentuated form. Whether by passage through some of the domestic animals, whether by conditions of soil and habitat with which we are as yet unfortunately unacquainted, the organism suddenly acquires virulence, infects others in its new surroundings and an epidemic of plague of a virulent type results.

Further and careful study of the "ambulant" type of the disease is an important subject from an epidemiological point of view, and justifies the precautions recently taken at the quarantine station of requiring all passengers from a suspected plague territory to display their axillary and inguinal regions to the view of the inspecting officer.

In the spread of the disease from one area to another of the same territory there is at present no doubt that the ordinary domestic rat plays the most important role. The researches of Yersin proved that flies could carry living plague organisms in their intestinal canals, and that they deposited them still living in their dejecta. This is a possibly large source of dissemination of the disease, but is insignificant as compared with the role played by the rat. In a dissertation on the subject by a committee of the French "Academie de Medicine" in 1897 occurs the following statement (translated):

> The plague, which is at first a disease of rats, becomes soon a disease of man. It is not unreasonable to think that a good prophylactic measure against plague would be the destruction of rats.

From numerous instance given by Simond in his article on "The propagation of the pest" (Annales du l'Institut Pasteur, October, 1898) the following instance is selected as typical, and showing the role played by the animal in disseminating infection:

> In Bombay, on the 13th of January, 1898, a coachman entering his stable in the morning found the body of a rat, dead. He picked it up, carried it beyond the inclosure, and threw it away. On the 16th he was striken with pest and died. A crusade was instituted against other rats in the buildings, and the premises were desinfected, with the result that no other cases occurred in the household.

But the question arises, How is the infection conveyed from rat to rat? for there is little controversy at this date that this very common domestic pest is largely responsible for the spread of perhaps the most terribly fatal diseases with which we are acquainted. Perhaps the rats, eating the dead bodies of their kind, as we know they do, become infected. It is possible, but numerous experiments by Roux, Batzaroff, Simond, and others all go to show that while infection may possibly be conveyed in this manner, it is at least a very uncertain factor. It is very possible that the fleas which infest rats, and which notoriously leave their bodies as soon as the cadavers become cold after death, may by their bites infect other rats, though the experiments of Nuttall would seem to show that the bites of insects play a very small role in the transmission of plague, except as furnishing a possible avenue of entrance for the bacillus. It is much more probable that the fleas or other insects having their habitat on animals deposit their dejecta, and in this way infect their bites. It is to be remembered, too, that a very small abrasion may furnish a point of entrance for the virus, and this too, may be made by the scratching consequent upon the irritation caused by the insect bites.

The following note by Roux, however, opens up a wide field for conjecture, and furnishes a most plausible explanation of the method of conveyance of infection from one animal to another. He says:

"Experiments on rats, guinea pigs and rabbits, made in conjunction with Dr. Batzaroff, have shown that it is easy to communicate fatal plague to these animals by depositing on their nasal mucous membrane, without in the least excoriating it, a little plague culture from agar-agar, or a little material from the spleen of a plague-stricken animal. We can thus transmit it as certainly as by sub-cutaneous injection. It would be interesting to know if the nasal mucous of pest-stricken rats is virulent. Should it be so, might it not play an important role in the infection of rats?" (Roux, note page 665, Annales de l'Institut Pasteur, October, 1898.)

Again, we have seen that in the pneumonic form of the disease the sputum contains a more or less pure culture of the plague bacillus. Experiments have shown that rats are susceptible to this form of plague, and their buccal and bronchial secretions could thus furnish abundant infectious material for the propagation of the disease to other rats and to other domestic animals.

PERIOD OF INCUBATION

In considering the transmission of the plague over long distances, which, as has before been said, usually closely follows the beaten route of commercial intercourse, there are two factors which present themselves, for, like other contagious and infectious diseases, plague would seem to be conveyed either by merchandise or by persons in the incubative period of the disease.

The period of incubation, therefore, demands attention. This has been variously stated as being from two to eleven or twelve days. Very careful observations have been made on this subject by Simond and by Haffkine, who practically agree in stating the incubatory period at from twelve to seventy-two hours. Simond says:

> In our opinion, whenever it is necessary to take account of the duration of incubation, in order to take prophylactic measures, we should not give it a maximum duration of more than four days.

He cites the following observations, made in a detention camp in the Kerachee district, in which the period of detention seems to have been eleven days, though it is not specifically stated.

Total number of admissions	3,975
Of these there were stricken	115

These 115 cases were noted as follows:

First day (day of admission)	11	Seventh day	6
Second day	15	Eighth day	5
Third day	22	Ninth day	7
Fourth day	19	Tenth day	5
Fifth day	13	Eleventh day	2
Sixth day	10		

Granted that all were infected on admission, it will be seen that, of the total number of cases given, 1.73 per cent occurred on the eleventh day; that 8.69 per cent occurred as late as the sixth day; that over 6 per cent occurred as late as the ninth day, or, in other words, that a fair proportion of the cases developed in a period which exceeds the average duration of a trans-Atlantic passage in these days of fast ships. This point has an important bearing on quarantine measures at ports of arrival, for it does not bear out the theory that the period of incubation is such that all cases which are to occur will occur on the voyage.

CAN THE INFECTION OF PLAGUE BE CONVEYED IN MERCHANDISE?

Personal effects are easily disinfected, but certain classes of merchandise are so difficult and expensive to disinfect as to render the measure impracticable. Generally speaking, it is now considered that new merchandise plays a comparatively small role in the conveyance of contagious diseases, yet when suspected it must be disinfected or forbidden entry until a time has elapsed covering the natural life of the bacillus.

This is an important point for the consideration of the quarantine or health officer. That it is not a new one is demonstrated by the fact that in 1846 the French Academy of Medicine appointed a commission to report upon the subject, and the findings of the commission were as follows:

"There is no proof that merchandise can transport plague outside of the epidemic foci," and the arguments upon which this conclusion was based were (translation): "In 1835 epidemic plague prevailed at Alexandria among the employes of all grades living in the warehouses of the Egyptian Government. A great quantity of bales of cotton, handled daily by laborers, were shipped to all the great ports of Europe from January to June—that is to say, during the period of the epidemic—without a single case of plague resulting. In 1835, 31,709 bales were carried to England, 33,812 to Marseilles, 424 to Leghorn, 150 to Holland, 32,263 to Trieste, 32 to various ports. These cotton bales, we repeat, did not convey plague to anyone although no precaution was taken to disinfect them. They were compressed before being put on board, and were then piled in as small a space as possible. The hatches were closed and the vessel left Alexandria. Of the sixteen English vessels loaded with cotton which left Alexandria from the beginning of January to the end of June, eight had plague on board, but the cotton loaded in these vessels was not more dangerous than that of noninfected vessels. We, close, gentlemen, what we have to say with regard to the transmissibility of plague by directing your attention to a fact of great importance, which is positively and officially recognized. Since 1720 not one of the porters employed at the lazaretto of Marseilles in loading and handling merchandise has contracted plague."

Sir John Simon brought this report to the attention of the privy council in England in 1875, and thus concluded his report:

"Under these circumstances, I evidently have no facts which would justify me in stating it to be necessary for the public safety that wool or other merchandise from Eastern places infected with plague should be excluded from this country."

This is a strong statement in the negative, but recently the idea has again gained ground that merchandise was a source of danger. The acting assistant surgeon of the United States Marine-Hospital Service at Yokohama, Japan, reports under date of November 15, 1899, as follows:

> So far as investigation has progressed, no connection with the previous case at Hiroshima has been detected, or with the steamer which brought the latter from Formosa. It is found, however, that all the victims were engaged in handling, or came in contact with, a certain lot of cotton recently imported from Niuchang, China, where plague has been severely epidemic.

But again, the report of the Imperial German Plague Commission quoted elsewhere in this article shows that the viability of the plague bacillus outside of the human body is very short, and that its virulence is rapidly lost under conditions of heat, light, exposure to sun and air, etc.

This latter finding is directly in accord with every-day laboratory experience, where the greatest difficulty is found in keeping cultures of the plague bacillus in a virulent condition. Under ordinary conditions of laboratory growth, in the presence of uniform temperature, on favorable nutrient media, and kept from the influence of strong light, a culture of the plague bacillus virulent to rabbits will in two or three days so deteriorate that it is no longer pathogenic for the very susceptible mouse.

Passage through the bodies of animals, repeated at short intervals, seems to be necessary to preserve the virulence of the bacillus. These conditions removed, its viability is short, and it either perishes altogether or becomes a purely saprophytic organism. It would therefore seem justifiable, in the present state of our knowledge, to assert that the relative danger from merchandise as a carrier of infection is slight, and that the greatest danger is to be apprehended from mild cases of the disease, unrecognized, little dangerous in themselves to the person having it, but as capable of spreading virulent contagion as is mild varioloid of communicating and imparting a virulent, fatal type of smallpox.

With a view to preventing the spread of the plague from India into Europe, an international sanitary conference, called by the Italian Government, at the instance of the Austro-Hungarian Government, assembled at

Venice February 9, 1897, and adjourned sine die about March 7. The representatives from the United States were Consul-General Wallace S. Jones and Passed Asst. Surg. H. D. Geddings, United States Marine-Hospital Service, technical delegate. The direct interest that the United States has in the prevention of the spread of the disease into Europe may be seen from a consideration of the dangers which would threaten this country provided the disease should become epidemic in certain European seaports, especially those from which large numbers of emigrants embark for the United States. For example, there is a large emigration from Naples, and the vessels which bring immigrants from Naples have Marseilles as their port of original departure. Thus, the infection of either port would be a matter of serious concern, and it should be remembered that Marseilles is the great entrepot on the Mediterranean of commerce from the Orient.

SPECIAL FACTORS IN THE SPREAD OF THE DISEASE

There are two features of this disease which are matters for serious consideration, so far as the United States is concerned: One is the ambulant, or walking form, or pestis minor, in which the symptoms are mild, the patients not being confined to bed. They may be afflicted for a period of from ten to thirty days before the symptoms have developed which call attention to the disease, and it may then develop into the violent form. The other feature is the possibility of infected rats on a vessel, a matter requiring the keenest vigilence on the part of the quarantine officer to determine.

The rat is beyoud a doubt largely responsible for the spread of plague from one area of an infected district to another, but it is entirely possible that he may also convey it to greater distances. The rat is notoriously a voyageur, and those who have observed his habits have noted that at irregular but frequently repeated periods he shows decidedly migratory tendencies. The enormous number of rats which infest cargo vessels is a matter of common knowledge among those who deal with this class of vessels at our quarantine stations. There is on record an instance in which after the sulphur fumigation of a cargo steamer of about 3,500 tons there were removed from the holds of the ship sixteen ordinary deck buckets of dead rats. A moment's thought will show what a terrible mass of infectious material this ship would have furnished if the plague had ever been introduced aboard by a single plague-infected rat.

From the foregoing lines it may be readily understood how the malady may be transmitted from one country to another by travel and commerce, either overland or by sea. As with cholera, the chief element connected with its spread from India to other portions of Asia and into Europe and Africa are the religious pilgrimages. Pilgrims from infested districts visit the shrines, which are also visited by people from non-infected districts, who carry back with them the germs of the disease.

MARITIME QUARANTINE AGAINST PLAGUE

Although the quarantine regulations of the Treasury Department contained provisions relating to the plague, it was deemed expedient to make the following special regulations, which were cabled to Bombay, January, 1897:

"QUARANTINE REGULATIONS TO BE OBSERVED AT FOREIGN PORTS AND AT SEA

"ART. IX. At all foreign ports and places infected, or suspected of being infected, with plague, the United States Quarantine Regulations, Treasury Department, 1894, relating to cholera, shall be observed with regard to vessels and cargoes bound to the United States. Passengers and crews of said vessels who have been exposed to the infection, or are liable to convey the disease, shall be detained a period of not less than fifteen days from the last possible exposure to infection, under the same regulations as those relating to cholera."

With regard to vaccination at the port of departure and en route of all emigrants as a preventive measure against smallpox, it is evident that this measure should be waived whenever the vessel, its personnel, or cargo comes from an infected port or district, inasmuch as the resulting abrasion will render the person more liable to the infection of plague, and, furthermore, the vaccination may complicate the diagnosis on arrival at quarantine as resulting frequently in enlarged axillary glands. In such cases the diagnosis would necessarily rest on microscopic examination of tissues or secretion. Vaccination, therefore, under the foregoing circumstances should be defered until the immigrant has arrived and until after all possibility of plague infection.

"QUARANTINE REGULATIONS TO BE OBSERVED AT PORTS AND ON THE FRONTIERS OF THE UNITED STATES

"ART. XIII. The regulations heretofore promulgated with regard to cholera shall be observed with regard to vessels, cargo, passengers, and crews infected, or suspected of being infected, with plague, but persons who have been exposed to the intection, or are liable to convey the disease, shall be detained for a period of not lesss than fifteen days from the last possible exposure to infection."

The quarantine methods of the United States are well adapted to meet emergencies, though the national laws should be strengthened. The law and regulations relate to foreign as well as to domestic ports and require every vessel leaving a foreign port for the United States to have a bill of health, signed by the consul, certifying that all the requirements have been complied with. The regulations for foreign ports are such as to insure the sanitary condition of the vessel, in cargo, and passengers before sailing.

In addition to the above, there is a complete and uuiform system of quarantine for domestic ports. The regulations are explicit with regard to inspection before entry, removal, and treatment of the sick with contagious disease, the isolation of those who have been exposed to contagion, the disinfection of the vessel and any articles of cargo that may be infected, and, finally, with regard to vessels bringing immigrants, a notification to be sent to the proper State health authorities of the expected arrival within their jurisdiction of immigrants who have arrived on the infected vessels, even though all precautionary measures necessary at quarantine have been taken.

The government is well equipped with quarantine stations for the disinfection of infected vessels, and has besides several large stations where immigrants can be detained in barracks under observation, as at the Delaware Breakwater, at the mouth of Delaware Bay, and Fishermans Island

(entrance of Chesapeake Bay), on the Atlantic coast, and Angel Island, San Francisco Bay, and Diamond Point, Washington, on the Pacific.

It seems impossible that the plague should ever again ravage the earth as in previous centuries. Modern quarantine is effective to a degree. Though old-fashioned and absurd as administered by some of the European countries and imperfectly executed in others, it nevertheless has proven, and will continue to prove, a powerful shield against this Asiatic invasion. Even should the disease spread to certain European countries, modern sanitation of cities, the knowledge of disinfectants and improved disinfecting appliances, and modern knowledge of the disease itself will doubtless enable it to be confined within reasonable limits.

NECESSITY OF EXTRAORDINARY CARE IN INSPECTION OF VESSELS AT DOMESTIC PORTS

The details of quarantine methods are set forth in the circular containing the most recent regulations, at the close of this article, but it is pertinent to here call attention to the necessity of great care in the quarantine inspection at domestic ports of vessels either coming from a plague-infected port or from a port which is itself not infected when the vessel brings passengers, members of the crew, stowaways, rags, or merchandise from an infected district.

When the vessel is from a port infected or suspected of being infected with the plague, the whole personnel of the vessel, including the crew and stowaways, should be subjected to removal of so much of their cloting as will allow of the most careful inspection of glandular regions, female inspectors being provided for female passengers and carefully instructed in their duties by the medical officer at the station. Special attention should be given to the ambulant, or walking cases, inasmuch as these present few outward symptoms to attract attention. In addition, careful search is to be made for the pneumonic type of the disease, and any severe pulmonic disease running a rapid course should arouse suspicion, and whether accompanied or not by glandular enlargement, should be subjected to a bacteriological examination of sputum.

PRINCIPLES OF TREATMENT AT QUARANTINE OF SHIPS INFECTED OR SUSPECTED OF INFECTION WITH PLAGUE

All ships arriving at a quarantine station may be divided into the following classes, viz.:

Iron ships, with cargo, without cargo; wooden ships, with cargo, without cargo; and in some particulars each class will demand separate consideration, while the same broad general principles are applicable to all.

These general principles have been so often discussed and are now so well known that a brief recapitulation of the ends to be obtained and the means of attaining them is all that is required.

The end to be obtained is, in brief, that the ship, her cargo, passengers, crew, and their effects shall each and every one of them be incapable of transmitting the disease quarantined against, and it is logical, therefore, to commence with the consideration of the treatment of the passengers and crew. These should be removed from the infected area or the area suspected of infection—viz., the ship—all passengers and as many of the crew as can be removed without jeopardizing the safety of the ship. If they are

sick, they should be placed at once in hospital, and those who have been specially exposed to infection should be carefully isolated and kept under the most rigorous observation. All, before entering the quarters destined to receive them, should be carefully bathed, clothed in sterile clothing, and not permitted to carry into the barracks or place of detention anything which has not been disinfected. If plague has occurred on the voyage, and if it is possible to procure the material, all should receive an immunizing dose of antipest serum of 5 to 10 c. c., which should be repeated at the end of ten to twelve days. All should be stripped before entering barracks and carefully examined to note the appearance of any glandular enlargements, which might escape the observation of the uninitiated and which might well be present in ambulant cases of the disease.

Those detained should be isolated in groups of a convenient number, and no intercommunication should be allowed among the groups. There should be a careful medical inspection twice daily, and any who may be found presenting suspicious symptoms at these inspections should be isolated pending determination of the nature of their ailment.

Any group among which plague may make its appearance should have all personal effects redisinfected and should be kept under the strictest possible supervision.

Care should be exercised as to food and water supply. No food should be allowed in the barracks, and no washing of clothing should be permitted by the inmates, but all such laundry work should be performed by specially designated employes of the station, who should be instructed to be certain, as a matter of personal protection, that all clothing to be laundered is disinfected by some approved method prior to passing into their hands.

The detention should last fifteen days from the time of last possible exposure to infection, and after a final disinfection of the effects carried into the barracks. all groups among whom no outbreak of plague has occurred may be discharged from quarantine in free pratique.

If the ship has cargo a special condition has to be met. It is very essential that every chance of conveying infection through this channel should be eliminated, and more important still that every effort should be bent to the destruction and safe disposal of all species of vermin which usually infest cargo ships and which in the present state of our knowledge play such an important role in the dissemination of the disease under consideration. Cargoes of coffee in sacks, sugar in bags, and general merchandise can at least be subjected to a surface disinfection if some little foresight has been exercised in loading the ship with this end in view. This is effected by leaving under each hatch a shaft leading down to the very bottom of the ship, the sides of this shaft being built up of planks and timber to prevent the shifting of cargo. Through the shaft thus constructed the pipe from the sulphur furnace should be conducted, and by the combustion of an appropriate quantity of sulphur in the furnace the vacant spaces and the interstices of the cargo are filled with sulphur dioxide, which is allowed to remain in the tightly sealed hold for twenty-four to forty-eight hours. Should these shafts not have been left in loading, they should be formed by the removal of sufficient cargo to accomplish the desired end, the cargo removed being discharged on lighters. The discharge of the cargo should then be begun, it being placed on lighters and so stored as to admit

of the greatest possible exposure to sunlight and circulation of air possible. Every evening when work has been suspended for the day the sulphur fumigation should be repeated, in this way insuring that every particle of cargo removed during any given day has been subjected to a disinfection during the night preceding.

During the discharge of the cargo a careful watch should be kept for rats, dead or alive. If possible, a bacteriological investigation should be made of their bodies, to determine whether their death is due to plague infection or to sulphur asphyxiation, and in any event the bodies of the vermin should be most carefully handled and promptly burned.

The discharge of the cargo completed, it should be retained in quarantine upon the lighters, exposed to sun and air.

The ship being emptied, the ordinary methods of maritime sanitation should now be practiced with the greatest care. Sulphur fumigation of the empty holds will, in all probability, dispose of any rats which remain, and this should be followed by thorough mechanical cleansing, another sulphur fumigation, washing with the solution of bichloride of mercury, the steaming of all clothing, bedding, textiles, and fabrics, and the disinfection of all living apartments, either by the prescribed methods of sulphur or formaldehyde disinfection.

Should an iron ship without cargo arrive at quarantine, the methods just detailed to be taken subsequent to the discharge of the cargo will be fully applicable, and another problem presents itself for consideration, viz., the handling and disposal of ballast.

Following a custom which has been practiced at quarantine stations for many years, the hold, with the contained ballast, is subjected to a sulphur fumigation, after which the treatment depends on whether the ballast is to be immersed in deep water or left exposed. In the first case the ballast may simply be removed and dumped; in the second it must be disinfected by immersion in an acid solution of bichloride of mercury, 1:800 or 1:1,000. The ballast which is to remain in the ship must, however, be thoroughly disinfected by "dipping" in the mercuric solution, and then be trimmed as desired.

If the ballast is to be discharged into a fresh-water stream or in brackish water, it must be disinfected before such discharge. No ballast removed from a plague-infected or plague-suspected ship should be removed from a quarantine station.

The treatment of wooden ships with or without cargo is conducted on the same general principles as that of the iron ships, with the exception that the sulphur fumigation must always precede the bichloride washing and the exposure to the sulphur dioxide must be longer.

The reasons for this are, in the first place, purely physical: If the cracks and seams of a wooden vessel are sealed even by even a thin layer of fluid, the penetration of the gaseous disinfectant is prevented and the disinfection of the spaces between the two layers of the ship's planking is rendered impossible. The longer time demanded is purely in the interests of more perfect germicidal action by penetration of the gas into the wood, an end which takes from forty-eight to seventy-two hours to accomplish. Wooden vessels are usually more filthy than iron ones; therefore the mechanical cleansing

will present more difficulties, but these difficulties are of degree and not of kind.

A few points should be mentioned here which may have value in the management of actually infected ships. Cargo which is suspected of infection should, if possible, be handled with gloves or mittens, for if actually infected the abrasions caused by the handling of cargo and tackle would afford an easy entrance for specific organism. The dead bodies of rats should not be handled with the naked hands, but should be gathered by means of tongs, or the hands certainly protected by gloves or otherwise. Most important too is the disinfection of the spots where these dead rats are found. They should be disinfected by the application of a solution of carbolic acid, 1:20, or by a solution of mercuric chloride, 1:1,000, or, in the absence of both of these, by the liberal application of actually boiling water in large quantity. The bodies should be collected in one place and promptly burned in a special creamating apparatus, or, in the absence of this, in the furnace of the boilers.

Most important, however, in the opinion of the Marine-Hospital Bureau, is a careful watch for ambulant cases of the disease. It is admitted that there may be a certain minimal risk in merchandise, but it would seem that by far the larger and more important danger is in these mild and unrecognized types of the disease. Great caution should therefore be exercised to prevent their embarkation on any ship bound for the United States, and there should be a careful scrutiny of the persons of all passengers, cabin and steerage, arriving in the United States from an infected or suspected port or place or from a suspected locality, via a healthy port. This scrutiny should be rigid, and false ideas of modesty should not be permitted to interfere in the discharge of this important duty. In the case of female passengers or immigrants it might be necessary to employ female inspectors, but this is a detail which can be safely left to the judgment of the individual quarantine officer. The greatest vigilance is demanded, and in it alone will be found that safety which this continent has heretofore enjoyed from the ravages of this terrible malady.

In the absence of a sulphur furnace at any quarantine station, the disinfection of cargo required by the regulations may be accomplished in a fairly efficient manner by means of sulphur fumigation with pots. A portion of the cargo immediately under the hatches should be removed and laid aside for future desinfecting procedures. This will afford room for the introduction overnight of an ample quantity of sulphur in pots, which should be lighted and the hatches closed until the following morning. This should be repeated every night until the hold is emptied, and insures at least a partial surface desinfection of the cargo with is to be removed during the day.

MEASURES AGAINST PLAGUE ADOPTED BY THE FRENCH GOVERNMENT

With a view of showing some preventive and restrictive measures which have been inaugurated abroad, and for purposes of comparison with our own practice and regulations, the following partial translations of recent pamphlets received from the consulting committee of public hygiene, department of the interior of the French Republic, are here introduced.

The consulting committee of public health (ministery of the interior) of

the French Republic has announced the following proposition and formulated the following suggestions and rules for the prevention of the spread of the plague:

I. Rats and mice are very active agents in the propagation of the plague. When they are striken they are not long in spreading the disease among the inhabitants of the places where they pass or where they live. The epidemic among these rodents precedes always by a few days the epidemic among men.

II. That therefore, at any price, it is necessary to rid ships and hospitals of their presence.

It is therefore necessary to use every care to prevent the access of rats and mice into hospitals, or to destroy them, if there, with the very greatest care. Therefore all openings should be protected by metal screens or other approved devices for preventing the entrance of the vermin; or should they have effected an entrance, they should be killed by some efficient rat poison, their bodies collected and burned, and the places where the bodies are discovered should be desinfected by some strong germicidal solution.

The same measure of precaution should be applied upon ships upon their voyage, viz, to prevent the access of rats to the vessel while she is lying at a pier and to destroy them effectively when their presence is discovered, carefully burning the bodies and disinfecting the localities where the bodies are found, as above.

Upon arrival the presence or absence of rats on board should receive the careful attention of the quarantine or health officer. If rats should be discovered, or if their bodies should be discovered, they should be subjected to bacteriological investigation, in order to establish the presence or absence of the *B pestis*. In cases where this shall be discovered the ship shall be discharged, its cargo and the baggage and effects of the passengers and crew desinfected, and the entire ship subjected to sulphur fumigations and the bodies of rats carefully burned.

A.

The plague is an infectious disease caused by a specific bacillus discovered by Drs. Yersin and Kitasato.

B.

The forms of plague are: Plague with visible buboes, or bubonic plague; plague without visible buboes, or plague septicæmic in character from the beginning; pneumonic plague; and intestinal plague, which is very rare.

I.—Bubonic plague

Bubonic plague begins by fever, nausea, pains in the head and limbs. Swelling of the glands of the groin, the axilla, or the neck soon shows itself. This swelling is very painful; if it remains diffuse, the general condition becomes more and more grave, with delirium and progressive enfeeblement of the heart's action. Death supervenes rapidly, because the plague bacillus has passed into the blood; the disease has become sepicæmic.

In milder cases the swelling is limited and an abscess is formed. Suppuration of the glands is ordinarily followed by a marked amelioration, and patients whose glands suppurate may recover. It may happen, however, that the plague abscesses may be the point of departure of secondary infections with multiple and prolonged suppurations, which may lead to cachexia.

The appearance of buboes may be preceded by that of pustulus, around which the skin becomes violaceous and finally ulcerates (plague ulcers).

Some patients present swellings and suppurations of the glands without general constitutional symptoms, and who are nevertheless plague stricken. This benign form ought to be particularly guarded against, as it is often unrecognized, and persons stricken with it may easily propagate the disease. This form is called ambulant. The serum from the swollen glands, form pustules, the pus from buboes contain the plague bacilli, and bacteriological examination gives a rapid and precise diagnosis. These fluids should therefore always be collected for examination.

II.—Plague, septicæmic from the beginning

Sometimes no localized glandular swellings are noted, or there may be a slight increase of volume of various lymphatic glands, in spite of which the fever, delirium, and other symptoms of plague poisoning may be very intense. The disease is then septicæmic from the beginning, and kills the patient in a few hours.

III.—Pneumonic plague

Pneumonic plague begins most frequently by a chill, with vertigo, nausea, and pains in the head and limbs. The temperature is raised. The general symptoms precede the pulmonary signs, which may not show themselves for three or four days after the beginning of the disease.

Pulmonary symptoms.—Pain in the chest; dullness, more or less accentuated; crepitant and subcrepitant rales, frequent or sometimes incessant cough. The sputa, according to circumstances, are either abundant, fluid serous, often foamy, and tinged red by blood, or viscid and prune juice colored. True spitting of blood may supervene.

Cause of the disease.—The vertigo of the commencing attack may disappear and consciousness be retained, elevated temperature, rapid pulse, tongue at first moist, then dry, and covered with a coating, cough and incessant expectoration, dyspnœa, delirium, petechiæ, hemorrhages from mucous surfaces, enfeeblement of the heart action cyanosis and death from the fourth to the eighth day, rarely more delayed.

Differential diagnosis.—Pneumonic plague is distinguished from ordinary pneumonia by the lack of harmony which exists at the beginning between the severity of the general condition and the condition of the lung as shown by physical signs.

Pneumonic plague may be confounded with the pneumonia with rapid course of influenza.

There is but one precise means of making a diagnosis, viz, to make a bacteriological examination of the sputum, which contains numerous plague bacilli.

It should be remembered that the plague bacilli do not exist in the sputum in pure culture, but are always associated with staphylococci, streptococci, and diplococci. It must be borne in mind that the plague bacilli are completely decolorized by the method of Gram; the other organisms mentioned are not so decolorized.

C

In countries threatened with the plague it is imperative that all febrile persons who show evidences of glandular enlargements should be submitted to bacteriological examination, as well as those who present symptoms of pulmonary troubles with grave general symptoms.

II.—Transmission of the plague

The germ of the plague is contained in the pus of buboes, abscesses, wounds, and sometimes in the products of expectoration; more rarely in the stools and urine of patients. It is found in the blood. It effects entrance especially by wounds, excoriations or crevices, and small lesions which often pass unrecognized.

It may be transported by parasites, fleas, etc., and especially by rats and mice.

Rats are often sick with the disease before men are attacked, and in certain epidemics a great mortality among rats has preceded by several days the first cases among human beings.

The germ of plague may be transmitted by the most diverse objects, as clothing, body linen, bedding, rags, wool, carpets, hair, untanned hides, etc. Food and drink may serve also as the intermediary of contagion.

The transmission may be effected by the respiration of dust, in which the germ of plague may be contained. In the pulmonary form the transmission is habitually effected from person to person by the sputum of patients, which contains the bacilli.

Transmission may also be effected to a distance by means of the intermediaries already cited—clothing, body linen, bedding, etc.—by convalescents, by patients with mild attacks (ambulant form), and by rats.

III.—Course to be pursued with regard to an individual stricken with plague or suspected of plague

As soon as a case of plague or one suspected of being plague comes under the observation of a physician, he should make declaration of the fact to the proper health authorities.

He should, if possible, communicate with the director of a bacteriological laboratory and ask for an investigation of the malady.

In large cities where such establishments exist he should apply at once for an examination, and in case of death he shonld make careful examination to see whether the bodies present glandular swellings or abscesses. In cases where they are found it would be well to remove from the body, with due precaution, some of the swollen glands or some of the pus of abscesses for bacteriological investigation.

In all cases where death has been caused by a pulmonary affection of unusually rapid course (simulating pneumonia, broncho-pneumonia, influenza, pulmonary congestion, etc.), they should endeavor to secure material for bacteriological investigation.

The glands, pus, or sputum enumerated above may be secured in a test tube, sealed, and securely packed for transmission to a laboratory.

IV.—Isolation and disinfection

A patient stricken with plague should be isolated.

The patient should be kept in a state of the utmost cleanliness.

The persons alone who are charged with his care should have access to him.

They should observe the following precautions:

To take neither food nor drink in the sick-room.

To never take food without washing the hands with soap and a disinfecting solution.

To frequently wash the face with a disinfecting solution.

To thoroughly air the sick-room several times a day.

To rinse the mouth from time to time, and always before eating, with a disinfecting solution.

In the sick-room the following precautions should be observed:

Curtains, carpets, rugs, and all furniture which is not necessary should be removed.

The bed is to be placed in the middle of the floor. It should be washed with a disinfecting solution. There should be no dust, dirt, nor parasites in the corners of the room. Cloths, coverings, and mattresses are to be disinfected by steam or boiling at the conclusion of the case, or as often as they accumulate.

The floor of the room or apartment should be washed or mopped daily with a disinfecting solution.

DISINFECTION

The disinfectants principally recommended are corrosive sublimate, carbolic acid, sulphate of copper; chloride of lime, freshly prepared; milk of lime,[1] freshly prepared.

The solution of corrosive sublimate will be employed in a strength of one per 1,000, with the addition of two parts per 1,000 of common salt or hydrochloric acid.

Carbolic acid will be employed in a strength of five per 100.

Solutions of sulphate of copper and chloride of lime will be in a strength of five per 100—i. e., fifty grams per liter—and milk of lime twenty per 100, or 200 per liter.

Washing of the face and hands, use the sublimate solution, 1–1,000.

Rinsing of the mouth, use a solution of hydrochloric acid, 4–1,000, or four grams of acid to one liter of water.

Dejections.—All dejections of patients (vomited matter, fecal matter, etc.) are to be immediately disinfected with either the solution of sulphate of copper, chloride of lime, or the milk of lime. The milk of lime is particularly recommended if freshly prepared.

A small quantity of one of these solutions should be placed in the bedpan or other vessel before being used by the patient.

If these dejecta are thrown into water-closets or latrines, these should be disinfected by one of the solutions at least once in each day.

[1] A very active milk of lime is prepared as follows: Take lime of a good quality and caustic, and cause it to crumble by moistening it little by little with half its weight of water. When crumbling is effected, place the powder in a container perfectly dry and carefully stoppered. As a kilogram of lime which has absorbed 500 grams of water in order to slake it has acquired a volume of two liters and 200 cubic centimeters, it is sufficient to dilute it with four liters and 400 cubic centimeters of water, which will give a solution of twenty per 100.

Dressings.—The dressings of buboes and ulcers should be promptly burned.

Body linen.—Soiled body linen may be treated by one of two methods—

(*a*) By being placed in a disinfecting apparatus. Contaminated clothing not stained with blood, pus, or fecal matter may be placed directly in the apparatus; stained linen should remain for an hour in a corrosive-sublimate or carbolic acid solution. Failure to exercise this precaution will result in indelibly fixing the stains after steaming.

(*b*) A simple, economical, and convenient method of disinfection consists in immersing the linen to be disinfected in a carbolic or sublimate solution for an hour. None of the articles enumerated above should be washed in the running water of a stream.

Clothing.—The clothing of patients and nurses is disinfected by steam or by immersion in boiling water for one-half hour.

If for any reason both of these methods are inapplicable, the clothing may be disinfected by sulphur dioxide by the method to be subsequently described.

Furniture, bedding, mattresses, etc.—Furniture should be washed or disinfected by one of the disinfecting solutions; bedding and mattresses by steam or by immersion in boiling water, or, failing one of these methods, should be destroyed by fire.

Corpses should at once be wrapped in a sheet wet in one of the strong disinfecting solutions, without preliminary washings, or inclosed in an air-tight coffin, surrounded by a layer of sawdust wet with one of the disinfecting solutions, to prevent the filtration of fluids. They should be at once interred, preferably surrounded by caustic lime.

PERSONAL HYGIENE

The purity of the water supply should be watched with great care.

In cases of epidemics, drink boiled water only.

Water from surface wells capable of contamination is to be forbidden, and bakers should be prohibited from using water from such wells in the making of their bread.

In the event of the outbreak of a case of plague, the health authorities should be at once notified.

The patient should be promptly isolated, and in the event of the occurrence of a case in a habitation occupied by several families, the patient should be removed to a hospital in a special ambulance.

PUBLIC HYGIENE

All causes of unhealthfulness which may prepare the soil for the invasion of epidemics ought to be eliminated when it is a question of the possible importation of plague.

Thus, the rules of general hygiene, applicable at all times, should be most rigorously observed in times of plague, especially in all which concerns—

The destruction of rats and other rodent animals.

The congregations of individuals, as fairs, celebrations, and pilgrimages.

The surveillance and supervision of markets.

The cleanliness of the soil.

The regular removal of garbage.

The cleanliness of habitations.

The particular supervision of places, workshops, forges, etc., intended for occupancy by the laboring and industrial classes.

The cleaning and regular desinfection of water-closets, public and private.

Supervision and desinfection of latrines and cesspools.

The care and cleaning of gutters, etc.

Administrative care should also be brought to bear to improve the sanitary condition of notoriously unsanitary quarters and dwellings.

V.—TREATMENT OF PLAGUE BY ANTIPEST SERUM

The sero-therapeutic measures to be taken in cases of declared plague are of two kinds. They deal on the one hand with the patients, and on the other with those who have nursed them, and with those who have come into contact with persons thus exposed. The measures are therefore curatives and preventive.

I. CURATIVE TREATMENT

The patient having been informed of the nature of his disease, it will be recommended to him to receive a dose of from 20 to 40 c. c. of the antiplague serum, according to the gravity of his case. Another injection of 20 c. c. should be given on the following day, and still another on the day following if deemed necessary. The technique of these injections will be the same as those of the diphtheria antitoxin. The open buboes will be dressed antiseptically, especially with gauze wet with a 1 to 1,000 solution or corrosive sublimate.

In addition to the sero-therapeutic measures, remedies which aid in supporting the strength of the patient, such as appropriate food, alcoholics, heart stimulants, etc., may be exhibited with advantage.

II. PREVENTIVE TREATMENT

The attention of those who nurse or otherwise care for patients suffering with plague should be called to the foregoing suggestions as to personal hygiene and the rules for those who act as nurses or those who have inadvertently been exposed to the danger of infection. These persons should also be informed that it would be a decided advantage to them to submit to an injection of 5 c. c. of antiplague serum, an injection which may advantageously be renewed in the case of nurses every ten to twelve days.

MEASURES TO BE ADOPTED AT BREMEN, GERMANY, FOR THE PURPOSE OF COMBATING PLAGUE

[From United States Vice-Consel G. W. Murphy.]

[Translation from the Weser Zeitung of November 25, 1899.]

The sanitary officials at Bremen have submitted a report concerning precautionary measures for combating the danger from bubonic plague. The outbreak of the plague in Portugal and in certain ports of England and Austria make it necessary to take steps to prevent the introduction of the disease at Bremen ports and to meet the possibility that plague may be brought in ships to the Weser River. A conference has been held in

the imperial sanitary department at Berlin, at which the director of the Bremen Bacteriological Institute was present, and the matter has been very carefully considered by the sanitary officials and a committee consisting of medical authorities, harbor officials, and ship owners. As a result the sanitary officials have made a report and requested appropriations as follows:

1. In addition to the director already empowered to make bacteriological investigations of cases of plague, a number of local bacteriologists must receive furthur instruction either in the Bacteriological Institute or in the imperial sanitary department at Berlin. To cover traveling expenses, etc., including the cost of sending a physician to Bremerhaven, a sum of 1,600 marks ($380) is needed.

2. Rooms must be fitted up specially for the purpose in the Bacteriological Institute. Estimated cost, 1,700 marks ($405).

3. If cases of plague occur at Bremerhaven, a branch laboratorium must be established there under the charge of a physician trained in bacteriology. A room in the quarantine hospital can be fitted up for this purpose at an expense of 350 marks ($83).

4. For perfecting arrangements for bacteriological plague investigations various articles are needed which will cost 2,480 marks ($690).

5. Recent investigations prove that rats and other vermin are the principal transmitters of the plague. Owing to the impossibility of preventing rats coming on board vessels at foreign ports and subsequently escaping to the land, the only defense against the danger which threatens us is to exterminate these animals as far as possible. Vessels engaged in traffic between the Weser and ports where the existence of plague is suspected should be supplied with cats. Poison should also be used, and such ships should be well smoked after the removal of the cargo. On shore the rats must be fought with cats and rat-catching dogs. Rewards must also be offered for the delivery of dead rats. In order to encourage port watchmen and other harbor employes to keep rat-catching dogs, a premium of 30 marks ($7.50) per annum should be allowed to the owner of each such dog, the total number at Bremen and Bremerhaven not to exceed twenty-five. With this allowance port employes will be willing to keep dogs and pay the dog tax.

In addition to the 750 marks ($187) needed for this purpose, 2,000 marks ($470) should be appropriated for paying a premium of 5 pfennigs (1¼ cents) for each dead rat delivered. The dead bodies can be disposed of in the ovens of the gas works and in the central heaters of the ports. The possibility that the premiums may encourage the bringing in of dead rats from other places can not be avoided. Another means for getting rid of rats is to sulphurize the sewers in Bremen and to flood with river water those at Bremerhaven. Both of these plans are being considered. Owners of warehouses and barns near the ports are urged in their own interest to do their utmost to destroy the rats nesting therein. Furthermore, they are required, as are all port employes, to send to the Bacteriological Institute all rats found dead without visible wounds, in order that they may be examined for traces of plague. Consideration is now being given to the question as to whether and when this requirement should be extended to the public generally, as has already been done at Hamburg. The question as to whether a general destruction of rats by means of poison should be resorted to is also being considered. For various reasons a decision has not yet been reached on either of these points.

6. Cases of plague which may occur at Bremen ports will be strictly isolated. For this purpose a portion of the cholera barracks at Bremen and part of the quarantine station in Bremerhaven will be used. They will be absolutely secured against the entrance and exit of rats, and the admission of unauthorized persons will be forbidden. For making these necessary preparations a sum of 14,080 marks ($3,450) is necessary.

REPORT FROM YOKOHAMA, JAPAN—PLAGUE AT KOBE AND OSAKA

YOKOHAMA, JAPAN, November 24, 1899.

SIR: Under dates of November 15th and 16th I reported one case of plague as having occurred at Hiroshima on the 5th, and the outbreak of the same disease at Kobe to the extent of five cases. Since last writing, so far as I have been able to learn, no second case has occurred at Hiroshima, and but three more undoubted instances of the malady have been met with at Kobe, making eight in all at the latter place, one each on November 7, 9, 11, 12, 13, 15, 16, and 17, all attacked having died.

At Osaka, a very large manufacturing city some thirty miles from Kobe, on the 20th two little girls were seized with plague after a visit of one of them to a cotton-mill where old cotton, suspected to be of the lot from Niuchwang referred to in my letter of the 15th, was being worked up. Both of these girls, sisters, are dead. This makes ten cases in all to the present date.

Many suspected cases have been reported from Kobe and its neighborhood which, under observation, have been found to be of other disease.

The Government has taken very active measures, briefly as follows:

(1) Professor Kitasato, with several expert assistants, was sent to Kobe at the news of the first case. He, intrusted with full powers, has called to him from various parts of the country a large number of physicians more or less trained by himself, and forty or fifty of these have already arrived in the epidemic district.

(2) A thorough examination of all persons well or ill who can possibly be supposed to have been exposed to infection is being made in Kobe and its neighborhood, as well as at Osaka.

(3) A careful examination is made of all passengers leaving Kobe or Osaka, either by steamer or railway, before embarkation, and, at Kobe, a locally prominent English medical man is employed for this work in association with the Japanese doctors.

(4) Thorough examination of passengers by rail is also made at several points on each of the different railways connecting with both Kobe and Osaka, north and south of these cities.

(5) A general cleaning and disinfecting of all cities and towns, not only inside of but beyond the present area of the epidemic, is being carried out under the superintendence of the police, and an energetic campaign against the pathogenic rat has been inaugurated in compliance with the published advice of Professor Kitasato and other experts.

(6) The laws of marine quarantine are being applied with almost excessive

stringency, or what would seem excessive were the personnel of the quarantine force of higher and more experienced character.

At present it looks as though the efforts for the suppression of the epidemic may be successful, though it must not be forgotten that cold weather is just beginning and is, probably, most unfavorable to the development of the disease. It is be hoped that the measures taken may be so thorough as not only to stamp out the present outbreak, but to afford security against its renewal next spring.

In connection with the apparent origin of the disease from old cotton imported from a plague center, I would add that all materials of this class are now destroyed wherever found, if of Chinese origin, in connection with the cleansing operations now being carried out.

In 1894, when upon myself, as a member of the imperial board of health, happened to fall the chief responsibility for preparing special rules and regulations to avoid the importation of plague from Hongkong, where it had just broken out, I stringently prohibited the admission of rags, old cotton, or old clothing, among other things, and put the period of quarantine for plague at nine days. Later, after the study of the disease made by Professors Kitasato and Awoyama, the regulations were changed and these prohibitions ceased to be effective, with what disastrous results is now shown; while the period of detention was reduced to seven days—in my opinion, another great mistake.

In accordance with your cable dispatch of the 16th instant, I immediately appointed as acting sanitary inspector, U. S. M. H. S., at Kobe, Dr. J. Bucknill Fowler, the only available man, and fortunately a very good one. He has accepted the appointment, I have instructed him to the best of my ability, and he has entered upon his duties.

As I understand this appointment to be one of emergency only, and so, it is to be hoped, temporary, I shall be glad to have instructions as to the conditions which should govern the period of Dr. Fowler's service,

Respectfully,

STUART ELDRIDGE, M. D.,
Acting Assistant Surgeon, U. S. M. H. S.,
Sanitary Inspector, Yokohama.

The SURGEON-GENERAL,
U. S. Marine-Hospital Service.

QUARANTINE REGULATIONS OF THE UNITED STATES RELATING TO PLAGUE.

CIRCULAR

[1900—Department Circular No. 6.]

TREASURY DEPARTMENT,
OFFICE SUPERVISING SURGEON-GENERAL MARINE-HOSPITAL SERVICE,
WASHINGTON, D. C., January 16, 1900.

To United States consular officers, masters and owners of vessels, national, State, and local quarantine officers, and others:

The following additions to the Quarantine Regulations of the United States, revised edition November 13th, 1899, are hereby promulgated for your information and guidance:

ADDITIONS TO REGULATIONS TO BE OBSERVED AT FOREIGN PORTS AND AT SEA

ARTICLE V

PAR. 18. Passengers should not be vaccinated at nor en route from ports or places infected with plague Such vaccination increases the liability to plague infection and, by inducing fever and swollen glands, tends to confuse diagnosis at the port of arrival. This operation must be performed at the port of arrival and just prior to release from quarantine.

ARTICLE IX

PAR. 2. Baggage labeled and sealed by the consul or medical officer of the Marine-Hospital Service at a non-infected city may be admitted without disinfection, even though shipped through an infected port or locality, provided it arrives with the seal unbroken. Such baggage should be accompanied by a certificate of origin and non-exposure to infection.

PAR. 3. Passengers coming from an infected or suspected locality and desiring to take passage at a non-infected port should be held fifteen days under observation before being allowed to embark, otherwise the ship and all on board will be considered by the quarantine officer at the port of arrival in the United States as coming from an infected port. Any baggage from such infected or suspected localities, destined from shipment through a non-infected port, must be desinfected prior to shipment.

PAR. 4. In a port where plague prevails the vessel should not tie up to the dock. No lines should be passed to the shore that might permit rats on board. Passengers and cargo should be lightered, the crew not be allowed ashore, and personal communication from shore to vessel shall be under medical supervision. A statement to this effect from a medical officer of the Marine-Hospital service will have weight with the quarantine officer at the port of arrival in determining the question of disinfection and time of detention.

PAR. 5. Mammalian animals, such as dogs, cats, monkeys, mice, etc., which not infrequently accompany passengers as pets, should not be shipped from a plague infected or suspected port or place.

ADDITIONS TO REGULATIONS TO BE OBSERVED AT DOMESTIC PORTS

ARTICLE I

PAR. 8. *Inspection for plague.*—(*a*) In the case of vessels infected or suspected of being infected with plague, place vessel in quarantine in anchorage sufficiently remote from the nearest land or other vessel to prevent the escape of rates by swimming.

(*b*) Pilots, customs officials, agents of vessels, or others who go aboard vessel may be deemed and be treated as a part of the personnel of the vessel. Such persons shall be detained in quarantine a sufficient time to cover the period of incubation of the disease, if in the opinion of the quarantine officer said persons have been exposed to infection, and their dunnage, if any, shall be disinfected.

(*c*) In inspecting infected or suspected vessels the personnel of the vessel shall be inspected after the removal of all clothing which will interfere with a thorough examination of all glandular regions, including axillary, inguinal, and cervical.

(*d*) Female inspectors should be provided for inspection of female personnel. They should be instructed by the quarantine officer in the general symptomatology and recognition of the disease, but final decision is to be made by the quarantine officer.

(*e*) Special attention shall be given to the detection of ambulant or walking cases, which are a source of great danger and apt to be overlooked, because they present few objective signs to attract attention.

(*f*) Special attention should be directed to the pneumonic type of the disease. Any person presenting pulmonic symptons of rapid course, with or without glandular enlargement, should be the subject of special inquiry and, if possible, of bacteriological examination.

(*g*) In suspected cases specimens of pus, sputum or the contents of lymphatic glands may be sent to the hygienic laboratory of the Marine-Hospital Service at Washington for examination, under the precautions prescribed by the postal regulations of the United States.

(*h*) The quarantine officer at the port of entry will carefully examine the ship's manifest of cargo for household goods, bedding, secondhand articles, personal baggage, corpses, rags, and articles apt to carry infection. Any articles believed by the quarantine officer to be infected must be disinfected in accordance with the quarantine regulations of the United States.

ARTICLE XIV.—TREATMENT OF VESSELS SUSPECTED OF PLAGUE

PAR. 2. If a vessel has been disinfected at the port of departure and the personnel bathed and their body clothing and baggage disinfected by a commissioned medical officer of the

Marine-Hospital Service, where proper facilities for such work exist, and in all other respects has complied with the United States Treasury regulations, and if no suspicious sickness has occurred enroute, such vessel may, in the discretion of the quarantine officer, have the time of the voyage deducted from the period of detention.

PAR. 4. No person from an infected or suspected port or place shall be admitted into the United States until a total period of fifteen days shall have elapsed under observation either at the port of departure, at sea, or at port of arrival, excepting as hereinafter provided.

PAR. 5. A first-cabin passenger, bearing the certificate of an officer of the Marine-Hospital Service certifying to non-exposure to the infection of plague for the fifteen days immediately preceding embarkation, may be admitted to entry without detention, provided, in the opinion of the quarantine officer at the port of arrival, he has not been exposed enroute to persons or things presumably infected.

PAR. 6. All passengers, excepting the first-cabin passengers, shall be bathed, and body clothing disinfected before landing. Similar measures shall be taken with the crew and their effects if the quarantine officer believes the crew has been exposed to infection.

PAR. 7. All baggage from infected places should be disinfected, either at the port of departure or entrance, in full accordance with the United States quarantine regulations. When disinfected at the port of departure, the containers shall be sealed and ticketed with a yellow "disinfected" label, signed by a medical officer of the Marine-Hospital Service at the port of departure; and if seals and labels are intact at port of arrival, such packages may, in his discretion, be passed by the quarantine officer at the port of arrival, without further disinfection. Hand baggage and baggage opened or used on the voyage must be disinfected on arrival. In no case shall soiled body linen be admitted without disinfection.

PAR. 8. A vessel from a plague infected or suspected port, carrying passengers but no ship's surgeon may, in the discretion of the quarantine officer, be quarantined with all on board for the full fifteen days from the completion of desinfection. (See note.)

PAR. 9. A vessel from a plague infected or suspected port, arriving with fewer persons on board than are accounted for on the bill of health, may, in the discretion of the quarantine officer, be considered as an infected vessel.

PAR. 10. Vessels suspected of plague shall be desinfected in whole or in part, in the discretion of the quarantine officer, and said disinfection shall be in accordance with the provisions of Article XVI.

ARTICLE XV.—TREATMENT OF PLAGUE-INFECTED VESSELS

PAR. 1. Remove all passengers from the vessel and all of the crew save those necessary to care for her. Place the sick, if any, in hospital, and isolate those specially suspected. Segregate the remainder in small groups, wherever facilities for such segregation exist.

PAR. 2. Persons with abrasions or open sores should have them protected with proper dressings before being permitted to handle persons or articles believed to be infected with plague.

PAR. 3. *Preliminary disinfection.*—After removal of the personnel a preliminary disinfection of all accessible parts of the vessel must be performed with sulphur dioxide. This preliminary disinfection should be started in the morning in order that guards may be placed on deck and in small boats around the vessel to detect and destroy any escaping rats.

PAR. 4. The water supply must be changed without delay, the casks or tanks disinfected by steam or 10 per cent solution of potassium permanganate, and, after thorough rinsing, refilled from a source of undoubted purity, or the water supplied must have been recently boiled. Some water tanks are not readily inspected and cleansed on account of their inaccessibility; these may be rendered safe by leading a steam pipe into them and boiling the water in situ.

PAR. 5. Nothing shall be thrown overboard from the vessel, not even deck sweepings. Such material shall be burned in the furnace or in a place specially designated, but not in the galley.

PAR. 6. Plague-infected vessels shall be desinfected in accordance with Article XVI.

PAR. 7. *Detention of personnel.*—(*a*) If practicable, antipeste serum should be used as a preventive measure on all the personnel of any vessel arriving with a history of sickness of a suspicious character on board during the voyage.

(*b*) The personnel of vessels shall be detained under observation fifteen days from the last possible exposure to infection.

(*c*) The people detained shall be inspected by the physician twice daily, and be under his constant surveillance, and no intercourse will be allowed between the different groups while in quarantine.

(*d*) No direct communication shall be allowed between any person detained in quarantine and anyone not in quarantine, except through the quarantine officer.

(*e*) The water and food supply shall be strictly guarded to prevent contamination, and issued to each group separately.

(*f*) Cleanliness of quarters and of persons shall be enjoined and enforced daily. Disinfection shall be used where there is any possibility of infection.

(*g*) Water-closets, urinals, privies, or troughs shall be provided, and their contents disinfected before they are discharged.

(*h*) In any group in which plague appears the sick shall be immediately isolated in hospital, and the remaining persons in the group shall be bathed and their effects disinfected, then removed to other quarters, if possible, and the compartment disinfected.

(*i*) No convalescent from plague shall be discharged from quarantine until after a sufficient time has elapsed to insure his freedom from infection, to be determined by bacteriological examination.

(*k*) The body of no person dead of plague shall be allowed to pass through quarantine. The body should be cremated, if practicable; if not, it should be wrapped without preliminary washing in a sheet saturated with a solution of bichloride of mercury, 1 to 500, surrounded in the coffin by twice the body weight of caustic lime and buried.

(*l*) Mammalian animals, such as dogs, cats, monkeys, mice, etc, which not infrequently accompany passengers as pets, should not be shipped from a plague infected or suspected port or place. Should, however, such arrive, they shall be held in quarantine at least fifteen days.

ARTICLE XVI.—DISINFECTION OF VESSELS INFECTED OR SUSPECTED OF BEING INFECTED WITH PLAGUE.

PAR. 1. *Holds of iron vessels.*—(*a*) With cargo: By twenty-four hours' exposure to sulphur dioxide, 10 per cent per volume strength, generated by an approved furnace, or forty-eight hour's exposure to 5 per cent per volume strength, generated by pots.

(*b*) Where cases of plague or death from the same have occurred on board, or where there have been deaths presumably from plague among the rats on a vessel, the cargo shall be lightered, in order to complete the disinfection of the vessel and facilitate the removal of all rats and other vermin.

This same procedure may be required by the quarantine officer whenever, in his judgment, the vessel or cargo is infected.

(*c*) Where it can be procured in sufficient quantity, liquefied sulphur dioxide may be used in the disinfection of cargoes, holds, and living apartments, it being borne in mind that it will be necessary to employ two (2) pounds of this material in lieu of one (1) pound of sulphur where indicated in the above regulations.

(*d*) No person should be allowed on the vessel or around the cargo with bare feet, and the use of proper precaution in handling dead vermin is advised.

(*e*) Without cargo: After the preliminary disinfection provided for in Article XV, paragraph 3, followed by mechanical cleansing, the hold must be thoroughly washed with a solution of bichloride of mercury, 1 to 800, applied under pressure to all surfaces by means of a hose, or disinfected by sulphur dioxide, 10 per cent per volume strength for twenty-four hours, or 5 per cent per volume strength for forty-eight hours.

(*f*) The water ballast of a vessel coming from infected or suspected ports should be discharged at sea, or if discharged in fresh or brackish water must be previously disinfected, the tanks to be flushed and refilled with sea water or disinfected.

PAR. 2. *Holds of wooden vessels.*—For a wooden vessel the treatment is the same as for iron vessels, except that the exposure of the hold to sulphur dioxide, 10 per cent per volume strength, must precede the washing with bichloride, and this exposure must be forty-eight hours in wooden vessels without cargo; or if only 5 per cent per volume strength sulphur dioxide is obtainable, the exposure must be seventy-two hours.

PAR. 3. All solid ballast on vessels infected, or suspected of being infected, with plague to be discharged or disinfected previous to disinfection of hold; all such ballast discharged in fresh water to be disinfected by saturation with, or immersion in, a solution of bichloride of mercury, 1 to 800.

PAR. 4. Clear, hard, cross-grained rock may be permitted to remain on board, but only after disinfection by immersion in a solution, 1 to 800, of bichloride of mercury. Ballast removed from vessels infected, or suspected of being infected, with plague, must not be taken from the quarantine station.

PAR. 5. Bilges shall be cleansed and disinfected in the manner provided for water tanks, Article XV, paragraph 4.

PAR. 6. *Living compartments of all classes of vessels.*—(*a*) The preliminary disinfection shall be done with sulphur dioxide, and not with formaldehyde, on account of the greater potency of the former against animal life.

(*b*) After this preliminary disinfection, remove bedding, hangings, carpets, clothing, and textiles for disinfection by steam or boiling or other methods prescribed by United States Quarantine Regulations. Subsequently the compartments themselves, with the non-removable fabrics therein, shall be disinfected in accordance with the United States Quarantine Regulations.

PAR. 7. *Personal effects.*—Clothing, bedding, and other such articles shall be disinfected in accordance with the provisions of Articles V and VIII, United States Quarantine Regulations.

PAR. 8. After the cargo has been discharged, the vessel must be submitted to a disinfection of all parts simultaneously by sulphur dioxide gas of 5 per cent per volume strength for not less than twenty-four hours, in order to insure destruction of all animal life aboard. The remains of all rats and vermin should be gathered and burned, and the places where gathered subsequently disinfected. Rats must not be handled with bare hands.

PAR. 9. After final disinfection, as provided in paragraph 8, the vessel must be kept under observation a sufficient length of time to satisfy the quarantine officer that the ship is reed from all rats and vermin.

WALTER WYMAN,
Supervising Surgeon-General, Marine-Hospital Service.

Approved:
L. J. GAGE, *Secretary.*

NOTE.—Navigation laws of the United States (sec. 5, act August 2, 1882):

* * * "Every steamship or other vessel carrying or bringing emigrant passengers or passengers other than cabin passengers, exceeding fifty in number, shall carry a duly qualified and competent surgeon or medical practitioner, who shall be rated as such in the ship's articles, and who shall be provided with surgical instruments, medical comforts, and medicines proper and necessary for diseases and accidents incident to sea voyages, and for the proper medical treatment of such passengers during the voyage, and with such articles of food and nourishment as may be proper and necessary for preserving the health of infants and young children; and the services of such surgeon or medical practitioner shall be promptly given, in any case of sickness or disease, to any of the passengers, or to any infant or young child of any such passengers, who may need his services. For a violation of either of the provisions of this section the master of the vessel shall be liable to a penalty not exceeding two hundred and fifty dollars."

Dr. M. J. Rosenau, Passed Assistant Surgeon, Director Hygienic Laboratory, Marine-Hospital Service, conducted a large number of experiments upon the viability of the *bacillus pestis*, an interesting report of which has been published by the United States Treasury Department, through the Marine-Hospital Service. The report is quite exhaustive and covers forty-four (44) pages. We present herewith his conclusions:

(1) The bacillus pestis is not a frail organism. It resembles the hemorrhagic septicaemic group or the cocco-bacilli as far as its viability is concerned.

(2) Temperature is the most important factor in the viability of the plague bacillus. It keeps alive in the cold, under nineteen degrees C., a very long time. It dies quickly, especially when dried, at the body temperature, thirty-seven degrees C.

(3) Moisture favors the life of the bacillus pestis. It usually dies in a few days when dry, even in the presence of albuminous matter, provided the temperature is above thirty degrees C. It may keep alive and virulent when dry for months in the cold, under nineteen degrees C.

(4) Sunlight kills the organism within a few hours, provided the sun shines directly upon the organism and the temperature in the sun is over thirty degrees C. The effect of sunlight is not very penetrating.

(5) The virulence of the bacillus pestis is often lost before its vegetability.

(6) It is unlikely that new dry merchandise would carry the infection. The organism usually dies in a few days on the surface of objects such as wood, sawdust, bone, paper, etc.

(7) Clothing and bedding can harbor the infection for a long time and may act as fomites. The bacillus lives for months when dry in albuminous media at temperatures under twenty degrees C.

(8) Food products may carry the infection of plague. The bacillus lives a long time in milk, cheese, and butter. It usually dies quickly on the surface of fruits and prepared foods.

(9) The organism may live a long time in water, although plague is not a water-borne disease.

(10) The plague bacillus does not live long on paper, and first-class mail is therefore not apt to convey the infection.

(11) The colder the climate the greater the danger of conveying the infection on fomites—clothing, bedding, food, merchandise, etc.—and more extensive disinfection is required in such a climate in combating the disease than in tropical regions.

(12) The plague bacillus is destroyed by sulphur fumigation and by formaldehyde gas in the strengths in which these disinfectants are usually employed The gases can only be depended upon as surface disinfectants. In disinfecting ships, warehouses, dwellings, and other places infested with rats, fleas, and vermin, sulphur is better than formaldehyde, because formaldehyde gas fails to kill the higher forms of animal life.

(13) A temperature of seventy degrees C. continued a short time is invariably fatal for the plague bacillus. The ordinary antiseptics are all efficacious in their usual strength for nonspore-bearing organisms. Efficient surface disinfection may be accomplished by exposing objects all day to the direct sunshine on warm days. The temperature in the sun must be above thirty degrees C.

XVI

RABIES; ITS CAUSE, FREQUENCY, AND TREATMENT

BY D. E. SALMON, D. V. M.

Chief of the Bureau of Animal Industry

RABIES IN THE DISTRICT OF COLUMBIA

In December of the year 1892 the brain of a man who had died of a mysterious nervous affection was brought to the laboratory of the Bureau of Animal Industry for examination. It was thought that the symptoms exhibited by the patient resembled somewhat those of hydrophobia, but the physician hesitated to make this diagnosis, as it was not known that rabies existed among the dogs in the District of Columbia, and as the opinion had been widely circulated by certain authors, supposed to have knowledge of the subject, that the disease was so very rare that a single case could not be found by years of energetic search. A careful consideration of the symptoms, however, led to the inoculation of rabbits in order to test the theory of hydrophobia, and somewhat to our surprise, these rabbits in due time became affected with and died of rabies. As the rabies of animals is identical with the hydrophobia of man, and as hydrophobia is practically always contracted from the bite of a rabid animal, the result of this experiment was a demonstration that the man had died of hydrophobia, with a strong presumption that rabies existed among the animals of this section of the country.

Owing to the supposed infrequency of the disease, this case aroused cosiderable interest; and when, in the following month (January, 1893) information was received that a horse had been destroyed in the city of Washington because it was thought to be affected with rabies, further inoculations were made from the brain of this animal. The rabbits used in this experiment also became affected with rabies.

About this time a disease of cattle was under investigation by the pathological division of the Bureau, and the conclusion was reached that the disease was rabies; but before making a definite decision it was thought advisable to compare it experimentally with the rabies of dogs. Several veterinarians were accordingly requested to bring to the experiment station all dogs supected of rabies, and the superintendent of the station shot a number of dogs which appeared to be affected. These dogs were all tested by inoculation experiments, and from March 24 to December 12, 1893, eleven were found affected with rabies.

As the investigations which required the virus of rabid dogs were closed in 1893, no further effort was made to procure cases, and no more were recorded until the fall of 1895. Interest was revived in the subject at that time by the death of a woman in Washington from this dreaded disease. Inoculations were made from the dog which bit this woman, but unfortunately the disease developed in the patient at the same time as in the inoculated rabbits, and there was, consequently, no opportunity for prophylactic treatment. This case was reported by Dr. Behrend to the Medical Society of the District of Columbia, and attracted considerable attention.

Arrangements were now made between the District health officer and the chief of the Bureau of Animal Industry whereby all dogs or other animals suspected of having rabies were to be sent to the Bureau laboratory in order that a positive diagnosis might be made. As a result of all these investigations, the number of cases of rabies which have been positively diagnosed and recorded in animals is as follows: 1893, eleven dogs, one horse; 1895, four dogs, two foxes; 1896, five dogs; 1897, two dogs, one cow; 1898, seven dogs; 1899, nineteen dogs, one cow, one cat; 1900, January to August, inclusive, thirty-two dogs, three cows, one horse, one cat. The total number of animals which have been proved to be suffering from rabies in the period from 1893 to August, 1900, is therefore ninety-one. Twenty-eight persons were reported as having been bitten by these rabid animals. The records of the health department of the District of Columbia show seven deaths of human beings from hydrophobia since August 1, 1874.

These developments were entirely unexpected. It was not supposed before the investigations began that rabies existed to this extent anywhere in the United States. Instead of being an extremely rare disease, to be found but once or twice in a lifetime, even by those who are diligently seeking it for the purpose of investigation, as has been represented, the facts cited show that rabies has existed for years almost continuously at the National Capital.

THE DISTRIBUTION OF RABIES IN THE UNITED STATES.

In order to learn something of the occurrence of rabies in other parts of the United States, information was requested of veterinary schools, State veterinarians, and other persons who would probably be in possession of such facts. A number of very carefully prepared replies were received, from which the following summaries have been made:

Dr. Charles P. Lyman, dean of the School of Veterinary Medicine, Harvard University, Boston, Mass.: During an outbreak of rabies, which was recognized as existing in Boston, there suddenly appeared in Harvard Square, Cambridge, one morning, a large crossbred Newfoundland dog. The animal entered a butcher shop and behaved in such a manner as to induce the butcher to throw him a bone and drive him away. The dog seized the bone and went into the street, and after gnawing for a short time he went one after another to five dogs and bit them all. He also bit a horse rather severely in the upper lip. The five dogs came under Dr. Lyman's professional care, and three of them died, showing all the symptoms recognized and described in the books as belonging to rabies. The wound on the horse was seared with a hot iron probably within thirty minutes from the time the injury was inflicted. Notwithstanding this treatment, the horse contracted the disease recognized and described as being rabies.

During a subsequent outbreak a dog bit a policeman on the streets of Lynn. This man declined to take the Pasteur treatment, said he was not afraid, and would take his chances. Within a short time he was taken ill with symptoms recognized by the local medical men as being those of hydrophobia, and he died after dreadful suffering.

Dr. Lyman estimates that there have been twenty-five to thirty cases of rabies observed at the Harvard Veterinary school during the last eighteen years.

Dr. W. J. Coates, chief surgeon of the American Veterinary College, New York: In looking over record books finds on the average about seven cases a year for the past twenty five years. Has never seen a case of rabies in man.

Dr. H. D. Gill, professor of surgery in the New York American Veterinary College, formerly dean of the New York College of Veterinary Surgeons: During the month of May last (1900) three positive cases of rabies came to the hospital, one dog having bitten the three. For the past three years the average was eight cases a year.

Dr. Robert J. Wilson, assistant bacteriologist, department of health, city of New York: Has confirmed the dianosis of rabies in about forty cases in domestic animals, and three in the human subject. His attention has also been called to two other undoubted cases in that city, where no opportunity was afforded to prove the diagnosis. All of these cases have been observed during the past three years.

Dr. Wilfred Lellmann, professor in the New York American Veterinary College, formerly of the New York College of Veterinary Surgeons: Has been lecturing on canine pathology for the past six years. During the last session has demonstrated to the students four evident cases of rabies. In his private practice met with one case. Of these five cases, four were mute rabies, while the one in private practice was of furious rabies. Besides these five cases, he saw two more at Dr. Gill's clinic. A physician, Dr. Schwyzer, a friend of his, has observed a case of rabies in a man at the German Hospital in New York city.

Dr. Leonard Pearson, dean of the department of veterinary medicine, University of Pennsylvania, and State veterinarian: A great many cases of the rabies have been brought to the hospital connected with this school. Can not tell without looking over a great many records just how many. Estimates that during the fourteen years' existence of the school from 300 to 400 unquestionable cases of rabies have been received in the hospital. Knows of several cases of rabies in man that have occurred in Pennsylvania, and the diagnosis in some of these cases have been confirmed by the inoculation of animals with pieces of the brain. During the last year there have been two fatal cases in Lancaster, one in Kennett Square, one in Philadelphia, and one in Allegheny. Three years ago one of the prominent veterinarians of Pennsylvania died of rabies following the bite of a rabid dog. There has been a great deal of rabies among the farm animals in different parts of the State. Cattle, swine, sheep, and horses have developed rabies of the furious form after having been bitten by a mad dog. A great many of these cases have been examined very carefully, and the diagnosis have been sustained by the results of laboratory examination.

Dr. J. M. Wright, professor in McKillip Veterinary College, Chicago (writing under date of April 5, 1900): Since January 1, 1900, his attention has been called to eleven cases in the dog and three in the horse. During the last year he handled twenty cases, which is a fair yearly average.

Dr. A. H. Baker, professor of theory and practice and dean of Chicago Veterinary College: "Many cases of rabies in dogs and horses have been brought here. We have kept no record of the number of cases, but I can safely say that during the last year we have had at least ten cases in horses and fifty in dogs. I have never seen a case of rabies in man. I may add that we are sincere believers in the Pasteur preventive treatment for rabies in man."

Dr. James Law, director of New York State Veterinary College, Cornell University, Ithaca, N. Y., says:

"This particular locality has never, to my knowledge, since 1868, furnished a single case of *casual* rabies. It has, however, been repeatedly sent to us from different parts of the state (Chatham, Saratoga, Buffalo, etc.) in the form of brains of the deceased animals, from which small animals were experimentally inoculated and the disease produced, so as to confirm the original diagnosis or suspicion.

"I know of the case of Neil, the keeper of the dog pound at Newark, N. J., who died of rabies consequent on the bite of a rabid dog. I brought a portion of his medulla to Ithaca and inoculated a dog and a number of rabbits, some on the brain and others sub-cutaneously, with the result that all showed rabies after the customary periods of incubation. I have the best of evidence of a number of men who contracted rabies after the bite, and from whom (saliva or brain) inoculation of the disease was successfully made on the lower animals to prove its infective character.

"On the other hand, I know of a number of cases in which people who had been bitten by dogs have developed symptoms of hydrophobia as the simple result of fear, mimicking the symptoms as nearly as their knowledge of the disease would guide them. * * * The unreal nature of such fanciful cases is not, however, any disproof of

the actual infections in which the virulent saliva or brain of the human victim has produced rabies in the lower animals in a continuous series, though they can have no apprehension of such a result. The person who denies the real because there exists a counterfeit is in this case an exceedingly dangerous person, about as much in need of seclusion as the rabid dog itself. The disease prevails at present in Erie County, N. Y."

Dr. S. Stewart, secretary Kansas City Veterinary College: Eleven or twelve cases have been brought to the hospital during the last three years, five within one year. No cases of rabies in man have come under his personal observation. Four or more authentic cases have occurred in that city in past five years. Typical, well-marked cases in dogs, horses, cattle, and swine have come under his personal observation.

Dr. John J. Repp, professor of pathology and therapeutics of veterinary department, Iowa State College of Agriculture and Mechanic Arts, says:

"Since my connection with this school, a little over a year, no case of rabies has been brought to it. By consulting the records I find that no case of rabies has been brought to this school during the twelve years covered by them. * * *

"During the past winter Dr. J. R. Sanders, Corydon, Iowa, has noted the death of eighteen cattle in his vicinity, seven out of one herd of fifty, all showing rabiform symptoms. He killed one of the seven out of the herd of fifty when it was suffering from these symptoms in a violent form, removed the cerebellum and medulla oblongata, according to my direction, and sent them to me packed in ice. I received the tissues in excellent condition, and at once inoculated a rabbit subdurally with a small portion of a mixture made with sterile water and about one-eighth of a cubic centimeter of the medulla cut from the floor of the fourth ventricle. On April 7, two weeks and four days after the inoculation, the rabbit died, after four days' suffering, from gradually increasing paralysis. * * * My diagnosis, therefore, is that the steer from which the tissues were taken was suffering from rabies at the time of his death, a diagnosis borne out by the symptoms presented. If this steer had rabies, it is presumed that the other cattle suffering in like manner had rabies also.

"During my four years' residence at the University of Pennsylvania I saw a large number of cases of rabies in the dog and made a number of rabbit inoculations from such cases with invariably positive results. Rabbits which I inoculated in the same manner from suspected but doubtful cases frequently remained perfectly well, showing that the mere operation will not bring on the symptoms of paralysis and death, and leading to a decision that the suspected cases were not rabies."

Dr. H. J. Detmers, Columbus, Ohio, formerly professor of veterinary medicine in Ohio State University: Has observed four very pronounced and unmistakable cases, three dogs and one horse, since 1893.

The health department of Buffalo, N. Y.: In a recent outbreak, not yet entirely over, investigated, on complaint, forty-five cases in dogs; in addition seventy-four cases of dumb rabies and forty-one cases of furious rabies were brought to the pound. Inoculation were made early from the case of a stray dog that ran amuck at Evans, biting seventeen dogs and two cats. The dogs inoculated developed typical rabies on the twenty-third day following.

Records of the county superintendent of poor and the city department of health show that twenty-nine persons were sent to the Pasteur Institute at New York, four of these being bitten by rabid cats. Four persons died of the disease—the first, a child, eighty-one days after being bitten; the second, the owner of the dog which bit the child, who was sent to the Pasteur Institute at New York, dying there, the disease in him developing on the eighty-third day; third, a young man, bitten by strange dog which he was trying to throw out of a crowded dancing hall, and which was acting strangely; fourth a woman, who died in October 1899, having been bitten by a dog. A considerable number of animals other than dogs also died of the disease.

Dr. A. W. Bitting, veterinerian of the Agricultural Experiment Station of Indiana (writing under date of April 18, 1900), says:

"Your letter was received on the 10th, and upon the 11th we had a typical case of rabies in a dog at this station. This makes the third outbreak at this place. One outbreak occurred last August and September, in which one dog, seven horses, and eight head of cattle died. Part of these were brought to the experiment station laboratories. The first outbreak occurred some years ago, and some two or three dogs in the neighborhood and several sheep and hogs belonging to the station were affected. A number of outbreaks have been reported in the state. I have never seen a case of rabies in man, but our State board of health records three deaths from such a cause last year."

Dr. C. A. Cary, professor of veterinary science in Agricultural and Mechanical College

of Alabama: Six cases have been brought to the college and many others have occurred in the vicinity; altogether twenty-four cases of rabies are recorded at the college.

Dr. J. W. Scheibler, State veterinarian, Memphis, Tenn.: Has seen about twenty cases of what he believed to be rabies.

Dr. George H. Bailey, State veterinarian, Portland, Md.: Has had one case in his private practice, and the Maine general hospital had one case in a young man several years ago.

Dr. A. W. Clement State veterinarian, Baltimore, Md.: Has had about thirty cases brought to his attention officially.

Dr. Samuel S. Buckley veterinarian at Maryland Agricultural Experiment Station, College Park, Md., says:

"We had, several years ago, an outbreak in this town, originating, as far as we know, in a collie. This animal, in the course of his depredations, bit three cows, a cat, a calf, and the farm superintendent and his son. All the animals developed the disease before being destroyed. The Farmer and his son were treated by Dr. Gibier, of New York, and never suffered any trouble."

Dr. Cooper Curtice, State veterinarian of North Carolina: Although he has been in that state but about a year, he has noted one case there in the human subject

Dr. W. H. Dalrymple, veterinarian, State University and Agricultural and Mechanical College, Baton Rouge, La.: Has seen one typical case of rabies in the horse and at least half a dozen cases in cattle. From an interview with Dr. J. W. Dupree, surgeon-general of the state and ex-president of the State Medical Association, he learned that the latter has had in his practice three typical cases in the human subject resulting from the bites of dogs. The dogs were not destroyed but kept under observation, and they died, showing typical symptoms of the disease.

Dr. F. A. Bolser, State veterinarian of Indiana: Three outbreaks of rabies in six years, affecting horses, mules, cattle, and hogs. Two young men were bitten, badly lacerated, and died in great agony.

Dr. H. P. Clute, State veterinarian of Wisconsin: Fourteen cases in dogs, sheep, cattle, and horses. A successful inoculation of rabies with virus taken from the brain of a calf and dog has just been made at the experimental station at Madison. The calf died, having been bitten by a sheep that was bitten by a dog. All of these animals died of rabies. Rabbits inoculated with virus from the brain of the dog on March 15th died of rabies on the eighteenth and nineteenth days after inoculation. Those inoculated with virus from the brain of the calf died of rabies on the twenty-first and twenty-second days after inoculation.

Dr. A. T. Neale, director of Delaware Agricultural Experiment Station: Has seen many cases of rabies during the last ten years. Horses, cows and dogs have been the victims. Has no complete record of the number of cases. Specifies the following cases:

(1) A cow, seen before death, was killed two days later, and medulla and sections of cord removed and taken to University of Pennsylvania, where rabies were successfully inoculated. Ten days later these inoculated animals died of dumb rabies. This cow was one of three or four in the same herd which died of similar symptoms.

(2) Inoculation from a suspicious dog at experiment station on rabbit caused death by paralysis ten days later.

(3) A horse observed at 10 A. M. died after four or five hours; was undoubtedly affected with rabies No inoculation test made.

Two or three dog cases have been demonstrated by Prof. Chester and Dr. Robin at this station since last summer. In every instance rabbits have been the test animals, and in every case the rabid dogs have been under observation for several hours prior to death.

Dr. H. P. Eves, of Wilmington, Del., has many cases of cows and dogs in his practice, victims of this disease. Dr. J. J. Black, of Newcastle, has had human cases in his practice.

Dr. M. E. Knowles, State veterinarian of Montana: Has seen about sixty cases of rabies during a practice of fifteen years, of which fifty-three cases were brought to his attention officially.

Dr. J. W. Elliott, State veterinary surgeon of South Dakota: Has had as many as 100 cases brought to his notice officially in the last two years, mostly in cattle, and the origin could be traced to dogs afflicted with rabies.

Dr. G. T. Seabury, State veterinarian of Wyoming: Destroyed a dog affected with rabies in Cheyenne on March 30, and has seen three cases of the disease.

Dr. Sol. Bock, State veterinary surgeon of Colorado: Has seen at least fifty cases of rabies in the past year.

Dr. Paul Fischer, State veterinarian and professor of veterinary science and pathology of Kansas State Agricultural College: Reports a case of rabies in a horse in 1897. The animal was brought to the college and showed very characteristic symptoms. It had been bitten by a rabid dog three weeks before. The animal died on the following day. Intracranial inoculation of a rabbit with portion of cord of the horse produced death after thirty days from paralytic rabies.

Dr. A. T. Peters, animal pathologist at University of Nebraska: Reports about eight different outbreaks of rabies recorded there. In one outbreak a dog bit several other dogs, and also a cow and a horse. The cow, a fine Jersey heifer, was bitten in the nose She was quarantined, and thirty-one days afterwards showed all the symptoms of rabies. The horse was bitten very slightly, and showed the disease some two hundred days later.

Dr. L. L. Lewis, professor of zoology and veterinary science at Oklahoma Agricultural and Mechanical College: Two cases of rabies have come under his observation since he has been in that position.

At this writing (December, 1900) information is received from Dr. George W. Coler, health officer of the city of Rochester, N. Y., of an extensive outbreak of rabies in that city and vicinity. Dr. Coler has officially reported to the mayor that since June 1st he has seen from twenty-five to fifty dogs with unmistakable evidences of rabies, a number of the animals having been shown to be rabid by inoculation experiments, which in four cases were verified by Prof. V. A. Moore, of Cornell University, and Dr. M. P. Ravenel, of the University of Pennsylvania. Upon the recommendation of the health officer, the mayor has issued a proclamation ordering "that, until further notice, the owners of dogs are prohibited from allowing them to run at large in any public street or place within the city of Rochester, unless such dogs be securely muzzled or led by a line or chain so as effectively to prevent them from biting any person or animal."

In a valuable article published in the St. Paul Medical Journal, October, 1900, Dr. F. F. Wesbrook, director of State Board of Health bacteriological laboratory and professor of pathology and bacteriology in the University of Minnesota, details investigations of specimens from suspected cases of rabies, from which he concludes:

> It is very evident that rabies does exist in this state and is fairly widespread in distribution and number of cases. The cases examined, and which proved to be rabies, include one human being, twenty dogs, one horse, seven cattle, one pig, one sheep, and one wolf. We have histories which show that infection was known to be due in these cases to the bites of nineteen different dogs, and perhaps one skunk, in which rabies infection may be assumed from the demonstration of rabies virus in the cases bitten by them. We have also data which show that at the time of the infection of the cases investigated by the laboratory one man, eight dogs, eight cattle, six swine, and six sheep were known to have been bitten, and of these, eight cattle, six swine, six sheep, and three dogs died of rabies—that is, all of the cattle, swine, and sheep developed rabies. The man received Pasteur treatment.
>
> The animals which were thus shown to have had rabies on laboratory investigation are known to have bitten seven human beings, three dogs, six cattle, one horse, and five hogs. Of these, five of the people received Pasteur treatment, and none, so far as is known, developed rabies. Of the animals bitten, five cattle, one horse, one hog, and four dogs developed rabies and died or were killed. Many more of the dogs known to have been bitten were killed before rabies had a chance to develop. As an example, it may be mentioned that in Willmar thirty were killed at one time These estimates have been carefully made, and where the information at hand stated that several animals had been bitten, account was taken only of one.*

*This statement apparently explains the inconsistency of some of the figures and indicates that in some cases they are below the actual number.

It will, therefore, be seen that from these forty-six cases examined, of which thirty-one were shown to be rabies, and concerning which there was data in only a small portion of the cases, we have been able to obtain positive knowledge of eighty-four cases of rabies in this state. (See table below.)

ITEMS.	Human beings	Horses.	Cattle.	Sheep.	Swine.	Dogs.	Wolves.	Total.
Rabies diagnosed by laboratory, Minnesota State Board of Health	1	1	6	1	1	20	1	31
Animals which bit the animals shown by the laboratory to have been rabid	....	....	....	....	....	19	....	19
Animals which developed rabies and died from bites inflicted under the same circumstances as those animals which were shown to have been rabid by laboratory investigation	....	....	8	6	6	3	....	23
Animals which developed rabies after having been bitten by animals shown by the laboratory to have been rabid	....	1	5	....	1	4	....	11
Total	1	2	19	7	8	46	1	84

In the Fifth Biennial Report of the West Virginia State Board of Agriculture for the years 1899 and 1900, Dr. S. E. Hershey, consulting veterinarian, states that quite a number of outbreaks of rabies have occurred within that State in the past few years, with considerable damage and loss of stock. He gives, as coming under his personal observation during the period covered by the report, four cases of cattle and one of a horse, four of which animals were known to have been bitten by dogs. In addition there were many similar cases in the same herds or on the same farms which he did not personally see. In Lewis County several horses died with rabies and several people were bitten. Some of the people were sent to the Pasteur Institute at New York for treatment. Several deaths occurred in the human family in that county.

The Biennial Report of the State Veterinary Sanitary Board and the State Veterinary Surgeon, of Colorado, for the years 1899 and 1900, contains this paragraph:

"Last year an epizootic of rabies occurred in this State, but the outbreaks in all cases have been vigorously handled by the local health authorities, and at the time of making report the epizootic may be considered to be effectually suppressed."

In the vital statistics of the census of 1890, the deaths from hydrophobia in man are reported by States for the year ending May 31, 1890, as follows:

Alabama	7	Michigan	2
Arkansas	4	Minnesota	4
California	1	Mississippi	5
Colorado	2	Missouri	11
Connecticut	2	Nebraska	2
Florida	2	New Hampshire	1
Georgia	16	New Jersey	3
Illinois	3	New Mexico	6
Indiana	4	New York	5
Kansas	3	North Carolina	3
Kentucky	5	Ohio	3
Louisiana	5	Pennsylvania	6
Massachusetts	21	South Carolina	6
South Dakota	1	Virginia	2
Tennessee	5		
Texas	3	Total	143

The results of the census of 1900 not being available, application was made to the health officers of the principal cities of the United States for the number of deaths from hydrophobia in man during the decade from 1890 to 1899, according to their official records. The reports received, to which have been added a few cases reported from unofficial but reliable sources, show that for the period named, and including in some instances the first half of the year 1900, there were in seventy-three cities 230 deaths from this disease after eliminating cases in which the diagnosis was reported as doubtful. The figures for some of the leading cities are as follows:

Greater New York	[1]27	Buffalo	[2]4
Chicago	68	Pittsburg	7
Philadelphia	[2]8	Washington	5
Baltimore	8	Nashville	5
New Orleans	14		

In a number of these cases the diagnoses were verified by inoculations of small animals with material from the human subjects.

FACTS AND FALLACIES CONCERNING RABIES

It required many years of patient scientific research to lead the ablest investigators to a clear comprehension of the cause, nature, and characteristics of rabies, and it is only recently that this has been accomplished. From the earliest dawn of history the disease has been feared and dreaded; its terrible manifestations have been surrounded with an atmosphere of awe and mystery, and it is not surprising that myths, fallacies and misconceptions in regard to it have been common and widely accepted. Nor have such errors been confined to the ignorant or those unfamiliar with the subject of disease, but on the contrary, they have been shared and propagated by men of learning, some of whom have stood high in the medical world.

As the investigations by which we have come to a tolerably clear understanding of the facts concerning rabies have been comparatively recent, and have appeared for the most part in scientific periodicals, fallacies in regard to the disease still have a strong hold upon the public mind, and are industriously circulated by many who believe they are working in the cause of truth and humanity. Persons in a position to known the facts have either not had the time, the disposition, or the opportunity to take up this subject and show its importance to the people and the desirability of educational work with a view to the control of the contagion. For years we have been living in fancied security from this disease; we have been told

1 Incomplete as the records of some of the boroughs did not go back for the whole period.

2 Only six of these cases are officially reported by the health department, and these are all prior to 1897. In one of the remaining cases inoculation experiments were made with positive results, and the other is well authenticated, though the coroner is reported as refusing to accept certificates of death from hydrophobia, and requiring that the certificates be made to ascribe the deaths to other diseases.

3 All occurred in 1900. No report was received covering the period previous to this outbreak.

that it was extremely rare, if, indeed, it had any existence outside the imagination; and during these years the plague has spread, with only the feeblest efforts for its control, until now it has become so common as to be a positive and constant meance to our animals and to human life. The facts already presented demonstrate its frequency, but they do not give an adequate idea of the losses from it.

In many sections where it exists nature is not recognized. Some outbreaks, in which most of the cases were of the dumb or mute form, were not recognized even by veterianarians. One such case, where fifty or sixty dogs were reported affected, was so characteristics in symptoms that its nature could not be doubted. The "dropping" of the jaw and the uniformly fatal results after a few days' illness attracted attention, but apparently did not excite suspicion. In the Rochester outbreak so many cases of dumb rabies occurred that the disease was popularly known as "drop jaw". Three animals so affected, the health officer states, were found in one load of dogs that was taken to the pound.

In order to convey a clear idea of the subject, some of the principal questions concerning rabies will be briefly considered *seriatim*.

THE REALITY OF RABIES

The first point in regard to which the earnest inquirer seeks information is the reality of rabies. Is there a particular and well-defined disease which can be clearly determined and separated from all other diseases and, which conforms to the description that has become classical in our text-books and has been accepted for generations? In other words, do we know there is such a disease as rabies? and, if so, How do we know it?

GENERAL RECOGNITION OF SUCH A DISEASE AS RABIES

From the time of Aristotle (322 B. C.) till the present day we have clear accounts of this disease existing through every age, and provoking fear and horror in many countries. It was caused by the bite of an animal, and such animal was generally alleged to be rabid. It was almost invariably described as fatal in men and animals. The symptoms, from the earliest times, have been given as nervousness, excitability, restlessness, fear, irritability, great sensitiveness of the skin, paroxysms of fury, spasmodic contractions of certain muscles, paralysis, and death.

The medical profession, as a whole, has always recognized the existence of such a disease as rabies in man, and also that this disease is caused by the bite of a rabid animal. The veterinary profession has, from its foundation, recognized the existence and contagiousness of the disease. Its schools from the earliest to the latest, have consistently taught this doctrine, and its text-books are all but unanimous on the subject. The same may be said of the text-books on human diseases. Would it not be extraordinary, amazing, incredible, if, at this late day, it were proved that the thousands and hundreds of thousands of observations recorded from the birth of history to the present day, by the trained physician or veteriniarian as well as by the laymen, were misconceptions, and the authors were deceived, and that the disease was a myth? Where can a parallel be found to such a sudden and complete overthrow of an ancient and almost universally accepted conclusion concerning a phenomenon so accessible to observation and investigation?

INSUFFICIENCY OF OBSERVATION TO PROVE THE DISEASE

There have, however, apparently been a few persons in all ages who have questioned the existence of rabies. The mysterious and unusual phenomena were suffiicient to explain this doubt on the part of thinkers and writers without personal experience with the disease, or who approached its study with preconceived opinions. Previous to the nineteenth century it was difficult to answer the objections of such critics. At the most, it could be affirmed that cases of a disease with such a train of symptoms had been observed, and that this disease followed the bite of a dog supposed to be rabid. It could not be proved that the dog which did the bitting actually was rabid, or that the disease certainly resulted from the bite, or that the disease in the dog and the man were identical.

EXPERIMENTATION MARKS A NEW ERA IN THE MEDICAL WORLD

With the beginning of the century came a new era in the medical world. The student of disease began to feel the necessity for a more substantial foundation for his knowledge than the ordinary observation of the accidental cases which from time to time occurred in his practice. These accidental cases were often too widely separated for comparative study, the conditions under which they developed could not be known or controlled, and the essential phenomena could not be determined. Observations made and conclusions reached under such circumstances were unreliable. Different observers would reach diametrically different opinions, and one apparently had as good evidence for his views as the other. The confusion and absurd hypotheses which resulted can only be realized by comparing the text-books of a century ago with those of the present day.

The doubts, errors and confusion which arose in the attempt to study disease by the observation of accidental cases were finally dispelled by experimentation. What could be more rational, for example, in case there was a doubt as to the transmission of canine madness by biting, than to make an experiment by allowing a rabid dog to bite four or five other dogs and to keep an equal number unbitten for comparison. If the bitten dogs contracted rabies and the unbitten ones remained free that would be presumptive evidence of transmission. Such an experiment, repeated perhaps a few times, with precautions against accidental infection, would afford positive demonstration as to this essential point in our knowledge of the disease.

DEMONSTRATION OF RABIES BY EXPERIMENTATION

Zinke,[1] in 1804, announced that he had inoculated a dog, a rabbit, and a cock with saliva from a rabid dog, taking the saliva with a brush from the animal soon after its death and spreading it over superficial wounds of the inoculated animals. The dog was inoculated in an anterior limb, and showed prodromic symptoms on the eighth day, and was rabid on the ninth day. The rabbit was rabid on the eleventh and the cock on the fourteenth day.

This experiment, made so early in the century, proved (1) the virulence of the saliva of rabid dogs; (2) that the disease might be artificially inocu-

1 Zinke, Gottfried: Neue Ansichten der Hundswuth, etc., Jena, 1804, S. 180. Quoted by A. Hogyes: Lyssa, Wien, 1897, p. 32.

caused by the bite of an animal similarly affected; communicable by inoculation with the saliva; having a long period of incubation (three to six weeks); comparatively short course of disease (two to ten days); invariably fatal. Is not that picture clear enough for identification? With what other disease can it possibly be confused?

The reality of rabies has been demonstrated by crucial experiments, so often repeated that there is no longer any reason for doubt. It is a fact established with the same certainty as any other fact in science, and it can not be overthrown by hypothetical arguments or general denials based upon intuitive reasoning.

THE COMMUNICABILITY OF RABIES TO MAN

Aristotle taught that rabies was fatal to dogs and to every other creature which they bite except mankind. This early mistake as to the immunity of man has been carefully handed down across the succeeding twenty-two centuries as though it were the most precious bit of knowledge, and is still repeated on every hand by the many who oppose measures for the prevention of the disease. There was some apparent support for this opinion in a number of facts connected with the disease. First, only a portion of the persons bitten by rabid dogs subsequently show symptoms of the disease; taking all the statistics available, not more than one individual in every six thus bitten is found to contract rabies even when no prophylactic treatment is administered. Second, there are other abnormal conditions of the nervous system in man which are accompanied by symptoms resembling more or less closely those ascribed to rabies. Third, some persons who have been bitten by dogs not rabid have, by constant worry, anxiety, and fear of rabies induced a nervous, hysterical condition, with symptoms simulating somewhat those of the actual disease.

With these known facts as a basis, it is not surprising that a certain number of writers of limited experience and the habit of superficial observation should reach the conclusion that the view of Aristotle was correct, and that the disease was not transmissible to man. They argued that it was only the comparatively few nervous and excitable people among those bitten who afterwards presented symptoms of rabies, and that these few had brought on these symptoms themselves by worry and fear, being affected not with true rabies, but with lyssaphobia (fear of rabies), which is simply a nervous and hysterical condition.

This reasoning was quite plausible a century ago, but it received a definitive answer when Magendie and other investigators inoculated dogs and various other animals from human victims of the disease, reproducing it in typical form. These experiments proved most conclusively that man as well as the lower animals is subject to rabies, and that when so affected his saliva becomes virulent, and may be the means of communicating the malady.

At present, when it is desired to make a positive diagnosis in a case of suspected rabies, this is done by the inoculation of some animal, usually a rabbit. Objection has been made by some critics to results obtained by inoculation of small animals, on the ground that the symptoms of the disease with such animals are not sufficiently characteristic to warrant a positive conclusion. This objection has little weight, since the long period of

incubation (fourteen to twenty-eight days), the sudden appearance of the symptoms, the paralysis, and the short course of the disease, ending in death, are not likely to be seen in any other disease. In case of doubt, it is always possible to inoculate a larger animal, such as a dog, calf, or sheep, and thus reach an incontestable decision. The results of rabbit inoculations have been confirmed so many times by the inoculation of other animals that there is no longer any reason to doubt the occurence of rabies in mankind or the reliability of the diagnosis by the usual tests.

Numerous cases of rabies in the United States affecting the human subject have been reported from various parts of the country, and tests have been made by our most competent investigators. These tests show how the disease not only exists, but that it is far more common than has been generally admitted. The extensive outbreaks of the disease in dogs reported from Buffalo, Rochester, and Washington City during the past year, and the numerous smaller outbreaks which have occurred in widely separated localities, are disquieting, and show the importance of more systematic repressive measures. A considerable number of persons, mostly children, have been bitten in these outbreaks, some of whom have died after the most intense suffering. Others have taken the Pasteur treatment, at great expense and inconvenience.

These are the facts in regard to the occurrence of rabies in man and animals in the United States. When the medical statistics of other countries are consulted there is found in many of them the same conditions. In Austria, Belgium, France, Germany, and Russia, the official reports show a large number of cases of rabies in dogs and other animals each year and a certain number in man. These are among the most enlightened countries of the world, where medical science has achieved its highest advancement, and where the theory of error on the part of the health authorities in regard to the nature of the disease is out of the question.

Such facts are met by the assertion that one prominent physician in Philadelphia has been endeavoring to find a case of rabies in man or in one of the lower animals for sixteen years without success; that another physician in New York has not been able to satisfy himself of the reality of the disease after many years of investigation, and that a neurologist in Washington City has publicly offered a reward of $100 for a case of rabies in man or dog. These assertions are plausible, and to those unacquainted with all the facts they may be convincing. In reality they are deceptive and misleading. There have been numerous cases of rabies in dogs brought to the veterinary department of the University of Pennsylvania every year for many years, and any physician in Philadelphia could make arrangement with that institution to see and study the cases if he so desired. In the same manner any reputable physician in New York could have arranged with one of the veterinary schools or with the board of health in that city for a similar opportunity. There have been also rather frequent reports in the medical journals of patients at the hospitals in that city affected with this disease, and in some cases inoculation tests have demonstrated the correctness of the diagnosis. How can it be possible that a prominent physician living there and presumably well acquainted with the members of his profession has diligently searched for years for such cases and failed to find any? As to the neurologist in Washington City, the writer publicly answered his adver-

tisement, and proposed to produce a case of rabies, the genuineness of the disease to be decided by a committee by the Medical Society of the District of Columbia, and the reward, if earned, to go to a charitable purpose. The gentleman, however, did not accept the proposition, but withdrew his advertisement, and apparently had no further desire to see a case of the disease.

THE FREQUENCY OF RABIES

Some idea of the frequency of rabies in the United States may be obtained from the facts which already have been given. The cases mentioned are, however, only a few of what have occurred in the country, since the inquiry which elicted them has been by no means extensive or exhaustive. It was nevertheless sufficient for the purpose, which was to show the wide distribution and comparatively frequent cases of the disease. It may be safely concluded that instead of being a much more rare disease than is generally supposed, it is a much more common disease than we had reason to expect.

In many other countries the disease is equally prevalent. The official reports of Germany show 1,202 cases of rabies in animals (mostly dogs) in 1898. In France there were 2,374 animals affected in 1899. In Belgium there were 444 cases. In Great Britian there were 727 cases in 1895, and in Hungary 1,397 cases in the same year.

It is frequently asserted as an argument against the existence of rabies, that it is unknown at Constantinople and in India, where dogs are common and unrestrained. But why go to distant countries, from which it is difficult or impossible to get accurate information, for arguments on this subject, when the disease exists in our own cities, where it is accessible and may be investigated. If the condition of New York City, with its newspapers, board of health inspectors, veterinary schools, and highly intelligent population, is misrepresented, what may not be said of Turkey and India without fear of successful contradiction!

Whether rabies is or is not frequent in the Orient has little bearing on its existence here. What we know is that the disease is or has been common in all of the highly advanced and best known countries of the world. Our investigations show that it is equally common in the United States. These facts can not be overturned by the citation of reports from other countries, even if the accuracy of such reports were satisfactorily established. The frequency of rabies in the United States can only be determined by careful scientific investigations here, and not by reports from elsewhere. The cases cited from European countries have been produced simply to show that the disease was common there as well as here, that it is recognized by scientific authorities and by the leading governments, and that, consequently the statement sometimes made to the effect that the highest authorities in the world deny the existence of rabies is incorrect and without foundation in fact.

THE EFFECT OF SEASONS UPON THE DEVELOPMENT OF RABIES

Homer is supposed to refer to rabies when he mentions the dog star, or Orion's dog, as exerting a malignant influence upon the health of mankind. This ancient belief has come down to our times, many intelligent people still holding that it is principally during the dog days that rabies develop, and that the disease can not exist during the cold months of the year. The

scientific study of the disease and the statistical records show, however, that rabies is prevalent in winter as well as in summer, and that if the season has any influence upon its development this influence is not very marked.

Bouley[1] compiled statistics showing 755 cases in December, January, and February; 857 in March, April, and May; 788 in June, July, and August; and 696 in September, October, and November. At the Alfort Veterinary School for the years 1887, 1888, 1889, and 1890 the cases were as follows: January, February, and March, 130; April, May, and June, 60; July, August, and September, 50; October, November, and December, 74.

The following table, giving a large number of cases by months, has been compiled from statistics at hand:

Cases of Rabies in Dogs, by months.

Source.	Jan.	Feb.	Mar.	April	May	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Bourrel *1*....	36	31	26	32	32	42	32	30	35	41	24	32	393
Saint Cyr *2*...	12	15	6	15	13	7	4	9	1	3	.....	2	87
Hogyes *3*....	319	310	314	367	450	502	580	537	455	438	303	396	4,961
Leblanc *4*...	103	97	121	192	155	138	147	123	104	117	95	100	1,492
France *5*													
1895..	89	155	153	184	181	129	157	147	133	110	105	149	1,692
1896.....	124	138	151	150	147	199	138	117	131	125	103	164	1,687
1897.....	131	151	189	202	225	172	192	154	136	131	150	140	1,973
1898	139	148	.....	181	216	278	185	177	150	.....	153	154	1,781
Total.	913	1,045	960	1,323	1,419	1,467	1,435	1,294	1,145	965	933	1,137	14,066

1 Fleming: Rabies and Hydrophobia, London, 1872, p. 96.
2 Loc. cit., p. 97.
3 Hogyes: Lyssa, Wien, 1897, p. 25.
4 Leblanc: Statistique de la rage, Bul. de l'acad. de med., 1880, pp. 960-963.
5 Official statistics.

These stastics are very interesting, and effectually dispose of the fallacy that rabies can not occur in the winter. The complication of Bouley shows 755 rabid dogs in December, January, and February, and 788 in June, July, and August—a very slight difference, and one which is probably without significance. The records of the Alfort Veterinary School are of especial value, because the diagnosis was made by the most skillful experts in the world. These show two and one-half times as many cases in January, February, and March as in July, August, and September. Taking the compilation or 14,066 cases by months, it is found that June stands highest, with 1,467 cases, or about 25 per cent more than the average. July is second, with 22.4 per cent over the average. May is third, with 21 per cent over the average. It would appear, therefore, that the most cases of rabies occur during May, June, and July, which are not usually the hottest months of the year. If the heat has any considerable effect in the development of rabies we should expect August to show the largest number of cases; but, as will be seen by the table, it stands fifth in the list of months, with only 10.4 per cent more than the average, being below April, which has 12.8 above the average.

The fewest cases occurred in November, which had 20.4 per cent less than the average; January had 19.5 per cent less than the average; March was 18 per cent below the average. As if to emphasize the uncertainty or predicting the distribution of rabies by reasons, according to the average

1 Dict. de Med. de chir. et d'hyg. vet. Zundel, Paris, 1877, p. 348.

temperature, February stands but 10.8 per cent below the average number of cases and December but 3 per cent below.

In a general way it may be provisionally admitted that more rabies occurs in dogs in the months from April to September inclusive, than from October to March; but the disesse is seen in every month of the year, and as June stands highest, with 1,467 cases, and November lowest, with 933 cases, the difference is not sufficient to warrant any one in deciding that a suspected animal is not affected with rabies because the symptoms are observed in one of the winter months.

THE SYMPTOMS OF RABIES

The symptoms of rabies are such as we should expect from serious disease of the central organs of the nervous system: First, irritation; second, paralysis and death. The rabies virus appears to have little effect upon the system until it reaches the brain and spinal cord. There it multiplies, sets up irritation, and finally interrupts the functions.

Rabies is generally divided into two forms; First, furious rabies; second, dumb rabies. In the former the animal is irritable, aggressive, and bites nearly every object which comes in its way; in the latter the muscles of its jaw are paralyzed almost from the first appearance of symptoms, and being unable to bite, the animal remains more quiet and tranquil. Essentially the two forms of the disease are the same, but owing to the parts of the brain attacked and the acuteness of the attack, paralysis appears much sooner in one of these forms than in the other. The saliva from a case of dumb rabies is just as dangerous and virulent as that from a case of furious rabies. The dogs with dumb rabies are less dangerous simply because they are unable to bite and thus insert their saliva into a wound.

The impression should not be formed that dumb rabies and furious rabies always represent two distinct types of disease, and that one may at a glance classify every case as belonging to one or the other of these types. Quite the contrary. The typical cases belong to the two extremes of symptoms, and there are all gradations between the two. In fact, almost every case of furious rabies sooner or later changes into the dumb form, that is, the final stage of rabies is almost invariably paralytic, and the dumb form in its typical development occurs when the paralysis appears on the first day of the disease. The paralysis may not appear, however, until the second, or third, or some subsequent day.

Again a dog does not necessarily bite everything about it even though it has rabies and its jaws are not paralyzed. It may be combative and furious all of the time, or only part of the time, or not at all. There is no disease in which the symptoms vary more than in rabies of the dog, and it is, consequently, impossible in any description of moderate length to give an idea of the different forms under which it may appear.

FURIOUS RABIES

Fleming has well said that it is a great and dangerous error to suppose that the disease commences with signs of raging madness, and that the earliest phase of the malady is ushered in with fury and destruction. The symptoms appear very gradually, and at first there is only the slightest evidence of brain disease. The animal's habits and behavior are changed. It

may be more restless and affectionate than usual, seeking to be near its master or mistress, fawning, licking the hands or face, and apparently seeking for sympathy or assistance. Such caresses are, however, extremely dangerous, for the animal's tongue, moist with virulent saliva, coming in contact with a part where the skin is thin, abraded, or wounded, may fatally infect the person for whom it is endeavoring to demonstrate its affection. The smallest abrasion may be, as Bouley has impressively said, a door opened to death; and such a death! The instances in which hydrophobia has developed from such inoculations are very numerous, and everyone should be warned against the kiss of affection, which carries with it not only death, but sufferings which are far more to be dreaded than the fatal termination.

In most cases dogs first become dull, gloomy, morose, taciturn, seeking solitude and isolation in out-of-the-way places, or retiring under pieces of furniture. But in this retirement they can not rest; they are uneasy and agitated; they lie down and assume the attitude of repose, but in a few minutes are up again walking hither and thither, "seeking rest, but finding none." Occasionally this restlessness may disappear for a time, and the animal become lively and affectionate; oftener it sinks into a sullen gloominess, from which even its master's voice rouses it but temporarily. It becomes more and more desperate in its efforts to prepare a comfortable bed, pawing or scattering the straw, or, if in a house, scratching, tumbling, and tearing cushions, rugs, carpets, and everything of that kind within its reach.

At this period dogs may have aberrations of the senses, of the sight, hearing, and feeling, which cause hallucinations, and lead them to think that they are being annoyed by something, or that some animal or person is endeavoring to injure them. They crouch, ready to spring upon an enemy; they rush forward and snap at the air; they throw themselves, howling and furious, against a wall, as though they heard sounds beyond it.

While at first the affected dog may not be disposed to bite, it becomes more dangerous as his hallucinations and delirium increase. The voice of the master or of an acquaintance may dispel the aberrations temporarily and lead him to friendly demonstrations, but an unexpected movement or touch may bring on another access and lead to a quick and unexpected bite.

The disturbance of the sensations leads to chills and itching. If the place where the bite occurred is accessible the dog licks the scar, and later bites and tears the tissues. This tearing of the flesh is not always confined to the site of the inoculation, but certain regions of the body appear to lose their sensitiveness, and at the same time to convey to the brain the sensation of itching. The animal in this case bites into its own flesh with apparent pleasure and satisfaction.

Such animals take food until the disease is considerably advanced, if it is something which can be swallowed without mastication; otherwise it is dropped after remaining a short time in the mouth.

Difficulty of swallowing is an early symptom, and frequently leads the unsuspecting owner to conclude that the animal has *a bone in his throat*. A dog which appears to have a bone in his throat is on general principles one of the most dangerous animals in existence. The supposed bone may be there, but on the other hand the symptoms which lead to this supposition

may be due to partial paralysis caused by rabies, and the owner may be inoculated with the virulent saliva while thrusting his finger or hand in the dog's mouth to discover a bone which has no existence but in his imagination.

It is commonly believed that mad dogs have fear of water and are unable to drink, but there could be no greater mistake. In this respect they differ entirely from the human patient. They have no fear or dread of water, but continue to drink until paralysis has progressed so far that they are no longer able to swallow. The fact that a suspected dog is seen to drink or to wade into a stream is consequently no evidence that he is not mad.

When the furious symptoms come on, the dog leaves his home and goes upon a long chase, with no apparent object in view other than to be traveling onward. He trots at a rapid pace, eye haggard, tail depressed, indifferent to his surronndings. He flies at and bites dogs and persons whom he meets, but usually does not apparently search for them, or even notice them if they remain quiet. Dogs in this condition may travel many miles, and finally drop from exhaustion and die. Often after an absence of a day or two they return to their home, exhausted, emaciated, covered with dust and blood, and presenting a most forlorn and miserable appearance. Those who have pity for such an animal, and try to make it clean and comfortable, are in great danger of being bitten, for the disease has advanced to a point where the delirium or insanity is most marked, and where a treacherous bite is most common. Doubtless the dog has no intention of injuring a friend, and would not do so did he not see that friend transformed by his disordered vision into some distorted and unrecognizable shape, which he thinks is about to injure him. But while we may give the dog due credit for not intentionally and deliberately inoculating his friends with this fatal virus, let us not forget that the inoculation is no less deadly because it is the result of the abnormal working of a disordered mind. Whatever the sentiment may be which leads the dog to turn upon his master or mistress and inflict an injury, the duty remains the same for the owner to take due precautions to prevent such an occurrence.

If the animal, instead of being allowed to escape, is kept confined, the paroxysms of fury are seen to occur intermittently, or in the absence of provocation, they may be entirely wanting. If excited, it howls, rushes upon objects that are thrust toward it, or throws itself against the bars of its cage and bites with great fury.

As death approaches, the animal becomes exhausted and scarcely able to stand; the eyes are dull and sunken, and the expression is that of pain and despair. Paralysis appears in the jaws or in the posterior extremities, and extends rapidly to other parts of the body. The animal, being unable to stand lies extended upon its side; the respiration becomes more and more diffcult; there are spasmodic contractions of certain groups of muscles, complete prostration, and death.

The ordinary course of the disease is four or five days; it may be as short as two or as long as ten days.

DUMB RABIES.

When this form of the disease is typical, it comes on with restlessness, depression, a tendency to lick objects, and paralysis of the muscles, which close the jaws. As a consequence of the paralysis, the lower jaw drops, the

animal is unable to close the mouth, the tongue hangs out, and an abundance of saliva escapes. The mucous membrane of the mouth becomes dry, discolored, and covered with dust. The animal remains quiet, does not respond to provocations, and appears to understand its helplessness. As Bouley has said, the animal can not bite and does not desire to bite.

When dumb rabies follows a period in which the animal has been affected with the furious form, the desire and tendency to bite may be retained even after the jaw is paralyzed.

The course of the disease is short, death usually occurring in from two to four days.

The dumb form of rabies is very common, and many persons know it as "drop jaw" who have no idea of its true nature.

Many of the common mistakes with reference to rabies arise from an imperfect knowledge of the symptoms. It is on this point that there is greatest need of educational work. Bouley has most earnestly warned us to "distrust a dog when it shows signs of illness; every sick dog should as a rule be suspected; more particularly distrust a dog when it becomes dull, morose, and seeks for solitude, which appears not to know where to rest, which is always on the move, prowling, snapping at the air, and suddenly barking at nothing when all around is perfectly still, whose countenance is somber, and only assumes its usual animated expression by brief starts; beware of the dog that seeks and scrapes incessantly, and exhibits aggressive movements against phantoms; and finally; beware, above all, of the dog which has become too fond of you, and is continually endeavoring to lick the hands or face."[1] The writer would add to this warning the injunction to beware of the dog which appears to have a bone in his throat, and further beware of this animal when he has wandered from home and returns covered with dirt, exhausted and miserable.[2]

THE PERIOD OF INCUBATION OF RABIES

The period of incubation of a contagious disease is the time which elapses between the inoculation or exposure and the appearance of the first symptoms. With rabies this period varies remarkably. It may be as short as six or seven day, and it occasionally exceeds one hundred days. In rare cases, it has been reported on good authority that a year, or even fourteen months, elapsed between the time the animal was bitten and the time when the disease manifested itself. The majority of cases develop in from three to seven weeks.

During the greater part of the period of incubation the infected animal is healthy, and would not cause disease in any animal or person which it bites. The saliva may become virulent, however, two or three days before the appearance of the first symptoms, and any animal or person bitten after the contagion has contaminated the saliva is, of course, liable to contract the disease.

There is a very erroneous and rather stupid belief, quite common, to the effect that if a dog bites a person and becomes mad at any time thereafter the person so bitten will contract hydrophobia. This fallacy may have arisen from some instance in which a person had been bitten within a few

1 Fleming: Rabies and Hydrophobia, London, 1872, p. 197.

2 In this description of rabies the writer has used as a basis the classical works of Bouley, Fleming, and Nocard and Leclainche.

days of the appearance of the symptoms of disease in the dog, and when the saliva was already virulent. However this may be, it is perfectly certain that a dog cannot convey this disease when he does not have it or before he has himself contracted it. If, therefore, a dog does not show symptoms of rabies within a week from the time the bite is inflicted there is no danger of the person contracting the disease. The only possibility of an exception to this rule is the very doubtful one, that in extremely rare instances a dog may have rabies and recover from it without showing characteristic symptoms. A very few cases of this kind may have been observed among dogs artificially inoculated, but it has not been shown that their saliva became virulent or that similar cases occur under natural conditions. The fact remains, however, that a person is in no danger of contracting rabies because a healthy dog has bitten him, which dog is afterwards inoculated with rabies.

The virus of this disease has been surrounded with so much mystery, and so many ridiculous opinions have been disseminated concerning it; that it is often looked upon with great awe and fear, as possessing either supernatural properties or at least being altogether different from anything else which has been known and investigated by scientific men. This is in no sense true, for while the rabies virus is peculiar to the disease and distinct from all other contagions and poisons, it is nevertheless subject to the same natural laws. If a person has set in a crowded street car by the side of another person who some months afterwards contracts smallpox, the former would have no fear of the disease because he had been exposed to the latter before infection had occurred. On the same principle, no one would feel concerned because he had drank pure water from a clean cup, which cup was afterwards used as a receptacle for poisons. These illustrations are strictly germane to the subject, and should be sufficient to show the impossibility of the theory under consideration.

The extremely long period of incubation of rabies in certain cases is a fact which has been incontestably established.

Peuch has compiled a table of 144 cases of rabies in the dog in which the date of inoculation and the appearance of the first symptoms were definitely ascertained. These cases were observed by Renault, Leblanc, Saint-Cyr, and Peuch. This table is so instructive that it is reproduced from the Nouveau Dictionnaire de Médecine, de Chirurgie et d'Hygiène Vétérinaire, and the writer has added a column of percentages.

INCUBATION OF RABIES IN THE DOG.

Number of days of incubation	Number of cases.	Per cent.	Number of days of incubation.	Number of cases.	Per cent.
5 to 10	3	2 08	55 to 60	2	1.39
10 to 15	8	5 55	60 to 65	7	4 86
15 to 20	13	9 03	65 to 70	1	.69
20 to 25	25	17 36	70 to 75	5	3 47
25 to 30	13	9 03	80 to 90	7	4 86
30 to 35	25	17.36	100 to 120	4	2 78
35 to 40	6	4 17	365	1	.69
40 to 45	11	7 64			
45 to 50	9	6 25	Total	141	
50 to 55	4	2 78			

Haubner mentions a case in which fourteen months elapsed after the bite before the disease developed. It is plain, therefore, that the rabies virus may retain its vitality and activity for a long time after it is deposited in the flesh of the animal body. How it can remain in the animal this length of time before it causes the disease is probably explained by the fact that it must reach the brain and spinal cord and multiply there before the disease develops. Now, the rabies virus is not able to penetrate through the body with the facility of many other forms of contagion; on the contrary, it appears necessary for it to be lodged in the circulating blood through a wounded vessel or to be deposited within the sheath of a nerve. If placed in the connective tissue beneath the skin in such manner as to avoid blood vessels and nerves it does not cause disease. In the cases of long incubation the virus has had difficulty in reaching the central organs of the nervous system.

Admitting, as we must, that a year may elapse between inoculation and the appearance of the disease, we must also accept the still rarer cases of fourteen months' incubation as not improbable. How absurd it is, therefore, to consider a bitten dog as safe after it has been quarantined for three or four weeks, as is the usual custom. Of the 144 cases carefully observed and brought together in the above table, 82, or 57 per cent, failed to develop the disease until after thirty days. A period of more than five weeks was required by 39 5 per cent of the animals, and 21.5 per cent showed no symptoms for seven weeks after being bitten. How long, then, should a dog that has been bitten by a rabid animal be quarantined before it is safe to mingle with the family and with other persons and animals? Is three months sufficient? Evidently not, for 3.47 per cent of this lot of dogs developed the disease after more than ninety days had passed. For absolute safety, every dog bitten by a rabid animal should be destroyed. For comparative safety a quarantine of one year is required.

DOES RABIES ORIGINATE SPONTANEOUSLY?

Most of the older writers on rabies, those whose writings appeared before 1865, admitted that the disease might develop spontaneously in the bodies of certain animals as a result of certain conditions of life and atmospheric influences. These same writers believed that most other contagious diseases frequently originated in the same manner. It was a time when the spontaneous generation of many living things was freely admitted, and when the ignorance of the nature of all kinds of contagion, with the exception of the larger animal parasites, was complete and impenetrable. Science had not yet definitely passed upon the doctrine of the spontaneous and continuous generation of living matter.

It was not a very long time before this when it was believed that the mite which causes scabies or itch was continuously developed spontaneously, and that it was folly for people to try to protect themselves from this disease. About the same time, or possibly a little earlier, it was thought that lice were spontaneously developed, and that both the domesticated animals and mankind were doomed to suffer from them for all time. Still earlier there was a common belief that crocodiles and other animal life developed spontaneously from the mud of the rivers and lakes in which they were found.

The study of natural history and the progress of science disproved one by one of these ancient beliefs, and made it clear that all animals developed

from preexisting animals of the same kind. Even lice and the mites of scabies were found to be subject to this invariable law of nature, and the eradication of such pests was taken up with energy and perseverance. The rarity with which these parasitic pests are encountered among civilized people of the present day proves the value of correct views upon such questions.

The last point to be yielded by the believers in spontaneous generation was the origin of the protozoa and bacteria, microscopic animals and plants so small that their life history could be studied only with great difficulty. It was finally shown, however, that even these infinitely small organisms obeyed the general law of nature and propagated and developed from ancestors, each species after its kind, and that in the absence of ancestors not even these low forms of life could appear.

About this time it began to be suspected that the cause of the contagious fevers was microscopic organisms, which were able to live a parasitic life in the bodies of men and the larger animals. After many observations pointing in that direction it was finally demonstrated in 1876 that the cause of anthrax was a bacillus, and shortly afterwards the fowl cholera, septicæmia, hog cholera, tetanus, blackleg, tuberculosis, and various other diseases were due to similar microscopic vegetable organisms, each disease being caused by its own distinct species of germs. It was also shown that malaria, Texas fever, and some other diseases were caused by miscroscopic animal organisms belonging to the protozoa, and that here again each disease had its own definite and distinct species. In every case the minute plant or animal parasite had its own definite form and certain biological characters by which it might be distinguished from all other living things. Each species multiplies and propagates its kind, and there is no more evidence here than elsewhere in nature to sustain the doctrine of the spontaneous appearance of living things.

The first effect of these scientific demonstrations was to clear away a vast amount of rubbish which had accumulated in the standard teachings as to the cause of contagious diseases. If, for example, anthrax is caused by the *Bacillus anthracis* gaining entrance to the interior of the body and multiplying there, and if the disease can not be produced in the absence of this bacillus, then it becomes plain that the disease is not caused by electrical disturbances of the atmosphere, by too much food or too little food, by forage containing too much water or that which is too dry, by intense heat of summers or extreme cold of winters, or indeed by any of the other influences to which the development of the disease had been usually attributed. It was contact with substances containing the bacillus which produced the disease, and when this bacillus gained access to the animal body the disease developed without reference to the atmospheric conditions, the food, or the other elements of the environment.

The comprehension of this fact led Bouley and other great pathologists to revise their opinion regarding the origin of many contagious diseases. It had been held that glanders originated spontaneously from overwork and insufficient food; that bovine pleuropneumonia developed as a result of exposure of cattle in the mountains of Europe to extremely low temperatures; that cattle plague arose spontaneously in eastern Europe and particularly on the steppes of Russia, and that rabies in the dog resulted from

unfavorable conditions of life. The demonstration of the germ theory of contagion, which was quite unexpected by the majority of medical men, completely overturned these old views, based upon an entirely different hypothesis. The idea of spontaneous development, of origin *de novo*, was generally abandoned, and the further scientific researches have been pushed, the more incontestable does it appear that the one and only factor of consequence in the production of these diseases is the entrance of the disease germ into the interior of the animal body, where it can multiply and disseminate itself.

If proper measures are taken to protect animals from the bacilli of anthrax, of glanders, of pleuropneumonia, they do not contract these diseases. Investigation of cattle plague in central Europe indicated that the disease always came from the East. Investigations on the steppes of Russia showed that it did not originate there, but came from the plains of Asia. Investigations in Asia indicate that even there the disease is always the result of contagion from some other affected animal. In the same manner, investigations of rabies failed to bring out any evidence to indicate that the disease might originate in any way except by contagion, that is, by inoculation from an affected animal. It may, therefore, be accepted as practically certain that rabies does not develop spontaneously in any animal, but that it is always the result of inoculation from some other affected animal.

If the doctrine of spontaneous generation, or abiogenesis, has been abandoned by scientific men, it has by no means lost caste with many persons who consider themselves philosophers; and these persons hesitate to accept or indeed bitterly contest the conclusion of science, which has been outlined above. If, they ask, every dog with rabies contracted the disease from some other dog affected with it, how did the first dog get it? This is a question as to the origin of things, which we may with equal reason ask in regard to all living organisms. If every dog is brought into the world by the sexual union of two other dogs, where did the first dog come from? This question is just as difficult, but no more difficult than the other. Because we have in our question implied the philosophical absurdity of a series of dogs without a beginning, we have not convinced anyone that dogs can originate in any manner except by ancestors of their own species; nor is the similar question as to the origin of the first case of rabies any better reason for accepting the theory of the spontaneous origin at the present day of this disease.

There are many diseases of which it may be said that in our time and in our country they arise only by contagion. Prominent among these are smallpox, scarlet fever, measles, cholera, tuberculosis, glanders, bovine pleuropneumonia, foot-and-mouth disease, and rabies. Recorded history does not tell us where and under what circumstances the first case of any of these diseases appeared, any more than it tells us where and under what circumstances the first dog appeared. We know by observation, and by observation alone, how dogs are propagated at the present day, and we accept observation as conclusive upon this point. Why should we not accept observation and experimentation as conclusive in regard to the propagation of a contagious disease?

While we can not reasonably expect at this late day to decide the cause of contagious diseases by the speculation as to the first appearance among animals

of such diseases, it is legitimate to make such an inquiry in order to obtain a better understanding of these plagues. Science has made great progress in explaining the origin of species, and even in tracing in general terms the development of life upon earth; and while it can not say definitely where, when, and how the dog originated, it has been made plain that in some prehistoric age the dog developed from some earlier and related form, not by a sudden transformation, but by gradual transition. And in the same manner this early ancestor of the dog developed from a still earlier ancestor, doubtless quite different from the dog as he is to-day. To be brief, in tracing the development of the dog, we should be obliged to go back, step by step, toward the dawn of creation, toward simpler and simpler forms of life, until the primordial germ is reached. Just where in this long series of succeeding forms or just when in the countless ages that have elapsed since the beginning of the series the disease known as rabies appeared it is impossible to say. It may have been in comparatively recent times, and when the dog had arrived at substantially its present form and development, or it may have been in some previous geologic age, when the conditions of environment upon all parts of the earth were far different from what they are at the present day.

It is not to be supposed that the strange animals whose fossil remains prove their existence many thousands of years ago were free from contagious diseases any more than are the animals which live today; but whether the diseases of the prehistoric animal species were propagated from animal to animal until our time, or whether they disappeared and were replaced by more recent plagues, it is now impossible to say.

A study of the communicable diseases indicates that most if not all of them are caused by parasitic organisms. Indeed, the animal body has become the host of a multitude of parasites, most astonishing because of the number of species and the great variety of forms. All of the parasites probably at one time in the existence of their species, or of the ancestors of their species, lived elsewhere in nature. Under certain conditions they were attracted to certain kinds of animals; they found they could live upon or within them; they adopted themselves to these new conditions; their form and their physiological requirements were gradually changed, until finally in the course of time they could not exist elsewhere. They were then strictly parasitic.

So far has this development and adaption to the conditions of environment gone that we find different species and varieties of lice, of mites, and of worms living upon each different species of animals, and in most cases these parasites perish if transferred from one species of animals to another species. If, therefore, these parasites can not exist when transferred to a different species of animals from that upon which they have developed and to which they have become adapted, there is all the more reason why they can not exist in nature elsewhere than upon or within the animal body. Hence, we find animal species living as parasites upon other animals, and having no individuals of their species living a nonparasitic existence. They have developed and have been modified since they began their existence as parasites, just as the species of animals living free in nature have been modified. Consequently, if an animal becomes infected with lice or mites

at the present day it must get them from some other animal which bears them.

The adaptation and modification of the bacteria and protozoa which cause the contagious diseases has probably occurred in much the same manner as that of the larger animal parasites which we have been considering. The glanders bacillus has lived a parasitic existence in the bodies of animals of the horse kind for many thousands of years. It is no longer able to multiply or live for any considerable time in nature outside of the animal body. It is therefore a strictly parasitic organism. The bacillus of tuberculosis is even further developed as a parasite than the bacillus of glanders, as it is much more difficult to cultivate in the laboratory even under the most carefully adjusted conditions. There is no reason to suppose that any bacilli exist in nature having the same biological characteristics as have the glanders and tuberculosis bacilli.

The exact form of the rabies virus has never been satisfactorily determined, but what we know of it leads to the conclusion that it is a parasitic organism of some kind, which has been modified by thousands of years of existence within the animal body, and which has no counterpart elsewhere in nature. Inoculation with it is easy; it has specialized as to the conditions of life to such an extent that it multiplies only in the brain, spinal cord, nerve trunks, and a few glands; it can not be made to grow outside of the body by any methods now known. All of these facts indicate an obligatory parasitic existence. When or under what conditions in the prehistoric ages of the past it first became parasitic can never be known, nor can we determine at this late date how long a time was required to transform it from an organism which was only occasionally or accidentally parasitic into one which could live no other than a parasitic life. What appears certain is that for more than two thousand years rabies has been the same disease it is today; that it has been propagated by the same species of animals, manifested itself by the same symptoms, and produced the same fatal results.

It is not unlikely that other microscopic organisms will from time to time take up their habitat in the animal body and become obligatory parasites. There are a number of different bacilli now known which are capable of living in the flesh and causing fatal disease, but which only do this under accidental conditions. Among these are the anthrax bacillus, the bacillus of blackleg, the bacillus of malignant œdema, and the bacillus of tetanus, all of which are deadly in their effects on animals inoculated with them, but all of which lack some quality required for their rapid dissemination or for the ready infection of susceptible animals. Consequently, they do not usually spread from animal to animal. With slight modification the anthrax bacillus might become the most terrible of the known disease germs. But that such modifications require time and conditions not often found, is proved by the fact that though this disease has been known since the beginning of medical knowledge, the bacillus has in the memory of man made no progress as a disease-producing organism, but on the contrary appears less capable to-day of gaining entrance to the tissues than it was two or three centuries ago.

THE PREVENTION OF RABIES

It is unfortunate and inconsistent that those who pretend to love dogs most and to be most anxious for their welfare should be the ones who place

the greatest obstacles in the way of attempts to control this disease. Of all animals, the dog is most often the victim of rabies, and he suffers not only from the disease, but from the reputation of propagating it. And to make the matter worse, he is still falsely accused of being a party to the spontaneous generation of the contagion. His true friends should come to the rescue and relieve him of this incubus, which he has borne so long.

There is no contagious disease more easily eradicated than rabies. As the disease can only arise from contagion, and as the contagion is practically always transferred by a bite, and as the animals which do the biting are almost always dogs, it suffices to stop the dogs from biting for a period sufficient to cover the incubatory stage of the disease, that is, for about a year, in order to stamp out the malady. As a scientific problem, therefore, the eradication of rabies is a very simple matter, but as a practical question it is one of the most difficult which confronts the sanitarian. And this difficulty arises not from anything inherent in the work to be accomplished, but in the opposition of those who own and keep dogs. The measures nacessary for the eradication of rabies are two in number: (1) Destruction of worthless, ownerless, and vagrant dogs; (2) efficient muzzling of all dogs which appear upon the streets or in public places.

The dog tax and license are efficient means of securing the destruction of worthless dogs, and if these are combined with the requirement that every licensed dog shall wear a metal tag of special form, the ownerless and vagrant dogs may be at once recognized and captured. As more than half of the dogs in the country are worthless or ownerless, this measure at once reduces very largely the canine population, and correspondingly lessens the material upon which the disease can work, as well as the chances of infection.

An efficient muzzle prevents dogs from biting, and, therefore, prevents the propagation of rabies. Muzzling is for this reason the most effective measure with which to combat the disease. Public sentiment in this country is generally against muzzling, and this measure is either not adopted or it is so imperfectly enforced as to have no other effect than to irritate the supersensitive dog owners. In Germany and Great Britain muzzling has had an immediate and most marked effect in eradicating the contagion.

The effect of these measures depends entirely upon the energy and thoroughness with which they are enforced. There should be a dog-catching force adequate to the work, whose duty it should be to seize all dogs found in public places without tags and all dogs wearing inefficient muzzles, and if these animals are not redeemed within a specified time to destroy them. Usually the requirements for tags and muzzles are evaded by a large number of dog owners, and it is common to see on the streets of cities, where they are supposed to be in force, numerous dogs without tags, and even a greater number with muzzles that are of no value as a means of preventing the animal from biting. This is due to the fact that there is seldom a sufficient force of dog catchers, and that the sympathy of the community is with those who violate the law rather than with those who endeavor to enforce it.

When there is an unusual prevalence of rabies among dogs, or when, unfortunately, some person contracts the disease, particularly if that person happens to be well known or prominent in the community, there may be a temporary exhibition of strict and energetic enforcement of the regulations.

But as soon as the public alarm subsides the efforts are relaxed, the dog catcher disappears, the dogs are seen upon the streets with or without tags and muzzles, and all things go on as before the panic occurred. While the number of dogs is thus periodically reduced somewhat, it is seldom that this reduction is sufficient to have much effect upon the propagation of the disease. It is probable that the tendency at such times to keep dogs confined in order to prevent them from being seized has more influence in arresting the propagation of rabies than has the mere reduction in numbers.

In nearly all cases when reliance has been placed upon the one measure of reducing the canine population the result has been unsatisfactory. What other disease would we attempt to stamp out by simply killing off one-fourth or one-third of the animals of the species affected? And if this measure is not efficient with other diseases, why should we expect it to be with rabies? It appears self-evident from a sanitary point of view that there should be some direct measures instituted to prevent the propagation of the contagion. Such a measure would be the quarantine and confinement of all dogs for a sufficient time to cover the ordinary incubation period of rabies. As the enforced and continuous confinement of dogs without open-air exercise for a prolonged period may be detrimental to the animals, they may be allowed in public places under such conditions as will absolutely prevent them from biting, that is, the animals should wear an efficient muzzle, or they should be muzzled and led in leash. As rabies is only propagated in nature by biting, such a regulation, if thoroughly enforced, would at once stop the transmission of the disease and soon lead to its disappearance. When this measure is inaugurated, however, it is at once opposed by a large class of citizens who hold it to be cruel and unnecessary. Some muzzles are unquestionably cruel, but a properly made muzzle is not cruel, nor does it greatly inconvenience the dog after he becomes accustomed to it. The authorities should, therefore, prescribe the kind of muzzle to be used, and should select one which covers the mouth with a wire cage so as to prevent biting without interfering with the movements of the jaw and the ingestion of liquids.

There have been many who have denied the utility of the muzzle, the strongest argument being that dogs do not wear it at home, and when they develop rabies and escape it is always when they are unmuzzled. Admitting the force of this argument, it is nevertheless a fact that if all dogs were required to be muzzled when in public places, the appearance of a dog without a muzzle would at once attract attention, leading persons to avoid it and causing its early seizure by the authorities. Children might be instructed that an unmuzzled dog was dangerous and that they should keep at a distance from it, and especially that they should never touch or fondle such an animal.

The results which have been obtained by muzzling justify its enforcement wherever there is an outbreak of rabies. Most of us have heard of the experience of Berlin with this measure about the middle of the century. From 1845 to 1853 there were received at the Berlin Veterinary School 278 rabid animals. This is an average of 35 a year. From March, 1852, to the same month in 1853 the number was 82, and from March, 1853, to the end of July there were 37 more. On July 20 it was ordered that the use of the muzzle should become general. From July to the close of the year but 6 cases were admitted. Only 4 cases were observed in the whole city during 1854, and

but a single case in 1855. For the seven years following there was not a single case recorded.[1]

While some have attributed the disappearance of rabies from Berlin at the time mentioned to other causes, muzzling has been adopted in Germany as the principal reliance in repressing this disease. It appears that the number of cases of rabies in Berlin increased progressively after 1863, until in 1868 it reached 66, declining again to 7 in 1870, only to increase in 1872 to 69. In 1875 a law was passed, extending to the whole of Prussia, which provides that all dogs suspected of rabies shall be immediately killed, as also all animals which it is evident have been bitten by rabid animals, and that all dogs in a district which has been infected by an outbreak of rabies shall be confined, or, when abroad, both muzzled and led. The technical section of the veterinary board in Berlin are of the opinion that the passing of this law, and not alone the existence of the muzzling order in that city, is the cause of the extinction of rabies in Berlin. No case has occurred there since 1883.[2]

Consul-General Mason reports from Berlin to the State Department that "in Berlin, Frankfort, and, so far as I know or can ascertain, in all cities and large towns in Germany, dogs are required to be muzzled whenever they are on the street or public place, and this regulation is enforced in cities even when the dog is led or held in leash by the owner, or is harnessed for working purposes to a cart or other vehicle.[3]

Fleming states that "in Vienna rabies was entirely suppressed by eighteen months of stringent muzzling, but that in 1886 the muzzling order was rescinded and badges had to be worn on dog collars instead; in the following half year there was only one case of the disease, but in the next half year rabies became epidemic, and the muzzle had again to be worn, with the result that the malady soon subsided and disappeared."

In Holland, before 1875, rabies was prevalent to a very serious extent, but in June of that year the use of the muzzle was ordered, with the result that in the autumn the number of cases fell to forty-one; in the next whole year there were fifty-five cases; in 1877 there were fourteen; in 1878 there were four, and in 1879 there were three. These, and the cases which have since been reported, occurred only on or near the frontier of Belgium, in which country the muzzle is not in use, though rabies is always prevalent.

In the Grand Duchy of Baden during the years 1871, 1872, 1873, 1874, and 1875 the number of cases of rabies was, respectively, 18, 37, 37, 50, and 43. Then the muzzle was rigorously applied, and in 1876 there were twenty-eight cases; in 1877, three; in 1878, four; in 1879, two; in 1880, two; in 1881, two; in 1882, three; in 1883, two; in 1884, two. Since that year only one case has been observed, and that was a dog from Metz contaminated before its arrival in Baden.

In Sweden rabies was at one time a somewhat common disease, and from eight to ten people died annually from hydrophobia; but muzzling being enforced, and the importation of dogs prevented, rabies has been unknown for many years, and no deaths from hydrophobia have occurred since 1870.

1. Renault, cited by Bouley, in Rapport sur la Rage, Bul de l'Acad. de Med., Paris, 1863, p. 725. Fleming: Rabies and Hydrophobia, p. 365.
2. Fleming: Paper read before the Seventh International Congress of Hygeine and Demography, London, 1891.
3. Consular Reports, June 19, 1900.

The value of the muzzle in suppressing rabies has been perhaps best demonstrated in London on several occasions, and specially in 1885. In the previous years hydrophobia had increased to a very alarming extent in England, and no steps worthy of note had been taken to check the mortality. For London alone in that year no fewer than twenty-seven deaths were reported as due to the bites of rabid dogs. A muzzling order was then enforced, and at the end of 1886 not a death was recorded. Unfortunately, the order prescribing the use of the muzzle was then rescinded, and in a few months a case of hydrophobia occurred in the south of London, soon to be followed by others, and in 1889, ten deaths were registered. In July of that year the muzzling order was again issued and stringently carried out, and rabies and hydyophobia once more disappeared.*

In the whole of Great Britain the results from enforcing the muzzling order have been phenomenal, both in the opposition encountered by the authorities and in the successful eradication of the disease. The number of rabid dogs officially reported was, in 1887, 217; 1888, 160; 1889, 312. In the last-mentioned year muzzling was adopted, and the number of cases fell to 128 in 1890, 79 in 1891, and 38 in 1892. Then, owing to persistent opposition, muzzling was stopped, and the effect of withdrawing this measure was at once seen in the increase of rabies. In 1893 there were 93 cases; in 1894, 248, and in 1895, 672. At this point, owing to public alarm, muzzling was again enforced, reducing the number of cases in 1896 to 438, in 1897 to 151, in 1898 to 17, in 1899 to 9. As no case was discovered from November, 1899, to March, 1900, it was believed by the veterinary officer that the disease had been extinguished from Great Britain.

These examples are certainly sufficient to demonstrate the value of muzzling as a means of repressing rabies, and it may be added that in countries like France and Belgium, where muzzling has not been adopted, the disease continues to prevail to a very serious degree.

* Fleming: Paper before Seventh International Congress of Hygiene and Demography, 1891, quoted by committee on public health of the Medical Society of the District of Columbia, Bul. No. 25, Bureau Animal Industry.

XVII

SMALLPOX IN IOWA

In the biennial report of this Board for the period ending June 30th, 1899, it was shown that there had been two hundred and forty-nine cases of smallpox in the state with two deaths. At the close of this biennial period there were in the state cases of smallpox at Cresco, Rome, Orleans township, Winneshiek county, Le Claire, and Iowa City—the last case being reported from that place June 26th by Dr. Shrader.

No cases were reported in July, but August 10th Dr. Shrader reported two more cases in Iowa City. This was followed by a letter from Dr. J. F. Herrick, of Ottumwa, reporting one case there, and October 21st Dr. C, W. Stewart reported a case in Washington, an importation from Albert Lea, Minnesota. These were but fitful murmurings—the forerunners of the epidemic that began in a graders' camp near Storm Lake, and was reported to the Secretary of the State Board of Health, November 9th.

The information first came from Dr. Reynolds, of Chicago, notifying the Secretary that a party had arrived there from Storm Lake with well developed smallpox. The authorities at Storm Lake were disposed to deny its existence. Dr. L. M. Johnson, Health Officer, telegraphed November 15th, "No case of smallpox here," and on the next day the Secretary received a joint letter from the Mayor and Health Officer stating that there was "No case of smallpox in or near Storm Lake and that there had been none." In the meantime another telegram was received from Dr. Reynolds, of Chicago, stating that a second case had gone there from Storm Lake and justly complaining of the lax methods prevailing there. Dr. R. E. Conniff, of Sioux City, member of the State Board of Health, was asked by the Secretary to make a personal visit to this point and ascertain and report the facts, which he did at once, and reported from there the morning of November 17th as follows: "Five cases of smallpox in Storm Lake, numerous exposures, source of infection unknown. Suspected cases quarantined. I fear a bad mess."

No. 9 —Iowa Case. Smallpox.

For the month there were reported to the Secretary cases at Storm Lake, Sioux Rapids, Marathon, and Province township, all in Buena Vista county; also at Corning, Northwood, Alvord, Coalfield, and Silver Lake township, Lyons county.

From this beginning the disease spread from point to point by exposure to persons affected at the places named above, and by persons coming into the state from Minnesota, Nebraska, and other places until up to the close of this report there is scarcely a county in the state that has not had one or more cases.

Where the character of the disease was promptly recognized and reported and the local health officers promptly and efficiently resorted to vaccination, isolation, quarantine, and disinfection the disease seldom got beyond the family or premises first infected.

Unfortunately, because of its mild type and modified form there were many physicians who failed to recognize its true character; or if recognizing it, for questionable reasons, neglected or refused to report it for quarantine. A number of these physicians after witnessing the spread of the disease in severer type by persons exposed to their patients, and after having had the real character of the disease specifically pointed out by the physicians of acknowledged skill who were called in consultation still persisted that they were right and that everybody else was wrong.

There is no doubt whatever that hundreds of cases occurred in Iowa and that valuable lives were lost because of such ignorance and obstinancy, and the State Board of Medical Examiners should have authority, if it does not now have it, to suspend from practice or to permanently revoke the certificates of those thus offending. It must be admitted, however, that among this number there must have been some who had never seen a case of smallpox and who in failing to recognize the disease were honestly mistaken. All such, however, were very free to acknowledge their mistake and to remedy it as far as possible.

But physicians were not alone to blame for the wide prevalence of this disease. Indeed, but a small per cent. of physicians seeing these cases failed to recognize and report them. Local boards of health were, in too many instances, reluctant to take proper cognizance of the cases reported, and to adopt and enforce measures required to prevent its spread. They too often had an idea, or acted as if they had such an idea, that to admit its presence and to inaugurate protective measures would advertise

their misfortune and thus injure if not paralyze business. A more serious mistake could not well occur. It has been over and over observed that where a place has been unfortunate enough to have such an outbreak occur, if the local authorities at once adpted and enforced rigid preventive measures it inspired confidence, and there was no interruption to business whatever; but where an effort was made to conceal it the most extravagant reports were hatched up and circulated and the individuals and surrounding towns were disposed to boycott the place and business was badly crippled in consequence.

Again, local boards have for mistaken commercial reasons been disposed to ignore the presence of contagious diseases because preventive measures meant heavy expenditures. There could not, however, have been a more expensive policy pursued. Proper measures promptly adopted and faithfully maintained would have perhaps restricted the infection to the premises first quarantined, whereas the neglect often caused the erection of detention hospitals, the employment of trained nurses and heavy expenses for medical attendance, supplies, etc.

Again, the local newspapers in many places have greatly discouraged and embarrassed local boards by discrediting the diagnosis of intelligent physicians and by bringing ridicule upon efforts on the part of local boards to prevent the spread of the disease. They have too often prominently endorsed and commended the course of physicians, however ignorant, and whom they would under no circumstances employ in their family, who denied the existence of smallpox even though these same physicians had not seen one of the cases in question. In every considerable town one or more physicians may be found who loudly declare through the "press" over their signature or by "interview" not only that there is not, and has not been, a case of smallpox in their locality, but that in their opinion there has not beon one in the State. These physicians are too often taken up by the local press presumably in the interest of economy and business, and their opinion is declared to be of more weight than that of all the other physicians combined.

It would be interesting if there could be presented herewith a reliable statement as to the number of cases together with the number of deaths that have occurred in the State during this biennial period.

In order to get as correct data for this report as possible, the

Secretary sent to every city, town, and township clerk in the State the following circular letter:

IOWA STATE BOARD OF HEALTH

OFFICE OF THE SECRETARY

DES MOINES, June 30, 1901.

To the City, Town, and Township Clerks of Iowa:

Section 2571, the Code defining the duties of the local boards of health, says: "And through their physician or clerk shall make general report to the State Board of Health at least once a year, and *special reports when it may demand them*, of its proceedings *and such other acts as may be required*, on blanks furnished by them and in accordance with instructions from it."

As the "health officer" or physician of the local board does not have the data upon which to make such a report, the State Board requires it to be made by the Clerk.

The Secretary of the State Board of Health is required to make to the Legislature through the Governor a report for the biennial period ending June 30th, every odd year. The Code requires that one part of the report shall contain "information concerning vital statistics." These statistics the Secretary can only obtain through the Clerks of local boards of health—so far as infectious diseases are concerned.

There is enclosed herewith a postal card which you will please fill out and return on or before the 10th day of July, *proximo*. If there have not been within the two years ending June 30th, any of the diseases named, state that fact upon the card and return it.

If you cannot give exact figures, make them as nearly correct as possible. This is a matter of great importance to this office and is a part of your sworn duty, and it is to be hoped that no one will neglect to report promptly.

In signing the card the City or Town Clerk shall give the postoffice address, and the Township Clerk, in addition, his township and county.

Very respectfully, J. F. KENNEDY.

The circular called for reports of diphtheria, scarlet fever, and smallpox—three quarantinable diseases—for the biennial period ending June 30th, 1901. Inasmuch as all cases quarantined are supposed to be recorded with the city, town, or township clerk, it was thought the returns from these officers might show, at least approximately, what the facts were.

Accompanying these circulars was a postal card with the address of the Secretary of the State Board of Health printed on; and also so printed that the clerk had nothing to do but fill up the blank spaces indicated and sign—giving name of clerk, postoffice address, and locality reporting.

There were twenty-three hundred of these cards and circulars sent out. Of this number, 1,194 were returned—433 of these fifty-six towns and 377 townships, either being blank or reporting no diseases named.

The 761 towns and townships reporting outbreaks of diphtheria, scarlet fever, and smallpox furnish facts for thoughtful consideration.

Van Buren is the only county in which one or more cases of diphtheria have not been reported.

Every county has had some cases of scarlet fever.

Adams, Delaware, Grundy, Jackson, Louisa, Mills, and Warren are the only counties reported as not having had a case of smallpox for the entire years of 1899 and 1900.

The 761 reports received that are not blanks show that during these two years there were in the entire State, covering about one-third of the towns and townships of the State, 1,762 cases and 315 deaths from diphtheria; 3,403 cases and 112 deaths from scarlet fever, and 4,792 cases with 24 deaths from smallpox.

These reports do not even approximately give the correct data as to places in the counties where these diseases occurred or the number of cases.

There is no report from the city of Des Moines, and there are other large towns that have failed to report where it is known that the disease existed and was quite widespread.

If all towns and cities as well as townships in Iowa had as faithfully reported their cases as Boone, Webster City, Davenport, Clinton, Ottumwa, and Burlington there would have been a pleasure in tabulating the results.

It may be interesting to know how many local boards in Iowa have had to quarantine for diphtheria, scarlet fever, and smallpox as shown by the responses to the cards referred to. The returns show that the following number of cities, towns, and townships had outbreaks of quarantine diseases during 1899 and 1900: Diphtheria, 336; scarlet fever, 500; and smallpox, 390. If the 1,206 local boards to whom cards were sent and not returned had reported in proportion as the above, the showing, it would seem, ought to open the eyes of the people to the wide prevalence of three diseases that are communicable and hence preventable or at least capable of restriction.

The deaths reported from these three diseases as above stated were diphtheria, 315; scarlet fever, 112; and smallpox, 24—in all 451. It is fair to assume that the above figures do not represent more than 50 per cent. of cases and deaths that have actually occurred within the biennial period.

Is there not here food for serious thought? A good many persons are to blame for this fearful loss of life and waste of

No. 3.—Iowa Case. Smallpox.

property from causes that ought in a great measure to have been avoided. The statute relating to public health and the rules and regulations of the State Board predicated thereon are most beneficent in design, and if carefully carried out would have saved much bereavement and many heartaches. Will not the presentation of these facts, meagre as they are, as far from presenting the ravages of these diseases as they do, lead to a better and more cheerful compliance in the future? And will not the city and township clerks throughout the State keep more faithful records so that when called upon again more reliable data may be obtained?

Will not the legislature provide such further legislation as will in the future insure more faithful and reliable returns?

The following table presents a detailed report, by counties, of the number of cases of smallpox occurring in the State and the deaths therefrom for the years included in this report:

Report of cases and deaths from smallpox in the different counties of the state as shown by official reports from city, town and township clerks for the biennial period ending June 30, 1901:

COUNTIES.	1899-1900—cases.	1900-1901—cases.	Total cases.	1899-1900—deaths	1900-1901—deaths	Total deaths.	COUNTIES.	1899-1900—cases.	1900-1901—cases.	Total cases.	1899-1900—deaths	1900-1901—deaths	Total deaths.
Adair	13	44	57	..	..	..	Jefferson	....	53	53	...	2	2
Adams	..	.....	.....	..	..	...	Johnson	2	2	4	....	....	...
Allamakee	1	....	1	....	....	...	Jones	....	6	6	..	....	...
Appanoose	1	394	395	1	..	1	Keokuk	7	103	110	....	....	...
Audubon	..	19	19	..	....	..	Kossuth	..	33	33	..	....	...
Benton	....	135	135	1	..	1	Lee	....	4	4	...	....	...
Black Hawk	...	86	86	..	..	..	Linn	4	19	23	..	....	...
Boone	77	139	216	..	....	...	Louisa	....	.....	.....	....	....	...
Bremer	....	43	43	....	....	...	Lucas	....	75	75	....	1	1
Buchanan	3	9	12	..	..	...	Lyon	22	11	33	4	....	4
Buena Vista	26	40	66	1	....	1	Madison	10	3	13	....	....	...
Butler	2	5	7	....	....	...	Mahaska	10	24	34	.	....	...
Calhoun	...	39	39	..	..	..	Marion	1	32	33	....	....	...
Carroll	1	36	37	..	..	..	Marshall	93	23	116	1	...	1
Cass	1	106	107	..	2	2	Mills	..	.....	.....	..	..	...
Cedar	..	3	3	..		...	Mitchell	11	4	15	....	....	...
Cerro Gordo	...	16	16	..	1	1	Monona	83	98	181	1	....	1
Cherokee	..	35	35	..	..	..	Monroe	9	70	79	....	..	...
Chickasaw		79	79	..		...	Montgomery		38	38	....	....	...
Clarke	..	2	2	..	..	...	Muscatine	.....	2	2	....	....	...
Clay	...	48	48	..	..	...	O'Brien	....	31	31	....	....	...
Clayton	....	13	13			..	Osceola	....	4	4	....	....	...
Clinton	18	61	79	..	..	...	Page	..	2	2	....	....	..
Crawford	..	28	28	..	....	...	Palo Alto	....	14	14	....	....	...
Dallas	....	6	6	..		...	Plymouth	2	6	8	1	....	1
Davis	..	67	67	..	1	1	Pocahontas	....	11	11	..	....	...
Decatur	..	13	13			...	Polk	67	22	89	....	....	...
Delaware	....	.....	...	....	....	...	Pottawattamie	2	29	31	....	..	...
Des Moines	..	3	3	..	.....	...	Poweshiek	10	63	73	1	1	2
Dickinson	1	5	6			...	Ringgold	....	4	4	....	....	...
Dubuque	..	8	8	....	....	...	Sac	....	28	28	....	....	...
Emmet	....	92	92		..	...	Scott	8	78	86	....	1	1
Fayette	..	49	49	.....	....	..	Shelby	1	10	11	....	....	...
Floyd	10	27	37	..	..	...	Sioux	....	39	39	....	1	1
Franklin	1	1	2	..	..	...	Story	20	25	45	..	1	1
Fremont	...	26	26		1	1	Tama	1	5	6	....	....	...
Greene	....	6	6	..	....	...	Taylor	....	51	51	....		...
Grundy	..	.....	...	....	....	...	Union	1	97	98	....	....	...
Guthrie	..	228	228	..	..	...	Van Buren	13	30	43	....	....	...
Hamilton	13	420	433		..	...	Wapello	1	136	137	....	....	...
Hancock	1	1	2	....	....	...	Warren	..	.....	...	..	..	...
Hardin	6	14	20	..	....	...	Washington	.	5	5	....	....	...
Harrison	....	40	40	....		...	Wayne	....	10	10	....	....	...
Henry	2	8	10	1	.....	1	Webster	43	161	204	....	...	...
Howard	15	13	28	....	.	..	Winnebago	....	43	43		....	...
Humboldt	..	156	156	..	..	...	Winneshiek	6	7	13	....	.	...
Ida	.	3	3	..	..	...	Woodbury	.	4	4	..	....	...
Iowa	6	15	21	..		...	Worth	2	1	3	..	....	...
Jackson		.....	.....	..	..	...	Wright	7	3	10	..	1	1
Jasper	12	48	60	..		...	Total	646	4 148	4 794	12	13	25

No. 4.—Iowa Case. Smallpox.

The exceedingly mild character of the disease produced in a great many cases a mistake as to its true character, and in many places only where severe cases occurred were they reported as smallpox. This characteristic of the disease was not confined to Iowa. In all the states of the Union, as well as abroad in many places, the disease has presented the same features. For the information of the people the State Board of Health prepared a circular (No. 8), on smallpox, many copies of which were sent wherever smallpox was known or suspected to exist. This circular is reprinted in the appendix of this report.

In addition to this circular the members of the Board and its Secretary visited many localities, especially where there was a dispute as to the true character of the disease, or where it was difficult to enforce quarantine regulations. All such visits resulted in much good by way of establishing the diagnosis, and helping the local authorities in the discharge of their duties.

A physician of this state, who subsequently unfortunately killed himself by taking by mistake a dose of his own medicine, conceived the idea that the disease was "Yaws", though he had never seen a case of this tropical affection. In a short time other physicians for various reasons unwilling to call it smallpox took up this name and some of the newspapers were prompt to accept this diagnosis. In order to show the fallcy of this claim the Iowa Health *Bulletin*—the official organ of the State Board of Health—in the June (1901) number gave the following description of yaws since which time no one has had the temerity to speak of this disease in connection with the eruptive disease so prevalent all over the country:

YAWS OR FRAMBOESIA.

As there are a couple of physicians in Bloomfield who are seeking to know the truth and who report that they have a disease that they cannot call smallpox, which for want of a better name they have been calling "Yaws," we have thought that we should if possible show at least why this prevalent disease should *not* be called "Yaws."

We have been disappointed somewhat in our search for information in this point.

The following leading medical text-books make no allusion to the disease, while they do mention pretty extensively even so simple a disease as mumps.

Pepper's SYSTEM OF MEDICINE, Loomis and Thompson's AMERICAN SYSTEM OF MEDICINE; Bartholow's PRACTICE OF MEDICINE; Watson's SYSTEM OF MEDICINE; and Ziemssen's CYCLOPEDIA OF THE PRACTICE OF MEDICINE. We have found the disease treated of somewhat extensively in Shoemaker's DISEASES OF THE SKIN; Reynold's SYSTEM OF MEDICINE; and by the medical editor of the BRITISH ENCLYCLOPEDIA.

Several also of our medical directories treat of it briefly.

Gould's NEW MEDICAL DICTIONARY says: "Framboesia Yaws, a contagious disease of the skin characterized by dirty or bright red raspberry-like tubercles, appearing usually on the face, toes, and genital organs."

We have seen no cases like this, nor have those described as Yaws in Monroe and Taylor counties in any way resembled it.

Thomas' MEDICAL DICTIONARY: "Framboesia—the Yaws—a contagious disease occurring in the West Indies, Guiana, and some parts of Africa, characterized by tumors resembling raspberries."

The next edition of this dictionary should include Monroe county and Taylor county, Iowa. In the latter county Dr. A. W. Fees, attorney of Lenox, says he saw and treated sixty cases of Yaws.

Dunglison's MEDICAL DICTIONARY: "Framboesia, hard papillary growth as in lupus, syphilis, sycosis, etc. Yaws, epian, pian. Disease of the Antilles and of Africa, characterized by tumors, of a contagious character, resembling strawberries, or champignons, ulcerating and accompanied by emaciation."

The cases seen by the Monroe county doctor, Brunt, and the Taylor county doctors, so far as described by those having seen them, though far out of the latitude where Yaws has heretofore been known to exist, bear a striking resemblance to the descriptions given above—in one particular. They are alike "contagious."

Quain's DICTIONARY OF MEDICINE: Article by Erasmus Wilson: "Framboesia consists of an eruption of yellowish or reddish yellow, which gradually develops into a moist exuding fungus without constitutional symptoms, or with such only as result from ulceration and prolonged discharge, debility and prostration. * * * This disease is peculiar to the African race." * * * The *period of incubation* of the poison ranges from *three to ten weeks*. * * * The *ordinary duration* of Framboesia extends *from two to four months*, but frequently this period is prolonged to one or several years. When it is irregular in its development the constitution is apt to suffer, ulcers form around the joints, the joints swell, the discharge from the ulcers is excessive, and the patient is crippled for life, or in some instances relieved only by death."

The people of Iowa should be devoutly thankful that the Yaws(?) as reported at Coalfield and in Taylor county possessed no such characteristics.

ENCYCLOPEDIA BRITANNICA: "Yaws is the name in use in the British West Indies and on the west coast of Africa for a peculiar disease of the skin in negroes. * * * Previous to the eruption there may or may not be disorder of the health. In children (who form a large part of the sub-

No. 6.—Iowa Case. Smallpox.

jects of Yaws) there will probably be rheumatic pains in the limbs and joints, with languor, debility, and upset of the digestion; *in adults* of ordinary vigor *the eruption is often the first sign*, and it is attended with few or constitutional troubles The eruption begins as small pimples like a pin's head, smooth and nearly level with the surface; they have a little whitish speck on their tops, grow rapidly and reach the size of a sixpence or shilling. The pustules then break and thick viscid ichor exudes and dries upon them as a whitish slough, and around their base a yellow brown crust. Beneath the whitish slough is the raspberry excrescence or Yaw proper—a reddish fungus with a nodular surface. Hairs at the seat of the yaw turn white. * * * If the patient be of sound constitution and good reaction, the Yaws may reach the full size of a mulberry in a month, in which case they will probably be few; but in persons of poor health they may take three months to attain the size of a wood strawberry. * * * Six weeks is the average time in a good case, from the first of the eruption to the fall of the excrescences; in such regular cases a scar remains; it may be for many months darker than the rest of the negro skin. But the disease is often a more tedious affair, the more protracted type having become common in the West Indies of recent years. In such cases the eruption comes out by degrees and as if with difficulty, crop after crop; foul excavating and corroding ulcers may remain, or a limb may be in part seamed and mutilated by the scars of old ulceration.

We cannot but rejoice that the Yaws (?) in Iowa was so different in type and that so few who were vaccinated against smallpox took the Yaws. We feel that with the foregoing we have almost raised a reasonable doubt as to the eruptive disease called by so many intelligent physicians all over the country smallpox being Yaws, or bearing any striking resemblence thereto. We desire, however, to produce such a preponderance of evidence that even the most obtuse may be thoroughly convinced. With this view we turn to a couple of recent text-books of good repute —one upon diseases of the skin, the other upon general medicine and with these we rest our case—well assured that if these do not convince nothing else will.

DISEASES OF THE SKIN—Shoemaker. "Framboesia, also termed Yaws and Pian, is a cutaneous malady, characterized by the formation of macules, papules, tubercles, and pustules * * * The eruption consists at first of a variable number of macules, which become elevated and transformed into papules or tubercles. * * * They gradually increase in size, and become covered with small, flat, red elevations, presenting a raspberry-like appearance. Some of the lesion, coalesce, forming large fungoid masses. After a time the lesions become fissured or abraded, and a semi-purulent substance oozes out. There is no itching at any time. The *period of incubation* of this disease is said to be *from six weeks to two months* * * * *The affection pursues a protracted course and may, if untreated remain for years.* * * * Framboesia is produced by contagion and is *most frequently propagated by sexual intercourse.*

REYNOLDS' SYSTEM OF MEDICINE—Hartshorne, Vol. 3, page 952: "The Yaws is a contagious disease, appearing once only during life, running a definite but *chronic course* and *characterized by* the eruption of *a number of raspberry-like tumors* on certain parts of the skin. * * * The disease is indigenous in Central Africa (where it is known as the Yaws), hence it has been conveyed to the West Indies, (where it is called Pian). * * * The period of incubation of the disease is about two months. It appears first as small red points like flea bites, these soon rise into pimples, which extend till they attain on *an average of one-half an inch in diameter*. As these tubercles enlarge their surface becomes covered with a scab. Beneath the seat a fungous growth consisting of florid prominent granulations springs up. From this fungus growth the disease derives its name Framboesia (*framboise, a raspberry*). Two or three months elapse before the red point attains the raspberry-like condition. * * * The course of the disease is very slow, extending in the case of adults *generally over a year*, or even a year and several months; *in children its duration may be stated at seven or eight months*. Framboesia cannot be mistaken very well for any other disease."

In the foregoing quotations the italics used are our own. We would have been glad had space premitted to have reproduced some other very interesting facts relative to this peculiar, but fortunately to us unknown disease. We would doubt the propriety of giving any space at all to a disease never known in this latitude, and only claimed by one author to have ever appeared in the most southern part of the United States, were it not that some physicians in Iowa, actually reported from quarantine cases of Yaws, in at least two counties in the state and that other physicians unwilling to call the disease smallpox stated that for the lack of a better name they called it "Yaws." It is our deliberate judgment in view of the descriptions of the Yaws as given above and as a result of extended personal observations in various parts of the state that with no consistency whatever can it be called Yaws. This disease and Yaws have but one common character—they are both contagious.

MODIFIED SMALLPOX

The Secretary takes great pleasure in presenting herewith, by permission of the Illinois State Board of Health, an open letter addressed to the Board by James Nevins Hyde, A. M. M. D., Professor of skin diseases in Rush Medical College, "Touching the Symptoms and Diagnosis of the Epidemic of Modified Smallpox Prevalent in some Portions of the United States."

The reputation and professional ability of Prof. Hyde and the scientific and yet untechnical style of speech in his "Letter"

No. 5—Iowa Case. Smallpox.

are such that the vexed question of diagnosis ought to be satisfactorily solved even by an intelligent layman. No educated physician should be mistaken after carefully reading it.

The fact that Prof. Hyde treats the disease as "Modified Smallpox" should not minify in the least the importance of preventive measures. The following from our leading text-books show that the only safety is in such restrictive measures as vaccination, quarantine, isolation, and disinfection.

"The infecting source bears no relation to the resulting disease; a mild case may and often does give rise to a severe one".—*Reynolds' System of Medicine.*

"Even the mildest form of modified smallpox in one person may cause pure hemorrhagic smallpox in another and *vice versa*"—*Allbutt's System of Medicine.*

"It must not be forgotten that an unprotected person may contract a very virulent form of the disease from the mild varioloid."—*Osler's Practice of Medicine.*

"The degree of mildness or severity of a case does not influence that of another caused by it, the severest cases being at times followed by the mildest forms, and *vice versa.*"—*Tyson's Practice of Medicine.*

"There is no relation between the severity of the type of the disease in the individual who is the source of the infection and in the individual who receives it. The lightest case may cause the most malignant, provided the susceptibility or predisposition of the victim who receives the infection is strong. On the other hand, the most severe confluent or malignant case may give rise to a very mild attack in a person whose susceptibility of predisposition is slight."—*Twentieth Century Practice of Medicine.*

AN OPEN LETTER TO THE STATE BOARD OF HEALTH OF ILLINOIS BY JAMES NEVINS HYDE, A. M., M. D.

GENTLEMEN,—An epidemic disease is prevalent at this season in certain portions of this and other states of the Union, which has awakened both among the laity and among men of the medical profession, no little discussion and some controversy. The question of the nature of the malady has been debated alike by men of science, by editors of daily papers, and by the victims of the disorder, who, it must be admitted, have a special interest in knowing the nature of the affection from which they have suffered. As I have had the opportunity of examining with care a number of the victims of this disease, both in this state and elsewhere, and last in an Illinois city, where I was given, by the courtesy of the mayor, an opportunity of observing a group of selected cases, I have ventured to address to your honorable body this open letter. It is my purpose avoiding, as far as may be, the technical language of science, to set forth in simple terms the ascertained facts respecting the disease under consideration. I am entertaining the hope, however faint of realization, that some fair-minded editors of daily journals in the smaller towns of Illinois, after reading these pages, may be persuaded to consider the subject from a different viewpoint from that which they have heretofore assumed. If I might even make shift to

gain the ear of a few sensible men and women, not either editors or physicians, who would listen without passion or prejudice to what is here set down, I should feel rewarded for my trouble. Since the members of your Board and hundreds of trained physicians throughout our state and country are well versed in all these problems, I have written, not for you nor for them, but under cover of your name and theirs in the hope of helping others.

The conservation of the health of the people is concerned with problems which interest all alike and which cannot be ignored by a few without danger to all. Springfield and Chicago have as great and vital an interest in the well-being of Aurora, Peoria, and Dixon as have these towns in the health of the people of Chicago and Springfield. What damages one is harmful for all. We are tied together by indissoluble bonds. Surely in this day when the men of the North and of the South are forgetting their old differences, when our brothers from all parts of a common country are shedding their blood in defense of our flag, when the Nineteenth is slipping into the Twentieth century, and there is promise in the future of less narrow ideals, broader aims, and of wider sympathies, men can ill afford to look in any other than an unselfish light upon questions that interest our domestic health and wealth. It is, let us admit it with thankfulness, a portent of good when the worshipers in so many of our churches Sunday after Sunday repeat the ancient formula, that "it may please God to bless and keep all His people," not those in this small town or that, not those only in the village inhabited by a few. "To keep all the people;" this is the keynote of the best work of the physicians concerned with the public health, alike in Cuba and Porto Rico, in Springfield and Chicago.

These sentences may sound like platitudes, commonplaces from the lips of a political speaker or a demagogue, but in point of fact they furnish a solid basis for the best legislation, whether in a common council or in a sedate chamber. They are often left unformulated by the busy physician because they are assumed to be granted and to require no superfluous demonstration. Yet it is not unwise when men's passions are aroused and their material interests are threatened, to repeat the text and to emphasize its importance. The family physician need not express in words his solicitude for those to whom he ministers. His personal attendance at all hours of the day and night, his obvious anxiety to relieve his patients, his gentle touch and kindly manner, prove better than words that his is not a selfish and heartless task. But it is different with the work allotted to bodies like yours. No member of your honored board is expected to make assurances to the public that your mission is one of beneficence and not of harm to the commonwealth. The very official character of your work places you, to a degree, at a disadvantage when your acts intimately concern the health and comfort and the property of those in behalf of whom it becomes your duty to interfere. For we know that pestilence destroys property; even the dread of pestilence is a source of disorder and wretchedness and waste.

It is a higher and more exacting task to prevent than to cure. But it is a task often thankless and unrewarded; indeed, in the past it has been rewarded, as among the French-Canadians in the anti-vaccination riots of Montreal, with a rain of missles and with armed resistance of the law. The daughters of the Hebrew race in the days of their first king sang of Saul that he [illegible] David his ten thousands," but before

No. 7.—Iowa Case. Smallpox.

[illegible]ned. If I might even make s[illegible]

another century ends the plaudits of the people will be based upon the nobler truth that while medicine and surgery have saved thousands, the enforcement of public hygiene has saved its ten thousands.

An official authorized by you to inspect a portion of the State, and if possible to stamp out an epidemic threatening the health of its citizens and thus threatening the health of all the people, would be far more devilish than the Satan who Milton depicted swooping down upon the happiness of Eden, if for an instant the health officer could rejoice that the hour had struck in which he was to have the chance to close factories and schools, to quarantine men and women in their accustomed service and toil, to create disorder, and to set up barriers in the highways previously traversed by the many without let or hindrance. Rather should his visit be regarded as that of one coming like an angel of mercy to stand between the people and the pestilence, calling a halt upon its ravages and bringing order and comfort out of demoralization. Only a vast pity and profound sympathy move the trained expert who is summoned to a community suffering as have some of those lately visited by this epidemic.

The illogical and unreasoning speech and actions of those who set their faces against the regulations prescribed for the preservation of the public health, remind one of the action of the men of Devon and of Somerset described in the popular romance entitled "Lorna Doone," wherein it appears that the men of these two English counties, having set forth to exterminate the nest of the robber Doones, concluded by firing upon each other over the valley, instead of upon their actual enemies. In the discussion of the important questions at issue, how unwise to premit prejudice, passion, greed or envy dictate to the judgment. These are the enemies of a judicial spirit, of the calmness with which reasonable men consider the troubles with which they are confronted, whether in war, in financial panic, in time of earthquake, or of pestilence. This is not the season for personal attack and carping criticism. Nor is it a time in which to hurl reproaches against those who might have done differently. Nor yet is it a day for upbraiding men with charges of ignorance and error. Rather is it a time for fraternal counsel and kindly suggestion. Many experienced physicians, wholly unaccustomed to the problems connected with this epidemic, have approached it from different points of view. They have been sufficiently wise to recognize that symptoms, in some points, differed from their experience in other cases, and they have been cautious enough to make their judgment go with their findings. We should respect their prudence and admit the skill with which they have treated so many patients without grave results. Many of us could learn much from them. If they have not at first accepted the correct view, ours it is merely to ask seriously, whether there are not very strong reasons for careful consideration of the subject. The people of this State owe an immense debt to the best of their physicians. The latter are both well educated professionally and as a class exceedingly intelligent outside of their special vocation. The great majority of these long since have accepted the statements here made respecting the facts of the prevalent epidemic. None need fear that even a large minority of them will not accept, and promptly accept, the truth when it is clearly presented to them.

Even supposing that the small number of those who refuse to accept the

facts herein set forth are quite in the right, and that those who are in accord with the view here expressed are wholly in the wrong, even thus the man with common sense will pause and weigh the facts before taking his stand, less he be betrayed into remediless error. He would be a prudent engineer who in the day of a tempest listened to the warning cry even of a lunatic before taking his precious freight of living beings over a dangerous bridge.

Now, there is no controversy possible in the matter herein considered. A scientific man will not be betrayed into argument where there are not two sides to be argued. For all the days of argument and controversy in this question have long passed, and few have the time to go back half a century in order to fight over the old battles which were waged by our grandfathers of narrower observation and less extended experience. This is not a contribution to a vexed question. It is an appeal to men to recognize long established fact. There are no novel phenomena to be noted in the prevalent epidemic. Expert physicians in England, Germany, France, and Austria have long since investigated and expounded every one of the symptoms that have in this day bred so much indecision and confusion in the minds of observers.

The prevalent epidemic is one of smallpox (variola). To refuse to accept this fact is to be guilty of egregious folly and to commit a dangerous blunder. Fortunately, the symptoms thus far exhibited have been those of modified or mitigated smallpox. The question of chief interest thus awakened concerns chiefly the difference to be established between unmitigated, unmodified smallpox (so-called, variola vera) and the mild or mitigated form from which so large a number of our people have lately suffered.

The history, symptoms, and career of unmodified smallpox have been so systematically and fully recorded in medical literature that it will be needless in these pages to recount them. They are equally accessible to physicians and to laymen in the pages of the standard treatises devoted to the subject. In this connection it will be needful merely to outline in brief terms the symptoms of the mitigated form of the disease as it now epidemically prevails.

In well-marked cases the malady is usually ushered in by a chill, or by sensations of unusual faintness, or even by milder symptoms. Not often has a history been obtained of long preceding languor and depression. The chill, when such is experienced, is followed by a rise in temperature and the records of many of these patients show that 105 degrees F. are often reached. Nausea, either with vomiting or amounting to merely a distressed feeling in the region of the stomach, may be present or be not perceived. Pain in the back (lumbar ache) is relatively frequent. With these symptoms may be experienced headache, dizziness, and faintness. Dr. William M. Welch (Phila. Med. Journ., Nov. 18, 1899), has presented an admirable picture of the symptoms noted in the prevalent epidemic, and he adds that in children there is apt to be a tendency to stupor and that convulsions often occur. In from two to three days there follows either a complete disappearence of all the symptoms of fever, or a very pronounced reduction of the temperature. In a few cases this practically closes the career of the disease. In the most, however, an eruption promptly appears, first, as a rule, on the exposed portions or the skin, such as the face, including the temples, and the scalp and the neck and hands, which, with greater or less rapidity, at

No. 8.—Illinois Epidemic. Cut kindly loaned by Illinois State Board of Health.

the most in two or three days, becomes distinctly generalized, that is, it spreads over the general surface, involving the head, trunk and limbs, including the mouth, the palms of the hands, and the soles of the feet. This eruption, usually completely developed in twelve hours, is declared by the production of minute, distinct, isolated, and firm elevations of the surface (papules), which, when compressed between the thumb and finger, produce the impression to the touch of small-sized shot imbedded within the skin. Between the second and third days, on the summit of these shot-like elevations, develop "watery heads" (vesicles), having imprisoned within each a clear fluid (serum, sero-pus), which becomes opaque or cloudy in the course of the third or fourth day. In some of these isolated elevations (papulo-vesicles) there may be evident a distinct puckering or infolding of the top of the head (umbilication). In many cases, however, this symptom is either wholly wanting or but faintly declared at a few points to be discovered only after careful search of the entire field affected with the rash.

The watery stage of these elevated semi-solid points is more or less rapidly exchanged for that where pus is formed in each, and the resulting pustules in well-marked cases are in the course of the fifth or sixth day rather symmetrically distributed over the surface of the regions already named, the largest and most distended occurring, as a rule, over the exposed parts, such as the face and the hands. At about this time a very distinctly defined narrow reddish blush forms as a margin (halo) about the elevated pock, which persists with greater or less conspicuousness until the crusts which form later are shed. The pustules are large, often as large as small beans; they may seem to "balloon" with matter; they are highly disfiguring.

Thus far in its career the disease corresponds to a degree with the usual course of unmodified smallpox, and in fact can rarely be mistaken for any other malady. It has been shown that even before reaching any one of the stages described, there may be a speedy relief of all symptons, and the patient may not only not have remained in bed, but may have actually undertaken the usual pursuits of his or her vocation in life. The most significant and startling contrast, however, between modified and unmodified smallpox, is exhibited when the patient, after reaching the stage described, of complete development of pustules, suddenly ceases to betray any further significant symptoms of smallpox. The pustules dry rapidly into crusts, which are thrown off and leave the skin either somewhat stained at the points where the crusts formed, or in nearly its normal condition. Some of the elevated points seem to recede; others with insignificant crusts atop each, when the latter are removed resemble in appearauce simple warts from which the head has been torn in the act of scratching. In yet others, semi-solid elevations (papules) of the skin remain, which do not betray the tendency to maturation (suppuration) displayed in other cases.

In the most of instances there is afterward an entire absence of the subsequent manifestations of unmodified smallpox, such as secondary fever, which in the severer forms of the disease is without question of septic origin. The grave consequences of the malady recognized in the nose, the mouth, the lungs, and the viscera, accompanied often by evidences of dangerous implication of the nervous centers, are all wanting. In rare cases, secondary fever has been recognized, but in a mild form.

It is claimed by some physicians that in the prevalent epidemic no scars

are left at the sites of eruption, a statement which may be accepted as true for certain cases only. In others scarring of the face follows, but to a less severe degree than in uncomplicated smallpox. Certainly in this epidemic the eruptive symptoms are far more superficial than in unmodified smallpox, where the deep set pustules work such havoc to the deep integument (the corium).

It is somewhat remarkable that the most precise and voluminous writers on the subject of smallpox lay but little stress upon a feature which is regarded by some practioners as absolutely diagnostic, viz., the odor. Some authors, among whom Moore may be cited as an example, barely refer to such a symptom. Others, such as Graham, who had a large experience of the disease both in this country and abroad, limit themselves to a mention of the intolerable stench emitted, naturally enough, by patients in the pustular stage of severe confluent smallpox. Whether or not specially characteristic, the odor in these instances is both persistent and disgusting. That, however, cases of true variola occur where the average physician is wholly incapable of recognizing any peculiar odor is absolutely certain; and the absence of such a perceptible symptom is to be expected rather in the modified than in the unmodified types of the malady. In the final stages of mycosis fungoides, pemphigus malignus, and even in gunshot wounds of the chest followed by pulmonary gangrene, the fetor may be even more offensive than at the close of the career of unmodified smallpox.

The portraits presented by Dr. Welch of the form of mitigated smallpox which has been epidemic in several counties of Pennsylvania, furnish ample proof that the symptoms are those seen by our Illinois observers. The disease is one, and its manifestations are the same. In order to show that smallpox with precisely the same mild symptoms, and exactly similar type is prevalent outside of Illinois, Kentucky, Tennessee, and Pennsylvania, it is only necessary to read the reports made by physicians in these other districts. By way of illustration, I append the following extract from one of a series of letters sent me by correspondents in Kansas. The author of the following paragraphs is a physician of large experience and intelligence, filling a responsible office in his community. He not only gives a suggestive sketch of the epidemic as it has happened among his people, but also describes somewhat in detail the case of his own child watched by him with the anxiety of a father and with the care of a skillful practitioner. His letter describes a case of modified smallpox of the precise type now prevalent in Illinois and other states of the Union:

"My boy, nine years old, just recovering, has the following clinical history: Thursday noon, October 19, he came home complaining of headache and dizziness, and did not want to go back to school after dinner. We kept him at home and he lay on the sofa most of the afternoon, but went out doors for about an hour. He had some fever, but was so slightly ill that I did not use the thermometer. Friday morning he rose and dressed and felt better, but about 11 o'clock had a chill, which was followed by fever, temperature 103°. I thought he was coming down with malarial fever, and so gave him quinine. The next morning his temperature was about 102°, but he felt pretty fair until towards noon, when he complained that his feet were cold. His temperature at about 9 p. m. was 105 1-5°. We began bathing him with water of a temperature about 85°, with a little alcohol added, and by 10:30 p. m he had a temperature of about 103°. He then went to sleep, resting quietly, calling for a drink two or three times during the night. On Friday he vomited several times, and I think once on Saturday. He did not complain of headache or backache except on Thursday. Sunday morning I discovered about half a dozen red macules on his face (left temple and cheek and right cheek), also several on his forearm and on his back. By night there were thirty or forty spots over his face, arms

No. 9.—Illinois Epidemic. Cut kindly loaned by Illinois State Board of Health.

and legs, and a few on his body over his chest and abdomen. Those that had appeared in the morning had increased slightly in size, had become papular, and showed a vesicle forming in their center. His temperature Sunday night was 101° F. Monday morning new spots appeared and more of the papules had become vesicles. His temperature was 99¼°, and he was feeling quite easy. Monday night more spots appeared; temperature, 101½°. Tuesday was about like Monday, but spots appeared larger, more raised, and with larger vesicles. By Thursday the vesicles first formed had reached as large a size as they ever attained. There was a slight red areola about them, but when the skin was compressed between the thumb and finger, it was found that the inflammation was confined to the vesicle. The papules would at times feel a trifle 'shotty' just before the vesicle formed, but when taken up between the thumb and the finger they felt decidedly less so. About the fifth or sixth day after the eruption, a dark spot appeared in the center of the vesicles, which gave it an umbilicated appearance. If, however, examined sidewise, it was seen to be not really umbilicated but only appeared to be so in consequence of the difference in color. This dark spot gradually got larger, and in about six days after the first appearance of the macule it began to turn white in color, then slightly yellow, and on the seventh day a scab began to form, which took about three to five days to drop off. If these vesicles are opened when they begin to turn white, that is, from a water color to a milk-color, and the contents are squeezed out, there is left an umbilicated spot which scabs over and falls off quicker than those not opened. On the boy's face I opened those on the left side and left untouched those on the right side. This evening one third of the scabs are off of the left side, and only one or two off on the right side. The last spots to appear were on the palms of his hands and the soles of his feet."

Turning to the other cases of which between 200 and 250 have been seen by himself and his colleagues, this physician writes: "The two to four days (usually three) of fever are uniformly present. Most of the patients complain of some aching in the head, back, and limbs. A few complain of severe aching. When the rash appears, there is uniformly a decline in the temperature and a feeling of relief. When the vesicles are not opened and pus forms, there is a slight increase of fever from about the seventh to the tenth day. If the vesicles are opened, and washed with some antiseptic lotion, little or no increase is noted. In none of the cases is there any deep or extended inflammation around the spots. They seem to be mostly in the epidermis or just below it, not in the derma. In a few cases there is umbilication, in about one to seven or twenty spots. Most of the spots are rounded throughout. The center of the spots holds the liquid and by pricking it all the fluid can be easily squeezed out. When the scab is formed, no pus is found under it if it is pulled off. The rash takes from two to five days to come out. It appears on the soft palate, one in eight to fifteen cases. The rash appears less frequently in the axilla and the groin."

The appended cuts represent some photographs taken of the disease as it has existed in the States of Illinois and Kansas during the past two months, and suggest at all points the disease as it has occurred within the past few weeks in our own State.

The State of Ohio, according to the report made by the Secretary of its Board of Health, Dr. Probst,* in the course of the fourteen months ending with June, 1899, was visited by an epidemic of smallpox, in which occurred 1,882 cases, with fatal results to 30 of those stricken. The description given of the disease, as it was observed by the physicians of the 61 cities and villages attacked, corresponds so closely with that of the cases observed in Pennsylvania, Illinois, Missouri, Kansas, and elsewhere that it is impossible not to recognize the identity of the disease wherever it has appeared. In the Ohio towns, as in other localities, the disease was so mild at first that it was erroneously termed, both by physicians and others, "Chickenpox" and

* Journal of the Amer. Med. Ass'n, Dec. 23. 1899.

"impetigo contagiosa." County fairs were held, theatrical amusements attended, and public schools opened, with victims of the disease freely communicating with the unaffected. The vaccinated were mostly exempt, but a few of the protected suffered. The preliminary fever was slight, the eruption superficial and the eruptive period brief and irregular of career; secondary fever was rare, and pitting was exceptional. A few malignant purpuric and hemorrhagic cases were observed, some of these swelling the list of fatal attacks.

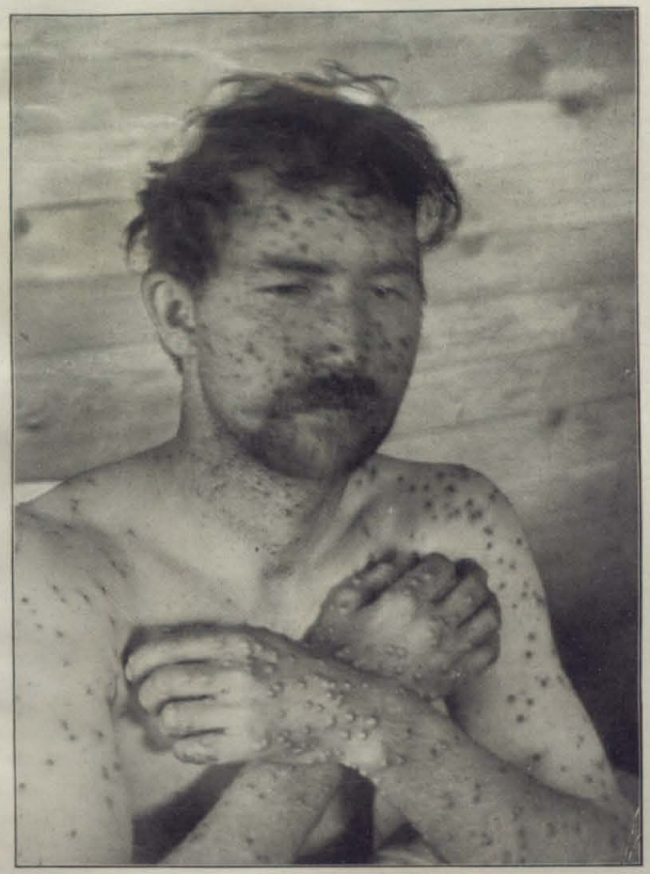
The patients affected with this type of mitigated smallpox in Missouri (more particularly in St. Louis) were affected in precisely the same manner as those observed elsewhere. The first cases seen were described as

No. 11.—Case of modified smallpox, Illinois epidemic. Diagnosed as "Puerto Rican chickenpox."

"chickenpox," but later the physicians in attendance freely acknowledged their error.

The objections raised against considering these and yet milder types of the prevalent disease as smallpox in a modified form cannot be supported by fact or well-founded argument. They may, however, be briefly noticed.

First, the objection is urged that the watery heads (vesicles) seen in the affected patients are not puckered (umbilicated) as in the types of smallpox described in the text-books. To this it is responded that in every epidemic the puckering, or, better, fluting, of the apex of the fluid-containing eleva-



No. 10.—Illinois Epidemic. Cut kindly loaned by Illinois State Board of Health.

tions of the skin may be wholly or in part wanting. At times the entire body-surface is practically covered with these small elevations of the outer skin filled with a cloudy fluid, each as distinctly puckered (crenated) as if the center of the roof were tied down by a centrally inserted thread. At other times one searches in vain for this interesting feature, of which it may be remarked in passing that it is not, as has been generally taught, seen only in smallpox. Other pustular diseases exhibit the same feature at times, though few to the same extent as variola. This symptom has been

No. 12.—Epidemic of modified smallpox, Illinois patient. "Puerto Rican chickenpox."

fairly well marked in a few patients seen by me in the present epidemic. Dr. Welch has had a similar experience. In the most cases, however, it has not been recognized.

A second objection is based not merely on the universal mildness of the symptoms in patients of the class described above, but on an almost entire absence of symptoms in the case of men and women who have been discovered on the streets pursuing their usual vocation. There is nothing novel and extraordinary in these histories. They are, however, sufficiently familiar to physicians who have had a large experience with smallpox. The lassitude and discomfort experienced by some sufferers is either ignored or absent in others, particularly in those of a vigorous constitution and of adult years. The eruptive symptoms in these cases may be limited to a few and even to two "pocks" on the body surface. The verdict of smallpox which has been properly made in such instances has often excited the derision of uninformed persons. But the published and unrecorded experience of groups of these phenomena is too well established to be ignored. Smallpox, indeed, may occur without producing any eruption whatever (variola sine variolis), the verification of this fact being best made in the pregnant woman who, after a chill and fever without any skin-symptoms whatever, afterward brings

into the world a new-born child covered with pustules of the confluent disease.

A third objection is presented on the ground of the condition of the patients affected with the disease now epidemic when examined with reference to cow-pox (vaccinia). It is alleged that in the present epidemic the vaccinated and the unvaccinated suffer alike. This is an important allegation which demands a word or two of explanation.

Vaccination is a method by which protection is secured against smallpox by introducing into the human system another and different disease. This disease, cow-pox, is well known to be different from the malady produced by the intentional production of smallpox in cows, though there is remarkable correspondence between the two, the differences proving that the two diseases, if not identical, are certainly allied. Vaccination is a very remarkable and satisfactory method of securing immunity from smallpox, but it is far from being a perfect method. No ingenuity of man has yet sufficed to create absolute safeguards against the manifold dangers of human life. The strongest iron steamship that can be constructed may be crushed like an egg shell under the blow of one of the largest billows in an Atlantic tempest. In the gravest of smallpox epidemics, for example, in the form known as hemorrhagic variola (''black measles''), the vaccinated and unvaccinated suffer, not, it is true, in the same degree, but both suffer. I have seen a man die of confluent smallpox with two excellent scars from vaccination on the arm. Of the cases seen by me in the towns of the State of Illinois, four out of six of the patients have exhibited no signs of vaccination and have been unable to give any record of having been vaccinated.

Now, it is not true, that on the whole the protected and unprotected suffer alike in the present crises, but even when the disease is mitigated, an epidemic influence will explain the occurrence of smallpox in the vaccinated. It must be remembered that while the symptoms under consideration are extraordinarily mild when compared with the frightful scourge of the unmitigated disease, still the epidemic influence has been extensive and many patients even though not dying have suffered enormously. Some of them have been well-nigh covered with pustules, many have endured high fever. Fortunately, the physicians interested in the study of these cases find them of special interest and worthy of careful attention, but many of the victims of the prevailing epidemic have an aspect which proves in the highest degree loathsome and suggestive of horror to persons unfamiliar with the disease, who probably, if occasion offered, flee affrighted from the presence of the sufferer. So, then, although the symptoms are unquestionably mitigated, still an epidemic actually prevails and one productive of serious, even if not always fatal, mischief. This epidemic influence is a potent factor. It is an influence exerted generally in any community attacked so that the susceptible suffer as they would not if a sporadic case, for example, if smallpox were by accident introduced among them. The French have a proverb which runs: "At night all cats are gray." In an epidemic of smallpox the shades of difference between the protected and unprotected often appear to vanish. It is under these epidemic influences that men and women have several successive attacks of smallpox, one attack not furnishing immunity against another. These cases are rare, but they do occur and are sufficiently suggestive. I have seen a physician in a severe variolous

No. 13.—Epidemic of modified smallpox, Illinois patient. "Puerto Rican chickenpox."

epidemic suffer from an attack of ophthalmia whenever he was introduced into the chamber of a sufferer. At these times the unprotected, in whose persons at other seasons it is difficult to insure vaccination, receive the virus with relative ease and with excellent results. Hence if in meager proportion the vaccinated suffer at the present time, it is not an argument against the prevalence of smallpox, it is rather strong proof in favor of the prevalence of a smallpox epidemic, even if the symptoms displayed in the most cases are mild or modified.

The same explanation is to be made in the cases where it is alleged vaccination has been successfully performed of patients convalescing from this modified smallpox. A few instances of this exception to the rule have been adduced as triumphant demonstrations of the fact that no smallpox had previously existed. But such alleged proof is absolutely valueless and not in the slightest degree subversive of the established diagnosis. The facts are all explicable by the prevalence of the epidemic influence in smallpox, and point conclusively to the presence of such a disease and to none other. I have with qualified success vaccinated after modified variola; there is no reason why one or even a series of patients might not exhibit some vaccination symptoms after suffering from smallpox in an epidemic form. It is to be remembered that a much severer test is made of the capacity of the patient when a virus is brought into actual contact with his body-fluids (as in vaccination) than when he is simply exposed through the medium of the atmosphere to the volatile contagion of a disease transmissible in that way. What physician would dare after the most successful vaccination of a patient at multiple points, to scarify the arm of that patient, and to attempt thus to introduce the virus of smallpox! He would be held criminally liable for the result, and that result in the time of a variolous epidemic, might be the transmission of smallpox to the person subjected to the experiment. The same is true of vaccination after modified variola when an epidemic is in progress. Brouardel has reported two consecutive attacks of smallpox in one patient, and in a blood relative of the same person six successful vaccinations at intervals of about six months. To sum up, then, in seasons of epidemic influence smallpox may occur several times in the same person; smallpox may occur in severe types in persons vaccinated; vaccinated persons may be revaccinated effectively at brief intervals; and vaccination may be followed by some results in persons convalescent from smallpox.

These facts being granted, it is nevertheless true that the immunity secured by vaccination is incalculably great and it may be well doubted if really typical results can be secured by the vaccination of persons convalescent from the disease now prevalent. It will be remembered that when referring to my vaccinations after modified variola, I did not say that *typical* results had been produced. An expert's description of the typical results of vaccination would probably differ widely from that of the inexperienced. Personally, I should view with great suspicion any report of typical results (scar foveation, areola, vaccinal, fever, etc.) occurring after vaccination of the victims of the prevalent epidemic.

Vaccination after the onset of smallpox and when practiced in the early stages of that disease, is commonly effective, and if not protective in the way of aborting the disease, has a high value in modifying its severity.

Even as recently as the current year, Kotowtschikoff* has discovered that in the suppurative stages of smallpox successes may be secured by vaccinating as often as twice in the day, and he hasadvocated this as a means of favorably influencing the course of the disease. But vaccination during the period of convalescence from smallpox, whether the latter be modified or unmodified, is typically successful only as a matter of very great rarity. The symptoms usually evoked by such attempts at vaccination are either the production of spurious and abortive pocks or what is more common the production of vesicles and pustules wholly unconnected with the vaccinal process.** It

No. 14. Child dead of smallpox on seventh day of eruption. Age 32 days. Illinois epidemic. "Puerto Rican chickenpox"

is an established fact that after the occurance of smallpox the skin is left in a very sensitive morbid state. It is the frequent seat of pustules, abscesses, carbuncles, and other pus-containing symptoms of the surface, and these are specially apt to be provoked where the needle of the vaccinator has been employed.

Turning now to the diagnosis erroneously made of the disease under discussion, many of its victims have been reported to suffer from chickenpox (varicella). An error here can scarcely be made by a conscientious and careful observer. Let it be thoroughly understood at the onset that a patient affected with modified smallpox may have milder symptoms than another suffering from chickenpox. The difference between these wholly distinct affections are not exclusively those of severity. We have seen tha

* Journ. of Amer. Med. Ass'n, Dec. 23, 1899.

** "Smallpox undoubtedly exhausts the susceptibility to the vaccine disease. There is however considerable virus in use at the present time which is sure to cause a sore arm even in immune persons. In testing the immunity of individuals who are thought to have had smallpox, it is important in performing vaccination for this purpose, to be sure that the disease which follows is genuine vaccinia."—WILLIAM M. WELCH, to the Illinois State Board of Health.

No. 17.—Variola confluens, in pustular stage. Notice constriction made by ring on little finger of left hand. Photograph taken at Mt Pleasant, May 14, 1900, by Dr. O. J. Porter. Kindly loaned by Tennessee State Board of Health.

a man with modified smallpox may exhibit perhaps but two pocks on his body, and even may be able to attend to his regular duties. While chickenpox is universally and justly recognized as a very much milder disease than smallpox, a child affected with a severe form of varicella may really be very uncomfortable for two days with the body extensively covered with the special symptoms of that disease. A man with a lion's cub for a pet would not dream of rating it below a fully grown German boar-hound because the cub was the smaller of the two beasts. He would know that in time the lion will be able to slay the dog with a single blow of its powerful paw. This is quite suggestive of the difference between what might be called figuratively "baby-small-pox" and chickenpox. The former may extend and develop until it is competent to destroy human life at the rate of the most fearful scourges of the human race. But no degree of development or extension can ever convert chickenpox into anything more than a trivial affection.

Chickenpox* (varicella) is ushered in, as a rule, by no pains in the loins, nor by nausea, vomiting, nor by a high range of bodily temperature for two or three days preceding the rash. At the most, there are but a few hours of mild fever in which the thermometer practically never rises as high as 105 degrees F., and the eruptive symptoms speedily appear, first as slightly reddened blotches scarcely larger than half a pea, upon the surface, which rapidly become exceedingly superficial "watery heads" (vesicles) without the previous occurrence at the site of each, of elevated, firm, shotlike masses in the skin underlying each point. A feature of distinguishing importance in this malady is the rapid occurrence of the eruption over the protected rather than as in smallpox over the unprotected surface of the body, and in successive crops, the patient at the moment of first examination, for exnmple, exhibiting large numbers of blister-like "watery heads" (vesicles) over the back or on the chest, with a relatively smaller number on the face. At the height of the process a finger-nail can practically erase most of the evidence of trouble at any affected point. The velvety elevations are never puckered on the roof-wall of the single chamber containing the clear or opalescent fluid (serum); the crusts which form subsequently are thin and friable; the vesicles never develop into unmistakable pustules; at the worst, in from two to four days, the eruption and the disease are practically at an end. From first to last there is no suggestion of the career of even the most modified smallpox in the symptoms here enumerated. The mild fever persists during the eruptive stage, and at the outset of such a stage does not vanish or dimish, as in smallpox. Second attacks are rare; one attack confers no immunity from smallpox. Here the vaccinated and unvaccinated suffer alike. Hence it follows that any patient exhibiting vesicles surmounting firm elevations of the surface of the skin, developing first on the exposed surfaces of the body, appearing on the third day after a high fever, with lumbar pain and nausea, and coinciding with marked fall of the febrile temperature, is almost certainly smitten with smallpox and not with chickenpox.

One might almost wish that the late Tilbury Fox had never introduced his "impetigo contagiosa" to the notice of the profession, seeing that in connection with smallpox more sins of diagnosis may be laid to its door

*"Varicella is essentially a disease of early life, occurring almost exclusively in infants and young children.—JAMES NEVINS HYDE, in Pepper's System of Medicine.

than in the case of any other disease in the nomenclature. A few considerations, however, suffice to stamp its individuality. The "watery heads" (vesicles) which appear with relative suddenness in this disorder, and which are not only superficial but which enlarge by lateral rather than by deep extension, are absolutely the result of infection with pus-organisms at every point where the symptoms develop. With this simple fact in view all errors of diagnosis may be avoided. Impetigo contagiosa is for the most part what may be termed a "finger-nail filth" disease of early life, chiefly of children or of young adults. The finger-nails, charged with the effective

No. 15.—Epidemic of mitigated smallpox, Kansas patient.

elements of the disease, convey these sparsely, not plentifully, to accessible portions of the body, the face (lips, nose, ears, cheeks), the hands, the knees, etc. The later "stuck-on," friable, readily removed, superficially attached crusts, never implanted on a firm base, are justly regarded as characteristic. In our clinical experience it is rare that more than a score of these individual symptoms may be counted in any single person. Our English brethren report cases in which the disease is widely generalized; I have rarely, very rarely, so seen it. When fever co-exists, as reported, it is unquestionably the result of the irritation produced in the skin by the purulent germs. No patient displaying numerous pustules symmetrically developed and seated on a firm base, after the subsidence of high fever, is suffering from any form of impetigo.

The distinction between a patient suffering from a generalized eruption of the pustules of syphilis and another exhibiting the pustules of smallpox, is chiefly interesting as an academic study, inasmuch as not rarely, in the great St. Louis Hospital of Paris, and occasionally at my own clinic, patients are found standing in the line of applicants for relief, one showing smallpox pustules, and another next or near exhibiting the pustular symp-

No. 18.—Showing a frequent type of mild eruption passing from the umbilicated vesicle to the pustular stage. From a cast made by Dr. Otey J. Porter, of Columbia, Tenn. Kindly loaned by Tennessee State Board of Health.

toms of syphilis. Both, it may be observed, may have a slight rise in temperature.

But it is to be remembered that the generalized pustular rash of syphilis is really rare in America, seeing that the eruption finds amplest expression only in the persons of the extremely filthy, the victims of debauchery, drink, and poverty. It is almost never recognized among the well-to-do, the cleanly, the comfortably housed, and the warmly clad; however often these latter may suffer from other symptoms of the disease. Of course, in any doubtful case, the history of syphilitic infection and the presence of other manifestations of the malady (mucous patches, alopecia, enlarged glands, traces of initial chancre) point to the truth. In syphilis the much slower evolution of the symptoms (time is a valuable aid to the physician in the diagnosis of smallpox), the obvious tendency of the pustules to cluster about the sides of the nose, about the cleft of the anus, about the ears, and

No. 16. Epidemic of mitigated smallpox, Kansas patient.

near the line of the hairs at the brow, the peculiarly dirty-looking crusts which form at the apex of the semi-solid elevations of the surface, the failure of such distinct isolation of the individual pustules as occurs in all but confluent variola, are important diagnostic features. The patient with pustules of smallpox generally distributed over his body is usually found in bed. The syphilitic subject commonly makes shift to present himself at the out-patient department of a dispensary or hospital; in other words, the one readily, the other only with difficulty, tolerates his disease.

In view of thoroughly characteristics features of even modified variola, it is almost superfluous to consider in detail the differences between its symptoms and those of eczema, acne, herpes, pemphigus, and the medicinal rashes. None of these is suddenly displayed after three days of fever and a rapid decline of temperature, in symmetrical development, attacking first the exposed surfaces of the body. The simple forms of herpes are generally seen clustered about the orifices of the body; the "shingles" variety (herpes zoster) is well-nigh invariably unilateral in disposition. Acne in pustular

development affects the face, it is true, but is wholly unaccompanied by fever, and in its manifestations far outlasts all the symptoms of smallpox. The doubtful physician here, as so often when attempting to distinguish between similar affections, is aided by the passage of time. Pemphigus, in its manifold expressions, is not only a disorder, the skin-symptoms of which outlast, as a rule, the brief career of the eruptive features of smallpox, but it is one in which the blister-like elevations of the surface (blebs, bullæ) are, as a rule, larger, and are filled with a fluid undergoing less rapidly than in smallpox the change to pure pus. With respect to the medicinal rashes, some of which, without question, are liable to be mistaken for the symptoms of smallpox, it is to be remembered that the withdrawal of the offending medicament is always followed by immediate amelioration of the symptoms in the skin. As in the other cases, the absence of fever and of a history of fever is to be considered in connection with the fact that very rarely indeed, if ever, do these rashes undergo changes consecutively from one type of eruption to another, firm elevations of the skin-surface, for example, changing to those exhibiting "watery heads" (vesicles) at the apex of the elevation; and these latter in turn changing to well-developed pustules. For the most part, the medicinal rashes develop in a single type, blushes, pustules, etc., appearing as such with promptness and not changing until the withdrawal of the efficient cause of the malady.

The severe and generally intolerable itching that distinguishes eczema need never be confounded with the excessive burning pain experienced by patients with a smallpox eruption over the face. A simple diagnostic difference will here suffice for the inexpert. There is almost never scratching of the affected part in smallpox, but that is a rare form of eczema in which at one time or another there is not only scratching, but also unmistakable evidence of scratching in the torn and abraided integument.

Returning to the prevalent epidemic of smallpox, it remains to explain, if possible, the mildness of the symptoms not in any one given case, but in such an extended series of cases, a mildness which has given rise to so much perplexity. I can think of no better illustration of this interesting fact than is furnished by another, even if vastly simpler, cutaneous affections, namely the mosquito-bite.

Even the uneducated people of our country are thoroughly familiar with the results of an extensive attack upon the skin by the mosquitoes of densly populated and well cultivated regions of the United States. The mild results produced are, without any contention, due to the fact that for the most part the individuals attacked are the children of generations of men and women bitten by mosquitoes on this soil, who have transmitted their relative but not perfect immunity to their children.

Far different is it with those who come to our soil from countries where the mosquito has never feasted on the blood of their ancestors. Early in the Revolutionary War, and during their first summer in this country, the mercenary troops coming from Hesse-Darmstadt and Hesse-Cassel were so seriously attacked by mosquitoes on their march from Trenton, in New Jersey, that hundreds of the men were unable to distinguish objects through their swollen eyeslids and were rendered wholly unfit for duty. Precisely the same symptoms are now recognized in mid-summer, especially in the City of New York, where the newly arrived immigrants from portions of

No. 19.—Face from case of confluent variola at Mt. Pleasant pest house, taken three hours after death. Cast made by Dr. O. J. Porter. Kindly loaned by Tennessee State Board of Health.

Great Britian in which there are no mosquitoes, are exposed for the first time to the incursions of the marauders. The results are often astounding to those unacquainted with the secret of their origin. The exposed faces are often enormously swollen and look to be affected with an erysipelatous process. Large blisters (blebs) rise from the excoriated surfaces. The limbs and even the trunk, particularly of women and children exposed during the discomforts of sleep in a tropical temperature to which they are wholly unaccustomed, may be affected equally with the face.

So should it be and so increasingly should it be, in the case of epidemics which can be mitigated by the skill of man, such as yellow fever, where we now know uncleanliness plays such an essential role, and smallpox, where vaccination has worked such important changes. Science, in the long-run, comes to its own. Generations of our ancestors have been vaccinated and re-vaccinated, and even their unvaccinated children confess the influence of the immunity thus secured.

A modification of the potency of any germ may be produced by cultivation in special soils. We need to go no further than the bacteriological laboratories to find proof of this accepted fact. Fraenkel has demonstrated that an enduring decrease, even "a complete and irrevocable loss of virulence," has been produced by artificial cultivation of most of the different species of pathogenic bacteria, and among these may be cited as conspicuous examples the germs of swine-erysipelas, of symptomatic anthrax, and of pneumonia.

Thus a minute organism descended from a death-dealing source may become in the culture-tubes of the experimenter as harmless as those found in an ordinary infusion of hay (bacillus subtilis). The mildness of the present smallpox epidemic can be accounted for rationally only on the basis of the very general practice during the last fifty years of vaccination of our people. Instead of being astounded at the result, we should greet it with a degree of satisfaction. It is the fruit of a century of progress. It is the dream of the exponent of state medicine to modify in similar measures the several scourges of the human race.

War is as destructive as pestilence, and the one often sails in the wake of the other. "After the conflict, what disease?" is the query of the scientist. All our wars have left an heritage of some sort in unusual or unusually prevalent maladies. The battles of the Revolution were followed by such an extensive invasion of the itch that the public journals of that day are seen to be filled with advertisements of remedies for its relief. In the aftermath of the late Civil War, among other disorders, followed an unprecedented number of cases of typhoid-malaria. Our armies in Cuba and Puerto Rico have been lately exposed to smallpox at Holguin and other points. If, as seems probable, they have brough back to us the contagion of the present epidemic, it should be noted that the carriers of these germs were not the natives themselves, but our own carefully vaccinated American soldiers. In these facts alone the scientist may find an explanation of the interesting features of the disease here discussed.

The names popularly given to the disease now epidemic in several states of the Union point more or less suggestively to its origin; for the terms

"Spanish measles," "Cuban itch,"* and "Puerto Rico scratches" are frequently heard in the houses of the sufferers. The island of Puerto Rico has, however, set a notable example to the smaller towns of this country in the way of stamping out the epidemic. Although in December of 1898 three housand cases of smallpox were reported in sixteen of its municipalities, after the establishment of a government vaccine farm about eight hundred thousand natives were successfully vaccinated without rioting or disturbance, at a cost of about four cents for each individual; with the result that in less than one year (according to the report of Surgeon-Major Groff), by October, 1899, no case of smallpox was known to either the civil or military authorities anywhere in the island.

It seems scarcely necessary in this connection to call attention to the fact that even the mildest epidemic of smallpox may, under special circumstances, give rise to the most malignant cases of the disease. It has been already shown that the mitigation of the malady has been largely produced by the universal vaccination and revaccination of generations of the American people. Still it should not be forgotten that all the aggravating factors in the production of an epidemic are not yet wholly revealed to us. It has been supposed that certain climate conditions have exerted some influence in one direction or the other. This, at least, is certain, that the introduction of even a single case of mitigated smallpox in a community which has been unvaccinated, has been again and again the fruitful source of one of the most fearful scourges that has ever afflicted the human family. Who, for example, would dare to introduce one of the victims of the present mild epidemic into such a community as that, for instance, furnished by the unvaccinated natives of Samoa! The consequences would certainly prove more formidable than if they had been subjected to a rain of the explosive missles which have been forbidden lately by the Peace Conference at The Hague. It follows that only the most skillful and energetic measures should be taken to prevent the spread of the present epidemic, even in its mild form, as no living man can predict what type it may assume on the morrow or the following week.

The conclusions which one is justified in drawing from the facts here set forth are as old as the days of Jenner and as imperative as in the year when the clear-sighted von Hebra wrote his chapters on smallpox so lucidly and emphatically that today they present a true picture, as well of the virus as of its most efficient antidote. Vaccination and revaccination of everybody—child, adult, foreigner, native-born—there is no other safe reliance for the present and the future. By the methods known and found most effective in the care of the public health the epidemic must be stamped out and the disease at last completely eradicated. We may well doubt whether a smallpox epidemic, even of mild character, could prevail in any of the smaller communities in England and Germany, where vaccination is so generally and efficiently enforced. It is said that the modern tourist, if he could be transported to the streets of London in the last century would be immensely astonished, not so much by the dress of the people, by the aspect of the shops, and by the odd looking vehicles on the streets, as by the extraordinary number of pock-marked faces on every hand.

*"I am aware of no disease called Cuban itch which could be mistaken for smallpox. There are several erythematous eruptions in Cuba called Cuban itch, but they are prickly heat or ringworm."—Surgeon General U. S. M. H. S. to Illinois State Board of Health, Dec. 7, 1899.

No. 20.—Light discrete case in early pustular stage, from Clarksville, Tenn. Negative by Dr. Louis Leroy. Kindly loaned by Tennessee State Board of Health.

No. 21.—Same case as No. 3. Negative by Dr. Louis Leroy. Kindly loaned by Tennessee State Board of Health.

At last the English people have learned their lesson and learned it well. They have had a bitter experience of the devastation which smallpox is capable of working among their kindred, whether in the hovel or in the palace. They have mourned the loss of a gracious sovereign smitten with the pestilence on the very throne of the kingdom. While we may not wish to follow them in all matters, they have set us a worthy example in the methods by which they have buttressed their bulwarks of immunity. The germs of this pestilence are powerless against the army of their humble villagers and peasantry, ranks upon ranks of whom bear on the arms of each no fewer than four and often as many as six and eight scars of effective vaccination. Vaccination should be the sole passport of entrance to the public schools, to the voters' booth, to the box of the juryman, and to every position of duty, privilege, or honor granted either by the State or by the Nation.

XVIII

FORMALDEHYDE DISINFECTION*

Much has been written in the past few years on formaldehyde gas as a disinfectant. Observers and experimentors have all come to the conclusion that it is the most powerful germicide and disinfectant known, but the mode of application for practical working purposes varies with each experimentor, each claiming good or superior results over others, and each working on different lines. Many different kinds of apparatus and methods have been invented for disinfection of houses after contagious diseases, some exceedingly simple, others, most complex machines—nearly requiring an engineer to operate them; all, however, serving more or less to accomplish the desired result, viz., disinfection. With some of these devices disinfection is so incompletely accomplished that all that can be said of them is that they are simply manufactured "for sale."

These reasons, and others, in February, 1898, led the Commissioner of Health of Chicago to request the writer to experiment with formaldehyde gas as a disinfectant, to determine, if possible, a satisfactory method for using it. Some experiments had been performed previous to that time with but partially satisfactory results, in a manner of boiling a diluted solution of formaldehyde, in an open vessel, over a spirit flame†, and then depending on the liberation of the gas for the purpose of disinfection. It was found that this was far from satisfactory. Other methods were tried. Apparatus, in which the liberation of the gas depended on heating the solution in closed reservoirs or passing through hot coils and then passed by means of a tube through the keyhole, was soon discarded, as it was found that the steam condensed in the room and dripped on the floor. Then the diffusion of the gas through hallways and a series of rooms was too slow to permit of practical working purposes.

Platinum gauze generators for the conversion of methyl alcohol into formaldehyde gas were unsatisfactory, as the gauze soon burnt out, giving a variable amount of the gas.

Paraformaldehyde, or polymerized formaldehyde, was heated and sublimed or converted into the gas; but it was found too much paraform sublimed, coming down as a fine white powder, slowly changing to formaldehyde gas, and producing for days a most persistent irritation to the respiratory passages and eyes, and with but slight disinfecting qualities.

At that time the writer, with the assistance of one of the disinfectors, sprayed the walls of a dwelling with the 40 per cent. solution of formalde-

*Text and cuts kindly furnished by the Chicago Health Department.

†January Bulletin, 1898, Chicago Health Department. Formaldehyde Disinfection.

Formaldehyde Disinfection—Chicago Health Department.

hyde. It was found that the liberation of the gas was so rapid as to force a most precipitate retreat.

This suggested the idea that if formaldehyde was sprinkled in the rooms in sufficient quantities it would disinfect them. But it was found that this was impracticable, because if any of the solution came in contact with the varnish or furniture and woodwork of a room, the wood alcohol in the solution would dissolve the varnish and leave a white spot which could not be removed, unless polish was put on again. Then to be sprinkled on carpets and rugs it soaked into them and very slowly evaporated, leaving a very persistent odor of formaldehyde, which sometimes lasted for days, and not at all pleasant for the occupants. This next led the writer to try bed sheets, which were hung on clothes lines stretched across the middle of the rooms, and on these sheets the solution was poured, and allowed to evaporate. For this purpose 150 c. c., or five oz., were used for every 1,000 cubic feet of air space. Still further experiments showed that when the solution was poured on the sheets a part of it remained as paraform. This again led the writer to arrange some device by means of which the solution could be evenly distributed all over the sheet without producing large splashes and leave a minimum of paraform. At first a bottle was used to which an ordinary watering pot rosehead* was attached, and the solution thrown on the suspended sheets, but this was soon modified and changes made until a suitable apparatus was devised for disinfection purposes and a new system of room disinfection was introduced.

The disinfection apparatus consists of a twenty-two-oz. bottle (700 c. c.) closed with a three-holed rubber stopper. Through one opening projects a straight vulcanized rubber tube surmounted by a rosehead sprinkler containing eight 1 m. m. perforations; to the other end is attached a rubber tube reaching to the bottom of the bottle. In the second opening of the stopper is another tube connected with a rubber bulb by means of a piece of rubber tubing. This is for the purpose of compressing the air in the bottle to force the fluid from the sprinkler top. The third opening is guarded by a metallic plug having a ring attached to it and under the guidance of the thumb to release the air pressure when sufficient formaldehyde has been sprayed on the sheets.

Apparatus devised by the Author and made by Sharp & Smith, 92 Wabash Ave., Chicago.

With this apparatus experiments have been conducted during the last two years and a half for the purpose of determining the efficiency of this method, with most excellent results, which will be noted after the method of disinfection and the details of preparation of infected rooms have been given.

METHOD OF OPERATION

When a house is to be disinfected all crevices around windows, doors, transoms, and all openings into the rooms should at first be thoroughly sealed up with strips of gummed paper about two

*March Bulletin, 1898, Chicago Health Department, Formaldehyde Disinfection.

inches wide and two feet long, to make the rooms as air-tight as possible. The surfaces under these strips should first be wiped with a cloth dampened in bichloride solution 1-1000 for the purpose of removing all germs which would be sealed under the strips covering the crevices. The stoves, fireplaces and flues should also be closed, or when it can be done several thicknesses of newspaper placed over the opening next to the stove and the stovepipe set on that. The draught caused by chimneys would soon weaken the quantity of the gas in a room, and just that much reduce the proper quantity necessary for the disinfection.

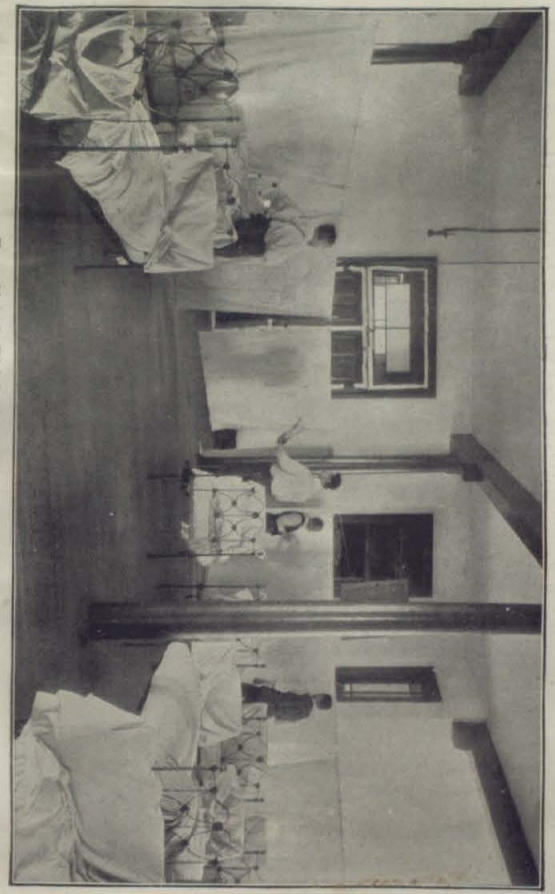
The beds should then be torn apart, the pillows hung over the backs of chairs or on lines, blankets and quilts hung over chairs as loosely as possible, bureau drawers are to be opened and the contents scattered and loosened; folded clothing must be unrolled. Books which came in contact with, or were used by the patient must be set on end and the pages spread to their greatest extent. Rugs, which through neglect, were permitted to remain in the sick room, must be lifted up on chair backs to allow the gas to come in contact with every part of them. Open clothes closets and separate the clothes. Clothing which the patient wore during his or her sickness must be thoroughly looked after, and should be hung on lines stretched across the rooms. This also applies to all soiled clothes, handkerchiefs, etc.

The patient should be given an antiseptic bath and fresh clothes put on before being allowed to mingle with other people. This is especially of importance after smallpox and scarlet fever (and it might be said of any infectious disease), as no matter how thorough would be the disinfection, if this bath and fresh clothing be omitted the rooms are liable to again be reinfected and the disinfection would be worse than useless.

After everything has been hung out and scattered about, a clothes line is stretched across the middle of the rooms, and on this line bedsheets are suspended, fastened by their edges with safety pins. They should not be doubled over the line. The sheets must hang high enough to clear the floor, and under them newspapers should be spread to catch any drops of formaldehyde which might spatter in the sprinkling process.

The sheets can be multiplied to any number, but one must be used for every 1,000 cu. ft. to be disinfected. Everything then being in readiness for applying the formaldehyde solution, the operator takes the sprinkling apparatus in the left hand and the bulb in the right and, compressing it, forces the solution in very fine streams on the sheets. The operator should stand about three feet from the sheets to be sprayed. Here again care must be taken to spread the solution over the sheets as evenly as possible, but not to saturation, going over each sheet but once. One sheet will carry about six ounces, but more should not be applied to any one sheet. Experimental research has shown that the minimum required is at least 180 c. c., or 6 oz. for every 1,000 cu. ft. of air space in the rooms to be disinfected.

A damp towel folded to several thicknesses and tied over the nose will permit the person using the apparatus to remain a little longer near the sprayed sheets. Always commence spraying the farthest sheet, working out, and after all have been sprayed the rooms should be left and the door of exit sealed at once. Thus prepared, the rooms should be left closed at



Formaldehyde Disinfection—Chicago Health Department.

least eight hours where the conditions of the premises are good, but where poor conditions prevail a longer time may be required, according to the judgment of the disinfector. If large halls or school rooms are to be disinfected, several bottles should be filled beforehand to facilitate the work.

After the termination of the disinfection the door is again opened and some of the gas allowed to escape before entrance is made into the rooms. Then one window after another is to be opened and the sheets taken down. If care has been taken in the sprinkling and none of the solution dropped on the floor or carpets, the rooms can be occupied from one-half to one hour after opening.

Should there be any odor of formaldehyde gas after one hour, a little ammonia water and oil of peppermint sprinkled around the rooms will soon dispel all traces of the irritating gas.

CONDITIONS TO BE OBSERVED IN DISINFECTION

When the temperature is low or near the freezing point, the full 40 per cent solution should be used; this also holds true till the temperature of the rooms reaches 78-80 degrees F. When above that disinfection will be much facilitated if the solution is diluted, and in excessively hot weather and rooms the solution can even be diluted one-half or more and then sprayed depending greatly on the evaporation in the rooms. It is this added water producing a "Moister gas", which will very markedly add to the value of disinfection. But the minimum of the actual 40 per cent solution must then still be 6 ounces for every 1,000 cubic feet.

Experiments were conducted at various places and under the most trying circumstances, as well as under favorable conditions of disinfection and premises. Sometimes basements of the dampest kind were disinfected and tests placed in these showed most gratifying results after disinfection. At first small cans of blood serum inoculated with various germs were used, being exposed in the rooms, some high, some low, open or covered with three or four thicknesses of bed sheeting, but it was always found that the growth was destroyed. The germs used were B. of Klebs-Loeffler, typhoid bacillus, Staph. Pyog. Aur., Coli Com., and anthrax. These cans have now been discontinued, as they have demonstrated to satisfaction the value of the gas as a surface disinfectant.

Inclined agar tubes were next used, inoculated and exposed in the rooms to be disinfected. Some were opened and some left with the cotton plugs in the top. Into those left open the gas penetrated to varying depths according to the germs used. Into the tubes left closed the penetration was not so deep, but still with very good results. The control tubes—also the cans—showed a most abundant and luxurious growth in every case, as fresh cultures were always used, insuring a good growth.

EXPERIMENTS WITH DRY GERMS

"One hundred swabs, which were used for collecting the throat secretions in cases of suspected diphtheria, were obtained from the laboratory after bacterial examination, showing 20 per cent of verified diphtheria and the remainder showing mixed infections of staphylococci, streptococci, the B. lanceolatus and B. prodigiosus. These swabs, in their original rubber-capped glass tubes, were taken to houses to be disinfected and there exposed

in their dry state to the action of the formaldehyde in the usual domestic disinfection.

They were returned to the laboratory in sterilized tubes, placed in bouillon and incubated from forty-eight to seventy-two hours, with the following results: In eleven of the tubes the bouillon showed some turbidity; in the remaining eighty-nine the bouillon remained clear. Microscopic examination of the cloudy bouillon showed chiefly the yeast germ, three staphylococci, eight B. prodigiosus; but no diphtheria bacilli were found." (Chicago Health Department Bulletin, May, 1899.)

Cover glass preparations of bacteria, dried, were used in over two hundred experiments. These consisted of B. Diph., Typhoid, Coli Com., Staph. Pyog. Aur. and alb. and the Class Bacteria of Scarlatina.

The slides were prepared from fresh cultures of these bacteria in the same manner as for microscopical examination. They were sent with the disinfectors and placed in various positions in the houses to be disinfected, then returned to the laboratory in sealed boxes, the smear taken up with distilled sterilized water and inoculations made on similar media from which they were taken. The results were that almost without exception no growth resulted, whereas in every instance control slides gave immediate and abundant growth. At times these slides were freely exposed; at other times wrapped in double thicknesses of sterilized woolen blankets, with the same results.

DATE.	ADDRESS.	DISINFECTOR.	METHOD.	CU. FT.	C. C.	GERMS.	RESULTS.	Remarks †
Mar.						Cans	Open	Condition.
1	19 Miller	Behm	Gehrman } Generator }	3976	720	B. Diph.	O	Poor
2	416 Wolfram	Helmuth	Sheets	2160	400	B. Diph.	O	Poor
4	Oak and State	Helmuth	Generator	1584	300	B. Diph.	O	Good
5	22 Gladys street	Grady	Generator	3672	400	B. Diph.	O	
7	260 Bowen Ave.	Carr } Behm }	Generator	6720	1200	B. Diph.	O	Good
8	556 W. 14th st.	Grady	Generator	4836	700	B. Diph.	O	
11	467 Southport	Helmuth	Sheets	2200	360	B. Diph.	O	Fair
13	1747 Carroll	Grady	Generator	12540	2500	B. Diph.	O	Fair
18	39 Pearson	Behm	Sheets	7400	1400	B. Diph.	O	Fair
19	100 Randolph	Behm	Sheets	100	50	B. Prodig	*	Very poor
21	1049 Winthrop	Gray } Behm }	Generator	3820	540	B. Diph.	O	Good
21	35 Norton	Behm } Daly }	Sheets	960	180	B. Diph.	O	Fair
21	686 Jackson	Grady	Sheets	4680	800	B. Diph.	O	
22	71 University	Behm	Sheets	1960	200	B. Diph.	O	Good
23	445 Elm		Mulford's } Generator }	3200	540	Noted	by	Gehrman*
24	445 Elm		Mulford's } Generator }	2560	480	B. Diph.	by	Gehrman*
24	529 W. 12 st.	Daly } Behm }	Sheets	900	180	B. Diph.	O	Good
25	234 Wells	Helmuth	Sheets	1850	375	B. Diph.	O	Good
26	1356 Washington	Grady	Sheets	1440	300	B. Diph.	O	Good
29	119 Willow	Helmuth	Sheets	4350	500	B. Diph.	*	Fair, slight growth after 72 hours.

† Results and charts the same as turned in for monthly reports.
* Most all germs green.
N. B. Controls grow in every case.

Formaldehyde Disinfection—Chicago Health Department.

SHEETS: 5 HOURS EXPOSURE

DATE.	ADDRESS.	DISINFECTOR.	CU. FT.	C.C.	MEDIA CULTURES.	RESULTS.	CONTROLS	CONDITI'N OF ROOM.
July								
5	1411 Newport	Helmuth	2000	360	Cans Coli Com.	O	†	Good
5	597 Union St.	Daly	2370	360	" "	O	†	Poor
5	239 Dearborn	Gossert	2700	400	" "	O	†	Very poor
7	640 Otto St.	Gray	1500	225	Tubes "	Penetration to 1 in. from bottom	†	Fair
7	312 Throop	Daly } Behm }	2280	382	" "	" " from bottom		Fair
9	182 Lewis	Gossert	2300	375	Cans	O		
11	Goethe	Gosser } Behm }	6500	900	Tubes			
					4 { 1 on bed, 8ft. 1 on floor, 4ft 1 on bed, 6 ft 1 on ch'r, 8 ft }	Penetration to 1 in. from bottom	†	Fair
12	6536 State	Carr	4200	600	Cans Mixed	Infection from swabbing throat	†	Bad
					1 on bed	†		
					1 on floor	O		
					2 on table	O		
14	91 Church	Behm	3300	475	2 Cans Typhoid	O	†	Very poor
14	405 W. 13th	Daly	3060	300	Cans Anthrax with Spores	Trans. Inc 24 hrs. very few colonies, most likely from spores	†	Very poor
15	195 14th Pl.	Daly } Behm }	5272	750	Cans "	Trans. inc. 24 hrs very slight growth	†	Very damp basement full of rags
					1 "	†		
					2 "	†		
					3 "	†		
					Typhoid	Trans. inc. 24 hrs no growth	†	Very damp basement full of rags
					1 "	O		
					2 "	O		
					3 "	O		
19	2876 N. Ashland	Gray	6000	900	Cans Typhoid	Trans. inc. 24 hrs. no growth	†	Good
					1 "	O		
					2 "	O		
					3 "	O		
21	532 14th Pl.	Daly	3108	450	Cans Typhoid	Trans. inc. 24 hrs. no growth	†	Poor
					1 "	O		
					2 "	O		
					3 "	O		
19	1411 Newport	Helmuth } Behm }	10000	1600	Cans Anthrax	Trans inc. 24 hrs. very small growth	†	Good
					1 "	†		
					2 "	†		
					Typhoid	Trans inc. 24 hrs. no growth	†	
					1 "	O		
					2 "	O		
					Cans Dipt.	Trans. inc. 24 hrs.	†	
					1 "	O		
					2 "	O		
					Tubes Dipt.	Penetration trans*	†	
					1 "	2 in. A O, B †		
					2 "	2 in. A O, B †		
					Typhoid	Penetration 1½ in. A O, B †	†	
						2 in. A O, B †		
					Coli Com.	Penetration trans., 1 in. A O, B †		
						1½ in. A O, B †		

*A—Above; no Growth. B—Below; no growth. († Represents plus sign in above table—Compositor.) Trans. inc. means transferred incubated.

DATE.	ADDRESS.	DISINFECTOR.	MEDIA	CULTURES.	RESULTS.	TRANSFERS.	CONTROLS	CONDITION OF ROOMS.
July								
25	361 W. 64th	Carr	Tube	Diph.	Penetration to 2 in. from bot.	A. O. B. †	†	
				Coli Com.	" " "	A. O. B. †	†	Fair
				Typhoid	" " "	A. O. B. †	†	
25	1079 S. Albany	Flood	Tube	Diph.	" " "		†	
				Typhoid	" " "		†	Very bad
25	523 Taylor	Daly	Tube	Diph.	" 1 "	A. O. B. †	†	
				1 Diph.	" 1 "	A. O. B. †		
				2 Diph.	" 1 "			
			Tube	Typhoid	" 1½ "	A. O. B. †	†	
			Tube	1 Typhoid				
				2 Typhoid	" 1½ "	A. O. B. †	†	Bad
26	93 Johnson	Gossert	Tube	Diph.	" 2 "	A. O. B. †	†	
			Tube	Diph.	" 2 "	A. O. B. †	†	Bad
			Tube	Typhoid	" 1½ "	A. O. B. †	†	
26	2934 Canal	Carr	Tube	Coli Com.	" 1 "		†	
				1 Coli Com.	" 1 "			
				2 Coli Com.	" 1 "			Fair
				3 Coli Com.	" 1 "			
				4 Coli Com.	" 1 "			
26	2189 W 12th	Flood	Tube	Coli Com.	" 1½ "		†	Good
26	264 Johnson	Daly	Tube	Diph.	" 2 "		†	Fair

Formaldehyde Disinfection—Chicago Health Department.

(1) 7000 cu. ft. 1200 c. c. Closed 11 A. M. Opened 4 P. M.
Tubes 6 in. x ¾ in.

Diph.	Open	Penetration to 2 in. from bottom
Typhoid	Open	Penetration to 2 in. from bottom
Coli Com.	Open	Penetration to 2½ in. from bot.

Three cans of blood serum; same germs, results: No growth.
Controls all grew.
Temperature 46° Wind N. E., 18 M.
Humidity 75 per cent. Sunshine 80 per cent.

(2) 4000 cu. ft. 600 c. c. Closed 11 A. M. Opened 4:30 P. M.
Tubes 6 in. x ¾ in.

Diph.	(1) Open	high,	penetration 2½ in. from bottom.
Diph.	(2) Open	low,	penetration to 2 in. from bottom.
Staph. Pyog. Aur.	high	Result O	high 2¾ in. from bottom.
	low	Result O*	low 2 in. from bottom.
Diph.	(3) clossd on table	Penetration to 2½ in. from bottom.	

Three cans of same germs on blood serum; result no growth.
Controls all grew.
Temperature 46 degrees. Wind, N. E., 18 M.
Humidity, 75 per cent. Sunshine 80 per cent.

(3) 1400 cu. ft. 200 c. c. Closed 11:30 A. M. Opened 5:30 P. M.
Tubes 6 x ¾ in.

1 Diph.	(a) Open	penetration to 1½ in. from bottom.
"	(b) Closed	" " 2¾ " " "
2 Typhoid	(a) Open	" " 2 " " "
3 Coli Com.	(a) Open	" " 2½ " " "
	(b) Closed	" " 2¾ " " "
	(b) Closed	" " 3½ " " "
4 Staph. Phyog. Aur.	Open	" " 2½ " " "

Temperature 70 degrees. Wind, S. Rain, Trace.
Humidity 86 per cent. Sunshine 20 per cent.

(4) 7,500 cubic feet. 1,125 c. c. Closed 11:30 A. M. Opened 5:30 P. M.
Eight cans of blood serum inoculated with B. Diph., Typhoid, Coli Com. and Staph. Pyog. Aur.
Covered with 3-4 thicknesses of bed sheets and pillow cases.
Result: No growth after incubation of 48 hours.
Inclined agar tubes with streak cultures.

Diph.	(1) high;	Penetration to 1 in. from bottom.
	(2) low;	" " 1 " " "
Typhoid	(1) high;	" " 1½ in. from bottom.
	(2) low;	" " 1½ " " "
Coli Com.	(1) high;	" " 2¾ " " "
	(2) low;	" " 2¾ " " "
Staph. Pyog. Aur.	low	" " 2½ " " "

Controls grew to the top of the agar in the tubes to 1 in. from top.
Six swabs of Diphtheria, Staph. and Strep.
Incubated after return in neutral bouillon: 72 hours.
Results: no growth.
Controls all became turbid, showing growth.

* O meaning all bacteria killed.

(5) 9,080 cu. ft. 1,320 c. c. Closed 12:30. Opened 8 P. M.

	Serum cans.			Inclined agar tubes.
Diph.	high	result	O	high; penetration to 2 in. from bottom.
	low	"	O	low; penetration to 1½ in. from bottom.
Typhoid	high	"	O	3 ft. from floor penetration to 2 in. from bottom.
	low	"	O	3 ft. from floor penetration to 2¼ in. from bottom.
Coli Com.	high	"	O	5 ft. from floor 3 in. from bottom.
	low	"	O	5 ft. from floor 2¾ in. from bottom.

Six dry swabs with infection of B. Diph., Staph., and Strep., incubated in natural bouillon 72 hours; result: no growth.

The agar tubes were used for the purpose of determining the penetration of the gas into small and confined places, and if it was present in sufficient quantities to destroy germ life.

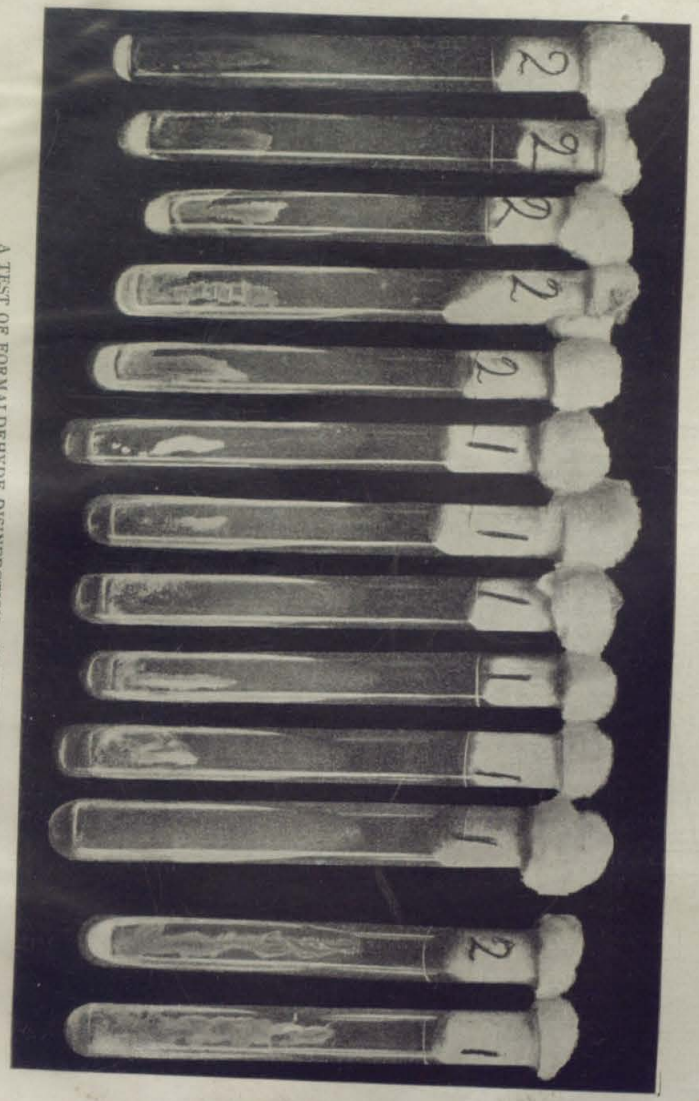
From the foregoing experiments one can at once see the value of formaldehyde as a disinfectant. Surface disinfection is complete. Where thick mattresses have been soaked with infectious material, it is recommended that they be sprayed with the solution and then folded together and left to lay for some time afterward. Penetration through fabrics occurs to a very great extent, but when too thick nothing short of a vacuum disinfection cylinder, with previous exhaustion of the air and then the admission of formaldehyde gas, would force it to the innermost parts.

In the course of hundreds of domestic house disinfections after contagious diseases, it is very seldom that a recurrence of disease is noted. When an *entire* house is disinfected there is *no possibility of a recurrence*, as is amply demonstrated by the reports of the Chicago Health Department disinfecting corps. Oftentimes disinfections are requested and performed before a case has really passed through the second or convalescing stage, and if then done disinfection is mere folly. A case should have absolutely recovered before the attempt at *general disinfection is undertaken*. Disinfection after smallpox has proven that formaldehyde gas is all that can be expected of it as a disinfectant. The cases after which it was performed ranged from the mildest to the severest types, with no recurrence of a single case in any of the premises where the work was done.

This method was demonstrated at the meeting of the American Medical Association in June, 1899, since which it has been very ably championed by many experimenters, and the system inaugurated by many health boards and quarantine stations, and also adopted for the disinfection of railway coaches by many of the great lines running into Chicago. A large number of coaches can be disinfected in one day. School boards are also using the method for the disinfection of schools, and in the last year the Board of Education of Chicago has applied the system in infected rooms and school houses, thereby checking an epidemic which seemed to have its origin in those schools.

The advantages of this system of disinfection are many—

First—Its simplicity and thoroughness.



A TEST OF FORMALDEHYDE DISINFECTION. FROM PHOTOGRAPHS.
A, C, F, G, H, K—Tubes exposed with open mouths. B, D, E, I, J—Tubes closed cotton plugs.
(Health Department Bulletin, May, 1899.)

Second—No burden or cumbersome generators have to be carried out, but the sprinkler and supplies can be carried in an ordinary hand satchel, and with an extra supply bottle enough can be taken at the start for three or four disinfections.

Third—Nothing is destroyed in the houses disinfected, as usually occurred after the old sulphur fumigation.

Fourth—Each room becomes its own source of disinfection.

Fifth—There is no fire or danger from explosions.

Sixth—It does not require hours of waiting on the part of the operator for the solution to evaporate, as is necessary when generators are used.

Entire disinfection is made as nearly perfect as can possibly be done; any person can thoroughly disinfect his own house, and it is the belief of the writer that the question of domestic disinfection has been solved.

CHAS. W. BEHM,
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XIX

DISINFECTION AND INDIVIDUAL PROPLYLAXIS AGAINST INFECTIOUS DISEASES*

(Revised by the Author in 1899)

INTRODUCTION

Definition. We are met at the outset by a difficulty growing out of the fact that the word *disinfection*, as commonly used, has a very different signification from that to which certain authors would restrict it. Thus, the Committee on Disinfectants of the American Public Health Association defines a disinfectant as "an agent capable of destroying the infective power of infectious material."[1] in the preliminary report of this committee the reasons for restricting the meaning of the word within the limits justified by its etymology, and of our knowledge of the nature of "infectious material," are very clearly stated, as follows:

"The object of disinfection is to prevent the extension of infectious diseases by destroying the specific infectious material which gives rise to them. This is accomplished by the use of disinfectants.

"There can be no partial disinfection of such material: either its infecting power is destroyed, or it is not. In the latter case there is a failure to disinfect. Nor can there be any disinfection in the absence of infectious material. * * *

"Popularly, the term disinfection is used in a much broader sense. Any chemical agent which destroys or masks bad odors, or which arrests putrefactive decomposition, is spoken of as a disinfectant. And in the absence of any infectious disease it is common to speak of disinfecting a foul cesspool, or a bad-smelling stable, or a privy vault.

"This popular use of the term has led to much misapprehension, and the agents which have been found to destroy bad odors—deodorizers,—or to arrest putrefactive decomposition—antiseptics—have been confidently recommended and extensively used for the destruction of disease germs in the excreta of patients with cholera, typhoid fever, etc.

"The injurious consequences which are likely to result from such misapprehension and misuse of the word disinfectant will be appreciated when it is known that recent researches have demonstrated that many of the agents which have been found useful as deodorizers, or as antiseptics, are entirely without value for the destruction of disease germs.

*Lomb Prize Essay, by George M. Sternberg, M. D., LL.D., surgeon general United States army—reprinted by permission of Dr. C. O. Probst, Columbus, O., Secretary American Public Health Association.

1 *The Medical News*, Phila., Jan. 24, 1885, p. 87.

"This is true, for example, as regards the sulphate of iron or copperas, a salt which has been extensively used with the idea that it is a valuable disinfectant. As a matter of fact, sulphate of iron in saturated solution does not destroy the vitality of disease germs, or the infecting power of material containing them. This salt is, nevertheless, a very valuable antiseptic, and its low price makes it one of the most available agents for the arrest of putrefactive decomposition in privy vaults, etc.

"Antiseptic agents also exercise a restraining influence upon the development of these germs, and their use during epidemics is to be recommended when masses of organic material in the vicinity of human habitations cannot be completely destroyed, or removed, or disinfected.

"While an antiseptic agent is not necessarily a disinfectant, all disinfectants are antiseptics; for putrefactive decomposition is due to the development of 'germs' of the same class as that to which disease germs belong, and the agents which destroy the latter also destroy the bacteria of putrefaction, when brought in contact with them in sufficient quantity, or restrain their development when present in smaller amounts.

"A large number of proprietary 'disinfectants' so called, which are in the market, are simply deodorizers or antiseptics of greater or less value, and are entirely untrustworthy for disinfecting purposes."[1]

The offensive gases given off from decomposing organic material are no doubt injurious to health; and the same is true, even to a greater extent, of the more complex products known as *ptomaines*, which are a product of the vital—physiological—processes attending the growth of the bacteria of putrefaction and allied organisms. It is therefore desirable that these products should be destroyed; and, as a matter of fact, they are neutralized by some of the agents which we recognize as disinfectants, in accordance with the strict definition of the term. But they are also neutralized by other agents —deodorants—which cannot be relied upon for disinfecting purposes, and by disinfectants, properly so called, in amounts inadequate for the accomplishment of disinfection. Their formation may also be prevented by the use of *antiseptics*. From our point of view the destruction of sulphureted hydrogen, of ammonia, or even of the more poisonous ptomaines, in a privy vault, is no more disinfection than is the chemical decomposition of the same substances in a chemist's laboratory. The same is true as regards all of the bad-smelling and little known products of decomposition. None of these are "infectious material," in the sense in which we use these words; that is, they do not, so far as we know, give rise *directly* to any infectious disease. Indirectly they are concerned in the extension of the epidemic "filth diseases," such as cholera, yellow fever, and of the fatal endemic filth diseases, such as typhoid fever and diphtheria, which in the long run claim more victims than do the pestilential maladies first named. This because persons exposed to the foul emanations from sewers, privy vaults, and other receptacles of filth, have their vital resisting power lowered by the continued respiration of an atmosphere contaminated with these poisonous gases, and are liable to become the victims of any infectious disease to which they may be exposed. Moreover, the accumulations of filth which give off these offensive gases furnish pabulum upon which certain disease germs thrive; and it may happen that the bad smelling air

1 *The Medical News*, Apr. 18, 1885, p. 425.

carries something worse than the poisonous gas which makes its presence known by offending the sense of smell. It may waft to our nostrils infectious particles which are beyond recognition by any sense, unless it be the sense of sight with the aid of a good microscope.

We desire, moreover, to have it fully understood that in restricting the meaning of the term disinfection within the limits given by the definition of the Committee on Disinfectants of the American Public Health Association, we do not wish to limit the practice of "disinfection," in the popular sense of the word.

It is but fair to say, also, that this popular usage is supported by good authority, and until quite recently has been the common acceptation of the term among physicians and chemists. Indeed, it is but a short time since the nose test was the only test of "disinfection" recognized by many intelligent persons.

Littre, in his Dictionary of the French Language, defines disinfectants as "substances which destroy, chemically, bad odors."

Vallin, the author of a valuable treatise upon "Disinfection and Disinfectants," says,—

"From a scientific point of view there is perhaps an impropriety in introducing into the idea of disinfection the suppression of odors which offend the sense of smell. The bad odor is not injurious in itself; it is an epiphenomenon, which does not necessarily give the measure of the hurtful properties of the air, or of any substance whatever. The public, unacquainted with medicine, has an unfortunate tendency to judge of insalubrity by the bad odor; the absence of this gives to it a deceitful security; when they are masked by any device, it [the public] believes that all danger has been removed *Nevertheless it is necessary to avoid violating the ordinary sense of words*.[1] An atmosphere which does not in the least offend the sense of smell may certainly be insalubrious, and engender the gravest maladies; but the fetid or disagreeable odors may reveal the presence of injurious principles, of toxic gases, or of organic matter in decomposition. We should not too much diminish the importance of these offensive odors in the eyes of the public; everything which smells badly is to be suspected."[2]

We agree with Prof. Vallin, that the bad odors should arouse suspicion, and lead to the use of deodorants, or of antiseptics, or of disinfectants, if required; but let us not leave the public to suppose that when the bad odors have been neutralized, the offensive material has been disinfected. Let us rather instruct the public that to deodorize and to disinfect are not synonymous terms. For our part we prefer to "violate the ordinary sense" of the word, and to restrict its signification within such limits as will prevent confusion, and, what is far worse, a reliance upon inefficient methods for the destruction of infectious material.

In the present essay we shall use the words disinfection and disinfectant, in accordance with the definition of the committee on disinfectants already given. But, inasmuch as this is intended to be a practical treatise for popular use, we shall also give, in the proper place, directions for the use of deodorants and of antiseptics, so that "disinfection," in the broad sense in which the word is commonly used, may be fully considered.

1 Italics by present writer.
2 Op. Cit., p. 2.

Tests of Disinfection. What means have we of proving that the infective power of infectious material has been destroyed?

Evidence of disinfection may be obtained (*a*) from the practical experiments—experience—of those engaged in sanitary work; (*b*) by inoculation experiments upon susceptible animals; (*c*) by experiments made directly upon known disease germs.

(*a*) It is a matter of common experience, that when a room has been occupied by a patient with an infectious disease, such as smallpox, scarlet fever, or diphtheria, susceptible persons are liable to contract the disease weeks or even months after the patient has been removed from it, unless in the meantime it has been disinfected. If a second case does occur from exposure in such a room, it is evident that it has not been disinfected. But the non-occurence of subsequent cases cannot always be taken as evidence that the means of disinfection resorted to were efficient. Negative evidence should be received with great caution. In the first place, the question as to whether susceptible individuals have been fairly exposed in the disinfected room must be considered. Then it must be remembered that susceptible persons do not always contract a disease, even when they are exposed in a locality known to be infected. A further difficulty in estimating the value of evidence obtained in practice arises from the fact, that, in connection with the special means of disinfection resorted to, such as fumigation, hanging up cloths saturated with a disinfecting solution, etc., it is customary to resort to additional precautionary measures, such as washing surfaces with soap and hot water, white-washing plastered walls, and free ventilation. It is apparent that under these circumstances it would be unsafe to accept the fact, that no other cases occurred in a room treated in this way, as evidence that the particular disinfectant used is efficient for the destruction of the infectious agent of the disease in question. The fond mother who attaches a charm to her child's neck to protect it from evil, also takes the precaution of guarding it from contact with other children who are sick with any infectious disease. If her child fortunately grows to manhood or womanhood without having suffered an attack of scarlet fever or diphtheria, she may imagine that her charm has protected it, but the evidence upon which her faith is founded is not of a nature to convince those who are familiar with scientific methods of demonstration. "Well educated" persons are often ready to testify in favor of methods of disinfection, or of treatment, upon evidence which, from a scientific point of view, has no more value than that which the fond mother in question has to offer in favor of the little bag containing camphor or assafœtida, or some other charm of equal value, which she has attached to her child's neck to keep it from catching scarlet fever or diphtheria at school. On a par with these charms, so far as disinfection is concerned, we may place the saucer of chloride of lime, which it was formerly the fashion to place under the bed of a patient sick with an infectious disease, the rag saturated with carbolic acid, or chloride of zinc, suspended in the sick room, and even the fumigations with burning sulphur, as sometimes practiced by those who are unfamiliar with the evidence as to the exact value of this agent, and the conditions necessary to ensure successful disinfection with it.

Chloride of lime, sulphurous acid gas, and carbolic acid are among our most useful disinfecting agents, but disease germs are not to be charmed away by them any more than by a little bag of camphor.

Having pointed out the fact that negative evidence, in a restricted field of observation, must be accepted with great caution in estimating the value of disinfectants, we hasten to say that the combined experience of sanitarians, derived from practical efforts to restrict the extension of infectious diseases, is of the greatest value, and that this experience is to a great extent in accord with the results of exact experiments made in the laboratory.

(*b*) Inoculation experiments upon susceptible animals, made directly with infectious material which has been subjected to the action of a disinfectant, have been made by numerous observers. The proof of disinfection in this case is failure to produce the characteristic symptoms which result from inoculation with similar material not disinfected. Thus, Davaine found that the blood of an animal just dead from the disease known by English writers as anthrax or splenic fever (Fr. *Charbon*), inoculated into a healthy rabbit or guinea-pig, in the smallest quantity, infallibly produces death within two or three days; and the blood of these animals will again infect and cause the death of others, and so on indefinitely. This anthrax blood therefore was infectious material, which could be utilized for experiments relating to the comparative value of disinfectants. Davaine made many such experiments, not only with the blood of anthrax, but also with that of a fatal form of septicæmia in rabbits, which is known by his name. Other investigators have followed up these experiments upon infectious material of the same kind, and also upon material from other sources—*e. g.*, the infectious material of glanders, of tuberculosis, of symptomatic anthrax, of fowl cholera, of swine plague, etc.

It has been proved that the infectious agent in all of the diseases mentioned is a living germ, and that disinfection consists in destroying the vitality of this germ. But in experiments made with blood or other material obtained directly from diseased animals, the results would be just as definite and satisfactory if we were still ignorant as to the exact nature of the infecting agent. The test shows the destruction of infecting power without any reference to the cause of the special virulence, which is demonstrated to be neutralized by certain chemical agents in a given amount. All of the experiments made with the above mentioned kinds of virus have been made upon the lower animals; but there is one kind of material which it is justifiable to use upon man himself, and with which numerous experiments of a very satisfactory character have been made. This material is vaccine virus. Fresh vaccine, when inoculated into the arm of an unvaccinated person, gives rise to a very characteristic result,—the vaccine vesicle. The inference seems justified that any agent which will neutralize the specific infecting power of this material will also neutralize the smallpox virus. Thus far it has not been definitely proved that the infective agent in vaccine virus is a living germ; but the numerous experiments made have shown that the chemical agents, which have the power of destroying the various kinds of infectious material heretofore mentioned, have also the power, in about the same amounts, of neutralizing vaccine virus, as shown by its failure to produce any result when inoculated into an unvaccinated person. In these experiments the more careful investigators have taken the precaution of vaccinating the same person with disinfected and non-disinfected virus from the same source. A successful vaccination with the non-disinfected virus shows that the individual is susceptible, and the material good; failure to produce any result is evidence that the potency of the disinfected virus has been destroyed by the chemical agent to which it was exposed.

(*c*) As already stated, it has been demonstrated that the infectious diseases of the lower animals, which have furnished the material for experiments upon disinfectants by the method of inoculation, are "germ diseases," and that the infectious agent is in each case a living microorganism, belonging to the class known under the general name of *Bacteria*. The bacteria are vegetable organisms, which, by reason of their minute size and simple organization, must be placed at the very foot of the scale of living things. But they make up in number and in rapidity of development for their minute size; and there is good reason for believing that the infectious diseases of man are also caused by pathogenic—disease-producing—organisms of the same class. Indeed, this has already been proved for some of these diseases, and the evidence as regards several others is so convincing as to leave very little room for doubt.

Many of these disease germs are now known to us, not only by microscopic examination of the blood and tissues of infected animals, but also by "culture experiments." That is, we are able to cultivate them artificially in suitable media, and to study their mode of development, etc., in the laboratory, quite independently of the animals from which our "pure cultures" were obtained in the first instance. The culture fluids used are prepared from the flesh of various animals; and when to one of these a certain quantity of gelatine is added, we have a "solid culture medium," upon the surface of which some of these germs will grow most luxuriantly. To start such a "culture," it is only necessary to transfer, with proper precautions, a minute quantity of the infectious material to the surface of our culture medium, or into a fluid which has been found to be suitable for the growth of the particular organism which we desire to cultivate. A second culture is in the same way started from the first, and so on indefinitely.

Now it is evident that these "pure cultures" furnish us a ready means for testing the power of various chemical agents to destroy the vitality of known disease germs, as shown by their failure to grow in a suitable culture medium after exposure for a given time to a given percentage of the disinfectant. Very many experiments of this nature have been made. The reader who desires fuller details as to the method of conducting such experiments, and of the results obtained, is referred to the preliminary reports of the committee on disinfectants of the American Public Health Association, published in 1885 in the *Medical News*, Philadelphia, and also published in full in the annual volume of the Association for 1888. We may say here, that the experimental data on record indicate that those agents which are efficient for the destruction of any one of the pathogenic organisms upon which experiments have been made, or of harmless species of the same class,—*e. g.*, the bacteria of putrefaction,—are efficient for the destruction of all, *in the absence of spores*. There is, it is true, within certain limits, a difference in the resisting power of different organisms of this class to chemical agents. This is not, however, sufficiently marked to prevent the general statement that a *disinfectant for one is a disinfectant for all in the absence of spores*.

The last clause of the above statement calls for an explanation, and certain details with reference to the mode of reproduction of disease germs.

All of the bacteria multiply by binary division; that is, one individual divides into two, and each member of the pair again into two, and so on. The spherical bacteria, known as *micrococci*, multiply only in this way, but the rod-shaped bacteria, or *bacilli*, also form spores. These spores correspond with the seeds of higher plants. They are highly refractive, oval or spherical bodies, which, under certain circumstances, make their appearance in the interior of the rods, which cease to multiply by binary division when spore formation has taken place. The point of special interest with reference to these spores is, that they have a resisting power to heat, and to the action of chemical disinfectants, far beyond that which is possessed by micrococci, or by bacilli without spores. The difference may be compared to the difference between a tender plant and its seeds to deleterious influences, such as extremes of heat and cold. Thus the spores of certain species of bacilli withstand a boiling temperature for several hours, while a temperature of 150° Fahr. quickly kills most bacteria in the absence of spores. A similar difference is shown as regards the action of chemical agents. Certain agents—*e. g.*, sulphurous acid gas and carbolic acid,—which are extensively used as disinfectants, have been proved by exact experiments to be quite impotent for the destruction of spores. This being the case, it is advisable, in practical disinfection, always to use an agent which has the power of destroying spores, in those cases in which the exact nature of the disease germ has not been demonstrated. The cholera germ of Koch does not form spores; and there is good reason to believe that the same is true as regards the germs of yellow fever, of scarlet fever, and of smallpox, which have not yet been demonstrated. This inference is based upon evidence obtained in the practical use of disinfectants, and upon certain facts relating to the propagation of these diseases.

A second general statement, which is justified by the experimental evidence on record, is, that *agents which kill bacteria in a certain amount, prevent their multiplication in culture fluids, when present in quantities, considerably less than are required to completely destroy vitality.*

An agent, therefore, which, in a certain proportion and in a given time acts as a "germicide" in a smaller quantity, may act as an *antiseptic, i. e.*, may prevent putrefactive decomposition by restraining the development of the bacteria of putrefaction. Antiseptics also prevent or retard the development of pathogenic bacteria. It follows from this that germicides are also antiseptics; but the reverse of this proposition is not true as a general statement, for all antiseptics are not germicides. Thus alcohol, common salt, sulphate of iron, and many other substances which are extensively used as antiseptics, have scarcely any germicide power, even in concentrated solutions, and consequently would be entirely unreliable as disinfectants.

Practically, antiseptics may accomplish the same result in the long run as we obtain in a short time by the use of disinfectants. If, for example, we prevent the development of the germs of cholera, or of typhoid fever, in an infected privy vault, by the continued use of antiseptics, these germs will in time lose their ability to grow, when introduced in to a suitable culture medium. But in the meantime there is always the possibility that some of them may escape, with the fluid contents of the vault, into the surrounding soil, and contaminate some well or stream from which drinking water is obtained. For this reason privy vaults, cesspools, and sewers should never be allowed to become infected. All infectious material, such as the dejections of patients with cholera or typhoid fever, should be destroyed at its source, in the sick-room; or, if it is ascertained that such material has been thrown into a privy vault, the entire contents of the vault should be promptly disinfected. The same rule applies to infectious material thrown upon the ground, or wherever it may be.

Finally, we desire to emphasize the following propositions:

Disinfection consists in extinguishing the spark, killing the germ, which may light up an epidemic in the presence of a supply of combustible material—filth.

The object of *general sanitary police* is to remove this combustible material out of the way, so that no harm may result even if the spark be introduced.

Antiseptics and deodorants are useful when it is impracticable to remove offensive organic material from the vicinity of human habitations, but they are a poor substitute for cleanliness.

PART FIRST

DISINFECTION

It will be our aim in the present chapter to give reliable, practical directions with reference to the use of disinfectants, and the best methods of disinfection. Keeping this object in view, we shall recommend for disinfecting purposes only those agents named in the following list:

1. Fire.
2. Steam under pressure (20 pounds).
3. Boiling water.
4. Formaldehyd gas.
5. Chloride of lime (in solution).
6. Mercuric chlorid (in solution).
7. Carbolic acid (5 per cent solution).
8. Caustic lime ("quicklime").
9. Dry heat (230° Fahr. for two hours).
10. Sulphur dioxid.
11. Copper sulphate (in solution).
12. Zinc chlorid (in solution).

All of these agents, properly used, are effective for the destruction of the "germs" of the following named diseases: Tuberculosis, diphtheria, typhoid fever, yellow fever, cholera, smallpox, measles, pneumonia, epidemic influenza, erysipelas, hog cholera, chicken cholera, swine plague, infectious pleuro-pneumonia of cattle, and, in general, of all infectious diseases in which the specific germ does not form spores. The five agents at the head of the list may also be relied upon for the destruction of the spores of anthrax, tetanus, and sy uptomatic anthrax, which are the principal diseases in which it has been demonstrated that resistant spores are present in the infectious material by which they are propagated.

We shall first give a brief account of the conditions of successful disinfection with these agents, as established by experimental data, and afterward detailed directions for their employment under the various circumstances in which disinfection is required.

1. Fire It is hardly necessary to say that burning of infectious material,

infected clothing, etc., is an effectual method of disposing of it. This method of disinfection is always to be recommended, when practicable or consistent with a due regard for economy and the rights of individuals. As a rule, articles of little value, which have been soiled with infectious material, had better be burned; and this is especially true of old clothing and bedding. But we have other efficient methods of disinfection, which make it unnecessary to sacrifice articles of value except under unusual circumstances.

2. Steam under Pressure The disinfecting power of steam given off from boiling water in an open vessel does not differ from that of the water itself, but confined steam has a temperature corresponding with the pressure as indicated by a steam gauge. At twenty pounds pressure the temperature is about 230 degrees Fahr. (105 degrees C.); at twenty-five pounds it is about 240 degrees Fahr.; at thirty pounds it is 250 degrees Fahr. Moist heat at the lowest temperature named destroys the most resistant spores in twenty minutes, while a temperature of 240 degrees Fahr. is effective almost immediately.

3. Boiling In the absence of spores, bacteria are quickly killed at a temperature considerably below the boiling point of water, and it is safe to say that boiling for half an hour will destroy all known disease germs, including the spores of anthrax, which have less resisting power than the spores of certain harmless and widely distributed bacilli, which have been found to resist boiling for several hours.

As a matter of fact a temperature considerably below the boiling point of water (140-160 degrees Fahr.), destroys within a few minutes the germs of cholera, typhoid fever, diphtheria, pneumonia, erysipelas, and many other known disease germs.

4. Formaldehyd Gas Since the first edition of this "prize essay" was published (in 1886) the most valuable addition to our knowledge of disinfecting agents has been the discovery of the germicidal action of formaldehyd, and this gas is now largely used for the disinfection of clothing, hospital wards, etc., as a substitute for steam or for sulphur dioxid. But like these agents its action is superficial and it cannot be depended upon for the disinfection of mattresses, pillows, rolls of clothing or bedding, etc. As is the case with chlorine and sulphur dioxid its germicidal power is increased by the presence of moisture, and by a high temperature. By means of a vacuum chamber, in which the articles to be disinfected can be placed and the air exhausted prior to the admission of the disinfectant, the necessary penetration can be secured for such articles, when they are properly arranged. But disinfection of clothing and bedding by these agents (steam, sulphur dioxid, and formaldehyd), calls for special apparatus and the supervision of an expert in the practical use of such apparatus. Formaldehyd gas is irritating to the mucous membrane of the eyes and nose, but it is not poisonous. It is produced either by the application of heat to an aqueous solution of the gas (formalin), or by the oxidation of wood alcohol, or by the volatization (by heat) of paraform. Various forms of apparatus have been devised for generating the gas. In the army the large "Formal Gas Generator" (No. 2) of the Kny-Scherrer Co., and the smaller apparatus manufactured by Chas. Lentz & Sons of Philadelphia, have been used with success.

5. Chloride of Lime (chlorinated lime, bleaching powder) This is one of the cheapest and most efficient of disinfectants. It should be packed in air-tight and moisture-proof receptacles,—glass is preferable,—and should contain at least twenty-five per cent of available chlorine. It should be used in solution, which had better be made as required. An insoluble residue will be left, which may be removed by filtration or decantation. This, however, is not at all necessary. Chlorinated lime owes its disinfecting power to the presence of the hypo-chlorite of lime, a salt which is freely soluble in water, and which is quickly decomposed by contact with organic matter. Germs of all kinds, including the most resistant spores, are destroyed by this solution, but it must be remembered that the disinfectant itself is quickly decomposed and destroyed by contact with organic matter, and that if this is present in excess, disinfection may not be accomplished, especially when the germs are embedded in masses of material which are left after the hypochlorite of lime has all been exhausted in the solution.

6. Mercuric Chloride (bichloride of mercury, corrosive sublimate) This salt is well known as a deadly poison, which has long been used in domestic practice as "bug poison." It has germicide powers of the first order, and it is consequently a disinfectant which may be recommended for certain purposes, due regard being had to its poisonous nature, and to the fact that it is decomposed by contact with lead, tin, or copper, and that lead pipes are soon rendered brittle and worthless by passing through them solutions of mercuric chloride. Its potency in dilute solutions (1 :500 to 1 :4000) makes it comparatively cheap,[1] and the danger of accidental poisoning from such dilute solutions is not very great. The concentrated solutions should be colored, as a precaution against accident, for they have neither color nor odor to reveal their deadly nature.

A standard solution which contains four ounces to the gallon of water is of convenient strength for a concentrated solution, to be issued by manufacturers or health authorities, in properly labeled bottles. This may be colored with permanganate of potash,[2] or with indigo, or with aniline blue.

It must be remembered, in using this and other disinfecting solutions, that the condition relating to time of exposure to the action of the disinfecting agent is an important one. The experimental evidence relating to the germicide power of the mercuric chloride shows that the time of exposure being two hours, this salt may be safely recommended for the destruction of pathogenic organisms in the absence of spores in the proportion of 1 :2000 or even less, *provided that the micro-organisms to be destroyed are fairly exposed to its action.* The fact that the mercuric chloride combines with and coagulates albuminous material, interferes to some extent with its value as a disinfectant, and will be kept in view in the recommendations to be made hereafter relating to the practical use of this agent. Mercuric chloride is an efficient antiseptic in the proportion of 1 :15,000, and it exercises a restraining influence upon the development of the spores of the anthrax bacillus, when present in culture solutions, in the proportion of 1 :300,000 and even less.

7. Carbolic Acid The disinfecting power of carbolic acid has been fixed by experiments upon vaccine virus, and upon various pathogenic organisms. A saturated aqueous solution cannot, however, be relied upon for the destruction of spores; but in the absence of spores it is fatal to micro-organ-

1 It costs about fifty cents a pound by the quantity.
2 Ten grains to the gallon is sufficient.

isms in the proportion of two per cent, the time of exposure being two hours. Indeed, less than one per cent is fatal to several of the species of pathogenic micrococci which have served as test-organisms in the numerous experiments which have been made with this agent. Upon the recommendation of the famous Dr. Koch, the discoverer of the cholera spirillum, the committee on disinfectants, of the International Sanitary Conference of Rome (1885), has given this agent the first place for disinfecting soiled clothing, excreta, etc., in cholera. For excreta it is to be used in five per cent solution, and for clothing, etc., in two per cent solution. The experimental evidence upon record indicates that it may be relied upon in this proportion.

8. Caustic Lime (*"Quicklime"*) All of the caustic alkalies have decided germicidal value, but quicklime is the cheapest and most generally useful. For the disinfection of excreta, in the sick-room or in sinks, privy-vaults, etc., freshly prepared "milk of lime" should be used, containing about one part by weight, of hydrate of lime to eight parts of water. This should be used freely—in quantity equal in amount to the material to be disinfected. The white-washing of exposed surfaces is a satisfactory method of destroying any disease germs which may have lodged upon such surfaces.

9. Dry Heat Dry heat is only to be recommended for the disinfection of such articles as would be injured by exposure to moist heat, or to a disinfecting solution. A properly constructed disinfection chamber or "oven" is absolutely essential, if dry heat is to be used. The experimental evidence on record shows that the destruction of spores requires a temperature which would injure woolen fabrics (140° C. for three hours). In the absence of spores, however, articles which are freely exposed for two hours to a temperature of 110° C. (230° Fahr.) may with safety be considered disinfected. In practice it will be necessary to remember that the penetrating power of dry heat is very slight, and that packages, bundles, or even articles loosely thrown one upon another, cannot be disinfected in this way.

10. Sulphur Dioxid (sulphurous acid gas) Fumigation with burning sulphur has long been a favorite method of disinfection. The experience of sanitarians is in favor of its use in yellow fever, smallpox, scarlet fever, diphtheria, and other diseases in which there is reason to believe that the infectious material does not contain spores. The experimental evidence on record shows that under certain conditions it is effective for the destruction of micro-organisms in the absence of spores, but that it is quite impotent for the destruction of these reproductive elements.

The presence of moisture adds greatly to the disinfecting power of this agent. It is freely soluble in water, one volume dissolving fifty volumes of the gas. It is therefore evident that a saturated aqueous solution is fifty times as strong as the pure gas—anhydrous. In aqueous solution, in the proportion of 1 :2000 by weight, sulphur dioxid kills micrococci in two hours' time. In gas-tight receptacle it destroys the infecting power of vaccine virus dried upon ivory points, when present in the proportion of one volume per cent, the time of exposure being six hours. The same proportion destroys anthrax bacilli, without spores, from the spleen of an animal recently dead, dried upon silk threads, in thirty minutes (Koch). These facts show that sulphur dioxid is a valuable disinfectant; but the conditions of successful disinfection, as established by the experimental evidence, are,

that the material to be disinfected shall be freely exposed to its action for a considerable time, *in a receptacle which does not permit the gas to escape*. It must be remembered that disinfection of a thin layer of vaccine virus upon an ivory point, or of anthrax blood upon a silk thread, exposed in a gas-tight receptacle, cannot be taken as evidence that thicker layers of infectious material, attached to the surface of bedding and clothing, or enclosed in folded blankets, bundles of clothing, mattresses, etc., can be disinfected by the same amount of sulphur dioxid generated in a room which is not gas-tight. It has been shown, by carefully conducted experiments, that the escape of sulphurous acid gas from a bed-chamber or hospital ward is very rapid, in spite of the usual precautions for stopping up crevices when such a room is to be fumigated; and infectious material, enclosed in bundles or protected by folds of blankets, etc., may escape disinfection, after having been exposed for many hours in a tightly closed chamber containing ten volumes per cent of this gas.

11. Copper Sulphate This salt has been largely used as a disinfectant in France, and experiments show that in the proportion of one per cent, it is a reliable agent for the destruction of micro-organisms, in the absence of spores. It is much below mercuric chloride in germicide power, but is a better deodorant—not a better antiseptic—than the more poisonous salt. When we take into account its efficiency, it is comparatively cheap, and is to be recommended for certain purposes.

12. Zinc Chlorid Solutions of chloride of zinc are largely used in this country and in Europe for disinfecting purposes. It is an excellent antiseptic and deodorant, but its power to destroy disease germs has been very much overestimated. It may, however, be relied upon for the destruction of pathogenic organisms, in the absence of spores, in solutions which contain from five to ten per cent of the salt.

GENERAL DIRECTIONS FOR DISINFECTION

In the sick-room we have disease germs at an advantage, for we know where to find them, as well as how to kill them. Having this knowledge, not to apply it would be criminal negligence, for our efforts to restrict the extension of infectious diseases must depend largely upon the proper use of disinfectants in the sick-room.

Disinfection of Excreta, etc. The dejections of patients suffering from an infectious disease should be disinfected before they are thrown into a water-closet or privy-vault. This is especially important in cholera, typhoid fever, yellow fever, and other diseases in which there is evidence that the infectious agent is capable of self-multiplication, in suitable pabulum, external to the human body. Vomited matters, and the sputa of patients, with these and other infectious diseases, should also be promptly disinfected. This is especially important in cholera, diphtheria, scarlet fever, whooping-cough, and tuberculosis. It is advisable, also, to treat the urine of patients sick with an infectious disease with a disinfecting solution.

For the Disinfection of Excreta, etc., in the sick-room, a solution of chloride of lime is to be recommended. This is an excellent and prompt deodorant, as well as a disinfectant. A quart of the standard solution (No. 1), recommended by the committee on disinfectants, of the American Public Health Association, will suffice for an ordinary liquid discharge in

cholera or typhoid fever; but for a copious discharge it will be prudent to use twice this quantity, and for solid fecal matter a stronger solution will be required. As chloride of lime is quite cheap, it will be best to keep on the safe side, and to make the solution for the disinfection of excreta by dissolving eight ounces of chloride of lime in a gallon of water. This solution should be placed in the vessel before it receives the discharge The material to be disinfected should be well mixed with the disinfecting solution by agitating the vessel, and from thirty minutes to an hour should be allowed for the action of the disinfectant, before the contents are thrown into a water-closet or privy vault.

For the disinfection of liquid discharges in cholera, typhoid fever, dysentery, etc., a five per cent solution of *carbolic acid* may be used. This was recommended by the committee on disinfectants of the International Sanitary Conference, which met in the city of Rome in 1885, of which committee the distinguished bacteriologist, Prof. Robert Koch, was chairman and the present writer a member. The solution should be used in an amount at least equal to the material to be disinfected—better twice this amount. The time necessary to insure disinfection was fixed by the committee at four hours.

Milk of Lime, made by slaking fresh quicklime with water and mixing the resulting hydrate of lime with eight parts of water, is one of the best and cheapest agents for the disinfection of excreta in the sick-room, on the surface of the ground, in open sinks, etc. This milk of lime should be used in an amount at least equal to the quantity of material requiring disinfection.

Chloride of Zinc in ten per cent solution may be used to disinfect the dejections of those sick with cholera or typhoid fever, or *sulphate of copper* in a solution of the same strength (ten per cent), the amount of solution used being equal to the amount of material to be disinfected.

It will be best to burn cloths used to wipe away the discharges of the sick, and especially those used in wiping away the infectious material from the mouth and nostrils of patients with diphtheria or scarlet fever. Bits of old muslin may be used for this purpose, and should at once be thrown upon an open fire or gas stove arranged in the fire-place for this purpose.

Infected sputum may be discharged directly into a cup half full of the solution of chloride of lime recommended for excreta, or of Labarraque's solution.

Handkerchiefs, napkins, and towels used in wiping away infectious discharges, if worth preserving, should be at once immersed in one of the following solutions: Chloride of lime, two per cent; carbolic acid, two per cent; mercuric chloride, 0.1 per cent (=1 :1000).

Cloths used for washing the general surface of the body should also be disinfected with one of the above mentioned solutions; and attendants should invariably disinfect their hands by washing them in one of these solutions, when they have been soiled by the discharges of the sick.

Disinfection of the Person Labarraque's solution, diluted with twenty parts of water, is a suitable disinfecting solution for bathing the entire surface of the body of the sick; or convalescents, or of those whose duties take them into the sick-room; or a two per cent solution of carbolic acid, may be

used, or a solution of mercuric chloride (corrosive sublimate) of 1 :1000. The poisonous nature of this solution must be kept in mind.

The International Sanitary Conference of Rome gives the following directions with reference to the disinfection of the body after death from cholera:

"The body should be enveloped in a sheet saturated with one of the strong disinfecting solutions,[1] without previous washing, and should at once be placed in a coffin."

We see no objection to washing the body, if the strong solution of chloride of lime is used for this purpose. Washing with water would necessitate the careful disinfection of the water and cloths used for this purpose, and of the hands of the attendants. As the odor of chlorine or of carbolic acid would be objectionable under certain circumstances, we see no good reason for insisting upon the use of these agents, rather than on the odorless solution of mercuric chloride, which, in the proportion of 1 :1000, would no doubt be equally effective. But when there is an odor of decomposition to be neutralized, the solution of chloride of lime will have a decided advantage on account of its deodorizing properties.

Disinfection of Clothing and Bedding The cheapest and best way of disinfecting clothing and bedding, which is not injured by the ordinary operations of the laundry, is to immerse it in boiling water for half an hour or longer. It should be placed in boiling water as soon as removed from the person or the bed of the sick, and if it is necessary to remove the articles from the room in order to accomplish this, they should be wrapped in a sheet or towel thoroughly saturated with a disinfecting solution. If it is impracticable to disinfect such infected clothing and bedding *immediately* by boiling, it will be necessary to immerse it in one of the following disinfecting solutions, in which it should be left for four hours: Mercuric chloride, 1 :2000; or the "blue solution,"[2] of this salt and sulphate of copper, diluted by adding two fluid ounces of the concentrated solution to a gallon of water; or a two per cent solution of carbolic acid. The solution of chlorinated lime (two per cent) may also be used, but we give the precedence to the first mentioned solutions, because of the bleaching properties of this solution. The blue solution does not injure clothing, and is to be preferred for domestic use to a simple solution of corrosive sublimate, which in the concentrated form is highly poisonous, and without odor or color. When diluted as directed, this solution may, however, be used without great danger. The metallic taste of the diluted solution could scarcely fail to prevent a fatal dose from being swallowed accidently.

Woolen garments and other articles which would be seriously injured by immersion in boiling water, or in one of the disinfecting solutions above mentioned, should be disinfected, in a properly constructed disinfection chamber, by steam or by formaldehyd gas.

Exposure to steam at 100 degrees C. (212 degrees Fahr.) for half an hour would be equivalent to exposure in boiling water for the same time, if the clothing is hung up in such a manner as to be fairly brought under the action of the disinfecting agent. To be certain that the steam does not fail

1 Chloride of lime, four per cent, or carbolic acid five per cent.

2 Bichloride of mercury..... 4 oz
Sulphate of Copper ..... 1 lb
Water ..... 1 gal

below this temperature in the disinfection chamber, a thermometer must be placed in a corner of a room, at a distance from the point of entrance of the steam, or in an aperture from which the steam escapes. This should mark at least 100 degrees C. for half an hour before the disinfection can be considered complete.* To accomplish this, it is evident that the steam must come from the generator at a higher temperature, or, in other words, must be under pressure.

It must be remembered that in a majority of the infectious diseases in which disinfection is most frequently required the specific germ does not form resistant spores (cholera, typhoid fever, tuberculosis, diphtheria, erysipelas, pneumonia, yellow fever, smallpox). In these diseases therefore it would be a mistake to forbid the use of carbolic acid, sulphur dioxid, and other agents which enjoy the confidence of sanitarians, and which have been proved by laboratory experiments to destroy pathogenic organisms in the absence of spores.

As disinfection by steam injures certain articles, *dry* heat may be used as a substitute for moist heat, but in this case a temperature of at least 110 degrees C. (230 degrees Fahr.), maintained for two hours, will be required. In the use of dry heat, even greater care is necessary that the articles to be disinfected are freely exposed,—that is not placed in the oven in bundles, or piled one upon another, but freely suspended in the disinfecting chamber. For it has been shown by carefully conducted experiments that the penetrating power of dry heat is very slight. A properly constructed disinfection oven, such as that of Ransom,† will be required if dry heat is to be used. But it will as a rule, be preferable to disinfect such articles in a steam disinfecting chamber of modern construction in which provision is made for exhausting the air before steam under high pressure is admitted, and in which, after disinfection, the clothing is rapidly dried before being removed from the steam chamber.

Sulphur Dioxid is a less reliable disinfectant than steam or dry heat, but when the necessary conditions are observed there is no doubt of its utility; and the fact that it does not kill the spores of anthrax and of other bacilli is no reason for rejecting an agent which has been demonstrated by experience to be one of great value, which has been proved by laboratory experiments to be fatal to pathogenic organisms in the absence of spores, and to destroy the infecting power of vaccine virus. But in using this agent the conditions of successful disinfection, which have been established by experiment, should be borne in mind. The room which is to serve as a disinfecting chamber must be very thoroughly closed; every crevice and key-hole should be carefully closed by fastening paper over it. Even this precaution will not prevent the rapid escape of gas from cracks around doors, windows, etc. It is therefore desirable, when practical, to use a disinfecting chamber which can be hermetically closed. The articles to be disinfected must be very freely exposed, and should never be thrown into the room in bundles, or piled one upon another. We concur in the recommendations of the committee on disinfectants of the American Public Health Association, as to the amount of sulphur which should be burned, and the method of effecting its complete combustion:

* The committee on disinfectants of the International Sanitary Conference of Rome fixes one hour as the time during which steam should be made to pass over articles to be disinfected

† *British Medical Journal*, Sept. 6, 1885, p. 274.

"To secure any result of value, it will be necessary to close the apartment to be disinfected as completely as possible, by stopping all apertures through which gas might escape, and to burn at least three pounds of sulphur for each thousand cubic feet of air-space in the room. To secure complete combustion of the sulphur, it should be placed, in powder or in small fragments, in a shallow iron pan, which should be set upon a couple of bricks in a tub partly filled with water, to guard against fire. The sulphur should be thoroughly moistened with alcohol before igniting it."*

Since the above was written with reference to disinfection by sulphur dioxid (SO_2) the valuable germicidal properties of *formaldehyd gas* have been demonstrated, and satisfactory methods of generating this gas for purposes of disinfection have been devised. Owing to its superior germicidal value and non-toxic properties it has to a considerable extent taken the place of sulphur dioxid as a gaseous disinfectant. In making practical use of this agent a suitable apparatus will be required. For the disinfection of a room with its contents, freely exposed for surface disinfection, one pound of formalin should be volatilized for each thousand cubic feet of air-space—the time of exposure to the disinfecting action of the gas being not less than twelve hours. When paraform is used the amount required will be sixty grams to 1,000 cubic feet (Novy). In the absence of any apparatus satisfactory results have been obtained by the Department of Health of city of Chicago, as follows:

"Ordinary bed sheets were employed to secure an adequate evaporatory surface, and these, suspended in the room, were simply sprayed with a forty per cent solution of formalin through a common watering pot rose-head. A sheet of the usual size and quality will carry from 150 to 180 cc. of the solution without dripping, and this quantity has been found sufficient for the disinfection of 1,000 cubic feet of space. Of course, the sheets may be modified to any necessary number. * * * Surface disinfection was thorough, while a much greater degree of penetration was shown than that secured by any other method."

Formalin may also be used in the disinfection of rooms and their contents by spraying all exposed surfaces.

Experiments made by Kinyoun and others show that formaldehyd gas does not injure the color or textile strength of fabrics of wool, silk, cotton, or linen, and that it has no injurious action upon furs, leather, copper, brass, nickel, zinc, polished steel or gilt work. Iron and unpolished steel are attacked by the gas.

We would remark, that in the absence of suitable appliances for disinfection, and in general when the disinfected articles are of little value, consumption by fire furnishes the readiest and safest method of disposing of such articles.

For articles of value, such as upholstered furniture, etc., which would be injured by any of the processes heretofore recommended, free exposure to the air (æration) for three or four weeks is directed by the Committee on Disinfectants of the International Sanitary Conference of Rome. The same committee directs that "objects made of leather, such as trunks, boots, etc., should be destroyed or washed several times with one of the weak

* Preliminary report, l. c., p. 427.

disinfection solutions,''—carbolic acid two per cent, or chloride of lime one per cent

The means heretofore recommended for the disinfection of woolen clothing, blankets, and similar articles will not be sufficient for soiled mattresses. As a rule, they should be opened, and the contents disinfected by steam, with subsequent free æration, and the cover should be washed in boiling water after treatment with a disinfecting solution.

Finally, the valuable germicidal properties of direct sunlight have been demonstrated by numerous carefully conducted experiments and the time-honored domestic practice of hanging infected clothing and bedding in the ''open air'' is to be recommended. This should supplement disinfection by formaldehyd or sulphur dioxid.

Disinfection of the Sick-Room Every effort should be made to prevent a room occupied by patients sick with an infectious disease from becoming infected. Carpets, stuffed furniture, curtains, and other articles difficult to disinfect, should be removed at the outset. Indeed, nothing should be left in the room which is not absolutely required, and all furniture and utensils should be of such a character that they can be readily disinfected by washing with boiling water or with a disinfecting solution. Abundant ventilation and scrupulous cleanliness should be maintained, and a disinfecting solution should always be at hand for washing the floor, or articles in use, the moment they are soiled by infectious discharges. For this purpose a solution of chloride of lime may be used (4 per cent).

It is impracticable to destroy infectious material in an *occupied* apartment by means of gases or volatile disinfectants, for to be effective these must be used in a degree of concentration which would make the atmosphere of a room quite irrespirable. These agents are therefore useful only as deodorants. They are all more or less offensive to the sick, and will seldom be required, even as deodorants, when proper attention is paid to cleanliness and ventilation.

Daily wiping of all surfaces—floors, walls, and furniture—with a cloth wet with a disinfecting solution, is to be recommended. For this purpose a solution of chloride of lime (2 per cent), or of carbolic acid (2 per cent), or mercuric chloride (1 :1000), may be used.

By such precautions as have been indicated, the infection of the sick-room may be prevented, especially in those diseases, such as cholera and typhoid fever, in which the infectious agent is not given off in the breath, or from the general surface of the body, of the sick person. In smallpox and in scarlet fever there is greater danger that the infectious agent may remain attached to the surfaces of the room; for the atmosphere becomes infected from particles given off from the surface of the patient's body.

As already stated, the atmosphere cannot be disinfected while the room is occupied. There is much less reason for disinfecting it when the patient has been removed, and it is much simpler to renew it by throwing open the doors and windows than to attempt to disinfect it. Indeed, there will be no infectious particles to destroy, except such as are dislodged from surfaces, window ledges, etc., where they have settled as dust while the room was occupied; and if the precautions above recommended have been taken, the danger of such reinfection of the atmosphere will be reduced to a minimum.

Disinfection of the vacated room, then, consists in the destruction of all infectious particles which remain attached to surfaces, or lodged in crevices, in interstices of textile fabrics, etc. The object in view may be accomplished by thorough washing with one of the disinfecting solutions heretofore recommended; but most sanitarians think it advisable to ''disinfect the room'' with a gaseous disinfectant, such as formaldehyd or sulphur dioxid. If the ''fumigation'' with sulphur dioxid is resorted to, the directions given by the Committee on Disinfectants of the American Public Health Association should be followed, *i. e.*, three pounds of sulphur should be burned for every 1,000 cubic feet of air-space. But, as already stated, disinfection with formaldehyd gas is to be preferred (see page 15).

At the end of from twelve to twenty-four hours, doors and windows should be opened, and the room freely ventilated. After this fumigation, all surfaces should be washed with a disinfecting solution (chloride of lime two per cent, carbolic acid two per cent, or mercuric chlorid 1:1000), and afterwards thoroughly scrubbed with soap and hot water. Plastered walls should be white-washed.

Disinfection of Privy Vaults, Cesspools, etc. The contents of privy vaults and cesspools should never be allowed to accumulate unduly, or to become offensive. By frequent removal, and by the liberal use of antiseptics, such necessary receptacles of filth should be kept in a sanitary condition. The absorbent deodorants, such as dry earth or pounded charcoal,—or the chemical deodorants and antiseptics, such as chloride of zinc, sulphate of iron, etc.,—will, under ordinary circumstances, prevent such places from becoming offensive. Disinfection will only be required when it is known, or suspected, that infectious material, such as the dejections of patients with cholera, yellow fever, or typhoid fever, has been thrown into the receptacles.

In the Manual for the Medical Department of the United States Army the following directions are given:

92. When accumulations of organic material undergoing decomposition cannot be removed or buried, they may be treated with an antiseptic solution, or with freshly burned quicklime. Quicklime is also a valuable disinfectant, and may be substituted for the more expensive chlorid of lime for disinfection of typhoid and cholera excreta, etc. For this purpose freshly prepared *milk of lime* should be used, containing about one part, by weight, of hydrate of lime, to eight of water.

93. During the prevalence of an epidemic, or when there is reason to believe that infectious material has been introduced from any source, latrines and cesspools may be treated with milk of lime, in the proportion of 5 parts to 100 parts of the contents of the vault, and the daily addition of 10 parts for 100 parts of daily increment of feces.

Hospitals The directions already given in regard to disinfection of the sick-room and its contents apply as well to hospital wards in which patients with infectious diseases are treated. In addition to this, it will be necessary in hospitals to guard against such infectious diseases as erysipelas, septicæmia, puerperal fever, and hospital gangrene. The antiseptic treatment of wounds, in connection with a proper regard for cleanliness and ventilation, has practically banished these diseases from well regulated hospitals. Of the first importance in effecting this are the precautions now taken with reference to the disinfection of sponges, instruments, the hands of attendants, etc.

Instruments of silver, such as probes and catheters, may be disinfected by passing them through the flame of an alcohol lamp. Instruments of steel, gum catheters, etc., may be disinfected by immersion in a five per cent solution of carbolic acid, or in a 1:1000 solution of mercuric chloride. For instruments and vessels of copper, brass, and tin, boiling water, or the carbolic acid solution, may be used. Vessels of porcelain or glass may be disinfected by heat, or by either of the disinfecting solutions mentioned. Sponges should be kept permanently in one of the disinfecting solutions, or, what is better, may be dispensed with entirely for the cleansing of wounds. In place of them, irrigation with a disinfectant solution may be resorted to, or the discharges may be wiped away with some cheap absorbent material which can be burned after having been once used.

Patients in hospitals, with infectious diseases, will of course be kept in isolated wards. Everything which comes from such a ward should be disinfected, and the immediate attendants of the sick should not be allowed to visit other parts of the hospital without first changing their outer clothing for a recently disinfected suit, and washing their hands in a disinfecting solution. When relieved from duty their underclothing should also be disinfected; and they should take a complete bath with one of the weak disinfecting solutions heretofore recommended.

Disinfection of Water and Articles of Food The disinfection of drinking water on a large scale, in reservoirs, wells, etc., is impracticable. But it is a very simple matter to disinfect water which is suspected of being contaminated with the germs of cholera, typhoid fever, or any other disease transmissible in this way. This is readily accomplished by boiling. As already stated, all known disease germs are destroyed by the boiling temperature maintained for half an hour. The importance of this precaution during the prevalence of an epidemic of cholera or typhoid fever cannot be over-estimated, when the water used for drinking purposes comes from an impure source, or is liable to contamination by discharges of patients suffering from these diseases. Those articles of food, and especially milk, animal broths, etc., which might serve as pabulum for disease germs, should, during the prevalence of an epidemic, be cooked but a short time before they are eaten. And such food, if put aside for hours after it has been prepared, should always be again subjected to a boiling temperature shortly before it is served. Food which gives evidence of commencing putrefaction is unfit for use, and in time of epidemics is especially dangerous.

Disinfection of Ships It should be the aim of a physician attached to a passenger ship, or of the master of a vessel having no physician on board, to prevent the vessel from becoming infected when in an infected port, or when cases of infectious disease occur on board. This is to be accomplished by keeping the ship clean; by disinfecting suspected articles, and especially the soiled clothing of passengers, before they are received on board; by the isolation of cases of infectious disease which occur on board; and by the thorough execution of those measures of disinfection recommended for the sick-room. When a case of cholera or of yellow fever occurs upon a ship at sea, it cannot be taken as evidence that the vessel is infected unless at least five days have elapsed since the person attacked came on board. For he may have contracted the disease from exposure at the port of departure, or in some other locality on shore. When, however, a longer time than this

has elapsed, or when several cases develop in a particular locality on shipboard, either simultaneously or successively, the vessel must be considered infected, unless it is shown that the cases are directly due to the opening of baggage containing infected clothing.

In practice, the sanitary officials at the port of arrival usually treat a vessel as infected if any case of infectious disease has occurred upon her during the voyage. This is a safe general rule, which should not be departed from unless a considerable time—five or seven days—has elapsed since the cases occurred, and they can be clearly traced to exposure before coming on board. In this case, if the ship is clean and the precautions relating to disinfection and isolation of the sick have been faithfully executed, the health officer may be justified in dispensing with the general measures of disinfection which are required for an infected ship.

These measures do not differ from those heretofore recommended for the disinfection of the sick-room and its contents; but the special conditions on shipboard, and the great interests at stake, make it essential that the execution of these measures should be in the hands of sanitary experts.

In the disinfection of ships, fumigation with sulphurous acid gas has been largely practiced by those in charge of quarantine establishments. The fact that the ship may be almost hermetically closed, and the escape of gas to a great extent prevented, makes this method of disinfection more trustworthy than in the case of dwellings and hospitals. The further fact, that certain parts of the ship are inaccessible for the application of disinfecting solutions, seems to make the use of a gaseous disinfectant imperative.

Disinfection by means of steam, especially of an iron vessel, would no doubt be a difficult matter on account of the condensation which would occur from contact with the cool walls of the vessel below the water-line. But it will be well to fill the vessel with steam before introducing the sulphur dioxid; for as already stated, the disinfecting power of this agent is much greater in presence of moisture. A well equipped quarantine establishment should have an apparatus for generating sulphurous acid gas, and injecting it into vessels, as this is the most expeditious and satisfactory method of fumigating a ship.

An essential part of the disinfection of a ship will consist in the thorough cleansing of the bilge. The International Sanitary Conference of Rome prescribed that the bilge water shall be pumped out and replaced by sea water at least twice at each disinfection of the vessel.

Merchandise Article V, of the Report of the Committee on Disinfection of the International Sanitary Conference of Rome, says:

"V. Disinfection of merchandise and of the mails is unnecessary. (Steam under pressure is the only reliable agent for the disinfection of rags—*les chiffons en gros*.)"

We think this statement too broad, especially so far as merchandise is concerned which has been on board a ship infected with yellow fever. The poison of this disease seems to be capable of self-multiplication on a foul ship in tropical latitudes, quite independently of passengers and crew. And there is ample evidence that even where no case has occurred on an infected ship at sea, those who are engaged in discharging her cargo after arrival in port may be seized with yellow fever from breathing the infected atmosphere of the hold. Evidently merchandise conveyed on such a ship should be dis-

infected. But it does not seem necessary to break packages which have gone on board in good condition, and a thorough fumigation with sulphurous acid gas will be sufficient if the unbroken packages are so distributed as to be fairly exposed to the action of the disinfecting agent. To accomplish this, and to effectually disinfect the ship, it will be necessary to discharge the cargo at the quarantine station.

The collections of the rag-man cannot properly be placed in the same category with other merchandise, such as agricultural products, hardware, new cotton or woolen goods, etc. An exception with regard to rags is indicated, but not stated with sufficient precision, in the article which we have quoted. There is evidence that smallpox has been not infrequently transmitted in rags, and sanitarians are generally agreed that it would be very imprudent to admit rags collected in or shipped from localities infected with cholera or yellow fever, without first subjecting them to thorough disinfection.

PART SECOND

INDIVIDUAL PROPHYLAXIS AGAINST INFECTIOUS DISEASES

The state establishes quarantine stations, to guard against the introduction of infectious diseases of exotic origin; and in enlightened countries sanitary officials, under the direction of the central government, or of states and municipalities, are charged with the duty of guarding the public against such diseases. It is generally recognized that this is to be accomplished by the isolation of the sick, the use of disinfectants, and by general measures of sanitary police.

One way in which the individual may indirectly protect himself against such diseases is by using his influence to have this sanitary service placed in the hands of competent men, and in sustaining them in their efforts to exclude or stamp out infectious diseases by such measures as has been demonstrated by science and experience to be efficient for this purpose.

But this is not the kind of "individual prophylaxis" which we have to consider here. The question is, What can the individual do to protect himself and those immediately dependent upon him, under the various circumstances in which he may be placed, and especially in the presence of an epidemic?

As the advice we have to give will differ greatly according to the disease, we shall pass in review the principal infectious maladies of man, and shall attempt to give for each such practical instructions as will enable an intelligent person to take all practicable precautions for his own protection, and for that of his immediate family. We have first, however, to make some general remarks.

Infectious diseases are contracted by contact with the sick, through the medium of infected articles—"fomites"—or by exposure in infected localities.

The evident general rule of prophylaxis is, therefore, to avoid all of these sources of infection; but there are circumstances in which this is either impossible or unjustifiable. Duty calls the physician and the nurse into the sick-room, and no argument based upon self-protection can keep the devoted mother from the bedside of her sick child; or the wife from giving her personal attention to her husband, or the husband to his wife, when stricken

by pestilence. Humanity requires that during an epidemic the sick shall be cared for, the dead buried, and the foul places cleansed. All this calls for the active and intelligent efforts of persons who have the courage to face danger, and not only of those who by their profession are necessarily brought in contact with the sick—physicians, clergymen, sanitary officials, nurses—but often, also, of volunteers; for, during the prevalence of an epidemic of cholera, or of yellow fever, the number of physicians and trained nurses within the affected area is commonly insufficient for the care of the sick.

The history of epidemics shows that brave men and women are to be found in every civilized country, who are willing to volunteer for such perilous duties; and also that physicians, and those whose legitimate duty it is to care for the sick, very rarely desert their post in time of danger; but the mortality among these brave men and women who stand by their guns, and among the volunteers who go to their assistance, is often very great. There is a widespread notion among people not familiar with the facts, that doctors enjoy a certain immunity from infectious diseases not possessed by other people, and that the absence of fear is a safeguard against infection. Such a supposition is without foundation, and is an insult to the brave men and women who fall at their post of duty in every epidemic. Courage is no more a protection against disease germs than against bullets. It is true, that in epidemics, as in war, the sulkers and cowards often run into danger which the men in the ranks escape. The rashness which results from ignorance or from thoughtlessness is not courage, any more than the prudence which avoids danger when there is no good reason for facing it is cowardice. Those who rashly venture within the lines drawn by an epidemic, in the pursuit or business or pleasure, on the supposition that they will escape the prevailing disease because they are "not afraid," often fall victims to their unreasoning temerity, and not infrequently beat a hasty retreat, with blanched face, when they are brought directly into the presence of the sick and dying.

Our advice to the brave is, Do not put your trust in your courage, for it is no armor against infection. Rely rather upon those precautions which science and experience indicate as best suited to the special circumstances in which you may be placed, and do not hesitate to retreat before an invisible foe, when you are not required by considerations of duty to remain upon the field of battle. If your services are not required, you are simply in the way; and if you fall ill, you add to the labors of those who devote themselves to the care of the sick. And to the timid we would say let not your fear control your actions, but look the circumstances fairly in the face, and be guided by reason and knowledge, or by the advice of those competent to decide for you. A premature flight may bring you into ridicule, or into greater dangers than those you flee from. Do not let your fears exaggerate the facts, and weigh these in the balance of your reason, and not of your apprehensions. The fact that Judge A or Col. B has fallen a victim to cholera or yellow fever is no more reason for deserting your home than is the fact that the humblest citizen of your town has died from the same disease.

If courage is no protection against infection, it cannot be denied that fear, in the presence of the infectious agent, is a predisposing cause which frequently determines an attack, and which may turn the balance in favor of a fatal result. The depressing effect of fear is well known, and all

influences which reduce the vital resisting power of the individual predispose to an attack when an epidemic is prevailing.

Other predisposing causes of a general nature are those conditions of enfeebled resistance which result from ill-health, venereal, and bacchanalian excesses, etc.

Of all these, it is probable that excessive indulgence in intoxicating drink is the most potent factor in swelling the mortality returns during the prevalence of pestilential diseases. The predisposing cause acts in several different ways. The individual whose reason is befuddled by drink, stumbles stupidly into all kinds of danger. He is "not afraid" to sleep upon the ground, exposed to the night air, when yellow fever is prevailing, or to quench his thirst with water which a prudent man would reject as unfit to drink in the presence of cholera, or to wrap himself in a blanket which has recently been in use by a patient with smallpox. Again, the debility, often attended with digestive derangement, which follows a recent debauch, constitute a most favorable condition for the reception of the germs of cholera, of yellow fever, and of infectious diseases generally. Those who use intoxicating drinks habitually, but within the limits marked by that mental aberration or loss of reason which constitutes intoxication, are less subject to infection than the man who is suffering from the effects of a recent "spree." But if they have any organic disease of the stomach, the kidneys, or of the liver, as a result of their habits, this constitutes a predisposition to be attacked, and is a very serious complication when an attack is developed.

Persons suffering from chronic wasting diseases, profuse discharges, or recent hemorrhage, are especially liable to become the victims of an infectious disease during its epidemic prevalence. The same is true of those whose vital resistance is below par from insufficient food, or from the continued respiration of vitiated air—crown poisoning, sewer-gas poisoning, etc.

In addition to the predisposing causes mentioned, which furnish indications of more or less value with reference to individual prophylaxis, there are individual and race differences in susceptibility to certain diseases manifested by those who are in perfect health. One man may be repeatedly exposed to an infectious disease without falling sick, while another may suffer several attacks of a disease, such as smallpox, in which one attack commonly confers immunity. Race diffenences in succeptibility are shown in the relative immunity of the negro from the effects of the yellow fever poison, and the great susceptibility of the same race to smallpox.

We shall consider in detail the question of individual prophylaxis against certain infectious diseases, which, by reason of their fatality and occasional widespread epidemic prevalence, seem entitled to special attention in an essay of this nature.

Cholera In Asiatic cholera the danger of infection from association with the sick, in the capacity of nurse or physician, is very slight. This is amply demonstrated by experience. On the other hand, laundresses, who do not come directly in contact with the sick, but who handle clothing soiled by their discharges, are liable to contract the disease. By far the greater number of cases, however, result from exposure in infected localities, and from drinking infected water. Outside of the area in India where cholera prevails as an endemic disease, localities become infected and the water supply contaminated as a result of the introduction of infectious material from previously infected localities, either in fomites, or through the medium of the discharges of the sick. These facts furnish the indications for individual as well as for general measures of prophylaxis.

In the sick-room the precautions to be taken are, to keep the room clean and well ventilated, to disinfect the discharges of the sick and all soiled articles as promptly as possible, and to wash the hands in a disinfecting solution when they have been in contact with the patient or with soiled clothing. Attendants should not take their food in the room occupied by the sick, and should not drink liquids which have been exposed in the sick-room.

The general directions relating to diet, drinking-water, etc., which we shall shortly give, apply to the attendants upon the sick, as well as to those at a distance from them; and it should be remembered, in the interest of the sick, that these attendants do not run any special risks beyond those to which all persons within the area of infection are exposed. Indeed, we may go further, and say that they run far less risk when they are in a well-regulated hospital and under intelligent supervision, than do those persons who dwell in the localities outside of the hospital from which the cases under their charge have come.

Attendants upon the sick should have their meals at regular hours, should not be deprived of a fair allowance of sleep, and should never be allowed to become exhausted by protracted vigils or excessive fatigue.

When cholera has been introduced into a country and is extending its limits from day to day, one of the first questions which will present itself to those who are able to change their place of residence will be, whether they shall attempt to keep out of its way, and if so, where it is best to go. The answer to this question must depend very much upon circumstances. Those who are unfortunate enough to live in a city or town which has a bad sanitary record, which is not provided with an efficient health department, or does not provide money to enable the officers appointed to do efficient work, had better decamp in good time, so as to evade the foe entirely, or to meet it upon a field more favorable for defensive operations. There should be no stampede, and no running away in haste without any definite idea of why and where. The time to go is before the disease has fairly obtained a lodgment. Consider that if the season is not far advanced, and the town is in an unfavorable sanitary condition, there is every reason to anticipate that the first cases will be followed by a severe epidemic, and decide at the outset whether you will put your castle in order to stand a siege, trusting to well-considered measures of individual prophylaxis, or whether you will beat a masterly retreat in advance of the first assaults of the enemy. Those who vacillate, in the hope one day that the epidemic is on the decline, and in the fear the next that it will sweep everything before it, in the end very often stay, when they could just as well have gone, and at the same time neglect those precautions which they should have taken at the outset if they had decided to stay.

To those who are unable or unwilling to desert their homes, we would say, that when proper precautions are taken the danger is really not very great, and that sanitarians look for the day when cholera will be practically banished from civilized countries. See that your premises are in good sani-

tary condition, and do what you can to induce your neighbors and the authorities in your town to prepare for the storm. Look especially after the plumbing of your houses, and if there is a cesspool or privy vault upon your premises, see that it is kept in good condition by the use of antiseptics and deodorants.[1] Above all, see that no food comes into your house except such as is sound and good, and that the drinking-water used by your family is beyond suspicion. Well-water is always open to suspicion, and in general, during the prevalence of cholera, it will be advisable to *boil all water used for drinking purposes*. This is a prophylactic measure of prime importance, and there is good reason to believe that if faithfully executed it would, to a great extent, limit the ravages of the Asiatic pestilence. Tea and coffee recently made can be taken with impunity. Milk, during the prevalence of an epidemic, should be boiled before it is used as food. Mineral waters, if bottled at places distant from the infected area, may be drunk in moderation. A moderate amount of sound wine, which was bottled prior to the epidemic, may be permitted to those who are in the habit of using it. Those not in the habit of using stimulants should not resort to their use during the progress of an epidemic. Those accustomed to them should restrict their libations within moderate limits, and will find a little brandy and soda, or Apollinaris water, to be better than wines, and especially than the acid wines, which are apt to derange the digestion.

Food should be plain and well cooked, and should be taken in moderate quantities. Intemperance in eating is quite as bad as intemperance in drinking. Soups, meats, and vegetables should always be served hot, and should not be put aside for a future repast, or, if served a second time, should be brought to the temperature of boiling water shortly before they are eaten. Pastry and rich puddings, and all coarse and indigestible meats and vegetables, are to be avoided. Sound, ripe fruit, which has been brought to the house with the outer skin unbroken, may be eaten in moderation by those who know by experience that it agrees with them. It should be carefully washed before it is eaten. Melons, cucumbers, unripe apples, peaches, or pears, acid fruits generally, and, in short, all those articles which are known to give rise to digestive derangements in the absence of cholera, would better be banished from the supply-list during the prevalence of this disease.

Next to the precautions relating to food and drink, we would place those relating to personal habits and clothing. The bowels should not be allowed to become constipated, and, on the other hand, any tendency to diarrhœa should at once receive attention. This is a matter of the greatest importance, and, indeed, is second to none other in individual prophylaxis. *Absolute rest*, a light diet, and a dose or two of chlorodyne, or of Hope's mixture, or of any approved combination of an opiate and an astringent, will usually suffice to control a slight diarrhœa, even if it is of a choleraic character.

The clothing should be suited to the season, but great care must be taken that it is warm enough at all times to prevent the body from becoming chilled. A broad flannel belt worn about the abdomen is recommended by many physicians of experience, and is no doubt useful. Baths should be taken at frequent intervals, but should not be too prolonged or too cold, and should

1 See Part First of this essay for details relating to the use of these agents.

be followed by a vigorous rubbing of the surface, to establish reaction. Excessive exercise and fatiguing labor of all kinds are to be avoided. One should never feel "done up," as a result of his exertions in the way of business or of pleasure, for the lassitude resulting from over-exertion, like that which results from fear, predisposes to an attack. Mental depression is, so far as possible, to be avoided; grief, despondency, and "carking care" are recognized as predisposing causes in cholera and in other infectious diseases.

The use of "sulphuric acid lemonade"—that is, of pure water acidulated with this acid and sweetened to taste—has been recommended as a prophylactic, and there is some evidence in favor of its usefulness. We would not advise its indiscriminate use, or that of any other prophylactic of this nature. When cholera has made its appearance in a dwelling or in a public institution, the inmates may be given this, to the exclusion of all other drinks.

Yellow Fever This disease, like cholera, is contracted in infected localities, rather than by contact with the sick. Indeed, it is rarely, if ever, communicated directly by a sick person to his attendants. In infected places the poison seems to be given off from the soil, or from collections of decomposing organic matter, and we have no definite evidence that it is communicated through the medium of food or drinking water. The history of epidemics of this disease shows that when it obtains a lodgment in a city or town which is in an insanitary condition, in southern latitudes and during the summer months, it extends its area and invades new localities similarly situated, until frost occurs, or at least until the weather becomes comparatively cool in the autumn. Those who remain in an infected area, unless protected by a previous attack, are almost certain to contract the disease, and much less can be done in the way of individual prophylaxis than in cholera. We therefore advise all those who can get out of the way of this fatal disease to do so. As a rule, there will be plenty of time, after there is evidence that the disease has established itself in certain parts of a city, for those who live at a little distance from these centers of infection to get away, in a deliberate and well considered manner. The occurrence of one or more imported cases cannot be taken as evidence that an epidemic will follow, and is no reason for deserting one's home. If proper precautions are taken by the sanitary authorities, it is very probable that no evil result will follow such importation of the disease. But when these imported cases are followed by the occurrence of other cases in the vicinity where they have been sick, or when such local cases occur in the vicinity of wharves where vessels from infected ports discharge their cargoes, or in sailors' boarding houses, etc., it must be taken as evidence that the disease has effected a lodgment, and that infected centers have been established, from which an epidemic will in all probability be developed, if the season is favorable and the city in an insanitary condition.

An epidemic is not developed so rapidly as in the case of cholera, but the disease usually extends its limits in a very deliberate way, and while it is claiming its victims in one section of a city, other sections in the immediate vicinity might be quite healthy. But the territory invaded remains infected until cold weather puts an end to the epidemic. Frequently it happens that no new cases occur in an infected area for several weeks, or even months, for the simple reason that all those who remained to do battle with the pestilence have suffered an attack or are protected by a previons attack. The

epidemic has ceased for want of material, but the infection remains, and will manifest itself if unprotected persons venture within the infected area from a mistaken idea that there is no more danger because there are no longer any cases.

In this disease, then, the most important point in individual prophylaxis is to keep away from infected localities, and from those places where the disease is epidemic—*e. g.*, Havana, Veracruz, Rio Janeiro—during the season of its prevalence. Very many lives have been sacrificed by a misplaced confidence in the protection which courage is supposed to afford against this disease. "I am not afraid," says the merchant whose business calls him into an infected city, or the sea-captain who wishes to obtain a cargo of sugar in Havana during the summer months. But not being afraid does not prevent such persons from being attacked. And the mortality in Havana among sailors from northern latitudes is very great. There is a tendency in places where the disease is endemic to underrate its malignity, and to ascribe every fatal case to some fault on the part of the unfortunate victim or his attendants. He was "frightened to death," or "was not properly nursed," or he was "imprudent," etc., etc The mortality is no doubt largely influenced by these secondary causes, but yellow fever is a malignant disease, which under the most favorable circumstances is very fatal to unacclimated strangers within the limits of its endemic prevalence, and which in its epidemic extension in new territory often claims from 30 to 35 per cent, or even more, of those who fall sick, as its victims. This being the case, we repeat our advice to all those whose duty does not require them to stay on the field of battle, to make an orderly retreat to some place of safety.

The precautions relating to food and to personal habits do not differ materially from those recommended in the case of cholera. The diet should be simple, and excesses should be avoided. Less care will be necessary with reference to the use of fruits and vegetables—indeed, they are rather to be recommended, as better suited than animal food to the warm latitude in which this disease prevails. Constipation should, above all things, be avoided; and if there is evidence that the functions of the liver or kidneys are imperfectly performed, suitable medication should be resorted to.

There is no special danger from the use of water, if it is from a source which insures it from contamination with organic impurities. Spirituous liquors, if used at all, should be taken in great moderation. Nothing is more likely to develop an attack than alcoholic excesses, and the habitual drunkard is almost doomed to death if he falls sick with this disease. Exposure to the direct rays of the sun, excessive fatigue, and venereal excesses are all predisposing causes which it is within the province of individual prophylaxis to avoid. Exposure to the night air, and especially sleeping out of doors near the ground, is recognized by experienced physicians in yellow fever regions as an invitation to an attack. Great care should be taken to avoid chilling of the body, and it is well to sleep as far from the ground as possible. The creoles of Louisiana and the West Indies generally insist upon closing the windows of a sleeping-room at night.

The mortality among natives of tropical climates, and especially among those whose habits are good, and who are accustomed to a frugal mode of life, is very much less than among the natives of northern latitudes, when

these come, without any previous "acclimation," within the influence of the yellow fever poison. Those who are habituated to life in the extreme South enjoy a certain immunity from the effect of the poison, which is shown by a lower death-rate rather than any exemption from being attacked. One attack of this disease, as a rule, confers immunity from a subsequent attack.

Individual prophylaxis in an infected city will include the avoidance of those localities which give special evidence of being infected, and especial care not to visit such localities at night.

The liberal use of disinfectants in cesspools and water-closets, and a perfect state of sanitary police in and around the premises, will constitute a most important part of the precautionary measures which every individual should take for his own protection and that of his family. A state of mental equilibrium, and an intelligent appreciation of the special circumstances in which he is placed, and of the various measures of prophylaxis heretofore indicated, will enable an individual to look the facts fairly in the face, and to be governed by the light of reason and science. Unfortunately it too often happens, among the ignorant and degraded, that a spirit of bravado, attended with a neglect of the simplest sanitary precautions, and a disposition to deny the presence of the dreaded foe, prevails during the earlier stages of an epidemic, and that this is followed by a disorderly stampede and a disgraceful neglect of the sick, when the presence and malignant nature of the pestilence are recognized.

Smallpox This disease is contracted by exposure to emanations from the body of the sick, or from articles which have been in use by them, or exposed in their vicinity. There is no evidence that the smallpox poison multiplies external to the human body, and the indications for prophylaxis are therefore quite different from those already given for cholera and yellow fever. One may eat what he pleases, and wallow in filth, when smallpox is prevailing, without contracting the disease, so long as he keeps away from the sick, and is not brought in contact with any article infected by them. In this disease, however, as in the infectious diseases generally, previous personal habits will greatly influence the result when exposure does occur; and the disease is more fatal to the victims of alcoholism, to those who are poorly nourished, and, in general, to those whose vitality is reduced by exposure to noxious effluvia from putrefying material, by living in overcrowded and ill-ventilated apartments, etc.

As it is now the universal practice to isolate smallpox patients as soon as the disease is recognized, the danger of coming, accidently, in contact with them is not great. There is but little danger of infection from passing within a few yards of a patient with smallpox in the open air, or from passing a building in which cases are under treatment. Unprotected persons who enter the sick-room are, however, extremely liable to contract the disease; and the infectious material given off from the patient's body clings most tenaciously to surfaces, to clothing, etc., and may give rise to an attack after many months, unless destroyed by disinfection.

It is evident, then, that individual prophylaxis will include the avoidance of places which have been occupied by the sick, and of articles used by them, unless there is a certainty that they have been thoroughly disinfected. It is probable that an unprotected person, who feels obliged, for special reasons,

to enter the sick-room, may escape infection by the use of an air filter placed over the mouth and nostrils. This should be constructed on the principle of the "Tyndal respirator," in which all inspired air is made to pass through a layer of cotton wadding, which arrests suspended particles. It would be necessary immediately on coming out of the room to burn the cotton filter, to bathe the hands and face in a disinfecting solution, and to change the outer clothing.

It is a general rule in regard to infectious diseases that those who are necessarily exposed to them should take the precaution of not going into the sick-room with an "empty stomach," or in a condition of exhaustion from any cause. A cup of coffee, or a glass of wine and a craker, may be taken if a considerable interval has elapsed since the last regular meal.

It is well known that against smallpox we have a special measure of prophylaxis, which has restricted the ravages of this disease within the limits which are left to it by carelessness in regard to the application of this measure, or ignorance of its value. Since the famous discovery by Jenner, vaccination has become the prophylactic *par excellence*.

The immunity conferred by vaccination is, as a rule, complete; but there are exceptions to this rule, and vaccinated persons occasionally suffer from a modified form of the disease. The statistics of the London smallpox hospital show that the mortality among unvaccinated persons received into that hospital with smallpox, is 35.55 per cent; while the mortality among vaccinated persons is less than seven per cent. No doubt a large proportion of the cases of post-vaccinal smallpox might have been prevented by revaccination.

It is now recognized that the protective influence of vaccination is not always of a permanent character, and children who have been successfully vaccinated in infancy should be revaccinated when they reach the age of puberty, or sooner, if smallpox is prevailing in the neighborhood. The operation is so trifling that it is customary to vaccinate old and young with the exception of those who have been successfully vaccinated within a year or two, whenever an outbreak of smallpox occurs. This practice is to be recommended, but when the operation has been performed in a proper manner, with virus which is known to be reliable, it is folly to insist upon a frequent repetition of the vaccination, because "it didn't take." If the first vaccination has been completely successful, a *perfect* result from revaccination is not usually obtained; and the fact that no results is obtained must be taken as evidence that the person is protected. The prophylactic value of vaccination practiced after exposure to smallpox has been demonstrated, and one who is not entirely certain that he is protected by a recent successful vaccination will do well to resort to this important prophylactic measure at once, if he has reason to suspect that he has been exposed to smallpox.

Scarlet Fever In this disease, as in smallpox, the poison is given off from the bodies of the sick, and is not reproduced independently of them. As we have no knowledge of any means of protection corresponding with vaccination, prophylaxis consists solely in keeping out of the reach of infection by the sick, or by articles infected by them.

The sick person may communicate the disease during the whole period of his illness and convalescence—a period which often extends to five or six weeks, or even longer than this. Infected clothing, which has been packed away for months, may communicate the disease; and there are numerous

instances on record of its transmission to children at a distance from the sick, by healthy persons who have recently come in contact with scarlet fever patients. The lower animals, and especially pet cats and dogs which may have visited the sick-room unnoticed, or which are thoughtlessly given to convalescent children for their amusement, constitute a great source of danger. Persons who have suffered an attack of the disease, or who have but little susceptibility to it, may have a slight sore throat as a result of exposure to the scarlet fever poison, and may communicate the disease in its more severe form to unprotected children. One great difficulty in arresting the progress of an epidemic by isolation of the sick and disinfection, results from the fact that these slight and often unrecognized cases are frequently allowed fnll liberty.

Infection has been traced to milk which had been standing in the sick-room, or to the same liquid which had become infected in a dairy where scarlet fever had prevailed, and where recent convalescents were permitted to milk the cows.

All of the facts point to a most rigid exclusion of susceptible children from every possible source of infection. The susceptibility of adults is very much less, and, when attacked, they usually have the disease in a mild form. But their responsibility extends far beyond the point of avoiding the sick for their own protection. Those who are associated with susceptible children have no right under any circumstances to visit the room of a scarlet fever patient without taking the most thorough precautions with regard to the disinfection of their person and clothing immediately upon leaving it; and even with these precautions, such a visit cannot be justified when it is made simply out of curiosity or friendship. Only those who are in attendance upon the sick should be allowed in the sick-room, and they must be regarded as infected persons, who are not to be permitted to come in contact with unprotected children while they are engaged in this duty.

Diphtheria This is a disease in which the infectious material is given off from the surfaces affected, and not from the general surface of the body. As the usual seat of the disease is the throat and the nasal mucous membrane, it is the discharges from these surfaces which are especially dangerous. Although adults are much less susceptible to the disease than children, there have been numerous instances in which they have contracted diphtheria by the accidental reception of a bit of infectious material directly into the fauces. This is especially liable to occur during the operation of tracheotomy; and several physicians have lost their lives in this way, in their efforts to save those of their patients by aspirating through the tracheotomy tube. It seems extremely probable that the diphtheria bacillus is capable of increase independently of the sick, in damp, foul places, such as sewers, damp cellars, and especially under old houses in which the floors come near the surface of the ground, leaving a damp, ill-ventilated space. At all events, the disease often clings to such houses in spite of the application of the usual means of disinfection. There is no doubt as to the influence of bad hygienic conditions in maintaining the infection when the disease has been introduced, and it is possible that such conditions may, in certain cases, originate it.

Insufficient nourishment, the malarial poison, and insanitary surroundings are predisposing causes to the disease. Those suffering from scarlet

fever, measles, whooping-cough, and tuberculosis are also especially liable to be attacked. As in the case of scarlet fever, mild cases, which in the absence of others more pronounced it would be difficult to recognize as true diphtheria, may give rise to malignant diphtheria in more susceptible individuals, or in those whose vital resisting power is reduced by any of the causes mentioned.

Prophylaxis will demand complete non-intercourse with the sick, avoidance of infected localities, and care to exclude all persons and articles coming from such houses from contact with yourself or children. The disease is often spread by thoughtless persons who visit the sick-room, and even kiss the infected patients, and then, without any precautions in the way of disinfection, fondle healthy children in other places, and perhaps by a kiss transmit the infectious material which has adhered to their lips. The possibility of transmission by pet animals is also to be borne in mind.

It has been demonstrated by the bacteriologists connected with the health departments in our large cities that the diphtheria bacillus is often found in the throats of patients convalescent from this disease for three or four weeks after the attack, and exceptionally for a much longer time than this. The time when it will be safe for a convalescent from this disease to associate with susceptible children can therefore not be determined with certainty except by a bacteriological examination made by an expert.

The most important method of prophylaxis for children who are unavoidably exposed to the danger of infection is the use of protective inoculations by sub-cutaneous injection, of the diphtheria antitoxin. The value of this method has been amply and repeatedly demonstrated in children's hospitals, in asylums, and in private practice. The protection afforded by such inoculations is not permanent, and probably, as a rule, does not last longer than a few weeks.

Tuberculosis Scientific researches have demonstrated that tubercular consumption is an infectious disease, and that the sputum of those affected with it, injected into susceptible animals, reproduces in them the same disease. This sputum is therefore infectious material, and should be destroyed by burning, or by the use of chemical disinfectants. There would be little danger of infection from the moist masses of sputum, but in a dessicated condition this material is liable to reach the lungs of susceptible individuals, and to induce the disease.

It is well known that there is a great difference in susceptibility to pulmonary consumption, and that in certain families this disease carries off one member after another, while it is unknown in other families. Those who have this hereditary predisposition should pay special attention to individual prophylaxis. They should avoid intimate association with comsumptive persons, should live under the best hygienic conditions, in dry, well ventilated apartments, and should select an occupation which will keep them in the open air, rather than one which keeps them confined to the house. Above all, they should avoid the respiration of an atmosphere loaded with organic impurities, or with irritating inorganic particles – dust of various kinds. Out of door life on the high and dry plains in the center of the continent, or in the mountains, will in most instances enable them to overcome the predisposition, if commenced before infection and the resulting tubercular lesions have occurred.

Those who are engaged in occupations which require them to pass some hours each day in an atmosphere loaded with dust will do well to wear a respirator for filtering the suspended particles from the air; for it is demonstrated that, independently of hereditary predisposition, the respiration of such an atmosphere predisposes to tubercular disease of the lungs.

Typhoid Fever In this disease, as in cholera, the infectious agent is contained in the alvine discharges of the sick. In the interest of self-preservation as well as in that of the public good, every individual who has charge of cases should see that the evacuations from the bowels are thoroughly disinfected before they are thrown out.

The drinking of water contaminated with such infectious discharges is recognized as a very frequent mode of infection; and individual prophylaxis demands an intelligent consideration of the source from which a supply of drinking water is obtained for personal or family use. If there is the least reason to suspect that this supply may be contaminated by typhoid material, or if it contains an undue amount of organic impurities, it should be rejected entirely, or boiled shortly before it is used.

Typhoid epidemics have in several instances been traced to using milk which had been contaminated by infected water, added to it directly, or used at the dairy for washing the vessels containing it. The remedy in this case is to verify the purity of the source of supply of all milk used for drinking, or to boil it immediately before it is used.

The water of wells located within the limits of a city or village should not, as a rule, be used for drinking purposes, for the soil is almost certain to be polluted; and it often occurs that the contents of privy vaults and cesspools pass into the same porous stratum of sand or gravel from which the well-water is obtained, or that surface drainage finds its way into shallow wells. It will be necessary, also, to regard with suspicion the water of small streams and ponds which are so situated that they may receive the drainage from collections of filth upon their margin.

Next to impure water we must place impure air as a factor in the etiology of typhoid fever. There is good reason to believe that the germs of the disease may be carried by the foul gases which are given off from sewers, privies, etc., when these become infected, and that the disease may be induced by the respiration of such a contaminated atmosphere. At all events, the breathing of a vitiated atmosphere, and insanitary surroundings generally, constitute predisposing causes which should be avoided.

There can be no doubt that typhoid fever, cholera, and other infectious diseases are not infrequently transmitted through the agency of insects, and especially of flies. These domestic pests are likely to light upon the excreta of persons suffering from infectious diseases, if it is left standing in receptacles of any kind, or is thrown without previous disinfection upon the ground or in shallow pits. From these foul places, with their feet and legs soiled by contact with material containing typhoid or cholera germs, they may fly to a neighboring kitchen and there light upon articles about to be served as food, or may fall into the milk jug, etc. This mode of infection is to be prevented by cleanliness, prompt disinfection of all infectious material and the use of suitable screens to exclude these carriers of infection from human habitations.

In typhoid fever, as in yellow fever and cholera, depressing mental emo-

tions, such as grief, despondency, or fear, and physical exhaustion from excessive fatigue, insufficient food, etc., are predisposing causes which may induce an attack in the presence of the infectious agent.

Malarial Fevers One of the latest and most important achievements of scientific medicine is the demonstration that malarial fevers are due to infection by a microscopic parasite which is found in the blood, and that the usual way in which such fevers are contracted is by the stings of infected mosquitoes. Fortunately not all mosquitoes are infected with this parasite. A certain species, found in marshy regions in tropical or sub-tropical countries, has been proved to be chiefly concerned in the transmission of these fevers to man. The evident measures of prophylaxis consists in avoiding the marshy regions where these noxious insects abound, and especially at night, when they are most active; or in the use of mosquito bars and other means of protection from the stings of these infected mosquitoes when in the vicinity of the places infected by them.

In addition to these precautions it is best to take from five to ten grains of quinine daily as an antidote to infection, when exposed in a decided malarious region. In giving these directions it must be remembered that they refer only to the typical malarial fevers which are contracted in marshy regions. The so-called "malaria" of cities is, as a rule, due to entirely different causes.

Concluding Remarks This chapter might be greatly extended, but, having passed in review the principal measures of individual prophylaxis against those infectious diseases which are most fatal, we shall not dwell upon precautions to be taken in other contagious diseases, such as measles and whooping-cough. These precautions will not differ from those already recommended in the cases of smallpox and scarlet fever. So, too, in regard to the infectious skin diseases. These are communicated by personal contact, and rarely occur except among those who neglect personal cleanliness, as well as other sanitary laws. Soap and water will generally suffice for individual prophylaxis. By avoiding filthy persons as well as filthy places, the danger of contracting these and certain other unmentionable infectious disease will be reduced to a minimum.

XXI

THE RELATION OF WATER SUPPLY TO ANIMAL DISEASES*

BY A. W. BITTING

Water is not a food within the strict meaning of the word, but it is necessary to the maintenance of animal life. It forms a part of every bone, muscle, nerve, and tissue in the body, and in such large proportions that it aggregates nearly 60 per cent of the total weight. In young animals the per cent is somewhat higher, and in old or very fat animals it is somewhat lower. Water is not only necessary because it is such an important component of the tissues, but also as an aid to digestion. Food can only be assimilated when in a soluble state, and hence a large quantity of water is required to carry on this physiological process.

It is not surprising that a relationship may exist between the water supply and disease. This relationship may exist in two ways: first, by not furnishing an adequate supply of water or not being accessible when needed; and second, by the water being the carrier of matter which may cause disease.

The quantity of water required by the different animals has not been determined for all conditions. The horse requires from sixty-four to eighty pounds, or eight to ten gallons per day, a gallon of water weighing eight pounds. During the months of February and March, five horses drank from forty-eight to sixty pounds per head when not at work, and from sixty-two to eighty-four pounds while at work. Forty-four per cent of the water was drunk in the forenoon and fifty-six per cent in the afternoon.

Cattle drink more than horses. During the period above referred to, cows not giving milk drank seventy-eight pounds, and cows in full flow of milk drank 112 pounds per day. The largest drink was 122 pounds and the greatest amount taken by one animal in one day was 176 pounds. The Utah Experiment Station[1] found that steers feeding upon dry feed required eighty-three pounds of water per day, while those fed upon green food consumed only thirty-three pounds per day.

Cattle drank seventy-two per cent of water in the morning and 28 per cent in the evening.

We have conducted no experiments to determine the quantity of water required during the summer months.

Our experiments to determine the quantity of water consumed by pigs,

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1 Utah Experiment Station bulletin No. 16. 1892.

were also conducted during the month of March. Four lots of pigs were being fed. Lot I received corn; lot II, wheat; lot III, corn and wheat, and lot IV, soaked wheat. Each hog also received three pounds of skim milk per day. Each hog in lot I drank 2.65 pounds of water; in lot II, 5.2 pounds, in lot III, 3.9 pounds; and in lot IV, 5.3 pounds of water per day.

No attempt has been made to determine the quantity of water needed daily for sheep, and I find no satisfactory tests recorded. Owing to the close grazing habits of sheep, they drink comparatively little water while upon pasture. They can endure privation as regards water far beyond other domestic animals. This has led to the common belief among farmers that sheep do not need water, and that the dew is sufficient. This is a serious mistake and accounts for the loss of many hundred lambs in this State every year.

The number of times an animal will drink during the day, when allowed full opportunity, is not known, but is indicated in a general way by the stomach.

The stomach of the horse is small, and, as might be supposed, does not require much water at a time, but often. The stomach in cattle is very large, and rumination (chewing the cud) is performed. This necessitates saturating the food with water before rumination can take place, and probably explains why so much water is drunk in the morning.

The diseases which arise as a result of supplying water in insufficient quantities, or not providing water in accessible places, are sporadic in character, that is, affect only an occasional animal or a few in a herd or flock. Probably the most serious disease having such cause is mad itch in cattle. This occurs especially in the fall of the year, when the cattle are upon dry pasture, or when turned in upon a dry stalk field. It may occur at other times, and also be due to other causes, but without doubt, ninety per cent of the cases occurring in this State are directly traceable to this cause. Sheep also suffer from impaction and constipation, and large numbers die for want of proper water supply. Hogs, especially young ones, often succumb from like treatment. Horses probably suffer least loss, because they receive the greatest care in this respect, but no doubt many cases of colic, impaction, and constipation are traceable to this source.

It is not the intent to give the symptoms or prescribe treatment for the diseases arising from an insufficient water supply, but to indicate that animals require large quantities of water, and that losses may be expected when not supplied in sufficient quantity or at the proper time. The remedy lies in prevention.

The losses that arise from an insufficient water supply are small compared with the losses that arise from supplying water of an improper character. Whether water will act as an agent for the carrying of the germs of disease, the ova, larvae, and special stages of parasites, will depend upon the source from which the water is obtained. If it comes from a deep well that is properly protected, these organisms will not be present. (See Fig. 14 showing 131 germs in water from tubular well 55 feet deep.) If it is obtained from the surface, as small ponds, ditches, and streams, they may be present. Not all surface waters are dangerous, but all are more or less exposed to infection and may become dangerous at any time. The time it becomes

dangerous cannot be detected by the eye, and may not be detected by laboratory tests.

The earth acts as a filter for all germs that fall upon it, no matter what may be their character. Only a small per cent will pass through the first inch of soil, and a very small number will pass through the first ten feet. In the first few feet of soil most disease germs are destroyed by the forms that inhabit it, but should they pass further down they are restrained only by the mechanical action of the earth. If, however, a soil becomes saturated with germs as for example in a barn-yard, or if the pollution is delivered below the surface, as in a cess-vault, little purification will take place, and the germs may find their way into nearby wells. In order to be certain of the water supply, wells should penetrate an impermeable layer of earth, and the sides be perfectly sealed, as with the iron tubular forms, so that no water can gain

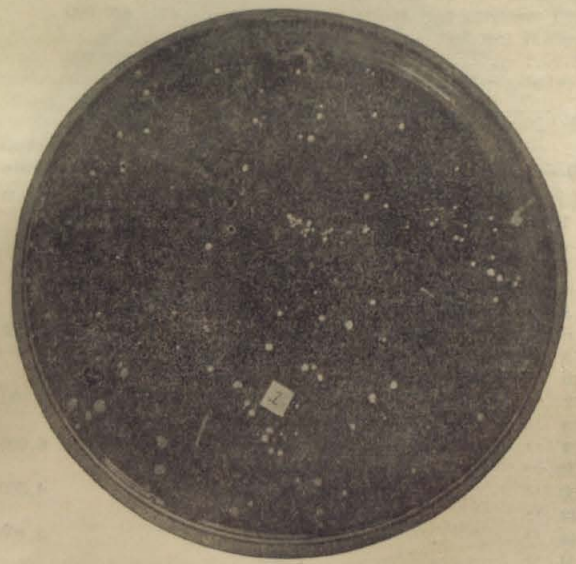

FIG. 14—Showing 131 germs in water of tubular well 55 feet deep

entrance except from below. A tubular well twenty feet deep, is a much deeper well, from a sanitary standpoint, than a dug well of the same depth. It is also true that a shallow well may produce pure water at one time and afterwards become contaminated because of the saturation of the soil with germs, either by the barn-yard or vault.

Water from different sources has frequently been tested in the veterinary laboratory, and some conception of the number of germs that are present in water and the filtering property of the soil may be obtained from the follow-

ing. The quantity in each case is one cubic centimeter, or a half thimble full:

Source	Number of germs per cubic centimeter	
Very filthy hog wallow	2,680,000	
Ordinary hog wallow	730,000	1,420,000
Wabash river above Lafayette	12,000	32,000
Wabash river below Lafayette	112,000	390,000
Clean looking pond	290,000	
Filthy watering trough	248,000	
Stock troughs	5,000	21,000
Tile drains	8,000	
Six cisterns, without filters	5,000	91,000
Four cisterns, with filters	580	3,000
Dug well receiving surface drainage	420,000	
Dug well 14 feet deep in corner of unprotected barn lot	398,000	
Eight tubular wells 60 to 150 feet deep	4	16

A test upon the filtering properties of the soil is as follows:

Depth	Number of germs	Number of germs after a heavy rain
Surface	518,400	312,000
1 inch	51,200	
2 "	28,800	
3 "	17,600	
4 "	17,600	
5 "	13,600	
6 "	13,200	47,500
8 "	8,000	
10 "	12,800	
12 "	5,200	16,000
18 "	10,400	
24 "	2,000	6,000
30 "	3,600	
36 "	4,000	4,300
42 "	3,600	
48 "	3,000	3,100
54 "	2,800	

The bacteria ordinarily found in water are not injurious, but the number present may always be taken as an index of its unwholesomeness. A large number, as shown in Fig. 15, indicates that it is easy for contamination to occur, while a smaller number may be accepted as an evidence of difficulty for extraneous germs to find entrance.

Of the different diseases of live stock in the State, none produce greater loss than hog cholera. For the year ending June 30, 1897, the loss was 899,457 head, valued at $5,396,742. A careful analysis of the statistics for each township in the State shows that the streams play an important part in its distribution. In 1895 sixty townships bordering upon the Wabash from

Cass county to its mouth show a loss of 15 per cent of the entire product, and forty-seven townships in the second tier show a loss of 10 per cent. In 1896 the bordering townships show a loss of 29.4 per cent, the second tier 20.5 per cent, and the third tier 16 per cent. In 1895 forty-four townships bordering upon the north fork of the White river lost 13.8 per cent, and forty-two townships in the second tier, 6.5 per cent. In 1896 the loss in the first tier of townships was 23.1 per cent, in the second tier 15.6 per cent, and in the third tier 7.5 per cent. In 1896 forty-four townships bordering upon the south fork of the White river lost 20 per cent of the hogs; fifty-eight townships in the second tier lost 15 per cent, and forty-two townships in the third tier lost 10.9 per cent. In 1897, the first tier of townships lost

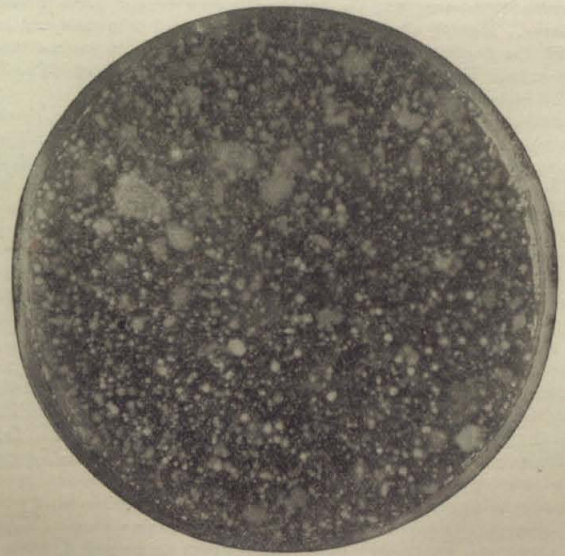

FIG. 15—Showing about 518,400 germs in surface water

32.1 per cent, the second tier 18.2 per cent, and the third tier 14.5 per cent. In other words, the losses in the bordering tier of townships is from 33 per cent to 112 per cent greater than in the second tier, and from 83 per cent to 208 per cent greater than in the third tier. In each case the difference in the per cent of loss in the different tiers is much less in the third year, as in that time the disease had become generally distributed. The statistics from 1882 to 1897 show the annual loss to be greatest along the rivers. These statistics have been presented because the number of townships involved is so large in each case that no local influences could have produced the result. The territory involved makes three long narrow strips in the State at distances sufficiently removed from each other, so that only a positive factor could show the marked differences that exist. The criticism is sometimes

made that more corn is grown along the river and more hogs are fed, which might account for the difference observed. This point has been carefully worked over, and no relationship is traceable to the number of hogs per square mile and the per cent of loss per square mile. An investigation made in 1895 and 1896 showed that the breeders of pure bred swine, who escaped hog cholera, nearly all used well water. Drs. Salmon and Smith came to this conclusion in their investigation of hog cholera.[2] "Perhaps the most potent agents in the distribution of hog cholera, are streams. They may become infected with the specific germ when sick animals are permitted to go into them, or when dead animals or any part of them are thrown into the water. They may even multiply when the water is contaminated with fecal discharges or other organic matter. Experiments in the laboratory have demonstrated that hog cholera bacilli may remain alive in water for four months. Making all due allowance for external influences and competition with the bacteria in natural water, we are forced to assume that they may live at least a month in streams. This would be time enough to infect every herd along its course."

If the larger streams have such a marked influence upon the percentage of loss along their courses, it is only reasonable to suppose that the smaller streams and ponds have a like effect. It is common practice to dig out a pond to receive the surface water from buildings and yards, to dam ravines and creeks, to catch the water from tile drains and springs for water for hogs as is illustrated in Fig. 16. In such cases it follows that they receive only only surface water. It is apparent then, that the first step to be taken in the prevention of hog cholera, is the securing of a wholesome water supply.

All animals are more or less subject to parasitic diseases, and the intestinal tract, owing to its relation to the food and water consumed, becomes the favorite seat of attack. Countless numbers of germs, eggs, larvae, etc., enter with the food, but only a small part are in a proper state of development when they enter or they do not find suitable conditions for continuing life and therefore perish. Water plays a more important part as a carrier of parasites than does the food.

The life cycle of the parasites that affect animals, nearly always includes a stage of development outside of the body. Some parasites are passed out of the body as eggs. These hatch and after undergoing greater or less change, they may be prepared to again inhabit another animal. Some pass out, as larvæ, and after a certain time may infect an animal if taken in the stomach. A few require an intermediate host, as the liver-fluke, which infects the snail, and most tapeworms must usually pass one period of their existence in a different species of animal before they can again cause disease in another animal. Altogether the number of parasites which again find their way into another host, represent a very small per cent of the eggs produced. The eggs and larvæ of all these parasites contain a great deal of water and are easily killed by drying. Moisture is a necessary factor in their existence outside of the body, and hence it is that they are found in large numbers in surface water and are ingested (taken up) with it. Bacteria can stand drying better than parasites, but must have water in which to multiply. It follows then, that fewer parasitic diseases of stock will occur

2 Report upon Hog Cholera, Bureau of Animal Industry 1889, p. 124.

upon high pasture land when well water is furnished, than upon bottom land where they must depend upon a natural supply.

Among the most destructive parasitic diseases with which we have to contend, is the twisted stomach worm of sheep (*Strongylus contortus*). It is found especially on low lands along creek bottoms and around ponds. It affects sheep of all ages, but is particularly fatal to lambs. In 1896 it caused a loss of 50,000 lambs and sheep in this State. In seasons of excessive rainfall it may occur upon any pasture, but in ordinary seasons it causes little damage except upon the low pastures. The eggs and embryos are passed from the sheep and fall with the droppings upon the pasture, and may be washed into the streams or ponds from which the sheep drink. Moisture is necessary for their existence outside of the body, and the dryer the pasture, the less the opportunity for conveying the parasite from one sheep to

FIG. 16—Drinking water source in ordinary pig lot

another. In seasons of heavy rainfall, when the grass is kept constantly wet, the danger may be mitigated to a certain extent by changing the sheep from one pasture to another every other day.

Another disease of sheep that is conveyed in the same way, is the nodular disease. It is due to a small worm, and while it does not manifest itself until winter, the time the infection is spread from one sheep to another is during the summer months.

Such parasitic diseases as paper-skin, liver-fluke, and lung-worm of sheep, and the worms in hogs, horses, and cattle, are all conveyed in much the same way and are largely due to surface water. Pure water from deep wells is the prevention.

XXII

SEWAGE DISPOSAL IN CITIES AND TOWNS*

BY SEVERANCE BURRAGE

INTRODUCTION

A sewerage system is the necessary complement to the public water supply. This is so because the water is essentially the cleanser of the building into and through which it passes. It carries out of the house a vast amount of filth. As the neighborhoods become more crowded, it is obviously undesirable, and even unsafe, to saturate the soil with such polluted water, as would be the case were the old-fashioned cesspools used to receive it. Consequently it becomes necessary, sooner or later, to introduce a general system of sewerage to carry away the filth, not only from the individual houses, but from the city or town itself as well.

Primarily the problem is an engineering one. Pipes are laid in the streets, and these connected with the buildings, so that by gravity or pumping the sewage is removed. Should there be a river or lake, or the sea in the neighborhood, the sewage is oftentimes discharged directly into such body of water, and then allowed to take care of itself. Such a disposal of the sewage, while it may be convenient and inexpensive, is exceedingly unsanitary. It creates a nuisance and menaces the health of neighboring communities. Except in the case of the disposal into the sea, such a dangerous method should, if possible, be avoided. Therefore it is desirous to know whether or not raw sewage can be so treated as to render it inoffensive and safe when it is discharged into a body of water that has several communities bordering upon it.

It has been seen in previous bulletins how serious epidemics have been caused by using sewage-polluted streams and lakes as water supplies. Such streams and lakes, laden with raw sewage, are likely to become public nuisances, even if they are not utilized as a water supply.

It is important, then, from the standpoint of sanitary science, and also of modern civilization, that the municipality should, in some way purify and dispose of its sewage, that it may neither menace the health of its neighbors, nor in any way create a nuisance that would tend to lower the charecter of the surrounding country.

Serious outbreaks of typhoid fever, causing much loss of life, have gradually been awakening the people to the importance of this sewnge-disposal question, and today in the United States and Canada there are a large number of cities that have adopted some system of sewage purification. Several have resorted to the utilization of sewage for irrigation purposes, especially in California where irrigation has become a science by itself. A few towns have been forced to purify their sewage in some way because a neighboring city was obtaining its water supply from that region. Framingham and Marlboro, in Massachusetts, had to do this because the Boston water supply came from that neighborhood. But very few have introduced anything of this kind because it was the proper thing to do. It is something which makes little or no return in money, and this fact has undoubtedly been the chief reason for the non-introduction of sewage purification works. The people are apparently waiting until something valuable can be obtained from the sewage; until the income from the sewage plant shall exceed the outlay, which, as far as known today, is a result that cannot in most cases be secured.

It is well known, however, that sewage can be treated in several ways on a large scale so that an inoffensive and harmless effluent is the result, and, in the following pages, after a short description of what sewage actually is, some of these methods of sewage purification will be described and discussed.

SEWAGE—ITS NATURE AND COMPOSITION

Sewage is "the matter which passes through sewers: excreted and waste matter, solid and liquid, carried off in sewers and drains."[1] It is the "drainage water, together with the solid refuse conveyed in it."[2] Ordinarily sewage is made up of a large number of constituents. It contains the waste water from the kitchens, bath rooms and laundries; the urine, faeces, etc., from the water closets, and, in many cities the surface water that is collected in the street drains. As a result of this mixture we have an opalescent, more or less watery liquid, with considerable sediment, a disagreeable odor, and unpleasant and dirty appearance. Its color depends largely on the nature of the industries that are located in the community, certain establishments, such as dye-works, giving a variety of colors at different times.

American sewage is much more watery in appearance than foreign because it is so dilute. We have seen in a previous bulletin how our cities use much more water than foreign cities, and analysis shows that American sewage contains on an average about 99 per cent water and the rest mineral and organic matter. But sewage differs from water very materially in one respect, as it contains no free oxygen. This has all been used up in the oxidation of the organic matter present. It is not a simple chemical oxidation, however, the bacteria being most active agents in carrying on the decomposition. The more oxygen supplied in one way or another to the sewage, the more rapid and complete will be the decomposition of the organic matter. On account of this scarcity of oxygen, the organic nitrogen is only partially oxydized. In other words, we find this nitrogen as *free* and *a bumenoid ammonia*, *nitrites* in small quantities, but none as *nitrates*. This process of nitrification, carried on largely by micro-organisms, has a most important bearing upon our modern ideas of sewage disposal, particularly upon the results obtained by discharging the sewage upon the soil, or upon sand filters.

* Purdue University Monograph –No. 5—issued by the Department of Sanitary Science. Permission to reprint kindly granted by the University which is located at Lafayette, Indiana.

1 Century Dictionary.
2 Standard Dictionary.

An average sample of American sewage contains about one million bacteria per cubic centimetre, and it is because some of these may be the germs of disease that sewage is, from the sanitary standpoint, such a dangerous material. Sewage may contain the bowel discharges of persons suffering with some infectious disease; it may contain the water in which the clothing of diseased persons has been washed, and in numerous other ways it can receive material which contains the living germs of various diseases. Although, owing to the lack of oxygen, these bacteria do not as a rule multiply very rapidly in sewage, nevertheless they are there and the sewage is dangerous. They may even decrease in numbers, and yet their presence, even in very small numbers, is an indication that the danger is still there.

OLD METHODS OF SEWAGE DISPOSAL

The most common method of getting rid of city or town sewage has been and is to simply discharge the contents of the sewers directly into some body of water, as a river, or a lake, and then allow it to take care of itself. If discharged into the sea, the salt water has a decided precipitative action upon the sewage, rendering it much less offensive. But when this is done, it is of the utmost importance that all such refuse be discharged at such a time of tide that none shall be carried back to the beaches, where it would become a nuisance. But there are numerous cases in the United States where the raw, unpurified sewage of good sized cities is discharged into bodies of *fresh* water. The self-purifying power, a more or less uncertain factor, is depended upon to convert this dangerous, filth-polluted water into a safe and inoffensive liquid. Under favorable conditions, such as enormous dilution and swift currents, it is undoubtedly purified to a large degree, but even then the water could hardly be considered an absolutely safe drinking water.

This system of simply discharging the sewage into fresh water we will not regard as a method of purification. It is one which has caused a great deal of legislation in foreign countries as well as at home. It gave rise in England to the Rivers Pollution Commission. It is going to be given an extraordinarily good trial at Chicago, where the sewage is to be washed down the drainage canal by means of the lake water into the Illinois River. The authorities claim that the dilution will be so great that no disagreeable or dangerous effects will result to those living down the river.

MODERN METHODS OF SEWAGE PURIFICATION

The old theory that filth, containing pathogenic or disease-producing organisms, would, when exposed to the sun, propagate contagious diseases, has been entirely overthrown. Experimentally and practically, sewage has been discharged upon the land, which may or may not have been especially prepared to receive it, with the result that the pathogenic organisms and the offensive nature of the material are most effectively destroyed.

If the sewage be discharged on to a piece of land for the purpose of enriching the soil for raising crops, it is known as *irrigation;* if over a large area, *broad irrigation*. When it is poured upon the land, usually especially prepared, with no idea of raising crops, it is known as *filtration;* and as the best results are obtained by not pouring the sewage on such beds continuously, it is then spoken of as *intermittent filtration*. It is quite common to have a combination of the two methods, broad irrigation and intermittent filtration, which has given very good results.

The following description of a *broad irrigation plant* is given by Palmburg.[1]

BROAD IRRIGATION

The fields should be divided into sections 30 to 50 feet square, raised in the middle and having an equal slope. The sewage is conveyed by a culvert to the middle of the section. At certain distances in this culvert dykes are placed, causing the water to overflow on the slopes of the section.

The suspended matters in sewage tend to become deposited on the surface, forming a layer almost like a bed of felt. It may entirely cover the soil and choke the vegetation. In England its formation is prevented by means of reservoirs, in which the sewage stands, to allow of suspended matters being deposited. Solid matters may also be separated by a grating or precipitated by means of preliminary chemical treatment.

Winter, especially in cold countries, causes some difficulties in the application of irrigation. The absorptive power of the earth is feeble with a low temperature; there is no active growth of vegetation. Under these circumstances the system becomes one of simple filtration.

* * * From a sanitary standpoint, the system of irrigation has had a most satisfactory effect. Numerous critical observations, especially in England, have failed to show the origin of any case of contagious disease from it.

Since 1870, when the Rivers Pollution Commission proposed in their report the purification of sewage by irrigation of cultivated land, the system has been introduced into over 145 English towns.[2] Other European towns, including Berlin, Breslau, and Dantzig have also adopted it.

In America there are several good examples, among which are Wayne, Pa.; Pullman, Ill.; Berlin, Ont.; and Greenfield, Mass. Farther west, where water is scarce, sewage has been utilized for irrigation with considerable success. In California: Fresno, Pasadena, Redding, Los Angeles, Santa Rosa, and Stockton, all irrigate with sewage. In Colorado: Colorado Springs and Trinadad do the same; as do Helena, Mont., and Cheyenne, Wyo.

INTERMITTENT FILTRATION

The word filtration, as used now in connection with water and sewage purification, has come to mean much more than the simple mechanical removal of particles of mud, filth, etc., from the material being filtered. Certain chemical changes take place which can be accounted for only by the presence in the filter of living micro-organisms. Remove these *soil bacteria* by sterilization, and the filter loses for a time its power of purification. Furthermore, the filter is much more effective when air is present, and thus came the process of *intermittent filtration*, in which the sewage is poured upon the especially prepared filter bed for a definite time and then the filter is allowed to rest. The sewage, as it sinks into the soil, drags or sucks air after it, which apparently adds greatly to the vitality of the organisms in the filth. This, then, is the theory of intermittent filtration, that beside the actual sifting process of the sand, the filter itself has a vital action that is dependent more or less upon the air which the intermittent discharge of the sewage gives access to the interior of the filter. Thus the presence of the air increases the nitrifying or oxydizing power of the filter, both by virtue of the oxygen present in the air and by the additional activity which its presence lends to the micro-organisms.

Experimentally, much work has been done at the Lawrence (Mass.) experiment station upon intermittent filtration, where sewage was passed

1 A Treatise on Public Health and Its Applications. Albert Palmburg, p. 140.
2 Public Health and Its Application.' Palmburg, p. 138.

through various thicknesses of various soils. It was found, among other results, that some forms of bacteria would pass through certain filters more readily than others; that in certain cases where the *numbers* of sewage bacteria had increased while the sewage was passing through the filter, the *kinds* of bacteria had greatly diminished, and so on.

Practically intermittent filtration has for some time been in operation at Gardner, Mass., Marlborough, Mass., Summit, N. J., Medfield, Mass., South Framingham, Mass., Brockton, Mass., and Hastings, Neb. The latter city being situated, as a good many western cities are, with no available outlet for their raw sewage, will be a good one to describe here in some detail as an example of considerable value. The facts are taken from Baker's Sewage Purification in America, in which the description was prepared by the engineer, Mr. J. M. Wilson of Omaha, Neb. As Mr. Baker[1] says: "One feature of the design and management of the Hastings plant is worthy of special notice and commendation. Purification is recognized as the first object to be obtained in disposing of the sewage, the raising of crops for revenue being made the second."

The land upon which the sewage is disposed is one and one-half miles from the city. It was graded into ten areas about two acres in extent, each area having its own level and separated from the adjacent areas by a low ridge of earth. These areas were brought to a uniform grade, except at the points where the sewage is received from the distributing gutters. Here the surface was slightly elevated to secure a better distribution of the sewage. The sewage is brought from the city by gravity to a settling and distributing tank, which is provided with cast iron gates for controlling the flow. Each area receives the sewage for a day or two at a time, followed by a rest until the sewage has been applied in succession to the other areas. The application of the sewage to the land creates no nuisance and causes but very little odor.

Brockton, Mass., has one of the most recently completed systems of sewage disposal and seems to promise the very best of results. Here again is the combination of filtration and irrigation. Vassar College, at Poughkeepsie, N. Y., has recently adopted the purification by irrigation and filtration with remarkable success.

To give the reader an idea of how complete the purification of the sewage is by this combined irrigation and filtration method, the writer describes the following occurrance during a visit to the South Framingham, Mass., plant in July, 1896, and while being shown around by the man in charge, all of the party, three in number, drank the water from the effluent underdrains. The water in no way indicated its origin by temperature or smell, although, it did taste quite soft. It might easily be mistaken for spring water as it came out of the pipe into the ditch, clear and sparkling. The principal crop on these sewage beds was corn, which was growing most luxuriantly.

SEDIMENTATION

In Amherst, Mass., the sewage is collected in a stone tank 15x20x6 feet, divided into two equal compartments, in which the sewage is allowed to settle. This division into two compartments enables one to be cleaned of its sludge while the other may be receiving the sewage. The sludge is

[1] Sewage Purification in America. M. N. Baker, p. 49.

removed once a week. The effluent through a pipe to a river some 500 feet distant. No further purification of the sewage is attempted. This method is obviously incomplete and should be used only as a preliminary step to irrigation, filtration, or precipitation.

SUB-SURFACE DISPOSAL

Lenox, Mass., was the first American town to attempt the purification of its sewage, and as Mr. Baker says, there are "hundreds of towns in the United States larger than the Lenox of today (3,120 in 1890) still without sewerage systems, although they have had public water supplies and leaching cesspools for many years." Col. Geo. E. Waring, now in charge of the New York Street Cleaning Department, was the engineer for this system, and his description is as follows:*

> The plan finally adopted and carried out consists of several miles of six-inch pipe sewers, connected at their upper end, for flushing and for ventilation with the rainwater leaders of such adjacent buildings as were available. The various lateral sewers, four or five in number, were connected with a single six-inch main sewer leading for a distance of about 2,500 feet to the upper edge of a field somewhat isolated with reference to present or probable building. It here discharges into a flush tank having a capacity of about 500 cubic feet, separated into two chambers by a wire-cloth strainer to hold back obstructing material. This tank is discharged by a Rogers Field's siphon into a smaller chamber having two alternative outlets, one leading to a system of sub-surface irrigation pipes aggregating 10,000 feet in length, and the other to a surface carrier for the disposal of the outflow over the ground should a portion of the tiles become obstructed. The main sewer leading to the tank has also a branch outlet by which the direct flow may in case of need be turned on to the ground.

This was the old system constructed in 1875-6, and after several years' use, the sub-surface pipes became clogged, and the sewage was then discharged entirely upon the surface. A new system was introduced in 1888, consisting of a settling tank and large stone drains for sub-surface disposal. The liquid from the top of the tank is drawn off through a pipe line, which connects with six brick manholes, or wells. The sewage passes through the bottom of the manhole into stone drains formed by digging trenches and then filling them with stone. These drains are about two feet wide at the bottom, four feet at the top, and four feet deep. Near the top of the drain an Akron pipe is laid with the bell joints on the down grade end, and through these joints the sewage escapes to the drain. They are covered with earth and extend for some three or four hundred feet across the field into a wooded area where they end abruptly. There are six of these drains in use. At the tank there is a slight odor, but usually none at the outlet of the effluent into the river. At intervals of eight to twenty-one days the sludge is drawn from the bottom of the settling tank into a large earth pit, from which it is removed to a compost heap.

MECHANICAL SEPARATION BY FILTRATION

Atlantic City, N. J., possesses a system of sewage purification which consists of an elevated filter bed, in which sand, with hay below, is used as the filtering material. This filter is supported by a wooden structure, and as the effluent comes through the filter it is allowed to fall some three feet to gathering gutters which lead to the effluent pipe. Thus the filtration is supplemented by aeration, and it is claimed that much greater purification is

*Sewage and Land Drainage. Geo. E. Waring, Jr.

thus secured. But the rate of filtration is so rapid that they only get a partial mechanical filtration. Mr. Baker visited these filter beds in October, 1892, and found that*—

> The creek at the point of discharge of the effluent showed scarcely any sign of pollution, there being only a slight deposit of fine matter on the bank of the creek which appeared to have come from the bed. Many small fish were observed in the water at the mouth of the effluent pipe. * * * A slight musty odor was noticeable at and about the beds, but appeared to come from the sewage-soaked wood rather than from the sewage itself. At a distance of 400 or 500 feet from the beds, facing a strong breeze from that direction, a slight oder, not especially unpleasant, was noticed. The effluent beneath the beds was found to be cloudy, which, with the presence of the fish at the mouth of the effluent pipe, as though securing food there, appeared to indicate that appreciable quantities of solid matter passed through the beds. But notwithstanding the color of the effluent and the presence of the fish, the creek showed but very slight pollution.

Some features of the above system have been patented, and the whole system, known as the "West System," is controlled by the National Sewerage and Sewage Utilization Company, of New York.

Leadville, Colo., has a system for removing the coarse, solid matter of its sewage. A body of sand and gravel, 24 feet square and 6 or 7 feet deep, divided into two sections, which alternately receive the sewage for four or five days. The effluent is discharged into an already polluted stream.

CHEMICAL PRECIPITATION

If certain chemicals are added to fresh sewage a flocculent precipitate will be formed, which settles to the bottom of the tank or basin, carrying with it a large part of the impurities. The clearer liquid remaining above may be drawn off as a comparatively harmless and inoffensive material. The whole process of the chemical treatment of sewage, as described by Rafter and Baker[1], comprises the following: The addition of chemicals, together with the working of the various appliances for grinding and mixing the same, the decanting of the effluent and the caring for the sludge; the complete process being in reality partly chemical and partly mechanical.

The same authorities classify the various ways of chemical treatment into the following groups:[2]

> 1 Intermittent treatment in shallow tanks, from five to eight feet deep, in which, after the addition and incorporation of the chemicals, the sewage is allowed to remain undisturbed until the completion of the process.
>
> 2. Continuous treatment in a series of tanks through which, after the addition and incorporation of the reagents, the sewage is allowed to flow slowly; crude sewage with freshly added chemicals passing in at one end, and purified effluent passing out at the other.
>
> 3. Vertical tanks, through which, after the addition of the chemicals, the sewage rises slowly.
>
> There are a number of variations of these three systems, but none of them are important enough to justify further subdivision into classes.

The conditions necessary for success from chemical treatment they[3] further state are:

> 1. That the sewage be treated while fresh.
>
> 2. That the chemicals be added to the flowing sewage and thoroughly mixed with it before it passes into the settling tanks.

* Sewage Purification in America. Baker, p. 127.

1 Sewage Disposal in the United States. Rafter and Baker p. 203.

2 Sewage Disposal in the United States. Rafter and Baker, p. 205.

3 Rafter and Baker, p. 204.

> 3. That there be a liberal amount of tank space.
>
> 4. That the arrangements for removing the sludge be such as to insure its frequent removal, for if left in the tanks until putrefaction sets in, the sludge is likely to rise to the surface, giving off foul odors.

The sludge resulting from this process may be either burned or utilized in various ways as fertilizing material.

The chemicals most commonly used as precipitants are lime, sulphate of alumina, and ferrous sulphate. These chemicals combine with the carbon dioxide or with a portion of the organic substances in solution, and thus form an insoluble precipitate that will sink to the bottom.

For several years this process has been studied with a view of finding out the best and cheapest precipitants to use. Mr. Allen Hazen carried on a valuable series of experiments in this line, in 1889, at the Lawrence (Mass.) experiment station, and he concludes, among other things, that—

> By reason of (a) variations in the composition of the sewage at different places and (b) changes in prices of the reagents, it is impossible to say that one treatment is universally better than another.
>
> By the use of a proper amount of either an iron or an aluminum salt, from one-half to two-thirds of the organic matter of sewage may be removed by chemical precipitation. With the process carried out in detail, the effluent can be discharged into a running stream without producing a nuisance. The incompleteness of the purification in comparison with the cost of the process will be likely to confine the application of chemical purification to narrow limits. There is nothing in these experiments to indicate that the effluents from chemical treatment are fit to drink.

It will be remembered by those who visited the Chicago Exposition in 1893 that the sewage from the fair grounds was treated chemically. The works[1] consisted of four cylindrical iron settling tanks of the Rochner-Rothe type, 32 feet high and 32 feet in diameter, with conical bottoms, which, in a height of 22 feet, tapered from 32 feet to 6 feet. The total height was thus 54 feet, and the capacity of each tank as ordinarily used, with sewage standing 18 inches below the top, was 237,000 gallons. The chemicals employed were crude ferrous sulphate, crude sulphate of alumina, ferric sulphate, and lime. During a period of twenty weeks, the analyses show that substantially one-half of the total organic matters was removed by the precipitation.

This sewage plant at the World's Fair held back from Lake Michigan 1,300 tons of sludge resulting from the treated sewage, which contained about 250 tons of actual organic matters. Mr. Hazen[2] further concludes in his report that—

> They (the sewage works) prevented the sewage from making a nuisance along the lake front such as often resulted from one of the city's sewers discharging untreated sewage just north of the grounds, and they reduced the danger of infection of the water drawn from the Hyde Park intake and supplied to the fair grounds and to the southern part of the city of Chicago
>
> As an object lesson to thousands of visitors, they have given new ideas as to the possibility and necessity of sewage treatment and as to modern methods of securing the cleanliness of the waters on which many cities and towns are located.

The sewage of the city of Worcester, Mass., has been treated by chemical precipitation since June 25, 1890,[3] the effluent being discharged into the

1 Massachusetts State Board of Health Report, 1893, p. 597

2 Massachusetts State Board of Health Report, 1893, p. 612

3 Massachusetts State Board of Health Report, 1893, p. 343.

Blackstone River, which had previously been complained of by the towns below as a nuisance.

CONCLUSIONS

Wherever the old system of cesspools has been replaced by a public sewerage system, in that town or city has the death rate been lowered. Notwithstanding this well-known fact, municipalities are always slow to introduce a sewerage system. It has also been known for some years that the sewage could be disposed of in an inoffensive manner, but still, with the most unsanitary conditions surrounding them, people are slow to act, and by this negligence unwittingly cause many deaths and much sickness.

The foregoing descriptions and examples of the more modern sewage disposal plants will serve to show that in almost any locality in this country, the sewage can be successfully treated, either by the adoption of some one system, or a combination of two or more. In no case is the undertaking a good thing as regards the money return, but in nearly all cases the results are most satisfactory from a sanitary standpoint.

It will be noticed in the preceding pages that no attention has been paid to the various methods of removing nightsoil from individual dwellings, other than by water carriage into a general sewerage system, but as we have been dealing with municipal sewage disposal, the other problem would hardly be properly included.

Furthermore, it has been the object to emphasize, not so much the removal or disposal of the sewage, as its purification. The former is the engineering question and the latter the sanitary one. Unfortunately, the data in regard to the results of the different sewage disposal plants are very meagre, for in many cases, the city, having spent the money to introduce the system, does not care to lay out any money on analyses to see how the work is being done.

The towns in Indiana are growing up rapidly, and will be obliged to meet this question some day in the near future. Indianapolis will be one of the first to grapple with the problem, although many smaller cities need to do so fully as much as the capital. Many, if not all, of the streams in the State are polluted, and many serve as water supplies. Knowing these facts, we have published this Bulletin to inform the people throughout the State what has been and is being done with this all important question.

XX

SCHOOL GARDENING

The State Superintendent of Public Schools has annually been trying to stimulate in the minds of the teachers and children of Iowa, by the programs prepared for Arbor Days, a love for nature—for flowers, and trees, and birds. The object is a most commendable one. There is no better way to instil a healthy and reverential morality in the minds of children than by teaching them to "look through nature up to nature's God." Æsthetic tastes and practices, like cleanliness, are next to godliness.

In the last Biennial Report of this Board, the SECRETARY reprinted a circular issued by Cornell University on "Rural School Grounds," which received quite a good deal of attention, and was heartily endorsed by State Superintendent Barrett. The SECRETARY herewith reprints another circular giving an interesting picture of German school life, and some practical suggestions that may prove interesting to all classes of our people. If such methods can be woven into the curriculum of our Common School life it would surely conduce to healthfulness as well as much greater usefulness.

Would it not be possible even in our urban schools—High Schools—to combine gardening with other industrial departments?

Chicago has been doing this for two years with much satisfaction. The School Board rents acreage, and the ground is platted and staked off, and a certain area given to each student—the whole supervision being under a skilled gardener. The students generally go on Saturday—the street cars carrying them free.

In the circular reproduced below a very thorough practical course of study is detailed, which if incorporated into the curriculum of our Iowa schools could not help but be beneficial, even though it might displace some of the so-called "accomplishments." The following is the circular alluded to:

A GERMAN COMMON SCHOOL WITH A GARDEN*

Most of the common schools in the smaller villages of Germany have attached to them a small garden. This garden is intended primarily for the use of the teacher of the school. It serves his table with a few fresh vegetables and fruits in their season and thus indirectly adds a mite to his modest salary. In most instances this garden is used solely as a source of income and pleasure to the teacher. Occasionally, however, some especially active and wide-awake teacher sees in the garden a means of instruction. Here plants can be watched in their development from seed to flower and fruitage; the curled leaves on a choice plant may show where an insect has made its home; a heavily laden apple-tree may suggest the value of pruning; a few

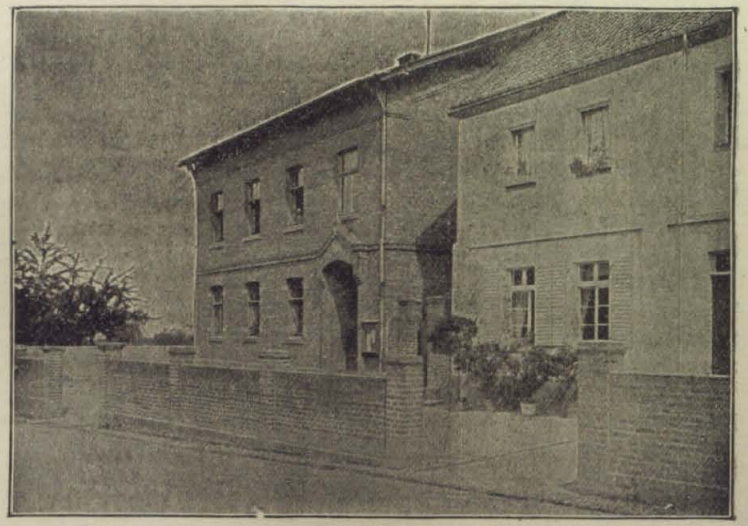

FIG. 1.—Alfter common school The school building on the left, the principal's residence on the right.

pansies or a rosebush rightly placed may awaken ideas of beauty. And so the garden becomes a field for observation. The teacher's nature study charts are supplemented with real flowers and fruits grown in his own garden and with insects, birds, bees, and low forms of life that make their homes in his own hedgerow or feed upon his choicest plants. Pupils working among these flowers, pruning trees, or gathering berries from vines planted and tilled by themselves, may acquire an interest in nature and husbandry which will remain with them throughout their after life. Certainly they will acquire a practical knowledge of the ways in which fruits, flowers, and garden vegetables are planted and cared for, which will be of value to them in their future work as farmers or the owners of homes and gardens.

* U. S Department of Agriculture. Circular No. 42. C. B. Smith. Experiment Stations. Reprint and cuts kindly furnished by the Department.

A school of this sort, located at Alfter, a village of some 2,000 inhabitants, in the German Rhine Province, between Bonn and Cologne, was visited by the author in 1899 (see figs. 1 and 2). The whole region lying round about the village is intensively farmed and forms practically one vast garden. Vegetables alternate with orchards with occasional strips of grain or forage plants. The school is what is known as a "people's school." This is the common school of Germany. Only the fundamental branches are taught in these schools, and the whole course is completed in eight years.

The Alfter common school contains 400 pupils and six teachers. In this school, as in all others in this province, two hours' instruction weekly in

FIG. 2.—Alfter common school. Pupils pruning trees and doing other work in the school garden under the direction of the principal.

fruit culture, gardening, and general farming during the last two years of the course is required. This has been compulsory by law since 1895. Outline suggestions for this work are sent the principal of the school by the provincial government, as follows:

OUTLINE OF AGRICULTURAL COURSE IN THE HIGHER GRADES OF RURAL SCHOOLS IN THE GERMAN RHINE PROVINCE

FIRST YEAR

April and May.—(1) Inner structure of plants; plant cells and tissues and their functions. (2) Outer divisions of plants: (a) The roots—their function in the nourishment of plants by the absorption of mineral matter, as phosphorus, potassium, sodium, iron, chlorin, and water; (b) the trunk—its branches and buds, the structure of the cambium, and the occurrence of ring growths.

June.—(1) The leaf; the nature and function of chlorophyll in the life of the plant and the effect of light on chlorophyll development; breathing of plants; nourishment of plants from atmospheric constituents—carbon, nitrogen, oxygen. (2) The blossom and its fertilization. (3) The fruit; seeds; reproduction of plants by seeds and by division of members.

July.—(1) The soil and its improvement—lime soil, clay soil, loams, sand. (2) The using up of plant food and its replacement by barnyard manure, compost, wood ashes, and indirect manures, as lime and gypsum. (3) Influence of the climate on plants.

August.—(A) Fruit culture. (1) Planting and nursery management of seedlings. (2) The most important methods of fruit improvement—root and stem grafting and budding with active and dormant buds. (3) Management of improved seedlings in the nursery—formation of the trunk and top; transplanting; handling of trained trees, especially espalier forms, with reference to their training against schoolhouse walls. (4) Culture of small fruits—gooseberries, currants, raspberries, strawberries and blackberries; setting grapevines and their afterculture.

September.—(B) Fruit utilization. (1) Ripening of the fruit; gathering, sorting, and storing winter fruits. (2) Fruit varieties—selection of the more commendable sorts with regard to their suitableness to different climates and soils and at varying altitudes. (3) Drying fruits; preserving; making fruit sirups; wine making. This work is planned especially for the girls.

October and November—(C) Fruit-tree management. (1) Planting trees; pruning the roots and branches; watering newly-set trees and tying to stakes. (2) Care during the first year; top pruning. (3) Management of old trees—rejuvenating by pruning, grafting, and scraping the bark. (4) Diseases of fruit trees and their prevention—knot growths, blights, gum excrescences, and frost injuries.

December.—Enemies of fruit trees in the vegetable kingdom—misletoe, mildew, lichens, and moss. (2) Animal enemies of fruit trees—rabbit, mole, marmot.

January.—June bug; plum, apple, and pear curculios; wasps; white butterfly; woolly aphis; and winter cankerworm.

February.—Minerals: Soft coal; stone coal; petroleum; clay and its application in the manufacture of pottery and bricks; table salt.

March.—Iron, lead, copper, nickel, gold, silver; German coins.

SECOND YEAR

April and May.—(1) Garden work—laying out plats, spading, manuring, sewing, seed, watering plants, hoeing. (2) Vegetables—white and red cabbage, savoy cabbage, lettuce, spinach, carrots, and onions.

June.—(1) Legumes—beans, peas. (2) Asparagus, cucumbers. (3) Utilization of vegetables—drying, pickling, making into kraut, and preserving. (4) Field work—plowing, harrowing, rolling.

July.—Field crops: Cereals—rye, wheat, oats. (2) Potatoes, beets. (3) Fodder crops—clover, grasses.

August.—(1) Necessity of crop rotation and consequent methods of manuring. (2) Weeds in garden and field and their eradication. (3) Animal enemies of plants and their control—field mice, phylloxera, asparagus fly, ground flea.

September.—(1) Cabbage butterfly, gooseberry measuring worm, pea weevil, army worm. (2) Useful insects: Bees, ichneumon fly; useful mammals—mole, hedgehog.

October and November.—Plant enemies among the birds—swallow, nightingale, lark, robin, owls.

December.—Domestic animals—dogs, cattle, horses, chickens, doves.

January, February, and March.—Physiology of man.

While this work is laid out for only two years, it practically requires three years for its completion. The plan is intended simply to be suggestive, and it is expected that the teacher will exercise his individual judgment as to time and method of presenting the different subjects, and that he will make his instruction along these lines conform to the agricultural needs of the district in which the school is located. Thus at Alfter nearly every possessor or renter of a small piece of ground is an experienced gardener. He understands thoroughly the value of cultivation and the money worth of every pound of compost. His wife and children work in the field with him. The children at an early age have a very clear understanding of garden operations.

In the matter of fruit culture, however, the community is not so far advanced. The principal of this school is at present, therefore, giving especial attention to this branch of horticultural work, and for this purpose has planted his garden largely to various fruits. The whole garden contains about one-half acre. Dwarf fruits or flowers border the paths about the garden. A nursery grown from seeds planted by the pupils and afterwards grafted or budded and pruned by them occupies a prominent place. Currants, gooseberries, raspberries, and other small fruits and flowering shrubs, annual and biennial flowers, and some vegetables planted in an orderly manner, serve to utilize every foot of available space. A few hives of bees are located on one side of the garden.

The whole work of spading the soil, planting, seeding, cultivating, pruning, and harvesting the crop in this garden, is done entirely by the boys of the sixth, seventh, and eighth grades under the direction of the principal who always works with them. Two hours a week is given to this work during the growing season, and at such times as the conditions of the garden may require. About twenty boys work in the garden at one time, while the remainder of the pupils of the principal's room are having exercises in gymnastics. At the time of a visit to this school a part of the pupils were sowing seed, others were covering them with soil to the required depth, while still others were laying out paths, picking off the dead leaves from flower stems, replanting beds, watering seeds already sown, etc. A few days later the fruits required attention; wall, espalier, and dwarf fruits require to be summer pruned, the fruits to be thinned, insects to be gathered and destroyed.

The children use the pruning shears and do the actual pruning, each pupil being given an opportunity to trim some portion of a tree; but no twig was allowed to be pruned until it was perfectly clear that that particular twig required pruning and indeed to be pruned in a particular place which the pupil himself first determined upon. The necessary tools for this work are furnished by the school. Whenever there is a deficiency it is made up from the principal's own stock or the children bring them from home. When it comes time for budding each pupil buds trees in the nursery. The fall pruning is always done by the children, and small fruits, vines, and shrubs put in order for the winter by wrapping some with straw, laying others on the earth and covering, and the like.

The garden is intensively farmed and made a source of revenue. The same soil is utilized for two or three crops during the growing season and the produce sold. This gives the pupils an opportunity to learn what crops best form a succession with each other during the season and also gives them practice in a limited way in preparing and putting up fruits, flowers, and vegetables for the market.

The principal purposes to walk through the garden each morning before school. Should he discover a harmful insect or disease, a specimen is immediately taken to the schoolroom and the nature and work of the injurious agent shown to the pupils and discussed. This enemy is especially hunted for during the following work hour and the children are asked to search the gardens at home for similar insects or diseases. Thus by daily associations with the garden, daily watching for some new development, and daily discussions and explanations, all the phenomena of the garden are

encountered and brought to the attention of the pupils before the year's cycle is at an end.

Occasionally the bees are made the subject of a special lesson in apiculture. One morning a hive swarmed and flew by the school window, alighting on a small tree. The school was taken to observe this phenomenon. The queen was found among the mass of clustering bees and was placed in the hive, the workers were gathered and placed with her, and a new colony was formed. Work in the apiary is incidental but no opportunity is lost to make available anything of an especially instructive nature concerned therewith and in the nature work the history of bees is considered.

So likewise flowering plants in the school windows are incidentally made a means of instruction. The principal's room contains three windows. These are filled with potted plants. The children (boys) are allowed to tend these flowers, to water them, guard them from insects, remove dead leaves and blossoms, and are permitted to have all the cuttings from the plants, either to take home for themselves or to plant in the school garden. The results of this plan are apparent in every garden and window of the village, where flowers are seen growing in the greatest profusion.

The principal is the local vineyard inspector and in this work is required to visit the different vineyards from time to time and make careful search for all injurious agents. He is at the same time a member of the Bonn horticultural association, and this gives him a wider field for observation and keeps him in touch with progress in horticulture. The principal has been a teacher in the village school for thirty-two years and has taught horticulture from the first. During these long years of service he has had an opportunity to observe something of the influence of his horticultural efforts in the school-room and garden on the community at large. In the matter of vegetable gardening, it is difficult to say what has been the influence of the school in securing the present high state of perfection, though through the principal's efforts the larger part of the present standard varieties of vegetables and fruits have been introduced in the village. It is certain, however, that there has been a decidedly beneficial influence exerted in the matter of flower and fruit culture, an influence which the principal thinks directly traceable to the school-room and garden. The children themselves seem to enjoy the garden work. They gather seedlings from the forest, graft or bud them at home, and are soon the possessors of their own fruit trees, and nearly all have little flower gardens or potted plants of their own.

It would be wrong to suppose that all the common schools of the Rhine Province have been equally fortunate in securing such high grade results in agricultural instruction. As a matter of fact, in the great majority of the schools of this province, the instruction in agricultural subjects is almost wholly theoretical. The teachers who make use of the school garden for purposes of instruction are the exception. The majority of teachers in German schools come from the cities and thus have not been in close association with rural life and work. The technique of orchard, garden, and farming operations has never been mastered by them and with only theoretical knowledge of these subjects the difficulty of successfully teaching them is greatly increased. The principal of the Alfter school ascribes whatever success along horticultural lines he has been able to bring to the school almost entirely to the fact that his early academic teacher was a man who thoroughly understood and who was thoroughly in love with horticultural work. The tendency is to confine the work too largely to the school-room. Even from this standpoint, however, the course, when illustrated by good charts, prepared specimens, and the use of simple text-books, has considerable educational value. But the Germans are becoming fully aware of the fact that the complete success of such a course will depend almost wholly on the teaching ability, theoretical and practical knowledge of the subject, and enthusiasm of the individual teacher.

XXIII

BEANS, PEAS, AND OTHER LEGUMES AS FOOD*

INTRODUCTION

The word legume is used by botanists to denote the one-celled two-valved seed pod, containing one or more seeds, borne by plants of the botanical order Leguminosæ. The most common representatives of this family which are used as food are the various kinds of beans and peas. In common usage the term is applied to the plants themselves, which are hence called leguminous plants or legumes. The term pulse is also sometimes applied to this class of plants. The papilionaceous or butterfly-shaped flowers and the pendant pods of the pea and bean are familiar in every garden, while the ripened seeds of the pea, bean, lentil, and peanut are among the standard food stuffs offered in our markets. Taking the world over, the legumes are, next to the cereals, the most valuable and the most extensively used among vegetable foods. The seeds are eaten green, either alone or with the pod, as in the case of string or snap beans and edible podded peas, and also in the fully ripened state, as split pea, dried beau, lentil, and peanut. Most species of the pea and bean have been greatly improved by the gardeners' art.

GEOGRAPHICAL DISTRIBUTION

Representatives of the legume family are found in all climates and countries. The pea and bean grow rapidly, three and four months being sufficient to bring most varieties to maturity, and consequently they can be grown in the short summers of far northern lands, the pea, the most hardy of them, at least as far as 67 degrees north latitude; and, as they also stand high temperatures, they are all largely cultivated in tropical and subtropical regions. The pea is the favorite legume of middle and northern Europe, while in the Mediterranean countries the bean is grown more generally than the pea. In nearly all sections of our own country both the pea and the bean are grown extensively, and are even exported. Peanuts of a superior quality are cultivated in our Southern States. So far as can be learned, the lentil is at present grown in this country only to a small extent in the southwestern portion of the United States.

THE BEAN

This valuable legume is known to have been cultivated by the Egyptians, the Greeks, and the Romans. The Romans used the broad bean (*Vicia faba*) in voting and in certain ceremonies. Early voyagers to the Western

*U. S. Department Agriculture, Mary Hinman Abel, Farmers' Bulletin 121. Permission to reprint kindly granted.

Continent speak of beans and peas as being cultivated by the Indians in different parts of North and South America, and we know that the Algonquins had one and perhaps two varieties of pole beans. The Indian name for the bean means "to wind about." Champlain, in 1604, describes the planting of what he calls the "Brazilian bean" in the region of the Kennebec. He says it grew five to six feet high and wound around the corn. It was certain that before 1600 A. D. beans were cultivated as far north as the St. Lawrence, and they were recognized by travelers as "proper to the country." Bean flour is spoken of as in use among the Aztecs. Beans are now widely distributed, one or more varieties being grown in all temperate, tropical, and subtropical countries.

FIG 1.— Broad or Windsor Bean

The main species of beans are briefly discussed below.

BROAD OR WINDSOR BEAN (Vicia faba)

This is the "bean of history," or that which was earliest cultivated. This bean (Fig. 1) grows erect about two and one-half feet high, has a square, reddish stem, and the leaves are made up of oval leaflets. The pods are broad, thicker at the end, and generally curved and pendent, containing thickish, bulging seeds. Several varieties are grown in Europe, both for fodder and for human food, but it does not continue as long in bearing as other beans. It is said to be more generally eaten there by the poor than by the wealthy, but, as it has a distinct and agreeable flavor of its own, quite different from the kidney bean, it should be better known among us. It is gathered when full grown, but unripe, and it is then best flavored. The Broad Windsor is perhaps the best known of the cultivated varieties but it is less successfully grown in the United States than in Europe, the climate being apparently unsuited to its best development. It is imported to some extent in exchange for varieties grown here.

KIDNEY BEAN
(Phaseolus vulgaris)

This species, with its numerous varieties, comprises all beans ordinarily used among us except the Lima bean. It is a native of a warm climate, probably of South America, and was introduced into Europe in the sixteenth century. It was not known to the ancients. It has since become very important, chiefly because varieties of it are easily produced by the gardener and the quality thus improved by cultivation. What is called the "keel" in papilionaceous flowers is reduced in the kidney bean to two small blades which do not adhere and cover the pistil, so that cross fertilization with different varieties is easily brought about. It is naturally a climber, but dwarf varieties have been developed which we call bush beans, which are used both as string or snap beans and as dried beans. This bean grows rapidly, flowering and seeding early. It has large, rough leaves, made up of three leaflets, and the butterfly-shaped blossoms, in cluster of from two to eight, start at the axils of the leaves. The pods and seeds are variously shaped and colored. The kidney beans may be divided into two groups—tough podded and edible podded (Fig. 2), there being both bush and pole varieties of each group. A great number of varieties have been developed, each locality having its own favorites, and the tendency of growers to rename standard varieties or those which have developed only unimportant differences tends to confuse the nomenclature. The many "wax" beans belong to this species. Most of the "shell" beans which are eaten before fully ripe are of the pole varieties. The prejudice against beans that grow dark in cooking is unfortunate, since many of them are of fine quality and full flavored.

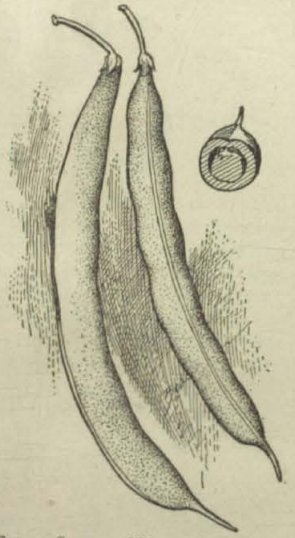

FIG. 2.—Snap or edible podded kidney bean

LIMA BEAN
(Phaseolus lunatus)

This bean is of South American origin, a tall climber, bearing a very flat, broad pod, with short, flat seeds, slightly kidney-shaped, one of the halves nearly always larger than the other and wrinkled or fluted (Fig. 3). The Lima Bean is of excellent quality and a favorite shell bean, both green and ripe, especially in the United States. There is also a cultural variety of bushy habit.

SCARLET RUNNER
(Phaseolus multiflorus)

This species, familiar as an ornamental climber but seldom used as food in the United States, is considerably used for that purpose in Europe, especially in England, some varieties being often preferred both

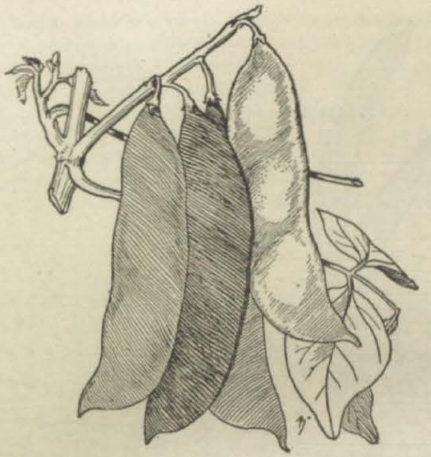

FIG. 3.—Lima Bean

as string and green shell beans to the kidney bean. They are, however, inferior to other beans when dry. It seems strange that this handsome climber, of vigorous and rapid growth, should be so little known as a food plant. It is used while young and tender in the form of string bean. It bears better if the growing points are pinched off.

FRIJOLE
(Phaseolus spp)

Another species which should be noted as being of local rather than general importance is the frijole (*Phaseolus* spp.) of Mexico and our Southwestern Territories, a small, flat bean frequently of a reddish brown or light tan color. Various other colors are also found. It is, next to maize, the staple food in those regions. It is largely used also as a green or snap bean. Either green or dry it is an almost daily food with the Mexicans or natives of Spanish-Indian descent.

It would seem that the dry frijole might well be used farther north. Several varieties that have been tried are very good both in soup and as a vegetable.

COWPEA
(Vigna catjang)

The cowpea (Fig. 4) belongs to the bean family; but it is the "field pea" of the Southern States. There are several varieties—the "red" and "black" varieties, the round "lady" peas, the large "black-eye" and "purple-eye," and the variously mottled and speckled "whippoorwill" peas, besides many others. There are both trailing and bush varieties. The plant bears a leaf with three leaflets and long pods growing in pairs on a long stem. The cowpea has been grown for at least one hundred and fifty years in our Southern States, the seed having been brought from India or China. It is grown both as a forage plant and for human food, but mainly as a fertilizer for the soil (green manure). Considerable quantities of the cowpea are consumed during the season, being gathered when the pods begin to change color and before they become dry. For winter use the dry peas are cooked like other dried beans and have a very agreeable flavor.

The cowpea requires a longer season than the kidney bean and will seldom, if ever, mature in the climate of New England. But as a dry bean it might well be introduced into our Northern markets on account of its distinctive and agreeable flavor.

FIG. 4—Cowpea

SOY BEAN
(Glycine hispida)

"The soy bean (Fig. 5) is an erect annual plant, with branching hairy stems, trifoliate, more or less hairy leaves, rather inconspicuous pale lilac or violet colored flowers, and broad two to five seeded pods covered, like the stem, with stiff reddish hairs. The seeds vary in color from whitish and yellowish to green, brown, and black; and in shape from spherical to elliptical and more or less compressed. Under favorable conditions the plant may reach a height of four feet or more."[1]

This leguminous plant, probably native in China, is the most important legume of China and Japan. Its remarkably high percentage of protein (34 per cent) and fat (17 per cent) attracted the attention of Europeans some twenty-five years ago. Since that time it has been cultivated to some extent, both in Europe and America, chiefly as a forage and soiling crop. In the Orient this bean and the various food products made from it are so largely consumed that it is perhaps the most important food plant next to rice.

1 U. S. Department Agriculture, Farmers' Bulletin, 58.

The soy bean is eaten to a small extent boiled like other beans, but in China and Japan it is elaborated into a variety of products, all of which have a high percentage of protein, and when eaten in connection with the staple food, rice, which is so deficient in that constituent, helps to make a well-balanced dietary. Some one of these products are eaten at, perhaps, every meal and by rich and poor alike, especially in the interior of these countries, where sea food is not obtainable. One of the most important of these preparations is shoyu, and it is the only one that has been introduced to any extent into other countries, where it is known as soy sauce. To make it, a

FIG. 5.—Soy bean

mixture of the cooked beans with roasted wheat flour and salt is fermented for some years in casks with a special ferment. The result is a thick brown liquid having a pungent and agreeable taste.

There are also several varieties of bean cheese or similar products made from this legume which are very important foods. These are natto, miso, and tofu. Natto is made from soy beans that have been boiled for several hours until very soft, small portions of the still hot mass being then wrapped securely in bundles of straw and placed in a heated, tightly closed cellar for

twenty-four hours. Bacteria, probably from the air or the straw, work in the mass, producing an agreeable change in its taste.

For tofu, the soy bean, after soaking and crushing, is boiled in considerable water and filtered through cloth. To the resulting milky fluid 2 per cent of concentrated sea brine is added, which, probably by virtue of the calcium and magnesium salts present, precipitates the plant casein, which is then pressed into little snow-white tablets. It is made fresh every day. Tofu is sometimes cooked in peanut oil before it is eaten. In natto and miso the action of minute organisms plays an important part. In tofu there is no such action. The composition of a number of these products is as follows:

COMPOSITION OF FOOD PRODUCTS MADE FROM SOY BEANS

Soy-bean food products.	Water.	Protein.	Fat.	Nitrogen free extract.	Fiber.	Ash.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Fresh tofu	89.00	5.00	3.40	2.10	.....	0.50
Natto	15.32	41.42	21.65	15.05	1.48	3.08
White miso	50.70	5.70	24.40		12.60	6.60
Red miso	50.40	10.08	18.77		8.25	12.50
Swiss miso	12.53	26.43	13.91	19.54	1.41	26.18
Shoyu	63.29	8.31	.....	5.10	.....	19.45
Do	67.42	7.37	.....	4.66	.....	17.47

LABLAB BEAN AND OTHER UNCOMMON VARIETIES

(Dolichos lablab)

There are several kinds of beans which, though articles of diet in Oriental countries, are used only to a limited extent in the United States, usually by Chinese or other residents of foreign birth or extraction. Lablab beans (*Dolichos lablab*); asparagus bean (*Dolichos sesquipedalis*), and mungo bean (*Phaseolus mungo*), may be mentioned. The green pods of the asparagus bean (fig. 6) are largely used as a snap bean. The pods are long, containing 10 to 16 seeds, more slender than string beans and slightly ridged along the middle of the two valves. Under the name of "tou kok" this vegetable is cultivated by the Chinese in some regions of California and is said to be finding favor with the white residents and is considered a valuable variety of snap bean.

LOCUST BEAN

(Ceratonia siliqua)

There is still another bean which may be said to be among our local food products since the pod is regularly found in a dried state on the confectioner's stands and sold under the name of St. John's bread. It is the carob or locust bean (*Ceratonia siliqua*), grown on the shores of the Mediterranean Sea as food for cattle. It is also eaten to considerable extent by the poorer people. The ripe seeds are surrounded by a sweet mucilaginous pulp of agreeable flavor. When dried the sugar content is as high as fifty per cent. Similarly, portions of the pods of the so-called honey locust (*Gleditschia triacanthos*) are also eaten to a limited extent in this country.

THE PEA

The pea was originally from a more northern clime than was the bean, and it has probably been cultivated from very early times, although it does

not seem to have been known to the Greeks and Romans. It appeared in Europe in the Middle Ages, but it was not cultivated in England even in the time of Elizabeth. Fuller says that peas were brought from Holland and were accounted "fit dainties for ladies, they came so far and cost so dear." From the market gardener's point of view, the pea is the most important of the legumes. In this country and in Europe great quantities are consumed in the green or unripe state, and in Europe the dried or "split" pea is as largely used as the dry bean; with us it is less popular.

FIELD PEA

(Pisum arvense)

The field pea has few varieties. It has in general colored blossoms and the seeds are more or less spotted with brown. The field pea is chiefly used

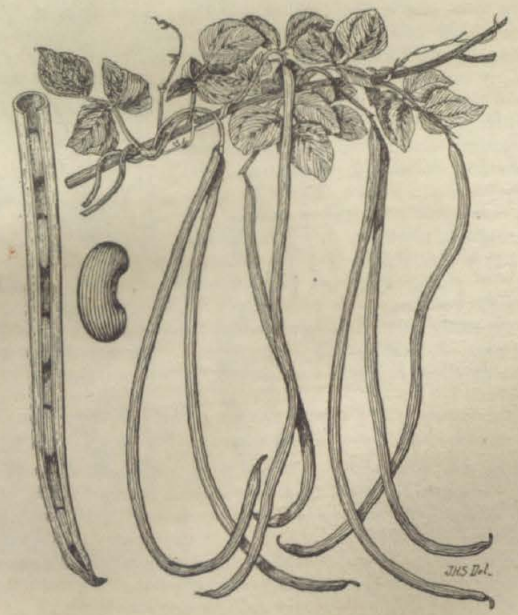

FIG. 6.—Asparagus bean

for fodder; but one variety, the Canadian field pea, is considerably used as a table vegetable. When two-thirds grown it is said to be delicate and well flavored, and it has the advantage of a longer season than the garden pea. As a dry pea it is inferior, as it does not cook soft.

GARDEN PEA

(Pisum sativum)

The garden pea (Fig. 7) has many varieties, but they are kept only by great care, as they easily revert to the original type. The culti-

vated pea has slender, hollow stems bearing compound leaves and terminating in tendrils which attach to any near object. The flowers, generally white, are produced in the axils of the leaves and are followed by pods containing a number of green seeds which are light green when unripe and green or white when ripe.

The garden pea is divided into tough podded or shelling peas, the only kind in general use in this country, and the edible podded or sugar peas. Both kinds may be tall, dwarf, and half dwarf.

Shelling peas are again divided into the smooth or round seeded and the wrinkled kinds. Many varieties of both have been developed by the gardener. There is indeed a useless multiplication of names and varieties.

The edible podded peas (Fig. 8) deserve to be better known among us. Many varieties are successfully cultivated in Europe, but here as yet they are grown chiefly by amateurs and are hardly in the market. The seed is furnished, however, by most growers. This pea has a very tender pod, the ordinary parchment-like lining being much attenuated. The pod is thicker and more fleshy than the pod of the shelling pea. It is gathered when the pea is just forming and used, pod and all, exactly like string beans. Some varieties tested were found to be excellent in flavor and texture.

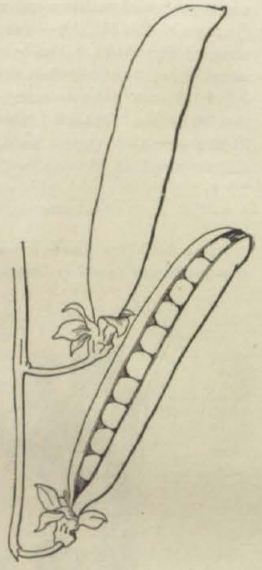

FIG. 7.—Garden pea

CHICK-PEA OR GRAM

(Cicer arietinum)

A shelling pea, practically unknown here, is the chick-pea (*Cicer arietinum*); the garbanzos of Spanish cookery, or the gram of India. It is largely cultivated in southern Europe, in Spanish America, and many parts of the East, especially British India, whence it is exported. It is a stiff, upright plant, covered with hairs and bearing inflated pods containing a few curiously shaped seeds; the two lobes distinctly marked and the germinal point very prominent.

These peas are eaten boiled, but more commonly roasted. This roasted pea seems to have been much in use in Roman times, the phrase *fricti ciceris emptor*, "buyer of roasted chick peas," meaning in conversation a poor fellow.

THE LENTIL

(Lens esculenta)

The lentil (Fig. 9) is a small branching plant with delicate pea-like leaves. The small white flowers growing in pairs are followed by flat pods, each containing two very flat round seeds, convex on both sides. Unlike the pea and bean, the lentil is eaten only when fully ripe. The brown or reddish lentil is smaller than the yellow, but of more delicate flavor.

The lentil is one of the most ancient of food plants, probably one of the first to be brought under cultivation by man. It has been grown from early times in Asia and in the Mediterranean countries. The reddish Egyptian lentil probably furnished the "red pottage" of Esau. In Europe this legume is far less grown than the pea and bean, partly because of its yield of seed and straw is less; therefore the market is partially supplied from Egypt. The lentil, according to analysis, is one of the most nutritious of all the legumes, but its flavor is pronounced and to some persons not as agreeable as that of the pea and bean. It has sometimes been claimed that indigestion and other bad effects followed the eating of lentils, but this impression is known in some cases to be traceable to the use of certain poisonous vetches, whose seed much resembles the lentil. There is every reason to consider the lentil a wholesome food. Until recent years the lentil was little known in the United States, but with the growth of the foreign population its use has steadily increased. The lentils found in our markets are all imported, but the culture of this legume with European seeds is being tried in our Southwestern Territories and elsewhere. There is already grown in New Mexico and Arizona, as well as in Mexico, a small variety of lentil, the seed of which was doubtless brought from Spain centuries ago by the ancestors of the present mixed race living there. The sandy soil of moderate fertility seems adapted to it; it has become acclimated, is hardy and prolific.

Fig. 8.—Edible podded or sugar pea

THE PEANUT

(Arachis hypogæa)

The peanut (Fig. 10) is so different in appearance from the bean and pea and is put to such different uses that it is seldom thought of as a legume,

but a study of the growing plant immediately shows the resemblance. Here we see the same straggling, more or less trailing annual, with characteristic leaves, and the butterfly-shaped blossom, whose ovary develops into a seed pod. The manner of growth from this point is very peculiar; as the flower

FIG. 9— Lentil.

withers the stalk or spike of the ovary rapidly lengthens and pushes into the ground, so that the pod is matured beneath the surface, but if the spike is prevented from doing this it soon withers. Other names for this plant are the earthnut, ground nut, ground pea, goober, and pindar. Where the peanut originally grew is uncertain. It is now widely distributed in tropical and subtropical countries, Africa and our own Southern States producing most of the crop.

NUTRITIVE VALUE OF THE LEGUMES

The different kinds of legumes are so similar in their general character, nutritive constituents, and digestibility that in these regards they may be treated together. Even in an immature state, as green peas and beans,

they are, as regards composition, equal or superior in nutritive value to other green vegetables, and the ripened seed shows by analysis a very remarkable contrast to most of the matured vegetable foods, as the potato and other tubers, and even to the best cereals, as wheat. This superiority

FIG. 10 —Peanut.

lies in the large amount of nitrogen in the form of protein that they contain. Another characteristic of the legumes brought out by analysis is the large percentage of mineral matter in them, the excess being chiefly in lime and potassium salts. In some instances they contain a large amount of fat; for instance, seventeen per cent in the soy bean and fifty per cent in the peanut.

A comparison of some of the more common fresh and dried legumes with other food materials is shown in the following table:

COMPOSITION OF FRESH AND DRIED LEGUMES COMPARED WITH THAT OF OTHER FOODS

MATERIAL.	WATER.	PROTEIN.	FAT.	CARBO-HYDRATES	ASH.	FUEL VALUE PER POUND.
Fresh legumes	Per cent	Per cent	Per cent	Per cent	Per cent	Calories.
String beans	89.2	2.3	0.3	7.4	0.8	195
Whole pods of *Dolichos sesquipedalis*	79.9	4 5	.5	13 9	1.2	365
Sugar peas or string peas	81.8	3.4	.4	13.7	.7	335
Shelled kidney beans	58 9	9.4	.6	29.1	2 0	740
Shelled Lima beans	68.5	7 1	.7	22 0	1.7	570
Shelled peas	74 6	7 0	.5	16.9	1.0	465
Shelled cowpeas	65 9	9 4	.6	22.7	1.4	620
Canned string beans	93.7	1.1	.1	3.8	1.3	95
Canned Lima beans	79.5	4.0	.3	14.6	1.6	360
Canned kidney beans	72 7	7.0	.2	18.5	1.6	480

COMPOSITION OF FRESH AND DRIED LEGUMES—CONTINUED.

MATERIAL.	WATER.	PROTEIN.	FAT.	CARBO-HYDRATES.	ASH.	FUEL VALUE PER POUND.
	Per cent	Per cent	Per cent	Per cent	Per cent	Calories.
Canned peas	85.3	3.6	.2	9.8	1.1	255
Canned baked beans	68.9	6.9	2.5	19.6	2.1	600
Peanut butter	2.1	29.3	46.5	17.1	5.0	2,825
Dried legumes:						
Lima beans	10.4	18.1	1.5	65.9	4.1	1,625
Navy beans	12.6	22.5	1.8	59.6	3.5	1,605
Frijoles	7.5	21.9	1.3	65.1	4.2	1,695
Lentils	8.4	25.7	1.0	59.2	5.7	1,620
Dried peas	9.5	24.6	1.0	62.0	2.9	1,655
Cowpeas	13.0	21.4	1.4	60.8	3.4	1,540
Soy beans	10.8	34.0	16.8	33.7	4.7	1,970
Chick-pea *a*	14.8	12.4	6.7	63.3	2.8	1,690
Peanuts	9.2	25.8	38.6	24.4	2.0	2,560
St. Johns bread (carob bean,) *a*	15.0	5.9	1.3	75.3	2.5	1,565
Potatoes	78.3	2.2	.1	18.4	1.0	385
Cabbage	91.5	1.6	.3	5.6	1.0	145
Tomatoes	94.3	.9	.4	3.9	.5	105
Rolled oats	7.7	16.7	7.3	66.2	2.1	1,850
Wheat breakfast foods	9.6	12.1	1.8	75.2	1.3	1,700
Spring-wheat flour	12.3	11.7	1.1	74.5	.4	1,650
Winter-wheat flour	11.9	10.7	1.0	75.8	.6	1,650
Lean beef	70.0	21.3	7.9	.....	1.1	730
Dried beef	54.3	30.0	6.5	4	9.1	840
Milk	87.0	3.3	4.4	5.0	.7	325
Cheese	34.2	25.9	33.7	2.4	3.8	1,950
Eggs	73.7	14.8	10.5	.....	1.0	720

a European analysis.

Fresh string beans, sugar peas, and shelled peas, like other fresh, succulent vegetables, contain considerable water, which, with the materials dissolved in it, forms the plant juice. They somewhat resemble cabbage in percentage composition. Fresh shelled beans, peas, and cowpeas contain a fairly large amount of protein or nitrogenous material, the nutrient which serves to build and repair body tissue as well as to furnish energy. They also contain considerable carbohydrates and small amounts of fat, both these classes of nutrients serving to supply the body with energy. The amount of ash or mineral matter in the legumes varies in amount. It doubtless serves the same purpose in the body as mineral matter found in other food materials. The canned legumes, which are simply cooked foods sterilized and kept in such a way that they can not ferment, resemble in composition the same materials uncooked. The dried legumes contain some water, though to the eye they seem to be perfectly dry. They contain a high percentage of protein, in this respect surpassing the other seeds commonly used as food, such as wheat. They approach animal foods as regards protein and total nutritive value, most of the legumes containing carbohydrates in place of the fat found in animal foods. Fats and carbohydrates, however, serve the same purpose in the body, although the fats yield two and one-fourth times as much energy per pound as carbohydrates.

NITROGENOUS CONSTITUENTS

Vegetable foods are nearly all rich in starch and other carbohydrates, which supply an abundance of carbon to the system; but they contain, in general, comparatively little nitrogen, an element that is of first importance in a dietary. Therefore, the very large percentage of this constituent found

in the legumes constitute for us their special interest, and the true nature of the compounds in which this nitrogen exists is also of the utmost importance.

Most of the nitrogen found in the pea, bean, and lentil is in a form very useful as food. It was called by Liebig "plant casein," on account of its general resemblance to the casein of milk. Although its action as a food is similar to the nitrogenous matter of other vegetables, it is markedly different in some of its characteristics from, for instance, the gluten of grains. Pea and bean flour will not form a dough with water and can not be utilized for making porous bread.

DIGESTIBILITY OF THE BEAN, PEA, AND LENTIL

Judged by the chemical analysis alone, we should give legumes the very highest place among foods, containing, as they do, more protein than the best cuts of meat, and in some cases a large percentage of fat, besides a considerable amount of starch. Pound for pound, they would thus be more valuable than meat or our best cereals. Forty years ago they were announced by Moleschott as "true treasure-houses for the renewing of our blood," being equal in their albumen content "peas to veal, beans to flesh of doves, while lentils left every kind of meat far behind."

Experiments on men and animals soon made it evident, however, that the true value of a food does not depend alone on the contained nutrients, but also on the ease and completeness with which the system utilizes these nutrients, since, to use the old adage, "man lives not by what he eats but by what he digests." Voit pointed out as early as 1869 that vegetable foods in general were less completely digested than animal foods, for three reasons:

(1) As generally prepared and used, the nutrients of vegetable foods are inclosed in cells composed of cellulose or woody fiber, which is more or less hard and greatly interferes with their absorption.

(2) Vegetable food is prone to fermentation in the intestines, thus increasing the peristaltic movements and, if large amounts are eaten, hastening the food onward before there has been sufficient time for the absorption of its contained nutrients.

(3) The cellulose present acts as a local irritant and produces the same effect.

PRACTICAL EXPERIENCE

Practical experience, reaching to ancient times, testifies that beans, peas, and lentils are "hearty food." To quote the physician Galen, "they are harder to digest than other foods and give bad dreams." There is a general opinion that while they are suitable for robust people leading an active, outdoor life, indispensable to the soldier's outfit and to the logging camp, welcomed by the hunter and woodsman, and a necessary part of the food of the hard-working poor, they are, on the other hand, unsuitable for people leading a sedentary life, and are generally to be avoided by the invalid and convalescent. Such persons often complain of distress after eating beans, especially if the skins have not been removed, and of the disagreeable evolution of gas in the intestines, testifying, as it does, to the fermentability of this class of vegetables. These foods are, therefore, called "indigestible," by which is meant in common speech that they give distress or that we are unpleasantly conscious of the digestive process. These symptoms, however, do not in general indicate anything as to the extent to which the contained

nutrients of a food are absorbed or used in the system. When eaten in reasonable amount by persons in health, it is doubtful if they give rise to unpleasant symptoms. That no bad results attend their use is shown by the important place they have held in the diet since early times.

LABORATORY EXPERIMENTS

Hoffman fed a man bread, lentils, and potatoes sufficient for his full nourishment and found that 47 per cent of the contained protein left the system unused. Of meat containing the same amount of protein, only 17.7 per cent was unabsorbed by the same person.

Woroschiloff, in comparing the digestibility of lentils with meat, found that from two to three times as much of the protein of the meat was utilized in the system as of the legume.

A very careful study was made by Strumpell of the extent of the digestibility of legumes. According to the results it would seem to depend largely on the form in which they are eaten. When he ate 250 grams (about three-fifths of a pound) of beans cooked, as they ordinarily are, whole and without removing the skins, 40 per cent of the contained protein was unabsorbed or four times as much as in the case of meat. On the other hand, when he used "Leguminosenmehl," a prepared food consisting chiefly of lentil flour, only 8.2 per cent of the contained protein was unabsorbed. This equals the average digestibility of meat. As pointed out by other workers, this is, however, not a fair showing, since in order to eat enough of this lentil flour to even partially meet the conditions of the experiment, he was obliged to make it up into cakes with milk, eggs, and butter, and the extent to which the nutrients of the legume were absorbed was, doubtless, much increased by the presence of stimulating animal foods.

Rubner, one of the later observers in this field, found a man who was able to eat for a few days enough cooked dried split peas (about 1½ pounds) to fully nourish him without help from other kinds of food, peas being selected because he liked them better than beans or lentils. Even with this large quantity only 17 per cent of the contained protein was unabsorbed. It may be said that this robust individual does not represent the normal feeder, but the aim in this case is to show a comparison between this and other foods. The same man failed to use in the system 11 per cent of the contained protein of macaroni.

FLATULENCE

It is a matter of common experience that after the eating of legumes in any quantity there occurs what is known as flatulence or the formation of gas in the intestines. This effect is not confined to people of delicate digestion, although it is to them more distressing, nor does it seem to have anything to do with the extent to which the nutrients of the food are used in the system. Experiments with animals indicate that the formation of methan is entirely due to bacterial action on carbohydrates in the intestine. Rubner's man who digested so well the large amount of peas above cited complained very much of this disagreeable accompaniment. In India the mungo bean is highly esteemed and is eaten by the rich and by sick people, but always "with a seasoning of asafetida to prevent flatulence."

DIGESTIBILITY IN MODERATE QUANTITIES

The digestibility of legumes is thought to be largely a question of preparation and amount eaten, as indicated above. Properly prepared and eaten in moderate quantities, peas, beans, and lentils can not be called indigestible in the ordinary sense of the word. The entire removal of the skin by sieving is to be recommended in the case of persons with whom they seem to disagree.

As to the extent of the digestibility of the contained nutrients when eaten with the above restrictions, they are probably as well used as those of other vegetable foods; but less so than the nutrients of meat. It should be remembered that a due amount of nonabsorbable or refuse matter is necessary in the food to insure the healthy action of the intestines, and it would be a great mistake to substitute, as a general thing, highly condensed foods for those containing some cellulose. None but the most hardy people could use the legumes as their sole source of nitrogenous food, since for that purpose, 18 ounces daily of dried peas or beans would be necessary for a laboring man, an amount which could be furnished in not less than 6 pints of thick soup; but this fact has nothing to do with their use in moderate amounts, and there is almost no dietary in which they may not profitably find a place.

DIGESTIBILITY OF PEANUTS

The peanut is remarkable among the legumes for its large proportion of fat (50 per cent) and its resemblance in taste and use to the true nuts. Long as the peanut has been cultivated in the South, it has never to any extent taken the place of a food, but remains a food accessory for occasional use only. No laboratory experiments seem to have been made on human beings as to the extent to which peanuts are digested, but, according to general experience, the peanut eaten in any quantity is indigestible in the sense of bringing on pain and distress. This is probably on account of their rich, concentrated character. It is to be noted that when they are eaten in connection with other food, as bread, the ill effects are less marked.

VEGETABLE PROTEIN COMPARED WITH ANIMAL PROTEIN

It has been well known that vegetable foods without any help from the animal kingdom will sustain men in health and working power, and careful experiments have shown that protein performs essentially the same part in nutrition, whether it be from milk, meat, cereal, or legume. Among other experiments may be mentioned that of Rutger, a Dutch physician and his wife, which lasted ten weeks. Their conclusion was that vegetable food can perfectly well be substituted for animal, provided only that it contain the same amount of nutrients in proper proportions. When living on a purely vegetable diet they relied largely on peas, beans, and lentils, eating them in some form at nearly every meal. From an economic standpoint the average difference in the cost of the two kinds of diet was that less fuel was used to cook the animal foods eaten.

It is not improbable, however, that there are differences between animal and vegetable protein that cannot be tested by any method now at our command, differences which would explain the almost universal preference for some animal food in the diet. From our present knowledge it would seem that the mixed diet made up of both animal and vegetable food is the best and most practicable for the vast majority of people.

EXTENT TO WHICH LEGUMES ARE USED IN DIETARIES

Since, as we have seen, peas, beans, and lentils contain as much protein as meat, and no other vegetable foods can approach them in this regard, we need not be surprised to learn that they are extensively used among all people who, either from necessity or from choice, eat little or no meat. This is but one of many instances of a wise choice of food made long before exact knowledge was able to give the reason for it.

Some food rich in protein will be found in the daily diet of all people. The Mongol eats with his rice, which is largely starch, small quantities of fish, fish eggs, and goose livers, but for his supply of proteid material he relies on his different preparations of bean cheese and on soja sauce made from the soy bean. The Mexican, whose supply of meat is scanty and of a poor quality, uses the native bean or frijole at almost every meal, made into a stew with vegetables and perhaps shreds of sun-dried beef, well spiced with the chili or red pepper. The cooking is said to be done now in the unsightly American tin can (in this case a lard or kerosene can), which has almost supplanted of late years the primitive earthern pot described by travelers. The bean stew or porridge, with the tortilla or cake of pounded corn, makes up the bulk of his food. The puchero or daily stew eaten by the poorer class of Spaniards has lentils for its basis, and with the Bedouins and other Asiatic people the porridge of lentils is in constant use. Church mentions twenty species of legumes, some having many varieties that are raised in India, and there they form not an occasional but a staple food among a people who, both by poverty and by religious scruples, are prevented from eating meat. There is a Hindoo proverb, "Rice is good, but lentils are my life." The Roman proverb, "The poor man grown rich no longer delights in lentils," intimates that though indispensable to the man of slender purse their too familiar flavor was gladly exchanged for the more expensive dish when it could be afforded. The legumes have been called the "meat of the poor." Nitti, an Italian writer, tells us that the Neapolitan bricklayers, restricted by their scanty wages to cheap food, but requiring food that is rich in protein, condemn themselves to a daily diet of kidney beans, a vegetable which is at the same time the cheapest and the richest in protein. With the Hindoo the lentil is reputed to have great staying power, aud it is a favorite food among those who are to undertake long journeys. Parched as we parch corn, it is much esteemed in Egypt and Syria for this purpose. Arabs feed their horses ground beans to prepare them for extraordinary exertions.

In early days in the New England States the woodcutter who went out for a day's work in the woods in winter almost always took with him "bean porridge," *i. e.*, beans that had been cooked to the consistency of a thick mush and then frozen in bowls. In each bowl had been placed a string, which served to lift out the contents. By the help of the camp fire the frozen cooked beans were again made into porridge.

In the dietary studies made in connection with the nutrition investigations of the Office of Experiment Stations of the United States Department of Agriculture and the earlier work from which this inquiry developed, calculations were made showing the proportion of total nutrients furnished by a number of the principal classes of foods. Taking the average of some fourteen studies with professional men of varied income and living in different

regions, dried legumes constitute 0.6 per cent of the total food and furnish 2.1 per cent of the total protein of the diet—a small amount when their high food value is considered. Wheat flour furnished 8.4 per cent of the total food and eggs 2.2 per cent, or 17.1 and 4.9 per cent, respectively, of the total protein. Considering the average results of fourteen dietary studies with mechanics' families and ten farmers' families, dried legumes furnished one per cent of the total food material and three to four per cent of the total protein, the proportions furnished by wheat, flour, and eggs being somewhat greater than in the case of the dietaries of professional men. The native inhabitants of the southwestern United States and Mexico are reported to consume large amounts of frijoles and other legumes. The average of four dietary studies of Mexican laborers living in New Mexico shows that these materials furnished 9.4 per cent of the total food and 21.3 per cent of the total protein. In this case eggs furnished only 0.8 per cent of the total food and 1.6 per cent of the total protein, while wheat flour furnished 12.3 per cent and 21 per cent, respectively. In the case of professional men, mechanics, and farmers, the total amount of dry legumes used was small, and in view of the high food value, palatability, and low cost of this class of foods it might have been profitably increased.

PREPARATION OF LEGUMES FOR FOOD

Since legumes are to be counted among our cheapest and most valuable food stuffs, if their contained nutrients can be digested, their choice and preparation is a matter of importance. The legumes are used—

(1) Chiefly for the tender pod, which for this purpose must be gathered when the seed is less than half grown. Such are the string bean and sugar pea.

(2) The nearly grown but unripe seed, as the "shell" bean and pea.

(3) The fully ripened seed, as the dried bean, pea, lentil, and peanut.

(4) The flour or meal made by grinding the fully ripe seed—bean, pea, or lentil, and peanut.

STRING BEANS AND SUGAR PEAS

French beans (*haricots verts*), snap or string beans, are the immature fruit pods of several varieties of the kidney bean, both the dwarf and the climbing. The best have little or no "string," some requiring no preparation for cooking. They must be freshly gathered and so young that the beans are hardly noticeable when they are cooked. After the string, if present, is removed, the pods are cooked, either whole or broken into bits. The German method is to cut them transversely a few times or "whittle" them. This seems to shorten the time of cooking and to allow of better distribution of seasoning. They are then boiled in salted water and drained, or the water may be thrown away after a few moments of boiling, the beans being then stewed in as little water as possible and the seasoning added when they are half done.

When the beans form the main dish of the meal, a piece of fat meat is often cooked and eaten with them. When the bean of most varieties is more than half grown the pod is no longer tender enough to be cooked in this way. String beans that must be cooked from one to two hours are not worthy the name. When young enough and freshly gathered they will cook

tender in twenty to forty minutes. There are a few varieties of which the pod is tender until nearly ripe. Sugar peas are cooked in the same way as string beans. After the pods are full grown they become tough, but furnish a good quality of shelled peas.

Salted beans—String beans are sometimes salted for winter use. They can be kept thus for months, and during the time a bacterium is at work effecting a change somewhat similar to that brought about by the fermentation of sauerkraut. The vegetable fiber is softened and certain flavors developed by the process. Thus preserved they are a favorite winter vegetable among the Germans. Before cooking they are soaked over night to remove the salt. Shredded string beans are also dried or disiccated and are much used by armies and expeditions.

String beans and sugar peas or edible-podded peas, eaten as they are for the pod rather than the seed, fall in much the same class with spinach, cabbage, etc. They contain relatively little nourishment in proportion to their bulk and are valuable chiefly for their agreeable flavor, the salts contained in them, and the healthful variety given to the diet.

SHELL BEANS AND GREEN PEAS

Immature or green peas and beans freed from the pod are a highly valued article of diet in almost all countries. They contain a good proportion of proteid material and starch. The cellulose, so woody in the ripened seed, is still tender and easily cooked and the flavor is excellent. The method of preparation is very simple. They must be freshly gathered and shelled, as they deteriorate rapidly in flavor and each hour that passes after their removal from the vines increases the length of time necessary for their cooking. They should be stewed rather than boiled, the water being reduced to only enough to moisten them, and the seasoning, including a generous quantity of butter, added while the beans or peas are only half cooked. A sprig of mint added to green peas when cooking is liked by some; but it may be said in general that so delicate a flavor as that of green peas should not be covered by any strong or pungent additions. The French have a special dish, *haricots verts panaches*, or "variegated" green beans, which is a mixture of the young shelled bean with string beans.

CANNED BEANS AND PEAS

Beans and peas are canned in large quantities. It would seem that the process might be improved, since much of the tastlessness of canned peas is said to be due to the fact that the water in which the peas are boiled is thrown away in the process of "blanching." Canned beans and peas are simply preserved, cooked foods having, in general, the same composition as those that come freshly cooked to the table.

DRIED PEAS, BEANS, AND LENTILS

Green peas and beans are often to be classed among delicacies, but we have in the ripened seed a standard food for all classes. Like the grains, they have good keeping qualities and can be combined with other materials into a variety of palatable dishes. Only fat is needed to make of beans and peas a complete food in the sense that the combination furnishes the proportion of protein, fat, and carbohydrates required by the accepted dietary standards. Hence the popular combination of beans and peas with fat meat, as pork and beans, bacon and peas, corned beef and beans.

Quality—A well-dried bean is smooth and shining; one poorly dried may be of inferior quality with folds in the skin. The best beans are of uniform size, not too small nor a mixture of different kinds. The larger are in general preferred because they have a smaller proportion of skin, but there are several varieties of small beans that bring a high price because they have a a thin skin and fine flavor. Heavy, well-filled beans bring a higher price, the weight of a bushel of different kinds varying by several pounds. The value of the dried legume depends finally on whether it will cook soft, and this is to be determined from a given lot only by putting a sample to the test. The main requirements in the cooking of dried legumes are:

(1) To so soften and disintegrate the cellulose that the nutrients that exist in close connection with it are freed.

(2) To cook the proteid constituent so as to make it digestible and palatable.

(3) To swell and burst the starch grains.

(4) To combine with various flavoring matters, as salt, pepper, fat, herbs, and butter or fat meat so that the result shall be a palatable dish.

Treatment of the skin—The first step in the ordinary household practice is the swelling and softening of the legume by soaking in water a number of hours, usually not less than eight, and the removal of such parts as will not soften by cooking. Some cooks, however, believe it is not necessary to soak the beans. They cover them with hot water and allow them to stand a short time before boiling. The first method is to be preferred.

In the ripened and dried legume, the envelope becomes tough and leathery; even when cooking has done its utmost, these skins and hulls pass through the intestinal tract quite unchanged. The skin of the ripened pea and lentil is easily removed and the "split pea" and the lentil, as generally sold, have this decided advantage over the bean in the making of digestible soup and porridge. Many kinds of beans, however, after proper soaking, may be freed from their skins by stirring in water. The skins rising to the top are then skimmed off. The large Lima beans after soaking may be easily slipped out of the skin by pressing between the fingers. They can then be boiled and served as a vegetable of the consistency of mashed potato—sometimes called bean pudding. Peas pudding cooked in the same way is a familiar dish. In cooking beans for soup the skins may be separated by sieving.

Hard v. soft water for boiling—The water for cooking dried legumes, it is agreed by all writers on the subject, should not be "hard" water, by which we mean that which is impregnated with various salts, as lime and magnesia salts, since the legumin of the seeds forms with these salts insoluble compounds with the result that portions of the vegetable remain hard, no matter how long they are cooked. Rain water is preferable for cooking legumes.

Strumpell in the course of his experiments on the digestibility of legumes compared the use of distilled water with that to which a certain amount of lime salts had been added. Lentils cooked in distilled water took up nearly double their own weight of water and cooked soft in one and one-half hours. Some of the same kind of lentils cooked in the hard water took up only their own weight of water, and after boiling for the same length of time only the skins had swollen and lay in folds over the kernel, which remained entirely hard. Such extreme results would not follow the use of ordinary

hydrant water, as it is less hard than the artificially hardened water in this case, but in proportion as it contains these salts it is unsuitable for the cooking of legumes.

The question then arises, What is to be done when the only water obtainable for cooking is hard water? In most books on cookery it is advised to add to the water in which peas and beans are cooked a small quantity of baking soda, a teaspoonful to the gallon, since, if the hardness is due to calcium carbonate, the soda will remedy it. Peas and beans cooked in this water are indeed easily softened, but experiment shows that the flavor is apt to be injured. If soda is added to the water it is better to boil and cool it and pour away from the sediment before using. But since the cook has generally no means of knowing the degree of hardness of the water and thus the exact proportion of soda to be added, it is probably better to simply boil the water before using and pour it from the sediment, since boiling alone will precipitate the bulk of the lime or calcium carbonate. When the hardness is due to the presence of the sulphate of lime or magnesia, neither boiling nor the addition of soda will avail. It is often possible to use rain water for cooking legumes, and this naturally distilled water is the very best for the purpose. The soft water should be used both for soaking and cooking.

Flavor—Soaking legumes in fresh water seems also to remove a certain bitter taste, especially noticeable in lentils, and in Eastern countries lentils are sometimes soaked for days for this purpose.

All dry legumes require a long application of heat, not only to soften the cellulose, but to develop the proper flavor; some say as long as twelve hours. The difference of opinion on this seems due to a differing estimate as to what is the desired result. The dried pea or bean that has been soaked overnight in water may be in one and one-half to two hours cooked soft enough to be pressed through a sieve, but the tongue can still detect individual grains. To disintegrate and soften absolutely every particle and to develop the best flavor a much longer time is needed. The dish of pork and beans baked all night in the New England brick oven, the pea soup slowly cooked for twelve hours, as in some of the special ovens which cook food very slowly, are instances of legumes properly prepared. The flavor of dry legumes is thought by many to be improved by the addition of onions and flavoring herbs or meat broth. Perhaps the best, as well as the most common, method of preparing the dried pea and lentil is in a thick soup or puree seasoned with salt, pepper, and butter. Beans are also often cooked in this way, although perhaps more frequently served in the United States as baked beans.

BAKED BEANS, PEAS, AND COWPEAS

After a preliminary boiling, beans, peas, and cowpeas may be baked in an oven, with various additions thought to improve the flavor, as pork, molasses, etc. The small white or navy bean is quite generally used for this purpose, chiefly because its skin is thin and tender, but the mode is well adapted to all varieties of beans. It is generally thought that the fat present in such dishes improves their flavor.

ROASTING

While roasting is almost the only method in use among us in the preparation of the peanut, it is perhaps never applied in the United States to the

other legumes. The pea and the lentil are roasted in the Mediterranean countries and form there a regular article of food. In India peas are parched in hot sand. For a people who possess only primitive cooking appliances, roasting certainly has the advantage over boiling. Just as a quantity of peanuts may be roasted with a handful of charcoal, while at least two hours of stewing are needed to soften them, so the chick-pea, as found by experiment, can be parched over coals in a few moments and thus made edible. The taste reminds one of pop corn and roasted chestnuts. A slight bitterness is present, due, probably to the skin, which does not slip off in roasting, as does the skin of peanuts. When this skin is removed before roasting, as it may be by half an hour's soaking, the product is improved.

Although these roasted legumes may not be needed as an addition to our bill of fare, it is easy to see how valuable they may be to the Arab who toils over arid plains or to the native of India in his mountain journeys.

Our common split pea is also palatable when parched. Parched peas are too hard for any but the strongest teeth, and, as used in India, they are ground and cooked after parching. The roasted chick-pea is also used as a substitute for coffee. The roasted peanut is spoken of later.

PEA AND BEAN FLOUR

Since it has been shown by such investigations as those of Strumpell that the legumes when ground into flour and cooked in soup or baked in cakes are much more completely digested than when cooked whole, it would seem that bean, pea and lentil flour, as such would be common in the market. It is, however, offered only in small packages mixed with the flour of grains and sold under various trade names as a nutritious and digestible food, especially recommended for invalids. In preparations for the market it has been cooked for a long time under pressure.

In certain countries of Europe a proportion of bean flour is mixed with wheat flour for bread making, especially with wheat which has a low percentage of gluten or that in which the gluten has deteriorated in quality because of the sprouting of the grain wet seasons. In such cases an addition of 2 to 4 per cent is thought to improve the bread, and 2 per cent, if stamped on the package, is allowed by law.

SOUP TABLETS AND PEA SAUSAGE

Finely ground peas, beans, and lentils form the basis of many soup tablets and condensed foods used extensively by armies, explorers, etc. The best known is the "pea sausage," which did so much good service for the German troops in the Franco-Prussian war. It was invented by a cook, and the German Government bought the secret of its preparation. It consists of pea and lentil flour well cooked, evaporated, and mixed with a proportion of bacon, the proper seasonings, and some preservative. Mixed with hot water, it made a very nutritious soup for the soldier. It was found by the German army to be invaluable, if used only in emergencies, but its continuous use brought on digestive disturbances and the eater soon tired of its taste.

PEANUTS AND PEANUT PREPARATIONS

Of the 4,000,000 bushels of nuts raised in this country 3,000,000 bushels are used as roasted peanuts. The remainder of the crop and the peanuts of an inferior grade go to the confectioner and appear in peanut candy and

other confections. Therefore at present the peanut, as used among us, is hardly to be considered a food, but, as already said, only as a food accessory or luxury. It is quite possible, however, that this highly nutritious and cheap product of our Southern fields may come to be used in more ways than it is at present, and especially in combination with other food materials.

The roasted nut, ground into an oily meal and generally mixed water to the consistency of butter, has been put on the market and is used to spread on bread. There are those who like its flavor when it is fresh. There seems to be but little known as to its digestibility in this form.

Peanut oil—At present the American peanut crop is not large enough to more than supply the roaster and the confectioner, hence the expressing of oil from the peanut has never become established here, but in Europe large quantities of the African-raised nut are used for this purpose. The shelled nuts contain from 30 to 50 per cent of oil. The oil is said to be of fairly good flavor, but inferior to olive oil. In 1899 some 80,000 tons of the nuts were used in Marseilles alone for oil making. The unhusked nuts are passed between a pair of rapidly revolving grooved rollers and the shells and red inner skins are then removed by a winnowing process with the use of air currents and oscillating sieves. The cleaned kernels are ground and then enveloped in fibrous mats and pressed to extract the oil.

According to Brannt, "the first cold pressure yields 16 to 18 per cent of very fine table oil. The residue is then broken up, moistened with water, and again cold pressed, yielding 7 to 8 per cent of more or less valuable oil, used for table purposes and burning. The residue from this is heated and then pressed, giving 7 to 8 per cent more oil, unfit for table use, but used for soap and lubricating." The finer grades of oil are sold as salad oil alone or mixed with olive oil.

Peanut cake—When the oil has been pressed from the ground peanut, the mass remaining, called oil cake, is used for fattening cattle. Some experiments have also been made as to its food value for human beings. Containing, as it does, 47 per cent of protein and 9 per cent of fat and starch, and costing about 5 cents a pound, this food attracted the attention of German scientists. The oil cake was broken up and cooked a long time in water and eaten as a soup or porridge in a hospital. Most of those who tried it ate it with apparent relish, not once only, but again and again. No effort seems to have been made to ascertain to what extent it was digested, and the use of the cake does not seemed to have passed the experimental stage.

COMPARITIVE VALUE OF LEGUMES IN RELATION TO THEIR COST

The legumes have been spoken of as economical foods. In the table below is shown the nutrients and energy furnished by 10 cents' worth of the different fresh, dried, and canned legumes commonly eaten in the United States. For purposes of comparison similar values are included for some of the common animal and vegetable foods. In all cases the values are calculated on the basis of the composition of the food materials as purchased, and include the usual amounts of inedible material (pods, bones, etc.). The prices selected per pound are necessarily somewhat arbitrary. They are, however, based on actual market conditions found in dietary studies and other investigations, and are believed to represent a fair range of prices. The legumes, although staple foods, have not yet attained the importance of the cereal grains, and therefore vary more in price

NUTRIENTS FURNISHED FOR TEN CENTS IN LEGUMES AND OTHER FOOD MATERIALS AT CERTAIN PRICES PER POUND

FOOD MATERIALS AS PURCHASED.	PRICES PER POUND.	TEN CENTS WILL PAY FOR—				
		TOTAL FOOD MATERIAL.	PROTEIN.	FAT.	CARBO-HYDRATES.	FUEL VALUE.
	Cents	Pounds	Pound	Pound	Pounds	Calories
Kidney beans, dried	5	2.00	0.45	0.04	1.19	3,210
Frijoles, dried	4	2.50	.55	.03	1.63	4,190
Lima beans, fresh, in pod	3	3.33	.11	.01	.33	850
Do	4	2.50	.08	.01	.25	640
Lima beans, fresh, shelled	6	1.67	.05	.01	.17	435
Do	8	1.25	.04	.....	.12	320
Lima beans, canned	6	1.67	.07	.01	.24	600
Lima beans, dried	4	2.50	.45	.04	1.65	4,065
Do	6	1.67	.30	.03	1 10	2,715
String beans, fresh, 20 cents per peck	2	5.00	.11	.02	.35	900
String beans, fresh, 30 cents per peck	3	3.33	.07	.01	.23	600
Beans, baked, canned	3	3.33	.23	.08	.65	2,000
Do	5	2.00	.14	.05	.39	1,200
Lentils, dried	10	1.00	.26	.01	.59	1,620
Do	6	1.67	.43	.02	.99	2,705
Peas, green, in pod, 20 cents per peck	2	5.00	.18	.01	.49	1,275
Peas, green, in pod, 30 cents per peck	3	3.33	.12	.01	.33	850
Peas canned	5	2.00	.07	.....	.20	510
Do	7	1.43	.05	.....	.14	365
Peas dried	3	3.33	.82	.03	2.06	5,510
Do	4	2 50	.62	.03	1.55	4,140
Do	5	2 00	.49	.02	1.24	3,310
Cowpeas, green, shelled	5	2.00	.19	.01	.45	1,240
Cowpeas, dried	2	5.00	1.07	.07	3.04	7,950
Wheat flour	2	5.00	.57	.05	3 76	8,250
Do	2.5	4.00	.46	.04	3.00	6,600
Do	3	3.33	.38	.03	2.50	5,495
Wheat bread	3	3 33	.31	.04	1.77	4,045
Do	5	2.00	.18	.03	1.06	2,430
Do	8	1 25	.12	.02	.66	1,520
Corn meal	2	5.00	.46	.10	3.77	8,275
Do	3	3.33	.31	.06	2.51	5,510
Oatmeal	3	3.33	.54	.24	2 25	6,195
Do	5	2.00	.32	.14	1.35	3,720
Rice	6	1.67	.13	.01	1.32	2,720
Do	8	1.25	.10	.....	.99	2,040
Potatoes, 45 cents per bushel	0.75	13.33	24	.01	1.96	4,130
Potatoes, 60 cents per bushel	1	10.00	.18	.01	1 47	3,100
Potatoes, 90 cents per bushel	1.5	6.67	.12	.01	.98	2,070
Cabbage	4	2.50	.04	.01	.12	315
Do	5	2.00	.03	.....	.10	250
Beef sirloin	10	1.00	.16	.18	.....	1,040
Do	15	.66	.11	.12	.....	685
Do	20	.50	.08	.09	.....	520
Do	25	.40	.06	.07	.....	415
Beef, round	8	1.25	.24	.16	.....	1,120
Do	12	.83	.16	.11	.....	745
Do	16	.63	.12	.08	.....	565
Ham, smoked	10	1.00	.14	.33	.....	1,675
Do	16	.63	.09	.21	.....	1,055
Do	22	.46	.07	.15	.....	770
Salt pork	12	.83	.02	.72	.....	3,045
Codfish, fresh	6	1.67	.14	.....	.....	275
Do	10	1 00	.08	.....	.....	165
Codfish, dried, salt	6	1.67	.27	.01	.....	525
Do	8	1.25	.20	.01	.....	395
Eggs, 15 cents per dozen	8.8	1.14	.15	.11	.....	725
Eggs, 25 cents per dozen	14.7	.68	.09	.06	.....	430
Eggs, 35 cents per dozen	20.6	.49	.06	.05	.....	310
Milk, 3 cents per quart	1.5	6 67	.22	.27	.33	2,170
Milk, 6 cents per quart	3	3.33	.11	.13	.17	1,080
Milk, 8 cents per quart	4	2.50	.08	.10	.13	815
Cheese, whole milk	12	.83	.22	.28	.02	1,620
Do	16	.63	.16	.21	.02	1,230

It will be seen that at the prices selected the dried legumes furnish more protein and energy than almost any food material except cereal grains, while the fresh legumes are directly comparable with our most nutritious green vegetables. Dried cowpeas at the price noted above furnish more protein and energy per pound than any other legumes and almost twice as much protein and nearly the same amount of energy as wheat flour at two cents per pound. Dried kidney beans at five cents per pound supply about the same protein and half as much energy as wheat flour at two and one-half cents per pound. The facts brought out in the above table show the importance of legumes when considered from the standpoint of pecuniary economy and go to prove that they may profitably be used to a considerable extent as a source of protein when the diet is deficient in this constituent and the income is limited.

SUMMARY

The green or immature pea and bean are among our most valuable green vegetables and fully deserve the place they now hold on our bill of fare. The value of the dried pea, bean, and lentil is such that one or more representatives are found in every country as a staple food, and they have been thus used from the earliest times. They are especially rich in protein, the nitrogenous constituent which forms the chief nutrient of meat, and are thus fitted to take the place of part of the meat in any dietary. Since in comparison with their value their price is low, they must be considered among vegetable foods as next in importance to bread. As compared with the cereals the legumes are (1) less completely digested if eaten in considerable quantities; (2) it is improbable that they can be made into any form of palatable bread, and (3) their flavor is less generally liked, and on that account will not be made a regular daily food except by people who are forced to it by necessity. In view of their low cost and high nutritive value, however, they may profitably be used even to a greater extent than they are at present.

Care in the preparation of legumes is very important both as regards their digestibility and their flavor.

XXIV

EGGS AND THEIR USES AS FOOD*

INTRODUCTION

Perhaps no article of diet of animal origin is more commonly eaten in all countries or served in a greater variety of ways than eggs. Hens' eggs are most common, although the eggs of ducks, geese, and guinea fowls are used to a greater or less extent. More rarely turkeys' eggs are eaten, but they are generally of greater value for hatching.

The eggs of some wild birds are esteemed a delicacy. Plover eggs are prized in England and Germany, while in this country the eggs of sea birds have long been gathered for food. On the eastern shore of Virginia, eggs of the laughing gull are frequently eaten, and the eggs of gulls, terns, and herons were a few years ago gathered in great quantities along the coast of Texas. Thousands of eggs of gulls and murres have been gathered annually on the Faralon Islands, off the coast of California.[1]

Other eggs besides those of birds are sometimes eaten. Turtle eggs are highly prized in most countries where they are abundant. They were once more commonly eaten in America than now, possibly owing to the more abundant supply in former times. The eggs of the terrapin are usually served with the flesh in some of the ways of preparing it for the table. Fish eggs, especially those of the sturgeon, are eaten in large quantities, preserved with salt, under the name of caviar. Shad roe is also a familiar example of the use of fish eggs as food. Mention may also be made of the use of the eggs of alligators, lizards, serpents, and some insects by races who lack the prejudices of Western nations. However, in general, the term eggs, when used in connection with food topics, refers to the eggs of birds, usually domestic poultry, and is so used in this bulletin.

The appearance of an egg—the shell with its lining of membrane, inclosing the white and yolk—is too familiar to need any discussion. The physiological structure of the egg is perhaps less familiar. A fertile egg contains an embryo and is at the same time a storehouse of material for the development and growth of the young individual from the embryo, until it has reached such a stage that life is possible outside the narrow limits of the shell. The embryo is situated quite close to the yolk, which furnishes the nutritive material for its early development, the white being used later.

For convenience, birds may be divided into two groups: (1) Those in which the young are hatched full-fledged and ready in a great measure to

*U. S. Department of Agriculture—C. F. Langworthy—Farmers' Bulletin, 128. Permission to reprint kindly wanted.

1 The danger of exterminating these desirable birds by gathering their eggs for food has been discussed in the U. S. Dept. Agr. Yearbook, 1899, p. 270.

care for themselves, and (2) those in which the young are hatched unfledged and entirely dependent upon the parents for some time. Domestic poultry are familiar examples of the first group; robins and sparrows, of the second. The eggs of the two classes differ materially in composition. It seems evident that more nutritive material is needed proportionally in the first case than in the second, since the growth is continued in the egg until the bird reaches a more advanced stage of development. The quite marked differences in composition of the two sorts of eggs have been shown by chemical studies but need not be referred to further in the present discussion.

Since in all cases the egg is designed to furnish the sole source of material for growth and development of the young individual for a considerable time, it is evident that it must contain all the elements required; that is, that it must be a perfect food for the purpose intended. Milk is another familiar example of animal food containing all the elements of a complete food for the young and growing individual. Milk and eggs are frequently spoken of as perfect foods on this account. The designation is, however, misleading, for although it is true that they contain all the required elements for the growth and maintenance of the young bird or the young mammal, as the case may be, the elements are not in the right proportion for the sole nourishment of an adult individual. The food value of eggs is discussed in greater detail beyond.

Considering both wild and domestic birds, the color of the shell ranges from white through a variety of tints and mottlings. The eggs of domestic fowls are not highly colored; those of hens vary from white to a more or less brown tone, the eggs from a particular breed of hens being always of the same color. The eggs of ducks are bluish white; those of geese are commonly white; the eggs of guinea fowls are light brown, more or less mottled with a deeper shade; and the eggs of turkeys are speckled with a yellowish brown. Any special coloring of eggs of wild birds is commonly explained as a protective measure which has been developed to render the eggs inconspicuous in their normal surroundings, and therefore less easily found by their enemies. Such reasoning would indicate that the observed differences in the color of hens' eggs are due to characteristics which different breeds have inherited from remote wild ancestors. The color of the shells, whatever its reason, is a feature which has some effect on the market value of eggs of domestic poultry, though not upon their food value.

USES OF EGGS

The methods of serving eggs alone or in combination with other food materials are very numerous. Cooked in various ways they are a favorite animal food, taking the place of meat to a certain extent, while raw eggs, usually seasoned in some way, are by no means infrequently eaten. Boiled eggs are often used for garnishing or ornamenting different foods. Eggs are combined with other materials in various ways in many made dishes. They are used in making cakes and such foods to improve their flavor, color, and texture, while in custards, creams, etc., they thicken the material and give it the desired consistency. The white of the egg is also employed in making icings and confectionery. Well beaten or whipped egg white is used to leaven many forms of cakes and similar foods, as well as to improve the flavor. The beaten white encloses air in small bubbles, which become distributed throughout the mass of dough in mixing. The heat of cooking expands the air and makes the walls of the air bubbles firm, so that the porous structure is retained. The power to inclose and retain air when beaten varies, being greatest in the fresh egg and much lessened in packed or old eggs. Convenient leavening powders have lessened the number of eggs used for this purpose. Sponge cake, however, is a familiar example of food so leavened. This use of eggs explains some of the recipes in old cookery books which call for such large numbers of eggs. These uses are all familiar; the reasons for them are doubtless seldom thought of.

There are several simple ways of cooking eggs which are very commonly followed. Thus, the egg in the shell is cooked by immersion in hot or boiling water or is less commonly roasted. After removal from the shell, the egg is cooked in hot water or in hot fat. In the latter case it may or may not be beaten or stirred, Combined with other materials to form various made dishes, eggs are boiled, baked, steamed, or fried as the case may be. The total number of methods of serving and preparing eggs is very large, but in nearly every case it will be found that the method of preparation is only a more or less elaborate modification of one of the simple methods of cooking.

When cooked in different ways there are marked changes in the appearance and structure of eggs. As ordinarily applied, the term "boiled eggs" refers to eggs cooked in the shell in hot, though not necessarily boiling, water. The resulting product varies greatly, according to the length of time the cooking is continued, the method of procedure, etc. Perhaps the most usual household method of "boiling eggs" is to immerse them for a longer or shorter time in boiling water. An egg placed in boiling water not over two minutes will have a thin coating of coagulated white next the skin, the remainder will be milky, but not solid, while the yolk, though warm, will be entirely fluid. This stage may be called "very soft boiled." If the egg is kept in boiling water two minutes, or a little over, the white becomes entirely coagulated. The egg thus cooked may be termed "waxy." If the boiling is extended to three minutes or so, the egg shows a tendency to rise in the water and will be solid throughout, *i. e.*, the "solid boiled." If the boiling is continued up to ten minutes or longer, the "hard-boiled" egg results. The white of such an egg is hard and elastic and the yolk crumbles readily. All these changes are due principally to the more or less complete coagulation and hardening of the albumen of the egg by heat.

Numerous experiments have been made to show the changes which actually take place when egg albumen is heated. If the egg white is gently warmed no change is noticed until the temperature reaches 134 degrees F., when coagulation begins. White fibers appear, which become more numerous, until at about 160 degrees F. the whole mass is coagulated, the white almost opaque, yet it is tender and jelly-like. If the temperature is raised and continued to 212 degrees F. (the temperature of boiling water), the coagulated albumen becomes much harder, and eventually more or less tough and horn-like; it also undergoes shrinkage. When the whole egg is cooked in boiling water the temperature of the interior does not immediately reach 212 degrees F., several minutes being probably required. It has been found by experiment that the yolk of egg coagulates firmly at a lower temperature than the white.

The changes in the albumen noted above suggest the idea that it is not desirable to cook eggs in boiling water in order to secure the most satisfactory product. Those who have given attention to the science as well as the practice of cookery recommend "soft-cooked," "medium-cooked," and "hard-cooked" eggs, all of which are cooked at a temperature lower than 212 degrees F. In soft-cooked eggs, properly prepared, the white resembles a soft, thick curd, while the yolk is fluid. Except for a suggestion of rawness, there will be little flavor, provided fresh eggs are used. Medium-cooked eggs are more thoroughly cooked than those just mentioned, the results being secured by longer cooking or by a somewhat higher temperature. The white is soft and tender and the yolk slightly thickened. The flavor (which is developed by cooking) is more pronounced than that of a soft-cooked egg and is generally considered more agreeable.

When an egg is covered with boiling water in a bain-marie or double boiler, and the temperature of the water in the outer vessel maintained at 180–190 degrees F. for thirty to forty-five minutes, the hard-cooked egg results. In this the yolk should be dry and mealy and the white solid, yet tender.

The directions given for preparing soft-cooked, medium-cooked, and hard-cooked eggs vary. The methods described in standard cookery books without doubt give the desired results if sufficient care is exercised. The chief difficulty encountered by most cooks is to secure uniform results, especially with soft-cooked and medium-cooked eggs. It must be remembered that such results cannot be expected when conditions vary. The time of cooking, the amount of water used, the number, size, and freshness of the eggs, and the kinds of vessels used are important factors. Thus, eggs which have been kept in an ice-chest require more heat to warm them before cooking begins than do those which have been kept at room temperature. Again, so apparently trivial a detail as the sort of vessel used (whether earthen or metal) or the place where the vessel stands during cooking may produce very different results. Many persons prefer to have eggs cooked at table in a chafing dish or other suitable vessel. In such cases the conditions may be controlled with comparative ease and uniform results obtained with a little practice if sufficient care is observed.

The following methods of preparing soft-cooked and medium-cooked eggs have been found to give uniform results in laboratory tests at the University of Illinois: Using a granite-ware stewpan of one quart capacity, one pint of water was heated over a gas flame; when the water boiled the gas was turned off and an egg which had been kept in a refrigerator was dropped into the water. Without disturbing the vessel it was covered closely and the egg allowed to remain in the water six minutes. It was then soft-cooked. As shown by tests, when the egg was dropped into the water, the temperature fell almost at once to 185 degrees F. and then slowly to 170-171 degrees F. If the egg remained in the water eight minutes, it was medium-cooked. In this case the temperature of the water at the end of the cooking period had fallen to 162-164 degrees F.

Uniform results can be obtained in the kitchen as well as in the laboratory if sufficient attention is given to details. Bearing clearly in mind the end desired, each cook must experiment for herself, as it is impossible to give directions which will apply to all cases.

The same changes which have been noted above as taking place in egg yolk and white when heat is applied in preparing boiled eggs take place when other methods of cooking are followed, though they are not always apparent.

Poached or dropped eggs are removed from the shell and then cooked in water. Thudichum recommends the use of salted water to which a very little vinegar has been added. The reason for this is perhaps that acetic acid (vinegar) tends to precipitate albumen; that is, to prevent a loss due to some of the egg being dissolved in the water. Flavor may also be one of the objects sought.

Fried eggs are generally cooked in a flat pan, in a little hot fat, oil, or butter, and may be either soft or hard, according to the length of time employed in the process. Eggs are also occasionally baked in much the same manner that they are fried.

The omelet is generally regarded as one of the most appetizing forms in which eggs can be served. It consists of the beaten egg with a little milk, water, and cream or melted butter added, quickly cooked in a little fat or butter in a suitable pan, and folded over so that it may be turned out of the pan in a half-round form. Some cooks insist that the best omelets are made by using hot water instead of milk or cream. The hot water is stirred into the egg yolk in the proportion of 1 tablespoonful to an egg. Scrambled eggs resemble an omelet in method of preparation, but no effort is made to preserve the characteristic form and appearance of the omelet. Generally speaking, lightness is desired in an omelet and thorough mixing in scrambled eggs. The former is secured by beating; the latter by stirring. Omelets are sometimes made with the addition of various materials, such as parsley, jams, etc. Many so-called omelets are made in which flour is used. These are more properly pancakes, and vary very greatly according to the ingredients used. Such dishes, as well as sweet omelets, etc., are treated of in cookery books, as are also many other ways of serving eggs which are in principle the same as those already noted, but in which the final appearance is more or less modified.

The foods in which eggs are combined with other materials range from a simple custard or cake to the most elaborate of the confectioner's products. In all such dishes, as previously noted, eggs are used to give consistency, color, flavor, or lightness.

Eggs are especially rich in protein (the nitrogenous ingredient of food). This material is required by man to build and repair the tissues of the body. Some energy is also furnished by protein, but fats and carbohydrates supply the greater part of the total amount needed. Combining eggs with flour and sugar (carbohydrates) and butter, cream, etc. (fat), is perhaps an unconscious effort to prepare a food which shall more nearly meet the requirements of the body than either ingredient alone. When eggs, meat, fish, cheese, or other similar foods rich in protein are eaten, such other foods as bread, butter, potatoes, etc., are usually served at the same time, the object being, even if the fact is not realized, to combine the different classes of nutrients into a suitable diet. The wisdom of such combination, as well as of other generally accepted food habits, was proved long ago by practical experience. The reason has been more slowly learned.

As previously stated, egg white when heated at the temperature of boiling water for a considerable time becomes hard and contracts. This explains the curdling of custards, shrinkage and toughening of omelets, souffles, meringues, sponge cake, and similar mixtures. The firm coagulation of albumen at 212 degrees F. explains the use of egg white for clarifying coffee, soup, or other liquids. The albumen, which is mixed with the liquid before boiling, coagulates and incloses the floating particles, leaving the liquor clear. When eggs are removed from the shell a little of the white usually clings to the inner surface unless it is scraped. Such eggshells are often used for clarifying purposes instead of the whole egg. The clarifying properties are, of course, due to the egg white and not to the shells.

The uses of eggs for other purposes than food are numerous. Large quantities of egg white are used in the manufacture of albumen paper for photographic purposes, and the egg white and yolk, and products made from them, are very important in the manufacture of many different articles.

DESCRIPTION AND COMPOSITION OF EGGS

Size—The eggs of different kinds of domestic poultry vary in size as well as appearance, and there is always a considerable range in the size of eggs of different breeds; thus, hens' eggs range from the small ones laid by bantams to the large ones laid by such breeds as Light Brahmas. On an average, a hen's egg is 2.27 inches in length and 1.72 inches in diameter or width at the broadest point, and weighs about two ounces, or eight eggs to the pound (one and one-half pounds per dozen). Generally speaking, the eggs of pullets are smaller than those of old hens, those of ducks somewhat larger than hens' eggs, while those of turkeys and geese are considerably larger. Guinea eggs, on an average, measure 1⅞ by 1½ inches, are rather pointed at one end, and weigh about 1.4 ounces each, or seventeen ounces to the dozen. Goose eggs weigh about 5.5 to 6.7 ounces each, or about five pounds to the dozen—that is, more than three times as much as hens' eggs. The eggs of wild birds are said to be smaller than those of the same species when domesticated. Wild ducks' eggs are said to be, on an average, 1.97 to 2.17 inches in diameter, domestic ducks' eggs 2.36 to 2.56 inches.

Composition—The shells of hens' eggs constitute about 11 per cent, the yolk 32 per cent, and the white 57 per cent of the total weight of the egg. According to tests made at the New York State Experiment Station, white-shelled eggs have a somewhat heavier shell than brown-shelled eggs. The shell of a duck's egg constitutes about 14 per cent of the total weight, and that of a plover egg 10 per cent. The following table shows the composition of hens' eggs, raw and cooked, brown-shelled and white-shelled, and of egg white and yolk, as well as the composition of the egg (whole egg white and yolk) of the guinea fowl, duck, goose, turkey, and plover, also evaporated eggs and egg substitutes. For purpose of comparison, the composition of beefsteak and several other familiar animal foods, and of wheat flour and potatoes, is also added.

AVERAGE COMPOSITION OF EGGS, EGG PRODUCTS, AND CERTAIN OTHER FOODS

	REFUSE.	WATER.	PROTEIN	FAT.	CARBO-HYDRATES	ASH.	FUEL VALUE PER LB.
Hen:	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Calories
Whole egg as purchased	11.2	65.5	11.9	9.3	.....	0.9	635
Whole egg, edible portion	.....	73.7	13.4	10.5	.....	1.0	720
White	.....	86.2	12.3	.2	.....	.6	250
Yolk	.....	49.5	15.7	33.3	.....	1.1	1,705
Whole egg boiled, edible portion	.....	73.3	13.2	12.0	.....	.8	765
White-shelled eggs as purchased	10.7	65.6	11.8	10.8	.....	.6	675
Brown-shelled eggs as purchased	10.9	64.8	11.9	11.2	.....	.7	695
Duck:							
Whole egg as purchased	13.7	60.8	12.1	12.5	.....	.8	750
Whole egg, edible portion	.....	70.5	13.3	14.5	.....	1.0	860
White	.....	87.0	11.1	.03	.....	.8	210
Yolk	.....	45.8	16.8	36.2	.....	1.2	1,840
Goose:							
Whole egg as purchased	14.2	59.7	12.9	12.3	.....	.9	760
Whole egg, edible portion	.....	69.5	13.8	14.4	.....	1.0	865
White	.....	86.3	11.6	.02	.....	.8	215
Yolk	.....	44.1	17.3	36.2	.....	1.3	1,850
Turkey:							
Whole egg as purchased	13.8	63.5	12.2	9.7	.....	.8	635
Whole egg, edible portion	.....	73.7	13.4	11.2	.....	.9	720
White	.....	86.7	11.5	.03	.....	.8	215
Yolk	.....	48.3	17.4	32.9	.....	1.2	1,710
Guinea fowl:							
Whole egg as purchased	16.9	60.5	11.9	9.9	.....	.8	640
Whole egg, edible portion	.....	72.8	13.5	12.0	.....	.9	755
White	.....	86.6	11.6	.03	.....	.8	215
Yolk	.....	49.7	16.7	31.8	.....	1.2	1,655
Plover:							
Whole egg as purchased *a*	9.6	67.3	9.7	10.6	.....	.9	625
Whole egg, edible portion *a*	.....	74.4	10.7	11.7	.....	1.0	695
Evaporated hen's eggs	.....	6.4	46.9	36.0	7.1	3.6	2,525
Egg substitute	.....	11.4	73.9	.3	5.3	9.1	1,480
Pudding (custard) powder *a*	.....	13.0	2.1	3.4	80.9	.6	1,690
Cheese as purchased	.....	34.2	25.9	33.7	2.4	3.8	1,950
Sirloin steak as purchased	12.8	54.0	16.5	16.1	.....	.9	985
Sirloin steak, edible portion	.....	61.9	18.9	18.5	.....	1.0	1,130
Milk	.....	87.0	3.3	4.0	5.0	.7	325
Oysters in shell as purchased	81.4	16.1	1.2	.2	.7	.4	45
Oysters, edible portion	.....	86.9	6.2	1.2	3.7	2.0	235
Wheat flour	.....	12.0	11.4	1.0	75.1	.5	1,650
Potatoes as purchased	20.0	62.6	1.8	.1	14.7	.8	310
Potatoes, edible portion	.....	78.3	2.2	.1	18.4	1.0	385

a European analyses.

The above figures represent average values. Individual specimens vary more or less from the average.

As is shown by analysis, eggs consist chiefly of two nutrients—protein and fat—in addition to water and mineral matter or ash. Carbohydrates are present in such small amounts that they are usually neglected in the analy-

sis. The protein or nitrogenous matter is the nutrient which is needed to build and repair body tissue, as already stated, while the fat is useful for supplying energy. Some energy is also derived from protein. Mineral matter is required by the body for many purposes, but less is definitely known concerning the kind and amount required than in the case of the other constituents.

In composition, eggs of all sorts resemble such animal foods as meat, milk, and cheese, more than such vegetable foods as flour and potatoes. As will be seen by the figures in the above table, hens' eggs and those of other domestic fowls do not differ greatly in composition. Neither does the cooked egg vary materially in composition from the raw, though it varies markedly in texture. The yolk and white differ greatly in composition. The yolk contains considerable fat and ash, while the white is practically free from fat and has a very small ash content. The white contains somewhat less protein and about half as much water as the yolk. As is usually the case with our familiar foods, the water is not visible as such, but is combined or mingled with the other constituents, so that the whole food is more or less moist, liquid, or juicy.

The figures quoted in the table show that there is practically no difference in composition between hens' eggs with dark shells and those with white shells, although there is a popular belief that the former are "richer." This point was studied by the New York State and California Experiment Stations, many analyses of the two sorts of eggs being made. At the California Experiment Station the brown-shelled eggs were laid by Partridge Cochins, Dark Brahmas, Black Langshans, Wyandottes, and Barred Plymouth Rocks. The white-shelled eggs were laid by Brown Leghorns and Buff Leghorns, White Minorcas, and Black Minorcas. The Michigan Experiment Station also analyzed the eggs of a number of different breeds, though the special object was not to determine whether there was any relation between the color of the shell and the composition of the eggs. However, no constant variation in the eggs of the different breeds was observed. These tests and others like them justify the statement that the eggs of one breed, whatever the color of the shells, are as nutritious as those of another, provided they are of the same size and the fowls are equally well fed.

As shown by their composition, eggs are nutritious food. They are less concentrated—*i. e.*, contain more water—than cheese, but are more concentrated than milk or oysters. In water content they do not differ greatly from the average value for lean meat. The kinds and amounts of nutrients in eggs indicate that they may be properly used in the diet in the same way as most other animal foods, and this belief is confirmed by the experience of uncounted generations.

The table shows the nutrients in different kinds of eggs and in a few other foods. Many studies have been made of the chemical bodies making up the different classes of nutrients. Egg white is sometimes said to be pure albumen. In reality it consists of several albumens, and, according to many observers, a little carbohydrate material. The phosphorus in the albumen of the egg white is equivalent to about 0.03 per cent phosphoric acid. The chief ash constituent is sodium chlorid (common salt).

A very extended investigation of the white of egg was made at the Connecticut State Experiment Station. The "albumen" or protein of egg white was found to consist of four bodies—ovalbumen, conalbumen, ovomucin, and ovomucoid. The ovalbumen is the chief constituent and makes up the greater part of the egg white. The conalbumen has much the same chemical properties as ovalbumen. Ovomucin and ovomucoid are glycoproteids, and are present in small amounts.

Egg yolk contains a number of different bodies, including about 15 per cent vitellin (a proteid); 20 per cent palmatin, stearin, and olein (the fatty constituents); and 0.5 per cent coloring matter, besides small amounts of lecithin (a fat-like body containing phosphorus), nuclein, etc. The total phosphorus in the yolk is equivalent to a little over 1 per cent of phosphoric acid. Besides phosphorus, the yolk contains such chemical elements as calcium, magnesium, potassium, and iron in the form of salts and other chemical compounds. The protein of egg yolk was studied extensively at the Connecticut State Experiment Station. According to these investigations it contains a large amount of proteid matter combined with lecithin. The name lecithin-nucleo-vitellin is proposed for this compound, which behaves like a globulin. It is solnble in a solution of salt. As prepared in the laboratory the lecithin-nucleo-vitellin contained from 15 to 30 per cent lecithin. A lecithin-free body insoluble in salt solution was also isolated. This was called nucleo-vitellin.

One of the constituents of egg albumen is sulphur. The dark stain made by eggs on silver is commonly and doubtless correctly attributed to the formation of silver sulphid. The albumens are readily decomposed with the liberation of hydrogen sulphid. The bad odor of rotten eggs is due largely to the presence of this gas and phosphurated hydrogen, which is also formed. The shell of the egg is porous, and the micro-organisms which cause the egg to ferment—*i. e.*, to rot or spoil—gain access to the egg through the minute openings. Like the mold spores, these micro-organisms are widely distributed.

Composition of shell—In the table no figures are given for the composition of the eggshell, which, of course, has no food value. The shell of the hen's egg is made up very largely of mineral matter, containing 93.7 per cent calcium carbonate, 1.3 per cent magnesium carbonate, 0.8 per cent calcium phosphate, and 4.2 per cent of organic matter. The shells of goose eggs, on an average, have the following percentage composition: Calcium carbonate, 95.3; magnesium carbonate, 0.7; calcium phosphate, 0.5, and organic matter, 3.5. The shells of ducks' eggs contain 94.4 per cent calcium carbonate, 0.5 per cent magnesium carbonate, 0.8 per cent calcium phosphate, and 4.3 per cent organic matter. The shells of other eggs are doubtless of much the same composition.

FLAVOR OF EGGS

It is generally conceded that eggs which are perfectly fresh have the finest flavor. After eggs have been kept for a time the flavor deteriorates, even if there is no indication of spoiling. Such differences are especially important when eggs are used for table purposes. Stale eggs are not regarded as palatable, and the flavor of spoiled eggs is such that for this, if for no other reason, they are totally unfit for food. The flavor of even perfectly fresh eggs is not always satisfactory, since it is influenced more or less by the character of the food eaten by the laying hens. The New York

State Experiment Station studied the effect of different rations upon the flavor of eggs. Those laid by hens fed a highly nitrogenous ration were inferior to those from hens fed a carbonaceous ration. They had a disagreeable flavor and odor, the eggs and yolk were smaller, and the keeping qualities were inferior. In a test at the Massachusetts (Hatch) Experiment Station to compare cabbage and clover rowen as the green portion of a ration for laying hens, it was found that the eggs produced on the former ration, although heavier and possessing a higher percentage of dry matter, protein, and fat, were inferior in flavor and cooking qualities to eggs produced on the ration containing clover. The North Carolina Experiment Station studied the effect of highly flavored food upon the eggs produced. A small quantity of chopped wild onion tops and bulbs was added to the feed of a number of hens. After about two weeks the onion flavor was noticed in the eggs laid. When the amount of onion feed was increased the flavor became so pronounced that the eggs could not be used. A week after the feeding of onions was discontinued the disagreeable flavor was no longer noticed. From these tests it appears that the flavor of eggs may be materially influenced by the food consumed. This is a matter of importance, especially when poultry are kept to supply eggs for table use.

DIGESTIBILITY OF EGGS

Raw eggs or eggs only slightly cooked are commonly said to be very digestible, the idea being obviously that they digest readily without giving rise to pain or other physical discomfort. The term digestibility has another meaning and one which is commonly intended when it is used in the discussion of food values. This refers to the thoroughness of digestion, that is, to the total amount of material which any food gives up to the body in its passage through the digestive tract. Since only soluble or possibly emulsified matter can pass through the walls of the stomach and intestines and be taken up into the circulation to nourish the body, it follows that only material which is soluble or is rendered soluble by the action of pepsin, trypsin, and other ferments in the digestive juices, is truly digestible. The original condition of food, the method of cooking, and the amount eaten at a given time are among the factors which determine the quantity of any given material which can be digested.

Statements are frequently made with regard to the length of time required to digest different foods. Many of these are doubtless far from accurate, as the subject is not easy to study. By methods of artificial digestion the length of time required to render different foods soluble has been frequently tested. It is possible to use in the experiments the same digestive ferments which occur in the body and to approximate body temperature, etc., but it is quite certain that all the conditions of digestibility in the body cannot be reproduced in the laboratory. The results obtained are interesting and often valuable, but it is worthy of note that careful investigators are much slower to make sweeping deductions from them than are popular writers on the subject.

Some years ago Dr. Beaumont, a United States Army surgeon, had an excellent opportunity for studying digestibility in the stomach. A healthy young man was accidentally wounded in the stomach by the discharge of a musket. In time the large wound inflicted healed, leaving a permanent

opening into the stomach, which was ordinarily closed by a valvular flap made by a fold of the stomach lining, which could be easily pushed aside and the interior of the stomach examined or the stomach contents removed as desired. Strange as it may seem, this could be done without giving the subject pain or annoyance, nor was his general health abnormal after the wound had healed in this curious way. For many years after the time of the accident (1822) the man was under Dr. Beaumont's care and observation. Very many experiments were made on the length of time required by different foods for digestion in the stomach, or "chymification." Many artificial digestion experiments were also made, using gastric juice removed from the man's stomach. Although these investigations were carried on long before the theories and methods of physiological chemistry now accepted were known, so much care was taken in making the experiments, and in recording the experimental data, that the work has never ceased to be of great value as well as interest. However, it should not be forgotten that Dr. Beaumont studied only digestion in the stomach; his work throws no light on digestion in the intestines. This is of especial importance in the case of starchy foods, as the digestion of starch, which is begun by the saliva, ceases in the stomach but is resumed in the intestines. The experiments reported include tests of the length of time required to digest eggs, hard and soft boiled, fried, roasted, and raw. The raw eggs were sometimes whipped and sometimes not. In all the tests fresh eggs were used. Hard boiled and fried eggs each required three and one-half hours for digestion in the stomach, *i. e.*, for the formation of chyme; soft boiled eggs required three hours; roasted eggs, two and one-fourth hours; raw eggs, not whipped, two hours, and raw eggs, whipped, one and one-half hours. When tested by the methods of artificial digestion followed by Dr. Beaumont, which approximate bodily conditions as closely as he was able to make them, the hard boiled eggs required eight hours for digestion; soft boiled eggs, six and one-half hours; raw eggs, not whipped, four and one-half hours; and raw eggs, whipped, four hours. The two methods gave results which agree in the relative length of time required for the digestibility of the different samples, though not in the actual time required. Similar results were obtained by the two methods with the greater part of the large number of foods studied. One of Dr. Beaumont's general deductions was that most of the common foods required from two to four hours to digest in the stomach. He says further:

> The time required for the digestion of food is various, depending upon the quantity and quality of the food, state of the stomach, etc., but the time ordinarily required for the disposal of a moderate meal of the fibrous parts of meat, with bread, etc., is from three to three and one-half hours.

As regards the time required for digestion in the stomach it will be seen that in this investigation eggs compare favorably with other common foods. It must be remembered that digestion continues in the intestine, and that no data are furnished by these experiments for judging of this factor. This is an important matter, as food material which escapes digestion in the stomach may be thoroughly digested later in the intestine. This fact seems to have been often overlooked in the discussion of Dr. Beaumont's work.

Among later experiments on the digestibility of eggs by artificial methods, the work of the Minnesota Experiment Station may be cited. The object

was to study the thoroughness as well as the ease of digestion. Five experiments were made by means of a pepsin solution with eggs cooked under different conditions. Eggs were cooked for three minutes in water at 212 degrees F., giving a "soft-boiled" egg, and for five minutes and twenty minutes at the same temperature. The egg boiled three minutes and digested for five hours in pepsin solution, compared with one boiled twenty minutes and treated in the same way, showed 8.3 per cent undigested protein in the former, against 4.1 per cent undigested protein in the latter. Under similar treatment the egg boiled five minutes gave 3.9 per cent undigested protein. In all cases the egg was quite thoroughly digested. Another trial was then made in which the eggs were cooked for periods of five and ten minutes in water at 180 degrees F.—that is, the albumen was coagulated at a lower temperature than that of boiling water. In both of these cases the protein was entirely digested in five hours. These results would indicate that while the time and the temperature of cooking has some effect upon the rate of digestion, it does not very materially affect the total digestibility.

As regards the general deduction that eggs cooked for different lengths of time vary somewhat in the length of time for digestion under the experimental conditions, the results agree quite closely with those obtained by Dr. Beaumont.

Experiments have also been made with man to learn how thoroughly eggs are digested. In such tests it is usual to analyze the food and the feces, the latter being assumed to consist principally of undigested food. Deducting the amount of the different nutrients in the feces from the total amount consumed, shows how much of each nutrient was digested. Such an experiment was made at the Minnesota Experiment Station with a healthy man. A very considerable portion of the nitrogenous material and fat of the ration was furnished by eggs, the other foods eaten being potatoes, milk, and cream. About ninety per cent of the total nitrogenous material and over ninety per cent of the fat consumed were digested. In experiments at the University of Tennessee with healthy men on a diet of bread, milk, and eggs, from ninety-three to ninety-five per cent of both the protein and fat were digested. The conclusion therefore seems warranted that, as shown by composition and digestibility, eggs possess the high nutritive properties which are popularly assigned to them.

A German investigator, Rubner, some years ago tested the digestibility of hard-boiled eggs with a healthy man. No other food was eaten with the eggs. It was found that 95 per cent of the total dry matter and 97 per cent of the protein were digested. The fat was also very thoroughly assimilated. The percentage of total dry matter and protein digested was about the same as Rubner found in similar experiments in which meat only was eaten, while the percentage of fat digested was larger. Discussing these tests, Rubner says in effect:

> From the fact that eggs are as completely digested as meat, it does not follow that they are digested in the same time, or that hard-boiled eggs do not produce more disturbance in the digestive organs. It is highly probable that there is no difference in the thoroughness of digestion of hard-boiled and soft-boiled eggs.

Jorissenne, discussing the digestibility of eggs with reference to some recent European work on the subject, states that he regards the yolk of raw, soft-boiled, and hard-boiled eggs as equally digestible. The white of soft-boiled eggs being semiliquid, offers little more resistance to the digestive juices than raw white. The white of a hard-boiled egg is not generally very thoroughly masticated. Unless finely divided, it offers more resistance to the digestive juices than the fluid or semifluid white, and undigested particles may remain in the digestive tract many days and decompose. From this deduction it is obvious that thorough mastication is a matter of importance. Provided mastication is thorough, marked differences in the completeness of digestion of the three sorts of eggs, in the opinion of the writer cited, will not be found.

Perhaps the most extended study of the digestibility of eggs was carried on recently at St. Petersburg, by Tikhvinski. Two experiments, each divided into two periods of seven days, were made with a healthy man. In the first period of the first experiment, the diet consisted of hard-boiled eggs, bread, and meat; in the second, of soft-boiled eggs with bread and meat. The second experiment was made under similar conditions, except that the soft-boiled eggs were used in the first period and the hard-boiled in the second. The eggs furnished about one-fifth of the total protein and two-thirds of the total fat of the diet. Considering the average results of the whole investigation or those of each experiment, the rations containing the eggs cooked in the two ways proved equally digestible, 90 to 91 per cent of the protein and 95 per cent of the fat consumed being retained in the body. As the only factor in the experiments which varied was the time of cooking the eggs, the deduction seems warranted that the hard and soft boiled were equally digestible.

From experimental evidence it seems fair to conclude that eggs are quite thoroughly digested and that the length of time of cooking has less effect upon this factor than upon the time required for digestion. In a healthy man the latter consideration is probably not a matter of much importance. In the diet of sick persons and invalids it may be more important. Diet in such cases, however, is a matter for the attention of skilled physicians.

In some of the experiments referred to above the eggs were used alone; in others, as a part of a more or less simple mixed diet. The effect of one food upon the digestibility of another is a matter concerning which little is definitely known. It is possible that when two foods are eaten together, the digestibility of either or both is (1) unchanged, (2) increased, or (3) diminished.

Apparently no experiments have been made in which the problem was studied with special reference to eggs combined with other foods. However, artificial digestion experiments were made by Fraser on the effect of beverages on the digestibility of a number of foods including raw and cooked egg albumen, which led to the deduction that tea, coffee, and cocoa retarded somewhat the digestibility of the nitrogenous constituents of eggs, although the effect was less marked with coffee than with the other beverages Water did not have this effect.

Though interesting in themselves, too wide application should not be made of the results of such tests, for even if the beverages retarded digestibility somewhat, it does not necessarily follow that this effect was harmful, or that the thoroughness of digestion was altered.

THE PLACE OF EGGS IN THE DIET

Eggs are used in nearly every household in some form or another in varying amounts. From the results of the numerous dietary studies, made under the auspices of this Department and by the agricultural experiment stations, it has been calculated that on an average eggs furnish 3 per cent of the total food, 5.9 per cent of the total protein, and 4.3 per cent of the total fat used per man per day. Cheese was found to furnish 0.4 per cent of the total food, 1.6 per cent of the total protein, and 1.6 per cent of the total fat, while the milk and cream together furnish 19.9 per cent of the total food, 10.5 per cent of the total protein, and 10.7 per cent of the total fat. Milk and cream together also furnish some carbohydrates, while eggs and cheese furnish no appreciable amount of this group of nutrients. Considering some of the common meats, beef and veal together were found to furnish 10.3 per cent of the total food, 24.6 per cent of the total protein, and 19.5 per cent of the total fat. The corresponding values for mutton and lamb together were 1.4, 3.3, and 3.8 per cent.

It will be seen that, judged by available ststistics, eggs compared favorably with the more common animal foods, as regards both the total food material and the total protein and fat furnished by them in the average daily dietary. In other words, investigations show that the high food value of eggs is appreciated and that they constitute one of the very important articles of diet in the American household.

The amount of nutritive material which a given amount of eggs will furnish at any stated price per dozen may be readily calculated. When eggs are fifteen cents per dozen, ten cents expended for this food will furnish one pound total food material, containing 0 13 pound protein and 0.09 pound fat, the whole having a food value of 635 calories. At twenty-five cents per dozen, ten cents worth of eggs will furnish 0.60 pound total food material, supplying 0.08 pound of protein, 0.05 pound of fat, and 380 calories. At thirty-five cents per dozen, ten cents will procure 0.43 pound total food material containing 0.06 pound of protein, 0.04 pound of fat, and furnish 275 calories. Ten cents expended for beef at eight cents per pound will furnish 1.25 pounds total food material, containing 0.24 pound protein, 0.16 pound fat, and 1,120 calories. Expended for beef sirloin at twenty cents per pound it will furnish 0.05 pound total food matter, containing 0.08 pound protein, 0.09 pound fat, and 520 calories. If wheat bread is purchased at five cents per pound, ten cents will pay for two pounds of total food material containing 0.18 pound protein, 0.03 pound of fat, 1.06 pounds carbohydrates, and 2,430 calories.

In many of the dietary studies made in the United States, data were recorded of the cost of different foods and the relative amount of nutritive material contributed by each in proportion to the total cost. Compared with other foods at the usual prices, eggs at twelve cents per dozen were found to be a cheap source of nutrients; at sixteen cents per dozen, they were fairly expensive; and at twenty-five cents per dozen and over, they were very expensive. This point needs some further discussion, since the value of eggs cannot fairly be estimated solely on the basis of the amount of nutrients furnished. Eggs are also valuable for giving variety to the diet and for furnishing a light, easily digested, nitrogenous food, especially

suitable for breakfast or other light meal, an important item for those of sedentary habits.

Many families of moderate means make a practice of buying fresh meat for but one meal a day—*i. e.*, dinner, using for breakfast either bacon, dried beef, codfish, or left-over meats, etc., and for lunch or supper, bread and butter and the cold meat and other foods remaining from the other two meals, with perhaps the addition of cake and fresh or preserved fruit. It is the thrifty housekeeper, who uses all her material as economically as possible in some such way, who is likely to fall into the error of excluding eggs at higher prices almost entirely from her food supply. If her economy was directed principally to restricting the use of eggs in the making of rich dessert dishes, cake, and pastry, one might not only refrain from criticising but welcome the circumstances which necessitated the making of simple and therefore more wholesome desserts. But usually the housekeeper economizes by the more obvious method of omitting to serve them as a meat substitute.

The statement so frequently made by housekeepers that eggs at twenty-five cents per dozen are cheaper than meat is true in one sense. Not, of course, with reference to the total amount of nutrients obtained for the money expended, but because a smaller amount of money is needed to furnish the meal. That is to say, whereas at least one and one-fourth pounds of beefsteak, costing twenty-five cents, at twenty cents per pound, would be necessary to serve five adults; in many families five eggs, costing ten cents, at twenty-five cents per dozen, would serve the same number and probably satisfy them equally well. If the appetites of the family are such as to demand two eggs per person, doubling the cost, it is still 20 per cent less than the steak. Many persons eat more than two eggs at a meal, but the average number per person it is believed does not generally exceed two in most families. A hotel chef is authority for the statement that at least one-half the orders he receives are for one egg. Frequently when omelets, souffles, creamed eggs, and other similar dishes, are served in place of fried, poached, or boiled eggs or meat, less than one egg per person is used.

These statements must not be understood as advocating a free use of eggs at any price, but merely as pointing out that even at the higher prices the occasional use of eggs in place of meat need not be regarded as a luxury. This is illustrated by observations made by Miss Bevier and Miss Sprague [1] at Lake Erie College, Ohio, during a dietary study of some 115 women, most of them students. It was found that the amount and cost of certain foods required for a single meal, when any one of them was served, was as follows:

1 U. S. Department Agriculture, Office of Experiment Stations Bulltein 91, and unpublished data furnished by Miss Sprague.

COMPARATIVE AMOUNT AND COST OF CERTAIN FOODS REQUIRED, PER MEAL, BY WOMEN STUDENTS' CLUB.

	Amount required.	Price per pound.	Total cost per meal.
	Pounds.	Cents.	
Beef steak	36	17	$6.12
Mutton chops	45	14	6.30
Hamburg steak	24	12½	3.00
Sausage	30	12	3.60
Bacon	12	9	1.08
Dried Beef	4	23	a .92
Eggs	b 15	c 14⅔	2.20
do	b 15	d 16⅔	2.50

a Milk, butter, and flour required for the dried beef, when creamed, would increase the cost somewhat.
b 15 pounds = 10 dozen eggs. c Or 22 cents per dozen. d Or 25 cents per dozen.

At the price at which board was furnished, steaks and chops were too expensive for use as breakfast dishes. Bacon or dried beef was considered cheap. Hamburg steak and sausage were regarded as practicable and were occasionally used. When the investigation was undertaken, the opinion was commonly held that eggs at twenty-two cents per dozen were expensive, and at twenty-five cents per dozen so dear that they could not be used, yet it will be seen by reference to the above table that at both prices the amount of eggs actually required to satisfy the members of the club cost less than any of the foods except bacon and dried beef. Observations showed that many of the students did not care for Hamburg steak or sausage and would eat eggs. If any boiled eggs were left, they could be used for garnishing salads or in other ways and therefore need not be wasted, while it was difficult to utilize the remnants of Hamburg steak or sausage in such a way that they were relished. It appears, therefore, that both as regards economy and palatability, the use of eggs in this case as a breakfast food was warranted.

In the instance cited, it is known that ten dozen eggs, thirty pounds of sausage, twenty-four pounds of Hamburg steak, twelve pounds of bacon, and the amounts of the other foods mentioned in the table, were not equivalent as regards the quantity of nutrients furnished, although any of the foods could be used as a breakfast dish in the quantity mentioned and give satisfaction to the club. It must be remembered, however, that other foods were served with the meat or eggs, and that the total amount of nutrients consumed at the meal may not have varied greatly from day to day, although the menu was quite different. Furthermore, physiologists believe that the quantities eaten each day need not conform exactly to the accepted dietary standard, but rather that the daily average throughout a considerable period must not vary very greatly from it. A deficiency on one day may be easily made good by an abundance the next. When, as was the case at Lake Erie College, each meal is abundant, the average daily diet corresponds with reasonable closeness to the commonly accepted dietary standard, and the persons consuming it have every appearance of being properly nourished, such substitutions of food of unlike nutritive value seem justifiable on theoretical as well as on practical grounds. It hardly needs to be said that the instance cited is in accord with the ordinary household practice.

Eggs and the foods into which they enter are favorite articles of diet

with very many, if not most, families, and in this as in other cases the income and the need for economy must determine how far and in what way they are to be used when they are high in price. Judged by their composition and digestibility, eggs are worthy of the high opinion in which they are usually held. Furthermore, they are generally relished. Although the physiological reason is perhaps difficult to find, it is generally conceded that the attractiveness and palatability of any food must not be forgotten in considering its true nutritive value. Refinement in matters of diet should keep pace with growth in general culture, and foods which please the esthetic sense as well as satisfy the hunger are certainly to be preferred to those which serve the latter purpose only, if they can be provided with the income at one's command.

MARKETING AND PRESERVING EGGS

In earlier times eggs, if sold at all, were marketed near the place where they were produced. Many are still sold in local markets; but with improved methods of transportation the market has been extended and large quantities of eggs are shipped from this country and Canada not only to distant points in America, but to England and more distant countries. For shipping long distances there are special egg cases, and the shipper should select the kind which is preferred in the market which he desires to reach.

The shells of new-laid eggs should be wiped clean, if necessary, and the eggs graded as regards size. In some markets brown eggs are preferred to white. It is stated that in the Boston market brown-shelled eggs, such as are laid by Partridge Cochins, Dark Brahmas, Barred Plymouth Rocks, etc., sell at from two to five cents per dozen more than white-shelled eggs, such as are laid by Brown Leghorns, Buff Leghorns, and White and Black Minorcas. In the New York market, on the other hand, white-shelled eggs bring the higher price. That the color of the shell has no relation to the food value, as shown by analysis, is pointed out on another page (p 355).

Eggs which are to be shipped, whether with or without a special attempt at preservation, should be perfectly fresh, and should never be packed in any material which has a disagreeable odor. Musty straw or bran will injure the flavor and keeping qualities of eggs packed in it. When shipped, eggs should not be placed near anything which has a disagreeable or strong odor. Keeping eggs near a cargo of apples during transportation has been known to injure their flavor and also their market value. As previously noted, micro-organisms may enter the egg through the minute pores in the shell and set up fermentation which ruins the egg. In other words, it becomes rotten. The normal eggshell has a natural surface coating of mucilaginous matter, which hinders the entrance of these harmful organisms for a considerable time. If this coating is removed or softened by washing or otherwise, the keeping quality of the egg is much diminished. If the process of hatching has begun, the flavor of the egg is also injured.

There are many ways of testing the freshness of eggs which are more or less satisfactory. "Candling," as it is called, is one of the methods most commonly followed. The eggs are held up in a suitable device against a light. The fresh egg appears unclouded and almost translucent; if incubation has begun, a dark spot is visible which increases in size according to the length of time incubation has continued. A rotten egg appears dark

colored. Egg dealers become very expert in judging eggs by testing them by this and other methods.

The age of eggs may be approximately judged by taking advantage of the fact that as they grow old their density decreases through evaporation of moisture. According to Siebel a new-laid egg placed in a vessel of brine made in the proportion of two ounces of salt to one pint of water, will at once sink to the bottom. An egg one day old will sink below the surface, but not to the bottom, while one three days old will swim just immersed in the liquid. If more than three days old, the egg will float on the surface, the amount of shell exposed increasing with age; and if two weeks old, only a little of the shell will dip in the liquid.

The New York State Experiment Station studied the changes in the specific gravity of the eggs on keeping and found that on an average fresh eggs had a specific gravity of 1.090; after they were ten days old, of 1.072; after twenty days, of 1.053, and after thirty days, of 1.035. The test was not continued further. The changes in specific gravity correspond to the changes in water content. When eggs are kept they continually lose water by evaporation through the pores in the shell. After ten days the average loss was found to be 1.60 per cent of the total water present in the egg when perfectly fresh; after twenty days, 3.16 per cent, and after thirty days, 5 per cent. The average temperature of the room where the eggs were kept was 63.8 degrees F. The evaporation was found to increase somewhat with increased temperature. None of the eggs used in the thirty-day test spoiled.

Fresh eggs are preserved in a number of ways which may, for convenience, be grouped under two general classes: (1) Use of low temperature, *i. e.*, cold storage; and (2) excluding the air by coating, covering, or immersing the eggs, some material or solution being used which may or may not be a germicide. The two methods are often combined. The first method owes its value to the fact that micro-organisms, like larger forms of plant life, will not grow below a certain temperature, the necessary degree of cold varying with the species. So far as experiment shows, it is impossible to kill these minute plants, popularly called "bacteria" or "germs," by any degree of cold; and so, very low temperature is unnecessary for preserving eggs, even if it were not undesirable for other reasons, such as injury by freezing and increased cost. According to a recent report of the Canadian commission of agriculture and dairying:

> When fresh-laid eggs are put into cold storage with a sweet, pure atmosphere at a temperature of 34 degrees F., very little, if any, change takes place in their quality. The egg cases should be fairly close to prevent circulation of air through them, which would cause evaporation of the egg contents.
>
> Eggs should be carried on the cars and on the steamships [at a temperature of] from 42 degrees to 38 degrees. When cases containing eggs are removed from the cold-storage chamber, they should not be opened at once in an atmosphere where the temperature is warm. They should be left for two days unopened, so that the eggs may become gradually warmed to the temperature of the air in the room where they have been deposited, otherwise a condensation of moisture from the atmosphere will appear on the shell and give them the appearance of sweating. This so-called "sweating" is not an exudation through the shell of the egg, and can be entirely prevented in the manner indicated.

It is stated by Siebel that in practice in this country 32 degrees to 33 degrees F. is regarded as the best temperature for storing eggs, although some American packers prefer 31 degrees to 34 degrees, while English writers recommend a temperature of 40 degrees to 45 degrees as being equally satisfactory. The amount of moisture in the air in the cold-storage chamber has without doubt an important bearing on this point. Eggs are generally placed in cold storage in April and the early part of May. If placed in storage later than this time they do not keep well. They are seldom kept in storage longer than a year. Eggs which have been stored at a temperature of 30 degrees must be used soon after removal from storage, while those stored at 35 degrees to 40 degrees will keep for a considerable time after removal from storage, and are said to have the flavor of fresh eggs. The author cited states that eggs for market, especially those designed for cold storage, should not be washed. Stored eggs should be turned at least twice a week, to prevent the yolk from adhering to the shell.

Eggs are sometimes removed from the shells and stored in bulk, usually on a commercial scale, in cans containing about fifty pounds each. The temperature recommended is about 30 degrees F., or a little below freezing, and it is said they will keep any desired length of time. They must be used soon after they have been removed from storage and have been thawed.

The substances suggested and the methods tried for excluding air conveying micro-organisms to the egg, and for killing those already present, are very numerous. An old domestic method is to pack the eggs in oats or bran. Another, which has always had many advocates, consists in covering the eggs with limewater which may or may not contain salt. The results obtained by such methods are not by any means uniform. Sometimes the eggs remain fresh and of good flavor, and at other times they spoil. Recently, in Germany, twenty methods of preserving eggs were tested. The eggs were kept for eight months with the following results: Those preserved in salt water, *i. e.*, brine, were all bad, not rotten, but unpalatable, the salt having penetrated the eggs. Of the eggs preserved by wrapping in paper, eighty per cent were bad; the same proportion of those preserved in a solution of salicylic acid and glycerin were unfit for use. Seventy per cent of the eggs rubbed with salt were bad, and the same proportion of those preserved by packing in bran, or covered with paraffin or varnished with a solution of glycerin and salicylic acid. Of the eggs sterilized by placing in boiling water for twelve to fifteen seconds, fifty per cent were bad. One-half of those treated with a solution of alum or put in a solution of salicylic acid were also bad. Forty per cent of the eggs varnished with water glass, collodion, or shellac were spoiled. Twenty per cent of the eggs packed in peat dust were unfit for use, the same percentage of those preserved in wood ashes, or treated with a solution of boric acid and water glass, or with a solution of permanganate of potash were also bad. Some of the eggs were varnished with vaseline; these were all good, as were those preserved in limewater or in a solution of water glass. Of the last three methods, preservation in a solution of water glass is especially recommended, since varnishing the eggs with vaseline is time consuming, and treatment with limewater sometimes communicates to the eggs a disagreeable odor or taste.

Many of these methods have been tested at the agricultural experiment stations is this and other countries. The Canada Station found that infertile eggs kept much better than fertile eggs when packed in bran. In view of the fact that preservation in brine has been said to injure the eggs by giving them an unpleasant, salty taste, experiments were recently made at the Berlin University to learn the proportion of salt which entered the eggs when

placed in brine of varying strength. It was found by the investigator that with a saturated or half saturated solution, the salt entered the eggs at first very quickly, and later much more slowly. After remaining four days in the saturated solution, an egg contained as much salt as one which remained four to six weeks in a one to three per cent solution. If kept in the saturated solution four weeks, 1.1 per cent of salt was found in the yolk and 1.5 per cent in the white of the eggs. None of the eggs tested were spoiled. When a one to five per cent solution was used, the eggs kept well for four weeks and did not have a salty flavor. These instances are sufficient to show that any given method will give different results in different hands, and this is not surprising, since the eggs used are not always uniformly fresh, nor is it at all certain that other experimental conditions are uniform.

In the last two or three years the method of preserving eggs with a solution of water glass has often been tested both in a practical way and in laboratories. The North Dakota Experiment Station has been especially interested in the problem. In these experiments a ten per cent solution of water glass preserved eggs so effectually that "at the end of three and one-half months eggs that were preserved the first part of August still appeared to be perfectly fresh. In most packed eggs, after a little time, the yolk settles to one side, and the egg is then inferior in quality. In eggs preserved for three and one-half months in water glass, the yolk retained its normal position in the egg, and in taste they were not to be distinguished from fresh store eggs. Again, most packed eggs will not beat up well for cake making or frosting, while eggs from a water glass solution seemed quite equal to the average fresh eggs of the market."

Water glass or soluble glass is the popular name for potassium silicate or for sodium silicate, the commercial article often being a mixture of the two. The commercial water glass is used for preserving eggs, as it is much cheaper than the chemically pure article which is required for many scientific purposes. Water glass is commonly sold in two forms, a sirup-thick liquid, of about the consistency of molasses, and a powder. The thick sirup, the form perhaps most usually seen, is sometimes sold wholesale as low as one and three-fourths cents per pound in carboy lots. The retail price varies, though ten cents per pound, according to the North Dakota Experiment Station, seems to be the price commonly asked. According to the results obtained at this station a solution of the desired strength for preserving eggs may be made by dissolving one part of the sirup-thick water glass in ten parts, by measure, of water. If the water glass powder is used less is required for a given quantity of water. Much of the water glass offered for sale is very alkaline. Such material should not be used, as eggs preserved in it will not keep well. Only pure water should be used in making the solution, and it is best to boil it and cool it before mixing with the water glass. The solution should be carefully poured over the eggs packed in a suitable vessel, which must be clean and sweet, and if wooden kegs or barrels are used they should be thoroughly scalded before packing the eggs in them. The packed eggs should be stored in a cool place. If they are placed where it is too warm silicate deposits on the shell and the eggs do not keep well. The North Dakota Experiment Station found it best not to wash the eggs before packing, as this removes the natural mucilaginous coating

on the outside of the shell. The station states that one gallon of the solution is sufficient for fifty dozen eggs if they are properly packed.

It is, perhaps, too much to expect that eggs packed in any way will be just as satisfactory for table use as the fresh article. The opinion seems to be, however, that those preserved with water glass are superior to most of those preserved otherwise. The shells of eggs preserved in water glass are apt to crack in boiling. It is stated that this may be prevented by puncturing the blunt end of the egg with a pin before putting it into the water.

In the East Indian Archipelago salted ducks' eggs are an article of diet. The new-laid eggs are packed for two or three weeks in a mixture of clay, brick dust, and salt. They are eaten hard-boiled. It is said that in this region and in India turtle eggs are also preserved in salt. These products, while unusual, do not necessarily suggest an unpleasant article of diet. The same can hardly be said of a Chinese product which has often been described. Ducks' eggs are buried in the ground for ten or twelve months and undergo a peculiar fermentation. The hydrogen sulphid formed breaks the shell and escapes while the egg becomes hard in texture. It is said that the final product does not possess a disagreeable odor or taste. Eggs treated in this or some similar way are on sale in the Chinese quarter of San Francisco, and very likely in other American cities. A sample recently examined had the appearance of an egg covered with dark-colored clay or mud.

SELLING EGGS BY WEIGHT

Since eggs vary more or less in size it has been proposed that they should be sold by weight rather than by the dozen, which is the usual custom in this country. The North Carolina Experiment Station, in investigating this point, recorded the weight of eggs per dozen and the number produced during six months by pullets and old hens of a number of well-known breeds and by ducks. Generally speaking, larger eggs were laid by hens than by pullets of the same breed. The eggs laid by Pekin ducks (old and young) averaged 35.6 ounces per dozen, and were heavier than those laid by any breed of hens. Of the different breeds of hens tested, the largest eggs weighed twenty-eight ounces per dozen and were laid by Light Brahmas. The Black Langshan and Barred Plymouth Rock hens' eggs weighed a little over twenty-six ounces per dozen, while those laid by Single Comb Brown Leghorns, late hatched Plymouth Rock, White Wyandotte, and Buff Cochin hens ranged from 21.7 to 23.7 ounces per dozen.

Of the pullets, the heaviest eggs (weighing 26.5 ounces per dozen) were laid by the Black Minorcas, the lightest by the Single Comb Brown Leghorns and Silver-Laced Wyandottes. These weighed 17.5 and 22.1 ounces per dozen, respectively. The Barred Plymouth Rock, White Plymouth Rock, White Wyandotte, Black Langshan, and Buff Cochin pullets' eggs all weighed not far from 24 ounces per dozen. As will be seen, the variation in the weight of the eggs was considerable. In tests carried on at the Maine Experiment Station it was noticed that eggs from hens that laid the greatest number were on an average smaller in size than those from hens producing fewer eggs. The percentage of fertility was also less in the former than in the latter.

In the North Carolina test all of the eggs, regardless of size, had a local

market value of 13½ cents per dozen at the time of the investigation. If a dozen Single Comb Brown Leghorn pullets' eggs weighing 17½ ounces were worth 13½ cents per dozen, or 12 cents per pound, the eggs of the other breeds would be actuallly worth from 16.3 cents for the Single Comb Brown Leghorn hens to 21.6 cents per dozen for the Light Brahma hens, or from 20.7 to 60 per cent in excess of their market value. The eggs of the Pekin ducks would be worth 26.7 cents, or 97.8 per cent above their market value. On the basis of the results obtained, the station advocates selling eggs by the pound instead of by the dozen. It is said that the egg packers and dealers maintain that this method would increase the cost of the eggs, owing to the extra handling necessary and the consequent breakage. An apparent objection to selling eggs by weight is that they are not generally used in the household in this way. Most recipes call for eggs by number and not by weight. There is no question that weighing the eggs would be more accurate, and recipes are occasionally met with in which this method is followed.

DESICCATED EGGS, EGG POWDERS, AND EGG SUBSTITUTES

Different methods of evaporating or desiccating eggs have been proposed and several products which claim to be prepared in this way are now on the market. It is said that the egg is dried in or out of a vacuum, usually by a gentle heat or by currents of air. When placed on the market the dried egg is usually ground. Sometimes salt, sugar, or both have been used as preservatives. As will be seen by reference to the table of composition (p. 355) such material is merely egg from which the bulk of water has been removed.

If the process of manufacture is such that the resulting product is palatable and keeps well, the value of evaporated eggs under many circumstances is evident.

This material is used by bakers to some extent as being cheaper when fresh eggs are high in price. It is also used in provisioning camps and expeditions, since desiccated foods have the advantage of a higher nutritive value in proportion to their bulk than the same materials when fresh. Fresh eggs contain about 25 per cent of dry matter. If all the water is removed in preparing evaporated eggs, one pound will furnish nutritive material equivalent to about four pounds of fresh eggs. One of the commercial egg products recently tested appeared to be dried egg coarsely ground. For use it was thoroughly mixed with a small quantity of water. The mixture could then be fried or made into an omelet, etc., and was found to be very palatable, closely resembling in taste the same dishes made from fresh eggs.

An egg substitute has been manufactured from skim milk. It is said to contain the casein and albumen of the milk mixed with a little flour, and is put up in the form of a paste or powder. Such material is evidently rich in protein and, according to reports apparently reliable, is used in considerable quantities by bakers and confectioners in place of fresh eggs.

Egg substitutes have been devised which consist of mixtures of animal or vegetable fats, albumen, starch or flour, coloring matter, and some leavening powder in addition to the mineral matters similar to those found in the egg. Such products are designed to resemble eggs in composition.

Other egg substitutes have been marketed which contain little or no albumen, but apparently consist quite largely of starch, colored more or less

with some yellow substance. These goods are specially recommended for making custards and puddings similar in appearance to those in which fresh eggs are used. There is no reason to suppose that such products cannot be made so that they will be perfectly wholesome. The fact must not be overlooked that in the diet they cannot replace fresh eggs, since they do not contain much nitrogenous matter or fat. As recently pointed out in one of the medical journals, this may be an important matter if such an egg substitute is used in the diet of invalids, especially, if the composition of the egg substitute is not known, and it is employed with the belief that, like eggs, it contains an abundance of protein.

POSSIBLE DANGER FROM EATING EGGS

Occasionally a person is found who is habitually made ill by eating eggs, just as there are those who cannot eat strawberries or other foods without distress. Such cases are due to some personal idiosyncrasy, showing that in reality "one man's meat is another man's poison." A satisfactory explanation of such idiosyncrasy seems to be lacking.

Overindulgence in eggs, as is the case with other foods, may induce indigestion or other bad effects. Furthermore, under certain conditions eggs may be the cause of illness by communicating some bacterial disease or some parasite. It is possible for an egg to become infected with micro-organisms, either before it is laid or after. The shell is porous, and offers no greater resistance to micro-organisms which cause disease than it does to those which cause the egg to spoil or rot. When the infected egg is eaten raw the micro-organisms, if present, are communicated to man and may cause disease. If an egg remains in a dirty nest, defiled with the micro-organisms which cause typhoid fever, carried there on the hen's feet or feathers, it is not strange if some of these bacteria occasionally penetrate the shell and the egg thus becomes a possible source of infection. Perhaps one of the most common troubles due to bacterial infection of eggs is the more or less serious illness sometimes caused by eating those which are "stale." This often resembles ptomaine poisoning, which is caused, not by micro-organisms themselves, but by the poisonous products which they elaborate from materials on which they grow.

Occasionally the eggs of worms, etc., have been found inside hens' eggs, as indeed have grains, seeds, etc. Such bodies were doubtless accidentally occluded while the white and shell were being added to the yolk in the egg gland of the fowl.

Judged by the comparatively small number of cases of infection or poisoning due to eggs reported in medical literature, the danger of disease from this source is not very great. However, in view of its possibility, it is best to keep eggs as clean as possible and thus endeavor to prevent infection. Clean poultry houses, poultry runs, and nests are important, and eggs should always be stored and marketed under sanitary conditions. The subject of handling food in a cleanly manner is too seldom thought of, and what is said of eggs in this connection applies to many other foods with even more force.

IMPORTANCE OF THE EGG INDUSTRY

The egg industry is of considerable commercial importance. The total number of eggs produced in the United States in 1890 was estimated to be

820,000,000 dozen, and these figures are quite often said to be too low. The United States formerly imported a large number of eggs and exported very few. The ratio has changed within the last ten years, and now the exports largely exceed the imports.

Growth of the egg industry—In 1890 the total number of eggs exported was in round numbers 381,000 dozen, worth $59,000; in 1899, 3,694,000 dozen, worth $641,000. In 1890 this country imported 15,000,000 dozen, worth $2,000,000, and in 1899 only 225,000 dozen, valued at $21,000.

Taking into account the five years up to and including 1898, 61 per cent of the exported eggs were sent to Cuba, 20 per cent to Canada, and 11 per cent to Great Britain, while the remainder was distributed among many other countries. During the same period, 96 per cent of the eggs imported came from Canada, 3 per cent from China, and the remainder from various other countries.

These statistics of the egg trade are of interest, since they show the great growth of the poultry industry, and indicate what it may become in the future. Some of the developments may be fairly attributed to the work of the government and the agricultural experiment stations. For many years a considerable number of the stations, especially these in Alabama, California, Indiana, Kentucky, Louisiana, Maine, Massachusetts, Michigan, New York, North Carolina, North Dakota, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, and West Virginia, have been experimenting upon methods of feeding and caring of poultry, the comparative value of different breeds, the possibility of increasing egg production by proper feeding and the selection of laying stock, and similar problems. The station bulletins reporting the investigations have been circulated widely. These investigations are being continued and promise to be even more valuable in their results in the future than in the past. The Department of Agriculture has done much to encourage the poultry industry by collecting and distributing information,[1] and in other ways.

Poultry raising is often carried on in conjunction with general farming, and may be profitably developed along such lines. When it is followed as an independent enterprise, its possibilities are also great. There is always a market for poultry and eggs for food, while the raising of fancy stock for breeding purposes is frequently worth consideration.

1 Farmers' Bulletins 41, 51, and 64 of the department are devoted exclusively to poultry topics. A number of Farmers' Bulletins of the series entitled "Experiment Station Work" contains short articles on poultry, poultry feeding, or similar topics. A bibliography of poultry literature has been published by the Department Library (Bul. 18). Bulletin 5, of the Division of Publications contains a list of references to articles on eggs and poultry in the Department publications. A number of the publications of the Bureau of Animal Industry contain articles on poultry diseases, egg production, and other topics, while many of the publications of the Section of Foreign markets give statistics of the poultry and egg industry.

XXV

SOME SANITARY ASPECTS OF MILK SUPPLIES AND DAIRYING*

BY SEVERENCE BURRAGE

This subject of public milk supplies is not a new one. It has been generally known for some time that milk and butter may be, and often are adulterated, and the legislature, by the enactment of laws, have in several cases protected the citizens against this fraud. But a far more serious fact from the sanitary standpoint is this: that milk and butter are commonly polluted, containing filth and foreign materials which are more or less dangerous to the health. Infected milk has frequently carried the germs of disease and caused severe epidemics. This paper has been written for the purpose of attracting attention to this bacteriological side of the subject, to show its importance to community life, and by the diffusion of facts to make it possible to blot out in the near future some of the dangers that now exist.

The following figures, taken from the eleventh United States census, will show the importance of the dairying industry in our State:

Production of milk in Indiana for 1889,	-	200,510,797 gallons.
Production of butter "	" - -	48,477,776 pounds.
Production of cheese "	" -	360,948 pounds.

†Figuring at eight cents a gallon for milk, ten cents a pound for butter, and five cents a pound for cheese, gives a total value of $20,906,687.76.

These figures have undoubtedly increased considerably since 1889, and could the corresponding figures be obtained for 1895 they would give a much more striking illustration of the value of dairying to the commonwealth.

It is certainly possible to raise the general standard of dairying throughout the State. Much trouble arises from the ignorance or carelessness of the milkmen. If they are uncleanly in their habits, if they do not take the proper care of their own bodies, and of the cattle and stable, they add an important factor toward making serious and dangerous conditions. The more unfavorable these conditions, just so much more is the chance that the milk will depart from the normal.

NORMAL MILK

Cow's milk is essentially an animal secretion, the direct product of certain glands, whose function it is to manufacture this liquid food for the calf while it is too young to partake of the more solid food. The milk is secreted

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†These prices were suggested by Prof. C. S. Plumb, Director of the Purdue Agricultural Experiment Station.

by these mammary glands, the cells of which actually contribute a certain portion of their own substance that they have manufactured from the blood. Thus we find stored in the udder a liquid made up largely of real animal substance, a rich food material suitable for human use. The chemical composition of milk will not be touched upon, as the proportions of its various constituents have little to do with the problems at hand. Suffice it to say, that this white, innocent looking liquid which is such an excellent food for the human family, is likewise a most fertile soil for various minute plants, micro-organisms belonging to one of the lowest divisions of the vegetable kingdom, scientifically known as "Bacteria."

It has been shown that milk in the udder of a perfectly healthy cow is absolutely free from bacteria or germs of any kind; in other words, it is sterile or germ-free. If the milk could be used when first drawn from the cow, as was done by people in a more primitive or patriarchal state, who domesticated many of the milk-giving animals, as the cow, goat, mare, and camel, this object, viz.: germ-free milk, would be partly attained. They did not have to store the milk for any length of time, nor did they have to transport it from one place to another, but in the modern civilized community real fresh milk is seldom obtained. It is delivered several hours after milking, and it often has to pass through several different handlings before it is placed upon the table for consumption. Therefore, it is not surprising that we rarely find normal milk in city households.

COMMERCIAL MILK IS NOT NORMAL MILK

It has been proven that normal milk in the healthy cow's udder is free from bacteria. City milk, on the other hand, shows an entirely different condition. It is swarming with bacteria. The average number of bacteria in fifty-seven samples of milk taken in Boston, in the spring of 1890, was 2,355,500 per cubic centimeter, a quantity equal to a small thimbleful. In some fifteen samples, taken in the suburbs of Boston, from the tables of well-to-do families, whose milkmen were exceptionally good, the average number of bacteria per cubic centimeter was 69,143. American cities appear to have better milk from a bacterial standpoint than European cities. In the latter, milk seldom contains less than 5,000,000 per cubic centimeter In the milk supply of Middletown, Connecticut, the number of bacteria was found to be comparatively low. In this case the milk is delivered to the consumer within a few hours of milking, as it does not have to be sent on an extended railroad journey, as ordinary city milk often does. The bacteria varied from 11,000 to 300,000 per cubic centimeter.

An examination of milk made at the end of a milking under the usual conditions, viz.: wide pail, and a more or less shaking of the udder during the process, showed an average of 30,500. Other figures might be given, showing the number of bacteria in the milk supplies of cities and towns, foreign and American, all showing that commercial milk had departed from the normal condition. It contains myriads of vegetable organisms. The examples cited above are sufficient to give an idea of the large numbers and will serve better as a demonstration than a long table of figures.

MAJORITY OF BACTERIA IN MILK ARE HARMLESS

All bacteria are not disease germs. A very small proportion of them are dangerous or harmful in any way. In this way they may be compared to

the larger and more familiar forms of the vegetable kingdom, which can be seen every day in the field, the forest, and the garden. Here are hundreds of trees, shrubs, and plants, nearly all perfectly harmless, but there are some ten or fifteen forms, including the poison ivy (*Rhus toxicodendron*) and the poison oak (*Rhus venenata*), both poisonous to the touch, and spotted cow-bane (*Cicuta maculata*), and wild carrot (*Daucus Carota*), poisonous to eat, and have to be avoided. Just so it is with these minute bacteria. There are countless species that are perfectly harmless, and many are exceedingly useful. At the same time several dangerous disease-producing forms exist, causing such diseases as diphtheria, Asiatic cholera, and typhoid fever, which are much more to be dreaded than the poisons of the more familiar plants mentioned above. The conditions, moreover, which favor the growth of the harmful forms are usually favorable for the more dreaded ones, also, just as in the case of the higher plants. Of the enormous number of bacteria found in milk, cited on previous pages, it is possible that none were pathogenic, or disease producers, and would not in any way harm the public health. The fact remains true that where these harmless or non-pathogenic bacteria thrive it is possible for the dangerous ones to thrive also. It is believed by some authorities that the large number of bacteria existing in milk may have an important relation to the high death-rate among children under five years of age, as will be discussed on another page.

Many of the common phenomena, as putrefaction and fermentation, are due to some of these minute organisms. The souring of milk will occur only when the lactic acid bacteria are present. If milk could be kept absolutely free from any contamination—from contact with any germs—it could be preserved indefinitely. All canning and preserving of fruits and vegetables is based upon this principle. The materials are cooked thoroughly, the high temperature killing all the germs; the cans are then sealed while still hot, and the air, always laden with spores of bacteria and molds, does not have access to the preserves. Consequently, if properly sealed, they should last indefinitely. Any means by which the milk can be protected from these germ-spores in the air must necessarily lengthen the time that the milk will keep fresh; and any method, such as cooling immediately after milking, thus retarding the growth of the organism, would give a similar result.

SOURCES OF BACTERIA IN MILK

(a) In the Barn and Vicinity If the normal milk in the udder of the cow is sterile, the first opportunity for bacteria to reach it would be during the operation of milking. It must be borne in mind that the bacteria are omnipresent, being in the air and soil, and particularly where dampness, dust, and dirt exist. Ordinary dust is made up of many spores of bacteria and molds, and it is evident that the conditions existing in a barn where cows are kept must be most favorable for the production of such dust. All animal refuse contains bacteria, and there is of necessity much such filth about the barn or stable, and even about the cows themselves, unless they are unusually well-kept. In order to show how many opportunities are afforded the milk to become contaminated, it will be instructive to follow closely the operation called milking, the usual method of drawing the milk from the udder.

If it is in the morning, the man starts from the house perhaps without having washed himself, takes the milk pail, which is supposed to be clean, opens the barn, seats himself on a stool near the cow to be milked, and holding the milk pail between his knees, he seizes the teats with more or less violence, and proceeds to fill the pail. With the shaking of the udder, the switching of the cow's tail, and the possible rubbing of the cow's sides by the hat or head of the milker, much disgusting material is often dropped into the pail; in fact, the following impurities have been found in unstrained fresh milk:

Manure particles (numerous), fodder particles (which have not passed the alimentary canal of the animals), molds and other fungi, cow hair (numerous), particles of the skin, human hair, parts of insects, down from birds, small wooden pieces, shavings, and pieces of fir-leaves, woolen threads, linen threads, soil particles (rather frequent), and moss particles, fine threads (most likely cobwebs), etc.

Admitting that many of these coarser materials are strained out before the milk is delivered to the consumer, nevertheless, the bacteria that were on them would remain in the milk, and finding a warm rich soil, would increase most rapidly. The example given above is supposed to be carried out under average circumstances, but if we imagine the milkman or farm hand to be untidy about the care of himself, the barn and the herd of cows, it is not difficult to imagine that a much worse state of affairs might exist, and a great deal more filth of the most disagreeble kind be found in the milk. It sometimes happens that a farmer is careful about the care of his barn, and just before milking he conscientiously takes the precaution to sweep the floor and stalls most carefully. He has obviously chosen the worst possible time to do this, for he has stirred up the dust and dirt so that it will settle into the pail, onto the cow and onto himself; consequently much of this dust stirred up by his sweeping is likely to reach the milk. Many men will moisten the hands with the milk, as this makes the operation easier for them. Unless their hands, and the cow's udder and teats are unusually clean this is an exceedingly unfortunate practice.

These illustrations, although very familiar to many of us, indicate clearly that under the most favorable circumstances, with the best conditions of barn, of men and of surroundings, it is only too easy for the milk to become an unpleasantly dirty food. This operation of milking seldom if ever occupies less than five minutes, and in that time, with the activity and stir within the vicinity of the pail, there would naturally much of the ordinary dust settle. It will not be required to further emphasize the fact that the barn and stable are the principal sources of bacteria in milk.

(*b*) *On the Road to the Consumer* Much milk, especially city milk, has to travel a considerable distance before reaching the consumer, the journey sometimes taking several hours. During this time it is subjected to various temperatures, seldom low enough to in any way retard the growth of the organisms. In many places where it is transported by railroad, particularly in cities of the Eastern United States, ice is so extensively used that the numbers of bacteria are comparatively low; but if the milk cans have to s and upon the depot platform in the sun, as often happens; if the milk has to be changed from one set of cans to another, the chances are enhanced that the number of bacteria will be greatly increased. The effect of this is clearly

demonstrated in milk which has been cooled directly after milking, such milk keeping fresh many hours after that which has been hurried directly from milking to the consumer. It has been observed that afternoon milk keeps much longer than morning's milk, which may be explained in this way, there being much more hurry and carelessness in the early morning.

It not infrequently happens that certain circumstances arise, after the milk leaves the barn or the place of milking, which allow water to be added to the milk. Whether this be premeditated or not is out of the province of this paper to discuss, as it has been the purpose here to emphasize the contamination and pollution and not the adulteration of milk. It is an interesting fact, however, that milk to which water has been added contains, as a rule, less bacteria than ordinary milk. The reason for this is apparent. The food is a more dilute one and the bacteria will not multiply as rapidly in it, and the addition of water presumably containing not as many bacteria will lessen the number ordinarily found in the straight milk. But there is a danger right here that must be carefully guarded against. This water, although containing comparatively few bacteria, may have come from a contaminated well; it may contain the germs of disease, particularly typhoid fever, as will be seen on a subsequent page. These facts illustrate that the journey of the milk from the barn to the consumer is often a productive source of bacteria, and sometimes of dangerous ones.

(*c*) *In the Dwelling of the Consumer* The house of the consumer, as a source of bacteria in milk, depends largely upon the habits of the family and servants with special reference to cleanliness. Milk pans and cans are difficult things to clean thoroughly. If the housewife or servant is at all careless some of the milk will remain lodged in the angles, and bacteria falling upon this, encouraged by the warm temperature of the kitchen, will flourish, awaiting the addition of fresh milk. The consumer's family should set a good example to the milkman by always returning to him the can or cans perfectly clean.

(*d*) *Diseased Cows, Farm Hands, and Milkmen* In all previous illustrations it has been taken for granted that the cows have been healthy ones; that the farmer and his help have not been diseased in any way, and that the men afterwards handling or delivering the milk have been in perfect health. In the case of the cows, statistics seem to indicate that there is a far larger proportion diseased than has been generally supposed. Many cows suffering from tuberculosis appear even to the veterinarian to be in good health, thus making it difficult to separate the diseased cows from the healthy ones. Today, however, this has been partially remedied by the introduction of the tuberculin test, which seems to indicate without fail the animals suffering from this disease. It has been demonstrated conclusively that the bacillus tuberculosis, the germ of the disease, has been found in the milk of the diseased cow, particularly if the udder is affected. It may happen that these germs get into the milk from the dust of the barn as often as they do directly from the animal itself. But the fact remains that the milk of tuberculosis cows is apt to contain the germs of the disease.

In regard to the persons that handle the milk after it leaves the cow, if they have suffered, or are suffering, from some sickness or disease, it is more than likely that some excretions or secretions from their bodies will reach the milk, unless they are exceedingly careful about their own personal cleanli-

ness. This source of bacteria would include to a great extent the sickness in families of these handlers or deliverers of the milk; particularly if they had any care of the sufferer, or even access to the sick-room. It occasionally happens that the class of people who handle the milk are careless and uncleanly in their habits, and, if they are sick, it is not probable that they will be more careful, but rather the reverse; hence, the dangers to the public are greatly increased.

We have seen heretofore that milk as sold in cities and towns contains a large number of bacteria. Taking into account these various sources of filth and foreign matters, as the barn and its surroundings, the handling of the milk on the road to the consumer, and the affected animals and men, it is almost a miracle that the milk is fit to drink at all.

INFECTED MILK AND THE PUBLIC HEALTH

It has been understood for several years by scientists and physicians that certain diseases are caused by minute vegetable organisms—bacteria—either directly by the presence of the bacteria cells themselves obstructing the normal action of the organs of the body (as tuberculosis), or indirectly by the poisons, ptomaines, secreted by the bacteria as products of their growth (as diphtheria).

A specific germ or bacterium can produce a certain disease in the animal body, and that same germ will always be found in the body of the person or animal suffering from that same disease; that germ will not be found in the body suffering from any other disease, and by the introduction of that germ into the healthy body, only that same disease will be produced.

The bacteria are the scavengers, the cleansers of the earth's surface. They are essential to the farmer in the working over of the soil, as also in the manufacture of butter. Pure cultures of certain forms of bacteria known to give an especially desirable flavor to the butter are distributed among the dairies today, and it is not improbable that pure cultures of other bacteria, which are peculiarly active in the soil, will soon be distributed around to the farmers who are having more or less difficulty with their fields and crops. It is through the agency of these bacteria that the organic manures and fertilizers are worked over into inorganic, less complex mineral substances, which are essential to the life of the plants.

It has been shown heretofore that large numbers of bacteria are found in milk; that some of these are harmless and some harmful, but there is much evidence that disease has been actually spread through the agency of milk.

(*a*) *Probable Relations of Milk to Infant Mortality* To those familiar with the vital statistics of the State or Nation it must have been a noticeable fact that the death rate of children under five years of age was remarkably high. For the benefit of some who may not have had access to the figures, a table from the eleventh United States census is given below, showing the comparative death rate per 1,000 of the living population of corresponding ages for both white and colored in the registration States as a whole, in the cities and in the rural portion.

SUM OF REGISTRATION STATES *

ITEMS.	White.			Colored.		
	Total.	Under 1 year.	Under 5 years.	Total.	Under 1 year.	Under 5 years.
Population	12,442,940	261,247	1,256,504	951,407	24,090	122,114
Deaths	244,442	59,335	86,034	18,619	4,807	7,345
Rate	19.65	227.12	68.47	19.57	199.54	60.15
CITIES IN REGISTRATION STATES						
Population	7,026,697	154,454	718,565	227,837	4,486	19,836
Deaths	163,184	45,912	65,697	7,865	2,534	3,504
Rate	23.22	297.25	91.43	34.52	564.87	176 65
RURAL PORTION OF REGISTRATION STATES						
Population	5,416,243	106,793	537,939	723,570	19,604	102,278
Deaths	81,256	13,423	20,337	10,754	2 273	3,841
Rate	15.00	125.69	37.81	14.86	115.95	37.55

These data are taken from the registration States, in which we would expect to get fairly accurate statistics, and they show clearly the high death rate among infants, and particularly among those children confined to the cities.

In Indiana, as well as in other States, about one-third of all the deaths are of those under five years of age, and this would be a much higher rate in the city districts than in the country districts.

The principal food of the child is milk. A large proportion of children today are bottle-fed, and this proportion is increasing, especially in the cities; and it is in the cities that the worst conditions exist in regard to procuring pure fresh milk. City milk contains millions of bacteria, many of which, during their process of growth in the milk, have produced ptomaines, or poisons, which might not affect us as adults, but without doubt do materially affect the health of the young child, whose system has not had time to become accustomed to the poison, and therefore cannot react against it. It is a well-known fact that the animal body can accustom itself to doses of poison, which doses, if given at first, would cause serious illness and perhaps death, but starting with easy, light doses, the system may get used to it. Smokers are good examples of animal bodies getting accustomed to a poison. They are oftentimes made sick when smoking their first two or three pipes, but after that the poison seems to have no immediate effect on the system. In this way the modern infant has to take a great many chances in starting its earthly career.

Dr. Mary A. Willard is quoted in the February (1896) "Popular Science Monthly" as follows:

"When the poor, pinched, blue, weazened little creatures were brought to me in the dispensary in New York, where they used to come by the dozen, I would call for their nursing bottles, take a whiff of their sour, putrid contents, swarming with bacteria, pull off the rubber nipple and the ivory guard, rip up the long tube with my penknife, and scrape off the green, poisonous matter, tyrotoxicon, and spread it out on my palm before the astonished mother."

* Page 6, Compendium of Eleventh Census, Part II.

This statement shows the necessity of great care on the part of the mothers and nurses. If they are not able to feed the babies themselves, and consequently have to resort to cow's milk, they should at least take every precaution to have that milk fresh and pure.

Admitting that there are several important causes combining to make the infant mortality so high, especially in the cities, where the crowded conditions, poor air, bad drainage, etc., all must have their effect upon the child's organization, yet the poor milk which is practically the only food given the child in the first months of its life must be a most important factor in swelling the number of children's diseases and deaths.

Whether or not there is some one form of bacterium that does more than any other may be for some time yet a doubted question. The cause of many cases of sickness among children lies with more probability upon the enormous number of germs that have been swarming, growing, and secreting their poisons in the milk for several hours, rather than upon any one species of a more pathogenic nature.

*Lesage claims that bacillus coli communis, the common intestinal bacillus, becomes virulent in milk, aided by the higher temperature, and has caused epidemics of infantile diarrhoea.

An epidemic of diarrhoea among infants broke out after the establishment of a brewery in a certain district in France. Brewers' grains are evidently injurious when kept till they are sour and fermenting. (Handbook of Hygiene and Sanitary Science. Wilson, p. 76). Another case of diarrhoea caused by milk is reported by Dr. Henry Ashby, Manchester, England, in the London Lancet, January 19, 1895. Dr. V. C. Vaughan, of the University of Michigan, has shown how the tyrotoxicon, produced by the bacteria in milk, cheese, ice cream, custards, etc., may be the cause of many cases of sudden sickness, and especially cholera infantum. Dr. Vaughan, under the title[1] "Infection of Meat and Milk," says: "The infection of milk is one of the most serious questions, etc., * * * * and constitutes one of the most important factors in the causation of infantile morality."

(*b*) *Milk and Typhoid Fever* In dealing with the question of milk as a cause of typhoid fever epidemics, there is a great deal of positive evidence, and much of it from sources which should leave no doubt as to the value of the facts. Dr. S. W. Abbott, Secretary of the Massachusetts State Board of Health, says:[2] "A great many typhoid epidemics, like those of Caterham and Plymouth, and also in multitudes of smaller epidemics which have occurred in connection with private water supplies and milk supplies, the chain of evidence, although rarely completed by the finding of the typhoid bacillus en route, as one might, from the ilium of the sick to the aesophagus of the well, whether by the medium of a glass of water, or a cup of tea, coffee, or any other drink in which either milk or water is used, is such as could rarely fail to produce conviction in the minds of a jury of experts."

The following cases of typhoid fever traced to polluted milk are reported from England: Dr. Ballard[3] records an epidemic of enteric fever as occurring at Islington in 1870. Mr. Power,[4] of Ratcliffe, one in 1873 at Marylebone, London. In 1881 Mr. Ernest Hart* collected information regarding fifty epidemics of enteric fever, fifteen of scarlet fever, and seven of diphtheria, which were traced to milk poisoning Twenty-two of these typhoid fever epidemics were due to the addition in some way of polluted water. Prof. Davies,† of the Army Medical School at Netley, Hampshire, England, studied nineteen epidemics of enteric fever and eighteen of scarlet fever due to infected milk since 1881. Dr. Goldie‡ describes an epidemic of enteric fever which broke out in Leeds, England, on June 27, 1889, traced to milk as cause.

Dr. Vincent,[1] physician to Geneva Board of Health, records and describes an epidemic of typhoid fever at that place in the spring of 1890. Dr. Robinson,[2] of Dover, England, related a case in which he thought the milk supply was polluted by typhoid poison by absorption. Dr. A. Campbell Munro[3] describes an outbreak of enteric fever in Shawland, near Glasgow, Scotland, in August, 1891, apparently caused by milk polluted with bad water. Another enteric fever epidemic is reported by Dr. Phillip Boobyer,[4] at Nottingham, England, in his annual report for 1890. Prof. Gaffky describes (in Deutsch Med. Woch.) three recent outbreaks of enteric fever[5] traced to milk supplies, and Dr. P. Q. Karkeek,[6] at Torquay, England, in his annual report, writes of an outbreak of typhoid fever due to the consumption of milk from a farm situated outside his own district.

Here are given eighty epidemics of typhoid or enteric fever (all of which are outside of the United States) traced to milk as the cause or vehicle of the disease, and the above list by no means includes all.

In regard to similar epidemics in this country there are several remarkably good examples. Massachusetts furnishes three notable ones, viz.: Springfield,[7] Sommerville,[7] and Marlboro,[8] and Connecticut one, at Stamford.[9] The Springfield epidemic originated at an outlaying farm which supplied a portion of the milk to the man on whose route the cases were more than suspiciously distributed. The Somerville outbreak was caused apparently by the milk becoming infected in a milk-house, where the milk was mixed or "set-up;" and in Marlboro and Stamford it was in both cases due to infected skim milk. In all these cases there was sickness either on the farm or among those who handled the milk.

(*c*) *Milk and Diphtheria* The evidence that diphtheria has been transmitted by means of milk is by no means as clearly demonstrative as in the case of typhoid fever. There have been several cases, however, that have seemed to have more or less connection with the inflammatory condition of the udder. Mr. Power[10] reports a case of this kind in 1878; another in Octo-

* Norveaux Elements d'Hygiene. Arnold p. 486.
1 Transactions Internatal. Congress Hygiene. Vol. VII.
2 American Public Health Ass'n Proceedings. Vol. XVI, p. 37.
3 Local Government Reports, 1885. V.
4 Mr. Simon's Reports, New Series, No. II.

* Transactions International Medical College (1881). Vol. IV, p. 391.
† Provincial Medical Journal, 1889.
‡ Lancet, July 13, 1889.
1 Lancet, October 4, 1890.
2 Lancet, August 15, 1891.
3 Public Health, June, 1892.
4 Public Health, January, 1892.
5 American Public Health Association Reports, Vol. XVIII, p. 305.
6 Lancet, March 9, 1895.
7 Mass. State Board of Health Report, 1892.
8 Mass. State Board of Health Report, 1894.
9 Lancet, June 1, 1895. Report State Board of Health, Conn., 1895.
10 Report of Local Government Board, 1878.

ber, 1886, at Yorktown;[1] Dr. Masou,[1] in the autumn of 1888, another at Barking; and, in 1890, Dr. Philpot[1] another at Croyden. Dr. Coleman,[2] of the Urban Sanitary District of Surbiton, describes an outbreak in December, 1891. Dr. W. N. Thursfield[3] reports other cases coincident with a disease among cows. But the facts in regard to such epidemics caused by milk, while showing the possibility, do not show that there is very much danger from this source.

(*d*) *Milk and Scarlet Fever* Dr. Buchanan's report to the Local Government Board in 1886-7, concludes that the famous "Hendon disease" is a form, occurring in the cow, of the very same disease that we call scarlatina in the human subject. Although this has been contested since by veterinarians and bacteriologists, nevertheless it has been proved that certain diseased conditions of the cows have caused outbreaks of scarlet fever in those using milk from or coming in contact with such cows.

Prof. Crookshank[4] believed the above Hendon case was caused by human infection, and not by the diseased cows. Such evidence as the following, however, will prove that milk may carry the scarlet fever contagion: Fifteen cases were reported by Mr. Ernest Hart,[5] as given on a previous page; one by Dr. Parsons[6] in February, 1889, at Macclesfield and Upton, England; one by Mr. Limmick,[7] Medical Officer of Health at Crosby, near Liverpool, and one by Dr. A. Campbell Munro,[8] in August, 1891, Medical Officer of Health in the County of Renfrew, England.

Dr. D. S. Davies,[9] Medical Officer of Health at Bristol, England, reports one in 1891, in which the disease originated from workers on the farm; another* is reported at Leyton, Essex, in September, 1892; Dr. Scarlyn Wilson,† Medical Officer of Hastings, England, records one due apparently to diseased cows, in his annual report for 1893; and Dr. Shirley Murphy‡ describes one in Blackheath, Greenwich, and Lee, England, in March, 1894, in which the milk did not probably receive infection directly from human agencies, but from diseased cows. Dr. Robert Saundry§ makes a statement in writing to the editor of "Lancet" that scarlet fever and diphtheria are frequently conveyed by milk. Other authorities could be quoted as showing the probable connection between diseased cows and scarlet fever and scarlatina, but it will not be necessary to further weary the reader with such statistics.

(*e*) *Milk and Tuberculosis* Tuberculosis is now considered as one of the contagious diseases. It is particularly dangerous as it works so slowly and insidiously. Milk is probably one of the great distributors of the germs of

1 Transactions International Congress of Hygiene and Demography, 1891. "Infectious Udder Diseases of the Cow in Relation to Epidemic Diseases in the Human Subject."
2 Public Health. Feb., 1892, p. 158.
3 Public Health. Feb., 1892, p. 130.
4 International Congress of Hygiene and Demography, 1891.
5 Transactions International Medical Congress, 1881. Vol. IV.
6 Local Gov't Board Report, 1889
7 Lancet, June 14, 1890.
8 Second Annual Report of Med. Officer Health of County of Renfrew.
9 Davies Annual Report for 1891. (Public Health, Sept., 1892.)
*Lancet, Sept. 24, 1892.
†Lancet, April 21. 1894.
‡Lancet, Aug. 25, 1894.
§Lancet, Feb. 25, 1893.

the disease, as this same disease is exceedingly common among cattle. It has been proved that the tubercle bacilli are often, but not always, found in the milk of tuberculous cows, even if there be no lesion of the udder. It is very difficult to prove, however, that the tuberculous milk causes consumption or tuberculosis in the consumer of the milk. Dr. Karl Hirschberger,[3] requested by Dr. Bollinger, states, on the strength of his experiments, that the danger of infection from the milk of tuberculous cows, does not only exist, but is very great, the bacilli being found in 55 per cent, of all cases examined. The more the tuberculosis has spread, the greater the danger, but even in mild cases of localized tuberculosis, the milk is more or less infectious. Wilson[4] is authority for the following in regard to the dangers attaching to the tuberculous infection of milk, basing his opinions on these facts: The bacilli of bovine tuberculosis are identical with those found in the human organs, although the disease presents different characters in man and cattle, and the experiments of Martin, Galteir, and Bang of Copenhagen, proved that milk which was found to contain tubercle bacilli, produced the disease either by ingestion when injected into the peritoneum of guinea pigs, or by inoculation: and this also applies to cream, butter, and whey[4].

The experiments of Dr. L. Heim[5] show that the tubercle bacilli in milk may produce the disease; that these bacilli may live for three days in decomposable substances; that milk to which tubercle bacilli had been added was after ten days still infectious, but not so in four weeks, especially if decomposition had taken place in the meantime. In butter the vitality of the bacilli lasted four weeks, and in whey and cheese were able to communicate the disease for a fortnight, and remained visible for thirty-two days.

As about one-seventh of all deaths in the human family are due to tuberculosis in some form, it can be readily understood how important it is to check any factor which may be helping along this unseen enemy. Tuberculous cows and carelessness in stables where tuberculous cows are kept, are the two great loopholes for the germs to reach the milk, and whether or not we can state an actual proof that the germ in the milk has caused the disease in man, the germ is there, and therefore the chance exists, and the possible results are too serious to allow of much experimentation.

The work of the Cattle Commissioners of Massachusetts has been quite extensive, and valuable results obtained. To those interested in the subject we would recommend "A Handbook on Tuberculosis Among Cattle," compiled by Henry L. Shumway. (Roberts Bros., Boston, 1895.)

(*f*) *Milk and Other Diseases* A disease at one time common in the Western and Southern States, a severe gastro-intestinal disorder, collapse, fever, etc., was brought on by using milk from cows suffering from the acute febrile disease called "tumbles."* In man it was known as milk-sickness, and Dr. Beach, of Ohio, estimates that twenty-five per cent of western pioneers and their families died of this disease.

The foot and mouth disease is reported from England by Dr. Thorne† and Dr. Paine,† at Cardiff, and a cholera‡ epidemic is described as caused

3 Lancet, Aug. 3, 1890.
4 Wilson. Handbook of Hygiene and Sanitary Science, p. 83.
5 Laboratory of German Imperial Health Department.
*Text-Book of Hygiene. George H. Rohe, M. D. 1894.
†Wilson. Hand-Book of Hygiene, p. 83.
‡Walter Voight. A Chapter on Cholera for Lay Readers, p. 38.

by infected milk on board the ship Ardenclutha, in Calcutta harbor, the milk having had water added to it from an infected well.

CONCLUSION

The science of bacteriology has thrown a new light upon this question of dairying and public milk supplies. New dangers confront the citizen as the communities increase in size. Instead of having his own well for drinking water, and his own cow for milk, he is obliged to get the water from a public source, and his milk from a man supplying several families. In this paper it has been the object to show that milk, as it is handled by a majority of people today, carries with it a certain element of danger against which the people should guard themselves. In many States a very careful watch is kept upon the adulteration of milk and dairy products,—thus the citizens are protected somewhat from fraud. Very little has been done, however, towards protecting the public against the possible infection of the milk by such elements as typhoid fever germs, tuberculosis, cholera, diphtheria, and scarlet fever. If milk is adulterated one does not get what he pays for, and the modern business man cannot stand being cheated; therefore inspectors are appointed to protect him against such outrageous frauds. On the other hand, he subjects to the chances of having all the above mentioned diseases, not only himself, but his whole family, who are liable, as far as public protection is concerned, to be carried off by one of these infectious diseases. It shows plainly that the general public has not yet become awakened to the serious nature of the question. It does not stand to reason that they would lay themselves open to these dangers did they understand the importance to themselves, their families, and the public, of greater watchfulness and care.

Dr. Thompson, of New South Wales, says that a milkman who is careless should be regarded and treated as a public enemy, for should an epidemic break out as a result of his negligence, it involves not only loss and suffering, but a heavy pecuniary charge results from the necessary hospital care and treatment; all this besides consequences of the death of the individuals.

From the standpoint of the milkman, if his milk is found to be below the required standard, he should not look upon the inspector as trying to injure his business, for it is the object of the public health authorities to improve it, and the better the milk the better sale it will have, and the better reputation the man will have also.

In the cities they should have not only milk inspectors, but dairy and farm inspectors who know good conditions from bad ones, who are not influenced by political or personal obligations, and who will conscientiously perform the duties given to them. These men should be backed by a vigorous, wide-awake public sentiment, which realizes that the best results are obtained when the milkmen and dairymen are working in co-operation with the health officials.

Laws Relating to the Public Health and Safety

Compiled from the Code, and from the Acts of the Twenty-seventh and Twenty-eighth General Assemblies

XXVI

STATE BOARD OF HEALTH

CHAPTER 16, TITLE XII

SECTION 2564. The state board of health shall consist of the attorney-general and the state veterinary surgeon, who shall be members by virtue of their offices, one civil engineer and seven physicians, to be appointed by the governor, each to serve for a term of seven years and until his successor is appointed; vacancies to be filled by the governor for the unexpired term. But no one of the seven physicians hereafter appointed shall be an officer or member of the faculty of any medical school, and the governor shall have the power to remove any member of said board for good cause shown. It shall meet semi-annually in May and November, and at such other times as it may decide upon, such meetings to be held at the seat of government; suitable rooms [office supplies and furniture, except postage and stationery*] therefor to be provided by the custodian of the capitol. At the meeting held in May, a president from their number, and a secretary who shall be a physician not of their number, shall be elected, and the latter have an office in the capitol.

SEC. 2565. The board shall have charge of and general supervision over the interests of the health and life of the citizens of the state; matters pertaining to quarantine, registration of marriages, births and deaths; authority to make such rules and regulations and sanitary investigations as it from time to time may find necessary for the preservation and improvement of the public health, which, when made, shall be enforced by local boards of health and peace officers of the state. It shall prepare and furnish, through its secretary, to the clerks of the several counties such forms for the record of marriages, births, and deaths as it may determine upon, and by its secretary make biennial reports to the governor, which shall include so much of its proceedings, such information concerning vital statistics, such knowledge respecting diseases, and such instruction upon the subject of hygiene, as may be thought useful for dissemination among the people, with such suggestions as to further legislation as may be thought advisable.

SEC. 2566. It shall be the duty of all assessors, at the time of making assessment, to obtain and report to the clerk of the district court, upon blanks adopted by the state board of health and furnished by the county auditor, such registration of births and deaths as occur within their respective districts for the year ending December 31st immediately preceding.

SEC. 2567. The clerk of the court in each county shall keep a book in which shall be recorded all marriages occurring within the county, together

* As amended by the Twenty-seventh General Assembly, Chapter 67.

with such data respecting the same as shall be required by the state board of health, and shall report to the secretary of the state board of health on or before the first day of June in each year such data respecting such marriages for the year ending December 31st immediately preceding. The clerk of the district court of each county shall keep a book in which shall be recorded all births and deaths occurring within the county as shown by the returns filed in his office by the assessor, as provided in section 2566; and on or before the first day of June in each year shall furnish to the secretary of the state board of health a report of such births and deaths.

SEC. 2568. The mayor and council of each town or city, or the trustees of any township, shall constitute a local board of health within the limits of such towns, cities or townships of which they are officers. The town, city or township clerk shall be clerk of the local board, which board shall appoint a competent physician as its health officer, who shall hold office during its pleasure. It shall regulate all fees and charges of persons employed by it in the execution of health laws and its own regulations and those of the state board of health; have charge of all cemeteries dedicated to public use not controlled by other trustees or incorporated bodies, and the burial of the dead; make such regulations as are necessary for the protection of the public health respecting nuisances, sources of filth, causes of sickness, rabid animals and quarantine, not in conflict with any regulations of the state board of health, which shall also apply to boats or vessels in harbors or ports within their jurisdiction; to proclaim and establish quarantine against all infectious or contagious diseases dangerous to the public, and maintain and remove the same, as may be required by regulations of the state board; may, when satisfied upon due examination that any cellar, room, tenement building, or place occupied as a dwelling or otherwise has become, or is by reason of the number of occupants, uncleanliness or other cause, unfit for such purpose, or a cause of nuisance or sickness to the occupants or the public, issue a notice in writing to such occupants or any of them, requiring the premises to be put in proper condition as to cleanliness, or requiring the occupants to remove or quit such premises within a reasonable time to be fixed; and, if the persons so notified or either of them neglect or refuse to comply therewith, may by order cause the premises to be properly cleaned at the expense of the owner or owners, or may forcibly remove the occupants and close the premises, and peace and police officers shall execute such orders, which premises so closed shall not be again occupied as a dwelling place without written permission of the board. The quarantine authorized by this section in case of infectious or contagious diseases may be declared or terminated by the mayor of any city or town, or the township clerk outside of such city or town, in cases required by regulations of the state board of health, upon written notice given by any practicing physician of the existence of such disease, or termination of the cause for quarantine, as the case may be.

SEC. 2569. The local board may with its physician, when of the opinion it is necessary for the preservation of the lives or health of the inhabitants, enter a building, vessel or place for the purpose of examining into, preventing, removing or destroying any nuisance, source of filth or cause of sickness, and, in case its members or physician shall be refused such entry, make complaint through any member under oath to any magistrate of the county,

whether a member of the board or not, stating the facts so far as known, and the magistrate shall thereupon issue his warrant, directed to any peace officer of the county, commanding him between the hours of sunrise and sunset, accompanied by two or more members of the board, to prevent, remove or destroy such nuisance, source of filth or cause of sickness, which shall be executed by the officer under the direction of such members of the board, and it may order the owner of any property, building or place to remove at his own expense, within twenty-four hours, or such other time as may be fixed by it, after notice has been served upon such owner, occupant or other person in charge thereof, any nuisance, source of filth or cause of sickness found thereon, and if such person fails or neglects to comply with the order and make such removal, it may cause the same to be done at the expense of the owner or occupant.

SEC. 2570. When any person shall be infected, or shall have been recently infected, or sick with smallpox or other disease dangerous to the public health, whether a resident or otherwise, it may make such provisions as are best calculated to preserve the inhabitants against danger therefrom, by removing such person to a separate house, when it may be done without injury to his health, and provide nurses, needful assistance and supplies, which shall be charged to the person, or those liable for his support, if able; if unable, it shall be done at the expense of the county. If such person cannot be removed, he shall be cared for in the same manner as in cases of removal with like results as to charges therefor, and in addition it may cause the people in the neighborhood to remove from the vicinity of the infected house, and take any and all other needed action to insure the safety of the citizens The removal or care of infected persons, as herein provided, shall be effected by an application made to a civil magistrate in the manner provided for the removal and abatement of nuisances, who shall issue his warrant, as directed in such cases, requiring the officer to remove such person, or take possession of condemned houses or lodgings, and provide nurses, attendants and other necessities for the care, safety and relief of the sick, which warrant shall be executed under the direction of the board of health.

SEC. 2571. Local boards of health shall meet for the transaction of business on the first Mondays of April and October in each year, and at such other times as may seem necessary. They shall give notice of all regulations adopted, by publication thereof in some newspaper printed and circulated in the town, city or township, or, if there is none, by posting a copy thereof in five public places therein, and through their physician or clerk shall make general report to the state board at least once a year, and special reports when it may demand them, of its proceedings and such other facts as may be required, on blanks furnished by and in accordance with instructions from it. All expenses incurred in the enforcement of the provisions of this chapter, when not otherwise provided, shall be paid by the town, city or township; in either case all claims to be presented and audited as other demands. In the case of townships, the trustees shall certify the amount required to pay such expenses to the board of supervisors of the county, and it shall advance the same, and, at the time it levies the general taxes, shall levy on the property of such township a sufficient tax to reimburse the county, which, when collected, shall be paid to and belong to the county.

SEC. 2572. Local boards of health shall obey and enforce the rules and

regulations of the State Board; and peace and police officers within their respective jurisdictions, when called upon to do so by the local boards, shall execute the orders of such board.

SEC. 2573. Any person being notified to remove any nuisance, source of filth or cause of sickness, as in this chapter provided, who fails, neglects or refuses to do so after the time fixed in such notice, or knowingly fails, neglects or refuses to comply with and obey any order, rule or regulation of the State or local board of health, or any provision of this chapter, after notice thereof has been given as herein provided, shall forfeit and pay the sum of twenty dollars for each day he refuses such obedience, or for each day he knowingly fails, neglects, or refuses to obey such rule or regulation, or knowingly violates any provision of this chapter, to be recovered in an action in the name of the clerk of the board, and, when collected, to be paid to the clerk of the town, city or township, as the case may be, and for its benefit; and, in addition thereto, anyone so offending, or knowingly exposing another to infection from any contagious disease, or knowingly subjecting another to the danger of contracting such disease from a child or other irresponsible person, shall be liable for all damages resulting therefrom, and guilty of a misdemeanor.

SEC. 2574. The secretary of the state board of health shall receive such salary as the board shall fix, not to exceed twelve hundred dolllars yearly, payable upon the certificate of the president to the state auditor, who shall issue his warrant for the amount due upon the state treasurer. Each member of the board shall receive only actual traveling and other necessary expenses incurred in the performance of his duties, such expenses to be itemized, verified, certified, audited, and a warrant drawn therefor in the same manner as the secretary's salary.

SEC. 2575. The sum of five thousand dollars or so much thereof as may be necessary, is annually appropriated to pay the salary of the secretary, expenses of the board, contingent expenses of the secretary's office, and all costs of printing; all such contingent and miscellaneous expenses to be itemized, verified, certified audited, and paid as other expenses of the board.

PUBLIC HEALTH DISTRICT

CHAPTER 88, LAWS TWENTY-EIGHTH GENERAL ASSEMBLY

SECTION 1. *Districts—vacancies—how filled.* That section two thousand five hundred sixty four (2564) of the Code be, and the same is hereby amended by adding thereto the following:

"For the purposes contemplated in this section the state shall be divided into health districts, numbered and consisting respectively of the counties named as follows:

DISTRICT NO. 1.—Allamakee, Butler, Bremer, Blackhawk, Buchanan, Chickasaw, Clayton, Delaware, Fayette, Floyd, Grundy, Howard, Mitchell, Winneshiek.

DISTRICT NO. 2.—Benton, Cedar, Clinton, Dubuque, Iowa, Jones, Jackson, Johnson, Linn, Muscatine, Scott.

DISTRICT NO. 3.—Appanoose, Davis, Des Moines, Henry, Jefferson, Keokuk, Louisa, Lee, Mahaska, Monroe, Wapello, Washington, Van Buren.

DISTRICT NO. 4.—Cerro Gordo, Calhoun, Emmet, Franklin, Hancock, Humboldt, Hamilton, Hardin, Kossuth, Pala Alto, Pocahontas, Webster, Winnebago, Worth, Wright.

DISTRICT NO. 5.—Buena Vista, Cherokee, Clay, Dickinson, Ida, Lyon, Osceola, O'Brien, Plymouth, Sioux, Sac, Woodbury.

DISTRICT NO. 6.—Audubon, Adair, Cass, Crawford, Carroll, Greene, Guthrie, Harrison, Monona, Pottawattamie, Shelby.

DISTRICT NO. 7.—Boone, Dallas, Jasper, Marshall, Madison, Marion, Polk, Story, Tama, Poweshiek, Warren.

DISTRICT NO. 8.—Adams, Clarke, Decatur, Fremont, Lucas, Mills, Montgomery, Page, Ringgold, Taylor, Union, Wayne.

When vacancies occur in the state board of health, it shall be the duty of the governor to appoint to membership on the board physicians residing in the various health districts, until seven such districts are represented on the board. After which time the annual appointment shall be made from the physicians residing in the district not represented on the Board the preceding year."

OF THE PRACTICE OF MEDICINE

CHAPTER 17, TITLE XII

SECTION 2576. *Board of medical examiners—examinations—certificates.*—The state board of medical examiners shall consist of the physicians of the state board of health, and the secretary of the board of health shall be secretary thereof. It shall hold regular meetings in May and November and special ones as may be necessary, due notice thereof being given, at which it shall discharge the duties contemplated by this chapter. All examinations shall be in writing, each candidate for examination in any school of medicine being given the same set of questions, covering anatomy, physiology, general chemistry, pathology, surgery and obstetrics. In materia medica, therapeutics and the principles and practice of medicine, a set of questions shall be used corresponding to the school of medicine which the applicant desires to practice. The examination papers, when concluded, shall be marked upon the scale of one hundred, each candidate for examination first to pay to the secretary of the board a fee of *ten dollars therefor. The average required to pass shall be fixed by the board prior to the examination. Each applicant shall, upon obtaining an order for examination, receive from the secretary a confidential number which he shall place upon his work when completed, so that the board, in passing thereon, shall not know by whom it was prepared. All matters connected therewith shall be filed with

* As amended by the Twenty-eighth General Assembly, chapter 89.

the secretary and preserved for five years as a part of the records of the Board, during which time they shall be open to public inspection. If the examination is satisfactory to five members of the board, it shall issue its certificate, under its seal, signed by its president, secretary, and not less than three other members, who may, in the absence of the others, act as an examining board, and the different schools of medicine represented in the board of health shall be represented in said number. The certificate, while in force, confers upon the holder the right to practice medicine, surgery and obstetrics, and be conclusive evidence thereof. †(Graduates from legally authorized medical schools, which in the opinion of the board are of good standing, holding genuine diplomas therefrom, upon presentation of the same, accompanied by a fee of five dollars, and such proof as may be required touching the genuineness and ownership of the diploma and the character and standing of the school issuing it, shall be by the board granted certificates, signed as above provided, conferring the right to practice as under certificates issued upon examination). In all examinations made or proceedings had pursuant to the provisions of this chapter, any member of the board may administer oaths and take testimony in any manner authorized by law. Any one failing in his examination shall be entitled to a second one, within three months thereafter, without further fee. If any person shall by notice in writing apply to the secretary of the board for an examination or re-examination, and it fails or neglects for three months thereafter to give him the same, he may, notwithstanding any provision of this chapter, practice medicine until the next regular meeting of the board without the required certificate.

SEC. 2577. *Recording certificates.* Every certificate issued under this chapter shall show whether it was granted upon examination or diploma, and the school of medicine the holder practices under. He shall, before engaging in the practice of medicine, file the same for record in the office of the recorder of the county in which he resides, who shall record it in a book provided for that purpose, which record shall be open to public inspection, and for which service the recorder may charge a fee of fifty cents, to be paid by the certificate-holder. The same record must be made of the certificate in any county to which the holder may remove and in which he proposes to practice.

SEC. 2578. *Refusal of certificate—revocation.* The board of medical examiners may refuse to grant a certificate to any person otherwise qualified, who is not of good moral character, and for like cause, or for incompetency, or habitual intoxication, or upon satisfactory evidence by affidavit or otherwise that a certificate had been granted upon false and fraudulent statements as to graduation or length of practice, may revoke a certificate by an affirmative vote of at least five members of the board, which number shall include one or more members of the different schools of medicine represented in said board; nor shall the standing of a legally chartered medical college, from which a diploma may be presented, be questioned, save by a like vote. After the revocation of a certificate, the holder thereof shall not practice medicine, surgery or obstetrics in the State.

SEC. 2579. *Who deemed practitioner.* Any person shall be held as practicing medicine, surgery or obstetrics, or to be a physician, within the

† Repealed by the Twenty-eighth General Assembly, chapter 89.

meaning of this chapter, who shall publicly profess to be a physician, surgeon or obstetrician, and assume the duties, or who shall make a practice of prescribing or of prescribing and furnishing medicine for the sick, or who shall publicly profess to cure or heal; but it shall not be construed to prohibit students of medicine, surgery or obstetrics, who have had not less than two courses of lectures in a medical school of good standing, from prescribing under the supervision of preceptors, or gratuitous service in case of emergency, nor to prevent the advertising, selling or prescribing natural mineral waters flowing from wells or springs, nor shall it apply to surgeons of the United States army or navy, nor of the marine hospital service, nor to physicians or midwives who have obtained from the board of examiners a certificate permitting them to practice medicine, surgery or obstetrics without a diploma from a medical school or examination by the Board, nor to physicians, as defined herein, who have been in practice in this State for five consecutive years, three years of which time shall have been in one locality, nor to filling prescriptions by a registered pharmacist, nor to the advertising and sale of patent or proprietary medicines.

SEC. 2580. *Penalties.* Any person who shall present to the board of medical examiners a fraudulent or false diploma, or one of which he is not the rightful owner, for the purpose of procuring a certificate as herein provided, or shall file, or attempt to file, with the recorder of any county in the state the certificate of another as his own, or who shall falsely personate any one to whom a certificate has been granted by such board, or shall practice medicine, surgery or obstetrics in the state without having first obtained and filed for record the certificate herein required, and who is not embraced in any of the exceptions contained in this chapter, or who continues to practice medicine, surgery or obstetrics after the revocation of his certificate, is guilty of a misdemeanor, and, upon conviction thereof, shall be fined not less than three hundred dollars, nor more than five hundred dollars and costs of prosecution, and shall stand committed to the county jail until such fine is paid; and whoever shall file or attempt to file with the recorder of any county in the state the certificate of another with the name of the party to whom it was granted or issued erased, and the claimant's name inserted, or shall file or attempt to file with the board of medical examiners any false or forged affidavit of identification, shall be guilty of forgery.

SEC. 2581. *Itinerant physician.* Every physician practicing medicine, surgery or obstetrics, or professing or attempting to treat, cure or heal diseases, ailments or injuries by any medicine, appliance or method, who goes from place to place, or from house to house, or by circulars, letters or advertisements solicits persons to meet him for professional treatment at places other than his office at the place of his residence, shall be considered an itinerant physician; and any such itinerant physician shall, in addition to the certificate elsewhere provided for in this chapter, procure from the State board of medical examiners a license as an itinerant, for which he shall pay to the treasurer of state, for use of the state of Iowa, the sum of two hundred and fifty dollars per annum. Upon payment of this sum, the Secretary shall issue to the applicant therefor a license to practice within the State, as an itinerant physician, for one year from the date thereof. The board may, for satisfactory reasons, refuse to issue such license, or may cancel such license upon satisfactory evidence of incompetency or gross immorality.

Any person practicing medicine as an itinerant physician, as herein defined, without having procured such license shall be guilty of a misdemeanor, and, upon conviction thereof, shall be fined not less than three hundred dollars nor more than five hundred dollars and costs, and shall be committed to the county jail until such fine is paid: *provided*, however, that nothing herein shall be construed to prevent any physician otherwise legally qualified from attending patients in any part of the State to whom he may be called in the regular course of business, or in consultation with other physicians.

SEC. 2582. *Examination and diploma required.* From and after January 1, 1899, all persons beginning the practice of medicine in the state of Iowa must submit to an examination as set forth in this chapter, and, in addition thereto, shall present diplomas from medical colleges recognized as in good standing by the state board of medical examiners, and all persons receiving their diplomas subsequent to January 1, 1899, shall present evidence of having attended four full courses of study of not less than twenty-six weeks each, no two of which shall have been given in any one year.

(The state board of medical examiners shall examine the graduates of the medical departments of the state university of Iowa and of such other medical colleges in this State as are recognized by said board of medical examiners as being in good and legal standing at the annual medical commencement and at the location of said state university and other medical colleges respectively.)[2]

SEC. 2583. *Fees--Compensation.* Each member of the board of examiners shall receive, out of the fund created by the payment of fees by applicants for examination or certificates, the sum of eight dollars for each day, and necessary traveling expenses, for the time he is actually engaged in the discharge of his duties as a member of the board, and the secretary shall receive (a sum not to exceed twenty-five ($25.00) dollars per month and) [3]his necessary expenses incurred for services which cannot be performed at the capitol. (All printing, postage, and other contingent expenses necessarily incurred under the provisions of this chapter shall be paid from said fund.)[4] Any balance of said funds remaining shall be turned over to the state treasurer for the use of the school fund.

OF THE PRACTICE OF OSTEOPATHY

CHAPTER 69, LAWS TWENTY-SEVENTH GENERAL ASSEMBLY

SECTION 1. Any person holding a diploma from a legally incorporated and regularly conducted school of osteopathy of good repute as such, and wherein the course of study comprises a term of at least twenty months or four terms of five months each, in actual attendance at such school, and shall include instructions in the following branches, to-wit: Anatomy, physiology, chemistry, histology, pathology, gynecology, obstetrics and theory and practice of osteopathy, shall upon the presentation of such diploma

[2] As amended by the Twenty-eighth General Assembly, Chapter 89.
[3] As amended by Chapter 90, Twenty-eighth General Assembly.
[4] As amended by the Twenty-seventh General Assembly, Chapter 68.

to the state board of medical examiners and satisfying such board that they are the legal holders thereof, shall be granted by such board, a certificate permitting such person to practice osteopathy in the state of Iowa, upon payment to said board of a fee of twenty dollars, which certificate shall be recorded by the county clerk of the county in which the holder desires to practice, for which he shall receive a fee of one dollar.

SEC. 2. The certificate provided for in the foregoing section shall not authorize the holder thereof to prescribe or use drugs in his practice, nor to perform major or operative surgery.

SEC. 3. Any person who, for the purpose of securing such certificate shall falsely represent himself or herself to be the legal holder of any such diploma, shall be deemed guilty of a misdemeanor, and on conviction be fined not less than fifty nor more than one hundred dollars.

SEC. 4. Any such certificate may be revoked by the state board of Health upon satisfactory proof of fraudulent misrepresentation in procuring the same or for any violation of the provisions of the certificate, and for any gross immorality by the holder thereof.

SEC. 5. The system, method or science of treating diseases of the human body commonly known as osteopathy is hereby declared not to be the practice of medicine, surgery or obstetrics within the meaning of section twenty-five hundred and seventy-nine (2579), title twelve (xii), chapter seventeen (17) of the Code.

RELATING TO BODIES FOR MEDICAL PURPOSES

CHAPTER 129, LAWS TWENTY-EIGHTH GENERAL ASSEMBLY

Be it enacted by the General Assembly of the State of Iowa:

SECTION 1. *Repealed.* That section forty-nine hundred and forty-six (4946) of the Code be and the same is hereby repealed, and the following enacted as a substitute therefor.

SEC. 2. *Bodies for medical purposes—how distributed.* Every coroner, undertaker, superintendent, or managing officer of any public asylum, hospital, poor house, or penitentiary in this state, shall deliver the bodies of uninterred deceased persons in his charge suitable for scientific purposes with the consent of the friends or relatives, if known, and without such consent if not known, to medical colleges or schools within the State, for the purpose of scientific medical study, unless the deceased person expressed a desire during his last illness that his body should be buried or cremated; such bodies shall be equitably distributed among the medical colleges and schools in the state under such rules and regulations as may be adopted by the state board of health, and the number so distributed shall be in proportion to the number of students matriculated at each medical college or school. The expense of such distribution shall be paid by the medical college or school receiving the bodies. If there shall be more bodies than are required by the medical colleges or schools of the State, the same may be delivered to physicians in the state, under such rules and regulations as may be adopted by the state board of health.

SEC. 3. *Duties of various officers.* It shall be the duty of every such coroner, undertaker, superintendent or managing officer of a public asylum, hospital, poor house or penitentiary, as soon as any such body shall come into his custody, or as soon as any person shall die, whose body, under the provisions hereof, should be delivered to a medical college or school, to at once notify the secretary of the state board of health by telegram of the fact, and to hold such body unburied for forty-eight hours thereafter, and to deliver the body to such medical college or school as the Secretary of the state board of health may direct. If, however, such body is subsequently claimed by any relative or friend, it shall be at once, by the person or persons having the same in charge, or by the medical college or school to which it has been delivered, surrendered to such relative or friend for burial.

SEC. 4. *Body held subject to claim.* Every medical college or school, or person receiving the body of any deceased person under the provisions hereof, shall hold the same for the period of sixty days, subject to the claim of relatives or friends.

SEC. 5. *Penalties.* Any coroner, undertaker, superintendent or managing officer of any public asylum, hospital, poor house or penitentiary within this state into whose hands the body of a deceased person shall come, which should be delivered to a medical college or school under the provisions hereof, who shall willfully neglect or refuse to notify the secretary of the state board of health of the existence of such body, or refuse to deliver the same to a medical college or school upon the direction of the Secretary of the state board of health, as herein provided, shall be guilty of a misdemeanor, and upon conviction thereof be fined any sum not exceeding firty dollars; and any person who shall receive or deliver any body or remains knowing that any of the provisions of this act have been violated, shall be imprisoned in the penitentiary not more than two years, or fined not exceeding twenty-five hundred dollars, or both.

Approved April 16, 1900.

PRACTICE OF VETERINARY MEDICINE, SURGERY AND DENTISTRY

CHAPTER 93, LAWS OF THE TWENTY-EIGHTH GENERAL ASSEMBLY

SECTION 1. *Unlawful practice.* That it shall be unlawful for any person to practice veterinary medicine, surgery, or dentistry in this state, who shall not have complied with the provisions of this act.

SEC. 2. *Existing practitioners—certificates of registration.* Any person who has practiced the profession of veterinary medicine, surgery, or dentistry in this state for a period of five years immediately preceding the passage of this act may be deemed eligible to registration as an existing practitioner and receive a certificate of registration upon presentation to the secretary of the board of veterinary medical examiners, which shall be hereinafter constituted, his sworn affidavit and letters of recommendation from ten reputable freeholders and stock owners in his locality, all such applications to be made on or before January 1st, 1901.

SEC. 3. *Graduates.* Any person who is a graduate of a legally chartered and authorized veterinary college or veterinary department of any university or agricultural college, at the time of the passage of this act, or who shall hold a diploma from such institutions prior to 1901, shall be entitled to registration as an existing practitioner upon the presentation of his diploma, duly verified.

SEC. 4. *State board of veterinary medical examiners—term—vacancies.* The governor of the state shall appoint a board of examiners within sixty days after the passage of this act; said board to be known as the state board of veterinary medical examiners. This board shall consist of three qualified veterinarians, residents of the state, each of whom shall be a graduate of a legally chartered and authorized veterinary college or veterinary department of any university or agricultural college, and who shall be of good standing in the profession. One of these members shall be appointed for one year; one for two years; and each succeeding appointment shall be for three years. Each shall hold office until his successor is duly appointed and qualified. No member of any veterinary college or veterinary department of the state university or agricultural college, or any person connected therewith, shall be eligible to appointment upon said board. The governor shall fill any vacancy which shall occur on the board, and may remove any member of said board for continued neglect of duty, for incompetency, unprofessional, or dishonorable conduct.

SEC. 5. *Powers of board.* This board shall have power to make all needed regulations for its government and proper discharge of its duties in accordance with this act, and shall have power to administer oaths, and take testimony concerning all matters within its jurisdiction.

SEC. 6. *Meetings.* The meetings of the examining board shall be held at least once a year, or at such times and places as it may elect. At any meeting of the board, a majority shall constitute a quorum to transact business, or to conduct examinations.

SEC. 7. *Certificate of qualification.* Said board shall receive applications for registration, according to sections two and three of this act, and shall issue a certificate of qualification to all applicants who conform to the requirements for such registration, signed by the members of the board, provided that the certificate thus granted specifically and plainly states whether or not the one to whom it is granted is a graduate or non-graduate in veterinary medicine. Such certificate shall be conclusive as to the rights of the lawful holder of the same to practice veterinary medicine, surgery, or dentistry in this State.

SEC. 8. *Registration fee.* The fee for registration shall be five dollars ($5), payable in advance to the secretary or the board.

SEC. 9. *Qualifications—examination—fee—license.* From and after January 1st, 1901, any person not authorized to practice veterinary medicine, surgery, and dentistry in this state, and desiring to enter upon such practice, shall be a graduate of a legally chartered and recognized veterinary college or veterinary department of a university or agricultural college, and shall pass the examination required by said state board of veterinary medical examiners. The fee for such examination shall be fifteen dollars ($15) payable in advance to the secretary of the board. The applicant shall be at least twenty-one years of age and of good moral character. Any person conforming to these requirements, and eligible to practice under section two

hereof, shall receive a license to practice veterinary medicine, surgery, or dentistry within this State, signed by the members of the board, which license shall be recorded in the office of the recorder of the county in which such person resides, the recording fee to be paid by holder of certificate.

SEC. 10. *Register—treasurer to hold fees—bond—vouchers.* The board shall keep a register of all registered practitioners in the state, setting forth such facts as the board shall see fit. All fees accruing under this act shall be held by the treasurer of the board, who shall execute good and sufficient bond to said board to faithfully discharge his duties, and who shall pay out such funds, only, on vouchers, certified by a majority of said board.

SEC. 11. *Compensation—expenses.* Each member of said board shall be entitled to receive five dollars ($5) per diem, also actual and necessary traveling expenses, incurred while actually engaged in the discharge of his official duties, provided such compensation and expenses do not exceed said income of fees accruing under this act.

SEC. 12. *Penalty.* Any person violating any of the provisions of this act shall be guilty of a misdemeanor and upon conviction shall be punished by a fine of not less than twenty-five dollars nor more than one hundred dollars, or by imprisonment in the county jail for a period of not more than thirty days for each and every such offense. It shall be the duty of the county attorney of the county in which violation occurs to conduct all proceedings against violators of this act.

SEC. 13. *Exceptions.* Nothing in this act shall be construed to apply to commissioned veterinarians in the United States army or to persons who dehorn cattle, or castrate domestic animals, or to persons who gratuitously treat diseased animals.

SEC. 14. *Further penalty.* Any person who shall, without having been authorized so to do legally, append any veterinary title to his name, or shall assume or advertise any veterinary title in such manner as to convey the impression that he is a lawful practitioner of veterinary medicine or any of its branches, shall be guilty of a misdemeanor, and punished according to the provisions of section twelve (12) of this act.

SEC. 15. *Re-examination.* In case the examination of any person shall prove unsatisfactory and his name be not registered, he shall be permitted to present himself for re-examination within any period not exceeding twelve months next thereafter, and no charges shall be made for re-examination.

SEC. 16. *Board to render an account to executive council.* The board shall render under oath annually on January first to the executive council an account of all fees collected and per diem expenses paid, and pay over the balance into the state treasury.

Approved May 5, 1900.

THE PRACTICE OF DENTISTRY

CHAPTER 91—(LAWS 28TH G. A.)

Be it enacted by the General Assembly of the State of Iowa:

SECTION 1. *Repealed,* That chapter nineteen (19) of title twelve (12)

of the Code be and the same is hereby repealed, and the following enacted in lieu thereof:

SEC. 2. *Board of examiners—how appointed—term.* The board of dental examiners shall consist of five practicing dentists, who shall have been engaged in the continuous practice of their profession in this State for the period of five years preceding their appointment, one of whom shall be appointed annually by the governor, and hold office for the term of five years from and after the first day of August following his appointment, and until his successor is appointed. The Iowa State Dental Society shall, at the request of the governor, submit a list of dentists of recognized ability, from which he may select the member of the board to be appointed. All vacancies occurring in the board shall be filled in like manner, and the appointee hold office for the unexpired term of his predecessor. All members of the present board shall continue in office under this act until the expiration of their respective terms of office.

SEC. 3. *Officers—meetings—quorum.* The board shall organize by selecting one of its members as president, and one as secretary and treasurer, and shall meet at least once each year, and at such other times as it may deem necessary, and at such place as it may select. A majority of the board shall constitute a quorum, and its meetings shall at all reasonable times be open to the public.

SEC. 4. *Examinations—license—record books—fees.* The board shall at any regular meeting, and may at any special meeting, examine applicants for license to practice dentistry as to their knowledge and skill in dental surgery, and shall issue to such applicants as are found to be qualified a license authorizing them to practice dentistry. The license shall be signed by each member of the board, attested by the president and secretary, and have the seal of the board affixed thereto; and shall be presumptive evidence of the right of the holder to practice dentistry in the state. The name, age, nativity, location, number of years of practice of the person to whom a license is given, the number of the license, and the date of the registration thereof shall be entered in a book kept in the office of the secretary of the board, which shall be open to the inspection of the public, under proper restrictions as to its safe keeping, and the number of the book and page containing such entries shall be noted on the face of the license. Each applicant for a license shall be a graduate of a reputable dental school, which is recognized as such by the board of dental examiners, and pay to the board a fee of twenty dollars before a license is issued.

SEC. 5. *Testimony—rules and regulations.* The board shall have authority to take testimony in relation to all matters within its jurisdiction, and the presiding officer thereof, or of any committee appointed thereby, may issue subpœnas for, and administer oaths to, witnesses called to testify before the board or such committee; and it may make and adopt all necessary rules, regulations and by-laws not inconsistent with law necessary to enable it to perform the duties and transact the business authorized and required by this act.

SEC. 6. *Treasurer to give bond.* The treasurer shall, on assuming the duties of his office, file with the secretary of state, a good and sufficient bond in the penal sum of one thousand dollars, conditioned for the faithful discharge of his duties; and shall keep a full and accurate account of all

moneys received by him under the provisions of this act, and pay out the same upon the written order of the president countersigned by the secretary.

SEC. 7. *Compensation.* Each member of the board shall receive the sum of five dollars for each day he is actually engaged in the duties of such office, with the actual expenses incurred by him in the discharge of his duties, and the treasurer shall receive a salary not exceeding three hundred dollars per annum for his services as secretary and treasurer, which amounts shall be paid out of the fund received by the board under the provisions of this act, and from no other fund or source.

SEC. 8. *Biennial report—auditing committee.* The board shall make a biennial report to the governor of its proceedings, including a full and accurate account of all monies received and disbursed, and the president shall appoint an auditing committee consisting of three practicing dentists of the state who are not members of the board, whose duty it shall be to audit the accounts of the board annually, and make a full report thereof, which report shall accompany the biennial report made by the board to the governor. Any sum of money, remaining after the payment of the compensation and expenses of the members of the board and the salary of the secretary and treasurer, shall be by the treasurer paid into the state treasury on or before the first day of May of each year.

SEC. 9. *License filed with clerk of district court—fee.* Every person to whom a license is issued under this act shall file the same with the clerk of the district court in the county in which he desires to practice dentistry, and the clerk of the court shall be entitled to charge a fee of twenty-five cents for filing such license; and a failure to so file such license within one year after the same was issued by the board shall work the forfeiture thereof.

SEC. 10. *Penalty.* It shall be unlawful for any person to practice dentistry in this state without having complied with the provisions of this act, and any person who shall violate the provisions thereof shall be deemed guilty of a misdemeanor, and upon a conviction shall be punished by a fine not exceeding two hundred dollars or imprisonment in the county jail not more than forty days, or by both such fine and imprisonment.

SEC. 11. *Who not eligible to appointment on board.* No member of a dental college faculty, or no person connected therewith, shall be eligible to an appointment upon the state board of dental examiners.

SEC. 12. *Provisions as to physicians, dental students and registered practitioners.* Nothing herein shall be construed to prevent physicians and surgeons from extracting teeth in the practice of their profession, or to prevent *bona fide* students of dentistry, in the regular course of their instruction, from operating upon patients at clinics, or under the supervision and in the presence of their preceptors, but no fee or salary for such operations shall be received, either directly, or indirectly, by any such student of dentistry. And nothing herein shall be construed to prohibit the practice of dentistry in this state by any practitioner who has been duly registered in accordance with the laws of Iowa existing prior to the passage of this act; or any person who is a member of an incorporated society or community and practicing dentistry solely for and among the members of such community or incorporated society without charge or compensation.

OF STATE VETERINARY SURGERY

CHAPTER 14, TITLE XII, CODE

SECTION 2529. The state veterinary surgeon shall be appointed by the governor, subject to removal by him for cause, who shall hold office for three years. He shall be a graduate of some regularly established veterinary college, skilled in that science, and shall be by virtue of his office a member of the state board of health.

SEC. 2530. He shall have supervision of all contagious and infectious diseases among domestic animals in, or being driven or transported through, the state, and is empowered to establish quarantine against animals thus diseased, or that have been exposed to others thus diseased, whether within or without the state, and, with the concurrence of the state board of health, may make such rules and regulations as he may regard necessary for the prevention and suppression, and against the spread, of said disease or diseases, which rules and regulations, the executive council concurring, shall be published and enforced, and in the performance of his duties he may call for the assistance of any peace officer.

SEC. 2531. Any person who wilfully hinders, obstructs or resists said veterinary surgeon, his assistants, or any peace officer acting under him or them, when engaged in the duties or exercising the powers herein conferred, or violates any quarantine established by him or them, shall be guilty of a misdemeanor.

SEC. 2532. Said surgeon shall biennially make a full and detailed report of his doings since his last report to the governor, including his compensation and expenses, which report shall not exceed one hundred and fifty pages of printed matter.

SEC. 2533. Whenever a majority of any board of supervisors or township trustees, or any city or town council, whether in session or not, shall in writing notify the governor of the prevalence of, or probable danger from, any of said diseases, he shall notify the veterinary surgeon, who shall at once repair to the place designated in said notice and take such action as the exigencies may demand, and the governor may, in case of emergency, appoint a substitute or assistants with like qualifications, and with equal powers and compensation.

SEC. 2534. Whenever in the opinion of the state veterinary surgeon the public safety demands the destruction of any stock, the same may be destroyed upon the written order of such surgeon, with the consent of the owner, or upon approval of the governor, and by virtue of such order such surgeon, his deputy or assistant, or any peace officer, may destroy such diseased stock, and the owner thereof shall be entitled to receive its actual value in its condition when condemned, to be ascertained and fixed by the state veterinary surgeon and the nearest justice of the peace, who, if unable to agree, shall call upon the nearest or other justice of the peace upon whom they agree as umpire, and their judgment shall be final when the value of the stock, if not diseased, would not exceed twenty-five dollars; but in all other cases either party shall have the right of appeal to the district court, but such appeal shall not delay the destruction of the diseased animals. The veterinary surgeon shall at once file with the governor his written report

thereof, who shall, if found correct, endorse his finding thereon, whereupon the auditor of state shall issue his warrant therefor upon the treasurer of state, who shall pay the same out of any moneys at his disposal under the provisions of this act, but no compensation shall be allowed for stock destroyed while in transit through or across the state, and the word "stock," as herein used, shall be held to mean cattle, horses, mules and asses.

SEC. 2535. The governor, with the veterinary surgeon, may co-operate with the government of the United States for the objects of this chapter, and the governor may accept and receipt for any moneys receivable by the state under the provisions of any act of congress which may at any time be in force upon this subject, and pay the same into the state treasury to be used according to the act of congress and the provisions of this chapter as nearly as may be.

SEC. 2536. There is annually appropriated out of any moneys, not otherwise appropriated, the sum of three thousand dollars or so much thereof as may be necessary, for the uses and purposes herein set forth.

SEC. 2537. Any person, except the veterinary surgeon, called upon under the provisions of this chapter, shall be allowed and receive two dollars per day while actually employed.

SEC. 2538. When engaged in the discharge of his duties, the veterinary surgeon shall receive the sum of five dollars per day and his actual expenses, the claim therefor to be itemized, verified, accompanied with written vouchers, and filed with the state auditor, who shall allow the same and draw his warrant upon the treasury therefor.

DISEASED ANIMALS

CHAPTER 11, TITLE XXIV CODE

SEC. 5012. If the owner of sheep, or any person having the same in charge, knowingly import or drive into this state sheep having any contagious disease; or knowingly turn out or suffer any sheep having any contagious disease to run at large upon any common, road or unenclosed lands; or sell or dispose of any sheep, knowing the same to be so diseased, he shall be fined in any sum not less than fifty, nor more than one hundred dollars.

SEC. 5013. If any person knowingly import or bring within the State any horse, mule or ass affected by the diseases known as nasal gleet, glanders or button-farcy, or suffer the same to run at large upon any common, road or unenclosed land, or use or tie the same in any public place, or off his own premises, or sell, trade or offer for sale or trade any such animal, knowing the same to be so diseased, he shall be fined not less than fifty nor more than five hundred dollars, or be imprisoned not to exceed one year in the county jail, or both.

SEC. 5014. If any horse, mule, or ass reasonably supposed to be diseased with nasal gleet, glanders or button-farcy be found running at large without any known owner, it shall be lawful for the finder thereof to take such animal, so found, before some justice of the peace, who shall forthwith cause

the same to be examined by some veterinary surgeon, or other person skilled in such diseases, and if, on examination, it is ascertained to be so diseased, it shall be lawful for such justice of the peace to order such diseased animal to be immediately destroyed and buried; and the necessary expense accruing under the provisions of this section shall be defrayed out of the county treasury.

SEC. 5015. The owner or person having charge of any swine any of which die or are killed on account of any disease, shall upon such fact coming to his knowledge, immediately burn the same.

SEC. 5016. No person shall sell or give away or offer for sale any swine that have died of any disease, or that have been killed on account of any disease.

SEC. 5017. No person shall convey upon or along any public highway or other public ground, or any private land except that owned or leased by him, any diseased swine, or swine that have died of or have been killed on account of any disease. Upon the trial for the violations of the provisions of this section, the proof that any person has hauled or is hauling dead swine from a neighborhood in which swine have been dying, or are at the time dying, from any disease, shall be presumptive evidence of his guilt.

SEC. 5018. It shall be unlawful for any person negligently or wilfully to allow his hogs or those under his control, infested with any disease, to escape his control or run at large.

SEC. 5019. Any person violating or failing to comply with any provision of the four preceding sections shall be fined not less than five nor more than one hundred dollars, or be imprisoned in the county jail not to exceed thirty days, or both.

SEC. 5020. Any person driving any cattle into the state, or any agent, servant or employe of any railroad or other corporation who shall carry transport or ship any cattle into this state, or any railroad or other corporation or person who shall carry, ship or deliver any cattle into this state or the owner, controller, lessee or agent or employe of any stock yard, receiving into such stock yard, or in any other enclosure for the detention of cattle in transit or shipment or reshipment or sale any cattle brought or shipped in any manner into this state, which at the time they were either driven, brought, shipped or transported into this state, were in such condition as to infect with or to communicate to other cattle pleuro-pneumonia, or splenetic or Texas fever, shall be fined not less than three hundred and not more than one thousand dollars, or be imprisoned in the county jail not exceeding six months, or both.

SEC. 5021. Any person who shall be injured or damaged by any acts prohibited in the preceding section, in addition to the remedy therein provided, may recover the actual damages sustained by him from the person, agent, employe or corporation therein mentioned, and neither said criminal proceeding nor said civil action shall be a bar to a conviction or to a recovery in the other.

SEC. 2343. The board of supervisors of any county, when notified in writing by five or more sheep owners of such county that sheep diseased with scab, or any other malignant, contagious disease, exist in such county, shall, at any regular or special meeting, appoint a suitable person as county sheep inspector, who shall take the oath of office, whose duties shall be as

hereinafter prescribed, and whose term of office shall be for two years and until his successor is appointed and qualified.

SEC. 2344. It shall be the duty of the sheep inspector, upon the complaint of three or more sheep owners that any sheep within his jurisdiction have the scab or any other malignant, contagious disease, to immediately inspect and report in writing the result of his inspection to the county auditor, to be filed by him for reference by the board of supervisors or any party concerned. And if he deem it necessary, in order to prevent the spread of the disease to the sheep of the other owners, he shall command the owner or agent to dip or otherwise treat such diseased sheep, and shall inspect such diseased sheep every month thereafter until such disease shall be eradicated.

SEC. 2345. It shall be the duty of the sheep inspector to dip or otherwise treat such diseased sheep, should the owner or agent refuse to do so, and all costs, expenses and charges, together with a per diem of three dollars per day, shall be charged against the owner of such sheep, and shall be a lien thereon, and may be recovered in an action.

SEC. 2346. Such compensation for the inspector shall be three dollars per day, and shall be paid by the owner of the sheep, or his agent, if the disease is found to exist. In case no disease is found to exist, the complainants shall pay such fee.

SEC. 2347. Upon the arrival of any flock of sheep within the state from a distance of more than twenty miles outside the boundaries of the state, the owner or agent shall notify the inspector of the county in which such sheep are being held, and he shall inspect the flock at the expense of the owner or agent; and if the sheep are found sound shall furnish the owner or agent a certificate, which shall be a passport to any part of the state; but sheep in transport on board of railroad cars, or passing through the state on such cars, shall not come within the provisions of this section. Any violation of, or failure to comply with, the provisions of this and the four preceding sections by the owner of any sheep shall subject him to a forfeiture of not to exceed one hundred dollars, which shall be a lien on such sheep, and shall be recovered in an action by the county attorney in the name and for the use of the county.

SEC. 4979. If any person throw, or cause to be thrown, any dead animal into any river, well, spring, cistern, reservoir, stream or pond, he shall be imprisoned in the county jail not less than ten nor more than thirty days, or be fined not less than five nor more than one hundred dollars.

SEC. 4981. If any person knowingly sell any kind of diseased, corrupted or unwholesome provisions, whether for meat or drink, without making the nature and condition of same fully known to the buyer, he shall be imprisoned in the county jail not more than thirty days, or be fined not exceeding one hundred dollars.

The flesh of pregnant animals must not be sold nor used for human food after the seventh month of pregnancy for cows, and the tenth week for sows. —*Regulations of the State Board of Health.*

OF PRACTICE OF PHARMACY

CHAPTER 18, TITLE XII

SECTION 2584. *Commissioners—powers.* The Commission of Pharmacy shall consist of three competent pharmacists who have been for the preceding five years residents of the state and engaged in practicing pharmacy, one of whom shall be annually appointed by the governor and hold office for three years and until his successor is appointed and qualified. The commission shall have power to make all needed regulations for its government and for the proper discharge of its duties under this chapter, the same to be done without expense to the state, save the necessary blanks and stationery which shall, upon requisition, be furnished by the secretary of State, and make such other regulations not inconsistent with law and as authorized in this Code, respecting the purchase, keeping and use of intoxicating liquors by registered pharmacists, not permit holders, as may be required for the prevention or abuse of the trust reposed in them, and such other matters as may be hereinafter specifically enumerated.

SEC. 2585. *Secretary and treasurer.* The commissioners of pharmacy shall annually, on the first Monday in May, elect a suitable person, who shall not be a member of said board, and who shall be known as secretary and treasurer; said secretary and treasurer shall enter upon the discharge of his duties as soon as he shall have filed with the secretary of state a good and sufficient bond in the penal sum of three thousand dollars, signed by at least two sureties, who shall justify in the aggregate to double the amount of said bond, and which shall bear upon its face the approval of the governor. The salary of said secretary and treasurer shall not exceed one thousand five hundred dollars per annum.

SEC. 2586. *License fees.* The secretary and treasurer shall keep in his office a book known as the "Commissioners of Pharmacy License Fee Book," which shall be made with ruled columns and printed headings, showing the date, the name of the person paying, and the amount of each license and fee paid, in which he shall enter all fees for licenses received by him, and on the first Monday of each month he shall file with the auditor of state a true statement thereof for the previous month, properly sworn to by him, and shall quarterly pay into the state treasury, on the first day of January, April, July and October of each year, the amount of license fees payable by law into such treasury.

SEC. 2587. *Records—compensation.* The books, accounts, vouchers and funds belonging to or kept by said board of pharmacy shall at all times be open or subject to the inspection of the governor, or any committee appointed by him. Each commissioner of pharmacy shall receive as full compensation for his services the sum of five dollars for each day actually employed in the discharge of his official duties, together with his actual traveling expenses in performing said duties, all of which shall be paid from the fees of the office, and each commissioner shall file with the auditor of state, at the end of each quarter of his official year, an itemized statement under oath of his actual time in days employed in the discharge of his duty, and traveling expenses incurred in the performance of his duty, for such quarter.

SEC. 2588. *Registered pharmacists.* No person not a registered pharma-

cist shall conduct the business of selling at retail, compounding or dispensing drugs, medicines or poisons, or chemicals for medicinal use, or compounding or dispensing physicians' prescriptions as a pharmacist, nor allow anyone who is not a registered pharmacist to so sell, compound or dispense such drugs, medicines, poisons or chemicals, or physicians' prescriptions, except such as are assistants to and under the supervision of one who is a registered pharmacist, and physicians who dispense their own prescriptions only; but no one shall be prohibited by anything contained in this chapter from keeping and selling proprietary medicines and such other domestic remedies as do not contain intoxicating liquors or poisons, nor from selling concentrated lye or potash having written or printed on the package or parcel its true name and the word "poison," sales of which need not be registered. Whoever violates either provision of this section, for the former shall pay five dollars for each day of its violation, to be recovered in an action in the name of the state, brought by the county attorney under the direction of the commission, and for the latter shall be guilty of a misdemeanor, and punished accordingly. In actions or prosecutions under this chapter it need not be proven that the defendant has not a pharmacist's certificate, but such fact shall be a matter of defense.

SEC. 2589. *Examinations—registration.* The commission, at such times and places as it may select, and in such manner as it may determine upon, shall examine all persons desiring to engage in and conduct business as registered pharmacists as contemplated in the preceding section, and, if found competent, the applicant's name shall be entered in the registry book of certificate holders. Graduates of pharmacy holding a diploma from the university, or an incorporated school or college which requires a practical experience in pharmacy of not less than four years before granting such diploma, may be registered without examination. Pharmacists thus registered have the sole right to keep and sell all medicines and poisons; except intoxicating liquors.

SEC. 2590. *Registration and examination fees.* Each person furnished a certificate and registered without examination shall pay to the commission two dollars, and each and every person whom they examine orally, or whose answers to a schedule of questions are returned subscribed to under oath, the sum of five dollars, which shall be in full for all services. And in case the examination of said person shall prove defective and unsatisfactory, and his name not be registered, he shall be permitted to present himself for re-examination within any period not exceeding twelve months next thereafter, and no charge shall be made for re-examination. The said commissioners are authorized to administer oaths pertaining to their said office, and take and certify the acknowledgments of instruments in writing. After registration, an annual fee of one dollar for a renewal certificate shall be paid on or before the twenty-second day of March by all pharmacists who continue in business, and the conduct of such business without such renewal shall be a misdemeanor.

SEC. 2591. *Registry book—certificate displayed.* The commission shall keep a registry book in which shall be recorded the names and places of residence of all certificate holders, with the date of such certificate, which shall hold good for one year, and no longer without renewal. Renewals shall be granted upon the payment of the annual fee fixed in the preceding

section. Should a certificate holder change his residence, upon notice thereof such change shall be noted in the registry book. Each certificate holder shall keep displayed in his place of business his registration certificate. A failure to comply with this requirement shall be a misdemeanor.

SEC. 2592. *Sale of adulterated drugs.* Registered pharmacists shall be responsible for the quality of all drugs, chemicals and medicines which they may sell or dispense, except those sold in the original packages of the manufacturer, and those known as patent medicines. If any such pharmacist shall knowingly adulterate or cause to be adulterated any drugs, chemicals or medical preparations by him kept for sale or sold, he shall be guilty of a misdemeanor.

SEC. 2593. *Sale of poisons.* No person shall sell at retail any poisons enumerated in schedules A. and B., except in dispensing poisons in usual quantities or doses upon the prescription of a physician as follows: Schedule A. Arsenic and its preparations, corrosive sublimate, white precipitate, red precipitate, biniodide of mercury, cyanide of potassium, hydrocyanic acid, strychnia and other poisonous vegetable alkaloids and their salts, essential oil of bitter almonds, opium and its preparations except paregoric and other preparations of opium containing less than two grains to the ounce; Schedule B. Aconite, belladonna, colchicum, conium, nux vomica, henbane, savin, ergot, cotton root, cantharides, creosote, digitalis, and the pharmaceutical preparations, croton oil, chloroform, chloral hydrate, sulphate of zinc, mineral acids, carbolic acid and oxalic acid; unless the package containing such poisons has placed thereon, and also on the outside wrapper or cover, the name of the article, the word "poison," and the name and place of business of the seller; nor sell or deliver such poison unless, upon due inquiry, it be found that the party receiving it is aware of its character and represents it is to be used for proper purposes; nor sell or deliver any of the poisons included in schedule A. without also, before delivering the same, causing an entry to be made in a book kept for that purpose of the date of sale, the name and address of the purchaser, the name of the poison, the purpose for which it was represented to be required, and the name of the dispenser, which book shall be open to inspection by the proper authorities and preserved for at least five years, the entry of each such sale to be signed by the dispenser. Any person violating any of the provisions of this section, except as otherwise provided by law, shall be adjudged guilty of a misdemeanor and be punished by a fine of not less than twenty-five dollars nor more than one hundred dollars, or by imprisonment in the county jail for not less than thirty days nor more than ninety days, or by both fine and imprisonment, in the discretion of the court.

SEC. 2594. *Itinerant vendors of drugs.* Any itinerant vendor of any drug, nostrum, ointment, or appliance of any kind for the treatment of any disease or injury, and all those who by any method publicly profess to treat or cure diseases, injury or deformity, shall pay to the treasurer of the commission of Pharmacy an annual fee of one hundred dollars, upon the receipt of which the secretary of the commission shall issue a license for one year from its date. Two thousand dollars annually of the money arising from the license fund, or so much as may be needed, shall be devoted to defraying expenses of the commission, and any balance remaining shall be paid into the state treasury. Said commission shall, on the first day of

January of each year, make a verified and itemized statement in writing to the auditor of state of all receipts and expenditures of moneys coming into their hands by virtue of their office. Any violation of this section shall be a misdemeanor, and any person shall, upon conviction thereof, pay a fine of not less than one hundred dollars, nor more than two hundred dollars. In actions or prosecutions under this chapter it need not be proven that the defendant has not a license, but such fact shall be a matter of defense.

SEC. 2595. *Penalty for false representations.* If any person shall procure or attempt to procure a certificate of registry for himself or another by means of false representations or device, or without being a registered pharmacist shall conduct a place for retailing, compounding or dispensing drugs, medicines or chemicals, or for compounding or dispensing physicians' prescriptions, or shall use or exhibit the title of registered pharmacist, he shall be guilty of a misdemeanor, and each several day a place shall be so used shall be held to be a separate and several offense.

SEC. 2596. *Revocation of certificate.* When a registered pharmacist has been convicted of a violation of the provisions of this chapter, in addition to the other penalties provided by law, the commission, in its discretion, may revoke his certificate of registry.

INSPECTION OF PETROLEUM PRODUCTS

CHAPTER 11, TITLE XII, AS AMENDED BY TWENTY-SEVENTH GENERAL ASSEMBLY

SECTION 2503. The governor shall appoint such number of inspectors of the products of petroleum as may be determined by the state board of health, not to exceed fourteen in number. Each inspector shall be a resident of the state, and not interested directly or indirectly in the manufacture or sale of products of petroleum. His term of office shall begin on the first day of July in each even numbered year. He shall give bond to the state in the penal sum of five thousand dollars, conditioned for the faithful performance of his duties, with sureties who shall, in addition to the usual justification, make oath, entered on the bond, that they are not directly or indirectly interested in the manufacture or sale of products of petroleum for illuminating purposes, which bond shall be for the benefit of all persons injured through the failure of the inspector to perform his duties, and shall be filed with, and the sureties thereon approved by, the secretary of state. (Where there are two or more inspection stations, under the jurisdiction of the same inspector, he may with the approval of the governor appoint a deputy or deputies, each of whom shall be a resident of the state and not interested directly or indirectly in the manufacture or sale of petroleum products, for all of whose official acts the principal shall be responsible, and who shall serve without additional compensation or expense to the state.)*

SEC. 2504. The state board of health shall make rules and regulgtions for the inspection of petroleum products, for the government of inspectors, and prescribe the instruments and apparatus to be used. Such rules and

*Amendment Chapter 61. Twenty-seventh General Assembly.

regulations shall be approved by the governor, and, when so approved, shall be binding upon all inspectors.

SEC. 2505. Each inspector shall be furnished, at reasonable expense to the state, with the necessary instruments and apparatus for testing, and shall promptly make inspection, and test and brand all illuminating oils kept for sale, and for such purpose may enter upon the premises of any person. He shall reject all oils for illuminating purposes which will emit a combustible vapor at a temperature of one hundred and five degrees, standard Fahrenheit thermometer, closed test, not less than one-half pint of oil to be used in the flash test. If upon test and examination the oil shall meet the requirements, he shall brand over his official signature and date the barrel or package holding the same, "Approved, flash test..... degrees," inserting in the blank the number. Should it fail to meet the requirements, it shall be branded under his official signature and date, "Rejected for illuminating purposes." All inspection shall be made within the state, and paid for by the person for whom the inspection is made, at the rate of ten cents per barrel, fifty-five gallons for this purpose constituting a barrel, which charge shall be a lien upon the oil inspected, and be collected by the inspector, reported and paid into the state treasury, except as otherwise provided in this chapter. For the purposes of this act, gasoline, benzine and naphtha shall be deemed illuminating oil. No gasoline shall be sold, given away or delivered to any person in this state until the package, cask, barrel or vessel containing the same has been plainly marked "gasoline."

SEC. 2506. Each inspector shall keep an accurate record of all oils inspected and branded, the number of gallons, the number and kind of barrels or packages, the date and number of gallons approved, the number rejected, the name of the person for whom inspection was made, and the amount of money received therefor, the necessary traveling expenses incurred, the amount expended for instruments and apparatus, and the expenses incurred in prosecutions, which record at all reasonable times shall be open to public inspection. A copy of this record for the preceding month shall be filed with the secretary of state on or before the fifteenth day of each month, and no item of expenses shall be allowed and paid not shown in such reports.

SEC. 2507. Each inspector shall be allowed as full compensation for his services all fees and commissions earned and collected by him up to fifty dollars per month, and twenty-five per cent of any sum collected in any one month in excess of fifty dollars, but in no case shall his compensation exceed one hundred dollars per month. He shall be allowed such other sum as he necessarily expends for prosecutions incurred in the discharge of his duties and for necessary help in branding barrels. All money collected by the inspector in excess of the allowance herein provided shall, on or before the fifteenth day of each month, be paid to the state treasurer. Should any inspector pay out more money in any one month for necessary expenses incurred, for prosecutions for the violation of the provisions of this chapter, or for necessary help in branding barrels, than fees collected, such excess shall be refunded to him on his filing a sworn itemized statement with the governor, showing fees collected and expenses paid or incurred, which statement must be approved by the governor.

SEC. 2508. If any person, company or corporation, or agent thereof, shall sell, or attempt to sell, any product of petroleum for illuminating purposes which has not been inspected and branded as in this chapter provided, or shall falsely brand any barrel or package containing such petroleum products, or shall refill with products of petroleum barrels or packages having the inspector's brand thereon, without erasing such brand and having the contents thereof inspected, and the barrel or package rebranded, or shall purchase, sell or dispose of any empty barrel or package without throughly removing the inspection brand, or shall knowingly or negligently sell, or cause to be sold, or shall use or cause to be used, any product of petroleum mentioned in this chapter not inspected and tested, except as otherwise authorized herein; or if any person shall adulterate with any substance for the purpose of sale or use any product of petroleum to be used for illuminating purposes in such a manner as to render it dangerous, or shall sell or offer for sale, or use any product of petroleum for illuminating purposes which will emit a combustible vapor at a temperature of less than one hundred and five degrees, standard Fahrenheit thermometer, closed test, except as otherwise provided in this section for illuminating railway cars, boats and public conveyances, and except that the gas or vapor thereof shall be generated in closed reservoirs outside the building to be lighted thereby, and except the lighter products of petroleum when used in and for street light by street lamps, shall be fined not less than ten dollars nor more than fifty dollars; or if any common carrier shall receive for transportation or transport in the state as freight any oil or fluid, whether composed wholly or in part of petroleum or its products, or of any substance which will ignite at a temperature of three hundred degrees Fahrenheit thermometer, open test; or if any such carrier of passengers shall burn any oil or fluid which will ignite at a temperature of three hundred degrees, for lighting any lamp, vessel or fixture of any kind in any railway passenger, baggage, mail or express car, or boat or street railway car, stage-coach, or other means of public conveyance; or if any inspector shall falsely brand any barrel or package, or shall practice any fraud or deceit in office, or be guilty of any official misconduct or culpable negligence to the injury of another, or shall deal or have any pecuniary interest, directly or indirectly, in any oils or fluids sold for illuminating purposes while holding such office, he or such person, company, corporation or agent shall be fined not less than fifty dollars, and be liable in a civil action for all damages which may be sustained on account thereof, and each such inspector shall be fined in a sum not less than ten dollars nor more than one thousand dollars, or imprisonment in the county jail not exceeding six months, or be punished by both fine and imprisonment.

SEC. 2509. It shall be the duty of the governor to remove from office an inspector who is incompetent or unfaithful in the discharge of his official duty or, having knowledge of the violation of any of the provisions of this chapter, shall neglect or refuse to prosecute the offender.

SEC. 2510. The secretary of state shall make and deliver to the governor a report, for the fiscal year ending on the thirtieth day of June in each odd-numbered year, of all inspections made, the receipts and expenditures therefor, and such other items as are by this chapter required to be made of record.

INSPECTION AND USE OF PRODUCTS OF PETROLEUM

CHAPTER EIGHTY-THREE, LAWS TWENTY-EIGHTH GENERAL ASSEMBLY

SEC. 1. *Use of gasolene lamps.* That section two thousand five hundred and eight (2508) of the Code, as amended by chapter sixty-two of the acts Twenty-seventh General Assembly, be, and the same is hereby, amended by striking out the words, "the Wellsbach hydro-carbon incandescent lamp," in the twenty-third line thereof, and inserting in lieu thereof, the following: "Such lamps which, having been submitted to the state board of health and having been examined and tested by said board shall be found to be safe for the use of the public."

SEC. 2. *Duties of state board of health* The state board of health shall examine the particular design, mechanism, and workmanship of such lamps as shall be presented to such board, and test said lamps, and, if it shall find any lamp to be safe, said board shall enter the findings of the board upon the records of the proceedings of said board. The board shall have power, in case it comes to the notice of the board that any lamp which it has heretofore approved as safe, because either of change of design, the use of unsuitable material, or poor workmanship in the construction of such lamps, or for any other cause, is unsafe as then manufactured, and dangerous to public safety, to cancel its approval of such lamp, and after such cancellation of the approval of said lamp it shall be unlawful to use the same, and no lamps manufactured or sold after such disapproval shall be used in burning the lighter products of petroleum for illuminating purposes.

USE OF GASOLENE, BENZINE, NAPHTHA AND OTHER EXPLOSIVES IN TENEMENTS

CHAPTER 130, LAWS TWENTY-EIGHTH GENERAL ASSEMBLY

SEC. 1. *Use of dangerous fluids forbidden.* That it shall be unlawful for any person to establish or operate any dye works, pantorium, or cleaning works, in which gasolene, benzine, naphtha, or other explosive or dangerous fluids are used for the purpose of cleaning or renovating wearing apparel or other fabrics, in any building any part of which is used as a residence or lodging house.

SEC. 2. *Penalty.* Any person convicted of violating the provisions of the foregoing section shall be fined in a sum not exceeding fifty (50) nor less than ten (10) dollars.

TO PROHIBIT THE USE OF IMPURE OIL IN COAL MINES

CHAPTER 9, TITLE XII CODE, AS AMENDED BY TWENTY-SEVENTH GENERAL ASSEMBLY

SECTION 2493. Only pure animal or vegetable oil, paraffine or electric lights shall be used for illuminating purposes in any mine in this State, and

for the purpose of determining the purity of oils the State Board of Health shall fix a standard of purity and establish regulations for testing said oil, and said standard and regulations, when so determined, shall be recognized by all the courts of the State.

SEC. 2494. Any person, firm or corporation, either by themselves, agents or employes, selling or offering to sell for illuminating purposes in any mine in this State any adulterated or impure oil, or oil not recognized by the State Board of Health as suitable for illuminating purposes as contemplated in this chapter, shall be demed guilty of a misdemeanor, and, upon conviction thereof, shall be fined not less than twenty-five dollars nor more than one hundred dollars for each offense; and any mine owner or operator or employe of such owner or operator who shall knowingly use, or any mine operator who shall knowingly permit to be used, for illuminating purposes in any mine in this state any impure* or adulterated oil, or oil that has not been inspected and approved by an inspector, or any oil the use of which is forbidden by this chapter, shall, upon conviction thereof, be fined not less than five dollars nor more than twenty-five dollars.

†SEC. 2495. It shall be the duty of an inspector of petroleum products to inspect and test all oil offered for sale, sold, or used for illuminating purposes in coal mines in this state, and for such purpose he may enter upon the premises of any person. If upon tests and examination the oil shall meet the requirements made and provided by the state board of health, he shall brand, over his own fficial signature and date, the barrel or vessel holding the same with the words "Approved for illuminating coal mines." Should it fail to meet such requirements, he shall brand it over his official signature and date, "Rejected for illuminating coal mines." All inspection shall be made within this State, and paid for by the person for whom the inspection is made at the rate of ten cents per barrel or vessel, which charge shall be a lien on the oil inspected, and be collected by the inspector. Each inspector shall be governed in all things respecting his record, compensation, expenses, and returns to the treasurer of state and secretary of state as provided in sections two thousand five hundred and six and two thosand five hundred and seven of the Code. It shall be the duty of the inspector whenever he has good reason to believe that oil is being sold or used in violation of the provisions of this chapter to make complaint to the county attorney of the county in which the offense was committed, who shall forthwith commence proceedings against the offender, in any court of competent jurisdiction. All reasonable expenses for analyzing suspected oil shall be paid by the owner of the oil whenever it is found that he is selling or offering to sell impure oil in violation of the provisions of this chapter. Such expenses may be recovered in a civil action, and in criminal proceedings such expenses shall be taxed as part of the costs.

SEC. 2596. The provisions of this chapter shall apply only to coal mines.

* As amended.

† Substituted for Section 2495, Code.

TO PREVENT THE ADULTERATION OF, AND DECEPTION IN THE SALE OF LINSEED OR FLAXSEED OIL, TND TO REGULATE THE SALE THEREOF

CHAPTER 52, ACTS OF THE TWENTY-SEVENTH GENERAL ASSEMBLY

SECTION 1. *Manufacture—sale.* No person, firm, or corporations shall manufacture or mix for sale, sell, or offer for sale, as raw linseed oil, any article which is not wholly the product of commercially pure linseed or flaxseed. Nor shall any person, firm, or corporation manufacture or mix for sale, sell, or offer for sale, as boiled linseed oil, any article, unless the oil from which said article is made be wholly the product of commercially pure linseed or flaxseed, and unless the same has been heated to at least two hundred and twenty-five (225) degrees Fahrenheit.

SEC. 2. *Compounds excepted.* Nothing in this act shall be construed as prohibiting the sale or manufacture of any compound of linseed or flaxseed oil; provided, that such compound, if it imitates in appearance and is designed to take the place of linseed or flaxseed oil, shall not be manufactured or mixed for sale, sold, or offered for sale under a name or description containing the words "linseed oil" or "flaxseed oil."

SEC. 3. *Penalty.* Any person, firm, or corporation who shall violate any of the provisions of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished for each and every such violation, by a fine of not less than fifty (50) dollars, nor more than five hundred (500) dollars; and in default of the payment of such fine shall be committed to the county jail for a period of not less than thirty (30) days.

SEC. 4. *Duties and powers of inspectors and board of health.* It shall be the duty of the inspectors of petroleum products, under such rules and regulations as the state board of health may prescribe, to enforce the provisions of this act. The violation of any of the provisions of this act relating to the manufacture and adulteration of linseed or flaxseed oil is hereby declared to be a public nuisance, and any court of competent jurisdiction is authorized, upon application of the board of health or its agents, to enjoin such violation, in the same manner as injunctions are usually granted under the rules and practice of such court. The board, its inspectors, assistants, experts, and chemists, and others appointed by it, shall have access, ingress, and egress to and from all places of business and buildings where linseed or flaxseed oil is kept for sale, stored or manufactured. They shall also have the power and authority to open any tank, barrel, can, or other vessel containing such oil, and may inspect the contents thereof, and take samples therefrom for analysis. All clerks, bookkeepers, express agents, railroad agents, or officials, employes of common carriers, or other persons, shall render them all the assistance in their power, when so requested, in tracing, finding, or inspecting such oil.

SEC. 5. *Cost of analysis—county attorney.* It shall be the duty of the court in every action brought under this act to tax as costs in the cause, the actual and necessary expense of analyzing the linseed or flaxseed oil which shall be in controversy in such proceeding; provided, that the amount so taxed shall not exceed the sum of twenty-five (25) dollars. It shall be the duty of the county attorney, upon the application of the state board of

health, to attend to the prosecution in the name of the state, of any suit brought for violation of any of the provisions of this act within his county.

BOXING CONTESTS OR SPARRING EXHIBITIONS

CHAPTER 133, LAWS TWENTY-EIGHTH GENERAL ASSEMBLY

SECTION 1. *Penalty*. Whoever engages in any boxing contest or sparring exhibition with or without gloves for a prize, reward, or anything of value, at which an admission fee is charged or received, either directly or indirectly, and whoever knowingly aids, abets, or assists in any such boxing contest or sparring exhibition, and any owner or lessee of any ground, lot, building, hall, or structure of any kind knowingly permitting the same to be used for such boxing contest or sparring exhibition, shall be fined not exceeding three hundred dollars, or imprisonment in the county jail not exceeding ninety days.

MISCELLANEOUS—FROM THE CODE

OPIUM SMOKING

SEC. 5003 Any person who shall keep and maintain any shop, house, room or other place to be resorted to by other persons, in which opium or any of its preparations or compounds is sold or given away to be smoked or used in such place, or who allows opium or any of its preparations to be smoked in such shop, house, room or other place, and every person who resorts to such shop, house, room or other place for the purpose of smoking opium or its preparations and compounds, shall be deemed guilty of a misdemeanor and upon conviction thereof shall be fined not exceeding five hundred dollars, or imprisoned in the county jail not exceeding six months, or both. The state, upon the trial of any person indicted for keeping a place described in this section, may, for the purpose of establishing the character of the place so kept by the defendant, introduce evidence of the general reputation of such place so kept, and such evidence shall be competent for such purpose.

SELLING FIREARMS TO MINORS

SEC. 5004 No person shall knowingly sell, present or give any pistol, revolver or toy pistol to any minor. Any violation of this section shall be punished by a fine of not less than twenty-five nor more than one hundred dollars, or by imprisonment in the county jail not less than ten nor more than thirty days.

SALE OF TOBACCO TO MINORS

SEC. 5005 No person shall directly or indirectly, by himself or agent, sell, barter or give to any minor under sixteen years of age any cigar or tobacco in any form whatever, except upon the written order of his parent or guardian. Any violation of this section shall be punished by a fine of not less than five nor more than one hundred dollars, and the offender shall stand committed until fine and costs of prosecution are paid.

SALE OF CIGARETTES

SEC. 5006 No one, by himself, clerk, servant, employe or agent, shall, for himself or any person else, directly or indirectly, or upon any pretense, or by any device, manufacture, sell, exchange, barter, dispense, give in consideration of the purchase of any property, of any services, or in evasion hereof, or keep for sale, any cigarettes or cigarette paper or cigarette wrappers, or any paper made or prepared for the purpose of making cigarettes, or for the purpose of being filled with tobacco for smoking; or own or keep, or be in any way concerned, engaged or employed in owning or keeping, any such cigarettes or cigarette paper or wrappers, with intent to violate any provision of this section; or authorize or permit the same to be done. Whoever is found guilty of violating any of the provisions of this section, for the first offense shall pay a fine of not less than twenty-five dollars nor more than fifty dollars and costs of prosecution, and stand committed to the county jail until such fine and costs are paid; for the second and each subsequent offense, he shall pay, upon conviction thereof, a fine of not less than one hundred dollars nor more than five hundred dollars and the costs of prosecution, or be imprisoned in county jail not to exceed six months: *provided* that the provisions hereof shall not apply to the sales of jobbers doing an interstate business with customers outside the state.

USE OF BARBED WIRE

SEC. 2817 Barbed wire shall not be used to inclose any school buildings or grounds, nor for any fence or other purpose within ten feet of any such grounds. Any person violating the provisions of this section shall be punished by fine not exceeding twenty-five dollars.

MINERS—PROVISIONS FOR THEIR SAFETY

SEC. 2486. *Escape and air shafts*. The owner or person in charge of any mine operated by shaft, or one having a slope or drift opening in which five or more men are employed, shall construct and maintain at least two distinct openings for each seam of coal worked, which in shaft mines shall be separated by natural strata of not less than one hundred feet in breadth, and in slope or drift mines not less than fifty feet in breadth, through which ingress and egress at all times shall be unobstructed to the employes, and in slope or drift mines shall be provided with safe and available travelingways; all traveling-ways and escapes to be kept free from water and falls of roof. All escape-shafts not provided with hoisting appliances as hereinafter provided shall have stairs at an angle of not more than sixty degrees in descent, kept in safe condition, with proper landings at easy and convenient distances apart. He shall provide all air-shafts where fans are used with working fans for ventilation, and those used for escapes with suitable appliances for hoisting underground workmen, at all times ready for use while the men are at labor, and no combustible material shall be allowed to be or remain between any escape-shaft and hoisting-shaft, save as it may be absolutely necessary in the operation of the mine. A furnace-shaft, if large enough, may be divided into an escape and a furnace-shaft, the partition to be of incombustible material for a distance of not less than fifteen feet from the bottom thereof, and so constructed throughout as to exclude the heated air and smoke from the side used as an escape-shaft. Where two or more mines are connected underground, the several owners, by joint agreement,

may use the hoisting-shaft or slope of the one as an escape for the other. In all cases where escape-shafts are constructed less than one hundred feet from the hoisting-shaft, there shall be built and maintained an under-ground traveling-way from the top of the escape-shaft, so as to furnish the proper protection from fire for a distance of one hundred feet from such hoisting-shaft. No escape-shaft shall be located or constructed without first giving notice to the district inspector, who shall determine the distance it shall be from the main shaft, and without his consent it shall not be less than 300 feet, nor shall any building except the fan-house be placed nearer than 100 feet of the escape; but the provisions of this chapter relating to escape-ways shall not apply to mines where the same are lost or destroyed by reason of the drawing of pillars preparatory to the abandonment of the mine, and in such mine not more than twenty persons shall be employed at one time.

SEC. 2488. *Ventilation.* The owner or person in charge of any mine shall provide and maintain, whether the mine be operated by shaft, slope or drift, an amount of ventilation of not less than 100 cubic feet of air per minute for each person, nor less than 500 cubic feet of air per minute for each mule or horse employed therein, which shall be so circulated throughout the mines as to dilute, render harmless and expel all noxious and poisonous gases in all working parts of the same; to do this, artificial means by exhaust-steam, forcing-fans, furnaces, or other contrivances of sufficient capacity and power, shall be kept in operation. If a furnace is used, it shall be so constructed, by lining the up-cast for a sufficient distance with incombustible material, that fire cannot be communicated to any part of the works. When the mine inspector shall find the air insufficient, or the men working under unsafe conditions, he shall at once give notice to the mine owner or his agent or person in charge, and, upon a failure to make the necessary changes within a reasonable time, to be fixed by him, he may order the men out, to remain out until the mine is put in proper condition.

SEC. 2489. *Safety appliances—competent engineers—boys not employed.* The owner or person in charge of any mine shall in all mines operated by shaft or slope, where the voice cannot be distinctly heard, provide and maintain a metal speaking-tube or other means of communication, kept in complete order from the bottom or interior to the top or exterior, also a sufficient safety catch and proper cover overhead on all cages, and an adequate brake to all drums or other devices used for lowering or hoisting persons, an approved safety gate at the top of each shaft, springs at the top of each slope, and a trail attached to each train used therein. He shall not knowingly place in charge of any engine used in or about the operation of the mines any but experienced, competent and sober engineers, who shall not allow anyone but those designated for that purpose to handle or in any way interfere with it or any part of the machinery, nor shall more than ten persons be allowed to descend or ascend in any cage at one time, or such less number as may be fixed by the district mine inspector, nor anyone but the conductor on a loaded cage or car. He shall not allow a boy under twelve years of age to work in the mines, and, when in doubt regarding the age of one seeking employment, shall, before engaging him, obtain the affidavit of the applicant's parent or guardian in regard thereto. He shall at all times keep a sufficient supply of timber to be used as props, convenient and ready for use, and shall send such props down when required and deliver them to the places where needed.

TO PREVENT ACCIDENTS BY RAILWAYS

SEC. 2054. *Cattle-guards—crossings—signs.* Every corporation constructing or operating a railway shall make proper cattle-guards where the same enters or leaves any improved or fenced land, and construct at all points where such railway crosses any public road good, sufficient and safe crossings and cattle-guards, and shall erect at such points, at a sufficient elevation from such road as to admit of free passage of vehicles of every kind, a sign with large and distinct letters placed thereon, to give notice of the proximity of the railway, and warn persons of the necessity of looking out for trains. Any railway company neglecting or refusing to comply with the provisions of this section shall be liable for all damages sustained by reason of such refusal or neglect, and it shall only be necessary, in order to recover, for the injured party to prove such neglect or refusal.

SEC. 2060. *Interlocking switches.* When in any case two or more rail roads cross each other at a common grade, or a railroad crosses a stream by swing or drawbridge, they may be equipped thereat with an interlocking switch system, or other suitable safety device rendering it safe for engines or trains to pass thereover without stopping, and if such interlocking switch system or other safety device shall have been approved by the railroad commissioners, then the engines and trains of such railroad or railroads may pass over such crossings or bridge without stopping, the provisions of any other law to the contrary notwithstanding.

SEC. 2071. *Liability for negligence or wrongs of employes.* Every corporation operating a railway shall be liable for all damages sustained by any person, including employes of such corporation, in consequence of the neglect of the agents, or by any mismanagement of the engineers or other employes thereof, and in consequence of the wilful wrongs, whether of commission or omission, of such agents, engineers or other employes, when such wrongs are in any manner connected with the use and operation of any railway on or about which they shall be employed, and no contract which restricts such liability shall be legal or binding.

SEC. 2072. *Signals at road crossings.* A bell and a steam whistle shall be placed on each locomotive engine operated on any railway, which whistle shall be twice sharply sounded at least sixty roads before a road crossing is reached, and after the sounding of the whistle the bell shall be rung continuously until the crossing is passed; but at street crossings within the limits of cities or towns the sounding of the whistle may be omitted, unless required by ordinance or resolution of the council thereof; and the company shall be liable for all damages which shall be sustained by any person by reason of such neglect. Any officer or employe of any railway company violating any of the provisions of this section shall be punished by a fine not exceeding one hundred dollars for each offense.

SEC. 2073. *Stopping at railway crossings.* All trains run upon any railroad in this state which intersects or crosses any other railroad upon the same level shall be brought to a full stop at a distance of not less than two hundred nor more than eight hundred feet from the point of intersection or crossing, before such intersection or crossing is passed, except as otherwise

provided in this chapter. Any engineer violating the provisions of this section shall forfeit one hundred dollars for each offense, to be recovered in an action in the name of the state for the benefit of the school fund, and the corporation on whose road such offense is committed shall forfeit the sum of two hundred dollars for each offense, to be recovered in like manner.

SEC. 710. *Dangerous buildings.* They (cities and towns) shall have power to provide by ordinance for the repair, removal or destruction of any building which is dangerous, or which may be liable to fall, and to levy and collect a special tax against the property and owner thereof for the expense thereof, as other special taxes are levied and collected.

SEC. 711. *Fires—electric apparatus—fire limits.* They shall have power to make regulations against danger from accidents by fire or electrical apparatus, to establish fire limits, and to prohibit within such limits the erection of any building or addition thereto, unless the outer walls be made of brick, iron, stone, mortar, or other non-combustible material, with fireproof roofs, and to provide for the removal of any structure erected contrary to such prohibition.

SEC. 712. *Fire escapes.* They shall have power * * * to require the construction of fire escapes to buildings, and regulate and control the same; to cause all buildings, structures and enclosures that may be in such condition as to cause danger from falling to be fixed, or from fire to be immediately made safe or removed.

SEC. 713. *Inspection of steam boilers and magazines.* They shall have power to provide for the inspection of steam boilers, and all places used for the storage of explosive or inflammable substances or materials, and to prescribe the necessary means and regulations to secure the public against accidents and injuries therefrom, and to assess the costs and expenses of such proceedings against the property and owners thereof in the manner provided for special assessments.

SEC. 2074. *Contract or rule limiting liability.* No contract, receipt, rule or regulation shall exempt any railway corporation engaged in transporting persons or property from the liability of a common carrier, or carrier of passengers, which would exist had no contract, receipt, rule or regulation been made or entered into.

SEC. 2079. *Couplers on new or repaired cars.* No corporation, company or person operating any line of railroad within this state, or any car manufacturer or transportation company using or leasing cars therein, shall put in use any new car or any old one that has been to the shop for general repairs to one or both of its drawbars, that is not equipped with automatic couplers so constructed as to enable any person to couple or uncouple them without going between them.

SEC. 2080. *On all cars.* After January 1, 1898, no corporation, company or person, operating a railroad, or any transportation company using or leasing cars, shall have upon any railroad in this state any car that is not equipped with such safety automatic coupler.

SEC. 2081. *Driver brake on engines.* No corporation, company or person operating any line of railroad in the state shall use any locomotive engine upon any railroad or in any railroad yard in the state that is not equipped with a proper and efficient power brake, commonly called a "driver brake."

SEC. 2082. *Power brake on cars.* No corporation, company or person operating a line of railroad in the state shall run any train of cars that shall not have therein a sufficient number of cars with some kind of efficient automatic or power brake to enable the engineer to control the train without requiring brakemen to go between the ends or on the top of the cars to use the hand brake.

SEC. 2083. *Penalty.* Any corporation, company or person operating a railroad in this state and using a locomotive engine, or running a train of cars, or using any freight, way or other car contrary to the provisions of the four preceding sections, shall be guilty of a misdemeanor, and shall be subject to a fine of not less than five hundred nor more than one thousand dollars for each and every offense; but such penalties shall not apply to companies hauling cars belonging to railroads other than those of this state which are engaged in interstate traffic. Any railway employe who may be injured by the running of such engine, train or car contrary to the provisions of said sections shall not be considered as waiving his right to recover damages by continuing in the employ of the corporation, company or person operating such engine, train or cars.

SEC. 2403. *Selling or giving (intoxicating liquors) to minor or intoxicated person or person in the habit of becoming intoxicated.* No person by himself, agent or otherwise, shall sell or give any intoxicating liquors to any minor for any purpose, except upon written order of his parent, guardian or family physician, or sell the same to any intoxicated person or one in the habit of becoming intoxicated. Any person violating the provisions of this section shall forfeit and pay the sum of one hundred dollars, to be collected by action against him, or, if a permit holder, against him and the sureties on his bond. Such action may be brought by any citizen of the county. One-half of the amount so collected shall go to the informer and one-half to the school fund of the county.

SEC. 2418. *Civil action for damages by wife, parent, child, etc.* Every wife, child, parent, guardian, employer or other person who shall be injured in person or property or means of support by any intoxicated person, or in consequence of the intoxication, habitual or otherwise, of any person, shall have a right of action in his or her own name against any person who shall, by selling or giving to another contrary to the provisions of this chapter any intoxicating liquors, cause the intoxication of such person, for all damages actually sustained, as well as exemplary damages; and a married woman shall have the same right to bring suits, prosecute, and control the same and the amount recovered, as if a single woman; and all damages recovered by a minor under this section shall be paid either to such minor or his parent, guardian or next friend, as the court shall direct, and all suits for damages under this section shall be by civil action in any court having jurisdiction thereof.

SEC. 4727. *Murder.* Whoever kills any human being with malice aforethought, either expressed or implied, is guilty of murder.

SEC. 4728. *First degree.* All murder which is perpetrated by means of poison, or lying in wait, or any other kind of wilful, deliberate and premeditated killing, or which is committed in the perpetration or attempt to perpetrate any arson, rape, robbery, mayhem or burglary, is murder in the first degree, and shall be punished with death, or imprisonment for life at

hard labor in the penitentiary, as determined by the jury, or by the court if the defendant pleads guilty.

SEC. 4729. *Second degree.* Whoever commits murder otherwise than as set forth in the preceding section is guilty of murder of the second degree, and shall be punished by imprisonment in the penitentiary for life, or for a term of not less than ten years.

SEC. 4747. *Killing in duel.* Whoever fights a duel with deadly weapons, and inflicts a mortal wound on his antagonist, is guilty of murder in the first degree, and shall be punished accordingly.

SEC. 4748. *Duelling—challenge.* Any person who fights a duel with deadly weapons, or is present thereat as aid, second or surgeon, or advises, encourages or promotes the same, although no homicide ensue; and any person who challenges another to fight a duel, or sends or delivers any verbal or written message purporting or intended to be such challenge, although no duel ensue, shall be fined in a sum not exceeding one thousand dollars nor less than four hundred dollars, and imprisoned in the penitentiary not more than three nor less than one year.

SEC. 4751. *Manslaughter.* Any person guilty of the crime of manslaughter shall be imprisoned in the penitentiary not exceeding eight years, and fined not exceeding one thousand dollars.

SEC. 4752. *Maiming or disfiguring.* If any person, with intent to maim or disfigure, cut or maim the tongue; cut out or destroy an eye; cut, slit or tear off an ear; cut, bite, slit or mutilate the nose or lip; cut off or disable a limb or any member of another person, he shall be imprisoned in the penitentiary not more than five years, and fined not exceeding one thousand nor less than one hundred dollars.

SEC. 5036. *Engaging in prize fight.* Whoever engages as principal in any prize fight shall be fined not less than one hundred nor more than one thousand dollars, or be imprisoned in the penitentiary for a term of not more than one year, or both.

SEC. 5037. *Aiding or abetting.* Whoever aids or assists in any prize fight shall be fined not exceeding five hundred dollars, or imprisoned in the county jail for not more than one hundred and fifty days.

SEC. 5039. *Racing or fast driving on highways.* Any person who shall be guilty of racing or driving upon the public highway, in a manner likely to endanger the persons or lives or others, shall be guilty of a misdemeanor, and shall be fined not exceeding one hundred dollars, or be imprisoned in the county jail not exceeding thirty days.

SEC. 4768. *Assault with intent to murder.* If any person assault another with intent to commit murder, he shall be imprisoned in the penitentiary not exceeding ten years.

SEC. 4771. *With intent to inflict great bodily injury.* If any person assault another with intent to inflict a great bodily injury he shall be imprisoned in the county jail not exceeding one year, or be fined not exceeding five hundred dollars.

SEC. 4773. *Mingling poison with food, etc.* If any person mingle any poison with any food, drink or medicine, with intent to kill or injure any human being, or wilfully poison any spring, well, cistern or reservoir of water, he shall be imprisoned in the penitentiary not exceeding ten years, and be fined not exceeding one thousand dollars.

SEC. 4775. *Carrying concealed weapons.* If any person carry upon his person any concealed weapon, or shall wilfully draw and point a pistol, revolver or gun at another, he shall be guilty of a misdemeanor, and be fined not more than one hundred dollars, or imprisoned in the county jail not more than thirty days; but this section shall not apply to police officers and other persons whose duty it is to execute process or warrants, or make arrests.

SEC. 4776. *Burning inhabited dwelling in nighttime.* If any person wilfully or maliciously burn in the nighttime the inhabited building, boat or vessel of another, or wilfully and maliciously set fire to any other building, boat or vessel owned by himself or another, by the burning whereof such inhabited building, boat or vessel is burnt in the nighttime, he shall be imprisoned in the penitentiary for life or any term of years.

SEC. 4759. *Attempt to produce miscarriage.* If any person, with intent to produce the miscarriage of any pregnant woman, wilfully administer to her any drug or substance whatever, or, with such intent, use any instrument or other means whatever, unless such miscarriage shall be necessary to save her life, he shall be imprisoned in the penitentiary for a term not exceeding five years, and be fined in a sum not exceeding one thousand dollars.

SEC. 4766. *Exposing child.* If the father or mother of any child under the age of six years, or any person to whom such child has been intrusted or confided, expose such child in any highway, street, field, house or outhouse, or any other place, with intent wholly to abandon it, he or she, upon conviction thereof, shall be imprisoned in the penitentiary not exceeding five years.

SEC. 4796. *Death caused by dynamiting.* If any person wilfully deposits or throws in, under or about any dwellinghouse, building, boat, vessel or raft or other inhabited place, where its explosion will or is likely to destroy or injure the same, any dynamite, nitroglycerine, giant powder or other material, and by reason of the explosion thereof any person is killed, he shall be guilty of murder.

SEC. 4797. *Or injury to person.* If any person wilfully deposits or throws any dynamite, nitroglycerine or giant powder or other explosive material as provided in the preceding section, and by means of the explosion thereof any person is injured, he shall be guilty of an assault with intent to commit murder.

SEC. 4809. *Placing obstructions on railways.* If any person shall wilfully and maliciously place any obstruction on the track of any railroad in the state, or remove any rail therefrom, or in any other way injure such railroad, or do any other thing thereto whereby the life of any person is or may be endangered, he shall be imprisoned in the penitentiary for life, or for any term not less than two years.

SEC. 4810. *Shooting or throwing at train.* If any person throw any stone or other substance whatever, or present or discharge any gun, pistol or other firearm at any railroad train, car or locomotive engine, he shall be guilty of a misdemeanor.

SEC. 4812. *Uncoupling locomotive or cars.* If any person shall wilfully and maliciously uncouple or detach the locomotive or tender or any of the cars of any railroad train, or in any manner aid, abet or procure the doing

of the same, such person shall be imprisoned in the penitentiary not exceeding five years, or fined not exceeding one thousand dollars, or both, at the discretion of the court.

SEC. 4945. *Violating sepulchre.* If any person, without lawful authority, wilfully dig up, disinter, remove or carry away any human body, or the remains thereof, from its place of interment; or aid, assist, encourage, incite or procure the same to be done or attempted; * * * he shall be imprisoned in the penitentiary not more than two years, or be fined not exceeding twenty-five hundred dollars, or both.

SEC. 5025. *Boxing tumbling rods of threshing machines.* If any person run any threshing machine in this state without having two lengths of tumbling rods next the machine together with the knuckles or joints and jacks of the tumbling rods safely boxed and secured while the machine is running, he shall be fined not less than ten nor more than fifty dollars for every day or part of day he shall violate this section.

SEC. 5026. *Steam boilers.* Any person owning or operating steam boilers in this state shall provide the same with steam gauge, safety-valve and water gauge, and keep the same in good order. Any person neglecting so to do shall be fined not less than fifty nor more than five hundred dollars,

SEC. 4989. *Sale of impure or skimmed milk—skimmed milk cheese—labeling.* If any person shall sell, exchange, or expose for sale or exchange, or deliver or bring to another, for domestic or potable use, or to be converted into any product of human food, any unclean, impure, unhealthy, adulterated, unwholesome or skimmed milk, or milk from which has been held back what is commonly known as strippings, or milk taken from an animal having disease, sickness, ulcers, abscess or running sore, or which has been taken from an animal within fifteen days before or five days after parturition; or if any person, having cows for the purpose of producing milk or cream for sale, shall stable them in an unhealthy place or crowded manner, or shall knowingly feed them food which produces impure, unwholesome milk, or shall feed them distilled glucose or brewery waste in any state of fermentation, or upon any substance in a state of putrefaction or rottenness or of an unhealthy nature, or shall sell or offer for sale cream which has been taken from milk the sale of which has been prohibited, or who shall sell or offer for sale, as cream, an article which shall contain less than the amount of butter-fat as prescribed in this chapter; or if any person shall sell or offer for sale any cheese manufactured from skimmed milk, or from milk that is partly skimmed, without the same being plainly branded, stamped or marked on the side or top of both cheese and package, in a durable manner, in the English language, the words "Skimmed milk cheese," the letters of the words to be not less than one inch in height and one-half inch in width, he shall be fined not less than twenty-five dollars nor more than one hundred dollars, and be liable for double damages to the person or persons upon whom such fraud shall be committed; but the provisions of this section shall not apply to skimmed milk when sold as such and in the manner and subject to the regulations prescribed in this chapter.

SEC. 4990. *What deemed adulterated or impure milk.* For the purposes of this chapter, the addition of water or any other substance or thing to whole milk or skimmed milk or partially skimmed milk is hereby declared an adulteration, and milk which is obtained from animals fed upon waste as defined

in this chapter, or upon any substance of an unhealthy nature, is hereby declared to be impure and unwholesome, and milk which is proved by any reliable method of test or analysis to contain less than twelve and one-half per cent of milk solids to one hundred pounds of milk, or three pounds of butter fat to one hundred pounds of milk, shall be regarded as skimmed or partially skimmed milk, and every article not containing fifteen per cent or more of butter fat shall not be regarded as cream.

SEC 4991. *Enforcement.* It is hereby made the duty of the dairy commissioner to enforce the provisions of the two preceding sections.

SEC. 4992. *Fraud in lard—from diseased hogs.* All persons or associations that engage in the business of selling lard rendered from swine that have died of disease shall, before selling or offering to sell any such lard, plainly stamp, print or write upon the cask, barrel or other vessel containing it the words, "Lard from hogs which have died of disease;" or, if sold without such cask, barrel or other receptacles, the purchaser shall be informed that the lard is from hogs which have died of disease. For a violation of the provisions of this section he shall be fined not less than five nor exceeding one hundred dollars, or imprisoned in the county jail not exceeding thirty days.

SEC. 4993. *Compound lard—labeling.* No manufacturer or other person shall sell, deliver, prepare, put up, expose or offer for sale any lard, or any article intended for use as lard, which contains any ingredient but the pure fat of healthy swine in any tierce, bucket, pail, package or other vessel or wrapper, or under any label bearing the words "pure," "refined," "family" or either of these words alone or in combination with other words of like import, unless every tierce, bucket, pail, package or vessel, wrapper or label in or under which said article is sold, delivered, prepared, put up, exposed or offered for sale bears on the top or outer sides thereof, in letters not less than one-half inch in length, and plainly exposed to view, the words, "compound lard," and the name and proportion in pound and fractional parts thereof of each ingredient contained therein. Any person violating the provisions of this section shall be fined, for the first offense not less than twenty nor more than fifty dollars, and for each subsequent offense not less than fifty nor more than one hundred dollars.

SEC. 4994. *Canned food—label.* It shall be unlawful for any packer of or dealer in hermetically sealed, canned or preserved fruits, vegetables or other articles of food, not including canned or condensed milk or cream, to knowingly offer such canned or preserved articles for sale for consumption in this state, unless the cans or jars which contain the same shall bear the name, address and place of business of the person, firm or corporation that canned or packed the articles so offered, or the name of the wholesale dealer in the state who sells or offers the same for sale, together, in all cases, with the name of the state, city, town or village, where the same were packed plainly printed thereon, preceded by the words "packed at." Such name, address, and place of business shall be plainly printed on the label, together with a mark or term indicating clearly the grade or quality of the articles contained therein.

SEC. 4995. *Soaked goods.* All packers of and dealers in soaked goods, or goods put up from products dried or cured before canning, shall, in addition to complying with the provisions of the preceding section, cause to

be plainly branded on the face of the label in legible type, one-half of an inch in height and three-eighths of an inch in width, the word "soaked."

SEC. 4996. *Penalty.* Any packer or dealer who shall violate any of the provisions of the two preceding sections shall be fined not more than fifty dollars for each offense in the case of retail dealers, and in case of wholesale dealers or packers, not less than five hundred nor more than one thousand dollars for each offense.

SEC. 4997. *Who deemed "packer" or "dealer."* The terms "packer" and "dealer," as used in the three preceding sections, shall include any firm or corporation doing business as a dealer in or packer of the articles mentioned therein.

SEC. 4998. *Information by board of health.* It shall be the duty of any board of health, cognizant of any violation of the provisions of the four preceding sections, to inform the county attorney, whose duty it shall be to institute proceedings against any person who is charged with a violation of such provisions, and in case of a conviction he shall receive twenty-five per cent of the fines actually collected in addition to any salary otherwise provided for.

SEC. 4999. *Seats for female employes.* All employers of females in any mercantile or manufacturing business or occupation shall provide and maintain suitable seats, when practicable, for the use of such female employes, at or beside the counter or work bench where employed, and permit the use thereof by such employes to such extent as the work engaged in may reasonably admit of. Any neglect or refusal to comply with the provisions of this section by any employer shall be punished by a fine not exceeding ten dollars.

SEC. 5078. *What deemed nuisances.* The erecting, continuing or using any building or other place for the exercise of any trade, employment or manufacture which, by occasioning noxious exhalations, offensive smells or other annoyances, becomes injurious and dangerous to the health, comfort or property of individuals or the public; the causing or suffering any offal, filth or noisome substance to be collected or to remain in any place to the prejudice of others; the obstructing or impeding without legal authority the passage of any navigable river, harbor or collection of water; or the corrupting or rendering unwholesome or impure the water of any river, stream or pond, or unlawfully diverting the same from its natural course or state, to the injury or prejudice of others; and the obstructing or incumbering by fences, buildings or otherwise the public roads, private ways, streets, alleys, commons, landing places or burying-grounds, are nuisances.

SEC. 5079. *Manufacture of gunpowder.* If any person carry on the business of manufacturing gunpowder, or of mixing or grinding the composition therefor, in any building within eighty rods of any valuable building erected at the time when such business may be commenced, the building in which such business is thus carried on is a public nuisance.

SEC. 5081. *Penalty—abatement.* Whoever is convicted of erecting, causing or continuing a public or common nuisance as provided in this chapter, (chapter 14, title xxiv), or at common law when the same has not been modified or repealed by statute, where no other punishment therefor is specially provided, shall be fined not exceeding one thousand dollars, and the court, with or without such fine, may order such nuisance abated, and issue a warrant as hereinafter provided.

SEC. 4976. *Sale of poison without label.* If any apothecary, druggist or other person deliver to another any arsenic, corrosive sublimate, prussic acid or other poisonous liquid or substance without having the word "poison" and the true name thereof written or printed upon a label attached to or affixed upon the vial, box or parcel containing the same, he shall be guilty of a misdemeanor.

SEC. 4977. *Spreading infectious disease.* If any person inoculate himself or any other person or suffer himself to be inoculated with the smallpox within the state, or come within the state with the intent to cause the prevalence or spread of this infectious disease, he shall be imprisoned in the penitentiary not more than three years, or be fined not exceeding one thousand dollars and imprisoned in the county jail not exceeding one year.

SEC. 4978. *Putting infected person on public conveyance.* If any person shall place or put, or aid or abet in placing or putting, any person upon any railroad car, steamboat or other public conveyance, knowing such person to be infected with diphtheria, smallpox or scarlet fever, he shall be fined not more than one hundred dollars or be imprisoned in the county jail not more than thirty days.

SEC. 4980. *Selling drugged liquors.* If any person wilfully sell or keep for sale intoxicating, malt or vinous liquors, which have been adulterated or drugged by admixture with any deleterious or poisonous substance, he shall be fined not exceeding five hundred dollars, or be imprisoned in the penitentiary not exceeding two years.

SEC 4982. *Adulterating food or liquor.* If any person adulterate for the purpose of sale any substance intended for food, or any wine, spirituous, malt or other liquor intended for drinking, he shall be imprisoned in the county jail not more than one year, or be fined not exceeding three hundred dollars, and the article so adulterated destroyed.

SEC. 4983. *Drugs or medicines.* If any person adulterate for the purpose of sale any drug or medicine in such manner as to lessen the efficacy or change the operation of such drug or medicine, or to make it injurious to health, or sell it knowing that it is thus adulterated, he shall be imprisoned in the county jail not exceeding one year, or be fined not exceeding five hunhundred dollars, and such adulterated drugs and medicines destroyed.

SEC. 4984. *Other adulteration.* No person shall mix, color, stain or powder, or order or permit any other person to mix, color, stain or powder, any article of food or confections with any ingredient or material so as to render the article injurious to health, with the intent that the same may be sold, and no person shall sell or offer for sale any such articles.

SEC. 4985. *With intent to sell.* No person shall, except for the purpose of compounding in the necessary preparation of medicine, mix, color, stain or powder, or permit any other person to mix, color, stain or powder any drug or medicine with any ingredients or materials, so as to affect injuriously the quality or potency of such drug or medicine, with the intent to sell the same, or shall offer for sale any such drug or medicine.

SEC. 4986. *Labeling.* No person shall mix, color, stain or powder any article of food, drink or medicine, or any article which enters into the composition of food, drink or medicine, with any other ingredient or material,

whether injurious to health or not, for the purpose of gain or profit, or sell or offer for sale the same, or order or permit any other person to sell or offer for sale any article so mixed, colored, stained or powdered, unless the same be so manufactured, used or sold or offered for sale, under its true and appropriate name, and notice that the same is mixed or impure is marked, printed or stamped upon each package, roll, parcel or vessel containing the same, so as to be and remain at all time readily visible, or unless the person purchasing the same is fully informed by the seller of the true names of the ingredients (if other than such as are known by the common name thereof) of such articles at the time of making the sale thereof or offering to sell the same; but nothing in this section shall prevent the use of harmless coloring material used in coloring butter and cheese.

SEC. 4987. *Glucose—skimmed-milk cheese—oleomargarin.* No person shall mix any glucose or grape sugar with syrup or sugar intended for human food, or shall mix or mingle any glucose or grape sugar with any article, without distinctly marking, stamping or lebeling the article or the package containing the same with the true and appropriate name of such article, and the percentage in which glucose or grape sugar enters into its composition. Nor shall any person sell or offer for sale, or permit to be sold or offered for sale, any such food, into the composition of which glucose or grape sugar has entered, without at the same time informing the buyer of the fact, and the proportion in which glucose or grape sugar has entered into the composition.

SEC. 4988. *Penalty.* Any person violating any provision of the four preceding sections shall, for the first offense, be fined not less than ten nor more than fifty dollars; for the second offense, not less than twenty-five nor more than one hundred dollars, or imprisoned in the county jail for not more than thirty days; for the third or any subsequent offense, not less than five hundred nor more than one thousand dollars, and imprisoned in the penitentiary not less than one nor more than five years.

XXVII

APPENDIX

CIRCULAR No. 1

Rules and Regulations

For the Protection of Public Health and for the Restriction and Prevention of Contagious Diseases

CONTAGIOUS DISEASES

RULE 1. It shall be the duty of every physician residing or practicing within the limits of any city, town or township to give written notice to the mayor or township clerk (as the case may be) of any case of Asiatic cholera, smallpox, diphtheria (membranous croup), scarlet fever (scarlatina, scarlet rash), typhoid fever, measles, whooping cough, leprosy, or puerperal fever, that he may be called to attend professionally, within twenty-four hours after he shall first visit and ascertain the character of any such disease named herein. In all cases where no physician is in attendance, it shall be the duty of any person having charge of, or being at the head of any family, or having the care or custody of any lodging rooms to give notice in like manner as required of physicians. Every school teacher and school officer who discovers, or who has knowledge of a case of these contagious diseases, shall cause the fact to be immediately reported to the mayor or clerk of a township.

RULE 2. It shall be the duty of the mayor or township clerk (as the case may be), upon receiving written notice of the existence of a case of Asiatic cholera, smallpox, diphtheria (membranous croup), scarlet fever (scarlatina or scarlet rash), to forthwith quarantine the premises, by serving written notice to the occupants thereof, and placing a danger card thereon; and take such measures as may be necessary and proper for the restriction and suppression of such disease; and to investigate all the circumstances attendant upon the occurrence of the same. He shall also make proper provision for care of the sick. Where the disease is measles or whooping cough, the premises shall not be quarantined, but they shall be placarded with the danger card.

And it shall be the further duty of the mayor or township clerk (as the case may be) to disinfect or cause to be disinfected, the premises whereon such quarantined diseases have occurred, together with all infected furniture, bedding, clothing and other articles, as provided by regulations of the State Board of Health.

RULE 3. If any person shall wilfully or maliciously remove or deface, or cause to be removed or defaced, any signal of danger, or cloth or card placed upon the quarantined premises, without the proper authority as provided herein, he shall be prosecuted, as provided by law.

RULE 4. During the existence of any contagious or infectious disease, in any family or household, or place, in any city, town or township, and until after the recovery of the sick and the disinfection of the premises where such disease shall have existed, no person residing in such household, family or place, shall be permitted to attend any public meeting, and no superintendent, teacher or officer of any school shall permit any child or person from any such family, household or place, to attend any school without a permit from the mayor or township clerk (as the case may be), upon the recommendation of the attending physician, showing thorough disinfection of the person, clothing and premises. School teachers, who are boarding in a family in which a contagious disease exists, must at once change their place of boarding and lodging, and change and disinfect their clothing.

QUARANTINE

RULE 5. Quarantine shall be deemed to be:

First—The serving of a written notice upon the family, and the placing upon such conspicuous place, on each building, hall, lodging room, or place wherein exists a contagious disease, as will best protect the public health, a cloth or card not less than eighteen inches square, having imprinted thereon in large letters the word "Quarantine," the name of the disease, and the words: "No person shall be permitted to enter or leave these premises except as provided by law, while it is quarantined, under the penalty provided by law."

Second—Separation of the sick from all persons except those in actual attendance.

Third—That no person shall leave said premises except the attending physician, without a permit therefor signed by the mayor or township clerk (as the case may be).

Fourth—That no article that has been used on or about a person sick with a contagious or infectious disease shall be removed from the sick-room, or from the premises, until the same has been properly disinfected.

RULE 6. Nurses who have been employed to care for persons sick with contagious disease may be released from quarantine when their services are no longer required, upon the order of the mayor, or township clerk (as the case may be). Before leaving the premises there must be thorough disinfection of their person and clothing.

RULE 7. Isolation means the complete exclusion of all other persons from the sick except the nurse and attending physician; that the nurse shall be restrained from going to and from the premises, or mingling with the family; that all well persons shall be prevented from contact with bedding, clothing, food, or other articles that have been used on or about the sick. Where from

necessity the parents or family are nurses, the isolation and quarantine applies to them.

RULE 8. Quarantine shall be established and maintained in each and every case for the period named herein, to-wit:

Scarlet fever—(Scarlatina, scarlet rash), thirty-five days.

Diphtheria—(Membranous croup), thirty-five days.

Smallpox—Forty days.

Asiatic cholera—Twenty-one days.

RULE 9. When a family is quarantined for diphtheria, the head of the family, or bread-winner, may at the discretion of the local board, have the privilege of attending to his regular business, and of going to and from his house only when complying with the following conditions, and the mayor or township clerk (as the case may be) shall issue a permit therefor:

First—He shall change his clothing before going to and leaving his home to go to his place of business.

Second—He shall wash his hands, face, head and beard with a two per cent solution of carbolic acid, each time before leaving his home to go to his place of business.

Third—While in the house he shall not act as nurse nor live in the same room with the sick person.

Fourth—He shall not attend any public meeting, nor attend any place where persons are congregated.

Fifth—This privilege shall not be granted to school teachers, nor to any person whose business brings him in intimate contact with children.

RULE 10. Whenever there is complete recovery or death of persons who have been sick with a contagious disease, and there are no further exposures thereto, the quarantine may be released, although the period prescribed herein has not elapsed. *Provided*, that no release of quarantine shall be permitted until at least seventeen days after the recovery or death of the last case, and proper disinfection of person and premises is made as hereinafter provided.

RULE 11. After death or recovery of persons sick from a contagious or infectious disease, the room, furniture, and other contents not to be destroyed, shall be thoroughly disinfected in accordance with regulations made by the State Board of Health.

RULE 12. No order for the release of quarantine shall be made by the mayor, or township clerk (as the case may be), except upon a report from the attending physician stating the number of persons on the quarantined premises sick with the infectious disease in question, their names, ages, and when the disease first appeared in each case, when recovered, and the means, if any, used for disinfection. If the mayor or township clerk (as the case may be), shall find that the regulations of the local board and of the State Board of Health respecting quarantine and disinfection have been complied with the quarantine shall be forthwith released. If quarantine regulations have been complied with, and proper disinfection has not been done, the mayor, or township clerk (as the case may be), shall order it done under the supervision of the health officer or some other competent person, and the quarantine shall be continued until it is done.

RULE 13. No person shall give, lend or sell, or offer for sale, any clothing or other articles liable to convey infection of any contagious disease unless

the same have been disinfected and such disinfection approved by the mayor or township clerk (as the case may be).

RULE 14. When Asiatic cholera, smallpox, diphtheria (membranous croup), scarlet fever (scarlatina, scarlet rash), typhoid fever, leprosy, measles, puerperal fever or any other contagious disease exists in any house or dwelling place of a dealer in, or seller of, milk he shall discontinue, to give, sell, or distribute milk to any person, or to creameries or butter factories, or in anywise handle such milk, until a permit is granted therefor by the mayor or township clerk (as the case may be), countersigned by the health officer. And no person who attends cows, and does the milking, or who has care of milk vessels, or the sale or distribution of milk, shall be permitted to enter any premises or place wherein exists any of the diseases named herein, nor have any communication, direct or indirect, with any person who resides in or is an occupant of such infected place; nor shall any milk or butter be given away, sold or distributed from such infected place. Any person, either as principal, agent or employe, who shall violate any of the provisions of this rule shall be prosecuted according to law.

CARE OF THE SICK

RULE 15. A flannel cloth, wrung out of a strong solution of carbolic acid, should be hung constantly across the door leading into the room in which one sick with either disease specified in rule 2 is placed.

RULE 16. The discharges from the throat, nose and mouth are extremely dangerous, and those from the skin, eyes, ears, kidneys and bowels are also dangerous, and remain so for a considerable time. Small pieces of rags should be substituted for handkerchiefs, and after having been once used must be burned immediately.

RULE 17. The discharges from the patient's bowels or bladder must be received into vessels containing a solution of corrosive sublimate which, (being a deadly poison, should be so labeled as to avoid accidents); or a strong solution of carbolic acid or some other disinfectant, and if not buried at once must be thrown into a cesspool or water-closet, after having been thoroughly disinfected, but *never* into a running stream. If buried, it must not be within one hundred feet of any well. All vessels must be kept scrupulously clean and disinfected.

RULE 18. Nurses and attendants must keep themselves and their patients as clean as possible—their own hands frequently washed and desinfected by carbolic acid solution.

The nurses must be few as possible, and they must not unnecessarily communicate with other persons. They must wear only such clothes as may be readily washed, which, when removed, must be placed immediately in boiling water and boiled at least thirty minutes. Neither they, nor any other person, should eat anything in the sick-room, or which has been there. Gargling, or washing the mouth occasionally with a cleansing fluid, is recommended for those exposed to the contagium of the disease.

RULE 19. Food left uneaten by the sick must never be carried where it will infect other persons. It must be burned immediately on removal from the sick-room, and the dishes used washed in boiling water, by themselves—never with other dishes.

SMALLPOX

Vaccination is the only preventive for smallpox. Hence it is important that the vaccination be thoroughly done, with reliable lymph, free from all impurities, and with sufficient frequency.

Immediate vaccination after exposure is important for safety. It should be done, if possible, within five days after exposure.

Every infant should be vaccinated within three months after its birth, unless an educated physician advises to the contrary. Should the first attempt fail, it should be repeated at intervals of a fortnight until a true sore is produced.

Every child should be re-vaccinated before it reaches its *twelfth year*.

DIPHTHERIA

Diphtheria is a most formidable disease, is widely prevalent, and one of the most fatal diseases in this State. It is produced by a specific bacillus which by multiplication produces blood poisoning. It attacks persons of all classes and ages, but most frequently children under sixteen years of age

In ordinary cases the germ producing diphtheria probably attacks the person by way of the mouth and the air passages.

The period of incubation of diphtheria, or the time from a person's exposure to the disease to his coming down with it, like scarlet fever, varies somewhat — being usually from a few hours to seven or eight days; in some cases it is twelve or fourteen days.

It has been conclusively demonstrated that the germs of diphtheria retain their vitality in dried dust for an indefinite period of time, and that cold — even to freezing, does not affect its vitality. Hence the importance of destroying by burning or thorough disinfection all the discharges.

Its most frequent local manifestations are in the mouth, throat and air passages. When in the mouth, or upper part of the throat only, the disease is, as a rule, less dangerous and fatal, but none the less contagious, than when in the air passages, below the fauces.

Avoid exposure to the disease.

Observe rigidly every measure as given for scarlet fever.

Beware of crowded assemblies in ill-ventilated rooms.

All influences which depress the vital powers, and vitiate the fluids of the body, tend to promote the development and spread of this disease. Among these influences, perhaps the most common and powerful are *impure air* and *impure water*.

RULE 20. Membranous croup must be treated as contagious, and be considered for all sanitary purposes as identical with diphtheria, and all rules applying to the latter apply equally to membranous croup.

SCARLET FEVER

Scarlet fever is one of the most contagious diseases. One attack does not always prevent subsequent attacks. The greatest number of deaths from this disease is of children under ten years of age. Adult persons do sometimes have the disease.

Scarlatina and scarlet rash are identical with scarlet fever—equally dangerous and equally contagious. They are one and the same disease.

Avoid the special contagium of the disease. This is especially important to be observed by children. Children under ten years of age are in much greater danger of death from scarlet fever than are adults, but adult persons often get and spread the disease, and sometimes die from it. Mild cases in adults may thus cause fatal cases among children. Because of these facts it is dangerous for children to go where adult persons go with almost perfect safety to themselves.

It is probable that the contagium of scarlet fever may retain its virulence for some time, and be carried for a long distance in various substances and articles in which it may have found lodgment.

MEASLES

RULE 21. Measles is a highly contagious and often fatal disease, hence is dangerous to the public health, but is not subject to quarantine regulations.

RULE 22. A danger signal must be placed upon the premises in some conspicuous place; all children of the family must be restricted to the home, and all other children excluded.

The specific poison or contagion of measles is in the rash which invades the membranes of the nose, throat, lungs and bowels, before, and often more severely than it invades the skin, so that it is contagious before the eruption appears on the skin.

This disease comes on like what is commonly called "a cold in the head," eyes watery and red; sensitive to light; watery discharge from the nose; fever; hoarse, dry, husky and painful cough; an eruption in the roof of the mouth, with or without sore throat. The eruption does not appear before the second or third day—first on the forehead and face—is in patches, and of dull red color; and the skin has a roughened feel to the touch.

Mothers can do more than all others to prevent the spread of the disease, because they see the first symptoms, and can promptly send the child to bed and isolate it until the true nature of the disease is determined. This early action, a hot bath, and a few days' rest and quiet will promote the safety and recovery of the sick, and also the safety of the other children of the family. In no one of the contagious diseases can the mother give greater aid, and in none is her co-operation more desirable.

WHOOPING COUGH

Whooping cough is a contagious disease. School children affected with it must be excluded from the schools until entire recovery, and should be isolated from all other children. The premises must be placarded as provided in rule 2.

TYPHOID FEVER

It is the opinion of the best and most experienced sanitarians that typhoid fever is a disease which need not exist. That it is the result of a specific germ. That it is a filth disease—not that it is alone produced by filth. There must be a specific germ, and this germ must, through the mouth, as food or drink, enter the small intestines, where it multiplies enormously, and is thrown off in the excreta, to again multiply under the favoring conditions of moisture and heat. Hence the disposal of the excreta of a typhoid fever patient is of the highest importance. The most dangerous source of infection is from water. The discharges are thrown into a privy vault, on a manure

pile, or on the ground, whence they sink into the earth, through the soil, and often contaminate neighboring wells.

There are many other ways in which water may be contaminated. The soiled clothing of a patient is washed and the water thrown upon the earth near a well, or poured into a leaky drain. Some kinds of food are very absorbent of disease germs. The most notable is milk, which becomes contaminated by being kept too near a patient. Several instances are known where milkmen have carried the germs of this disease in milk kept where the sick were, or by rinsing their cans with contaminated water.

The disease is not considered contagious in the sense that smallpox, measles, scarlet fever, and diphtheria are, yet it has been practically demonstrated that the germs may enter the system through the respiratory tract, as sewer air. Attendants upon those sick are not in danger from contracting the disease directly from the patient. It goes through families because every individual, usually, has been exposed to the producing cause,—the disease germs,—first through contaminated water or food, then the house surroundings.

Protect the water supply from any possible source of contamination. The water supply of cities and towns should be procured from sources where there can be no contamination, immediate or remote, from privies, cesspools, stables or cemeteries.

Great care should be had to prevent the contamination of the water supply by discharges from the bowels or a person sick with typhoid fever, as by drainage into wells, springs, streams or other water supply, from a privy vault, sewer, drain or cemetery. Privies often drain into wells, unsuspected by those who use the water. Should typhoid discharges pass into such a privy an outbreak of typhoid fever among those using the water from a neighboring well would be likely to occur. If such a well were the source of the general water supply of a city, typhoid fever might soon be epidemic there.

There is good reason to suspect the water of a well whenever a vault is situated within less than a hundred feet of it, particularly if the soil be porous. In numerous instances fluids from excreta have leached into wells from much greater distances; and it has been proved that a well thirty rods from a cemetery received water which had filtered through the soil of the cemetery.

The use of water from a source likely to be infected with excreta from a typhoid fever patient should be promptly stopped. Great care should also be given to the milk supply.

Dangerously contaminated water may be, and often is, found to be clear and colorless, and to have no bad taste.

Keep the premises pure and clean as possible. Of all forms of filth none are so dangerous to houses as the "hole-in-the-ground" privy, and the sink-drains.

All discharges from the patient should be received in a vessel containing a pint or more of a solution of chloride of lime (six ounces of lime to one gallon of water), and kept covered three or four hours, and then buried in the earth, at such distance from wells, springs or streams that they cannot possibly be drained therein. NEVER MINGLE THEM WITH ANY KIND OF FILTH, IN A PRIVY OR ELSEWHERE.

All soiled clothing and bedding soiled with discharges from the patient should be at once removed and placed in a tub and completely covered with solution of chloride of lime or other reliable disinfectant, and kept there until they can be boiled, or put in boiling water as soon as removed from the patient. It is important this should be closely observed, otherwise the substance on the clothing dries, becomes dust, floats in the air and endangers the attendants. It is probable that in this way washerwomen often become infected and have typhoid fever. After this disinfection the clothing may be washed with safety.

During sickness, disinfect at once carefully any spots on floor, carpet or rug accidentally soiled.

There is no necessity for burning the clothing, bedding and bed of a typhoid fever patient even when death occurs, nor for a private funeral, but the coffin must not be opened in any church, hall, place of public assembly or residence.

Strict isolation of the sick is not necessary, but it is wise, for all who can properly do so, to keep away.

After death or recovery, disinfect the sick-room with sulphur fumigation and then wash the floors and woodwork with solution of corrosive sublimate or carbolic acid.

Nurses and others in the family should eat nothing in the room where the patient is, nor of anything that has been there. The food for the family and attendants should be prepared and kept as far as possible from the sick. As boiling will kill all disease germs it is safer, when the disease is in a house, to boil all water and milk just before using.

PUERPERAL FEVER

Puerperal fever is a fearfully fatal disease. Hence, every attendant upon cases of child-birth should, by the use of antiseptic measures, sedulously guard against the occurrence of the disease. The hands and all instruments and appliances should be thoroughly disinfected, and all discharges subject to decomposition and capable of producing septicæmia should be promptly removed and destroyed. The only way to avoid this terrible disease is for every practitioner to recognize his personal responsibility in the matter, and he who does not is guilty of criminal negligence.

LEPROSY

Persons afflicted with well developed leprosy should be required by all local health boards to remain on their own premises, and should not be permitted to mingle with the general public.

TUBERCULOSIS—CONSUMPTION

This is an infectious and therefore a communicable disease, due to a germ—the *bacillus tuberculosis*. The disease is propagated and disseminated by infected meat and milk, and especially by the excretions and sputum of persons affected by it.

INFECTION.—It has been shown that the expired air is not infective. Cornet has said, "The consumptive, in himself, is almost harmless, and only becomes harmful through bad habits." The virus is largely contained in the sputum, which, when dry, is disseminated in the form of dust, and

constitutes the great medium for the transmission of the disease. In the last stages of consumption, the patient is weak, the sputum is expelled improperly; pillows, sheets, handkerchiefs, etc., are soiled. If a male, the beard or mustache is smeared. Even in the hands of the cleanly, without especial precautions, such circumstances all tend to the production, around the patient, of a halo of infected dust maintained by every process of bed making or cleaning, which includes the pernicious habit of "dusting." In the hands of the careless and dirty, the infectivity is of course, greatly aggravated.

It attains its maximum of intensity where the filthy habit of spitting on the floor prevails, especially if it is carpeted.

All rooms frequented by persons suffering from tuberculosis very soon become infected, and consequently dangerous, such as hospitals, jails, poorhouses, etc.; all such rooms where ventilation and disinfection are neglected are very dangerous, as proven by the great number of deaths of those who are confined in these poisoned abodes. Boats and cars on our great lines of travel, without great care being used, become veritable pest houses.

MEANS OF PREVENTION.—*Sunlight* is one of the most powerful agents in destroying the tubercle bacilli. Avoid imperfectly ventilated dwellings, dark, damp, musty rooms. Let your dwellings be light, dry and well ventilated, with an abundance of sunlight. The *sputum* should always be kept moist. In all public places, spittoons, partly filled with water, to which may be added some disinfectant, such as carbolic acid, or a two-per-cent solution of formaldehyde, should be freely distributed, and which all persons who spit should be required to use, if necessary.

Spitting in the streets and in all public places should be prohibited. No child should even be allowed to sleep with a person suffering from tuberculosis, especially if of the pulmonary variety.

Persons suffering from tuberculosis should not drink out of the same cup used by other members of the family, and when traveling should carry his own cup, as the microbes will adhere to the cup in great numbers, and thus endanger others.

As most cities obtain their *water supply* from rivers, whose waters are contaminated with sewage, all water for drinking purposes should be boiled before using, thus preventing typhoid fever, as well as tuberculosis. All *soiled clothing* from tuberculous patients should be thrown into a tub of water, to which some disinfectant has been added, preventing the *sputum* from drying, and thus protecting the washerwoman, as well as all others exposed.

Quarantining those affected, and placarding the premises, are not required in this disease; nor are public funerals prohibited.

THE DEAD

RULE 24. A body dead from smallpox must be immediately wrapped in a cloth saturated with the strongest disinfectant solution, without previous washing, and cremated or buried deep, and no body dead from this disease shall under any circumstances, or any lapse of time, be disinterred.

RULE 25. The body of a person who has died from Asiatic cholera, yellow fever, leprosy, diphtheria (membranous croup), scarlet fever (scarlatina or scarlet rash), must not be removed from the sick-room until it has been

wrapped in a cloth saturated with a solution of corrosive sublimate (one ounce to six gallons of water), and then tightly enclosed in a coffin. The body shall then be cremated or buried immediately without the attendance of any person other than is necessary for the interment thereof, provided that bodies dead from diphtheria, scarlet fever, and puerperal fever, if prepared in accordance with the rules adopted by this board for the transportation of corpses by embalmers holding a license as such from the State Board of Health, may be deposited in a vault or be shipped by a public conveyance.

RULE 26. No public funeral[1] shall be held by any person who has died from either of said diseases named in rules 24 and 25, and no public funeral shall be held in a house, nor on any premises where there is a case of, nor where a death has recently occurred from, either of said diseases.

RULE 27. No person, company, corporation or association having charge of or control of any schoolhouse or church, or of any building, room or place used for school or church purposes, or for any public assembly, shall permit the body of any person dead from any of the contagious or infectious diseases named in these regulations, or any other dangerous contagious disease, except typhoid fever, to be taken into such schoolhouse, church, building, room or place, for the purpose of holding funeral service over such body; and no sexton, undertaker or other person having charge of or direction of the burial of any body dead from any of the said diseases, shall permit the coffin or casket containing such body to be opened; nor shall any child be permitted to act as pallbearer or carrier at any such funeral.

BURIALS

RULE 28. Upon the death or any person within the limits of a city, town or township, it shall be the duty of the physician who was attending at the time of death, or of the coroner, when the case comes under his official jurisdiction, to furnish within twenty-four hours after such death, to the undertaker, or other person superintending the burial of said decedent, a certificate setting forth the full name, age, sex, color, place of death, date and cause of death, and such other facts as may be required by regulations of the State Board of Health and the statutes of the State of Iowa. If any person shall die without a physician in attendance, it shall be the duty of the undertaker, or of any person acquainted with the facts, to report the same to the health officer of the local board of health, who is hereby authorized to give a certificate of death as aforesaid, *provided*, it be not a case requiring the attendance of a coroner.

RULE 29. No sexton or other person or persons, having charge or control of any cemetery, burying place, or tomb, or vault, and no undertaker, or other person or persons, shall inter, entomb, or place in any vault, the dead body of any person, or remove such body from or out of any city, town or township without having procured a certificate of death as provided in rule 28; and it shall be the duty of any undertaker, or other person or persons having charge of the burial or removal of the dead body of any person to deliver said certificate of death forthwith to the clerk of the local board of health.

RULE 30. It shall be the duty of the clerk of a local board of health upon the presentation of a certificate of death, to issue a permit to inter, entomb, or place in a vault the body of the deceased person named in such certificate. *Provided*, a body dead from smallpox, Asiatic cholera, leprosy, yellow fever, typhus fever, or bubonic plague, shall not be deposited in a receiving vault.

RULE 31. If any physician, or any other person, shall knowingly attempt to secrete, or withhold the true character of any of the contagious or infectious diseases specified in these regulations, or shall in any manner whatsoever attempt to deceive or defraud, or who shall make any false statements in making a certificate of cause of death by giving any other than the true cause of such death; or, if the decedent was affected with any such contagious or infectious disease during his last sickness, he shall neglect or refuse to state such fact in such certificate, he shall be liable to the penalty prescribed in section 2573 of the Code.

RULE 32. Upon the presentation of the proper application in accordance with the regulations made by the State Board of Health for the removal of the dead body of a human being out of the limits of a city, town or township, it shall be the duty of the clerk of the local board of health to issue a permit countersigned by the president of the board or mayor (as the case may be) for such removal. *Provided*, that where said body is to be disinterred such application must be accompanied with a disinterment permit from the State Board of Health, but no permit for such removal hall be granted in any case of a body dead from Asiatic cholera, smallpox, leprosy, yellow fever, typhus fever or bubonic plague, or from any sequelæ or complications of said diseases. Bodies dead from diphtheria (membraneous croup), scarlet fever (scarlatina, scarlet rash), may be disinterred only upon a special permit issued by the State Board of Health. No permit for such removal shall be granted in any case whatsoever where the cause of death was a contagious or infectious disease, or any sequelæ of such disease, unless the permit be approved and signed by the president of the local board of health, and also approved by the health officer, nor shall a permit be granted except upon the presentation of the proper certificate of the cause of death.

[1] A "public funeral" is deemed to be the indiscriminate attendance of persons not immediately connected with the family of the deceased person, *especially children;* the carrying of a dead body to a church or other public building; or exposure thereof to the public at any place, preceding or during the funeral service. In other words, there must be none present except those absolutely necessary to prepare the body for interment or inter it.

DISINFECTION

As a result of patient and prolonged investigation two simple means have been determined upon which, if faithfully carried out, would soon rid the world of infections and contagions which, if not checked, become epidemic in character and frightful in mortality. These "means" are QUARANTINE, or isolation of the sick and their nurses, and thorough DISINFECTION—"the former means to let the matured disease die out, and the latter to kill the new germs before they can develop fresh mischief." To these means should be added in the case of smallpox and perhaps some other of the communicable diseases, vaccination or inoculation.

It is important, first, to know what parts of the body are the favorite

breeding places of the germs or micro-organisms that are the cause of infectious diseases and what parts give them off most freely.

As a result of observation and experiment it has been found that—

In cholera they are most numerous in the discharge from the bowels.

Consumption, in the expectoration from the lungs.

Diphtheria (membranous croup), in discharges from mouth, throat and nose.

Measles, in the air passages and skin.

Puerperal fever, in the discharges of the reproductive organs.

Scarlet fever, in the discharges from mouth, throat and nose, and particles from the skin.

Smallpox and varioloid, in the pustules of the body.

Typhoid fever, in the discharges from the bowels.

Whooping cough, in the air passages.

From these sources they get into our bodies by means of the food we eat, the water we drink, the air we breathe, or through broken surfaces of the skin and mucous membranes. Many of these germs are very tenacious of life, and under favoring conditions multiply with wonderful rapidity.

Freezing or drying destroys but few of them—boiling or burning kills them all.

It is important, as well as interesting also, to know, at least approximately, how long the infection lasts in given cases. The following shows the average period of such infection:

Cholera, until complete recovery from the vomiting and purging.

Consumption, as long as the tubercular bacilli are found in the sputa.

Diphtheria, at least three weeks after nose and throat are well.

Measles, from three days before eruption until scurfiness has gone—two to four weeks.

Scarlet fever, from five to six weeks, until the throat is well and desquamation (peeling off) has ceased.

Smallpox, from four to eight weeks, until all the scabs have fallen off.

Typhoid fever, from five to seven weeks, until the fever has disappeared and the diarrhœa relieved.

Whooping cough, until the "whoop" is gone—from four to six weeks.

The following illustrate some of the best known and most reliable methods of caring for those sick with infectious diseases and of destroying the disease-producing germs:

CLEANLINESS

A careful inspection of the premises, inside and out, should be made, including the cellar, well and outhouses, not only with a view of ascertaining the breeding-places of the disease germs, but for the purpose of destroying everything that is a menace to health. Cleanliness of dwellings, closets, cupboards, privies, alleys, person, clothing, and bedding should be enjoined and enforced. Carpets, dirty and dust-laden, and successive layers of paper on the walls, especially when partially detached, form most excellent receptacles for preservation of these disease germs.

DISINFECTION

Disinfection is based upon the fact that all these communicable diseases are caused by a micro-organism—specific in character, whose multiplication

and vitality are dependent upon favoring conditions, that can be successfully combatted by agents denominated *disinfectants*. The terms "antiseptics," "deodorants" and "disinfectants" are, by many, thought to express the same thing. They are widely different.

A DEODORANT has the power of removing offensive odors, but may have no disinfectant powers whatever, and, *vice versa*, the disinfectant may have no deodorizing power. Therefore, the removal of an offensive odor by means of a deodorant does not remove the danger from disease germs already present.

An ANTISEPTIC is an agent which retards, prevents or arrests putrefaction, decay or fermentation. It may also arrest the development of the germs of disease, and may be used as a preventive of such diseases, but it does not destroy the life of disease germs, and hence cannot be relied upon when such germs are present.

A DISINFECTANT or GERMICIDE is an agent which has the power of destroying germ life.

The following is a list of the most useful disinfectants:

I.—FIRE

Complete destruction of every infected thing of little value.

II.—STEAM

Under pressure, superheated, temperature 221 degrees Fahrenheit. Exposure to this for ten minutes will destroy all germs. Ordinary steam at 212 degrees Fahrenheit will not penetrate sufficiently. Pressure is required to secure penetration. Every well regulated local health department should have ample facilities for the application of "steam" and "dry heat," where all infected articles suitable for such methods of infection that are too valuable to be destroyed should be officially disinfected. For this service a small fee might be charged.

III.—DRY HEAT

Baking in an oven at temperature of 230 degrees Fahrenheit, for two hours. Greater heat than this is liable to destroy the texture of most articles.

IV.—BOILING IN WATER

Actively for half an hour. This will destroy all known germs of disease.

V.—FRESH CHLORIDE OF LIME

Six ounces to one gallon of soft water. Specially useful for faeces, urine and sputa.

VI.—CORROSIVE SUBLIMATE

(Bichloride of mercury.) This is a powerful poison, and when the solution is made it should be colored by some aniline dye or permanganate of potash, so that it may not be mistaken for water. Always use wooden or earthen vessels for holding this solution.

VII.—CARBOLIC ACID

Useful for most purposes.

VIII.—SULPHUR FUMES

RULE 33. When a room and its contents are to be disinfected by sulphur fumigation, heavy woolen clothing, silks, furs, stuffed bed covers, beds and

other articles which cannot be treated with the solution, shall be so arranged in the room as to expose the greatest amount of surface, all pockets turned inside out, and after fumigation they shall be hung in the open air, beaten and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, etc., shall be cut open, the contents spread out, and thoroughly fumigated. Carpets shall be taken from the floor and so placed as to be thoroughly fumigated. It will add greatly to secure successful fumigation if the room be previously moistened by water spray or a dampened sponge.

RULE 34. If the disease was scarlet fever (scarlatina, scarlet rash) or smallpox, the paper on the walls or ceiling, if any there be, must be removed and completely burned. If the disease was diphtheria, typhoid fever or measles, the paper on the walls must be thoroughly dusted and brushed.

IX.—FORMALDEHYDE

Clothing, bedding, or any infected article can be completely disinfected by immersing for two hours in a two per cent solution of formaldehyde. It is also useful for spraying walls, washing woodwork, furniture, etc.

This solution is made by taking one part by measure of the commercial formaldehyde solution and adding to it thirty parts of water.

GENERAL RULES

The following rules for the use of disinfectants are recommended:

RULE 1. *Precautions to be taken when removing a patient suffering from a contagious disease.* Remove all clothing, linen, coverings or other effects of the patient, and replace them by others which have not been used since the beginning of his illness or which have not remained in the room in which he has been isolated, unless, however, such clothing, linen, coverings or other effects, after having been used by the patient or having remained in his room, have been disinfected in the manner described in rule 4. Provide the patient with rags for receiving his expectorations or evacuations during the transport, and burn these rags or disinfect them according to one of the three methods described in rule 4.

RULE 2. *Disinfection of a house or apartment, and of the furniture and effects contained therein.* First method: Formaldehyde vapor. Second method: Close all outlets of the premises to be disinfected, then fumigate with sulphurous acid by burning for at least six consecutive hours, four pounds of sulphur for each one thousand cubic feet of space.[1] Third

[1] Many health boards have discarded the use of sulphur entirely as a disinfectant, because of the careless manner of its use.

To have a successful disinfection, every aperture, hole, joint, etc., must be impermeably closed, and the windows so arranged that they may be opened from the outside, either by a string or by some other contrivance, after disinfection is completed. It must be borne in mind that sulphurous acid gas (vapor of burning sulphur), when inhaled in large quantities, is destructive to life.

To insure the combustion of the sulphur, and as a precaution against fire, place the sulphur, either in powder or in small fragments, in an iron pan which should be placed upon a couple of bricks or stones in a tub partly filled with water. In order to insure the ignition of the sulphur, the surface should be well moistened with alcohol before applying the light. Several twisted slips of newspapers imbedded in the sulphur and projecting above the surface and ignited at their ends will answer the same purpose.

After the room has been subjected to these sulphur fumes twenty-four hours, throw open all doors and windows and air the house well, after which sponge all exposed surfaces with a solution of carbolic acid, two ounces in each gallon of water, and give a final scrubbing with soap and hot water.

method: Remove all the effects, furniture and articles contained in the premises in order to disinfect them in the manner described in rule 4, then thoroughly wash the walls, ceilings and floors with a solution of bi-chloride of mercury; one drachm to a gallon of water.

RULE 3. *Disinfection of a vehicle or boat used in the removal of a patient, or of the body of a patient who has died of a contagious disease.* First method: Remove all cushions, curtains and other accessories, and disinfect them according to one of the methods described in rule 4, then wash out the vehicle or boat with a solution of bi-chloride of mercury, two drachms to one gallon of water. Second method: Put the vehicle in a closed-in place and fumigate with formaldehyde or sulphur as described in rule 2. Wrap the body in a well sewed sheet completely saturated with one of the following solutions: (1) bi-chloride of mercury; two drachms to one gallon of water. (2) Carbolic acid; four ounces to one gallon of water. (3) Chloride of lime; six ounces to one gallon of water.

RULE 4. *Disinfection of everything taken out from the room where the contagious patient is isolated.* **Food:** Burn the remains of the food which has been served to the patient, or sprinkle them with a solution of carbolic acid or bi-chloride of mercury, or sprinkle them with chloride of lime and bury them.

Vessels and utensils: Wash them in boiling water.

Clothing, sheets, napkins, coverings and other linen: (1) Burn them, if of little value; or, (2) Boil them in water for at least half an hour; or, (3) Steep them for four hours in a solution of one drachm of bi-chloride of mercury to one gallon of water; or, (4) Steep them for four hours in a solution of two ounces of carbolic acid to one gallon of water; or, (5) In a two per cent solution of formaldehyde for two hours.

Furniture, mattresses and articles which might be injured by the foregoing methods of disinfection: (1) Expose them for ten minutes to a current of steam in a suitable apparatus; or, (2) Expose them for two hours to dry heat at a temperature of two hundred and thirty degrees Fahrenheit; or, (3) If neither of the two preceding methods can be employed, put them in a well closed room and expose to the fumes of formaldehyde; or of sulphur as described in rule 2 of general rules.

Expectoration and evacuations: Collect them in vessels and mix with them one-half their quantity of one of the following disinfectants, to be left in contact with them for half an hour: (1) Bi-chloride of mercury, two drachms to one gallon of water. (2) Carbolic acid, four ounces to one gallon of water. (3) Powdered chloride of lime. (4) Chloride of lime, six ounces to one gallon of water. (5) Lime milk, prepared as follows: Sprinkle gradually lime of good quality with one-half its weight of water; dilute the powder so obtained with twice its volume of water.[1]

RULE 5. *Disinfection of persons and effects before leaving a house which has been quarantined.* Wash, at least, the uncovered portions of the body, the hair and beard with a solution of carbolic acid in the proportion of a tablespoonful to one gallon of water.

Completely change clothing and put on other which has not remained in the infected house, or, if it has remained there, which has been disinfected in the manner described in rule 4.

[1] Lime milk keeps only for a few days, and only when the vessel containing it is kept carefully closed.

RULE 6. *Disinfection of the patient and his effects after his recovery.* Wash the body with a solution of one tablespoonful of carbolic acid to one gallon of water.

Disinfect as described in rule 4 all clothing and other articles used by him since a period of fifteen days before the beginning of his illness.

RULE 7. *Disinfection of a stable, enclosure, litters, excrements, blood and other contaminated liquids.* **Stable:** First method: Close all outlets, then fumigate with formaldehyde, or sulphur as described in rule 2.

Second method: Wash the walls, ceilings and floors with a solution of bi-chloride of mercury, two drachms to one gallon of water.

Third method: Whitewash with lime the walls, ceilings and floors.

Enclosure: Remove the dirt to a depth of three inches and bury it at least a foot deep.

Whitewash with lime the walls of the enclosure.

Litter, excrements, blood, and other liquids from the sick animal: Burn them, or bury them a foot deep, at least, after covering them with quicklime.

RULE 8. *To disinfect a privy.* Almost impossible to do it if full. Empty it.

1. Corrosive sublimate, two drachms to one gallon of water.
2. Carbolic acid, four ounces to one gallon of water.
3. Sulphate of copper (bluestone), four ounces to one gallon of water.
4. Chlorinated lime, one half pound to one gallon of water.
5. Fresh slaked lime to cover the contents.
6. A two per cent solution of formaldehyde.

Whichever is used must be used in large quantities and added frequently.

In preparing any disinfectant solution, always use soft water, because the chemical constituents of hard water injure the solution. Always use a wooden or earthen vessel for any solution of corrosive sublimate.

RULE 9. *To disinfect rooms and their contents with formaldehyde gas.* Formaldehyde gas is to be used in preference to any other gaseous disinfectant. In order to obtain desired results the following directions must be closely observed and practiced:

(1) All cracks or openings in the plaster or in the floor or about the door and windows should be calked tight with cotton or with strips of cloth.

(2) The linen, quilts, blankets, carpets, etc., should be stretched out on a line, in order to expose as much surface to the disinfectant as possible. They should not be thrown into a heap. Books should be suspended by their covers so that the pages are all open and freely exposed.

(3) The walls and floor of the room and the articles contained in it should be thoroughly sprayed with water. If masses of matter or sputum are dried down on the floor they should be soaked with water and loosened. No vessel of water should, however, be allowed to remain in the room.

(4) Eight ounces (240 C. C.) of the commercial 40 per cent formaldehyde solution for each one thousand cubic feet of space, to be disinfected, should be used. This solution should be rapidly vaporized, or distilled into the room.

(5) The room thus treated should remain closed for ten hours.

(6) The apparatus used for carrying out these instructions must be approved by this board, upon the recommendation of its bacteriologist.

(7) The so-called "disinfectant" lamps and other apparatus that use wood alcohol for generating formaldehyde are condemned as worthless, and their use cannot be considered as disinfectant.

NOTE—As an Appendix to this circular there is printed Chapter 16, Title XII, the Code, a copy of which will be found elsewhere in this Report.

CIRCULAR No. 2, 1901

REVISED EDITION

REGULATIONS FOR LOCAL BOARDS OF HEALTH IN THE STATE OF IOWA.

ORGANIZATION

The mayor and council of a city or incorporated town, and the trustees of a township are the local board of health. The clerk of a city, recorder of a town, or the clerk of a township is the clerk of the local board.

It is only necessary for the board to elect a president or chairman from its members, and a health officer, to complete the organization of the board.

MEETINGS

Local boards must meet on the first Monday in April and October, and at such other times as may be necessary for the protection of the public health. Notice to all members must be given of all emergent meetings. The board cannot delegate any person or committee to do any act required to be done by the board.

Meetings of the board must be separate and distinct from meetings as trustees. When in session as trustees they must adjourn and reconvene as a local board. This, for the reason that the local board is created, and derives its power, under a different statute than that of trustees. They cannot act as a local board when sitting as trustees. It is important that these distinctions be understood and fully observed, as frequently large expenses are incurred by local boards, and the supreme court says such boards must act in the manner prescribed by statute.

The same rule applies to local boards of cities and towns.

All proceedings of a local board should be kept in a separate record and should embrace every action of the board.

COMPENSATION

The statute creating local boards makes no provision for the compensation of such boards, but it is provided in the Code that township trustees shall receive "for each day's services of eight hours necessarily engaged in official business, to be paid out of the county treasury, two dollars each." When engaged in the duties of a local board, the trustees are engaged in official duties imposed by the statute. The same rule applies to the clerk.

The statute provides that the local board shall fix the compensation of all persons employed by them in the execution of the health laws, of their own regulations, and regulations of State Board. The presumption of law is that these expenses are to be paid in the same manner as other expenses of the township. Whoever is employed, the employment must be by the local board, not by any member of the board, nor by a committee of the board.[1]

EXPENSES

The statute says all expenses incurred in the enforcement of the health law "shall be paid by the town, city, or township; in either case all claims to be presented and audited as other demands. In the case of townships the trustees shall certify the amount required to pay such expenses to the board of supervisors of the county, and it shall advance the same, and at the time it levies the general taxes, shall levy on the property of such township a sufficient tax to reimburse the county, which, when collected, shall be paid to and belong to the county."

REGULATIONS

Local boards must adopt such regulations as are necessary for the protection of their jurisdiction, regarding nuisances, sources of filth, and causes of sickness, etc., and also enforce regulations made by the State Board of Health.

Regulations when adopted must be put on record and public notice given by publication or posting. The State Board has prepared regulations suitable for posting in townships, which will be sent to local boards upon a request for circular No. 7.

It is not sufficient for a local board by resolution to merely adopt regulations of the State Board. The specific regulations must be named, a copy thereof marked for identification, and filed in the clerk's office, and the facts put on record.

To render one liable for violation of an order of a board of health there must be legal evidence that the order was made by the board. The mere service of notice is no evidence of the action of the board. There must be record evidence of the action of the board regarding the subject-matter, as the removal of a nuisance, or the incurring of expenses.

It is the duty of local boards as public officers to provide all possible protection to the lives and health of the people of their jurisdiction. The statute says they shall do this. For neglect of official duty they are liable to heavy penalty. Not only this, the courts have established the rule that the corporation of which they are such officers is liable to damages for injuries sustained by reason of neglect of official duty of such officers. Every stagnant body of water, with green slime throwing off noxious vapors and disease; every filthy, stinking alley with accumulated garbage and rotting manure; filthy stock yards; noxious waste from creameries; every cesspool and privy exhaling disease; every knacker plant, or every slaughter house, comes within the purview of the duties of a local board. A city or town may enforce regulations made by the local board of health by the enactment of an ordinance providing a penalty for any violation of such regulations.

1 The board of supervisors does not have the right to regulate the fees and charges of persons employed by the local boards of health.—*Tweedy v. Fremont County*, 68 N. W., 921.

Copies of such ordinance may be procured upon application to the secretary for circular No. 4.

JURISDICTION

Local boards have no jurisdiction beyond the limits of the territory of which they are the board. Where a town is within a township the township board has no jurisdiction within the town, except in a case when the town aforesaid owns and operates a cemetery within the township aforesaid, in which case the town has jurisdiction over said cemetery. It may quarantine against the town whenever deemed necessary. When a city or town includes an entire township, the local board of the city or town has superior jurisdiction.

While certain duties are devolved upon the mayor and clerk, under the law, these officers are subject to the general powers of the local board.

QUARANTINE

Quarantine applies to all institutions, public or private, city, county or state.

All expenses incurred by reason of quarantine must be by direct order of the local board, when in session, or by some regulation of the board duly made and recorded.

HEALTH OFFICER

The statute requires every local board of health to apppoint a "competent physician" as health officer. The provision is mandatory, not directory. The local board has no discretion in the matter; the statute says they *shall* appoint. The presumption of law is that he is to be the sanitary adviser and counsel of the board.

He should be competent to diagnose correctly all contagious aud infectious diseases. He should be a person of practical, professional experience, and of good judgment and discretion. He should be the most "competent physician" obtainable, as the statute makes competency the required qualification. It makes no difference to what school of medicine he belongs.

A physician who is a member of a local board may be also the health officer of the board, but he must be elected to the office.

The powers and duties of a health officer must be previously given by a local board when in session, and must be of record. He has power to do whatever is directed by the local board, not in contravention of the statute, the rules and regulations of the State Board, or the lawful powers of the local board.

He is an advisory counsel of a local board in sanitary matters, and not an executive officer, except when made such by formal action of the local board.

It is not his duty to attend persons quarantined for contagious diseases. The sick, when quarantined, may employ whom they please to attend them during sickness, except in the case of paupers, as provided in the Code, and neither the health officer nor local board can interfere. It is not his duty to assist an undertaker in preparing for burial the body of a person dead from contagious disease, unless so specially directed by the local board as a protective measure.

It is not his duty to verify the statement of an attending physician as to suspected cases of contagious disease. Whenever well authenticated symp-

toms lead to a certainty that the attending physician is in error in diagnosis, it is the duty of the board to direct the health officer, or other person, to visit the case, but such visit should not be made except after notice to the attending physician, and a courteous recognition of his professional rights.

It is not his duty to put up danger signals. That should be done by some police officer, constable or specially-delegated officer.

It is not his duty to disinfect quarantined premises. That should be done under the supervision of the attending physician, or some member of the board, acting by advice of the health officer. Upon the occurrence of small-pox within his jurisdiction, he must report the same by telegraph—if there be no telegraph, by mail—to the State Board, and this, whether the case be mild or severe, or modified by vaccination.

It is his duty to study the cause, rise, progress and decline of any epidemic disease in his jurisdiction, and report the same to the State Board, on subsidence of the disease.

It is his duty, by statute, to make a report to the state board on blank forms furnished by the State Board, of statistics concerning the jurisdiction of which he is health officer. If he is the health officer for a township and a city or town within a township, or more than one township, he must make a separate report for each board, just as distinct and separate as though made by different persons.

He must be a lawful physician—holding a certificate of authority to practice medicine from the State Board of Medical Examiners. The State Board of Health will not recognize any but lawful physicians as health officers of local boards. It is doubtful if a local board can appropriate public money to pay for the services of a person not lawfully qualified to perform the service.

He is a public officer and must take the oath required of every civil officer before entering upon the duties of his office. He must be a citizen of the State, but not necessarily an elector or voter of the place where he is elected; hence he may be the health officer of more than one local board.

No compensation is fixed by statute. That must be done by the local board. If given an annual salary, such salary will be deemed by law in full compensation for all services rendered in connection with the duties of his office, unless the board otherwise provide. The presumption of law is that his compensation will be paid in the same manner as other expenses of the city or township, except in cases of quarantine of contagious diseases, the expenses of which are to be paid by the county if the persons quarantined are unable to pay.

NUISANCES

Local boards must make such regulations respecting nuisances, sources of filth, and causes of sickness as are necessary for the protection of the public health.

While the statute gives the board the discretionary exercise of judgment as to what they may deem necessary for the public health, the intent and purpose of the whole statute is the protection of the public health, and it is mandatory. The statutes have defined clearly what are nuisances.[1]

1 Code, section 5078: "The erecting, continuing or using any building or other place for the exercise of any trade, employment or manufacture, which, by occasioning noxious exhalations, offensive smells or other annoyances, becomes injurious and dangerous to the health,

A nuisance is anything done or permitted which injures or annoys another in the enjoyment of his legal rights. Every person has the legal right to the fullest enjoyment of his life and health. Therefore, anything which injures or annoys the puplic in the enjoyment of life or health is a nuisance, which it is the duty of a local board to abate. With nuisances

comfort or property of individuals or the public; *the causing or suffering any offal, filth or noisome substance to be collected or to remain in any place, to the prejudice of others*; the obstructing or impeding without legal authority the passage of any navigable river, harbor or collection of water; or the corrupting or rendering unwholesome or impure the water of any river, stream or pond; * * * are nuisances."

"Where an indictment charged that the defendant 'unlawfully and injuriously did erect, continue and use a certain enclosure, or pen, in which cattle and hogs were confined, fed and watered, and the excrement, decayed food, slops and other filth were retained,' whereby were occasioned 'noxious exhalations and offensive smells, greatly corrupting and infesting the air; and other annoyances dangerous to the public health, comfort and property of the good people residing in that immediate neighborhood,' it was *held* that the acts charged constituted a public, indictable nuisance, both under this section (4089) of the statute, and at the common law."—*The State v. Kaster*, 35 Iowa Supreme Court Reports, 221.

Any use of property, or any trade, that corrupts the atmosphere with smoke, noxious vapors, noisome smells, dust, or other substances or gases producing injury to property or to health, or impairing the comfortable enjoyment of property, is a nuisance.—Wood on Nuisances, page 574, section 531.

Where defendant erected stock yards so near plaintiff's dwelling, and so kept them, that the odors therefrom were not only an annovance, but were unwholesome, threatening the health of plaintiff and his family, *held* that the defendant could not escape liability on the ground that the yards were necessary to the operations of the road, and that the odors could not be avoided.—*Shively v. Cedar Rapids, I. F. & N. W. R. R. Co.*, 74 Iowa, 170.

Meeker v. Rensselaer, 14 Wend., 397.

In the case of *City of Salem v. Eastern Railroad Company*, the supreme court of Massachusetts (98, page 443) under a statute which is a verbatim copy of the Iowa statute, held that the adjudication of the board that a nuisance exists is conclusive, and no appeal lies therefrom. The board should keep an accurate record of their proceedings, and all adjudications should appear therein in clear and distinct language. It is not the purpose of the order to direct in what mode the person should proceed to remove the nuisance. It should direct the end to be accomplished, leaving the party to adopt any effectual mode he may choose. If the owner or occupant neglects to remove the nuisance, the board are at liberty to enter upon private property, where it exists, and take such measures as they may see fit for its removal.

The court further says, in relation to boards of health: "Their action is intended to be prompt and summary. They are clothed with extraordinary powers for the protection of the community from noxious influences affecting life and health, and it is important that their proceedings should be embarrassed and delayed as little as possible by the necessary observances of formalities. Although notice and opportunity to be heard upon matters affecting private interests ought always to be given when practicable, yet the nature and object of those proceedings are such that it is deemed to be most for the general good that notice should not be essential to the right of the board to act for the public safety. Delay for the purpose of giving notice, involving either of public notice or of inquiry to ascertain who are the parties whose interests will be affected, and further delay for such hearings as the parties may think necessary for the protection of their interests, might defeat all beneficial results from an attempt to exercise the powers conferred upon boards of health. The necessity of the case, and the importance of the public interests at stake, justify the omission of notice to the individual.

"Notice must be given of general regulations prescribed by the board before parties can be held in default for a disregard of their requirements. No previous notice to parties so to be affected by them is necessary. They belong to that class of police regulations to which all individual rights of property are held subject, whether established directly by enactments of the legislature, or by its authority through boards of local administration."

Shuster v. Met. Board of Health, 49 Barb. (N. Y. S. C.), 450; Wood on Nuisances, sections 494, 504, 525.

A slaughter house in a city or public place, or near a highway, or where numerous persons reside, is *prima facie* a nuisance.—*Bushnell v. Robeson & Co.*, 62 Iowa, 540.

Wood on Nuisances, section 837.

affecting only private interests, local boards have nothing to do, as where A complains that a schoolhouse privy, situated just across the street from his residence, is unsightly. The order of the local board for its removal must be upon the ground that it is dangerous to the public health.

If a local board of health finds any decomposing or offensive matter upon private property, which, in their opinion, is injurious to the public health; or if a local board of health at one of its meetings should, upon investigation, find and determine that the emptying of refuse matter into a river, or into any passage-way which conducted it into the river, was causing a nuisance dangerous to health and life, or that such refuse matter was being disposed of in any other such way as to cause a nuisance, the board must make a record of that fact and order the owner of the property, place or building, to remove the nuisance or cause of sickness within twenty-four hours, or such other time as is deemed reasonable. After notice is served in accordance with the statute, if the owner or occupant fails to comply with such order, then the board can lawfully make another order directing the removal of the nuisance or cause of sickness, and provide that the expense thereof shall be paid by the owner, occupant or other person who caused or permitted the objectionable conditions. The local board can then take such reasonable steps as are deemed proper to summarily and promptly execute this order, and the expense of the same can afterwards be recovered against the party whose duty it was in the first instance to remove the nuisance or cause of sickness.

This work of removal or prevention must be executed with as little damage as possible to the owner of the property or others, consistent with the imperative demand of safety to the lives and health of the inhabitants. But the controlling motive must be this safety, and to the extent that the objectionable conditions threaten it. To that extent they must be removed or prevented, whatever the consequences to individuals may be.

The board of health should be careful to keep a full and accurate record of its proceedings. All jurisdictional requirements should be stated in the record, and the finding of facts should be clearly stated therein. The adjudications of the board should be stated in unmistakable language.

The power of the board of health is extraordinary, and its exercise may result disastrously to individual interest; but the emergencies that confront the board are very great, involving the destruction of health and life. In this conflict individual interest must yield, and the public welfare have sway.

It is undoubtedly the intention of the Code contained in section 2573 to leave it to the owner or occupant to cause this removal or prevention with as little injury to himself as possible, and to leave it to him to determine what method he will adopt, requiring only that this method shall be effectual. If he fails to act within the time designated, then the board must act.

A local board has no authority to order a business closed or stopped. The power is vested in the courts, but has power to require that it shall be conducted in a clean and wholesome manner, and not offensive to the public.

SCHOOLS

When a contagious disease appears in a community the schools should not be closed unless the sick outnumber the well, and the school becomes decimated. By closing the schools the children are thrown together by inter-

visiting and play, and the risk of exposure thereby is greatly increased. By continuing the school and isolating the sick the danger of exposure is greatly decreased.

If a pupil is affected the teacher must immediately remove such pupil from the school, and unless the other children in the family go from home to live, they, also, must be excluded from the school. The exclusion of pupils is a part of the quarantine regulations, with which neither the attending physician, school directors, nor even health officers can interfere.

Should any pupil be attacked with any infectious disease in any schoolroom all the pupils in such room shall at once be dismissed and the schoolroom remain closed until thoroughly disinfected.

If a teacher is boarding in a family wherein is a contagious disease he must immediately change his boarding place.

While schoolhouses are by law in the control of school directors, it is within the power of a local board of health to prohibit their use whenever it is deemed necessary for the protection of the public health, and it is their duty to so prohibit their use. For more specific directions relative to schools ask the secretary of the State Board of Health for circular No. 3.

QUARANTINE EXPENSES

Local boards must provide by regulations for furnishing supplies, nurses, medical attandants, etc., where quarantine is established, otherwise they will fail to receive the expense thereof from the county. The mayor, clerk or health officer have no authority to incur such expense.

If a local board has neglected to make such provision and a contagious disease appears in their jurisdiction, the board must convene immediately and make the necessary provision for the care of the sick, nurses, etc., and make such orders as are necessary for the suppression of the disease. This cannot be done by any member of the board nor by a committee of the board, except upon direct order of the board. The supreme court has so decided.

PENALTY

The Code, section 2573, makes the following provision for violation of regulations of the State Board and of local boards:

"Any person being notified to remove any nuisance, source of filth or cause of sickness, as in this chapter provided, who fails, neglects or refuses to do so after the time fixed in such notice, or knowingly fails, neglects or refuses to comply with and obey any order, rule or regulation of the State or local board of health, or any provision of this chapter, after notice thereof has been given as herein provided, shall forfeit and pay the sum of twenty dollars for each day he refuses such obedience, or for each day he knowingly fails, neglects or refuses to obey such rule or regulation, or knowingly violates any provision of this chapter, to be recovered in an action in the name of the clerk of the board, and, when collected, to be paid to the clerk of the town, city or township, as the case may be, and for its benefit; and, in addition thereto, anyone so offending, or knowingly exposing another to infection from any contagious disease, or knowingly subjecting another to the danger of contracting such disease from a child or other irresponsible person, shall be liable for all damages resulting therefrom, and guilty of a misdemeanor."

PROSECUTIONS

The attorney-general gives it as his opinion that under the statute it is a criminal offense for any person to violate regulations and rules made by a local board. This includes disobedience to quarantine lawfully established. It is also the duty of the county attorney to give advice and council to the local boards of health, and to prosecute persons who violate the rules of the board of health and refuse to obey the order of quarantine. The proceedings to impose a fine should be brought by information in the name of the State, it being a criminal action.

When information is filed, notice must be given the county attorney of the time and place of hearing.

The Code has the following as to the duty of local boards in relation to the rules and regulations of the State Board:

SEC. 2572. Local boards of health shall obey and enforce the rules and regulations of the State Board; and peace and police officers within their respective jurisdictions, when called upon to do so by the local boards, shall execute the orders of such board.

REPRINT FROM CIRCULAR 3

The following, in regard to the right of the State Board of Health to require as a condition of attendance upon the schools of Iowa, satisfactory evidence of successful vaccination, will be of interest.

A local newspaper contained this item:

The question of compulsory vaccination has at last been carried into the courts and there decided. The circumstances are of interest. The local board of health of Shelby, in compliance with the directions of the State Board of Health, ordered all the scholars in the Shelby public schools to be vaccinated on or before January 1, 1895, or be excluded from the schools. About two hundred and fifty children complied with the order of the local board, while the parents of some ten of the pupils put on war paint and refused to have their children vaccinated, whereupon they were duly sent home and forbidden to re-enter school, until they should be vaccinated. Their parents carried it into the courts, sueing out an injunction against the local board of health of the town of Shelby, and on last Saturday the local board and their opponents appeared in court at Harlan, before Judge Macy, who, after hearing the evidence, sustained the local board of health of the town of Shelby.

This, we believe, is the first case in the state of Iowa, and the fight was made on the constitutionality of the regulations of the State Board of Health as having the power to exclude children from school who refuse to be vaccinated. This is a very important decision and will tend to quiet those who are always ready to oppose good health regulations.

A request was made by the secretary, of Judge Macy, for a copy of his opinion in the case above cited, to which he replied as follows:

HARLAN, IOWA, February 4, 1895.

Dr. J. F. Kennedy, Des Moines, Iowa:

MY DEAR SIR—Your letter at hand. I can only hurriedly answer. The opinion I rendered was oral, and I have not before me even the notes and citations I used. I have no doubt about the points involved. The legislature provides for the State Board of Health, and committed to it general powers with regard to health protection. That legislation does not contravene the principle of constitutional law that the right of authority of the legislature to pass or enact laws does not give that body authority to delegate the power to another body or branch of the government. The protection of health and morals of the citizens comes within police regulation, and the State Board can enact rules and regulations upon the matter of preserving the public health, and if they are not oppressive, whimsical, discriminating, but reasonable and just, and apply to all, will be sustained.

N. W. MACY.

When the State Board in November, 1899, ordered general vaccination, and re-vaccination when deemed necessary, attorney-general Milton Remley

furnished the secretary the following, as his views from a legal standpoint of the right of the State Board to make such an order, and of the duty of local boards to enforce it:

It is claimed that compulsory vaccination is an invasion of the person of the individual. People submit to laws imposing burdens in the form of taxation and restraints upon their conduct or action with comparative equanimity, but when the enforcement of a law touches their person they are disposed to consider it a personal indignity. In such cases resentment and indignation often arise to the exclusion of reason and judgment. The power of the State to require all persons to be vaccinated, when the necessity therefor arises, is the same power as that exercised when whole blocks of buildings are torn down or blown up to stop the spread of a conflagration. It is the same kind of power as that which arrests and confines an insane person, or one who, for any cause, is a menace to others. It is called the police power of the State. "Public safety is the supreme law," is a maxim left us by the Romans. In times of danger to the public all things must yield to the demands of public welfare. No one having the smallpox would be permitted to parade the populous streets, spreading contagion everywhere. If under no statute law he could be restrained, he would be restrained by force; his life even would be taken, if necessary, under the law of self-protection or public safety, which is instinctively recognized by every human being.

The power to restrain one already infected with the disease, and the power to compel one to an act which will prevent him from becoming infected, are one and the same—only differing in degrees.

The power of a state to require all persons to be vaccinated, when danger threaten, has not been directly determined by any court, to my knowledge, except in the case of *Morris v. City of Columbus*, by the supreme court of Georgia, which was decided a little more than a year ago. The constitutionality of the law was upheld by the court in a very able opinion, in which the principles of the law are clearly stated, and the authorities are cited and reviewed. Other courts have upheld laws involving the same principle and powers, but space will not permit me to review them. It will well pay any one interested in the subject to read the Morris case. It is reported in 30 S. E. R., 850.

The State of Iowa has not authorized city councils to determine when the necessity arises for vaccination of the public generally, or the people of a city, as has the state of Georgia. Nor has it empowered school boards to require the vaccination of the pupils as have Pennsylvania and some other states. The duty of determining what is necessary to be done to preserve, to protect public health, and when it is to be done, has been entrusted by the legislature to the boards of health, state and local. From the necessity of the case such matters must be left to the local authorities to a large extent. It is competent for the legislature to clothe boards of health or town councils, or whatever agents may be selected, or by what name they may be called, with power to take whatever steps the emergency or conditions demand to protect the public health. The legislature of this state has given this power to the boards of health, and I am thoroughly convinced that every reasonable order made by the boards of health will be upheld by the courts, even to the extent of requiring all persons not immune, in a community threatened with the dread scourge, to be vaccinated. The reasonableness of any order depends, of course, upon the necessity for it, the proximity of the danger. Many considerations enter into the problem of what is reasonable. Care should, in all cases, be taken not to exceed the bounds of reasonableness. But when the necessity arises the matter should be taken hold of kindly, but with a firm hand and in a heroic manner, remembering that "*salus populi suprema est lex.*"

CIRCULAR No. 3. 1901

REVISED EDITION

RESTRICTION AND PREVENTION OF CONTAGIOUS DISEASES IN THE PUBLIC AND PRIVATE SCHOOLS OF IOWA

OFFICE OF THE STATE BOARD OF HEALTH,
DES MOINES

At a meeting of the Iowa State Board of Health, held March 24, 1898, the following rules, as revised by the committee on publications and papers,

were adopted for the restriction and prevention of contagious diseases in the public and private schools of this state, pursuant to authority vested by chapter 16, title 12 of the Code, and the same are binding upon boards of health, school boards, teachers, and all persons throughout the state.

By order of the board,

J. I. GIBSON,
President.

J. F. KENNEDY,
Secretary.

RULES

RULE 1. Every person entering any public or private school of Iowa must give satisfactory evidence of protection by vaccination.

RULE 2. The fact of vaccination and protection must be entered with each name on the school record, and on transfer and promotion lists.

Order of Vaccination—At a meeting of the State Board of Health, February 2, 1894, for the purpose of preserving and improving the public health and of preventing the spread of the disease known as smallpox, the following rules and regulations were ordered:

First—All persons in this state over the age of one year, who have not been vaccinated, or who in the opinion of the local board of health of the district or jurisdiction in which such persons reside or are found, do not furnish satisfactory evidence of protection from smallpox, are hereby ordered to be vaccinated.

Second—Local boards of health and all officers who compose said boards, and all sheriffs, constables, city marshals and police officers, within their respective jurisdictions, are hereby directed to enforce the foregoing order as soon as practicable, and so far as said order shall apply to the pupils of any public or private school or to the teachers thereof. The officers of the school district in which such school is held shall also require its enforcement.

RULE 3. Persons affected with diphtheria (membranous croup), measles, mumps, rotheln, scarlet fever (scarlatina, scarlet rash), whooping cough, smallpox, Asiatic cholera, typhoid fever, or leprosy, must be excluded from school until upon a certificate from the attending physician, showing complete recovery, thorough disinfection of his or her person and clothing, and the disinfection of the home, the mayor or township clerk, as the case may be, issues a written permit for their readmission, after the quarantine rules of this board have been first complied with. All other persons from families where such diseases exist shall also be excluded from the schools until they are furnished with a permit as above required.

RULE 4. Every school teacher who discovers among his or her pupils a case of these contagious diseases, must immediately report the fact to the mayor or township clerk, as the case may be; also, to the superintendent or principal of the school, and to the parents of the children, and must send the pupils thus afflicted to their homes at once. Teachers must not visit premises wherein are children sick with any contagious disease, and must carefully avoid exposure to such diseases.

RULE 5. If a person is ascertained to have attended school when affected with either of these contagious diseases, the local board of health shall immediately close the room wherein such person attended until it has been properly disinfected.

In case of an outbreak of smallpox in any community, or a threatened outbreak, every child attending the schools and every *teacher* must be examined relative to having been successfully vaccinated, and if they have not been vaccinated they must be excluded from the schools until so protected. This vaccination should include the community generally, as far as possible.

EARLY SYMPTOMS OF CONTAGIOUS DISEASE

Smallpox—This disease, though highly contagious, is comparatively rare, owing to the fact that vaccination is a safe preventive. Its early symptoms are so nearly similar to those of some other diseases that only an experienced physician can properly diagnose it. Vaccination and re-vaccination are better in this disease than rules for diagnosis or for restriction.

Scarlet Fever—This disease is also called *scarlatina* and *scarlet rash*, both of which names are misleading, inasmuch as they are often used to express some harmless form of eruption. They are both accommodating terms for, and are identical with, scarlet fever. The disease is often sudden in its attack. There are nausea; vomiting; hot, dry skin; full, rapid pulse; high temperature; headache; flushed face; whitish coated tongue, with little red projections through the coating; very fine rash in the roof of the mouth; sore throat and pain in swallowing. Rash usually appears within the first twenty-four hours, first about the neck and face, and thence extends over the entire body. It is light red, uniformly smooth, and is followed by a white line, or mark, if the finger is passed over it. These symptoms may not all be present, nor in the order named. The characteristic symptoms are: Vomiting; high fever, setting in early; sore throat; whitish furred tongue; and appearance of fine rash within twenty-four hours.

Measles—The onset of this disease is similar to what is commonly called a "cold in the head." Eyes watery and red; watery discharge from the nose; fever; hoarse, dry, husky and painful cough; and eruption in the roof of the mouth, with or without sore throat. The eruption does not appear before the second or third day—first in the forehead and face—is in patches, and of a dull red color; and the skin has a roughened feel to the touch. The earliest initial symptoms are: Watery eyes, sensitive to the light; discharge from the nostrils; sneezing; rough, dry cough, with pain under the breast bone; the late appearance of the eruption, its occurring in patches, with interspersed spaces of healthy skin, and the roughened feel and swollen appearance of the skin.

Rotheln, or German Measles—This disease in its early symptoms occupies an intermediate place between scarlet fever and measles, without possessing the dangers of either. Hence it is better to mistake it for scarlet fever or measles and treat it as such than to mistake either measles or scarlet fever for rotheln, and treat them as such. It is highly contagious, and children so affected must be sent home, and only allowed to re-enter the school on a certificate, as required in rule 3. It should be treated by isolation and disinfection. The common symptoms are sore throat; watery eyes and nostrils; slight fever; an eruption appearing early on the neck and upper part of chest, rapidly spreading over the body and soon subsiding.

There is very little constitutional disturbance. Its characteristic symptoms are. Moderate amount of fever; early appearance of a fine rash resembling the so-called "scarlet rash," with early disappearance of same, and more or less swelling of the glands of the neck.

Diphtheria—This disease is especially characterized by precursory symptoms. There is more or less languor; impaired appetite; slight fever and restlessness for some days before the throat symptoms manifest themselves; and if diphtheria is prevalent in a community a child manifesting such symptoms should receive prompt attention and should excite serious apprehensions. In addition to these premonitory symptoms, the pulse is rapid and rather feeble; the throat and soft palate are red and moderately swollen; there is pain on swallowing fluids rather more than solids; putrid breath and the appearance upon the tonsils of whitish or ash-colored spots, which rapidly coalesce and form a thick, leathery, ash-colored membrane. If the air passages become involved, there is a croupous cough and breathing. The characteristic symptoms of diphtheria are: Languor and debility; redness, soreness and swelling of the throat; fetid breath; ash-colored spots running together, rapid, feeble pulse; and croupous symptoms if there is extension of the membrane into the air passages.

Membranous Croup so closely resembles diphtheria when the latter invades the air passages that the Board has included it in the rules and regulations for the restriction and prevention of diphtheria.

Whooping Cough—Whooping cough is an infectious disease. A pupil affected with it must be excluded from the schools until entire recovery. There is no necessity for quarantining the adult members of the family, or the premises, which should be placarded, and the children excluded from the schools and from public gatherings.

Typhoid Fever—This disease closely resembles diphtheria in the initial symptoms. There is languor, a tired feeling lasting many days; headache; wakefulness; frequent diarrhœa; tongue red, especially at tip and edges; tendency to bleeding at the nose; with fever, which gradually increases toward evening. There are no throat symptoms.

Typhoid fever is deemed to be the result of a special contagion present in the excreta of typhoid fever patients. The disease germ is multiplied after being thrown from the bowels, and finds its way into the intestinal track through water or food. The patient should be isolated from the well and all discharges be thoroughly disinfected and buried. The premises need not be quarantined.

Upon the outbreak of diphtheria or typhoid fever, the teacher, especially in country districts where the local board of health is too often ignorant or neglectful of its duty, should suggest, and, so far as possible, insist upon a careful inquiry into the source and healthfulness of the water supply. In nearly all such cases the drinking water is found contaminated, and its early discovery may prevent many other cases occurring.

Isolation—Isolation means the complete exclusion of all other persons from the sick except the nurse and attending physician; that the nurse shall be restrained from going to and from the premises, or mingling with the family; that all well persons shall be prevented from contact with bedding, clothing, food or other articles that have been used on or about the

sick. Where from necessity the parents or family are nurses, the isolation and quarantine applies to them.

When a contagious disease appears in a community the schools should not be closed unless the sick outnumber the well, and the school becomes decimated. By closing the schools the children are thrown together by intervisiting and play, and the risk of exposure thereby is greatly increased.

By continuing the school and isolating the sick the danger of exposure is greatly decreased.

If a pupil is affected the teacher must immediately remove such pupil from the school, and unless the other children in the family go from home to live, they, also, must be excluded from the school. The exclusion of pupils is a part of the quarantine regulations, with which neither the attending physician, school directors, nor even health officers can interfere.

Should any pupil be attacked with any infectious disease in any schoolroom all the pupils in such room shall at once be dismissed and the schoolroom remained closed until thoroughly disinfected.

If a teacher is boarding in a family wherein is a contagious disease he must immediately change his boarding place.

VACCINATION AND THE LAW

The following, in regard to the right of the state board of health to require as a condition of attendance upon the schools of Iowa, satisfactory evidence of successful vaccination, will be of interest.

A local newspaper contained this item:

The question of compulsory vaccination has at last been carried into the courts and there decided. The circumstances are of interest. The local board of health of Shelby, in compliance with the directions of the state board of health, ordered all the scholars in the Shelby public schools to be vaccinated on or before January 1, 1895, or be excluded from the schools. About two hundred and fifty children complied with the order of the local board, while the parents of some ten of the pupils put on war paint and refused to have their children vaccinated, whereupon they were duly sent home and forbidden to re-enter school until they should be vaccinated. Their parents carried it into the courts, sueing out an injunction against the local board of health of the town of Shelby, and on last Saturday the local board and their opponents appeared in court at Harlan, before Judge Macy, who, after hearing the evidence, sustained the local board of health of the town of Shelby.

This, we believe, is the first case in the state of Iowa, and the fight was made on the constitutionality of the regulations of the State Board of Health as having the power to exclude children from school who refuse to be vaccinated. This is a very important decision, and will tend to quiet those who are always ready to oppose good health regulations.

A request was made by the secretary, of Judge Macy, for a copy of his opinion in the case above cited, to which he replied as follows:

HARLAN, IOWA, February 4, 1895.

Dr. J. F. Kennedy, Des Moines, Iowa:

MY DEAR SIR—Your letter at hand. I can only hurriedly answer. The opinion I rendered was oral, and I have not before me even the notes and citations I used. I have no doubt about the points involved. The legislature provided for the State Board of Health, and committed to it general powers with regard to health protection. That legislation does not contravene the principle of constitutional law that the right of authority of the legislature to pass or enact laws does not give that body authority to delegate the power to another body or branch of the government. The protection of health and morals of the citizens comes within police regulation, and the State Board can enact rules and regulations upon the matter of preserving the public health, and if they are not oppressive, whimsical, discriminating, but reasonable and just, and apply to all, will be sustained. N. W. MACY.

When the State Board, in November, 1899, ordered general vaccination, and re-vaccination, when deemed necessary, Attorney-

General Milton Remley furnished the secretary the following, as his views from a legal standpoint of the right of the State Board to make such an order, and of the duty of local boards to enforce it:

It is claimed that compulsory vaccination is an invasion of the person of the individual. People submit to laws imposing burdens in the form of taxation and restraints upon their conduct or action with comparative equanimity, but when the enforcement of a law touches their person they are disposed to consider it a personal indignity. In such cases resentment and indignation often arise to the exclusion of reason and judgment. The power of the State to require all persons to be vaccinated, when the necessity therefor arises, is the same power as that exercised when whole blocks of buildings are torn down or blown up to stop the spread of a conflagration. It is the same kind of power as that which arrests and confines an insane person, or one who, for any cause, is a menace to others. It is called the police power of the State. "Public safety is the supreme law," is a maxim left us by the Romans. In times of danger to the public all things must yield to the demands of public welfare. No one having the smallpox would be permitted to parade the populous streets, spreading contagion everywhere. If under no statute law he could be restrained, he would be restrained by force; his life even would be taken, if necessary, under the law of self-protection or public safety, which is instinctly recognized by every human being.

The power to restrain one already infected with the disease, and the power to compel one to do an act which will prevent him from becoming infected, are one and the same—only differing in degrees.

The power of a state to require all persons to be vaccinated, when danger threatens, has not been directly determined by any court, to my knowledge, except in the case of *Morris v. City of Columbus*, by the supreme court of Georgia, which was decided a little more than a year ago. The constitutionality of the law was upheld by the court in a very able opinion, in which the principles of the law are clearly stated, and the authorities are cited and reviewed. Other courts have upheld laws involving the same principle and powers, but space will not permit me to review them. It will pay anyone interested in the subject to read the Morris case. It is reported in 30 S. E. R., 850.

The State of Iowa has not authorized city councils to determine when the necessity arises for vaccination of the public generally, or the people of a city, as has the state of Georgia. Nor has it empowered school boards to require the vaccination of the pupils as have Pennsylvania and some other states. The duty of determining what is necessary to be done to preserve, to protect public health, and when it is to be done, has been intrusted by the legislature to the boards of health, state and local. From the necessities of the case such matters must be left to the local authorities to a large extent. It is competent for the legislature to clothe boards of health or town councils, or whatever agents may be selected, or by what name they may be called, with power to take whatever steps the emergency or conditions demand to protect the public health. The legislature of this state has given this power to the boards of health, and I am thoroughly conviaced that every reasonable order made by the boards of health will be upheld by the courts, even to the extent of requiring all persons not immune, in a community threatened with the dread scourge, to be vaccinated. The reasonableness of any order, depends, of course, upon the necessity for it, the proximity of the danger. Many considerations enter into the problem of what is reasonable. Care should, in all cases, be taken not to exceed the bounds of reasonableness. But when the necessity arises the matter should be taken hold of kindly, but with a firm hand and a heroic manner, remembering that "*salus populi suprema est lex.*"

CIRCULAR No. 4. 1900

REVISED

ORDINANCE FOR THE PROTECTION OF PUBLIC HEALTH, AND RECOMMENDED BY THE STATE BOARD OF HEALTH FOR ADOPTION BY THE CITIES AND TOWNS OF THE STATE OF IOWA

SECTION 1. Be it ordained by the council of the.....of.....that it shall be the duty of every physician residing, or practicing, within the limits of this .....to give written notice to the mayor immediately, of any case of Asiatic cholera, smallpox, diphtheria, (membranous croup,) scarlet fever (scarlet rash, scarlatina), typhoid fever, measles or whooping cough that he may be called to attend professionally, and any physician who shall neglect, or refuse, to give such notice as herein required, within twenty-four hours after he shall first visit and ascertain the character of any such disease herein named, shall be fined not less than ten dollars nor more than twenty-five dollars for each and every day he so neglects to give such notice. In all cases where no physician is in attendance, it shall be the duty of any person having charge of, or being at the head of a family, or having the care or custody of any lodging rooms, to give notice in like manner as required herein of physicians, and anyone refusing or neglecting so to do shall be subject to like penalty.

SEC. 2. It shall be the duty of the mayor, upon receiving written notice of the existence of a case of Asiatic cholera, smallpox, diphtheria, (membranous croup,) scarlet fever (scarlet rash or scarlatina), to forthwith quarantine the premises; by serving written notice of such quarantine on the occupants thereof, and placing a danger card thereon; and take such measures as may be necessary and proper for the restriction and suppression of such disease; and to investigate all the circumstances attendant upon the occurrence of the same. He shall also make proper provision for care of the sick. Where the disease is measles or whooping cough, the premises shall not be quarantined, but they shall be placarded with the danger card, unless otherwise ordered by the local board of health.

And it shall be the further duty of the mayor to disinfect, or cause to be disinfected, the premises whereon such quarantined diseases have occurred, together with all infected furniture, bedding, clothing and other articles, as provided by regulations of the State Board of Health.

SEC. 3. For the purpose of this ordinance quarantine shall be deemed to be:

(1.) The placing upon such conspicuous place on each building, hall, lodging room or place wherein exists a contagious disease, as will best protect the public health, of a cloth or card not less than eighteen inches square, having imprinted thereon in large letters the word "Quarantine," the name of the disease, and the words, "No person shall be permitted to enter or

leave these premises except as provided by law, while it is quarantined, under the penalty provided by law."

(2.) The separation of the sick from all other persons, if possible, and from all persons except those in actual attendance.

(3.) The complete exclusion of all persons from the premises.

(4.) That no person shall leave said premises except the attending physician without a permit therefor signed by the mayor.

(5.) That no article that has been used on or about a person sick with a contagious or infectious disease shall be removed from the sick-room, nor from the premises, until the same has been properly disinfected.

SEC. 4. Nurses who have been employed to care for persons sick with a contagious or infectious disease may be released from quarantine when their services are no longer required, upon the order of the mayor. Before leaving the premises there must be thorough disinfection of their person and clothing.

SEC. 5. Isolation means the complete exclusion of all other persons from the sick except the nurse and attending physician; that the nurse shall be restrained from going to and from the premises, or mingling with the family; that all well persons shall be prevented from contact with bedding, clothing, food or other articles that have been used on or about the sick. Where from necessity the parents or family are nurses, the isolation and quarantine apply to them.

SEC. 6. Quarantine shall be established and maintained in each and every case for the period named herein, to-wit:

Scarlet fever—(Scarlatina, scarlet rash), thirty-five days.

Diphtheria)—(Membranous croup), thirty-five days.

Smallpox—Forty days.

Asiatic cholera—Twenty-one days.

SEC. 7. When a family is quarantined for diphtheria, the head of the family, or bread winner, may, at the discretion of the local board, have the privilege of attending to his regular business, and of going to and from his house only when complying with the following conditions, and the mayor shall issue a permit therefor.

First—He shall change his clothing before going to and leaving his home to go to his place of business.

Second—He shall wash his hands, face, head and beard with a two per cent solution of carbolic acid each time before leaving his home to go to his place of business.

Third—While in the house he shall not act as nurse or live in the same room with the sick person.

Fourth—He shall not attend any public meeting, or attend any place where persons are congregated.

Fifth—This privilege shall not be granted to school teachers, nor to any person whose business brings him in intimate contact with children.

SEC. 8. Whenever there is complete recovery or death of persons who have been sick with a contagious disease, and there are no further exposures thereto, the quarantine may be released, although the period prescribed herein has not elapsed. *Provided*, that no release of quarantine shall be permitted until at least seventeen days after the recovery of the last case, and proper disinfection of person and premises is made as hereinafter provided.

SEC. 9. After death or recovery of persons sick from contagious or infectious disease, the room, furniture, and other contents not to be distroyed, shall be thoroughly disinfected in accordance with regulations made by the State Board of Health.

If the disease was scarlet fever (scarlatina, scarlet rash) or smallpox the paper on the walls and ceiling, if any there be, shall be removed and completely burned. If the disease was diphtheria, typhoid fever or measles the paper on the wall shall be thoroughly dusted and brushed.

SEC. 10. No order for the release of quarantine shall be made by the mayor, except upon a report from the attending physician stating the number of persons on the quarantined premises sick with the infectious disease in question, their name, age and when the disease first appeared in each case, when recovered, and the means, if any, used for disinfection. IF THE MAYOR SHALL FIND THAT THE REGULATIONS OF THE STATE BOARD OF HEALTH RESPECTING QUARANTINE AND DISINFECTION HAVE BEEN COMPLIED WITH THE QUARANTINE SHALL BE FORTHWITH RELEASED. If the quarantine regulations have been complied with, and proper disinfection has not been done the mayor shall order it done under the supervision of the health officer or some other competent person and the quarantine shall be continued until it is done.

SEC. 11. No person shall give, lend or sell, or offer for sale any clothing or other articles liable to convey infection of any contagious disease unless the same have been disinfected and such disinfection approved by the mayor.

SEC. 12. If any person shall wilfully or maliciously remove or deface, or cause to be removed or defaced, any signal of danger, or cloth or card placed upon any quarantined premises, without proper authority as provided herein, he shall be fined not less than twenty-five, nor more than one hundred dollars, or imprisoned not less than five, nor more than thirty days, at the discretion of the court.

SEC. 13. If any person has attended school when affected with diphtheria, (membranous croup), scarlet fever (scarlatina, scarlet rash), smallpox or measles, the room in which such person attended shall be immediately closed until properly disinfected.

SEC. 14 It is the duty of every school teacher and school officer who discovers, or who has knowledge of a case of these contagious diseases, to cause the fact to be immediately reported to the mayor.

SEC. 15. During the existence of any contagious or infectious disease in any family or household, or place, in this.....and until after the recovery of the sick and the disinfection of the premises where such disease shall have existed, no person residing in such household, family or place, shall be permitted to attend any pubic meeting without written permission from the mayor, and no superintendent, teacher or officer of any school shall permit any child or person from any such family, household or place, to attend any school without a permit from the mayor, upon the recommendation of the attending physician showing thorough disinfection of the person, clothing and premises. And any person who shall knowingly violate any of the provisions of this section shall be fined not less than twenty-five nor more than one hundred dollars or be imprisoned not less than five, nor more than thirty days.

SEC. 16. When Asiatic cholera, smallpox, diphtheria, (membranous

croup), scarlet fever (scarlatina, scarlet rash), typhoid fever, leprosy, measles, or any other contagious disease exists in any house or dwelling-place of a dealer in, or seller of milk, he shall discontinue, and cease to give, or sell, or distribute milk to any person, or to creameries or butter factories, or in anywise handle such milk, until a permit is granted therefor by the mayor. And no person who attends cows, and does the milking, or who has care of milk vessels, or the sale or distribution of milk, shall be permitted to enter any premises or place wherein exists any of the diseases named herein, nor have any communication, direct, or indirect, with any person who resides in, or is an occupant of such infected place; nor shall any milk or butter be given away, sold or distributed from such infected place. And any person, either as principal, agent or employe, who shall violate any of the provisions of this section, shall be fined not less than twenty-five dollars, nor more than fifty dollars, or be imprisoned not less than five days, nor more than ten days, at the discretion of the court.

SEC. 17. No person, company, corporation, or association having charge of, or control of, any schoolhouse or church, or of any building, room, or place used for school or church purposes, or for any public assembly in this .....shall permit the body of any person dead from any of the contagious or infectious diseases named in this ordinance, or any other dangerous contagious disease, to be taken into such schoolhouse, church, building, room, or place, for the purpose of holding funeral services over such body; and no sexton, undertaker, or other person having charge of, or direction of, the burial of any body dead from any of the said diseases, shall permit the coffin or casket containing such body to be opened in the presence of any child, nor shall any child be permitted to act as pall-bearer or carrier at such funeral. Any person who shall violate, or cause to be violated, any of the provisions of this section shall be liable to a fine of not less than twenty-five dollars, or to imprisonment not less than five days, at the direction of the court.

SEC. 18. If any person, whether as owner, occupant, lessee, or agent, shall rent or lease, or permit the occupation by any person of any house, room, or place in which there have been any of the contagious diseases named in this ordinance, unless the same has been previously thoroughly disinfected, and such disinfection approved by the mayor, he shall be fined one hundred dollars, or be imprisoned thirty days, at the discretion of the court; and it shall be the duty of the mayor and sanitary police to maintain a danger signal upon any such premises, as provided in section three of this ordinance, until such disinfection be made.

SEC. 19. A body dead from smallpox must be immediately wrapped in a cloth saturated with the strongest disinfectant solution without previous washing, and buried deep, and no body dead from this disease shall, under any circumstances, or any lapse of time, be disinterred.

SEC. 20. The body of a person who has died from Asiatic cholera, yellow fever, leprosy, diphtheria (membranous croup), scarlet fever (scarlatina or scarlet rash) must not be removed from the sick room until it has been wrapped in a cloth saturated with a solution of corrosive sublimate (one ounce to six gallons of water), and then tightly inclosed in a coffin. The body shall then be buried immediately without the attendance of any person other than is necessary for the interment thereof.

SEC. 21. No public funeral shall be held of any person who has died from either of said diseases named in sections nineteen and twenty, and no public funeral shall be held in a house, nor on any premises where there is a case of, nor where a death has recently occurred from, either of said diseases.

SEC. 22. Any railroad car, street car, omnibus, cab, hack, or other vehicle, in which a person has been carried affected with any of the diseases named herein, shall be forwith removed from service and be disinfected before being used again. And any person, either as owner, lessee, agent, or employe, who shall violate the provisions of this section in the use of such vehicle, shall be fined not less than fifty dollars, nor more than one hundred dollars, or be imprisoned not less than ten days, nor more than thirty days, at the discretion of the court.

SEC. 23. Rules and regulations made by the State Board of Health and by the local board of health of this....., concerning Asiatic cholera, smallpox, diphtheria (membranous croup), typhoid fever, scarlet fever (scarlatina, scarlet rash), or other contagious or infectious diseases, shall be enforced by the mayor under the supervision of the health officer; and it shall be the duty of all police, and other public officers of this..... , in their proper capacity, to report to the mayor or health officer any violations of such rules and regulations, and to aid and assist the board of health the mayor, and health officer, in the enforcement of said rules and regulations.

SEC. 24. It shall be the duty of all police officers to observe the sanitary condition of their districts, and to report through their chief to the health officer promptly, any nuisance or accumulated filth found in any portion of the corporation.

SEC. 25. The mayor shall have authority to appoint sanitary police whose duty it shall be to aid in the establishment and enforcement of quarantine regulations, and such other sanitary regulations as may be provided by the local board and the State Board of Health, and at such time, and in such manner as the mayor or the health officer may direct. Said sanitary police shall visit each quarantined premises at least once each forty-eight hours, and at such other times as the mayor or health officer may direct. He shall see that strict quarantine is maintained, and the premises properly placarded. *Provided*, he shall not enter any dwelling or place unless so requested by the occupants thereof, nor shall he disturb the inmates or the sick unless he has good and sufficient reason to believe there is wilful violation of the quarantine regulations therein. He shall have full powers of a police officer to make arrests for violations of quarantine or health regulations, and shall file information against such offenders before the police court. He shall appear for duty at the office of the mayor on or before ten o'clock A. M. each day. His compensation shall be the same as that allowed other police officers.

BURIALS

SEC. 26. Upon the death of any person within the limits of this..... it shall be the duty of the physician who was attending at the time of death, or of the coroner, when the case comes under his official jurisdiction, to furnish within twenty-four hours after such death, to the undertaker, or other person superintending the burial of said decedent, a certificate setting forth the full name, age, sex, color, place of death, date and cause of death,

and such other facts as may be required by regulations of the State Board of Health and the statutes of the state of Iowa. If any person shall die without the attendance of a physician, or if the physician who did attend the decedent at the time of death shall neglect or refuse to give such certificate as aforesaid, it shall be the duty of the undertaker, or of any person acquainted with the facts, to report the same to the health officer of the local board of health, who is hereby authorized to give a certificate of death as aforesaid; *provided*, it be not a case requiring the attendance of a coroner.

SEC. 27. No sexton, or other person or persons, having charge or control of any cemetery, burying place, or tomb, or vault within the limits of this ..... or under the control of this ..... ; and no undertaker, or other person or persons, shall inter, entomb, or place in any vault within the limits of this ..... the dead body of any person, or remove such body from or out of the ..... without having procured a certificate of death as herein provided; and it shall be the duty of any undertaker, or other person or persons having charge of the burial or removal of the dead body of any person to deliver said certificate of death forthwith to the clerk of the local board of health.

SEC. 28. It shall be the duty of the clerk of the local board of health upon the presentation of a certificate of death in accordance with the provisions of this ordinance, and not otherwise, to issue a permit to inter, entomb, or place in a vault the body of the deceased person named in such certificate, and said clerk shall be entitled to charge and receive for issuing such permit a fee of ..... cents. *Provided*, a body dead from diphtheria (membranous croup), scarlet fever (scarlatina, scarlet rash), smallpox, Asiatic cholera, leprosy or typhus fever shall not be deposited in a receiving vault.

SEC. 29. Upon the presentation of the proper application in accordance with the regulations made by the State Board of Health for the removal of the dead body of a human being out of the limits of this ...., it shall be the duty of the clerk of the local board of health to issue a permit countersigned by the mayor for such removal. *Provided*, that where said body is to be disinterred such application must be accompanied with a disinterment permit from the State Board of Health, but no permit for such removal shall be granted in any case of a body dead from Asiatic cholera, smallpox, leprosy, typhus fever, or yellow fever, or from any sequela or complications of said diseases; nor shall any permit for such removal be granted in any case whatsoever where the cause of death was a contagious or infectious disease, or any sequela of such disease, unless the permit be approved and signed by the health officer of the local board of health, nor shall a permit be granted except upon the presentation of the proper certificate of the cause of death.

SEC. 30. The clerk of the local board of health shall enter in a suitable book to be kept for that purpose, a record of all burial permits issued, specifying the date of issue, to whom issued, together with all the items of information contained in the certificate upon which the permit was issued. And on or before the tenth day of each month he shall report to the State Board of Health the deaths and causes thereof for the preceding calendar month.

SEC. 31. No hack, omnibus, street car, or other closed vehicle used for the conveyance of the living shall be permitted to carry the body of any person dead from an infectious or contagious disease; nor with the knowledge of the owner, driver, or person in charge thereof, to carry any person or article liable to communicate the infection or contagion of such disease.

SEC. 32. Each undertaker or sexton, and every person engaged or concerned in the burial of the body of a human being in violation of the provisions of sections twenty-six, twenty-seven and thirty-one of this ordinance, and the owners, officers and employes of any transportation company, or any other person engaged or concerned in the removal of such dead body from the limits of this ..... in violation of any of the provisions of this ordinance, shall be fined not less than fifty dollars, nor more than one hundred dollars, or be imprisoned not less than ten days, nor more than thirty days, in the discretion of the court, for each offense.

SEC. 33. If any person shall neglect or refuse to furnish the certificate of death as required by section twenty-six of this ordinance, he shall be fined not less than five dollars for each offense. *Provided*, that this section shal not apply to coroners engaged in official investigation of a cause of death.

SEC. 34. If any physician, or any other person within the limits of this ..... shall knowingly attempt to secrete, or withhold the true character of any of the contagious or infectious diseases specified in this ordinance, or shall in any manner whatsoever attempt to deceive or defraud, or who shall make any false statement in making a certificate of cause of death as required by this ordinance, by giving any other than the true cause of such death; or, if the decedent was affected with any of such contagious or infectious diseases during his last sickness, he shall neglect or refuse to state such fact in such certificate, he shall be fined not less than twenty-five dollars, nor more than one hundred dollars, or be imprisoned not less than five days, nor more than thirty days, at the discretion of the court.

SLAUGHTER HOUSES

SEC. 35. No slaughter house shall be erected nor used within the limits of this.....unless a permit from the mayor has been first obtained, with the advice and assent of the health officer, and no slaughter house shall be erected, nor used within three hundred and twenty feet of any public highway, nor within six hundred feet of any dwelling house, schoolhouse or church, or any building used for church purposes. It shall be erected on dry, hard land that can be well drained. It shall be amply supplied with clean, wholesome water from springs, wells, or unpolluted streams. It shall be floored with a tight, solid floor of hard wood, or cement, or well-joined stone. The yards, sheds, and close pens shall be dry, and free from mud and filth, and their sides or walls shall be thoroughly whitewashed at least twice each year. All its apparatus shall be kept in a neat and orderly manner, and free from offensive smells. When the slaughtering for the day is completed, the sides and floor of the slaughter room shall be thoroughly washed with an abundance of clean water. No animal matter of any kind shall be permitted to remain in, under, or near the slaughter house to decompose or putrefy. When blood and offal, or immature animals are fed to swine on the premises, such arrangement shall be made that such material shall be speedily consumed. The blood of all slaughtered animals shall be conducted by a water-tight gutter to a water-tight trough in the hog-yard. The offal and

bodies of immature animals shall be thrown into a pen with a tight, dry floor, to be consumed at once by the swine; and all portions not consumed within twelve hours shall be removed from the pen, and be burned, buried or composted with fresh earth. When the blood or offal are not fed to swine on the premises, they shall be carried away each day in close tanks, or be converted into fertilizers, or otherwise utilized by some apparatus the gases from which shall be carried under the furnace and consumed. The fat, and all material from which fat or oil is to be extracted, shall be rendered within such a time after the slaughtering of the animals that no offensive odors shall arise from them, or from the process of rendering. Any person who shall violate any of the provisions of this section shall be fined not less than twenty-five dollars, nor more than one hundred dollars, or be imprisoned not less than five days, nor more than thirty days. And upon conviction thereof, all grants, licenses, or privileges contemplated herein shall be immediately revoked and annulled.

The provisions of this section, so far as practicable, shall apply to so-called "knacker's" plants, or plants for the disposal of the bodies of dead animals, and to premises used for the killing and shipment of poultry.

DISEASED ANIMALS

SEC. 36. Every person owning, or having the care or custody of any animal which he shall know, or have reason to suspect, is affected with glanders, farcy, anthrax, or any other contagious or infectious disease dangerous to the public health, shall immediately isolate such annimal from all other animals, and shall give notice thereof and of the location of such animal to the mayor. And no person having the care or custody of, or owning any animal affected with, or which there is good reason to believe is affected with such disease, shall lead, drive, or permit such animal to go on or over any public grounds, uninclosed land, or on any street, public highway, lane or alley; nor permit it to drink at any public water trough, pail or spring; nor to keep such diseased animal in any inclosure in or from which such diseased animal may come in contact with, or close proximity to, any animal not affected with such disease. And an animal will be deemed as "suspectcd" when it has stood in the stable with or been in contact with, an animal known to have any of said communicable diseases; or if placed in a stable, yard or other inclosure where such diseased animal has recently been kept. Whenever an animal affected with any of the diseases herein named shall die, or shall be killed, the body of such animal shall be immediately burned, or buried not less than four feet deep, without removing the hide from the carcass. All bedding, litter, excrement, etc., that have accumulated about such animal, together with all blood, or other fluid elements that have escaped from it shall be burned. Dirt floors of stables wherein such animal has been kept shall be removed to the depth of four inches and burned. Everything about the stable, combs, brushes, or any post or fence where it has stood, and every part of harness or wagon used with such animal, and the stable where it has been kept, shall be thoroughly disinfected under the direction of a duly qualified veterinary surgeon. Whenever the owner, or person having in charge any animal declared by the state veterinary surgeon or other authorized person to have the glanders, shall neglect or refuse to destroy said animal, the premises whereon said

animal is kept shall be quarantined until such animal is destroyed, and the premises thoroughly disinfected. And any person who shall neglect, or refuse, to obey any of the provisions of this section shall be fined not less than twenty-five dollars, nor more than fifty dollars, for each diseased animal, and for each day of such refusal, and for all damages that may result therefrom.

SEC. 37. The "quarantine" shall be construed to mean the perfect isolation of all diseased or suspected animals from contact with healthy animals; as well as the exclusion of such healthy animals from the yards, stables, enclosures or grounds wherever said suspected or diseased animals are, or have been kept.

SEC. 38. The flesh of pregnant animals must not be sold nor used for human food after the seventh month of pregnancy for cows, and the tenth week for sows.

NUISANCES

SEC. 39. (1.) No privy, vault, cesspool, nor reservoir into which a privy water closet, stable or sink is drained, except it be water tight, shall be established nor permitted within one hundred feet of any well, spring or other source of water used for drinking or culinary purposes.

(2.) All privy vaults, reservoirs or cesspools named in rule 1 must be cleaned out at least once each year; and from the first day of May to the first day of November of each year shall be thoroughly disinfected by adding to the contents thereof twice each month two pounds of copperas, dissolved in a pail of water, or the contents be thickly covered with fresh lime.

(3.) No privy vault nor cesspool shall open into any stream or ditch, nor into any drain except common sewers.

(4.) All sewer drains that pass within one hundred feet of any source of water used for drinking or culinary purposes shall be water-tight.

(5.) No sewer drain shall empty into any lake or pond, nor into any cesspool or abandoned well.

(6.) No offal or waste from any creamery shall be thrown upon or into any stream, ravine, open ditch or drain.

(7.) No house offal or dead animal shall be left upon any lot or land within this .....unless the same be buried. The carcass of all animals dead from an infectious or contagious disease shall be immediately burned. All cellars and outbuildings must be cleaned before the first day of May in each year.

(8.) Between the first day of May and the first day of November no hogs shall be kept within the limits of this.....except in pens with dry floors, or pens free from all filth and standing water. Cattle yards, barns and stables must be kept free from all filth and offensive odor.

Any person violating any of the provisions of this section shall be fined not less than five, nor more than fifty dollars, or be imprisoned not less than two nor more than fifteen days, and the court shall order the abatement of the nuisance at the cost of the defendant in substantially the manner provided in sections five thousand and eighty-one to five thousand and eighty-five, inclusive, of the Code of Iowa.

GENERAL PROVISIONS

SEC. 40. It shall be the duty of every police officer who has any knowledge of, or has good reason to believe, that any of the provisions of this

ordinance is being violated, to make report of same through his chief to the health officer of the local board of health.

SEC. 41. Any citizen who has reason to believe that any of the provisions of this ordinance is being violated may file an information under oath, describing the person and the offense charged, and it shall be the duty of the attorney of the.....forthwith to prosecute the same before the proper court.

SEC. 42. If any person by himself, or by his agent or employe, shall wilfully violate any of the provisions of this ordinance, where no other penalty is provided, he shall be fined not less than ten dollars, nor more than one hundred dollars, or be imprisoned not less than three days, nor more than thirty days, in the discretion of the court.

SEC. 43. This ordinance shall take effect and be in force on and after its publication.

NOTES

Local boards of health shall make such regulations as are necessary for the protection of the public health respecting *nuisances, sources of filth, causes of sickness, rabid animals and quarantine* NOT IN CONFLICT WITH ANY REGULATIONS OF THE STATE BOARD OF HEALTH. *Sec. 2568.*

While the statute gives the board discretionary exercise of judgment as to what they may deem necessary for the public health, the intent and purpose of the whole statute is the protection of the public health, and it is mandatory.

NUISANCES

(1.) Code, section 5078: "The erecting, continuing or using any building or other place for the exercise of any trade, employment or manufacture, which, by occasioning noxious exhalations, offensive smells, or other annoyances, becomes injurious and dangerous to the health, comfort or property of individuals, or the public *the causing or suffering any offal, filth or noisome substance to be collected or to remain in any place to the prejudice of others*, the obstructing or impeding without legal authority the passage of any navigable river, harbor or collection of water or the corrupting or rendering unwholesome or impure the water of any river, stream or pond, * * * are nuisances."

"Where an indictment charged that the defendant 'unlawfully and injuriously did erect, continue and use a certain enclosure or pen, in which cattle and hogs were confined, fed and watered, and the excrement, decayed food; slops and other filth were retained,' whereby were occasioned 'noxious exhalations and offensive smells, greatly corrupting and infesting the air; and other annoyances dangerous to the public health, comfort and property of the good people residing in that immediate neighborhood,' it was *held* that the acts charged constituted a public, indictable nuisance, both under this section (four thousand and eighty-nine) of the statute; and at the common law." *The State v. Kaster*, 35 Iowa Supreme Court Reports, 221.

Any use of property, or any trade, that corrupts the atmosphere with smoke, noxious vapors, noisome smells, dust, or other substances or gases producing injury to property or to health, or impairing the comfortable

enjoyment of property, is a nuisance. Wood on Nuisances, page 574, section 531.

Where defendant erected stock yards so near plaintiff's dwelling, and so kept them, that the odors therefrom were not only an annoyance; but were unwholesome, threatening the health of plaintiff and his family, *held* that the defendant could not escape liability on the ground that the yards were necessary to the operations of the road, and that the odors could not be avoided.

Shively v. Cedar Rapids, I. F. & N. W. R. R. Co., 74 Iowa, 170.
Meeker v. Rensselaer, 14 Wend., 397.

In the case of *City of Salem v. Eastern Railroad Company*, the supreme court of Massachusetts, (98, page 443), under a statute which is a verbatim copy of the Iowa statute, held that the adjudication of the board that a nuisance exists is conclusive, and no appeal lies therefrom. The board should keep an accurate record of their proceedings, and all adjudications should appear therein in clear and distinct language. It is not the purpose of the order to direct in what mode the person should proceed to remove the nuisance. It should direct the end to be accomplished, leaving the party to adopt any effectual mode he may choose. If the owner or occupant neglects to remove the nuisance, the board are at liberty to enter upon private property, where it exists, and take such measures as they may see fit for its removal.

The court further says, in relation to boards of health: "Their action is intended to be prompt and summary. They are clothed with extraordinary powers for the protection of the community from noxious influences affecting life and health; and it is important that their proceedings should be embarrassed and delayed as little as possible by the necessary observances of formalities. Although notice and opportunity to be heard upon matters affecting private interests ought always to be given when practicable, yet the nature and object of those proceedings are such that it is deemed to be most for the general good that notice should not be essential to the right of the board to act for the public safety. Delay for the purpose of giving notice, involving either of public notice or of inquiry to ascertain who are the parties whose interests will be affected, and further delay for such hearings as the parties may think necessary for the protection of their interests, might defeat all beneficial results from an attempt to exercise the powers conferred upon boards of health. The necessity of the case, and the importance of the public interests at stake, justify the omission of notice to the individual.

"Notice must be given of general regulations prescribed by the board before parties can be held in default for a disregard of their requirements. No previous notice to parties so to be affected by them is necessary. They belong to that class of police regulations to which all individual rights of property are held subject, whether established directly by enactments of the legislature, or by its authority through boards of local administration."

Shuster v. Met. Board of Health, 49 Barb. (N.Y. S. C.), 450.
Wood on Nuisances, sections 494, 504, 525.

A slaughter house in a city or public place, or near a highway, or where numerous persons reside, is *prima facie* a nuisance.

Bushnell v. Robson & Co., 62 Iowa, 540.
Wood on Nuisances, section 837.

CITIES AND TOWNS SHALL HAVE POWER TO ABATE NUISANCES—CODE, SECTION 696

The power to abate nuisances does not enable the council to determine conclusively that a particular thing constitutes a nuisance; and if it orders the removal of a thing which is, in fact, not a nuisance, the person causing its removal will be individually liable in damages.

Cole v Keglar, 64 Iowa, 59.

The power given in relation to nuisances is to abate them, and in the exercise of this power a city cannot provide for the punishment by fine of one who maintains a nuisance.

Nevada v. Hutchins, 59 Iowa, 506.

Under the authority of section 696 a city cannot by ordinance provide for the imposition of fines against persons committing a nuisance. The power of the city is limited to the abatement of such nuisances.

Knoxville v. C., B. & Q. Ry. Co., 83 Iowa, 636.

The power to suppress does not imply the power to punish, and must be exercised in such way that suppression shall be the direct, and not merely the incidental, result of the exercise of power.

Charlton v. Barber, 54 Iowa, 360.

A municipal corporation is not authorized to bring an action in equity to enjoin and abate a nuisance on the ground that it is injurious to its citizens, and the authority given by section six hundred and ninety-six must be exercised through the medium of an ordinance, and not by equitable proceedings in court.

Ottumwa v. Chinn, 75 Iowa, 405.

A regulation adopted by a local board of health, and enforced by ordinance, prohibiting hogpens, except for the purpose of commerce, in cities of fifteen thousand inhabitants, is not unreasonable, even though it thereunder becomes a misdemeanor to keep in such city a clean and inoffensive pen with but one hog therein.

Cedar Rapids v. Holcomb, 68 Iowa, 107.

QUARANTINE

The city is not responsible to individuals for the neglect or nonfeasance of its agents or officers in executing the powers there conferred.

Ogg v. Lansing, 35 Iowa, 495.

The board of health may, under section two thousand five hundred and seventy, erect a temporary building to which infected persons may be removed for isolation, and the county will be liable for the expenses thereof in case of the inability of the infected person or persons to pay such charge.

Staples v. Plymouth County, 62 Iowa, 364.
Clinton v. Clinton County, 61 Iowa, 205.
Gill v. Appanoose County, 68 Iowa, 20.

The board will not be bound by the actions of individual members in authorizing a physician to render services. Such action must be by the board as a body.

Young v. Black Hawk County, 66 Iowa, 460.

SLAUGHTER HOUSES, REGULATION OF

Code section six hundred and ninety-six. See cases cited under "nuisances."

DISEASED ANIMALS

Punishment for knowingly bringing within the state, or harboring therein. Code, section five thousand and twelve to five thousand and nineteen inclusive.

Diseased animals may be killed. Code, sections two thousand three hundred and thirty-nine, two thousand five hundred and thirty-four.

BURIAL OF THE DEAD

Cities and towns have power to regulate the burial of the dead. Code, section six hundred and ninety-seven.

Local boards of health shall regulate cemeteries and burial of the dead. Code, section two thousand five hundred and sixty-eight.

CIRCULAR No. 5, 1900.

INFORMATION WITH RECOMMENDATIONS RESPECTING TUBERCULOSIS

PREFATORY

The Iowa State Board of Health, as created by law, is the guardian of the public health within the state. This circular is issued to inform the people that tuberculosis, an infectious disease which exists throughout the state, is causing more human suffering and greater loss of life among our people than any other existing disease, and to advise them how to prevent its spread.

Tuberculosis, properly, should be subject to quarantine restrictions; and its control should be a parf of the duties of state and local boards of health in order that such boards may fulfill their mission in the sanitary world.

With this conviction this circular is placed before the people of the State with the hope that it may be given the widest possible circulation.

Tuberculosis, more commonly called consumption, has existed from a very early period in the world's history. Owing to its prevalence, its insidious approach, its easy communicability and its great fatality, it becomes necessary that the people of Iowa should enlighten themselves as to the nature of the disease and its prevention.

Tuberculosis is an infectious disease, due to the presence and action of a germ—the *bacillus tuberculosis*. The disease is characterized by the presence of nodules called tubercles, which may undergo certain changes, become cheesy, hard and calcified, or ulcerating and breaking down form abcesses.

It is estimated that nine persons, on an average, die daily of tuberculosis in Iowa!

Tuberculosis affects man and animals alike. Hence, the disease may be transmitted from man to man, animal to animal, man to animal, and *vice versa*. It is transmitted by inhalation, injection and inoculation. A tuberculosus patient may, by expectorating, coughing, sneezing, or through the excretions of the body, infect the house in which he or she lives, so that the air is constantly impregnated with the tubercle bacillus, and persons associating or living with such patient or in such infected premises, are constantly in danger of contracting the disease.

Recognizing these facts, the State Board of Health of Iowa has placed tuberculosis on the list of infectious diseases, and recommends that local boards of health deal with deceased persons and infected premises accordingly.

The greatest source of infection to man is the tuberculous human patient, and the next greatest is the tuberculous bovine.

The milk of a tuberculous cow is a great menace to the health and life of its consumer. Sterilization of such milk will prevent the spread of tuberculosis by destroying the germs, but it will not make such milk a good food for those who consume it. The flesh of a tuberculous animal, when eaten rare, is dangerous; but, if well cooked, cannot transmit the disease. The flesh and milk of tuberculous animals contain tuberculin as manufactured by the tubercle bacillus, which is an intestinal irritant, and consequently such meat and milk must be classed as inferior food, and dangerous to a delicate consumer.

Tuberculosis in our bovine herds causes unthriftiness, the loss of many valuable animals, and is a constant menace to human life. Instances are recorded where tuberculosis in a bovine has been rapidly spread through a herd of hogs, thereby causing financial loss. The government inspectors at the abattoirs are daily consigning the carcasses of hogs to the fertilizing tanks because of this disease. From a financial standpoint it would pay our cattle owners to test their herds and get rid of the disease, and thereby prevent such losses.

PREVENTION

Prevention is infinitely better than cure. Tuberculosis is preventable, just as other germ diseases are. By testing our dairy herds we remove a fruitful source of infection to man and domestic animals.

By restricting tuberculous persons in their habits we remove the greatest source of infection to mankind. Such restrictions should be as follows:

No tuberculous person should be permitted to sell meat or milk.

No tuberculous person should be permitted to spit in any premises or upon the public highways.

No tuberculous person should be permitted to drink from a public drinking cup.

No tuberculous person should be permitted to teach in public or private schools.

No tuberculous person should be permitted to nurse the sick.

No tuberculous person should be permitted to sleep in the same room with other persons or children.

No tuberculous mother should be permitted to nurse her child.

DIRECTIONS FOR THE CARE OF TUBERCULOUS PATIENTS

1. Try to have the patient hopeful and anxious for recovery. Let all attendants be cheerful, encouraging the patient at all times. A cheerful, hopeful patient has much better chances for recovery than a despondent patient.

2. Have the patient live in the open air as much as possible, avoiding damp or dusty atmosphere, and taking what exercise he or she can endure without causing exhaustion. Plenty of sunlight is good for the patient, protecting the head from the hot sun while giving the body a sun bath. Teach the patient to inspire a deep, full breath through the nostrils, retaining the same for as long a time as is convenient before expirating, which should be through the nostrils.

3. Have the patient warmly clad in woolen garments, so as to prevent chilling or taking cold.

4. Give the patient all he or she can eat, of good, nutritious food, changing the diet as a stimulus to the appetite.

5. Have the patient take plenty of rest. In summer, a hammock, so placed as to shade the head and expose the body to the direct rays of the sun, is good.

SUMMARY

Plenty of fresh air and sunshine.
A reasonable amount of exercise in open air.
Plenty of good, nutritious food.
An abundance of rest.

DISINFECTION

Premises in which tuberculous persons live should be disinfected at least once a week, and the sputum and excretions of such persons should be consigned to receptacles containing a sufficient quantity of effective disinfectant solution to submerge the same. All public houses, including hotels, halls, opera houses, railway coaches, depot waiting-rooms, churches, and school buildings, should be disinfected and thoroughly ventilated. Sunlight is one of the best general disinfectants, and should be admitted to all homes and buildings.

DIRECTIONS FOR DISINFECTING PREMISES

1. Remove all movable furniture, bedding, carpets, rugs, etc., once a week, placing same in the open air and sunlight.

2. Disinfect the room with formaldehyde gas, after plugging all openings.

3. Thoroughly ventilate the room before replacing the furniture, bedding, etc.

4. Use as a disinfectant solution in cuspidors, slop jars, etc., carbolic acid and water, five (5) parts of acid to ninety-five (95) parts of water; or, bichloride of mercury and water, one to 500.

DIRECTIONS FOR DISINFECTING DAIRY BARNS, AND FOR THE CARE OF MILK

1. Clean out all litter, excrement, rejected fodder, cobwebs and dust, thoroughly sweeping down the walls and ceilings.

2. Spray ceiling, walls and floor with a solution of bichloride and water, one to five hundred.

3. Thoroughly whitewash all parts of the barn with a wash containing one-quarter of a pound of carbolic acid and a pound and one-half of lime to a gallon of water.

4. See that the drainage from under the floors is sufficient to carry away all refuse matter. This is an important factor in keeping a healthy, clean barn.

5. See that all manure is carted away daily. We find in some instances great piles of heating manure against the outside walls, and the offensive fumes therefrom permeating all parts of the barn.

6. See that the watering troughs are cleansed two or three times a week, and only pure water given the dairy cow.

After milking each cow the milk should be carried to a scruptously clean milk room, and there strained and cooled. It should be stirred frequently until thoroughly cooled. A can of milk may be placed in a refrigerator and allowed to cool without stirring and it is certain to have a bad odor and taste, but with proper stirring while cooling this will be prevented.

THE DUTY OF LOCAL BOARDS

Local boards of health should require all such general preventive measures to be carried out under their jurisdiction. They should also require the testing of dairy herds from which milk is sold within their jurisdiction, as well as a sanitary condition of such dairy premises and utensils.

Shall we not, one and all, unitedly make sanitary war upon this insidious disease, which is the greatest menace to human life and happiness in our fair state, as well as throughout the entire civilized world?

The State Board of Health confidently appeals to the local health boards, to the progressive "press" of the state, and to the enlightened judgment of our people, for prompt and efficient co-operation in the restriction and, so far as possible, the prevention of this Great White Plague!

CIRCULAR No. 6, 1898.

INSPECTION OF ILLUMINATING OILS AND LINSEED OIL

RULES AND REGULATIONS

KEROSENE OIL

RULE 1. *The instruments* —The instrument to be used in testing oil under the provisions of chapter 11, title 12, the code, shall be that made by Eimer & Amend, New York, and shall have inscribed thereon the words: "Oil Tester, Iowa State Board of Health," and shall be constructed as shown in the following diagram:

Fig. 1 represents the instrument entire. It consists of a sheet copper stand 8½ inches high exclusive of the base, and 4½ inches in diameter. On one side is an aperture 3½ inches high for introducing a small spirit lamp, A; or, better, a small gas burner, instead of a lamp, when gas is available.

The water bath, Fig. 2, is also of copper, 4½ inches in height and 4 inches in diameter inside, provided with a flanged cover; the opening in the cover 2⅞ inches in diameter. The flange, which supports the bath in the cylindrical stand, is one-fourth inch projection. The capacity of the bath is about 20 fluid ounces, which is indicated by a mark on the inside.

Fig. 3 represents the oil cup, which is also of copper. The section below the flange is 3⅜ inches high and 2¾ inches in diameter. The section above the flange is 1 inch high and 3⅛ inches in diameter, and serves as the vapor chamber. A small flange at the upper rim serves to hold the cover, which is of glass, in place.

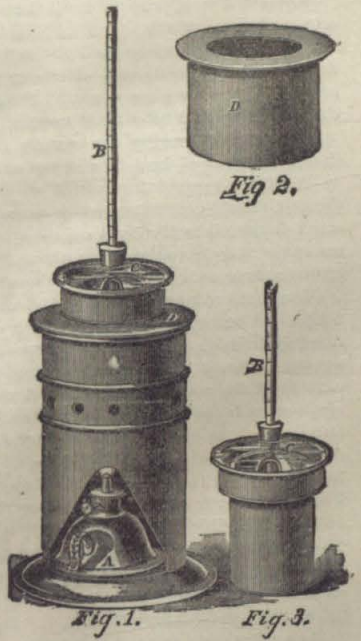

Fig 2.

Fig. 1. Fig. 3.

To prevent reflection from the otherwise bright surface of the metal, the inside is blackened by forming a sulphide of ammonia. The capacity of

the oil-cup is about ten fluid ounces, when filled to within one-eighth of an inch of the flange which joins the oil-cup and the vapor chamber.

The cover of the oil-cup, C, is of glass, three and five-eighths inches in diameter; is perforated on one side with a circular opening, which is filled with a cork, through which passes the thermometer, B. On the rim is another oval opening three-fourths of an inch deep, and the same in width, through which is to be passed the flashing jet in testing. The glass cover is used instead of metal that the operator may more readily note the exact point at which the flash occurs. A small gas jet one-fourth of an inch in length is best for igniting the vapor. Where gas cannot be had, and to prevent the frequent discrepancy in tests made by different inspectors of the same oil at different places, owing largely, if not entirely, to the difference in their torches, and to obviate the frequent annoyance from that fact, and from smoke from waxed threads filling the vapor chamber of the cup, thereby preventing an accurate and reliable test, a portable gas torch has been devised, which inspectors in this State are required to procure and use for testing products of petroleum.

THE FLASH TEST

RULE 2. The test shall be made as follows:

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

Apply the apparatus for heating the water-bath, and so adjust the flame that the degree of heating will *not exceed* two degrees per minute.

When the temperature of the oil has reached ninety degrees Fahrenheit, the test should commence by inserting the torch, which should have a very small flame, into the oval opening in the glass cover, passing it in at such an angle as to have the flame about three-eighths of an inch above the oil, and reaching near the center of the vapor chamber.

The motion must be steady and uniform, rapid, and without any pause. This must be repeated at every two degrees' rise in the thermometer until one hundred degrees is reached, when the torch must be applied at each degree of temperature until one hundred and five degrees is reached. Great care must be exercised to secure accuracy at this point, and to this end the torch must be applied just before the temperature reaches the one hundred and five degree point. If no flash is shown at this point continue the test at each two degrees' rise until the flashing point is reached, which is indicated by the appearance of a slight bluish flame ON THE SURFACE OF THE OIL. The *lowest point at which this vapor flame appears on the surface of the oil*, and a perceptible flash is produced, is to be designated as the flashing point. The temperature of the oil must be noted before the torch is applied. The flame of the torch must not touch the oil or come within three-eighths of an inch of its surface. Oil that flashes at one hundred and five degrees, or below that, must be rejected.

As cold oil will expand by heating, care must be taken that it does not rise so as to flow over or on the flange or shoulder of the oil cup. That part

of the oil cup comprising the vapor chamber and the flange must be dry and entirely free from oil. All iar bubbles must be removed from the surface of the oil; this can be done with ordinary blotting paper. The water-bath cup must be filled with cold water for each separate test, and the oil in the cup brought to a temperature of sixty to sixty-five degrees before the lamp is placed under the water-bath. The oil cup must be carefully and thoroughly wiped dry of oil from the previous test. The flame of the torch must not exceed one-eighth of an inch in length or size.

FOR TESTING THREE HUNDRED DEGREES

RULE 3. The instrument to be used for testing oils which come under the provisions of section two thousand five hundred and eight of the Code, shall consist of the cylinder shown in Figure 1 of the diagram, the copper oil cup, shown in Figure 3, the copper collar, D, for suspending the oil cup in the cylinder, and an adjustable wire support for suspending the thermometer in the oil.

RULE 4. To ascertain the igniting and burning point the test should be made as follows:

Fill the cup with the oil to be tested to within three-eighths of an inch of the flange joining the cup and the vapor chamber above. Care must be taken that oil does not flow over the flange, by expansion from heating. Place the cup in the cylinder, covered with the collar D. Adjust the wire support so that the thermometer bulb, when supported thereon, will be just covered by the oil, the bulb also being near the center of the cup. Place the lamp or gas jet under the cup. Adjust the flame so that the degree of heating will not exceed ten degrees each minute until two hundred and fifty degrees Fahrenheit is reached, when the rate must not exceed five degrees a minute above that point. The torch to be used must be the same as described in rule one, for obtaining the flash-point. Apply the torch lightly across and not less than three-eighths of an inch above the surface of the oil at each five degrees rise in the temperature. until the oil ignites and burns. The lowest point at which the oil will ignite and burn is to be taken as the burning point, and no oil which burns at a temperature below three hundred and one degrees Fahrenheit must be approved for the purposes set forth in section two thousand five hundred and eight. When approved, the package, cask, barrel, or vessel, containing the oil from which the oil tested was taken, must be branded with stencil number three, as provided in said section and rule seven. The actual point at which the oil burns must be branded on the barrel. If it burns at three hundred and one degrees, or below that, it must be rejected. In this test the water-bath cup and the glass cover are not used. the flame of the lamp being applied directly to the bottom of the oil cup.

GENERAL RULES

RULE 5. All instruments, testers, and thermometers to be used by inspectors must be approved by, and registered in, the office of the State Board of Health.

RULE 6. Inspectors must have all previous brands of tests removed from packages, casks, or barrels before affixing their brand thereon.

RULE 7. Brand number one must be circular in form, not less than

eight inches in diameter, outside measurement, with ample margin to protect the vessel or barrel from the stencil brush, and must contain the following words: "Approved, flash test ..... degrees, Iowa." And also the name of the inspector, date of inspection, and degree of test. It must also be arranged for adjustable dates, and the degrees of test.

RULE 8. Brand number two shall be square in form, not less than seven inches outside measurement, without date, and must contain the following words: "Rejected for illuminating purposes ....., inspector, Iowa." It must contain the name of the inspector; it must be affixed to all packages, casks, cans, barrels, or vessels containing kerosene which does not flash at a point above 105 degrees Fahrenheit. It must also be affixed to all packages, casks, barrels, or vessels containing gasoline, naptha, or benzene.

Brand number three shall be of like form and dimensions as brand number one, and shall contain the words: "For illuminating cars, approved (or rejected as the case may be) .....degrees, Iowa ..... 189.....Inspector." It shall have adjustable spaces for dates, degrees, and the words "approved" and "rejected." It must also contain the name of the inspector. No oil must be approved for illuminating cars that burns at a temperature below 301 degrees, Fahrenheit.

Stencil brands must conform to patterns, on file in the office of the Secretary of the State Board of Health.

RULE 9. The inspector's brand must be placed on the package, cask, or barrel, in clear, distinct letters, and must be affixed by the inspector in person, or by some person under his personal supervision and control, who is not directly, nor indirectly, interested in the manufacture nor sale of any product of petroleum. The brand of an inspector is deemed to be his official signature, and must not be permitted to pass out of his custody or control.

RULE 10. Upon the inspection of oil by an inspector, the inspector shall deliver to the owner of the oil, or the person for whom the inspection was made, a certificate of inspection, which shall be in the following form:

[STUB]

Total fees $...../100

No. barrels approved.....

No. barrels rejected.....

Total No. barrels @ .... inspected.....

For whom inspected.....

Date of inspection.....

No. of certificate.....

.....Inspector.

[FRONT]

[PRESERVE THIS CERTIFICATE]

OIL INSPECTOR CERTIFICATE

$...../100 ..... 190...

RECEIVED OF ..... DOLLARS,

..... 100

as fees for the inspection of ..... Barrels

ILLUMINATING OIL, under Chapter 11, Title XII, Code as amended by Chapters 60 and 61, Laws Twenty-seventh General Assembly.

No .....

..... Dept. Inspector.

[BACK]

APPROVED TEST.

Brand of oil.	Degrees.

REJECTED TEST.

APPROVED TEST.

Brand of oil.	Degrees.

REJECTED TEST.

RULE 11. Where oil of different grades, or standards, is placed in receiving or storage tanks, an inspection must be made, and the actual standard of oil from such tanks obtained at all times before it is put into barrels for sale and use. There must be no average test, by taking an average of the different qualities or standards of oil before it is placed in such tanks. The inspector must know the quality and standard of the oil before he affixes his brand thereon. Where a number of barrels are filled consecutively from a tank, previously inspected, an inspection of one barrel would suffice for that particular lot of barrels, *provided*, no oil has been added to the tank during the process of filling the barrels. The barreling, testing and branding must constitute one transaction. There must be no lapse of time therein. The statute requires all products of petroleum, kerosene as well as gasoline, to be inspected and branded. The branding is notice to the public of the inspection. The statute makes no distinction in the form or size of the vessel in which such product is placed. It is no less imperative that when fifty gallons of kerosene are drawn from a tank into five ten-gallon cans that the cans should be branded than that fifty gallons of kerosene taken from the same tank and put into a barrel be branded. When a product of petroleum to be used for illuminating purposes has been inspected, the fact of such inspection must be shown upon the vessel from which it is to be sold again or used. When inspected in a storage tank or tank-car, it need not be re-inspected when barreled or canned, but the barrel, can or package must be branded according to the actual standard of the article contained therein. The barrel or vessel must not be branded before filling.

Empty barrels to be subsequently filled with gasoline may be branded with stencil number three as "rejected for illuminating purposes."

RULE 12. Oil received from jobbers in barrels is frequently of various standards, and the actual standard cannot be ascertained except by a separate test of each barrel. There must be no average or cumulative tests. For instance, a sample of oil taken from five barrels of 102 degree oil and five barrels of 108 degree oil would give a mixture that would, when tested, cause the whole ten barrels to be rejected, whereas five barrels, separately tested, would have to be approved. Averages are not permissible in the inspection service. Every barrel must be tested.

RULE 13. Where oil is shipped into this state in barrels, or from one point in this state to another point in this state, that has not been lawfully inspected within this state, each and every barrel must be inspected and the oil therein tested. The testing of one barrel will not authorize an inspector to brand the entire number as of the standard of the barrel tested.

The practice of jobbers in delivering oil to retail dealers without inspection is a direct violation of law. The delivery constitutes *prima facie* evidence of sale. A retail dealer receiving a lot of uninspected oil cannot justify himself for selling such oil on the ground that the jobber is responsible to the state for the violation of law. He must immediately notify the inspector that the oil is in his possession. Inspectors must exercise diligence to arraign offenders and stop the practice. They must, with strict impartiality, insist upon obedience to law in their respective districts.

RULE 14. Oil in transit must not be inspected outside of the district to which it is sent.

RULE 15. In case of a lamp explosion the inspector in whose district the accident occurred shall immediately investigate all the facts in connection therewith and report the same to the State Board of Health.

RULE 16. Inspectors must regard their duties as inspectors paramount to all other duties, and upon notification must perform them without delay.

RULE 17. No thermometer shall be used by inspectors for testing oil unless the same has been calibrated and tested for errors at the observatory at Yale college, and a certificate secured showing the result of the calibration. A copy of all such certificates shall be sent to the secretary of the State Board of Health, and recorded in his office.

The law relating to the inspection of kerosene was amended by the twenty-seventh general assembly as follows:

Chapter 61—Appointment of Deputies. SECTION 1. Amend section twenty-five hundred and three (2503) of the Code by adding thereto the following:

"Where there are two or more inspection stations, under the jurisdiction of the same inspector, he may with the approval of the governor appoint a deputy or deputies, each of whom shall be a resident of the state and not interested directly or indirectly in the manufacture or sale of petroleum products, for all of whose official acts the principal shall be responsible, and who shall serve without additional compensation or expense to the state."

MINERS' OIL

The Code has the following relative to the sale, use, and inspection of miners' oil:

"SECTION 2493. **Purity of Oil.**—Only pure animal or vegetable oil, paraffine, or electric lights shall be used for illuminating purposes in any mine in this state, and for the purpose of determining the purity of oils the State Board of Health shall fix a standard of purity and establish regulations for testing said oil, and said standard and regulations, when so determined, shall be recognized by all the courts of the state."

"SEC. 2494. **Penalty.** Any person, firm or corporation, either by themselves, agents or employes, selling or offering to sell for illuminating purposes in any mine in this state any adulterated or impure oil, or oil not recognized by the state board of health as suitable for illuminating purposes as contemplated in this chapter, shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be fined not less than twenty-five dollars nor more than one hundred dollars for each offense; and any mine owner or operator or employe of such owner or operator who shall knowingly use, or any mine operator who shall knowingly permit to be used, for illuminating purposes in any mine in this state any impure or adulterated oil, or any (1oil that has not been inspected and approved by an inspector), or any oil the use of which is forbidden by this chapter, shall upon conviction thereof, be fined not less than five dollars nor more than twenty-five dollars."

("SEC. 2. That section twenty-four hundred and ninety-five (2495) be stricken out and the following substituted therefor: 'It shall be the duty of an inspector of petroleum products to inspect and test all oil offered for sale, sold, or used for illuminating purposes in coal mines in this state, and for such purpose he may enter upon the premises of any person. If upon test

1 Parts in parentheses as amended by the twenty-seventh general assembly, chapter 60.

and examination the oil shall meet the requirements made and provided by the state board of health, he shall brand, over his own official signature and date, the barrel or vessel holding the same with the words "approved for illuminating coal mines." Should it fail to meet such requirements, he shall brand it over his own official signature and date, "rejected for illuminating coal mines." All inspection shall be made within this state, and paid for by the person for whom the inspection is made at the rate of ten cents per barrel or vessel, which charge shall be a lien on the oil inspected, and be collected by the inspector. Each inspector shall be governed in all things respecting his record, compensation, expenses, and returns to the treasurer of state and secretary of state as provided in sections twenty-five hundred and six and twenty-five hundred and seven of the Code. It shall be the duty of the inspector whenever he has good reason to believe that oil is being sold or used in violation of the provisions of this chapter to make complaint to the county attorney of the county in which the offense was committed, who shall forthwith commence proceedings against the offender in any court of competent jurisdiction. All reasonable expenses for analyzing suspected oil shall be paid by the owner of the oil whenever it is found that he is selling or offering to sell impure oil in violation of the provisions of this chapter. Such expenses may be recovered in a civil action, and in criminal proceedings such expenses shall be taxed as part of the cost.")

In pursuance with the provisions above quoted, the state board of health at a meeting held May 11-13, 1898, adopted the following rules:

RULE 1. The specific gravity of oil used for illuminating purposes in coal mines must not exceed twenty-two degrees, Tagliabue hydrometer, at sixty degrees temperature, Fahrenheit.

RULE 2. All oil must be tested in a glass footed cylinder, one and one-half inches in diameter and eight inches deep.

RULE 3. Fill the hydrometer jar to within three-fourth inch of the top, introduce the hydrometer, cool or heat as the case may be to sixty degrees, Fahrenheit. Allow the hydrometer to come to rest, read from below, and the last line which appears under the surface of the oil should be regarded as the true reading, care being taken that the hydrometer does not touch the sides of the jar when reading.

RULE 4. Fill a round, clear glass bottle two-thirds full with the oil and shake well; the bead should not show fluorescence similar to that of petroleum products.

RULE 5. Fill an ordinary miner's lamp with the oil, light and note character and quantity of smoke.

RULE 6. All material used for illuminating purposes in coal mines shall be free from smoke, bad odor, and by-products of resin, known as mystic oil.

RULE 7. Paraffine wax should not contain more than three per cent of oil, and the maximum melting point shall be one hundred and ten degrees Fahrenheit. To test the melting point of paraffine wax, place a chip of it on hot water, then allow the water to cool slowly, and note the temperature of the water when the wax globule loses its transparency.

RULE 8. In all cases of doubt, or question as to inspection, or as to the purity of the oil or paraffine to be used in mines, a sample of the same shall be furnished the state board of health for chemical analysis.

All oils, therefore, sold by dealers, or their agents, or furnished by mine owners, or operators; or used by miners in any of the coal mines of Iowa, for illuminating purposes, shall, previous to such use, have been duly inspected and branded by some district oil inspector, legally qualified by the state.

LINSEED OIL

Chapter 52, laws of the twenty-seventh general assembly, relating to the sale of linseed (or flaxseed) oil, imposes new duties upon the state board of health and upon the oil inspectors of the state. Sections 4 and 5 relating to the "duties and powers of inspectors and board of health" and "the cost of analysis," are as follows:

SEC. 4. **Duties and powers of inspectors and board of health.** It shall be the duty of the inspectors of petroleum products, under such rules and regulations as the STATE BOARD OF HEALTH may prescribe, to enforce the provisions of this act. The violation of any of the provisions of this act relating to the manufacture and adulteration of linseed or flaxseed oil is herebv declared to be a public nuisance, and any court of competent jurisdiction is authorized, upon application of the board of health or its agents, to enjoin such violation, in the same manner as injunctions are usually granted under the rules and practice of such court. The board, its inspectors, assistants, experts, and chemists, and others appointed by it, shall have access, ingress, and egress to and from all places of business and buildings where linseed or flaxseed oil is kept for sale, stored or manufactured. They shall also have the power and authority to open any tank, barrel, can, or other vessel containing such oil, and may inspect the contents thereof, and take samples therefrom for analysis. All clerks, bookkeepers, express agents, railroad agents, or officials, employes of common carriers, or other persons, shall render them all the assistance in their power, when so requested, in tracing, finding, or inspecting such oil.

SEC. 5. **Cost of analysis.** It shall be the duty of the court in every action brought under this act to tax as costs in the cause, the actual and necessary expense of analyzing the linseed or flaxseed oil which shall be in controversy in such proceeding; provided, that the amount so taxed shall not exceed the sum of twenty-five (25) dollars. It shall be the duty of the county attorney, upon the application of the state board of health, to attend to the prosecution in the name of the state, of any suit brought for violation of any of the provisions of this act within his county.

CIRCULAR No. 8, 1901

Information, with Recommendations Respecting

SMALLPOX

AND

Rules in Relation to Quarantine and Disinfection

ISSUED BY THE

Iowa State Board of Health

Revised Edition

SMALLPOX

Definition: Small sacks—Variola—A pimple. First applied to this disease in France and Italy in 570 A. D. It is highly contagious, extremely dangerous, and a much dreaded disease by the people of all the nations of the earth. The symptoms vary very much, from the mildest type to the most malignant, the mildest type communicating the disease as well as the severest. It has existed from time immemorial in India and Africa. A severe epidemic prevailed in Rome A. D. 160, and in China A. D. 200. It did not invade England until the thirteenth century, and Germany and Sweden in the fifteenth century. It reached America, via the West Indies, early in the sixteenth century, destroying whole tribes of the natives. Outbreaks of the disease have always been very severe among the Indian tribes. In 1874–5 a half million people fell victims to the disease in India. Since vaccination has been known and practiced, it has lost much of its malignity and terror. It is computed that in the century preceding vaccination, fifty million people succumbed to the disease. McCauley called it "the most terrible of all the ministers of death." Dr. Watson says: "There is no contagion so strong and sure as that of smallpox, and none that operates at so great a distance." Susceptibility is almost, though not quite, universal. Carefully kept statistics show that no age is exempt. The negro race is especially prone to contract the disease, and its malignity is greatly increased among them.

It is an acute, contagious and infectious disease, characterized by an eruption which passes through the stages of macule, papule, vesicle, and pustule or crust, ending in desiccation and desquamation. The mucous membrane in contact with the air may also be affected. Severe cases may be complicated with cutaneous and visceral hemorrhage. If of microbic origin, the germ has not been discovered

The contagium develops in the system of the smallpox patient and is reproduced in the pustule. It exists in the secretions and excretions, and in the exhalations from the lungs and skin, and may live for months on clothing and furniture. The dried scales constitute by far the most important element, and as a dust-like powder are distributed everywhere in the room during convalescence. The disease is probably contagious during the first three or four days previous to the eruption. The poison is of unusual tenacity, and clings to infected localities, showing the absolute necessity of thorough disinfection after its termination.

One attack confers immunity for the future, except in rare instances. The lightest attack protects, as a rule, for life. A second attack, should it occur, is usually, but not always, milder. Chronic diseases of the lungs, heart, kidneys, etc., do not diminish liability. It co-exists, with other infectious diseases, such as scarlet fever, measles, whooping cough, etc.

Epidemics occur more frequently in the colder months of the year, and the disease is also more malignant during these periods. But no age, race, sex or climate is exempt.

SYMPTOMS

Smallpox occurs under three distinct heads:

I. *Variola Vera.*
   (a) Discrete.
   (b) Confluent.

II. *Variola Hemorrhagica.*
   (a) Black smallpox.
   (b) Hemorrhagic pustular form.

III. *Varioloid.*
   Smallpox modified by vaccination.

The disease is characterized by various stages:

I. That of incubation, from the time of exposure until the initial symptoms begin—seven to twenty-one days. Usually few if any symptoms occur during this period.

II. Invasion. In adults the disease is generally ushered in with a chill; children may have convulsive moments. There may be repeated chills during the first twenty-four hours, except in the milder forms of the disease. Severe frontal headache, lumbar pains and vomiting are almost constant symptoms. The pains in the back and limbs are more severe than in other eruptive fevers during this initial period.

Headache and vomiting are frequently persistent and severe. These symptoms, during the period of invasion, assist in making an early diagnosis, often days before the eruption is sufficiently characteristic to enable one to do so.

The early and rapid rise in temperature, reaching 103 to 106 degrees Farenheit, takes place frequently on the first or second day. The pulse is quick and full. Delirium in severe cases is also characteristic, especially when accompanied with high fever. There is a profound impression made upon the nervous system. The person is restless, distressed; the face flushed. The eyes may be bright and clear. As a rule the skin is clear, but there may be profuse sweats. In children these symptoms may be aggravated, especially the delirium. In this stage of invasion, and before the true eruption makes its appearance, we have in some cases what is known as initial rashes which assume a diffuse scarlatinal rash, or a darker and more measly form, with here and there petechia. As a rule the whole body is not affected with this rash, but the inner surface of the thighs, axillæ, etc.

The scarlatinal and also the measly form of the rash that may spread over great portions of the body, causes many errors in diagnosing the case. Physicians often claim the disease is something else than smallpox. But in due course of time the true eruption appears, and then the disease can be diagnosed quite readily.

III. *Eruption* occurs under two forms:
   1. Discrete.
   2. Confluent.

Usually on the third or fourth day small red spots appear on the forehead, about the roots of the hair, or on the wrists. Within twenty-four hours

after their first appearance they occur more thickly over the face and extremities, and perhaps a few on the trunk. As the rash comes out the fever subsides and the patient feels much more comfortable.

In the confluent form the initial symptoms are more severe. It is only as the disease progresses that the rash assumes the confluent form. On the fifth or sixth day the papules become vesicular; the summits become clear, circular, and soon become depressed in the center, umbilicated. Some two days later the clear fluid becomes yellow, pustular; the top becomes more rounded again, and assumes a grayish yellow appearance. An areola appears around the base of the pustules, and the intervening skin is swollen. The maturation first takes place and follows the order in which it appeared. The temperature now rises; a secondary fever makes its appearance. The swelling about the pustules is attended with a good deal of pain; the eyelids swollen and closed, especially in the confluent form, and delirium may again ensue. About the tenth day the scabs begin to dry, the fever subsides again, and the crusts now begin to fall off. By the fourteenth or fifteenth day desquamation will be far advanced on the face. There may be pustules in the mouth and throat, insomuch that the voice is thickened or altogether lost. The amount of pitting depends upon the severity of the disease.

When death occurs it is usually about the time the pustules begin to dry up, or the tenth to the twelfth day of the disease. In many of the severer cases the glands of the throat are badly swollen and sometimes suppurate.

The patient presents a terrible picture, unequaled by that of any other disease, which justifies the horror and fright which smallpox gives rise to in the public mind.

In the confluent form the virulence of the poison is greatly increased and deaths are more frequent. The period of desiccation is prolonged from three to four weeks. The crusts adhere much longer and the pitting extends much deeper.

Until the present epidemic of smallpox began, now some three or four years ago, this disease was, as a rule, easily preventable. Its fatal, loathsome character, and its terrible ravages in pre-vaccination days, had inspired the people with such a horror of smallpox as to cause them to flee from its presence, to readily submit to vaccination for protection against it, and to aid the authorities in all efforts to limit its spread. While mild, masked cases of smallpox were continually occurring, in most instances the symptoms were well marked, and the disease easily recognized, even by physicians who had not previously seen cases of smallpox.

The present epidemic is quite different in many of its features, being of such a mild type that it has added greatly to the difficulties health authorities encounter in controlling it. While but comparatively few deaths have occurred, much suffering has been caused, and a great loss to individual communities by the expenses of quarantine, disinfection, and the destruction of property; and above all, by the loss and interruption of trade. It behooves every community—for financial if for no higher reasons—to be prepared to enforce prompt, vigorous, and above all, intelligent measures to suppress the disease upon its first appearance.

II. Hemorrhagic smallpox is much more malignant and occurs under two forms. The first or the petechial form is denominated black smallpox,

death occurring in from two to six days. In the hemorrhagic pustular form the disease presents the ordinary symptoms until the vesicular or pustular stage is reached, when hemorrhage occurs in the pocks or from the mucous membranes. It is less frequent in childhood.

III. Varioloid is used to designate the modified form of smallpox, found in cases that have been successfully vaccinated. It will communicate the disease as well as the true smallpox. The symptoms vary very much from a mild form ordinarily to a quite severe one. The headache and backache may be severe. The papules appear about the third day, are few in number, and generally confined to the face and hands. There is not often pitting.

COMPLICATIONS

Considering the severity of the disease the complications may be said to be few. Laryngitis exists in some cases and extends to the nose and throat, and in severe cases produces gangrene and death. Diarrhœa occurs more frequently in children. Albuminuria exists in many cases, but true nephritis is rare. Inflammation of the ovaries or testes may occur. Boils frequently occur during convalescence. The eyes become inflamed, the lids glued together with the purulent discharge, and in severe cases the sight is destroyed. During convalescence pains in the joints resembling rheumatism are not infrequent. But the most serious complications are affections of the nervous system. Convulsions may occur in children, with delirium during the pustular state and post fibrile insanity, sometimes resulting in fatal coma.

DIAGNOSIS

Smallpox, like fire, is easily stamped out in the beginning. The disease should never be mistaken for chickenpox, cerebro-spinal fever, measles, scarlet fever, or impetigo contagioso. Great care should be exercised in making a diagnosis, and if proper care and attention are given to the clinical history and the symptoms—very few mistakes need occur even in the mildest cases.

PROGNOSIS

In persons unprotected by vaccination, smallpox in its common form is a very fatal disease. The death rate, however, varies in different epidemics, ranging from 0 to thirty per cent. The hemorrhagic forms are invariably fatal, and a majority of those having the confluent form die. In young children the mortality is indeed grave. Death results from the system being overwhelmed with the poison. Throat and lung complications, when occurring in children or in old age, are quite fatal.

PREVENTION AND VACCINATION

Vaccination is the means par excellence for the prevention and mitigation of the disease. The vaccine must be pure.

Vaccination has rarely caused undesirable results except in cases when uncleanly methods have been employed in collecting or inserting the lymph, and as at present conducted the operation is free from all objection

The protection afforded by successful vaccination is probably quite as effective as that produced by a previous attack of smallpox, but there is much uncertainty concerning the duration of this immunity. The operation

of vaccination should be conducted with aseptic precautions, and none but glycerinated lymph from a trustworthy producer should be employed. After the arm has been bared the clothing should be securely held away from the site of the proposed abrasion, and the surface should be made clean by thorough washing with warm borax water. After drying with absorbent cotton the skin is scarified in one or more places by the use of a needle which has been rendered sterile by passing it through the flame of an alcohol lamp. One drop of the glycerinated vaccine is then applied and rubbed in with the needle. The clothing should not be allowed to touch the wound until it is dry, and an improvised shield, made by using a large paper bottle-cap, held in place by two strips of adhesive plaster, extending not more than half way around the arm, affords desirable protection for the first six hours.

Vaccination, when successful, will in three or four days produce a small papule which becomes vesicular and is surrounded by a circumscribed areola. This continues to develop till the seventh or eighth day, gradually forming a crust, which falls off, showing the scar which is characteristic. This all occupies from eighteen to twenty-one days. In this State all children should present a certificate of successful vaccination before entering any school. Immediate vaccination after exposure should not be neglected.

QUARANTINE

Upon the outbreak of smallpox the physician called, or where no physician is in attendance the householder where the case may be, should immediately notify the mayor or township clerk of the same, whose duty it shall be to at once quarantine the premises as directed by the rules of the State Board of Health. They should provide for suitable medical attendance where such has not already been done. An immune nurse should if possible be provided also, and whatever may be necessary to prevent the spread of the disease and to provide for the care and comfort of the sick. Special hospitals for the care of patients suffering from infectious diseases have proved of great value in controlling the disease, and this is especially true with smallpox. Insolation of not only the sick, but also of those who may have been exposed, is absolutely necessary to prevent the spread of the disease. When the disease has become epidemic, a daily house to house inspection is necessary to prevent its spread. Also all persons who have been exposed should be vaccinated, and those whom the virus failed to take effect upon should be re-vaccinated. Cases of varioloid should always be treated as cases of genuine smallpox, as they are equally dangerous in spreading the disease. Quarantine shall be established and maintained in each and every case of smallpox for forty days. (See rules and regulations of the State Board of Health, circular No. 1.

In most instances smallpox patients will be treated in their homes. The board of health is morally, if not legally, bound to use every necessary precaution to protect the public against danger from smallpox patients. As soon as a case or suspected case of smallpox is declared, or found, a quarantine notice should be served in writing upon the head of the family, or other person responsible, requiring all inmates of the house to remain in until further notice, and prohibiting other persons from entering the house. If the case is reported as smallpox the house should be placarded "SMALLPOX." Inquiry should be made of the whereabouts of any absent members

of the household; and if they have been exposed to the disease they should be promptly returned to the house and quarantined. If any such person has left the community, and his whereabouts can be learned, the authorities of the community to which he has gone should be notified. A list of all other persons who have been exposed to the patient, as far as possible, should be written down. These persons should be found and quarantined in their homes.

What shall be considered "exposure to smallpox?"

It is possible for smallpox to be communicated during the stage of primary fever to those in close contact with the patient; there is but little danger prior to the appearance of the eruption. For practical purposes the line between exposure and non-exposure, except for the members of the household, may be fixed at the *beginning of the eruption*. It has frequently happened during the present epidemic that smallpox patients, after the eruption appeared, have been up and about; on the street, at work, or in school, so that a large number of persons were exposed. It may be difficult in such instances to determine whether all such persons, or which of them, should be quarantined. To pass such a patient upon the street should not be considered a serious exposure; to shake hands with the patient would be. If the patient is going to school after the eruption appears, all the children in that particular school-room should be counted as having been exposed; other school children would possibly be.

Good judgment must be used in deciding all such cases, erring, if at all, on the side of safety to the public.

When recovery occurs the patient should not be discharged until desquamation has entirely ceased, nor until the redness at the bottom of the pocks has disappeared. The surface of the body should then be bathed in a solution of bichloride of mercury (1 to 1,000), and afterwards washed with water. Clean clothing should then be provided.

BURIALS

Rule 24 of regulations in regard to contagious diseases, 1899, says:

"A body dead from smallpox must be immediately wrapped in a cloth saturated with the strongest disinfectant solution, 1 to 500 bichloride of mercury, without previous washing, and cremated or buried deep, and no body dead from this disease shall, under any circumstances or after any lapse of time, be disinterred.

"No public funerals shall be held after deaths from smallpox. The coffin or casket containing such bodies shall not be taken into any school house or church or any building, room, or place used for church purposes, or for any public assembly, nor shall such coffin or casket containing such body be opened, nor shall any child be permitted to act as pall bearer or carrier at such funeral. Neither shall such body be deposited in a receiving vault.

PRECAUTIONS IN THE IMMEDIATE PRESENCE OF AN EPIDEMIC

The state board of health recommends that in whatever city, village or town smallpox appears, the entire neighborhood in which there has been any communication with the patient, or exposure to the contagion, shall be notified that the *state board of health requires that every person shall be protected by vaccination;* that tramps and other persons suspected of infection with

smallpox shall be taken in charge by the police and sanitary authorities; that **employers shall advise their companies of employed persons to be vaccinated,** and in case of smallpox in their vicinity, *shall make such vaccination one of the conditions of being continued in employment*. This rule should be strictly enforced in all manufactories that make goods which are liable to become infected, and especially should be a standing regulation *in paper mills, in public houses, and among all classes employed on railroad trains and passenger vessels*.

PRECAUTIONS IN THE FAMILY

Every member of the family in which a case occurs should be vaccinated afresh.

PRECAUTIONS IN THE SICK-ROOM

The patient should be placed in one of the upper rooms of the house, the farthest removed from the rest of the family, where is to be had the most complete ventilation and isolation. The room should be instantly cleared of all curtains, carpets, woolen goods, and all unnecessary furniture. The rooms should be kept *constantly well ventilated*, by means of open windows, and of fires, if necessary. The utmost cleanliness should be observed both with regard to the patient and the room.

The nurse and patient should have no direct communication with those not quarantined. There should be no passing of notes, letters, papers, books, etc., from the sick-room to those on the outside. All food should be prepared and placed outside the room where the nurses can get it; and all remains of food, left after a meal, dishes, and everything that has been taken into the room of the sick person must be disinfected. The food remaining should be burned, dishes placed in a disinfectant solution before leaving the sick-room. Milk of lime answers well for this purpose. Towels, handkerchiefs, aprons, and all loose clothing should be placed in a basin and immersed in a solution of formalin or carbolic acid, a five per cent solution, and boiling water poured over them, or what is better, the boiling the same in the disinfecting solution, that all germs may be destroyed. For disinfecting the stools the milk of lime answers well; this should be prepared each morning, sufficient for the day; ten per cent of this should be added to sufficient water to cover the excreta, and then left standing at least two hours before it is burned or buried.

DISINFECTION.

Disinfection in smallpox should always be done by the board of health, or under its direct supervision. It requires knowledge and care to properly disinfect a house where smallpox has occurred, and this should never be left to the family. The disinfection of excretions, towels, bedding, etc., during the patient's illness, will generally be looked after by the attending physician, but the board of health is to be held responsible for the disinfection of the house and its contents after the patient has died or recovered.

Clothing, bedding, etc., which have been in contact with the patient, *and which cannot be boiled in water*, should be burned. The best plan to disinfect all fabrics that may be placed in water is by boiling them for one hour. This should be done after the rooms are fumigated.

To prepare a room for disinfection by fumigation close all exits for gas,

such as chimneys, window and door cracks, key-holes, etc. Open closet doors, bureau drawers, etc. Hang clothing, bed covers, etc., on lines stretched across the room.

Formaldehyd gas has now been shown to be an efficient disinfectant when properly used. Its advantage over sulphur is that it does not tarnish metals or injure colored goods. It can be depended upon to disinfect *only the surface* of things.

There are a number of efficient farmaldehyd generators on the market. It should be capable of rapidly generating formaldehyd gas; and should be large enough to disinfect large rooms. No less than ten ounces of the formaldehyd solution (formalin 40 per cent), should be used for each 1,000 cubic feet of air space, and proportionately larger amounts for larger rooms. Better results are claimed by adding ten per cent of glycerine to the formalin. The temperature of the room should not be below sixty degrees Farenheit. The room should be kept tightly closed for not less than eight hours. By placing a few shallow dishes containing ammonia water in the room when it is opened the fumes of the formalin may be rapidly dissipated.

After fumigation, carpets, clothing, bed covers, etc., should be hung out of doors and thoroughly aired and sunned. Dependenee should not be placed upon fumigation alone. It should be supplemented, especially for the room occupied by the patient, by washing with a disinfectant solution all woodwork, windows, window-sills, floors, etc. A five per cent solution of formalin, or of carbolic acid, or a solution of corrosive sublimate, one drachm to a gallon of water, is suitable for this purpose.

Remember that these substances are poisonous.

If the patient, during the disease, has had the liberty of the entire house, every room in it, and its contents, should be disinfected by fumigation.

CAUTION TO BE OBSERVED BY NURSES AND PHYSICIANS

There has been too much carelessness—especially during this present mild form of the disease. Nurses, after entering the ward in the detention hospital, or the sick-room, should be under a strict quarantine as long as his or her services are required; during the continuance of the service the nurse must not leave the premises nor come in contact with the well. After the close of the case or cases, he should take a full bath with some disinfectant solution, thoroughly cleansing the body, then a complete change of clean, sterile clothing.

Physicians in the discharge of their duties should exercise the greatest care, that they may not carry the germs of the disease from house to house. An outer garment completely covering the ordinary clothing, should be put on before entering the house or sick-room, and upon retiring should remove this clothing; should wash his hands, beard, hair, and other portions of the body with a solution of bichloride of mercury 1 to 1000, and sprinkle the clothing worn in the sick-room with some of the same. No physician would wilfully expose another to the germs of an infectious disease. Great caution should be observed in this respect.

APPENDIX

RULES ADOPTED BY THE BOARD.

CONTAGIOUS DISEASES

RULE 1. It shall be the duty of every physician residing or practicing within the limits of any city, town or township to give written notice to the mayor, or township clerk (as the case may be) of any case of Asiatic cholera, smallpox, diphtheria (membranous croup), scarlet fever (scarlatina, scarlet rash), typhoid fever, measles, whooping cough, leprosy, or puerperal fever, that he may be called to attend professionally, within twenty-four hours after he shall first visit and ascertain the character of any such disease named herein. In all cases where no physician is in attendance, it shall be the duty of any person having charge of, or being at the head of any family, or having the care or custody of any lodging rooms to give notice in like manner as required of physicians. Every school teacher and school officer who discovers, or who has knowledge of a case of these contagious diseases, shall cause the fact to be immediately reported to the mayor, or clerk of a township.

RULE 2. It shall be the duty of the mayor or township clerk (as the case may be), upon receiving written notice of the existence of a case of Asiatic cholera, smallpox, diphtheria (membranous croup), scarlet fever (scarlatina or scarlet rash), to forthwith quarantine the premises, by serving written notice to the occupants thereof, and placing a danger card thereon; and take such measures as may be necessary and proper for the restriction and suppression of such disease; and to investigate all the circumstances attendant upon the occurrence of the same. He shall also make proper provision for care of the sick. Where the disease is measles or whooping cough, the premises shall not be quarantined, but they shall be placarded with the danger card.

And it shall be the further duty of the mayor or township clerk (as the case may be) to disinfect or cause to be disinfected, the premises whereon such quarantined diseases have occurred, together with all infected furniture, bedding, clothing and other articles, as provided by regulations of the State Board of Health.

RULE 3. If any person shall wilfully or maliciously remove or deface, or cause to be removed or defaced, any signal of danger, or cloth or card placed upon the quarantined premises, without the proper authority as provided herein, he shall be prosecuted, as provided by law.

RULE 4. During the existence of any contagious or infectious disease, in any family, or household, or place, in any city, town or township, and until after the recovery of the sick and the disinfection of the premises where

such disease shall have existed, no person residing in such household, family, or place, shall be permitted to attend any public meeting, and no superintendent, teacher or officer of any school shall permit any child or person from any such family, household, or place, to attend any school without a permit from the mayor or township clerk (as the case may be), upon the recommendation of the attending physician, showing thorough disinfection of the person, clothing and premises. School teachers who are boarding in a family in which a contagious disease exists, must at once change their place of boarding and lodging, and change and disinfect their clothing.

RULE 10. Whenever there is complete recovery or death of persons who have been sick with a contagious disease, and there are no further exposures thereto, the quarantine may be released, although the period prescribed herein has not elapsed. *Provided*, that no release of quarantine shall be permitted until the following conditions have been complied with:

First—Seventeen days must have elapsed after the recovery or death of the last case. The attending physician and the health officer shall together determine the proper date for raising the quarantine.

Second—The entire body of the patient and exposed individuals must be thoroughly washed with five per cent solution of formalin, or with a one to two thousand solution of bichloride of mercury.

Third—In case of smallpox, attention to the following additional requirements is imperative. Unvaccinated individuals must be vaccinated at once and kept under quarantine until evidences manifest themselves that the vaccination has been successful. Requirement No. 2 must then be carried out and the individual dismissed. If the vaccination should fail to succeed in the normal period of time, the quarantine must be continued until seventeen days after date of exposure, when requirement No. 2 may be complied with and the individual released. Persons who are able to show proof that they have been efficiently vaccinated within the preceding three years before the date of exposure, are subject to requirements of No. 2 only.

Persons who have not been vaccinated within a period of three years preceding the date of exposure must be dealt with as unvaccinated individuals according to requirement No. 3.

RULE 11. After death or recovery of persons sick from a contagious or infectious disease, the room, furniture, and other contents not to be destroyed, shall be thoroughly disinfected in accordance with regulations made by the state board of health.

RULE 12. No order for the release of quarantine shall be made by the mayor, or township clerk (as the case may be), except upon a report from the attending physician stating the number of persons on the quarantined premises sick with the infectious disease in question, their names, ages, and when the disease first appeared in each case, when recovered, and the means, if any, used for disinfection. If the mayor or township clerk (as the case may be), shall find that the regulations of the local board and of the state board of health respecting quarantine and disinfection have been complied with the quarantine shall be forthwith released. If quarantine regulations have been complied with, and proper disinfection has not been done, the mayor, or township clerk (as the case may be), shall order it done under

the supervision of the health officer or some other competent person, and the quarantine shall be continued until it is done.

RULE 13. No person shall give, lend or sell, or offer for sale, any clothing or other articles liable to convey infection of any contagious disease unless the same have been disinfected and such disinfection approved by the mayor or township clerk (as the case may be).

RULE 14. When Asiatic cholera, smallpox, diphtheria (membranous croup), scarlet fever (scarlatina, scarlet rash), typhoid fever, leprosy, measles, puerperal fever, or any other contagious disease exists in any house or dwelling place of a dealer in, or seller of, milk he shall discontinue, to give, sell or distribute milk to any person, or to creameries or butter factories, or in anywise handle such milk, until a permit is granted therefor by the mayor or township clerk (as the case may be), countersigned by the health officer. And no person who attends cows, and does the milking, or has care of milk vessels, or the sale or distribution of milk, shall be permitted to enter any premises or place wherein exists any of the diseases named herein, nor have any communication, direct or indirect, with any person who resides in, or is an occupant of such infected place; nor shall any milk or butter be given away, sold or distributed from such infected place. Any person, either as principal, agent or employe, who shall violate any of the provisions of this rule shall be prosecuted according to law.

CIRCULAR No. 6

RULES FOR THE PREVENTION AND RESTRICTION OF CONTAGIOUS DISEASES AMONG DOMESTIC ANIMALS

OFFICE OF THE IOWA STATE BOARD OF HEALTH,
DES MOINES, January 19, 1898.

Pursuant to authority vested by chapter 14, title 12, of the Code, section 2530, the state veterinary surgeon by and with the approval of the State Board of Health, and the executive council, does hereby make and establish the following rules and regulations for the prevention and restriction of contagious diseases among domestic animals:

RULE 1. All cattle brought within this State from any county or parish within the United States where pleuro-pneumonia is known to exist, shall be subject to quarantine for a period of not less than sixty days.

RULE 2. No person owning or having the care or custody of any animal affected with glanders or farcy, or which there is reason to believe is affected with said disease, shall lead, drive, or permit such animal to go on or over any public grounds, unenclosed lands, street, road, public highway, lane, or alley; or permit it to drink at any public water trough, pail, or spring; nor keep such diseased animal in any enclosure, in or from which such diseased animal may come in contact with, or close proximity to, any animal not affected with such disease.

RULE 3. Whenever notice is given to the trustees of a township or to a

local board of health, of animals suspected of being affected with glanders or farcy, said trustees shall immediately require such suspected animals to be isolated and kept separate and apart from all other animals until released by order of the state veterinary surgeon or some person acting by his authority.

RULE 4. An animal must be considered as "suspected" when it has stood in a stable with, or been in contact with an animal known to have the glanders; or if placed in a stable, yard, or other enclosure where a glandered animal has been kept.

RULE 5. Whenever any animal affected with anthrax, glanders or farcy, shall die, or shall be killed, the body of such animal shall be immediately burned, or shall have kerosene poured over it, and buried not less than four feet deep without removal of the hide, or any part of the carcass.

Reasons for Rule 5.—To prevent the possibility of a recurrence of these diseases from germs existing in the grave, which, if not destroyed by some powerful agent, will retain their vitality for a number of years, so as to impart the disease.

As they are communicable by inoculation to human beings, great precaution should be used in handling animals affected with this disease.

RULE 6. No animal diseased with glanders or farcy shall be deemed to have any property value whatever, and no appraisal thereof will be made.

Reasons for Rule 6.—Glanders is an incurable disease, and there is no warrant for expending public money in appraising property manifestly worthless, and which can be compensated for only at "its actual value in its condition when condemned." Also to prevent the introduction of diseased animals into the state, and the inoculation of worthless ones for speculative purposes.

RULE 7. Whenever the owner, or person having in charge any animal declared by the state veterinary surgeon or other authorized person to have the glanders, shall neglect or refuse to destroy said animal, the premises whereon such animal is kept shall be quarantined until such animal is destroyed and the premises thoroughly disinfected.

QUARANTINE

RULE 8. The term "quarantine" shall be construed to mean the perfect isolation of all diseased or suspected animals from contact with healthy animals, as well as the exclusion of such healthy animals from the yards, stables, enclosures, or grounds wherever said suspected or diseased animals are, or have been, kept.

RULE 9. So-called "piggy" or pregnant sows and rejected cattle found in railway or packing-house stock yards must not be sold nor delivered to farmers, but held subject to such quarantine as may be deemed necessary to prevent the communication of any contagious disease.

RULE 10. All hogs presented for the Iowa State fair and Sioux City fair shall be subject to examination by the state veterinary surgeon before entering the fair grounds, and to daily inspection during the exhibition. Should any animal be found diseased with hog cholera or swine plague, it must be immediately removed to a place of quarantine. The show-pens must be cleansed and disinfected under the supervision of the state veterinary surgeon before and during the fair.

RULE 11. In suspected cases of glanders and farcy, when the symptoms do not warrant the state veterinarian in condemning the animal, the Mallein test shall be recognized as a valuable diagnostic.

RULE 12. In suspected cases of bovine tuberculosis the tuberculin test shall be recognized as a valuable diagnostic.

DISINFECTION

Among the most efficient and convenient agents for destroying disease germs, are heat, solutions of creolin, carbolic acid, sulphate of iron, caustic soda, or sulphate of copper, fumes of chlorine, chloride of lime, slaked lime, lime water, whitewash and kerosene oil.

Heat—This is conveniently applied by means of boiling water or oil, and is especially recommended for disinfecting fabrics of all kinds, leather or wood. Articles of iron or other metals may be purified by heating in a fire. All bedding, litter, excrement, etc., that have accumulated about animals affected with any form of contagious disease, and the carcasses, together with all blood or other fluid elements that have escaped from such carcasses and contaminated soil should be burned, as surest means of eradicating the disease.

Dirt or earth floors of stables wherein animals affected with glanders or anthrax have been kept, should be removed to the depth of four inches and burned.

SOLUTIONS

Creolin—One to fifty or one hundred parts.

Carbolic Acid—Add one part of the acid to five or ten parts of water or oil.

Sulphate of Iron, Copper and Caustic Soda—Add as much of the substance to a given quantity of warm water as will be dissolved.

Whitewash—For disinfecting interior walls of buildings, feed-boxes, mangers, yards, fences, etc., the application of a coating of whitewash prepared from lime in the ordinary way, so thoroughly done as to completely cover every part of the surface designed to be cleansed, is an economical method.

FUMIGANTS

Chloride of Lime—Chloride of lime and slaked lime for disinfecting floors, yards, carcasses and ground where dead or diseased animals have lain, in fine powder, should be scattered over the surface of objects to be disinfected thickly, so as to form a complete covering.

Chlorine—To generate, take peroxide of manganese (to be obtained at any drug store), place in an earthen dish and add one pound of hydrochloric acid (sometimes called muriatic acid), to each four ounces of the peroxide of manganese. Care should be taken not to inhale the gas.

After the floors, walls, etc., of a contaminated building have been cleansed, they should be fugimated by some of the foregoing agents. The doors should be closed, and the building otherwise made as tight as possible. Fumes should then be evolved in the building for not less than half a day, and the doors kept closed not less than twenty-four hours, when air and sunlight should be freely admitted.

BURIALS

Kerosene Oil—Carcasses buried in the earth, where there is danger of infection by exhumation by other animals should, previous to burial, be thoroughly covered with quicklime, or saturated with kerosene oil. This will tend to destroy the virus, and will prevent carnivorous animals disturbing the carcass and thereby spreading the disease.

Freezing—It has been demonstrated repeatedly in Iowa, that the frosts of winter thoroughly disinfect pasture lands that have been poisoned with the virus of Texas fever by herds of southern cattle during the summer months. From the first of April to the first of November, the virus is likely to retain its vitality, and the strictest precaution is necessary to prevent communication of the disease to northern cattle. The purifying effect of frost, however, cannot be relied upon for destroying the virus of any other disease than Texas fever, liable to attack live stock in Iowa.

It is for the interest of every community, on the appearance of contagious or infectious disease among animals, to adopt speedy measures to eradicate

the same, and to co-operate with the state veterinary surgeon in securing such results in the shortest possible time.

Approved, January 19, 1898.

NOTE—Chapter 14, Title 12, Code published with this circular will be found in the appendix of this report.

[Form 90B—1898.]

REGULATIONS FOR THE USE OF KEROSENE, GASOLINE AND PETROLEUM PRODUCTS.

OFFICE OF THE STATE BOARD OF HEALTH,
DES MOINES

Kerosene may be said to be the middle product of petroleum, the upper being several volatile hydro-carbons known under the general term of naphtha, a highly inflammable substance, and the lower, of paraffine, heavier and less combustible than kerosene. Naphtha is a very dangerous explosive. An excess of naphtha in kerosene renders the kerosene dangerous. An excess of paraffine makes the kerosene heavy and less combustible.

The statutes of Iowa demand that so much of the naphtha shall be removed that oil, when heated to a temperature of one hundred and five degrees Fahrenheit, will not throw off a vapor which will ignite when in contact with a flame or lighted match. That is what is termed the flashing point. Extensive observation and experiment have demonstrated that this standard will give satisfactory results for illuminating purposes and be safe for use in ordinary lamps. It would not, however, be safe for kindling fires in the kitchen stove. No oil having a flashing point below one hundred and five degrees can be lawfully sold nor used for illuminating purposes in this state.

The flashing point should not be confounded with the burning point, or fire test, which signifies that degree of temperature or heat at which oil placed in an open vessel will ignite and burn without a wick. The fire test is not recognized by the Iowa statute, and has little or no value as determining the actual quality of the oil. Retail dealers should especially bear this in mind. Refiners and tank line companies frequently brand oil "one hundred and seventy-five degrees Fire Test," "Head Light, one hundred and seventy-five degrees," or other trade marks which have no relation whatever, under the law, to the actual quality of the oil. The brand of an Iowa inspector, indicating the flashing point, is to be deemed the actual quality and standard of the oil. The difference between the flashing and burning point of kerosene is ten to fifty degrees, the average being twenty to twenty-seven degrees, so that oil branded one hundred and seventy-five degrees fire test should have a flashing point of one hundred and twenty-six degrees. Hence, no person should be misled or deceived by the dealer who says an oil is one hundred and fifty degrees or one hundred and seventy-five degrees fire test. Look at the inspector's brand, get the degree of the flashing point there given, and add twenty-seven to it, and you will have very nearly the actual fire test. The law interposes no inhibition against trade marks,

except that no trade mark asserting a fraud can stand. The branding of oil one hundred and seventy-five degrees fire test that has a flash test below one hundred and twenty-six degrees is clearly an attempt to defraud the purchaser.

The flashing and burning points are independent of each other. The flashing point depends upon the amount of naphtha or volatile substance present, while the burning point depends upon the general character of the whole oil. The addition of only two per cent of naphtha would not affect the burning point, while it would lower the flashing point ten degrees. Hence the burning point or "fire test" is not deemed a reliable standard of safety.

The tendency of retail dealers is to purchase oil having a high flashing point, presumably on the theory that if oil having a flashing point of one hundred and six degrees is safe, that of one hundred and twenty-six degrees is so much safer. Theoretically that is true, but the higher the flashing point, the heavier the oil. Heavy oil congeals more or less in cold weather, will not rise freely, hence there is imperfect combustion. There is a limit to capillary attraction. Oil having a flashing point of one hundred and six degrees to one hundred and ten degrees will give better illumination, burn freer and with greater satisfaction in ordinary lamps, than an oil with a flashing point of one hundred and twenty degrees or one hundred and twenty-four degrees.

Heavy or high grade kerosene has more or less paraffine, which tends to harden and clog the wick, and over-heat the wick-tube. Such oil will not give good satisfaction in ordinary flat-wick lamps, and should be used only with burners and wicks especially adapted for heavy oil. The fire test of oil is made in an open cup. The flash test, under the Iowa law, is made in a closed cup. It is proper here to say, for the benefit of retail dealers, that experiments made covering thousands of tests have shown that the average difference between the burning and flashing point of oil when both tests are made in the same cup, is from twenty to twenty-seven degrees. The average difference between the flashing point of oil tested in an open cup, and the same oil tested in the Iowa (closed) cup is twenty-five to thirty degrees. The difference between the burning point of oil tested in an open cup and the flashing point of the same oil tested in the Iowa (closed) cup is from fifty to fifty-five degrees. Hence, commercial headlight carbon oil, that has a burning point, or fire test, of one hundred and seventy-five degrees tested as it always is by the refiner, in an open cup, should have a flashing point of one hundred and twenty-five degrees (minimum) to one hundred and thirty degrees when tested in the Iowa cup (closed). The specific gravity should not be above forty-five degrees Baume at sixty degrees Fah. If deficient in these requirements, as shown by the inspector's brand, a carbon oil cannot be deemed true commercial headlight oil.

LAMPS

Lamps should be of metal. Glass lamps should not be used in families where there are children. The bowl should be large in diameter, and shallow, not exceeding three inches in depth, so as to bring the flame as near the oil as possible, to secure an even combustion of all the contents. With deep lamps the wick will fail to raise the oil when half consumed; a crusted tube and over-heated burner, and deficient illumination is the result.

The base should be large and heavy, to prevent overturning.

They should be cleaned and filled every day, and once each week entirely emptied of their contents, to remove dregs and sediment.

When oil has been kept forty-eight hours in a half-filled lamp, a dangerous vapor forms. This will be released by the process of filling the lamp.

Never remove the top nor refill a lamp when burning.

Before lighting, turn the wick down even with the tube, and raise it gradually, from time to time, as the burner becomes heated.

Never blow down a chimney to extinguish a lamp. Turn the wick down until the flame flickers, then place your open hand behind the chimney top and give a quick puff of breath horizontally against your hand.

Do not fill a lamp to overflowing, as oil expands greatly as it becomes heated, and may rise up the wick tube and become ignited and dangerous.

During the day keep the lamp where the oil will not become warm. Never set it on a mantel over a fire-place, grate, or stove where there is a fire.

Never leave a lamp burning with the wick turned town. Air currents are liable to cause the chimney to break; the wick tube will then become greatly heated, and the lamp filled with dangerous vapor. A burning lamp with a broken chimney becomes liable to violent explosion in about fifteen minutes. A lamp should not be left burning at all in a vacant room or house. If a dim light is desired for a sick-room, place the lamp in another room, burning at the usual flame, leaving the connecting door ajar. Never leave a lamp turned low in a sick-room, nor for a "night light." Several explossions have been caused by this practice. Let the flame be at usual height at all times when in use.

BURNERS

The burner should be adapted to the oil to be used, whether heavy or light. It should be properly constructed for draft and ventilation for the escape of vapor from the vapor chamber of the lamp. It should burn without heating the burner—the cooler the better.

For heavy oil, a more liberal wick is required to raise the oil freely enough to supply the flame, hence two or more wicks are provided.

Burners should be kept perfectly clean inside and outside, and free from pieces of burned matches, charred wick, crustation on the wick tube, and accumulation of charred wick on the perforated disk. The disk is for the purpose of supplying draft and the necessary amount of oxygen of the atmosphere to consume the carbon of the oil. When the disk is clogged, imperfect combustion and smoke are the result.

Foul and ill kept burners are a more frequent cause of poor light than the oil.

To clean the wick turn it up even with the tube and rub the finger lightly across it to remove the charred surface.

Keep the vent-tube along the wick-tube into the lamp open and clean, as it is the safety valve of the lamp.

Gummed and clogged burners can be easily cleaned by boiling a few minutes in sal-soda or concentrated lye and water.

The important features of a lamp are safety, brilliancy of illumination, economy, cleanliness and durability. It becomes dangerous when the oil in

a lamp is heated over one hundred and six degrees. The space above the oil in a lamp in which the oil is unduly heated becomes filled with a highly explosive naphtha vapor. The higher the temperature of the oil, the more naphtha vapor is thrown off.

CHIMNEYS

It is desired to impress upon the people that the chimney is an important factor in illumination. It is, in fact, a necessary part of the burner, as much as is a gear wheel of a machine. It is made for the burner. Every burner made is a patented device, and requires a special chimney to secure the intended perfect combination. Over two hundred shapes of chimneys are made. If your stove or fire-place smokes, the chimney is wrong. If your lamp smokes or smells, the chimney is wrong, not the lamp nor the oil. If the draft is right, and a chimney on the lamp it is made for, there is perfect combustion; no smoke, no bad odor. The top should be cylindrical in form to secure the best draft.

WICKS

Probably not one person in one hundred gives a lamp wick thought or attention. Yet it is one of the most important factors in the burning of kerosene, as it is also one of the very probable causes of complaint of the unsatisfactory burning of oil. The markets are filled with cheap wicks, worthless and valueless at any price. Select a wick which will snugly fit the tube, yet move freely when saturated with oil. If it binds in the tube draw a few threads from it lengthwise. It should only reach the bottom of the lamp, and should be changed each month, as from long use it becomes hardened and does not raise the oil freely.

SAFETY BURNING FLUIDS AND LAMPS

The sale or use of so-called safety fluids, or of any oil for illuminating purposes, the product of petroleum, which has not been inspected in this state, and approved by a state inspector, is prohibited by law, except gasoline of seventy-four degree specific gravity may be used in the Welsbach incandescent lamp.

GASOLINE AND ITS DANGERS

First—Keep it in a well ventilated, cool place, inaccessible to children, never in any part of a dwelling.

Second—No unclosed vessel, as a pitcher, basin, or cup, containing gasoline should be carried or placed within ten feet of a burning stove, lamp, gas or flame of any kind, nor left standing in any room within a dwelling house.

Third—Gasoline should never be poured from one vessel to another in any room in which there is a lighted lamp or a burning gas jet, an open grate burning, or within ten feet of a stove in which there is a fire, as the current of air in a room is always toward a fire or a burning lamp, and the vapor of gasoline will be carried in that direction and will ignite at a long distance.

Fourth—It is dangerous to fill the reservoir of a stove when the burner is lighted, or near another stove in which a fire is burning. When not in use, close the cut-off between the reservoir and burner. This will prevent overflow from defect or leakage at the burner. If there be an overflow of

gasoline when filling the reservoir, or from the burner, wipe it carefully up before lighting the burner. If the overflow should become ignited smother it with a blanket or cloths. Do not throw water on it, as that spreads the gasoline and increases the danger. Flour will squelch the flames quickly. This is true of the accidental ignition of any quantity of gasoline or kerosene. Keep the reservoir continually closed air tight.

Fifth—If from leakage of a stove, or vessel, there is discovered an odor of gasoline in a room that has been closed, throw open the doors and windows until the air is changed before a match is struck, or a flame of any kind is permitted therein.

Sixth—Never kindle a fire with gasoline.

Seventh—Keep gasoline in a tight vessel, and after drawing therefrom place the cap over the spout and close the neck and vent-tube if there be one. This will prevent evaporation of the fluid. It is from evaporation, filling the air with an explosive vapor, comes the danger.

Eighth—Never attempt to clean gloves on the hand nor dresses with gasoline, near a flame or stove. The fire from the stove will draw the vapor from the gasoline through the crevices, and ignite it like a lightning flash. If gasoline is spilled upon your clothing remove the garment at once, keeping entirely away from flame of any kind. The deodorizing of gasoline for toilet use does not change its explosive nature.

[CIRCULAR No. 15—1898]

DISINFECTION OF WOOLEN-RAG MATTRESSES, BED QUILTS, CARPETS, RUGS AND UPHOLSTERED FURNITURE.

RULES AND REGULATIONS

It having come to the knowledge of the Iowa state board of health that the ordinary "wool" or rag bed-quilts and mattresses manufactured in Iowa, or imported into the state and largely sold therein, are composed of unsanitary and often filthy materials, and, therefore, are a menace to the public health; further, that it is a fact that danger to the public health also lurks in the upholstered furniture, the carpets, the mattresses and bed clothing stored for sale in the numerous second-hand stores of our towns and cities; and further, as we have reason to believe that the present methods of carpet cleaning, as exemplified in the carpet-cleaning establishments of cities and towns, are also menaceful to the public health; therefore, the Iowa state board of health decrees the subjoined rules, devolving upon local boards of health in this state, through the health officers thereof, the duty of their early and strict enforcement.

RULE FIRST

The proprietors, or managers, of all factories or stores in Iowa, which are devoted in whole, or in part, to the manufacture of so-called woolen-rag bed-quilts and mattresses, from and after the publication of these rules, are required to cause all rags, collected for use in the aforesaid industry, to be dusted, torn into small fragments, and rinsed in clean water—preferably under a forcible hydrant stream – before they are used in the manufacture of the woolen-rag bed-quilts and mattresses aforesaid; and when the completed article is ready to be put on the market, it shall, before being offered for sale, be thoroughly disinfected in the manner specified hereinafter. This rule as to the disinfection of completed woolen-rag mattresses and bed-quilts shall also apply to such articles elsewhere manufactured and imported into, and put on sale in, the state of Iowa.

RULE SECOND

It is ordered: That all mattresses sent to mattress factories for renovation, shall be subjected to thorough disinfection before being returned to their owners.

RULE THIRD

It is ordered: That all venders of second-hand upholstered furniture, bed-clothing, carpets, rugs and mattresses, shall be required to disinfect such articles, in the manner hereinafter specified, before putting them on sale

RULE FOURTH

It is ordered: That all articles named hereinbefore, after having been disinfected in the manner specified hereinafter, shall, as evidence of that fact, have securely attached to each one a label, on which is printed, in large type, these words: "DISINFECTED IN ACCORDANCE WITH THE RULES OF THE IOWA STATE BOARD OF HEALTH." Said label to be provided and attached at the expense of the manufacturer or vender, under the possible supervision of the local health officer.

RULE FIFTH

It is ordered: That all carpets, rugs, etc., sent to a carpet-cleaning establishment for the purpose of being cleaned, shall be disinfected, after the dusting process has been completed, and in the following manner, to-wit: The carpets, rugs or other articles that have thus been cleaned in the said carpet-cleaning establishment shall at once be sprayed with a two-per-cent solution of formaldehyde, in the proportion of one fluid ounce of that agent to each square yard of carpet, rug or other article. Then, immediately, said article shall be tightly rolled and placed aside in a clean apartment, where it shall remain for at least ten hours undisturbed, before being returned to the owner. To each article thus disinfected, the label, prescribed in rule fourth, shall be attached, showing that the disinfection required by law, has been done. The local health officer shall exercise a general supervision over these carpet-cleaning establishments also.

RULE SIXTH

For the information of those concerned, the subjoined explanation of the inexpensive apparata and methods, necessary to be employed to carry into effect these rules, is now given. In mattress factories or second hand stores a tight, pine board box, planed within, should be provided as a disinfecting chamber. It should be sufficiently large to hold a dozen mattresses, etc., at once. They should be separated by slat partitions, onto which the mattresses, etc., should be placed flatwise. In second-hand stores such a disinfecting chamber would hold a variety of upholstered furniture, on top of which mattresses or other articles of bed wear could be spread out.

Then a copper or tin receptacle, cylindrical shape and holding at least one-half gallon, having a screw top, *fitting absolutely air tight*, should be provided. A substantial metal support carries this receptacle or can and holds beneath it an alcohol lamp or other heating device. If an alcohol lamp, it should give a flame sufficiently large to spread over the entire bottom of the receptacle and hold not less than eight ounces. If other means of heating are used they must produce very rapid boiling of fluid in the receptacle. *Slow heat will not produce the required results.*

At or near the top of the apparatus is a metal tube connecting with the interior and fitted with a flexible rubber tube which terminates in a metal or hard rubber nozzle. The apparatus must be so made that it will not clog, or serious explosions may occur.

In one lower corner of the disinfecting chamber a small hole is bored through its wall. When the articles to be disinfected are well adjusted in the

aforesaid chamber, place in the can the disinfecting agents—that is to say, one ounce of powdered borax to each pint of forty per cent solution of formaldehyde (formaldehyde alone cannot be used). Such a can as that described above would hold four pints of formaldehyde and four ounces of powdered borax. The materials being thus placed in the can, fill the alcohol lamp with best alcohol, light and place it under the can. Introduce your metal or hard rubber tube into the hole bored into the box and then leave the apparatus to work for at least forty minutes after it commences to boil. The formaldehyde will have become vaporized and will have filled the chamber. Then remove the tube from the chamber and tightly plug the hole, leaving the box undisturbed for at least twenty-four hours. The purpose had in view will then have been accomplished.

CIRCULAR No. 9

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EMERGENCY HOSPITALS

Emergencies are liable to come to any community demanding hospital accommodation and service. The importation of contagious disease by an infected tramp or immigrant is possible and liable at any moment. Floods and conflagrations are also imminent. Every city and town in the state should be prepared for such an emergency, and thereby save what might otherwise cost life and property. Believing that a knowledge of temporary hospitals, cheaply provided, would be of value, the following plans and estimates are suggested, the illustrations for which are given by courtesy of the Provincial Board of Toronto, and the Pennsylvania State Board of Health:

For comfort, security, and thorough ventilation, this tent is the nearest approach to a house in tent form.

Dr. F. H. Brown says of tent hospitals: "The more nearly patients are brought to the condition of being treated in the open air, the more quickly and surely will they recover. The wooden barrack, and the hut, are good, but in many cases the tent is better."

Dr. J. H. Kellogg, of Battle Creek, Mich., writes in Handbook of Hygiene and Medicine: "During the late war a large hospital had in the winter season three hundred and twenty cases of measles. Just at this time it took fire and burned to the ground. The patients were placed in tents, and all but one or two recovered. If the patients had remained in the hospital there is no doubt but thirty to forty, at least, would have died. At one time, one hundred men, but slightly ill, were sent to the general hospital at Nashville, and seventy-five of them died."

FIG. 1—HOSPITAL TENT

SIZE—24x14 Four rooms, 7x7 (two in each end), and one larger room, 14x10, through the centre. The divisions are of sheeting, to slide on cord, and the same heighth of the tent wall. The tent poles are twelve uprights, one ridge pole ten feet long, and twenty-two wall poles six feet long.

MATERIAL—Ten-ounce white or nine-ounce striped duck of best quality.

COST—Complete, with poles, stakes, guys, etc., about sixty dollars. Flooring, beds and furniture are, of course, extra.

FIG. 2—COOK TENT

Size, 7x7 feet, wall four feet high. Material, ten-ounce white duck, best quality. Cost, completed, with poles and stakes, not including furniture and utensils, about $12.00.

Such hospital tents have been in use in Berlin, Vienna, Dresden, Leipsig, and other European cities for many years, with great success.

A more permanent structure is in use in Geneva, Switzerland, and is known as "Pavilion Hospital," an illustration of which is here given from "*La Nature*."

The movable canvas walls give complete ventilation, and, on pleasant days, gives the open air, while they protect at night, and against inclement weather. In winter these walls are double, the ridge construction affording ample ventilation.

To provide for contagious diseases not advisable to admit to the general hospital, what is called a "hut" is recommended, an illustration of which is here given from Wylie's excellent work on "Construction and Organization of Hospitals."

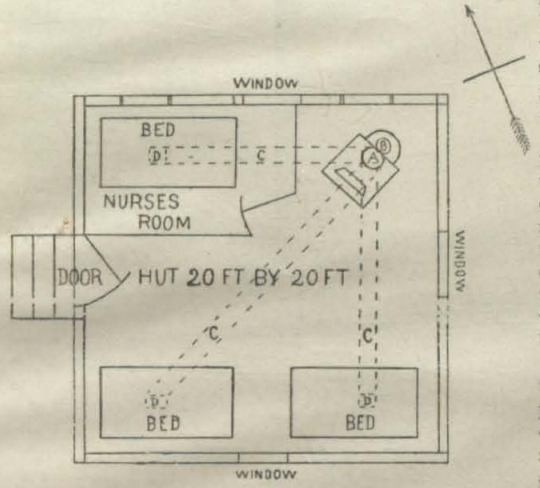

FIG. 4—ISOLATING WOODEN HUT—(Wylie.)

A—Stove. B—Smoke flue. C—Air conductors under floor from under each bed to stove. D—Openings into air ducts.

These huts are planned to have two fresh air ducts from the roof down to within seven feet of the floor, and there provided with scatter boards.

Frame structures are more permanent and durable, and may be used at all seasons. In winter they are warmer than tents. Portable frame houses can be procured, sufficient in size to accommodate a few patients, and with proper arrangement for ventilation will serve admirably as pavilion hospitals. They can be quickly set up, and if necessary quickly destroyed, and their cost is not great. Illustrations are here given of such a structure:

Every city and town should be provided with one or more such buildings, which can be stored in small space until an emergency necessitates their use. Time is an important factor in suppressing a contagious disease in a community. The sooner isolation of the risk is secured, the more certain are favorable results, and nowhere can proper isolation be more completely secured than in an isolation hospital.

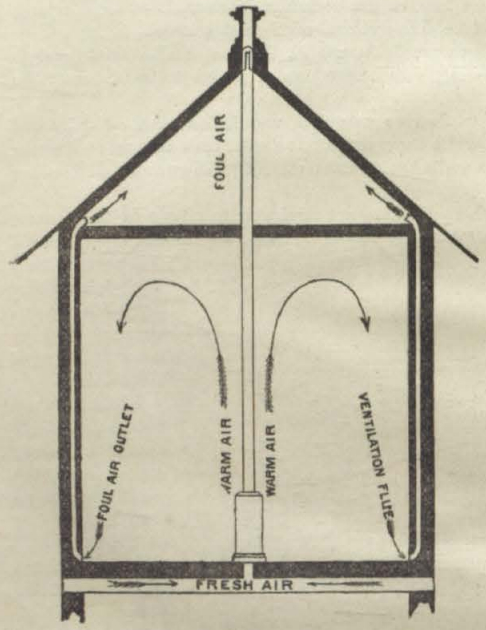

FIG. 7—PROVISION FOR "RIDGE" VENTILATION—(Hatchison.)

Isolate the first case of a contagious disease, so that others cannot be exposed to it and there will be an end of it—there will be no epidemic. With every additional case the danger of spreading is multiplied rapidly. This is the true purpose of an isolation hospital—to prevent epidemics by segregating the first case in a community.

One of the most important essentials of a hospital is ventilation. The illustration shows an admirable plan to secure this.

Whether pavilions or tents are used, portable or permanent, they should be trenched around to prevent dampness.

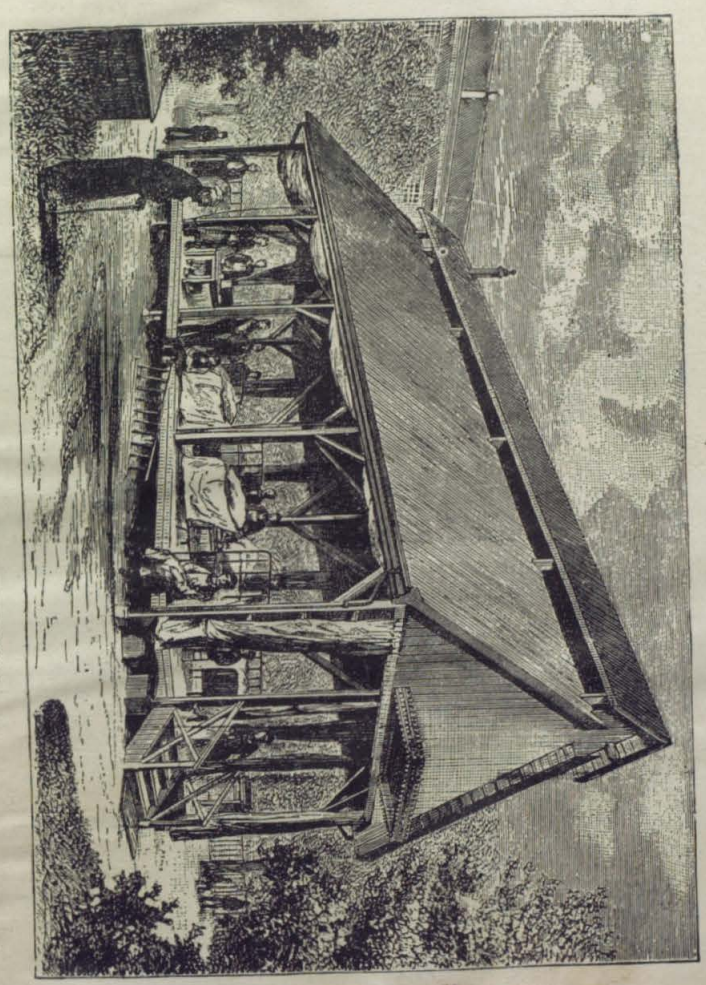

FIG. 3—PERMANENT PAVILION HOSPITAL

FIG. 5—PORTABLE HOSPITAL PAVILION—EXTERIOR

FIG. 6—PORTABLE HOSPITAL PAVILION—INTERIOR

In locating a hospital the healthiest possible location should be selected. It should be in an open field, on high, dry, porous ground, but protected so far as possible, from chilling winds. In summer a tree-sheltered field or orchard, with grass soil is an excellent location. Pleasant surrounding scenery is also desirable. Avoid valleys and neighborhood of swamps, marshes, open sewers, or offensive factories, and slaughter-houses most rigidly.

Secure also an ample supply of pure water.

No furniture should be used that will absorb or harbor disease germs. Bedsteads should be of iron and nickel-plated. The mattresses should be of wire. The beds should be of two-thirds the usual size. No upholstered furniture should be used.

When completed do not condemn it and excite public abhorrence by calling it a "pest house." Give it any name but that, which invariably shocks the sensibilities of every human being.

A very commendable and inexpensive permanent frame isolation hospital was planned by St. Thomas' local board, an illustration of which is here given.

The addition of another story over the kitchen and dining room would provide dormitories for nurses. By placing a tank above the furnace, and taps on pipes, hot water could be carried to each room.

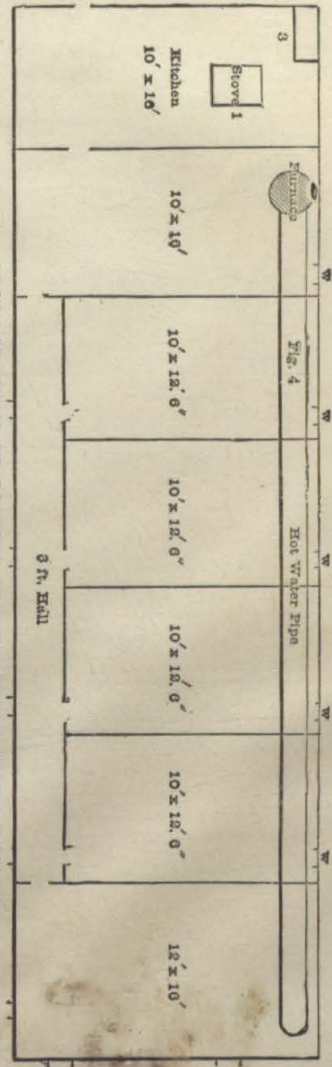

FIG. 8. CROSS SECTION OF GROUND FLOOR OF ISOLATION HOSPITAL.
1, cooking stove; 2, Baker furnace—combination of hot water and steam; 3, cupboard; 4, heating pipe, alongside of wall the length of building.

INDEX.

A

B

C

D

E

F

G

H

I

R

S

T

U

V

W

Y